

June 2022

# Sustainable Agriculture and Food Systems in the Global South:

## AN INDIAN PERSPECTIVE

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*Photo by Guru Moorthy Gokul on Unsplash*

SECTION **1**

# INTRODUCTION

**As outlined in the UN's 1987 Brundtland report, sustainable agriculture should be able to meet the current needs of society without compromising the ability of future generations to meet their own needs. It should take into account environmental, social, and economic sustainability, which constitute the three central pillars of sustainable development.**

Organic farming, permaculture, precision agriculture, and other practices are often referred to as modern techniques. Yet many of these practices (Figure 1) have been an integral part of the cultural heritage of the Global South for millennia, and can be deeply regenerative, natural and organic. On one hand, the ability to grow grains in high quantities has massively reduced the starvation and malnourishment of our world's population, but at the same time, the current practices used are not sustainable. Yet while our traditional practices are sustainable, they are not scalable. The real dilemma is to connect these two strategies together, both at the production and the consumption sides. According to a [report](#) by the IUCN, sustainable agriculture will need first and foremost to consider two inseparable, intertwined societal priorities – preserving the environment and providing safe and healthy food for all.

Agriculture is critical for both human welfare and economic growth. However, it has particular significance in the Global South, which has a major concentration of poor smallholder farmers sustaining 60% of the population with 80% owning less than two hectares of land. The majority of the population in these countries are dependent on subsistence agriculture as their

main source of livelihood. Smallholder farmers in the Global South provide up to 75% of the food supply. Meanwhile, the average farmer owes up to 60% of their income in debt and nearly 40% of the food that they produce does not reach our tables due to loss in production, processing and/or distribution. These agricultural issues are intensified in the Global South and particularly in India due to population pressure, subsistence agriculture, rural poverty, natural resource depletion, uninformed policies, and gender disparities. Amidst these concerns, the agricultural system needs to feed an ever increasing population whose food demands are projected to double over the next 50 years. These concerns coupled with the adverse impacts of climate change have threatened our food security. Currently, 13% of global deaths in children under five are due to malnourishment. In India, that figure rises nearly to 20% even with current advances in food security. Food systems are locked in a spiral of decline with environmental systems: they are also major causes of degradation of the environmental systems on which they themselves depend.

Countries in the Global South have struggled to recover from the side effects of intensive agriculture initiated during the Green Revolution. Technological advances, for example, have revolutionised our agricultural production by increasing uses of insecticides, fungicides, herbicides and other agrochemicals. But these same advances now leave 40% of our world's insects like our honeybees at the brink of extinction. These dichotomies lie at the heart of current challenges in our food systems. Systems-level solutions are needed that work for every sector and every individual in the process. These solutions must be human-centred, which means they need to take into account the social, cultural and historical context wherever they are to be



*Photo by Nandhu Kumar on Unsplash*

implemented. In India, for example, sustainable agriculture is far from mainstream with only 5 types of sustainable practices scaling beyond 5% of the net sown area (Figure 2, [CEEW Report](#)).

Achieving food security through sustainable practices in the Global South faces many concerns including population growth, urban migration, poverty, social inequalities, fluctuations in the market and depletion of natural resources. These issues, though all interconnected, look different when viewed from different lenses. We convened a small group of thought leaders from different sectors and continents who attempted to address the biggest challenges in sustainable food systems through the perspectives of farmers, consumers and the environment itself. This whitepaper is a result of a panel discussion that our leaders engaged in during the [RISE World Summit in January 2022](#) with key recommendations and examples that all stakeholders in the agricultural system can use to identify a common path that embraces both food and environmental security in a sustainable manner.



