THE/NUDGE INSTITUTE

Study of India's Safe Food Industry & Challenges Faced

Understanding demand-led farmer transition

FEBRUARY 2024

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Background

The Nudge Institute has researched solutions for a sustainable increase in small and marginal farmers' income. Our Agri-IKIGAI initiative is working on both sides of the climate challenge, i.e. to understand the impact of climate change on smallholder farmers as well as identify solutions to reduce the effects of climate change on farming income.

During our primary research with smallholder farmers, climate change was identified as one of the critical challenges for farmers. Our "Agri-IKIGAI" initiative is working on both sides of the climate challenge i.e. to bring out the voices of smallholder farmers and identify solutions to alleviate the impact of climate on farming. We identified Agri-IKIGAI solutions, those agricultural practices that are (a) Good for farmers- leading to sustainable income increase (b) Good for the environment - having a positive impact on soil, water, and GHG emissions, and (c) Good for consumers- better for human consumption.

Identifying the Agri-IKIGAI solutions mentioned above prompted us to understand what changes in the ecosystem will bring about transitions in the farmers' existing cultivation practices to the proposed practices. Based on our understanding, we believe that farmers' adoption of safe food practices, like organic, natural, residue-free farming, etc., is driven by the demand for its produce, and there needs to be more buyers/demand for such produce.

To augment our comprehension of the challenges in demand-led transition and to gain deeper insights into the safe food market in India, we facilitated a roundtable discussion. We engaged in consultations with key industry stakeholders. We also complemented this with supply side, or farmer groups and our on-field experience. Our goal was to understand the complete transition process from consumer demand to farmer production. This community paper is an outcome of that research. It highlights the challenges the domestic market players face and recommendations that companies can adopt to grow their businesses in India.

The paper aims to provide insights to civil society organisations, agri-tech companies, foundations, investors, and other ecosystem players interested in the safe food industry's growth or are looking forward to supporting efforts that help farmers switch to safe food cultivation practices.

Note- During the course of working on this research, we came across commonly used terms such as regenerative agriculture, organic farming, agroecology, permaculture, natural farming, non-pesticide management and others that are used interchangeably across civil society organizations, governments, researchers, retailers, and others. Each follows a certain set of principles or defining characteristics. We have defined each of these terms in the appendix of this paper (refer page 31). Each of these agricultural systems are not mutually exclusive and have considerable overlaps. In the context of this paper, we refer to these terms collectively as 'Safe food', encompassing all the terms mentioned below.

Acknowledgements

This community paper has been written after speaking with 15+ organisations working in the safe food space. The portfolio of these companies ranges from retailing safe food products to consumers, supporting farmer transitions to safe food cultivation practices, or investing in safe food startups. Collectively, we estimate that these organisations account for the majority of the organic food market share in India.

We would like to express our gratitude to Oak Foundation for financially supporting our research study. We are grateful to Swati Agarwal, for being a great thought partner.

We would like to deeply thank the moderators and panelists who actively participated in the 'Safe Food Round Table Panel Discussion' organised by The Nudge Institute on 30th November 2023 and contributed to the community paper.

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Outline

This community paper is based on secondary research and insights that the team gathered through conversations with companies that are retailing safe food products to Indian consumers. The paper begins with a brief literature review on the impact of conventionally grown agri produce on human health, followed by the global and domestic trends in the safe food industry (covering the key players, consumer trends, and key investors). Further, it highlights the significant challenges safe food companies face in scaling their businesses within India.

After gaining an in-depth understanding of the Indian safe food industry and its key challenges, the team organised a 'Safe Food Round Table Panel Discussion' to discuss these challenges in detail and propose solutions.

The panel discussion was structured to address two main themes: (i) challenges and solutions from the consumer demand side and (ii) challenges and solutions from the safe food supply side. In organising this panel discussion, the intention was to explore every facet of the challenges encountered by the industry. Hence, the team invited diverse panelists, including domestic safe food players, conventional food players (serving both domestic and export markets), impact investors, impact consulting firms, and a farmer.

The paper briefly sheds light on farmers' experiences transitioning from conventional farming to safe food farming. The paper concludes with recommendations for organisations and ecosystem players that can be implemented to boost safe food businesses in India, leading to greater farmer adoption.

Impact of farming techniques on health, environment and farmer income

a. Food grown using conventional methods can have an adverse impact on consumer and farmer health

Farmers in India have been using synthetic pesticides and fertilisers to ensure crop protection and high yields. The motive of the farmers, whose livelihoods primarily rely on agricultural income, is to keep themselves updated about the most "effective" farm inputs in the market that are claimed to increase yield and protect crops from unforeseen pest attacks and climate change, thereby safeguarding their income. On the other hand, the farmers are directly exposed to these toxic chemicals, leading to high risks to their health. Research published by WHO and other recognised international journals (like the National Library of Medicine and Sage Journals) has also reported the adverse impact of pesticides on farmers' health.[1,2] A study conducted with 54 vineyard farmers (treatment sample) and 108 healthy unexposed individuals found these farmers had high exposure to heavy metals, especially copper, as compared to non-farmer control groups.[3] Another study reported that even low levels of environmental pesticide exposure could negatively affect neurological and behavioral development in children.[4]

A recent report by the Environment Management and Policy Research Institute (EMPRI) that tested 400 samples of 10 vegetables from 20 stores across Bengaluru found heavy metals at a significantly higher level than the permissible FAO limits.[6] A literature review of the impact of pesticides on human health has reported that the consumption of such vegetables and fruits that are grown in pesticide contaminated soil and water used for long-term accumulation increases the concentration of toxins inside the body organs and causes chronic diseases such as neurotoxicity, cancer, necrosis, asthma, reproductive disorder, cardiac disease, diabetes, etc.[7]

Apart from the use of pesticides in crop production, fertilizers have also been reported to pose a risk to human health. A UN report reveals that contaminants in fertilizers (e.g., potentially toxic trace elements) affect soil quality and may enter the food web through uptake by plants and ingestion of contaminated food or feed.[8] Toxic trace elements found in fertilizers include mercury, cadmium, arsenic and lead. Amos Institute's research article states that toxic concentrations of nitrite, cadmium, and aluminium in the soil have been reported to cause various health impacts.[7]

Overall, lower chemical usage during crop cultivation and, therefore, human consumption can positively impact the health of farmers and the environment and is also safer for human consumption.

b. Economic benefits to farmers of safe food farming

In this paper, we consider organic cultivation, natural farming, agroecology, residue-free practices of cultivation, or pesticide-free produce as part of safe food

farming.

