



AGROECOLOGY **POSSIBILITIES AND** **CHALLENGES IN INDIA**

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This report on *Agroecology: Possibilities and Challenges in India* captures the discussions in the two captures the discussions in a two part dialogue series. Part A of the report captures the discussions in the first dialogue in the series which focused on *Vulnerabilities of Farmers & Farming Today - Is Agroecology a Solution?*, and Part B of the report summarises the deliberations in Dialogue 02 on *Pathways to a Sustainable Agriculture & Critical Assessment of Government Policies*.

Collaborating Organisations:

All India Peoples Science Network (AIPSN)

Focus on the Global South

Speakers:

Peter Rosset (The College of the Southern Border (ECOSUR),

G V Ramanjaneyulu (Centre for Sustainable Agriculture),

Chukki Nanjundaswamy (Amrita Bhoomi Agroecology School/Karnataka Rajya Raitha Sangha)

Shalmali Guttal (Focus on the Global South)

Parthib Basu & Anshuman Das (University of Calcutta)

Sagari Ramdas (Food Sovereignty Alliance & Kudali Learning Centre)

Dharmendra Mishra (hFServices)

Dinesh Abrol (All India Peoples Science Network)

Report compiled by Dhruv Somayajula

(This report reflects the views presented at the online dialogue and does not represent the position of either organisations)

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Part A. Issues Faced by Small-scale Farming Sector

Background

Currently, the world is facing up to another global food crisis. The Food and Agriculture Organisation (FAO), the United Nations' wing responsible for addressing issues of global hunger and food security, has noted that 828 million people were affected by hunger in 2021.¹ Additionally, the FAO reports that hunger continues to rise in most of Asia, Africa, Latin America and the Caribbean, with an estimated 8 percent of the world population predicted to be undernourished in 2030. Around 2.3 billion people suffered from moderate to severe food insecurity, of which 40 percent face severe food insecurity with 207 million people added to this count just between 2019 and 2021.² It seems apparent that the world is not just at the precipice of a food catastrophe, but that it is already underway for a significant part of the world population.

At this stage, it may be helpful to identify the factors causing the stresses on the agricultural sector and its key components. The effects of the COVID-19 pandemic and the Russian invasion of Ukraine have caused disruptions in the global supply chain. There are substantial economic and environmental factors at play as well. Global multi-level and cross-sectoral market concentration in the hands of a few corporations and the rise in commodity speculation in the agricultural sector have led to price volatility. Adding to these factors, climate change continues to severely affect the agricultural sector. However, the impacts to the agricultural sector are not felt equally, as the sector is not a monolith. As is the case with inequality of means across sectors, the impact is felt most by small and marginal farmers. In terms of the current food crisis, aspects of food insecurity, widespread inequality and poverty can be traced to the unique issues faced by small-scale farmers. This report seeks to discuss the major issues faced by small-scale farmers today, and offers agroecology as a potential alternative that can benefit this class of farmers.

The importance of small-scale farmers

Small-scale farmers, also called smallholders, refer to those agricultural producers who operate in small farm holdings typically less than 2 hectares. Recent research by the FAO shows the stark inequality in terms of global landholdings. Farms larger than 50 hectares make up one percent of the number of all farms, but operate on more than 70 percent of the world's farmlands, whereas small farms account for 84 percent of all farms in the world while operating in around 12 percent of all farmlands.³ However, it is important to note that while small-scale farmers occupy a minor amount of agricultural land, they account for an out-sized 35 percent of the world's food production. Merely in India and China, small-scale farmers account for 47 percent and 80 percent of the total national value of food production respectively.⁴ As these figures indicate, small-scale farmers are critical to food production and supply chains, providing 80 percent of the food supply in Asia and sub-Saharan

¹ Food and Agriculture Organization 'The State of Food Security and Nutrition around the World 2022', available at <<https://www.fao.org/3/cc0639en/online/sofi-2022/food-security-nutrition-indicators.html>>

²Section 2.1, *ibid*.

³Sarah Lowder et al 'Which farms feed the world and has farmland become more concentrated?' (2021) 142 *World Development Journal* 105455 <<https://www.sciencedirect.com/science/article/pii/S0305750X2100067X?via%3Dihub>>

⁴Fig. 5, *ibid*.

Africa.⁵ The concentration of farmlands in the hands of few large farm holders is seen primarily in upper-middle income and high-income countries. Large-scale farming and concentration of farmlands in the hands of a few has been directly linked with economic development, with a large amount of farming in developed countries happening mainly through large-scale farms.⁶ Such trends present a dire forecast for the fate of small-scale farmers, whose impact runs deeper than mere food production and supply.

Small-scale farmers play a key role within the agricultural sector in several ways. In developing countries across the world, small-scale farmers produce around 90 percent of staple foods. Additionally, small-scale farming tends to maximize land productivity, seeking to have a diversified crop production around the year. Through the benefits of polyculture, small-scale farmers globally outperform large farm holding monocultures in yield per unit numbers.⁷ This productivity is achieved not at the cost of environmental damage. Instead, small-scale farmers efficiently marshal soil, water and biodiversity resources, and often act with the environment instead of shaping it as per their needs.⁸ Small-scale farmers in developing countries comprise the vast majority of farmers, and sustain themselves through their crops both in consumption and through sale, allowing for self-employment and self-sustenance. They produce seasonal crops due to their focus on polyculture and diversified farms. For this, small-scale farmers often act as custodians of indigenous knowledge, and are key to ecological conservation and biodiversity restoration efforts.⁹ However, as elaborated in the following sections, the benefits attainable by small-scale farming, and evidenced across the world, can be impacted by socio-economic and environmental issues.

