

Compendium of Abstracts

Managing Sustainable Transitions in Agriculture

**Newer Directions for Research
and Civic Action**

16th – 18th November 2023



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Track 1: Framing Agroecological Transitions

Title	Potential of Farmer Producer Organisations to Enable Transition to Organic Farming
Author	Sachin Oza (<i>DSC Foundation</i>) and Astad Pastakia (<i>Free lance consultant</i>).
Abstract	<p>While the need for farming to make the transition to organic forms (sustainable agriculture), is widely felt and acknowledged, achieving it has remained a distant goal, leaving policy makers with only isolated success stories and some clues but no substantial movements. In this paper we demonstrate using case studies that FPOs offer a strong potential to enable this transition provided they have an enabling policy environment and ecosystem of support institutions. The methodology also used interaction with over a dozen innovative organic farmers within the FPO's domain.</p> <p>It is well recognized that the transition from green revolution technology to organic farming cannot be achieved overnight. It can only be achieved through a planned strategy which goes through stages of transition. Countries like Sri Lanka paid a heavy price in terms of sudden drop in productivity across the country when the government tried to force farmers to change suddenly. The transition involves multiple challenges, which must be dealt with simultaneously. Ignoring any of these leads to negative results and farmers may revert to chemicals or adopt only partially. The paper presents a comprehensive understanding of these challenges and shows why FPOs rather than individual farmers, are ideally suited to address them simultaneously.</p>
Keyword	Farmer Producer Organisation, Organic farming, Challenges in scaling up organic farming

Title	Sustainable Transitions in Indian Agricultural Systems: A Theoretical Overview.
Author	Abhilasha Singh (<i>Indian Institute of Technology, Delhi</i>) and Upasna Sharma (<i>Indian Institute of Technology, Delhi</i>).
Abstract	<p>At a time when achieving worldwide food and nutritional security is a major developmental goal, managing the imminent threat of climate change to the global agri-food systems is an arduous challenge. According to the latest synthesis report by the Food and Agriculture Organization, global agricultural production (food, livestock fodder and biofuels) needs to increase by 50 percent from 2012 levels to meet the world’s food and nutritional requirements by 2030. Moreover, decades of unsustainable use and exploitation of land, soil and water for the intensification of agriculture have led to severe environmental repercussions which makes these agro-ecosystems even more vulnerable to climate change impacts.</p> <p>Even though the share of agriculture in India’s GDP has declined from over 45% just after independence to merely 15% in the present times, we are still a predominantly agrarian economy employing around 46% of the total workforce (Dhar & Kishore, 2021). But the performance of this sector has been characterized by consistent and abysmally low growth rates as compared to the non-agricultural sectors. In addition, Indian agrarian sector is going through a structural transformation with respect to the fragmentation of landholdings and increasing feminization of agriculture. At present, the sector predominantly comprises small and marginal farmers with 86.08% of all operational holdings and the average landholding size of 0.6 hectares (Manjula, 2021).</p> <p>Different existing theories in sustainable transition literature have been applied to studying agricultural transformation. The most widely used theoretical framework is the Multi-level Perspective that seeks to analyze the dynamics of long-term transitions from one socio-technical system to another (Geels 2004). According to MLP, transitions are steered and shaped by processes at three levels: landscape, regime and niche. Transition Management on the other hand, ‘focusses on coordinating and bringing together (niche) actors and their activities in such a way that together, they can accelerate the change towards sustainability’ (Wieczorek 2018). Other transition theories include the innovation systems approach, techno-economic paradigm and socio-metabolic transitions approach (Lachman 2013). This study also illustrated examples of two alternative experiments: Timbaktu Collective in Anantapur and Andhra Pradesh Community Managed Natural Farming.</p>
Keyword	Sustainable transition, Indian agroecology, Multi-level perspective