A 2023 study (conducted with 562 households across 12 villages and three agro-ecological regions) on natural farming promoted under the Andhra Pradesh Community-Managed Natural Farming (APNCF) program has shown the following key benefits that farmers who practised **Community Natural Farming (CNF)** reported[9]-

- The adoption of CNF resulted in an average increase in the **number of crops grown, from 2.1 to 4 crops**, in all the three regions covered in the study.
- Although the study indicated that labour usage increased (up to 21%), farmers could see significant savings in cultivation costs with **44% lower input costs** than counterfactual (non-CNF) farms.
- Overall, **67% of CNF farms in the study** reported improved **farm income**. Net income per ha doubled with the adoption of CNF (by USD 1177 or +99.1%) across the three regions.

Another study on Zero Budget Natural Farming (ZBNF) by the Center for Study of Science, Technology and Policy (CSTEP) that studies five crops (chilli, paddy, groundnut, maize and cotton) cultivated through ZBNF vs. conventional farming reported[10]-

- A reduction in the cost of cultivation for ZBNF crops by INR 3,000–INR 22,000 per acre for Paddy, Groundnut, and Maize. However, the study also highlighted that the cost of cultivation increased in the case of cotton by INR 9,000/acre due to larger labor engagement.
- The net revenue was reported to be higher in ZBNF by INR 9,000–INR 37,000 per acre for paddy groundnut and chilli. because of the lower cost of cultivation. However, for maize and cotton, a decrease of income between Rs 7,300 to Rs 34,800 per acre was observed.

c. Environmental benefits of safe food farming

Soil Health - The transition from conventional to organic, natural, or low-input farming has shown changes in the soil's chemical composition that affect its fertility. The change occurs because of the use of cow-dung manure, green compost, and bio inputs that increase the bioavailability of nutrients in the soil or by reducing the use of chemical fertilizers.

These changes directly affect nutrient availability to crops by contributing to nutrient pools or indirectly by influencing the soil's chemical and physical environment. As per the carbon sponge theory, an increase in soil organic carbon leads to higher water absorption from the air. Estimates indicate that every 1% increase in the soil organic matter results in 82,000 kg of more water being retained per acre.[11]

Research that observed the changes in soil chemical properties during the transition from conventional to organic and low-input farming reported that after 4 years of using animal manure and cover crops, the low-input farming showed higher levels of

soil organic carbon and ceasing of manure application in year 4 of the same low-input farmlands resulted in the declining of soil organic C levels.[12]

Another study that reports the impact of organic inputs on the physical status of soil in a rice-potato cropping system in Chattisgarh, India, reported that a supply of 100 percent nitrogen from cow dung manure, neem cake, and composed crop residue appreciably increased the organic carbon (6.3 g kg−1) over initial value (5.8 g kg−1) as compared to supply from inorganic fertilizers alone.[13]

A study that does a literature review on the impact of organic farming in the northern region of India shows that the activity of earthworms in organically managed fields is higher than in inorganic agriculture. In the biodegradation process, earthworms and microbes work together and produce vermicompost, which is the worm fecal matter with worm casts. Vermicompost also provides macroelements such as N, P, K, Ca, and Mg and microelements such as Fe, Mo, Zn, and Cu to the soil.[14]

GHG emissions - Based on the Zero Budget Natural Farming (ZBNF) study by the Center for Study of Science, Technology and Policy (CSTEP), natural farming can reduce emissions by 89% in Paddy, 90% in groundnut, and 98% for cotton when compared to conventional farming.[10]

Organic food market- Global and Indian statistics

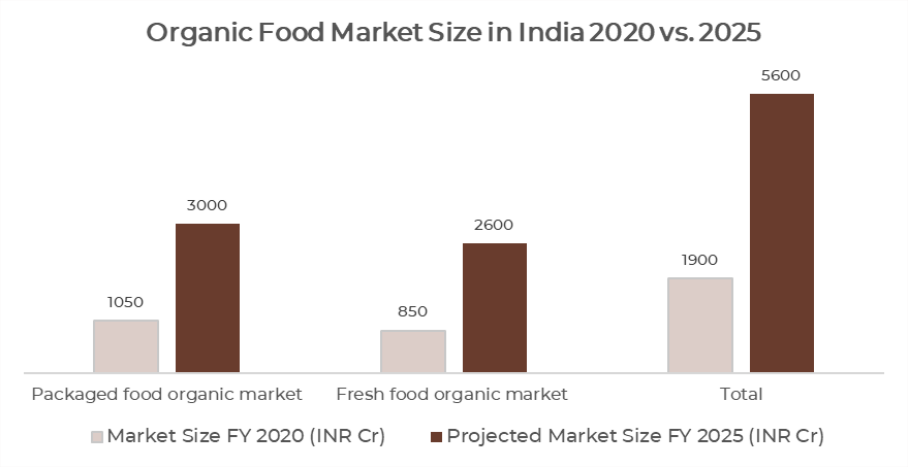
Since organic produce is the most commonly used term to denote all safe food products, we use this as our report's central theme. This section collates secondary data on the market trend of organic food at global and domestic levels. It also highlights the major drivers for the growth of such businesses and companies working at the forefront in India.

a. Market trends

The global market is witnessing many shifts in production and consumption patterns, especially due to rising environmental awareness and a growing inclination toward sustainable living choices. Due to the rising awareness of sustainable products, businesses across various sectors, including beauty, wellness, and food, are shifting their focus to environmentally friendly options. Specifically in the food industry, the global organic food market is expanding rapidly, with numerous new ventures offering consumers safe and eco-friendly produce.

The developing nations are not far behind and are viewed as potential emerging markets for organic products. As per the Global Health and Wellness Report published by the Nielsen Company in 2015, the willingness to pay premiums for health benefits was found to be highest in developing countries. India is one such emerging market for organic products where the demand for organic food products is showing promising growth, along with other organic product categories like textile and personal care.[15]

A report by Sresta Natural Bioproducts Pvt. Ltd. and Technopak Advisors Pvt. Ltd. stated that the domestic organic food market in India was estimated at INR 1,900 Cr in 2020 and is expected to reach INR 5,600 Cr by 2025, with an expected CAGR of 24% accelerated by COVID-19 induced demand for the segment.[16] While the paper states that factors such as increased disposable income, increased awareness and willingness to pay the premium are rising amongst Indians, there is still a need for significant efforts to drive the demand for organic food among the consumers.