In India, small-scale farmers occupy a unique position within the agricultural sector due to their sheer magnitude. The Agricultural Census, 2016 refers to distinct entities of marginal and small farmers, based on marginal farmers holding less than one hectare of land and small farmers holding between one and two hectares of land. Small-scale farmers make up around 86% of all farmers in India, while owning around 47% of the cropped area, with around 44% being held by medium-scale farmers.¹⁰ The average size of operational farm-holding in India has decreased from 2.28 hectares in 1970 to 1.08 hectares in 2016, showing the increasing fragmentation of farm holdings in India.¹¹ Farming is the largest job-creator in India, with over half of the Indian workforce relying on farming as a source of livelihood. With a rising number of India's farmers becoming classified as small-scale farmers, conversations on India's agricultural sector and the approach to policy-based cross-sectoral reforms

⁵ 'Factsheet- Smallholders and Family Farmers' Food and Agriculture Organisation
<https://www.fao.org/fileadmin/templates/nr/sustainability_pathways/docs/Factsheet_SMALLHOLDERS.pdf >

⁶Ibid

⁷Miguel Altieri 'Small Farms as a Planetary Ecological Asset: Five Key Reasons Why We Should Support the Revitalisation of Small Farms in the Global South' (2008) Environment & Development Series, Third World Network
<<https://monthlyreview.org/wp-content/uploads/2009/07/end07.pdf>>

⁸Ibid

⁹Miguel Altieri 'Agroecology, Small Farms, and Food Sovereignty' (June 2009) Monthly Review
<<https://monthlyreview.org/2009/07/01/agroecology-small-farms-and-food-sovereignty/>>

¹⁰Syantana Bera 'Small and marginal farmers own just 47.3% of crop area, shows farm census' (1 October 2018) LiveMint<<https://www.livemint.com/Politics/k90ox8AsPMdyPDuykv1eWL/Small-and-marginal-farmers-own-just-473-of-crop-area-show.html>>

¹¹Agriculture Census Division 'Agriculture Census 2015-16: All India Report on Number and Area of Operational Holdings' (2019) Department of Agriculture, Co-operation & Farmers Welfare <https://agcensus.nic.in/document/agcen1516/T1_ac_2015_16.pdf >

must place front and centre the challenges faced by small-scale farmers. The next section seeks to throw light over some of the major challenges faced by small-scale farmers, and provide directions for impactful policy-level intervention.

Issues faced by small-scale farmers in India:

One of the biggest issues faced by small-scale farmers is the question of economic viability due to lack of institutional support. While it has been demonstrated the world over that small-scale farming is productive, efficient and regenerative in terms of soil quality, the support for small-scale farmers in India has been dismal. These issues have played out in recent years through regulatory missteps, income stagnation, ecological risks and apathy from policymakers and public institutions. The current approach to policy interventions in the agricultural sector seeks to replicate the experience of developed countries. However, the policies needed for the largest farms in the world are most certainly different from the resources and support needed by small-scale farms in the developing world, broadly facing the following concerns.¹²

Regulatory missteps:

In India, the recent protests regarding the three farm laws, introduced in 2020 and repealed in 2021, saw farmers flagging fears relating to corporatization, weakening of traditional Agricultural Produce & Livestock Market Committees (APMC), and *mandis*, and corporatization through contract farming. The example of Bihar's agricultural sector, where the APMC structure was abolished in 2005, was often cited as a concern in the protests. The elimination of the APMC structures was planned to bring in investments, modernization and eliminating the middleman to benefit small-scale farmers. However, the inverse happened, with this move leading to lower farm harvest prices of paddy and only minor increases in maize prices. Further, the losses were greater and gains were smaller for small-scale farmers compared to large-scale farmers for both paddy and maize crops.¹³ There were additional regulatory failures such as inability of local bodies to step in and achieve procurement targets, resulting in small-scale farmers needing to pay market fees, bribes and commissions. Given that small-scale farmers typically do not have warehousing or storage capacities, the need for immediate cash after harvests and dependency on traders has led to them making INR 350- 450 lesser than MSP rates for most major crops in Bihar during 2019-20.¹⁴ APMCs as an institution are designed to protect small-scale farmers from such a monopsony, with each state modifying these institutions to suit its unique requirements. As a result of sustained protests, these central laws were repealed after the government failed to broker a deal with farmer unions. The agricultural sector certainly is impacted with several issues that need regulatory action. The sector urgently needs a shift in

¹²Sarah Lowder et al 'Which farms feed the world and has farmland become more concentrated?' (2021) 142 World Development Journal 105455 <<https://www.sciencedirect.com/science/article/pii/S0305750X2100067X?via%3Dihub>>

¹³Sunil Saroj et al 'Impacts of Sweeping Agricultural Marketing Reforms in a Poor State of India: Evidence from Repeal of the APMC Act in Bihar' (October 2021) presented at International Conference of Agricultural Economists <https://www.researchgate.net/publication/355586640_Impacts_of_Sweeping_Agricultural_Marketing_Reforms_in_a_Poor_State_of_India_Evidence_from_Repeal_of_the_APMC_Act_in_Bihar>

¹⁴Sukhpal Singh et al 'Contentious farm laws: What the Bihar experience shows' (17 March 2021) DownToEarth Magazine <<https://www.downtoearth.org.in/blog/agriculture/contentious-farm-laws-what-the-bihar-experience-shows-75989>>

governmental approach towards small-scale farmers in terms of ecological assistance and financial support.

Income stagnation:

In recent years, small-scale farmers in India have suffered from income stagnation. A study conducted by the Ministry of Statistics and Programme Implementation shows that most small-scale farmers in India have taken to depending on income from wages (non-farming labour) as a substantial portion of their monthly income, with between 30 and 40 percent of the income coming from farming.¹⁵ The same study shows that income from farming as a share of total income is much higher for those farmers holding more than 2 hectares of agricultural land, i.e., large-scale farmers. Farming income contributes 50 percent or more of overall income for only 39 percent of agricultural households in India or approximately 36 million households.¹⁶ The dependency on wage income shows the monetary constraints faced constantly by small-scale farmers, and the inability of the current system to help provide adequate support for this section.