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SECTION **2**

**SUSTAINABLE  
AGRICULTURAL  
PRACTICES AND  
SYSTEMS IN INDIA**

## PRACTICES AND SYSTEMS IN INDIA



Agroforestry



Precision farming



Integrated pest management



System of rice intensification



Organic farming



Partial conservation agriculture



Natural farming



Integrated farming systems



Biodynamic agriculture



Permaculture



Rain water harvesting-artificial recharge of groundwater



Crop rotation



Cover crops and mulching



Inter cropping



Contour farming



Floating farming



Vermicomposting



Shade net house



Farm pond lined with plastic film



Mangrove and non-mangrove bio-shields



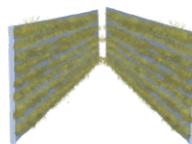
Alternate wetting and drying technique (for rice)



Direct seeding of rice



Silvipastoral systems



Vertical garden



Hydroponics/aeroponics



Crop-livestock-fisheries farming system



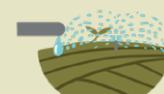
Plastic mulching



Saguna rice technique



Canopy management



Drip irrigation/sprinkler

FIGURE 1: India currently uses about 30 sustainable agriculture practices (SAPs) and systems (SAPs). Some are focused only on one aspect of agriculture and are called "practices", while others are more holistic and are known as "systems". Adapted from the [CEEW Report on Sustainable Agriculture in India 2021](#).



**CROP ROTATION** is the most popular SAP across the country, covering about **30 mha** and **~15 million farmers**.



Close to **1 million farmers** practise **NATURAL FARMING**, mostly in Andhra Pradesh, Karnataka, Maharashtra, and Himachal Pradesh.



The area under **PARTIAL CA** is estimated to be around **2 mha**, mostly in a few states in the Indo-Gangetic Plains (IGPs).



Despite government policy support, **ORGANIC FARMING** currently covers only **2%** of the country's total net sown area (**140 mha**).

**FIGURE 2:** Area and scale of adoption of a few Sustainable Agricultural Practices and Systems In India. Data obtained from the [CEEW Report on Sustainable Agriculture in India 2021](#).



*Photo by Unsplash*

SECTION  
**3**

**PERSPECTIVES  
ON PROBLEMS  
AND POTENTIAL**

## A. THE FARMER'S PERSPECTIVE

Roughly 86- 87% of farmers in India are smallholder farmers (including marginal farmers) who own only 47-48% of the crop area. In India, agricultural economy and food security depend on smallholder farmers. According to a [study](#) by the FAO, agricultural lands with land-holdings less than 1.0 ha have contributed proportionately more to the national grain production than larger holdings. Despite this contribution, smallholder families, who constitute about one-half of the national population, comprise almost three-fifths of the nation's hungry and poor. In most cases, we

tend to overlook the fact that farmers themselves are important consumers and they consume most of what they produce. Therefore, it is socially beneficial that agricultural lands with smaller land-holdings and their farmers are supported to adopt sustainable practices that increase productivity and at the same time conserve the environment. The complication of transitioning to sustainable practices arises in bringing the benefits of scale, technology and finances to these small land-holdings.

### SMALLHOLDERS DILEMMA IN THE NILGIRIS

Indigenous farmers in the [Nilgiri Biosphere Reserve](#) in the Nilgiris district of Tamil Nadu are all smallholder farmers with one or two acres of land per household, engaged in rain-fed agriculture. These farmers also belong to particularly vulnerable tribal communities situated very close to the forest. Their agriculture holdings are very close to the forest landscape either in the buffer region or forest fringe or sometimes within the forest itself. In addition to the challenge of adopting new technologies, the communities also face nature-based challenges. These plots of land are not contiguous flatlands. They are scattered across very difficult terrain. Wildlife interactions and water stress are also big issues in the Nilgiris as the agriculture is rain-fed. There are also institutional challenges in terms of land tenures and the process of receiving land securities through the [Forest Rights Act](#). These challenges stem from the fact that these landholdings, in many instances, are yet to be recognised legally in the name of the head of the household and the spouse. Without clear property rights or land titles, farmers face challenges in accessing institutional, state, and district level provisions. They are also not organised well enough, and because they reside in settlements that are small and scattered across the landscape, and in some instances difficult to access, their access to market infrastructure and technology is also limited.