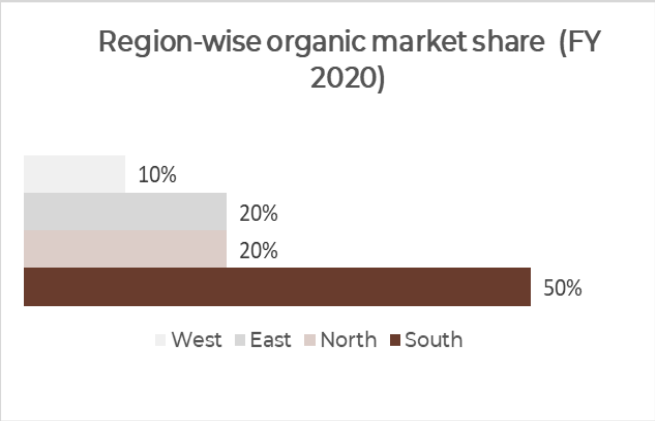
Source: Industry Report on Organic Food Market in India, Sresta Natural Bioproducts Pvt. Ltd. and Technopak Advisors Pvt. Ltd., 2022

The table below is a compilation of data quoted in FIBL and IFOAM's The World of Organic Agriculture Statistics and Emerging Trends 2023 report to show the position of India at the global level concerning various parameters of organic produce landscape[17]-

Parameter	India's Ranking/Position
No. of producers	1st worldwide (15.99 lakh producers)
Number of affiliates of IFOAM – Organics International	3rd worldwide (46 affiliates)
Area under organic farming (2021)	6th worldwide and 2nd in Asia (26.57 lakh ha)
Share of the organic land of the total agricultural land (2021)	1.5% share (not amongst the top 50 countries worldwide)
Organic retail sales	Retail Sales: 185.9 Million €(2017) Per capita consumption: 0.2 € in 2021 vs. 0.09 € in 2009 (the highest being Switzerland 425 € in 2021)

Organic exports (2021)	1st in Asia To EU- 205,928 MT To USA- 43,226 MT
Producers certified under a PGS initiative	1st in Asia (1,561,320 producers)
Area under PGS certification	1st in Asia (9.7 lakh ha)

As per the FIBL's report, the leading host countries for Indian organic exports are the U.S.A., European Union, Canada, Switzerland, Vietnam, Israel, Australia, and New Zealand.



Source: Industry Report on Organic Food Market in India, Sresta Natural Bioproducts Pvt. Ltd. and Technopak Advisors Pvt. Ltd., 2022

As per Sresta Natural Bioproducts Pvt. Ltd. and Technopak Advisors Pvt. Ltd.'s report, the Indian organic food market is distributed region-wise, as shown to the left. As per the data, the southern region has the leading market share.[16]

b. Drivers for growth of the organic food market in India

- Increasing health and environmental consciousness amongst Indian consumers

Consumers are becoming increasingly aware of the side effects caused by chemically synthesized foods and health and wellness products.

As stated in this research report titled, *"Comparison of consumer perceptions and preference toward organic versus conventionally produced foods: A review and update of the literature"*, consumers purchase organic foods because of a perception that such products are safer, healthier, and more environmentally friendly than conventionally produced alternatives. The study also reported health and food safety as the number one quality attribute considered by organic produce buyers, followed by concern for the environment, suggesting that such consumers rank private or personal benefits higher than the social benefits of organic agriculture.[18]

Another report that comments on "The role of demand in the agroecological transition" states that the demand for organic produce is majorly concentrated

among specific consumers, women, those with higher levels of education, and middle- and higher-income individuals.[19]

Interestingly, few of the safe food brands who participated in the roundtable have observed that their consumers find organic food tastier than conventional food. Hence, they are willing to pay a premium for the better taste than for health safety reasons.

According to a Nielsen report (2015) on Healthy Eating Trends around the World, Generation Z and millennials are more willing to pay a premium for organic or safe food. A negative relationship has been pointed out between age and organic buying behavior i.e. younger consumers are more likely to purchase organic products, attributing this to their preference for chemical-free products and interest in environmental quality.[15]

> We as an industry are not talking enough about nutrient density in organic food. Educating people on that will generate a shift in the demand
>
> -Shameek Chakravarty, Farmizen

> COVID has increased the demand for organic. They are appreciating sustainability.
>
> -Sanjeev Bisht, ITC

The following table, referred to from the above-mentioned Nielsen report, shows the % of the population willing to pay a premium for organic food based on their age groups (as of 2015)-

Generation:	%ge population willing to pay a premium
Gen Z (under 20)	31%
Millenials (21-34)	29%
Gen X (35-49)	26%
Baby Boomers(50-64)	23%

Silent Generation(65+)	15%

- **Impact of the COVID-19 outbreak on the organic food market in India**

Ever since the pandemic, customers' preferences for food have changed for the better. Today, millennials are the real advocates for an organic, healthy lifestyle. In an article by Pure Eco India that interviewed several Indian organic food companies, it is mentioned that organic food sales spiked from 25-100% for most of the players post-pandemic.[20] Consumers are now more sensitive to terms such as:

Purity **Adulteration** **Clean Food** **Organic** **Immunity**

It was also highlighted during the 'Safe Food Panel Discussion' that although the sales spiked post-COVID, there has been a drop in customers gradually, thus saying that COVID has led to sustained demand for such products may not be true for all companies.

> Consumers are not buying all their groceries as organic, they are only buying only a part of it. Getting into consumers full basket will take time.
>
> -Raghuveer Reddy, 24 Mantra

Research, as well as conversations during the panel discussion, suggested that Indian consumers are aware of the benefits of organic products over their chemical alternatives, and while they are not ready to completely switch to organic products, they are willing to have some portion of their grocery basket dedicated to health and wellness products such as organic spices, organic beverages, concoctions, etc.

- **Growing disposable income in India**

According to a report by the World Economic Forum, by 2030, India will move from being an economy led by the bottom of the pyramid to one led by the middle class.

Nearly 80% of households in 2030 will be middle-income, up from about 50% today. The middle class will drive 75% of consumer spending in 2030. This will result in a wider target audience that will be open to paying for organic food alternatives.[21] However, some studies also suggest that a positive correlation exists between income and willingness to buy a product up to a given income level, beyond which further increases in income do not lead to a corresponding increase in willingness to purchase organic food.

As per the report published by Sresta Natural Bioproducts Pvt. Ltd. and Technopak Advisors Pvt. Ltd., India has the second largest urban population in the world in absolute terms at 472 Mn in FY 2019, second only to China. Currently, the urban population contributes 63% of India's GDP. Going forward, it is estimated that 37% (541 Mn) of India's population will live in urban centers by FY 2025. The urban population is expected to contribute 75% of India's GDP in FY 2030. The growth of urbanization will witness people moving into cities from their small towns or rural areas. The migrants, as has been witnessed in the past, adapt to local food habits and are open to experimentation.[16]

c. Key players in India

As per the research published by Sresta Natural Bioproducts Pvt. Ltd. and Technopak Advisors Pvt. Ltd, below are some of the key players in the packaged food organic market[16]-

Key Players	Revenue in Cr (FY 2020)	Primary Nature of Business
Organic India	342.6	B2C
Akshaykalpa**	300	B2C
24 Mantra Organic	273.6	B2C
Nature Land Organic	108.2	B2B and B2C
Organic Tattva	85	B2B and B2C
ProNature Organic	53.73	B2B and B2C
Phalada Pure & Sure	20	B2B and B2C
Conscious Food Pvt. Ltd.	8.3	B2C
*Safe Harvest	No data	B2C

*Safe Harvest was not mentioned in the report but we have added it as it is a significant player in this space.
** Majorly from sales of milk and milk products
Note- Some other significant players serving the Bangalore market are Organic Mandya and Healthy Buddha.

d. Investing landscape for the safe food industry

During the panel discussion, we also heard the investors' views to understand their perspectives on the opportunity of investing in the safe food space in India. The view we received was that **although the market for organic food is picking up in India, the general feeling amongst investors, as pointed out during the panel discussion, is that the market is not yet mature enough, and hence, investors with substantial resources are only willing to invest in it.** The ones who are willing to invest are seeking scale in return, which not many companies have been able to showcase yet. Another reason is the possibility of a giant conventional food player entering this market and disrupting the business of other small-scale, lesser-known brands.