Steps such as replacing informal loan credit systems with formal credit through the banking sector at low interest rates have been in place for several years, but lack implementation and do not address the issue directly.¹⁷ Schemes such as *Rythu Bharosa* in Andhra Pradesh and *Krushak Assistance for Livelihood & Income Augmentation* in Orissa act as income augmentation programs as opposed to typical loan waiver programs and aim at ameliorating income-based concerns of small-scale farmers.¹⁸ These programs are laudable steps towards providing direct income support to small-scale farmers. However, additional steps such as ensuring proper implementation, inclusion of tenant farmers, farm workers and other non-landowning farmers and reconfiguring the market are necessary for sustained positive impact. In this regard, these programs should include landless agricultural labourers, tenant farmers and other marginalized groups in providing income, along with offering insurance schemes and zero-interest crop loans.

Soil degradation and environmental concerns:

The agricultural sector is tied with nature at its core, relying on nutrients in the soil, water and seasonal variations in the climate to foresee and accordingly plan their produce. Thus, farming is particularly vulnerable to weather variations caused by climate change, such as unseasonal rains or

¹⁵'Situation Assessment of Agricultural Households and Land and Livestock Holdings of Households in Rural India, 2019' (September 2021) National Statistics Office, Ministry of Statistics and Programme Implementation, NSS Report No. 587(77/33.1/1)<https://www.mospi.gov.in/documents/213904/301563//Report_587m1631267040957.pdf/3793650e-8cf1-7872-ae90-51470c8d211c>

¹⁶Harish Damodaran et al 'Agricultural Households and Farming Income: An initial analysis of variations in income from farming and other sources among agricultural households in India' (30 September 2021) Centre for Policy Research <<https://cprindia.org/agricultural-households-and-farming-income-an-initial-analysis-of-variations-in-income-from-farming-and-other-sources-among-agricultural-households-in-india/>>

¹⁷Sukhpal Singh 'Replicating Small Farms, Prosperous Farmers in India: Lessons for Policy and Practice' (2017) 8 Journal of Agribusiness Marketing 1.

¹⁸Rahul Pisharody 'Explained: RythuBandhu, Telangana govt's DBT scheme for farmers' assistance' (29 December 2021) The Indian Express <<https://indianexpress.com/article/explained/explained-rythu-bandhu-telangana-govt-dbt-scheme-farmers-7696651/>>; 'Letter from Chief Secretary to district collectors on KALIA Scheme' (29 December 2018) D.O. No. Agril&FE/AP-I-247/18-234381/CS <<https://kalia.odisha.gov.in/assets/guidelines/C-S-letter-on-KALIA-Scheme-to-Collectors.pdf>>; Krushak Assistance for Livelihood & Income Augmentation Coffee Table <<https://kalia.odisha.gov.in/assets/downloads/KaliaCoffeeTableBook.pdf>>

high temperature deviations during winters or summers. Studies highlight yield declines in rainfed crops such as maize and paddy, and irrigated yields generally, as a result of growing CO₂ fertilization in the soil caused by rising CO₂ emissions.¹⁹ Reduced crop yields may accelerate the ongoing food shortage crisis in developing countries, spiking cases of malnutrition and global hunger. Further, scientists conclusively link climate change caused by human-driven greenhouse gas emissions to extreme weather events.²⁰ Such weather events may include droughts, heat waves or cold waves, all of which negatively impact crop yields. The harms caused by reduced yields due to these extremities are not faced equally. Small-scale farmers are disproportionately impacted by such events. Small-scale farmers rely on their produce for both sustenance and income. Additionally, current institutional systems catering to small-scale farmers do not take into account the lack of financial security or the need for climate-based insurance covers.

Another aspect of environmental concerns is soil degradation. Soil degradation is defined as a change in the soil health resulting in reduced capacity of the ecosystem to support its beneficiaries.²¹ Soil degradation may happen in a variety of ways, such as land degradation due to excessive use of chemicals depleting nutrient-rich soil, soil erosion due to environmental hazards, over-irrigation, deforestation, overgrazing or agricultural overuse. In this process, otherwise healthy soil loses its ability to provide nutrients needed to produce crops, causing farmers to invest heavily in fertilisers for such nutrients. Researchers draw a direct link between soil degradation to poor crop rotation and inadequate organic matter inputs in India.²² The reliance on chemical fertilisers compounds soil degradation, causing soil acidification and deterioration of the rhizosphere.²³ In India, the Green Revolution has brought on heavy reliance on chemical fertilisers for wheat crops, such as urea, potash and phosphates. The overuse of such chemical fertilisers has been linked with directly causing an increase in the salt levels of the soil.²⁴ To counter this, methods such as conservation agriculture, diversified cropping (using maize as an alternative to rice in areas with water scarcity), and agroforestry to regenerate soil capacity has been suggested.²⁵

The provision of MSPs for limited crops influences crop choices of farmers, who are disincentivized to grow nitrogen-fixing crops to naturally stabilize the ecosystem. The use of high-yield varieties as part of the Green Revolution requires high-input farming, which cuts out the benefits to small-scale

¹⁹Gerald Nelson et al 'Climate Change: Impact on Agriculture and Costs of Adaptation' (2009) Food Policy Report, International Food Policy Research Institute
<<https://ebrary.ifpri.org/utils/getfile/collection/p15738coll2/id/130648/filename/130821.pdf>>

²⁰Sonia Seneviratne et al 'Weather and Climate Extreme Events in a Changing Climate' (9 August 2021) Working Group I: Sixth Assessment Report, Intergovernmental Panel on Climate Change <
https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter11.pdf>

²¹'Soil Degradation' Soil Portal, Food and Agriculture Organization <<https://www.fao.org/soils-portal/soil-degradation-restoration/en/>>

²²Ranjan Bhattacharya et al 'Soil Degradation in India: Challenges and Potential Solutions' (2015) 7(4) Sustainability Journal 3528.