*Photo by Keystone Foundation*

The transition to more sustainable practices is limited due to a need for produce marketing, capital for organic farm inputs, better logistical linking of producers to consumers to minimise post harvest losses, greater responsiveness for consumer needs, and accessibility to technologies promoting sustainable food systems. There have been many investments from government and bilateral agencies, private donors, and investors. Billions of dollars are invested every year in agricultural innovation for the Global South. Yet [CoSAI research](#) shows that only a small fraction of such funding is intended to promote environmental and social objectives. We need to develop mechanisms that can create regional funds and focus on bringing diverse investors and donors together locally to create the ecosystem required for farmers to flourish, particularly small and marginal farmers. Stakeholder consultations that involve key decision makers from the government and corporate sectors can help influence the implementation of programmes with mechanisms that increase farmer's incomes and can be scaled. Farmers could also be incentivised directly for adopting sustainable approaches through direct account transfers.

The accessibility of mobile technologies presents an opportunity for immense innovation and impact on food systems around the world through digitisation, especially within the Global South. It is estimated that there are approximately 3.6 billion mobile phone users worldwide, with numbers on the rise, particularly in rural areas (Rees, 2016)<sup>1</sup>. However, digital solutions may not be necessarily accessible and viable in some places. Farmers should be able to not only use digital spaces, but also become a producer and owner of that

knowledge. As the production and value chain systems become increasingly digitised, we need to empower farmers to gain more revenue not only from the food they produce, but also from the knowledge they bring to the process within these digital spaces. This can be achieved by training farmers to use agricultural apps, participate in policy making decisions, interpret meteorological data, analyse consumer patterns, and other participatory interventions. We also need to increase their digital literacy to ensure they take advantage of connectivity to reach consumers as directly as possible and with virtual support networks. Platforms such as [Digital Green's FarmStack](#) are allowing secure and controlled exchange of data that can inform tailored solutions for farmers, greatly reduce costs for organisations, and expand the reach of existing tools. Use of technology and new systems that enable improved production decisions and market outcomes has to be contextually tailored and implemented.

Recently, there has been a sudden revival of interest in farming and many individuals are beginning to see the potential of farming as an option for their livelihood, resulting in reverse migration from cities to villages. This, perhaps, is a reaction to the pandemic. To keep this momentum, agriculture must be made economically viable and market-friendly. The issue of markets has to be approached practically. To maintain the value chain, we need to think about changing the market to address challenges at the market level and ensure supply and demand for natural and regenerative products at a fair price for all. We need more local and contextualised market solutions for different

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<sup>1</sup>Rees, A. (2016). Mobile Technology and Sustainable Development. Reset. Retrieved from <https://en.reset.org/knowledge/mobile-technology-and-sustainable-development>

types of localities, agricultural practices, stakeholders, landscapes, etc.

Farmers need to be our initial focus while framing policies and designing technologies. This will make a difference in terms of improving productivity, ensuring permanency through better resilience

in agriculture, and generating increased profits by linking to the market. Such focus is also important to address the Sustainable Development Goals. Unless farmers are empowered with increased incomes and capabilities, our proposed recommendations and techniques will not be implemented successfully.

## B. THE CONSUMER'S PERSPECTIVE

**In 2018, the Food and Agriculture Organisation of the United Nations (FAO) and the United Nations Environmental Programme (UNEP) jointly framed sustainable agriculture as "a consumer driven, holistic concept that refers to the integrated implementation of sustainable patterns of food consumption and production".**

Consumers around the world can be a powerful force for change towards more sustainable and equitable agri-food systems. As a result of the Covid-19 pandemic, consumer awareness of the relationship between food, health, and environmental issues has increased. However, marketing approaches continue to view consumers as passive actors, which deepens the disconnection between consumers, producers and nature.