This points out that consumer demand is the driving factor for attracting new and more investments into the safe food industry.

Market Challenges Faced by Domestic Players

This section highlights the challenges mentioned by domestic safe food players in scaling such businesses. The four categories of challenges listed below have been further categorized into demand and supply-side challenges, each including key questions to be addressed by the relevant stakeholders.

a. Organic Food Certifications

As per the Press Information Bureau release of the Ministry of Agriculture & Farmers Welfare, two types of organic certification systems have been developed for quality assurance of organic products in the country[22]-

National Programme for Organic Production (NPOP)

- A third-party certification program (by any accredited certification agency)
- Production and handling of activities at all stages, such as production, processing, trading, and export requirements for organic products, are covered

Participatory Guarantee System (PGS-India)

- A quality assurance initiative for certification of organic produce that is locally relevant, emphasizing the participation of stakeholders, including producers/farmers and consumers, and operates outside the frame of third-party certification.
- Stakeholders (including farmers/ producers) are involved in decision-making and essential decisions about the operation of the PGS-India certification

Food Safety Regulation has made it mandatory for organic products to be certified under NPOP or PGS for being sold in the domestic market under the Jaivik Bharat logo.

Based on our discussion with domestic players, certifications remain a major challenge for companies (especially those in their early stages) to transact smoothly with farmers. To follow the current process, farmers must certify their land as organic, which is costly and requires knowing the process thoroughly (for example- maintaining all records, application procedures, etc.). As per the fee structure mentioned on the APEDA website, the annual charges of getting an organic certification for a small farmer come to be in the range of INR 16-17k.[23]

An Agcon search study has pointed out that certification could be prohibitive for small farmers unless alternatives like small farmers' group certification and internal control systems for farmers exist.[24] A market study report that asked Indian producers and exporters the major constraints they faced in the certification process stated that the cost of certification and the amount of time required to get it done were the major constraints.[25]

It was also shared by a few companies that for exporting organic produce, even if there are valid certifications in place, there has to be mandatory sample testing done on the exported produce. The testing costs are very high, and the buyer doesn't bear the complete costs, thus making it expensive for the farmer or the exporting agency.

> Certification is just one aspect. Not much can be accomplished with this as they can still do malpractices. Strict management is the answer to ensure the food is clean.
>
> -Madhu Chandan, Organic Mandya

According to safe food companies, certification and traceability are not the primary concerns for farmers. Although it builds trust amongst consumers, it is a costly affair for them, and hence the onus is on the companies to pool farmers into collectives and facilitate this process for them. While large companies can pool farmers into a cooperative and apply for a group certification, small companies struggle to get the certifications and streamline their supply-side roadblocks.

The companies also acknowledged that certification is just one way of building trust amongst consumers; however, the true authenticity of the produce can only be achieved if a regulatory mechanism ensures the farmers are not following malpractices.

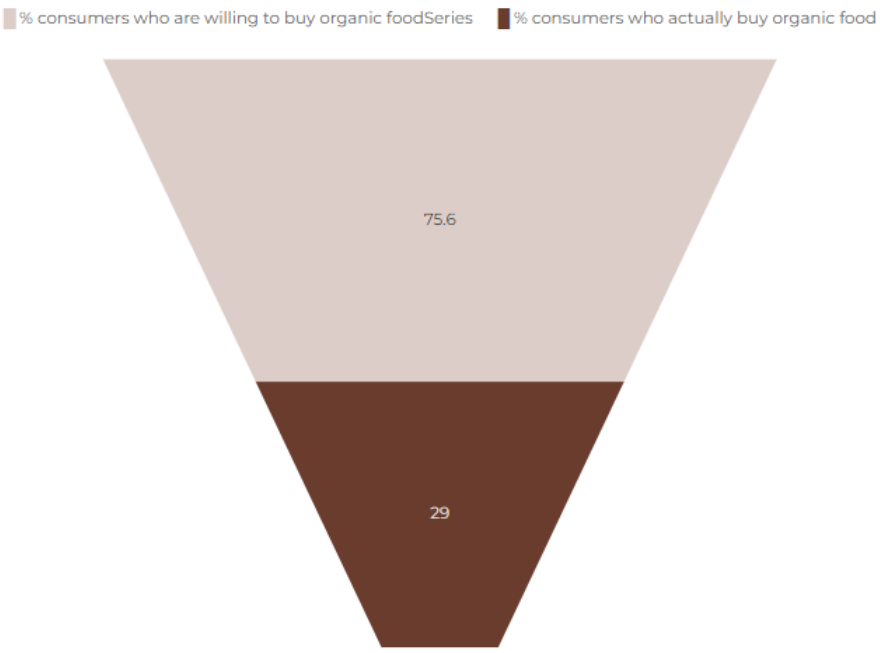
b. Go To Market

Retailers prefer conventional products over organic ones for their quick movement from the shelf, thereby bringing in a greater margin per square inch of shelf space. This preference arises because the organic material replenishment cycle is much longer than that of conventional products. Hence retailers generally charge higher margins for safe food brands than for conventional ones. This makes safe food even more expensive for the end consumer as compared to the conventional food brands. The taxation rate etc., is also the same for the smaller as well as bigger brands.

During the 'Safe Food Panel Discussion', all panelists also shared the challenge of economies of scale. Safe food companies usually handle a small number of farmers and have limited inventory. When these players enter the market with high built-in costs, their products are priced slightly higher than the mainstream ones. This leads to the retailers assuming that these players aim for higher profits, increasing shelf space costs. Also, due to the smaller scale of operations, the costs get passed to consumers through higher prices.

c. Consumer Demand

According to India's Phytonutrient Report, most Indian consumers (75.6 percent) are willing to purchase organic products as they consider them to be of better quality and free of pesticides and chemicals. However, only 29 percent of the respondents actually buy organic products.[26]



Source: Executive Summary, India's Phytonutrient report

The report states the **gap between the willingness to buy and actual purchase** is due to the non-availability of organic fruits and vegetables. However, as per our understanding from conversations with various domestic players, it is also dependent on the price sensitivity of consumers, where it is observed that consumers are usually willing to pay for such organic food if it does not exceed 20-25% markup to the conventional alternatives.