²³Weimei Lin et al 'The effects of chemical and organic fertiliser usage on rhizosphere soil in tea orchards' (2019) 14(5) PLoS One <<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6538140/>>

²⁴Space Applications Centre 'Desertification and Land Degradation Atlas of India' (June 2016) Indian Space Research Organisation, Government of India <https://www.sac.gov.in/SACSITE/Desertification_Atlas_2016_SAC_ISRO.pdf>

²⁵Ranjan Bhattacharya et al 'Soil Degradation in India: Challenges and Potential Solutions' (2015) 7(4) Sustainability Journal 3528.

farmers, and creates further stress on profitable yields.²⁶ Here, the small-scale farmer instead relies on efficiency and productivity by maximizing the produce from their smaller pockets of land in order to grow enough crops for sustenance and sale. Further, pesticide residue leading to health problems²⁷ are addressed by small-scale farmers seeking out organic alternatives to fertilisers and pesticides, presenting a cost-effective and sustainable solution. The current agricultural policy framework seeks to draw maximum benefit from the agricultural sector in the interest of food security. However, it is necessary to identify the root causes of soil degradation in order to reimagine our approach to food security and ecological sustainability.

Small-scale farmers are uniquely affected by these issues, and are acutely aware of the need for efficiency in tackling them. In this regard, the following Part of this report seeks to present agroecology as a viable policy direction that takes into account the impact of soil degradation and income concerns. Further, it recommends necessary steps to aid the agriculture sector and alleviate the issues faced by small-scale farmers in particular.

Part B. Agroecology and the Way Forward

In the previous part, the report discussed the importance of the small-scale farmer, and the major issues impacting the small-scale farmer. Part A discussed the recent regulatory missteps and issues with surrendering governance to corporate interests. It also analysed the issues of income stagnation and economic viability, as well as the issues of soil degradation due to various environmental and human factors. In this part, we seek to introduce and discuss agroecology as a holistic approach towards these issues. We also analyse the manner in which certain forms of agroecology have been rolled out in recent years and discuss why they do not produce the impact needed from this approach. This part seeks to place the positive impact of the small-scale farmer central to the discussion of agroecology. We shall present recommendations that underline the potential benefits of agroecology by looking at it through the lens of small-scale farmers.

What is agroecology?

Today, the term ‘agroecology’ is widely understood as an approach that leverages science and social movements to develop agriculture in a local, adaptive and sustainable manner to empower marginalised farmers. By looking to build in sustainability and fresh value chains, agroecology seeks to empower the key drivers of the agricultural sector. Agroecology seeks to take on some of the biggest issues in the agricultural sector such as soil degradation, environmental depletion and the need to empower small-scale farmers at an economic and social level. It offers an alternative to the monoculture-based, chemical-dependent approach taken post the Green Revolution. To understand today’s agroecology, it is necessary to take a step back and analyse its evolution.

²⁶AphiphanPookpakdi ‘Sustainable Agriculture for Small-scale Farmers: A Farming Systems Perspective’ (1992) Kasetsart University < https://www.ffc.org.tw/htmlarea_file/library/20110721152329/bc44002.pdf>

²⁷‘Agriculture at a crossroads: Synthesis Report’ (2009) International Assessment of Agricultural Knowledge, Science and Technology for Development.

Evolution of agroecology

The evolution of agroecology can largely be traced to two broad stages. The first stage (1930s-1960s) involved greater scientific and academic acceptance of agroecology. The second stage (1970s-2000s) saw the rise of agroecology outside its scientific context, taking into account holistic food systems and evolving into social movements with various developing countries leading the way in embracing agroecology and sustainability. The term agroecology was introduced in 1930 by Basil Bensing to explore ecological research into commercial crops.²⁸ Wolfgang Tischler defined agroecology as the science of life events in the agricultural parts of a landscape, and conducted research on ecological methods of pest management, discussing soil biology and protection of plants in their natural habitat.²⁹ This was expanded by the works of Karl Klages and Stephane Henin to an applied ecology to plant product and land management.³⁰ Girolamo Azzi further expanded the scientific understanding of agricultural ecology, characterising it as the study of physical characteristics of the environment in relation to the development of agricultural crops.³¹ A formal scientific understanding of the benefits of ecological farming practices were developed in these years.

However, it was in the 1970s when the study of agroecology started gaining traction in terms of social and historical contexts. Daniel Janzen developed research on traditional farming methods in developing countries.³² Stephen Gliessman and Miguel Altieri focused on agroecology as a way to protect natural resources by designing and managing sustainable agroecosystems.³³ During this period, the focus of agroecology grew towards a systemic approach towards food and environment, taking into account the global networks of food production, distribution and consumption. The Green Revolution's impact in the 1960s caused people across the world to notice the lack of a holistic view of agriculture, with public policy not accounting for the impact of chemicals on the environment, soil or the nutritious value of food. Agroecology grew in this space by providing a holistic approach that focused on organic farming in a sustainable manner. In 1987, Gordon Conway identified productivity, stability, sustainability and equity as the four main properties of agroecology.³⁴

Finally, in the 1990s, agroecological practices started to be recognised as a 'movement', as a reframing of the normal ways of agriculture and its relationship with society, with movements springing up in Latin American countries such as Mexico and Brazil. In these countries, movements were launched against the use of pesticides and to approach local markets connecting farmers and consumers. These movements shall be discussed in depth below, to illustrate the impact of agroecology on small-scale farmers across the world. While organic farming practices have been analysed as forms of input substitution from chemical inputs into the soil, agroecological practices

²⁸Basil Bensing 'Possibilities for international co-operation in agroecological investigation' (1930) *International Review of Agriculture*, International Institute of Agriculture.

²⁹Wolfgang Tischler 'Results and Problems of Agroecology' (1950) 3 *Faculty of Keil* 71, 82.

³⁰ Karl Klages 'Ecological crop geography' (1942) Macmillan Company, 615; Stephane Henin 'Technical acquisitions in crop production and their application' (1967) 74(1) *Rural Economics* 37, 44.

³¹ Girolamo Azzi 'Agricultural ecology' (1956) Constable & Company 424.

³²Daniel Janzen 'Tropical agroecosystems' (1973) 182 *Science* 1212, 1219.