The biggest challenge is to make consumers understand the supply chain and the role they can play to promote sustainable and climate-resilient food systems. The supply chains through which food reaches consumers can be incredibly complex. Food producers, processors, transporters and retailers are among the many key players involved in making sure food reaches our plates. The [Food Bundles company](#) connects farmers with consumer markets by providing a digital platform where farmers can advertise and sell their produce. This enables a zero-waste system in which produce directly reaches the consumers. However, we need to work on mechanisms to ensure that food is also economically accessible to consumers. Studies<sup>2</sup> on consumer behaviour show that people in India are willing to spend a premium price for organically grown and sustainably sourced food but their purchase intention is affected largely by accessibility and availability, amongst other factors. On the other hand, some people are willing to pay a premium price for a movie ticket,

<sup>2</sup>Singh, A., Verma, P. (2017). Factors influencing Indian consumers' actual buying behaviour towards organic food products. Journal of Cleaner Production. Volume 167, ISSN 0959-6526, <https://doi.org/10.1016/j.jclepro.2017.08.106>.

but not on organic food. This suggests that a significant mindset change is necessary.

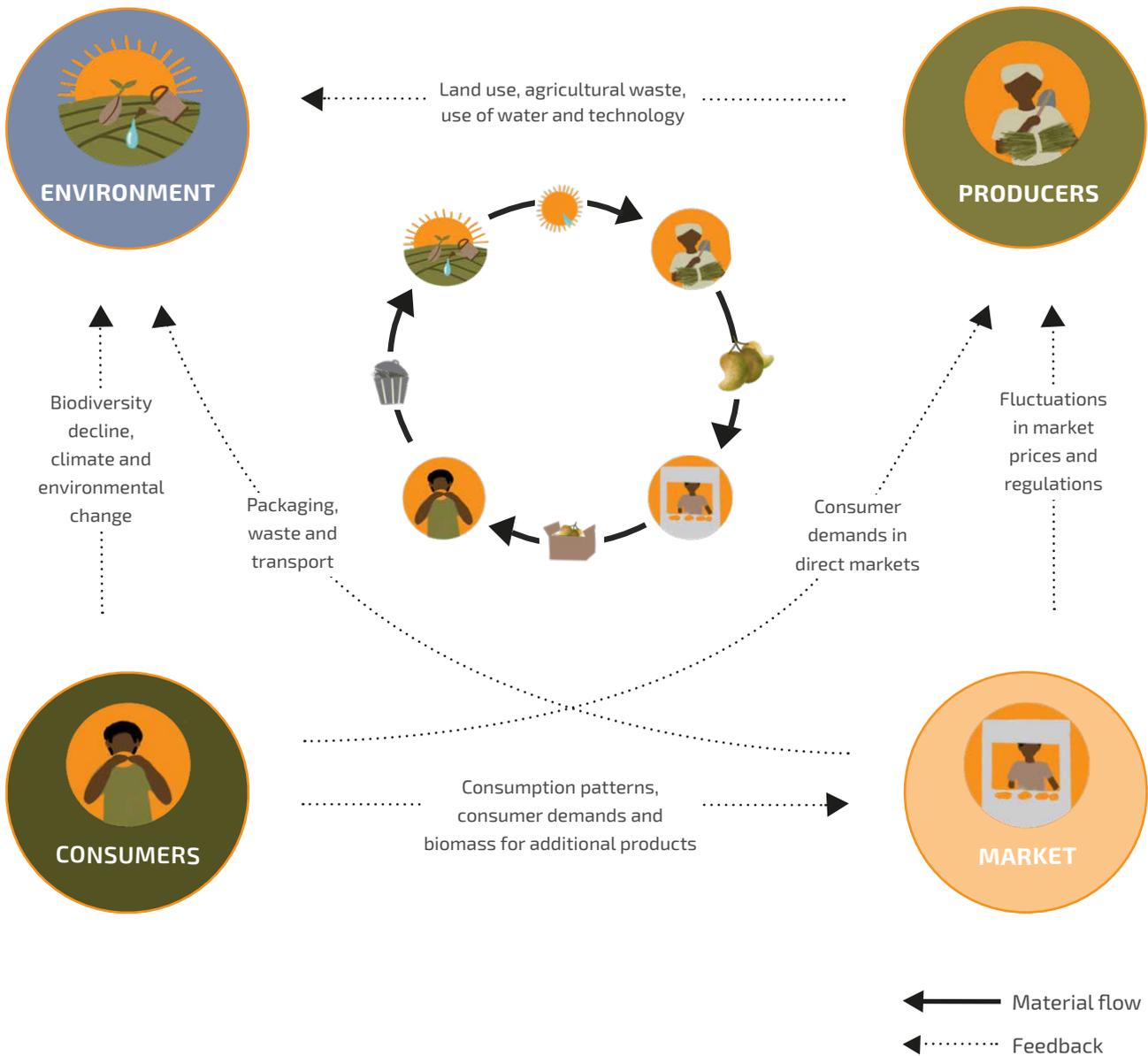
From a market perspective, we need to develop communication strategies to help consumers understand that well-being is not simply a matter of exercise, but is also about making the right food choices. We need to make consumption of healthy, nutritious, and sustainable food aspirational for all. This can be achieved by framing policies that encourage green lifestyles in circular economies. Information and communication technology (ICT) in agriculture has played a vital role in enhancing agricultural and rural development through improved information and communication processes. The transformative nature of ICT is capable of enabling innovation across the whole production spectrum from the extraction of natural resources, to manufacturing, distribution, logistics and reuse, and in the ways of organising production and consumption in multiple interrelated industries and societal applications.