This has also been concluded in a study that did a global literature review of consumer perceptions and found that demand for organically grown food declines sharply with premiums above 20%. A point to be noted is that consumers' price elasticity of demand varies in different nations, and we could not come across any research papers that comment on the Indian context.

Most of the safe food players pointed out trust as a major factor for limited consumer demand. Consumers find it difficult to trust the source of the produce if it is not organically certified or if it is not traceable to its source, thereby leading to these companies having to invest in traceability solutions or facilitate the certifications of their produce.

A report that emphasizes the role of consumer demand in farmer transitions also concurs with the panelists' views that for sustainable changes in consumer behavior, particular pull attributes, such as **trust and traceability**, are important.[27]

Food labeling and certification can increase consumer consciousness and encourage them to purchase such products. The report further states that food labelling can be considered a push strategy to change consumers' food choices to incentivize purchasing food with specific attributes (i.e., healthy, nutritional, and organic). Certifications can be viewed as pull strategies, which focus on increasing the number of consumers who want to buy a particular product with such attributes.

However, the report also acknowledges the fact that using labels to inform consumers about the source of produce does not imply that they will read or use them at the time of purchase.

A report by Sresta Natural Bioproducts Pvt. Ltd. and Technopak Advisors Pvt. Ltd. states that as of 2020, it is estimated that the addressable target audience for organic food in India (which includes health-conscious households coinciding with the elite and affluent households) is approximately 25 Mn households.[16]

It is estimated that only 10-12% of the addressable customer segment (30 lakh households) are consuming organic food. We believe this is because

(i) there is still a segment of the potential market that is not yet aware of the safe food options available in the market.

(ii) some consumers may have general knowledge about safe food options but do not have enough detailed information to differentiate the unique attributes of safe

food from conventionally grown alternatives (regarding the impact on health and the environment).

This was also highlighted during the panel discussion, where companies pointed out that it is easy for a big FMCG brand to back its product research claims through R&D investments. Due to budgetary and regulatory constraints, safe food brands aren't able to invest in research-backed claims of the impact of their products on consumers' health.

(iii) consumers perceive a benefit in consuming safe food produce as compared to conventional produce but they do not trust the certifications of such produce and thus shy away from investing in it.

(iv) Those who trust the certifications and are aware and willing to buy cannot convert their entire food basket to organic because of its high pricing.

d. Safe Food Supply

Based on our conversations with domestic companies, the following challenges were highlighted on the production and supply side of the business-

Farmer Transition: Implementing Natural Farming involves a significant amount of knowledge and on-farm effort/labour, making it challenging for farmers to shift from the long-practiced traditional farming approach. According to the APNCF study on natural farming, increased labour requirements (up 21% across all farms, from 277 hours to 336 hours) is significant in the sample. In some cases, this could pose a problem in the adoption of CNF, which will depend on farm labour availability and capacity to pay for local labour.

Farmers also need support and handholding while transitioning to safe food farming practices, and above all, need evidence for income increase within a cropping cycle as they make the transition. **During the 'Safe Food Panel Discussion', the leading players in this space highlighted that the farmer transition period is the most difficult and crucial part for any player. This is because if farmers do not see the profitability of switching to safe food practices, they quickly drop out and switch back to conventional farming.**

> Transition support should be given to the farmers in the initial 3 years.
>
> -Kuldip Singh, BRLF

It is usually ignored that when a farmer switches to natural or organic farming or farming with reduced chemical use, from chemical-intensive farming, their entire farming management system must be optimized to make the transition successful. This includes soil management, livestock integration, trenching and bund work, intercropping, mulching, learning how to prepare organic fertilizers and pest repellants, and other end-to-end farming practices.

> If you are a small player and dependent on third party for processing, then you might land up with a lower realization today.
>
> -Rangu Rao, Safe Harvest

> We cannot equate a chemical spray to an organic spray. The entire farming system has to be changed. Soil management, trenching, bunding, dairy integration, end-to-end integration.
>
> -Shashi Kumar, Akshayakalpa Organic

Since these steps take atleast two crop cycles, the produce cannot be immediately marketed and sold as organic or natural. Also, since farmer transitions require a lot of handholding and ground support, organizations responsible for marketing their produce must bear the transition costs. That's why it becomes difficult for companies to reach scale in this industry.

During the panel discussion, it was also pointed out that the availability of organic inputs is also a significant challenge that farmers face. India's two major chemical farming inputs, i.e. Urea and DAP, are highly subsidized. The farmers who use organic nitrogen-fixing fertilizer on the farm will have to buy inputs that will mostly cost more than the subsidized products. This is especially true in the case of organic farming, which intensively relies on the application of bio-inputs. There is also a need to establish R&D units to produce effective substitutes for chemical fertilizers and pesticides.

Storage Challenges: Apart from pricing, a hike in expenses is noted in terms of storage and preservation. Conventional farmers apply chemicals to reduce their loss of crops, while organic farmers need to store products using natural and chemical-free methods. Without the prerequisite chemical preservatives added to conventional foods, organic foods have a shorter storage time and shelf life and hence require greater maintenance and have higher chances of losses. There are not enough storage facilities which are suitable for safe food.

Processing Cost: Processing is a volume business and it is difficult for an organic food business with its scale to match the market prices of conventional product processing. Since safe food products are to be milled in small batches (mainly because production is scattered and companies procure in small batches based on the demand), the processing cost is higher and it is also difficult to set up a processing unit for just organic/safe food products, which further impacts the pricing. **During the 'Safe Food Panel Discussion', the panelists (also leading**

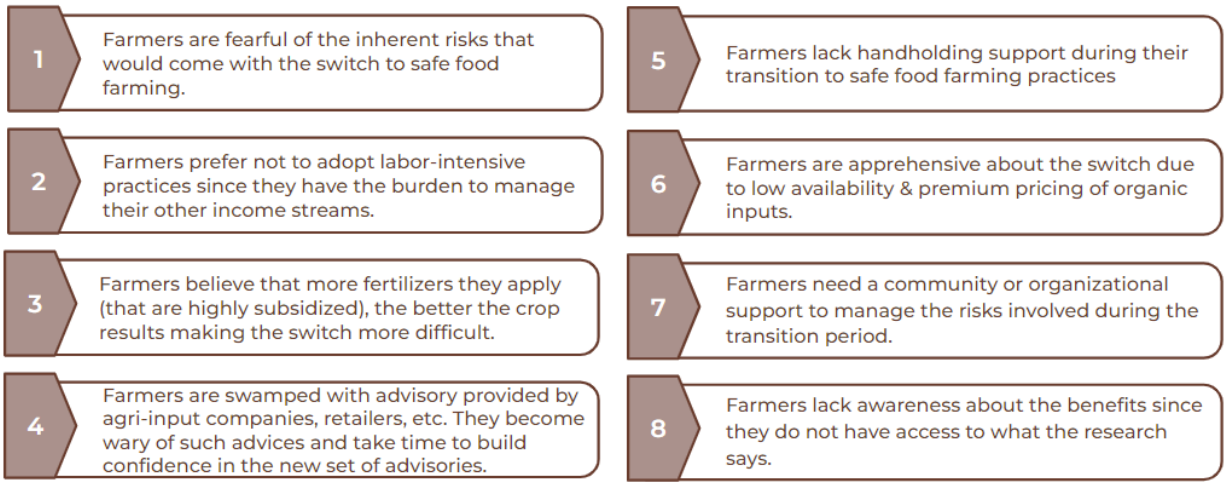
players in the safe food industry) pointed out that for a small player who is dependent on a third party for processing, it becomes difficult to utilize the state-of-the-art technology used by other conventional players leading to low realization rates.