³³Stephen Gliessman 'Agroecology: researching the ecological basis for sustainable agriculture' (1990) *Ecological Studies Series No. 78*, Springer; Miguel Altieri 'Agroecology: The Science of Sustainable Agriculture' (1995) 2nd Edn. Taylor & Francis 374, 448.

³⁴Gordon Conway 'The properties of agroecosystems' (1987) 24(2) *Agricultural Systems* 100, 117
<<https://www.sciencedirect.com/science/article/pii/0308521X87900564>>

seek to present a case for a larger rethinking of agricultural practices. It seeks to highlight indigenous knowledge and traditional farming practices prior to chemical farming popularized by the Green Revolution. At the same time, agroecology seeks to reintroduce the farmers at the core of the value chain by empowering them economically. The agroecology movement is cognizant of widespread societal and gender inequality in the agricultural sector and seeks to mend it through the practices of sustainable farming and a bottom-up reframing of agricultural institutions.

With this background in mind, it is important to frame the goals sought to be achieved through agroecological methods. The FAO has identified ten elements emanating from agroecological discussions- diversity, synergies, efficiency, resilience, recycling, sharing of knowledge, human and social values, culture and food traditions, responsible governance, and circular and solidarity-based economy.³⁵ These elements are aimed at directing policy-making efforts for planning and managing agroecological transitions. Practices such as intercropping and diversified cropping increases the temporal and spatial diversity of crops within small-scale farm holdings. The use of synergies such as nitrogen-fixing legumes improves soil nutrition value, and the use of traditional and indigenous knowledge acts as a form of technology transfer across grassroots. Similarly, the macro elements of agroecology such as social values and food traditions aim to take advantage of knowledge sharing to afford greater dignity to farmer lives.

Agroecology and its impact on small-scale farmers across the world

The impact of agroecology on small-scale farmers across the world can be noted from research conducted across developing countries in Africa and Latin America. One of the most effective ways agroecological practices are seen is in water conservation and harvesting efforts to grow crops in poor rainfall areas. In rural Tanzania, surveys conducted in an agricultural growth corridor showed a positive effect on farmer wellbeing and a higher awareness of benefits from nature tied to agroecological practices such as mulching, intercropping, and post-harvest use of residues.³⁶ The study also showed that greater access to social, produced and natural capital also resulted in increased yield outputs. In southern Tunisia, the arid region is often at risk of drought. Agroecological practices such as rainwater trapping through earthen dams create catchment areas for water, which is adequate for producing almonds, figs, pomegranates etc.³⁷ Similarly, in the semi-arid regions of the Sonora desert in Arizona, rainfed crops rely on rainwater harvesting through knowledge systems used by tribes such as the *Seri*, *Pima* and the *Papago* to grow maize, tepary beans, corn and squash.³⁸ Due to the sparse and irregular water in the desert, small field holdings rely on diversified cropping for efficiency. Instances of water harvesting methods such as the *zai* in Mali and Burkina Faso, the use of reservoirs

³⁵Food and Agricultural Organisation 'The 10 Elements of Agroecology: Guiding the Transition to Sustainable Food and Agricultural Systems' (2018) <<https://www.fao.org/3/i9037en/i9037en.pdf>>

³⁶Sergio Milheiras et al 'Agroecological practices increase farmers' well-being in an agricultural growth corridor in Tanzania' (2022) 42(56) *Agronomy for Sustainable Development* <<https://link.springer.com/article/10.1007/s13593-022-00789-1>>

³⁷Miguel Altieri, Victor Toledo 'Natural Resource Management among Small-scale Farmers in Semi-arid Lands: Building on Traditional Knowledge and Agroecology' (2005) 44(3) *Annals of Arid Zones* 367, 385

³⁸ *Ibid*, p 369

in Zimbabwe, and water harvesting efforts in the Mezquital and Mixteca regions of Mexico show local knowledge being key to efficient management of natural resources.³⁹

In recent years, several studies of agroecological practices show benefits to small-scale farmers across parameters. Agroecology as a system seeks to minimize external inputs into the farmland and maximizes local knowledge and farm-generated inputs. Given the right support and in favorable economic conditions, agroecology has been shown to outperform conventional agriculture in several ways. For example, a recent study on yields showed that yields increased in 61 percent of the cases analysed and profitability increased by 66 percent.⁴⁰ In another study, it was shown that diversification of crops reduced or eliminated yield gaps in organic farming and conventional farming.⁴¹ In terms of biodiversity, conventional agriculture relies on monocultures and clearing out of biodiversity across large tracts of land. Conversely, agroecology seeks to harness local animal biodiversity in pest management, pollination, and local plant biodiversity by using diversified cropping and mixed farming to conserve crop choices through careful use and to protect and rebuild natural soil nutrients.⁴² Agroecology is also directly beneficial in terms of climate change concerns, as the use of sustainable natural alternatives for pest management adds positive value to the soil and prevents soil degradation, while sustainable means of farming includes water management and localized supply-chain management leads to reduced transportation costs.⁴³ Benefits to nutrients have also been noted in Mexico, where the *milpa* system of intercropping maize with other crops resulted in improved household body mass index and in Ecuador, where agroecological practices improved nutrition in poor households while also offering greater income generation and employment for women.⁴⁴

In Brazil, agroecological practices have been recognised under law as organic farming practices to be encouraged by the state. The Law No. 10.831 of 2003 on Organic Farming aims to provide an organic production system that ensures preservation of natural ecosystems and biodiversity, maintenance of soil fertility and reducing any form of contamination on soil, water and air used for farming practices. Brazil has taken massive steps in nurturing agroecological movements in the past two decades. Since 1998, the *Rede Ecovida* is one such example of an agroecological movement that undertakes organic certification and knowledge sharing movements in several states in Brazil. The Ecovida network is a decentralized movement that maintains cohesion through farming families being organized at the family level, which are joined at a larger level with NGOs and consumer groups to form regional collectives called ‘Nucleo Regionals’.⁴⁵ The *Fome Zero* program aimed at providing direct financial

³⁹Ibid, p 370, 376.