We also need to empower and engage consumers so that they play an active role in the sustainable transition. The [Participatory Guarantee System \(PGS\)](#) is a qualitative process undertaken by a farmer/ producer group, who collectively take the responsibility to peer review each member's farm production process. It is a quality assurance initiative that is locally relevant, emphasising the participation of stakeholders, including producers

and consumers. It ensures that the farmer or producer abides by the criteria and standards that guarantee the organic quality and integrity of the product produced in their respective farms. Involving consumers in this process collectively allows them to take responsibility to peer review the production process and ensure the integrity of products verified by the PGS. This leads to equal sharing of power and responsibilities, the formation of trust, and a permanent learning process through the engagement of all stakeholders.

From being the largest drivers of global environmental change to becoming agents of global sustainability, the transition to more sustainable practices requires a major shift from farm-level solutions to a focus on the entire value chain (Figure 3) keeping the producers and consumers in focus for all our discussions. The [Periodic Table of Food Initiative \(PTFI\)](#) is a global effort to create a public database of the biochemical composition and function of the food we eat. PTFI includes over a thousand foods to ensure the cultural and geographic diversity of foods around the world are represented. This is critical in ensuring that neglected climate-resilient and nutritious foods can gain more visibility globally and we have less reliance on 5 crops (wheat, rice, corn, potatoes and soybeans) that are easily interrupted if a major producer is disrupted by war or other disasters within their national borders.

# A DYNAMIC FEEDBACK SYSTEM IN THE AGRICULTURAL VALUE CHAIN



**FIGURE 3:** The diagram shows a subset of stakeholders in an agricultural value chain, highlighting the feedback loops involved in our food systems. Major stakeholders such as the government (not depicted in the diagram) also affect the value chain through policies, taxes and subsidies. Most agricultural value chains are outlined in a linear format, placing consumers at the end of the value chain. However, consumers directly impact not just the market but also the producers and the environment. In the entire value chain, consumers have the ability to disrupt the system towards more sustainable and equitable agri-food systems.

## C. THE ENVIRONMENTAL PERSPECTIVE

Historically, we have approached agriculture largely from an extractive and intensive approach to increase productivity for the ever-growing population. This has led to degradation of the ecosystems on which agriculture inherently depends. It is estimated that over the last 40 years, 30% of the world's top soils have been degraded while productivity losses due to climate change in the Global South are over 20%. Three additional challenges that are being faced today are the ecosystem services on which agriculture depends, the health of biodiversity, and climate change. In most countries across the Global South and particularly in India, cultivation patterns such as mono-cropping with heavy reliance on groundwater and chemical inputs have reduced food sovereignty and have added to the growing environmental problems. These farming methods have decreased the carbon-sequestering ability of soil, which is one of the reasons for our increasing global temperatures.