Supply-demand disparity: The basket of organic production is not balanced. Demand is ahead of supply in the case of fresh fruits and vegetables, while the supply of some grains outgrows the demand. Hence, there is a disparity in terms of what the consumers need versus what the producers provide. This gap needs to be filled by local production in clusters.

Another challenge is the scattered availability of safe food practicing farmers within a cluster, which leads to not enough supply being available at one location during procurement. This adds to the procurement cost of the company, further adding to the end consumer pricing. On the other hand, few early-stage organizations reported that in the safe food space, since the consumer demand is limited, a situation arises when they are unable to buy the entire produce that the farmer harvests; hence, it becomes challenging for the farmer to deal with a company in such small quantities.

Farmers' Perspective

The team's accumulated knowledge from two years of delving into the challenges faced by farmers in adopting safe food practices was crucial in amplifying the farmer's perspective within this paper. Given that safe food companies often emphasize supply-side challenges, such as **farmers discontinuing their participation during the transition phase or expressing reluctance to depart from conventional methods**, it became imperative to share the following insights and observations derived from our fieldwork conducted over the past couple of years-



Takeaways from Field Visits

To understand the farmers' perspectives on safe food cultivation as a primary source

of their income; the team conducted exploratory field visits where it interacted with farmers who transitioned to safe farming practices i.e. organic, natural, or minimum residue farming. These visits aimed to have focused discussions with farmers and develop an understanding of their journey from chemical to natural/organic farming practices.

The first visit was conducted in Mandya, Karnataka, with the support of Organic Mandya. The team interacted with farmers who transitioned to natural farming practices. The key insights from the visit are listed below-

Major crops in the region	Ragi, Vegetable crops, Paddy and Coconut
Reason for transition	Farmers reported that they switched to natural farming because they wanted to produce safer food and for better soil health. Organic Mandya also played a key role in handholding farmers during their transition (farmers mentioned the key role that training conducted by the organization played in their transition).
Change in farming income	Farmers experienced improved net income after transitioning from conventional farming to natural farming. ● All farmers experienced reduced cost of cultivation. ● Along with the transition, farmers also made intelligent decisions based on their land. For e.g., one farmer changed the variety of paddy with a higher market price, while another started intercropping to maximize the profits from his land.
Plan ahead	100% responded that they will continue natural farming.
Environmental benefits	All farmers observed improved soil health, increased water retention of soil, and an increase in earthworms, which, according to them, is an indication of good soil health.

Note: n=4 farmers; but in-depth open-ended discussions done with farmers

A second visit was conducted in Tiptur, with the support of Akshaykalpa, where the team interacted with farmers who transitioned to natural farming practices. The key insights from the visit are listed below-

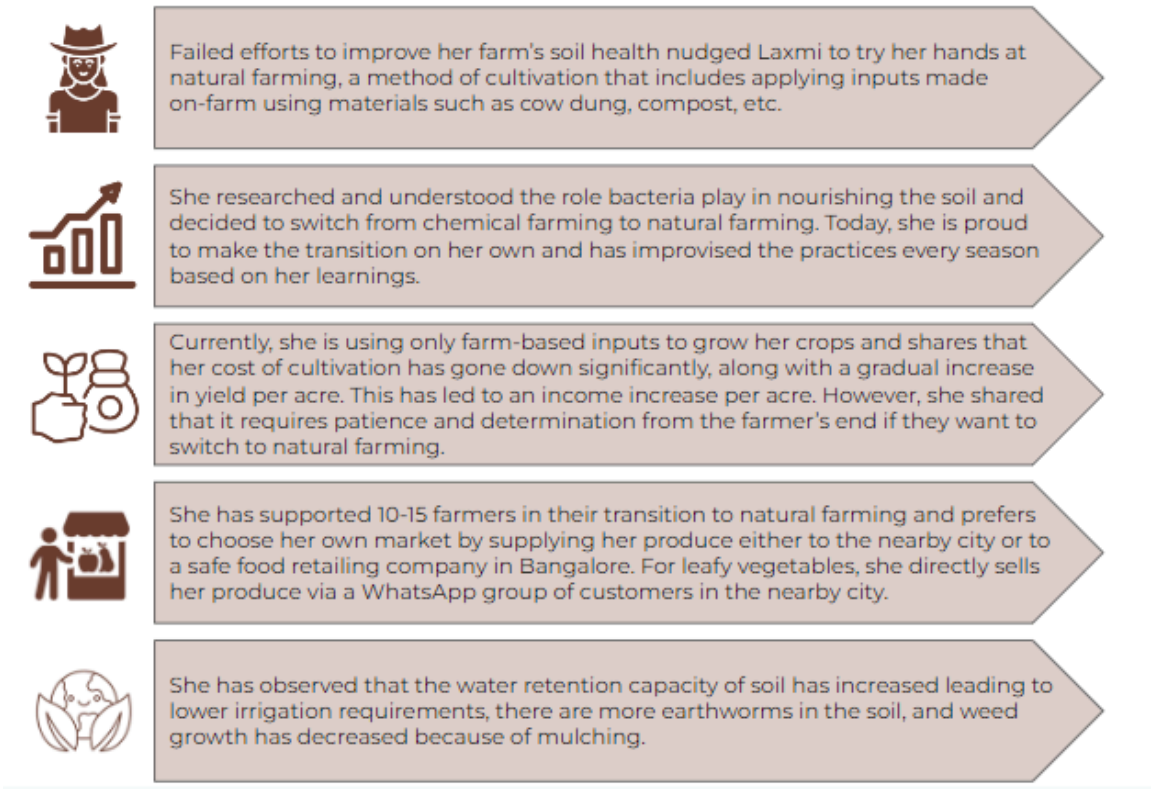
Major crops in the region	Banana, Coconut, Ragi, and Vegetable crops
Reason for transition	The major reasons for the transition range from (i) motivation to grow food that is safe for human consumption and soil health, (ii) external factors like training and sensitization by a leader or organization or (iii) availability of cow dung to do natural farming.
Change in productivity	Most of the farmers faced a yield drop in the first 1-3 years after the transition. However, all of them remained committed to such a method of cultivation and gradually observed an increase in productivity.
Change in input costs	Their input costs have decreased. Farmers replaced store-bought fertilizers and pesticides with farm-made nutrients and pesticides.
Plan ahead	100% responded that they will continue natural farming
Why were other farmers in the region not switching to natural farming?	1. Farmers who do not possess cattle usually don't make the switch since the market price of cow dung is significantly high. As per the NSS 2019 survey, about 30% of households in India own cattle.[28] 2. There is an increase in hours that a farmer has to dedicate towards farming since all the inputs have to be prepared on-farm and require more effort than conventional farming. 3. There is not enough clarity on the real benefits of natural farming, especially long-term benefits. Farmers mostly think that productivity decreases and are not ready to take that risk.