⁴⁰Raffaele D’Annolfo et al ‘A review of social and economic performance of agroecology’ (2017) 15(6) International Journal of Agricultural Sustainability 636, 644.

⁴¹Lauren Ponisio et al ‘Diversification practices reduce organic to conventional yield gap’ (2015) 282(1799) Proceedings of the Royal Society B: Biological Sciences <https://www.researchgate.net/publication/271535047_Diversification_practices_reduce_organic_to_conventional_yield_gap>

⁴²Colin Ray Anderson et al ‘Origins, Benefits and the Political Basis of Agroecology’ (2021) Agroecology Now! Palgrave Macmillan <https://link.springer.com/chapter/10.1007/978-3-030-61315-0_2>

⁴³Ibid.

⁴⁴Ana Deaconu, Geneviève Mercille, Malek Batal ‘The Agroecological Farmer’s Pathways from Agriculture to Nutrition: A Practice-Based Case from Ecuador’s Highlands’ (2019) 58(2) Ecology of Food and Nutrition <<https://www.ccrp.org/wp-content/uploads/2019/10/Deaconu-Batal-Mercille-2019.pdf>>

⁴⁵About Us, *Rede de Agroecologia Ecovida* <<https://ecovida.org.br/sobre/>>

aid along with providing food, water and special credits for family farming.⁴⁶ The *Fome Zero* program successfully reduced extreme poverty from 17.5 percent in 2003 to 3 percent in 2013.⁴⁷ Similarly, the Association of Organic Producers, founded in 1995 in Parana, Brazil, has morphed into the Association for Development of Agroecology in 2004.⁴⁸ This organisation acts as a convergent space for multi-stakeholder deliberations and knowledge exchange, facilitating discussions between social movements, farming networks and civil society to promote agroecology across Brazil. Agroecology was officially recognised recently as a science by the Brazilian Agricultural Research Corporation.⁴⁹ The foregoing examples show the wide-ranging application of agroecological practices across the world, and particularly in developing countries. These experiences show that agroecology, when supported by the state or a strong social movement, has provided valuable positive change in farmers' lives.

Agroecology in India today

In recent years, India has sought to realize the value of agroecology through various central government and state government programs. The *Bharatiya Prakritik Krishi Paddhati* program was launched in 2019 under the centrally sponsored scheme *Paramparagat Krishi Vikas Yojana*. The program seeks to promote indigenous practices to offer alternatives to external inputs in farmlands. As such, it focuses on on-farm biomass recycling through mulching, cow dung-urine use, and exclusion of synthetic chemical inputs. Currently, this program has been launched in eight states- Andhra Pradesh, Chhattisgarh, Kerala, Himachal Pradesh, Madhya Pradesh, Odisha, Tamil Nadu and Jharkhand. India's return to zero-budget natural farming that restores soil fertility and avoids use of chemicals have been touted by the government.⁵⁰ These programs and schemes fall under the umbrella of India's National Mission for Sustainable Agriculture (NMSA), launched in 2014. The NMSA aims to make agriculture more productive, sustainable and climate resilient, and seeks to develop the capacity of farmers in mitigating the risks of climate change. For this, the NMSA has identified four major objectives- development of rainfed areas, on-farm water management, soil health management, and using sustainable agriculture to monitor, model and address climate change concerns.⁵¹ The NMSA's strategy for achieving these objectives relies on agroecological practices such as integrated farming systems, resource management, promoting indigenous strains of crops and their nutrient management practices, knowledge sharing programs, and the use of government intervention to tackle specific issues through nodal agencies and NGOs.

⁴⁶FAO Regional Office for Latin America and the Caribbean 'A Reference for Designing Food and Nutrition Security Policies: The Brazilian Fome Zero Strategy' (2009) Coleccion Regional No. 1 <<https://www.diculther.it/wp-content/uploads/2020/12/5-FOME-ZERO-FAO-RLC-2009.pdf>>

⁴⁷Food and Agricultural Organisation 'The 10 Elements of Agroecology: Guiding the Transition to Sustainable Food and Agricultural Systems' (2018) <<https://www.fao.org/3/i9037en/i9037en.pdf>>

⁴⁸Alexander Wezel et al 'Agroecology as a science, a movement and a practice. A review' (2009) 29(4) *Agronomy for Sustainable Development* <<https://hal.archives-ouvertes.fr/hal-00886499/document>>

⁴⁹EMBRAPA 'Marco Referencial Agroecologia' (2006) Brazilian Agricultural Research Corporation <<https://www.embrapa.br/busca-de-publicacoes/-/publicacao/107364/marco-referencial-em-agroecologia>>

⁵⁰'PM Modi Appeals to Farmers to Cut Down the Use of Chemical fertilisers and Pesticides' (August 2019) Niti Aayog Initiatives <<https://naturalfarming.niti.gov.in/pm-modi-appeals-farmers-to-cut-down-use-of-chemical-fertilisers-and-pesticides/>>; Niti Aayog 'Agroecology and Natural Farming Could Accelerate Inclusive Economic Growth in India' (1 June 2020) Press Information Bureau Delhi <<https://pib.gov.in/PressReleasePage.aspx?PRID=1628285>>

⁵¹Department of Agriculture & Cooperation 'National Mission for Sustainable Agriculture (NMSA) Operational Guidelines' (2014) Ministry of Agriculture <https://agricoop.nic.in/sites/default/files/Final_guidelines.pdf>