As a specific example regarding soil, [Vijay Kumar Thallam and Walter Jehne](#) in Andhra Pradesh find that healthy soils may hold up to 50 times more water than chemically driven agricultural soils<sup>3</sup>. Increased soil water-holding capacity decreases the chances of floods, which is one of the major expenses in terms of climate disasters in the world. Healthy soil also promotes the soil's ability to sequester carbon. Carbon is released in the atmosphere through a process called tillage, where the soil is ripped up in order to plant seeds. It is predicted that soils have lost between 50-70% of original carbon stock. Soil carbon sequestration

helps restore degraded soils, which can improve agricultural productivity. As a result, healthier soils make farms more resilient against both droughts and heavy rainfall. Therefore, farmers who adopt sustainable practices will suffer much less from a low-yield season as compared to conventional chemical-based farming because of better carbon sequestration and soil resilience.

For finance ministries, incentivising sustainable agricultural practices is critical in terms of food security, biodiversity conservation, and the overall well-being of humans, animals and the larger ecosystem. This should be advocated not only by the ministers themselves, but governments at national and international levels. We need to consider the urgency of adopting better agricultural practices in a functioning society. This can be realised through, for example, capacity-building programmes where farmers are educated to adopt a farming systems approach that depends more on livestock and agroforestry and not just single cropping systems.

It is very important to ensure that overall government schemes and strategies are adapted across various agro-ecological zones (Figure 4). Crop productivity in a particular agro-ecological zone may not necessarily be directly transferable to other locations. Nevertheless, many existing schemes and innovations are designed at a local level but government programmes are either state-wide or at a national level with generalised guidelines. Better adaptation of policies for agro-ecological considerations in India could be

<sup>3</sup>According to Bryant (2015) <https://www.nrdc.org/experts/lara-bryant/organic-matter-can-improve-your-soils-water-holding-capacity>