	4. The change of PoPs sometimes acts as a barrier for farmers who have been using conventional farming practices for several years/decades. 5. In natural farming, farmers prepare farm inputs using cow dung, cow urine, and other types of compost. It was highlighted that many farmers are averse to the smell that such natural ingredients generally have.
Environmental benefits	All farmers observed improved soil health, increased water retention of soil, and an increase in earthworms, which is an indication of good soil health.
Challenges faced	Farmers reported that they could benefit from this transition if they had assured market access for their produce, which can provide them better prices than the chemically grown produce.

Note: n=6 farmers; but in-depth open-ended discussions done with farmers

Transition journey of Laxmi Lokur, a natural farmer from Dharwad, Karnataka

Laxmi Lokur, is a farmer who is a practicing natural farmer, hails from Udikeri village in Belgaum district of Karnataka. With almost 20 years of experience in conventional farming, she was looking for ways to improve her soil health, leading her to explore the world of natural farming. She is a self-learned natural farmer and has now become a role model for many other farmers in the village.



Recommendations to promote the growth of the safe food industry in India

Based on the various hurdles to the growth of the safe food industry, as highlighted in the panel, as well as based on secondary research, here are some of our thoughts to address these. We believe this requires an interconnected approach across the ecosystem of consumers, buyers and farmers

a. Consumer Focussed

1. Increasing Consumer Awareness

Enhancing consumer awareness is pivotal in stimulating demand-driven farmer transitions towards safe food practices. Investors can facilitate this by providing capital to safe food companies, enabling the launch of targeted marketing campaigns along with capital to invest in R&D and impact studies to raise awareness about the advantages of safe food consumption. E.g., There have been successful mass campaigns ("Roz khao Ande") around egg consumption in India and around Milk ("Got Milk") in the US.

2. Gaining consumers' trust

Traceability - Traceability of products to their source holds great potential in gaining consumers' trust. The goal is for consumers to know where their food comes from and how it has been grown. Traceability is important in having trust and transparency between all parties in the supply chain, from farmers to buyers to consumers.

There have been more solutions around traceability from farm to fork with the increased adoption of underlying blockchain-based technology. Traceability lets the customers know where their produce is being sourced and how it is grown. However, there is a need to make this affordable and accessible for a small farmer group or a small buyer to implement.

The automation and digitization of the supply chain, which can track the individual field operations that a farmer does, in an automated manner. Example is tracking irrigation to a field through remote sensing, if you are trying AWD (Alternate Wetting and Drying) system of paddy farming. There is a need to promote more startups and innovations to emerge in this year. Carbon markets also are acting as a catalyst to these companies, as carbon credits require regular and accurate tracking of package of practices.

Online platforms that link the key stakeholders (buyers, consumers, farmers) and educate consumers about various organic certifications can play an essential role in promoting safe food farming. The government-run platform Jaivik Bharat is an example of the use of technology to bring awareness about organic certifications to consumers. They also link various stakeholders like

regional councils, local groups, individual farmers, buyers, government agencies and input suppliers.

Creating more evidence of safe food on health - Having impact & longitudinal studies on human health of safe food would create more awareness and evidence around the topic among consumers.

Price Driven by Economies of Scale - We believe as the economies of scale increases in safe food systems in India, the cost of production would go down, as shared by several players in the discussions. This inturn may lead to more affordable pricing, and this inturn may further increase the demand. Our secondary research shows that demand for organically grown food declines sharply with premiums above 20%.

b. Strengthening Farmer Ecosystem

3. Digital Led Farmer Extension & Training

Farmers' awareness of the optimal agricultural practices (suited to soil, region and crop) is essential for sustainably maximizing their incomes, from safe food farming. Open platforms like VISTAAR, Digital Green, YouTube, and several startups in the ecosystem can play a key role in disseminating such practices.

Example- Training videos for preparing on-farm fertilizers and pesticides can inform the farmers of the processes that work or do not. Such platforms ensure that the farmers' knowledge and prior experience are captured to keep them at the center of any extension methodology.

While progressive farmers may directly search for new information online on the crop, farmers often depend on extension service providers or local retailers. Thus, such digital platforms can be built for such extension providers to make it easy to have the latest and updated information about farming packages of practices for a region and inputs needed in all the stages.

4. Alternate models that enable faster adoption among farmers to transition

There is a need to build out models that would make it easier for farmers to adopt. Models that would enable the farmer to make the transition to safe food farming without seeing a decline in their earnings during the initial phase.

If there are proven models with predictable cash flow during and after transition, blended finance models which use a mix of philanthropic and commercial capital will emerge. Action-oriented research is needed to find those successful models which then the market and/or other government and non-government players can help propagate and proliferate.

5. Collectivisation of Farmers

Collectivizing farmers into Farmer Producer Companies (FPCs), or FPOs, can play a key role in simplifying the aggregation and processing of produce. We have seen farmers adopt such farming practices, often succeeding in clusters. This also leads to economies of scale of such produce for selling and higher incomes from aggregation, as well as any kind of post-harvest processing.

If the FPCs/FPOs adopt safe food farming practices within an agroecological zone, based on what is optimal for that region, it can lead to a smoother transition for the farmers. There is a need for action-oriented research to identify ideal agro ecological zones where such practices and collectivization should be attempted first.

6. Innovations in supply chain traceability, & crop monitoring

Many agritech startups provide Indian organic farmers with digital tools to enhance crop monitoring, supply chain traceability, market access, and post-harvest tracking. Such technologies are the essential catalysts of farmer transitions to safe food practices.

These agritech startups need more investors to help expand their farmer reach and provide such technical services at affordable prices, even for small and marginal farmers.