Additionally, certain states in India have launched natural farming programs in order to realize the value of agroecological practices. In 2020, the state of Andhra Pradesh (AP), through the *Rythu Sadhikara Samstha*, launched the Andhra Pradesh Community Managed Natural Farming program (APCMNF).⁵² The APCMNF seeks to introduce zero budget natural farming to over five lakh families in AP. The project currently seeks to reduce cultivation costs, improve crop yields and soil fertility, and make crops resilient to weather-based events. The programs avoid chemical fertiliser use by relying on a system of bio-inoculations through the use of cow dung and urine to build nutrient value in the soil, and other regenerative methods such as mulching, soil aeration, and diversified cropping. Further, natural alternatives such as neem, chili or sticky paper are preferred to chemical pesticides to reduce soil degradation and nutritious value of crops which occurs through chemical pesticides.⁵³ Similarly, the state of Karnataka has had a successful zero budget natural farming movement since 2002 due to a vibrant social movement spearheaded by the Karnataka Rajya Raitha Sangha.⁵⁴ With concerns such as farmer indebtedness and consistent drought conditions, farmers in Karnataka have been receptive to the zero budget nature of agroecological practices. The use of homemade fertilisers and pesticides such as *jivamrita* and *bijamrita* (homemade fermented microbial cultures made of water, cow dung and urine, jaggery, legume flour, and a handful of soil), soil and straw mulching, and irrigating only at noon to increase moisture content of air are examples of agroecological practices being followed under this program. Studies conducted on the participating families show improvements in yield, soil conservation, seed diversity, household food autonomy, income and quality of produce.⁵⁵ Lastly, the state of Himachal Pradesh has also trained around 77,016 farmers in natural farming practices, which has led to a reduction in diseases of the apple and wheat crops, as well as an increase in productivity of apples.⁵⁶

Adopting Agroecology - Challenges and Recommendations

Part A of this report discussed the issues faced by small-scale farmers, which are central to the agricultural sector. It further highlighted the issues arising from income stagnation, soil degradation and climate-based vagaries. Part B of the report presents agroecology as a solution to these issues, analysing its evolution and its application in developing countries across the world. Part B of the report has also reviewed the use of agroecological practices, or natural farming practices in India and has noted recent concerns regarding the commercialisation of this space. Given that adoption of agroecology in India is currently limited to certain states and certain pockets, the widespread use of agroecological methods is of the utmost necessity for reshaping the impact of agricultural value

⁵²Agriculture & Cooperation Department 'Implementation of Natural Farming – Allocation of subjects to RythuSadhikaraSamstha (Ry.S.S) – Orders – Issued' G.O.R.T. No. 764 dated 10 November 2016 <<https://apcnf.in/wp-content/uploads/2021/06/GO-RySS-new.pdf>>

⁵³Mark Hillsdon 'Innovative BNP Paribas loan helping 6 million Indian farmers go chemical-free' (27 May 2019) Reuters Events <<https://www.reuters.com/sustainability/innovative-bnp-paribas-loan-helping-6-million-indian-farmers-go-chemical-free>>

⁵⁴Ashlesha Khadse et al 'Taking agroecology to scale: the Zero Budget Natural Farming peasant movement in Karnataka, India' (March 2017) 45(1) Journal of Peasant Studies <https://www.researchgate.net/publication/313693179_Taking_agroecology_to_scale_the_Zero_Budget_Natural_Farming_peasant_movement_in_Karnataka_India>

⁵⁵Ibid

⁵⁶Neelam Patel, Bruno Dorin and Ranveer Nagaich 'A New Paradigm For Indian Agriculture: From Agroindustry To Agroecology' (April 2022) Niti Aayog <https://www.niti.gov.in/sites/default/files/2022-04/Working_Paper_on_Agriculture_With_Cropmarks_060402022.pdf>

chains to benefit small farmers and consumers experiencing localized and positive benefits. In order to translate its benefits meaningfully, this report seeks to set out some recommendations for the agroecological practices in India. These recommendations can be made within the broad heads of science, resource-management, and social structures.

The need for agroecological measures arises from issues ranging from environmental stresses to income inequality. While Part A explores the various issues faced by the small-scale farmer, the previous sections explore how agroecology has become acknowledged, both in India and globally, as a necessary force to address small-scale farmer concerns.

In this section, we put forward a few challenges that small-scale farmers currently face in adopting agroecological measures, and recommendations to those challenges to form the building blocks for agroecology to take root in India.

1. Bio-farms and upscaling of agroecological measures- The need of the hour, in agroecological measures, involves mimicking nature by developing natural multi-species ecosystems (a prime example being bio-farms). In addition to a multi-species ecosystem, it is necessary to understand soil management techniques and the soil's interactions with other living beings for the health of the crops. Such diverse ecosystems can ensure the use of natural means for the purposes of nutrients, pollination, and pest management. Agroecology in India must further take into account local variations of plants to suppress plant pathogens. These multi-tiered ecosystems can be effectively designed with proper landscape planning and soil management planning, through the creation of multi-purpose habitats from erstwhile single purpose cultivation lands.
2. Technological adoption- Small-scale farmers face issues from various quarters- climactic vagaries, market failures due to factors beyond their control, disengagement from government and public institutions, low rate of access to land and resources, and failures to adopt and implement technology at scale. In this regard, the introduction of technology in a manner that is compatible with the goals of agroecology would help make adoption of agroecological measures at scale feasible. Technological mechanisms in this domain would broadly meet the following objectives: (a) distilling the value of local knowledge systems, (b) economically viable, (c) locally sourced and accessible at the local level, (d) environmentally sound and sensitive to the local needs, and (e) must enhance farm production and farm stability.
3. Creating value at the local level- Agroecological practices undertaken in farming can create greater impact when matched with reforms to the food system at large. Currently, small-scale farmers face issues with establishing a local-level food business operator (FBO). The registration for FBOs laid out in the Food Safety and Standards (Licensing and Registration of Food Businesses), Regulations 2011 include fees for applying for licenses, photo ID cards, source of water supply etc., which may pose challenges for small-scale farmers seeking to monetise their crops at the local level itself. Going forward, agroecological practices may gain greater use and visibility through the availability of post-harvest infrastructure accessible at the village level, such as cold storage and warehousing facilities. Focusing on the value of

local procurement and consumption instead of long supply chains may help boost the local economy. In this manner, local value chains shall also benefit from an institutional approach favoring diversified cropping as opposed to monoculture cropping in the context of necessary nutrition and soil health regeneration. For example, deploying value-creating tools such as rice de-huskers and other food processing operator tools at the gram-panchayat level would help localise the value of the crops.