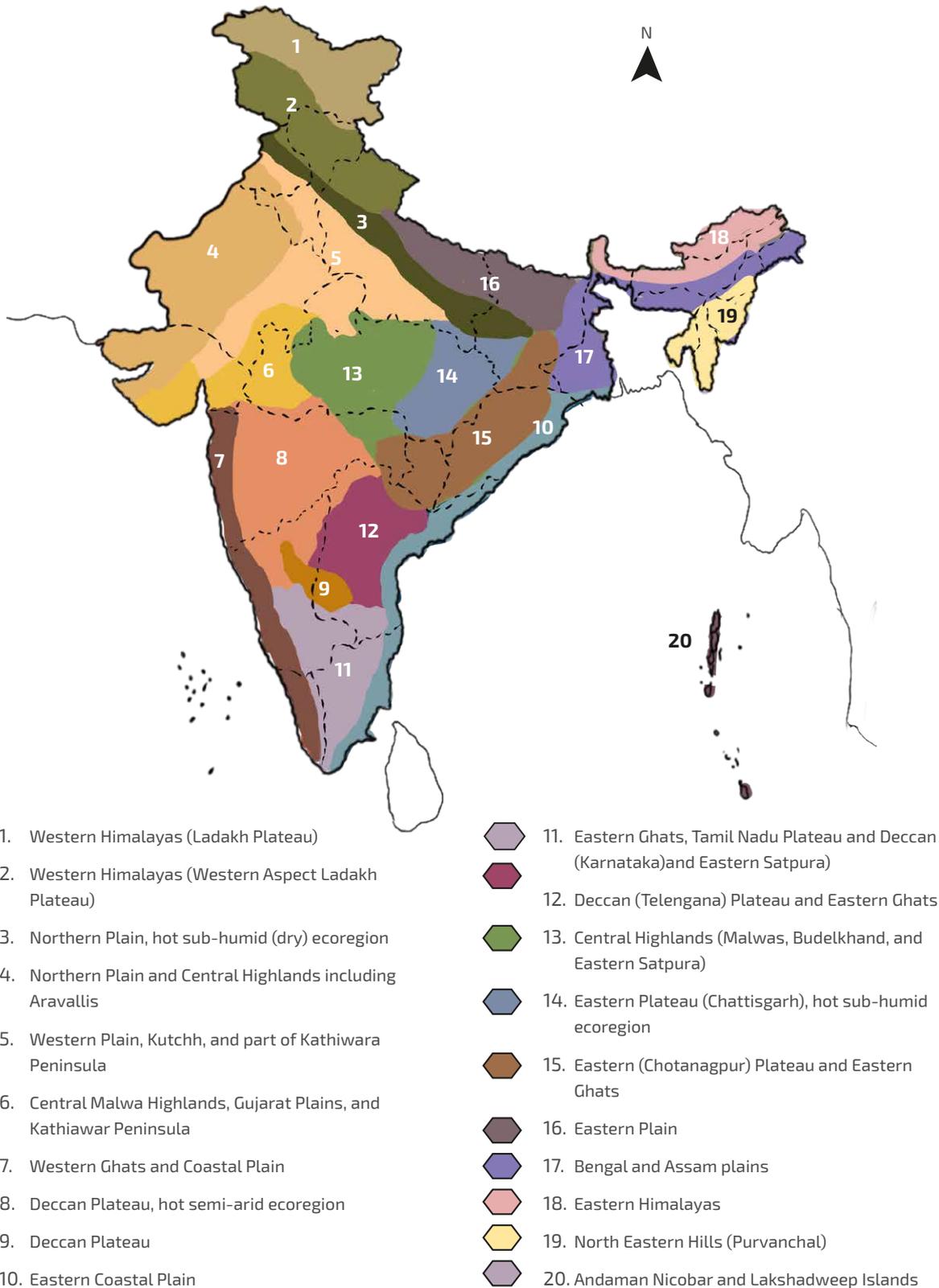
achieved through effective implementation of programs and activities under the [National Action Plan on Climate Change \(NAPCC\)](#), [National Water Mission](#), [National Mission for a 'Green India'](#), [National Mission for Sustainable Agriculture](#), and the proposed [National Mission on Biodiversity and Human Wellbeing](#).

In addition, many sectoral policies and development planning procedures must be adapted contextually to the different agro-ecological zones. Important policy areas include rural development (e.g. guaranteed employment for the rural poor for part of the year, investment in rural infrastructure); spatial planning (e.g. land use planning, zoning regulations); environmental regulations (e.g. strategic environmental assessments); water policies and planning (e.g. integrated water

resources management approaches, water tariffs); agricultural pricing (e.g. tariffs, minimum price guarantee, and subsidies for agricultural commodities); and risk management (contingency plans, insurance, seed banks). The policies of local and national governments directly contribute to adapting various schemes and strategies across different agro-ecological zones.

Through community consultations with farming communities, researchers and local environmental experts can work together to identify the gaps and develop guidelines and toolkits that are more contextualised and region-specific. Advancing agro-ecology requires harnessing the power of a social movement and knowledge intensive practices. Both must be intrinsically linked for success to happen.

## AGRO-ECOLOGICAL ZONES OF INDIA



**FIGURE 4:** The National Bureau of Soil Survey & Land Use Planning (NBSS & LUP) came up with twenty agro-ecological zones based on climatic factors, soil properties and physiographic settings (topography and drainage)



*Photo by Guru Moorthy Gokul on Unsplash*

SECTION **4**

**LET'S GET  
STARTED**

The successful transition to sustainable agricultural practices will require decision-makers, investors, farmers, distributors, retailers and consumers to work collaboratively. Such a transition will require major shifts in our strategies and behaviour. We need to promote strategies that take into account social, human and natural capital growth, in addition to monetary profits. We recommend the following starting points to enable this transition in India, with a viewpoint to future contextualisation to the Global South:

1. Establish market mechanisms and economic stewardship that prioritises duty of care for ecosystem services to enhance community adoption and improve farmer livelihoods. These market mechanisms should ensure that farmers have multiple revenue streams, including those based on ecosystem services, to support themselves. The support for this can be redirected from schemes that are currently being used for subsidies, farmer credit, waiving of loans, electricity, etc.
2. Create human-centred projects in which stakeholders and scientists work closely together to enable direct knowledge transfer. Public-private partnerships in Denmark and southern Scandinavia have a [Plant Biologicals Network](#) where both industry, organisations, and universities work together and exchange ideas not only for crop protection, but also for bio-fertilizers and biostimulants. We need to create similar opportunities to foster knowledge-intensive food systems instead of resource-intensive food systems.
3. Initiate farmer groups where many farmers participate to discuss issues related to their farms together with professional advisors. This helps them to develop their farms and find new solutions for production and markets.
4. Build an industry consortium where we commit to keeping a proportion of the retail value within the rural setting for farm produce, value addition, processing, storage or bio-inputs to ensure better value for all stakeholders. Enterprises can also be created around farm activities to produce food. This can involve, when possible, ensuring that 90% of carbon credit value goes back to the entire value chain.
5. Promote alternative uses of agricultural biomass such as crop residues, animal waste, food and processing waste and byproducts, leaves, straw, seaweeds, etc., in side-streams and circular economies that can increase the value and revenue of crop production, as well as provide new market opportunities that can feed back into the value chain.
6. Increase literacy around food systems amongst policymakers, bankers, micro-lending institutions, cooperatives and the larger public through targeted awareness campaigns to reorient current policies and practices.
7. Create consumer demand by producing material that provides education on the benefits of non-chemical farming and similar mass media outputs through various communication channels. This will not only enhance consumer awareness for adopting

sustainable consumption practices, but also incentivise farmers to move in this direction.

8. Build capacities of young farmers by setting up workshops and developing easy-to-read toolkits that provide the knowledge to navigate through the agricultural space, particularly markets. This will empower them to negotiate their needs and demands.
9. Develop customer centres and services to allow farmers to take maximum advantage of new technologies, policies and schemes that are quite often designed for large agricultural

fields that can use heavy machinery. Self-help groups or farmer cooperatives can assist in this initiative.

10. Establish effective think tanks that influence the decisions of policymakers. In India, the NITI Aayog is a policy think tank that provides policy and directional inputs to the government. Policy makers need to be informed to avoid policies leading to overexploitation of natural resources and rather support policies to scale innovations that save water, promote biodiversity, and improve soil health.



Photo by Shantanu-Desai on Unsplash



*Photo by Sooraj Perambra on Unsplash*

SECTION

**6**

# CONCLUSION

Social, economic, and environmental sustainability are closely intertwined and necessary components for truly sustainable food systems. Farmers faced with poverty are often forced to mine natural resources to make ends meet, even though environmental degradation may affect their livelihoods in the long run. Consumers, who in most cases are placed at the end of the traditional linear agri-supply chain, play an important role in the transition to sustainable food systems. Consumption patterns regulate markets and farm production, while also determining the nature of the waste and side streams produced in the process that can be used as inputs for subsequent production. On the

other hand, behavioural aspects of consumers can also negatively impact the soil, water, biodiversity and climate inputs for producers. It is important to understand the interrelationships between the various actors and stakeholders in our agriculture and food systems. Only by creating policies and practices that integrate social, environmental, and economic interests can societies promote more sustainable food security. There is enormous power when all stakeholders come together. Listening and learning how to trust each other is just the beginning. We need to turn networks into communities of practice that share, multiply, expand and scale knowledge.



# Glossary of Abbreviations

CA - Conservation Agriculture

CEEW - Council on Energy, Environment and Water

CoSAI - Commission on Sustainable Agriculture Intensification

FAO - Food and Agriculture Organisation of the United Nations

IUCN - International Union for Conservation of Nature

NITI Aayog - National Institute for Transforming India

SAP - Sustainable Agriculture Practices

SRI - System of Rice Intensification

UN - United Nations



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