7. Infrastructure capacity must be increased for production and post-harvest stages (Bio input centers, seed banks, storage, and processing)

The availability of organic inputs has been highlighted as a major challenge in farmers' transition to organic farming; training micro-entrepreneurs at the village level to produce organic farm inputs can motivate farmers to make the switch without hesitation. It begins with having a seed bank for indigenous seeds.

Post-harvest infrastructure is also needed to store and process such produce at an affordable price. Investments are needed in the ecosystem to build pre-production and post-harvest infrastructure capacity.

c. Policy & Systems

8. Improved Food Labeling & Certification

Research done in developed nations has shown a positive impact of food labeling and certifications on consumers' demand. We believe a similar impact can be expected with Indian consumers as well.

However, there is a need for such research in the Indian context that would include understanding how best to build trust in the certifications, which may include the participation of trusted third parties, and determining what consumers desire from these certifications and do they see these as a

traceability mechanism.

9. **Simplified & Effective Certifications**

   Our study clearly identified a need to make organic certifications more cost-effective, farmer-friendly, and transparent to the consumer. More dialogue is needed between the farmer groups and policymakers to understand and address the current challenges in the processes.

10. **Consortium of Demand Side/Safe Food Companies**

    An industry body of safe food companies, which takes on the responsibility of reducing hurdles and building collaborative approaches within the various market players could be a key catalyst in the industry's growth.

    There are newer initiatives focussed more on the supply side, like a Consortium of Agroecological Transformation, but a demand side consortium is also needed. Given one of the challenges in the industry is around economies of scale, if there are opportunities for resource sharing as a group in post-harvest infrastructure or post-processing.

Conclusion & Way Forward

We believe that the transition of farming practices to those that reduce chemical and produce safe food can only happen when these practices increase the farmers' income. Hence, as a sequel to this study, we are undertaking action-oriented research and piloting alternate models to understand the supply side of the transition. We will specifically look at evidence of income growth & benefit to the environment in terms of soil, and water use, in natural farming, or organic farming, or practices that reduce the use of chemical fertilizers and/or pesticides.

From the demand side, driving this transition, while researching for this paper, we encountered several barriers to scaling safe food businesses in India. The farmer transitions depend on enough safe food buyers in the market, which depends on consumer demand.

There needs to be more clarity among the ecosystem of what constitutes natural farming, organic farming, residue-free farming, regenerative agriculture, or agroecology practices, as there are variations in the practices. Standard terminology and common understanding are a must-have for practitioners. This, coupled with being open to approaches that are more middle path - or having a hybrid practice that is appropriate to a region and the preference of a farmer, is the need.

We have highlighted ten recommendations to focus on to enable the growth of the safe food ecosystem, end to end.

These include more investments, government policy measures, and collaboration between safe food businesses, civil society organizations, and other ecosystem participants. The Nudge Institute, through this community paper, intends to contribute one such spark towards this collaboration.

Appendix - Differences between various farming systems covered

	Allows usage of synthetic chemical agro-inputs	Allows usage of Bioinputs- biofertilizers and biopesticides	Allows use of external and/or store bought inputs	Promotes usage of on-farm made natural inputs (from cow dung, cow urine, neem, jaggery, pulse flour, plant extracts, compost etc)	Promotes practices like reduced tilling, crop rotation, cover cropping, composting, cow dung manure, etc.	Certification
Organic Farming *"Organic agriculture promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity. This is accomplished by using, where possible, agronomic, biological, and mechanical methods, as opposed to using synthetic materials, to fulfil any specific function within the system."* [29] *It prohibits the use of synthetically produced agro-inputs and promotes the use of ecologically based pest controls and biological fertilizers derived largely from animal and plant wastes and nitrogen-fixing cover crops.*[30]	No	Yes	Yes	Yes	Yes	Organic Certification is available and certifying agents are accredited by the USDA and similar national organizations across the world to make sure that the farm meets all organic standards.
Natural Farming/ Zero Budget Natural Farming (ZBNF)/Community Natural Farming *A local low-input climate-resilient farming system that advocates elimination of* synthetic chemical agro-inputs.[29] Natural farming system aims (i) to end dependence on external synthetic inputs and agricultural credit, (ii) improve soil condition, (iii) source inputs from local resources, (iv) emphasise conser*vation of functional biodiversity, (v) reduce reliance on irrigation and (vi) conserve soil moisture.*[31]	No	No	No	Yes	Yes	Eligible for Organic Certification with additional criteria. There is no specific Natural Farming certification at present though there are many peer certifications available.
Biodynamic Farming *Biodynamic farming is a regenerative and holistic approach to agricultural, gardening and food production and processing.*[32] *It uses management practices that are intended to "restore, maintain and enhance ecological harmony".* [33]*Central features include crop diversification, avoidance of*	No	No	Minimal external inputs	Yes	Yes	The Biodynamic Federation - Demeter International is the certifying body for farms practicing Biodynamic Agriculture.

chemical soil treatments and off-farm inputs generally, decentralized production and distribution, and the consideration of celestial and terrestrial influences on biological organisms.[34]						
Permaculture *Permaculture integrates land, resources, people and the environment through mutually beneficial synergies – imitating the no waste, closed loop systems seen in diverse natural systems. It is a multidisciplinary toolbox including agriculture, water harvesting and hydrology, energy, natural building, forestry, waste management, animal systems, aquaculture, appropriate technology, economics and community development.*[35]	No	Minimal external inputs	Minimal external inputs	Yes	Yes	Permaculture Farms do not have a certification but the practitioners and trainers have a Permaculture Design Course Certification. Eligible for Organic Certification with additional criteria.
Agroecology *Defined as the interaction between farm, people, and other living species by using the principles of ecology.*[30] *Dalgaard et al. refer to agroecology as the study of the interactions between plants, animals, humans and the environment within agricultural systems.*[36]	Promotes reduced dependenc y on purchased agro-inputs	Minimal inputs	Minimal inputs	Minimal inputs	Yes	No Certification Available
Regenerative Agriculture *Regenerative agriculture is a collection of practices that focus on regenerating soil health and the full farm ecosystem.*[36] *In practice, regenerative organic agriculture can look like cover cropping, crop rotation, low- to no-till, compost, and zero use of persistent chemical pesticides and fertilizers. Natural farming, Permaculture, Biodynamic, Organic Farming, Agroecology can all be termed as Regenerative agriculture.*	Reduced usage of chemical inputs	Yes	Yes	Yes	Yes	Led by the Regenerative Organic Alliance, which includes organizations and brands like Rodale Institute, Dr. Bronner's, and Patagonia, Regenerative Organic Certified is a certification available for Regenerative farms
Non-Pesticide Management *An ecological approach to pest management using knowledge and skill based practices to prevent insects from reaching damaging stages by making the best use of local resources, natural processes and community action.*[37]	Yes (chemical fertilizers) No (chemical pesticides)	Yes	Yes	Yes	Yes	No Certification Available

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