4. Takeover by agribusiness- The current deployment of agroecology in India in its present form raises questions based on its funding, its motivations and its proposed direction. Projects such as these are further sustained by private investments such as the \$2.3 billion loan offered by BNP Paribas, and funding secured from the United Nations-based International Fund for Agricultural Development, the Japan International Cooperation Agency and the World Bank. The influx of foreign aid and corporate sponsorship into this fledgling space has been a cause of concern for some stakeholders of the agroecological space. The use of green growth as a form of raising investments and undertaking export-based and profitability-based objectives have been flagged for caution. Further, the centrality of agribusiness in natural farming raises the risks of displacing the small-scale farmer at the center of the impact cycle. The current use of agroecology in India requires widespread transmission, conversion of supply value chains, and an impact on the public policy-making decisions taken in the agricultural sector. While the current steps taken by state governments and the central government to facilitate natural farming as an alternative for small-scale farmers are laudable, agroecology's journey in India is only at its preliminary stages, and needs to improve its accessibility and immediate impact to farmers for greater adoption across the remaining states. Going forward, agroecological movements must be spearheaded by, and must be undertaken for the benefit of, farmers who are at the heart of these issues.
5. Taking into account intersectional and social challenges- Lastly, the social aspect of agroecology must take into account the existing issues of landlessness, marginalization of Dalit, Muslim and women workers and their intersectional harms to mend the structural inequality at the root of India's agricultural sector. Refocusing the social movement aspect of agroecology is a necessary step to preventing agroecological practices being absorbed by large corporate interests, and shall serve to realize the benefits of farming to its deserved beneficiaries.

Today, agroecology is facing a strong pushback from the structures and systems under the neoliberal policy regime. In India, agroecology-based production systems will have to offer space for a dignified participation of landless peasants and labor and indebted tenant cultivators. The agroecological pathways need to be conceptualized as an essential part of a radical transformation in socio-technical systems, guided by social equity and ecological sustainability.⁵⁷

⁵⁷ Abrol, Dinesh (2023), "**Agroecology and Agrarian Transitions: Current Debate in India**", *Agrarian South: Journal of Political Economy* 12(2) 161–186, Centre for Agrarian Research and Education for South (CARES), Sage Publication

As part of this, poor peasants, landless peasants, and rural labourers need urgent collective action from state and society and need secure access to means of land, water, livestock, industry, and knowledge to adopt agroecology, which is impossible under the neoliberal regime consolidating the power of landlord capitalists and corporate capital. The global food crisis has already shown that the food security lies in the viability of the small farms pursuing cooperation and not in their subordination to industrial farming by corporations. The agroecological interventions must unite the peasantry and rural labor.

In India, agroecological approaches need to pave the way for autonomous systemic development of primary production through crop and livestock integration and region-specific secondary production integration through the policy of reservation of products with the AGMARK label for local businesses.

Further, the potential for rural industrialization needs to be closely integrated into the plans for agricultural transformation. The practitioners of agroecology must go beyond the widely pervasive farm-based approach and strive for the development of agroecological approaches at the territorial level, and include agricultural labour as also a social carrier of innovation. Agroecology will have to target the advancement of the idea of cooperation in production. Development of self-sustaining local economic units necessarily involve a focus on rural industrialization and the agroecological approaches would have to combine the targets of agrarian industrial and energy transitions with the promotion of priority to land for food (Abrol, 2023).


There has to be a shift from technology-centric approach to ecosystem centric approach. These included changes in cropping patterns and production practices, strategies to increase soil organic matter and reduce water and energy use (Ramanjaneyulu, 2023)⁵⁸.

Agroecological approaches can help bring rural off-farm and nonfarm employment opportunities which in turn will improve the incomes and livelihood opportunities for the rural poor. Rural nonfarm employment has also much potential on the input side and on the side of local production of agricultural implements. Thus, on the input side, agroecological approaches offer many more opportunities for rural industrialisation (Abrol, 2023).

The agro-ecosystems and landscapes have experienced drastic degradation. Unsustainable resource use, declining primary productivity, rising costs of production, and falling incomes of the peasantry are interlinked challenges. Environmental degradation and unequal share of resources are closely related to land-use-related social injustice. The agenda of land distribution needs to be taken up afresh with an agenda of enhancing access to land for the development of new commons. The landless labourers, poor peasants, tenant cultivators, and women farmers need to be treated as the stewards/custodians of common lands and common pool resources, such as rural ponds and village forests and the law needs to recognise real cultivators, including tenant farmers and sharecroppers. (Abrol, 2023)

⁵⁸ <https://www.cseindia.org/market-access-in-india-for-organic-and-natural-produce-11758>

The issues highlighted, and recommendations made, seek to serve as a guide towards the direction the agroecological movement needs to move towards, in order to achieve its potential in India. Additionally, the agroecological movement cannot be solely reliant on changes and progress in the small-scale farmer's space. In order for impact to be sustainable, both in an environmental and an economic sense, it is also important for consumers to be made aware of the need for agroecological measures in farming, and have their buy-in towards crops sourced through these measures. The success of any agroecological movement, to that extent, rests largely on the awareness that can be spread about the ground-realities faced by small-scale farmers and its impact across the food systems value chain.



The COVID-19 pandemic thoroughly exposed the inequities and frailties of corporate agriculture systems. The breakdown of global supply chains resulted in shortages and increased food insecurity in many countries, and large commodity traders made windfall profits.

However, as international trade collapsed due to lockdowns, local and public food systems emerged as viable alternatives and peasant organisations set up solidarity networks to protect livelihoods and ensure access to food. Agroecology has emerged as an important approach promoting practices that are more sustainable, ecologically safer and enhance peasant incomes and fulfill the right to food, which are in stark contrast to corporate-led industrial scale agriculture.

This report collates these issues discussed in a two-part dialogue series organised on Agroecology: Possibilities and Challenges in India. It discusses in depth, with a focus on the current state of agriculture in India, the challenges being faced by the farmers and the agroecological alternatives and the debates around these.