Title	Rejuvenating Agriculture by Transforming Irrigation Science and Practice.
Author	Santana Gopal Komandur (<i>Centre for Environment Concerns</i>)
Abstract	<p>Indian agriculture faces multifaceted challenges, such as water scarcity, soil health issues, and changing climate patterns. Small farmers in India face unique challenges, as they lack the resources to store groundwater for summer use. This further depletes groundwater resources and affects crop viability. However, horticulture offers labour-intensive opportunities and livelihoods for these farmers.</p> <p>This paper emphasises the importance of achieving "More Crop per Drop" and doubling farmer incomes in a country where water resources are scarce and unevenly distributed. The excessive use of groundwater for irrigation, inefficient water utilisation, and the rising demand for perennial crops add complexity to the situation, especially for small-scale farmers. The paper discusses the collaboration between farmers and scientists to create a scientifically validated technology ecosystem to guide research in agriculture.</p> <p>The paper explores two dominant irrigation technologies, Drip and Precision, and their limitations. Drip irrigation, despite its efficiency, often results in overuse of water due to subsidies, disregards root zone moisture, and lacks consideration for soil biology. Precision irrigation, on the other hand, relies on plastic mulch, leading to environmental issues and dead soils. To address these issues, a collaborative approach involving water-scarce horticulture farmers, especially women, was taken. The Criteria and Ecosystem for Ideal Irrigation (CEC) was co-designed with farmers to mitigate water wastage, enhance root zone moisture management, and promote soil biology.</p> <p>A sub-surface root zone moisture delivery system (SWAR) was developed, reducing water application by 50% while improving yields, crop quality, and soil health. SWAR technology fosters a diverse ecosystem of native soil organisms, offers smoother water flow, and is an affordable add-on to existing drip systems.</p> <p>In 2022, SWAR received national and international recognition for its effectiveness, significantly reducing water usage, improving crop yields, and cutting costs. The paper concludes that revamping agriculture requires government investment in research and farmer-guided initiatives to address the complex interplay of soil, irrigation, and plants. This collaboration is essential for achieving sustainable agriculture in India.</p>
Keyword	Shift measure, water quantity to moisture intensity, value of chemicals to biological, doubt to confidence

Title	Making sense of sub-regional diversity for successful and just transition towards Regenerative Agriculture in Central India Tribal Region.
Author	Ishan Agrawal (<i>Foundation for Ecological Security</i>), Laxmi Sharma (<i>Shiv Nadar University</i>) and Saheb Bhattacharya (<i>PRADAN</i>).
Abstract	<p>The current situation in India reflects the degradation of approximately 97.8 million hectares of land, primarily due to harmful agricultural practices, deforestation, climate change, and evolving land use patterns (SAC, 2021). Conventional agriculture, driven by heavy machinery, chemical fertilisers, and pesticides, has contributed to soil degradation, water scarcity, and a decline in biodiversity, posing a significant strain on land resources. In response to these challenges, there is a growing call for a transformative shift towards agroecology, an ecosystem-oriented approach that extends beyond conventional productivity-focused models.</p> <p>Numerous terms and concepts have emerged in recent years to define this alternative approach to agriculture, such as organic farming, natural farming, zero-budget farming, conservation agriculture, and agroecology. This paper acknowledges the diversity of terminology but underscores that they all converge towards the broader movement of agro-ecology and regenerative agriculture, marking a transition away from chemical-based conventional farming. In practice, both government and non-government agencies often adopt a one-size-fits-all blueprint approach, even in the context of agroecological programs failing to account for regional variations in biodiversity, climate, socio-economic factors, land tenure, and livestock composition.</p> <p>To address these issues, this paper explores a novel approach that combines GIS technology with data and leverages the experiences of two NGOs: the Foundation for Ecological Security (FES) and Professional Assistance for Development Action (PRADAN). The study focuses on Central Indian Tribal Regions (CITR), including states such as Jharkhand and Madhya Pradesh. By conducting spatial analysis at the block or sub-divisional level, the study assesses tribal population density and forest cover. This approach strikes a balance between granularity and complexity when designing regenerative agriculture programs. The spatial analysis relies on GIS methodologies and secondary data to identify regenerative agriculture zones based on forest cover, tribal population, and cropping intensity.</p> <p>The paper proposes a zone-based regenerative agriculture extension approach, which offers a practical strategy for civil societies, NGOs, and government organizations. By categorizing different blocks according to various parameters, this approach facilitates programmatic planning and field-level changes that promote sustainable agriculture.</p>
Keyword	Regional diversity, regenerative agriculture, agroecology, CITR, blueprint approach

Title	Exploring Agrarian Knowledge in India.
Author	Adrija Chaudhuri (<i>Socratus</i>)
Abstract	This study aims to understand the process of knowledge construction and dissemination within Indian agriculture, with a focus on agroecological programmes. It will explore the effects of broader changes in the knowledge economy of agriculture on the agrarian practices of small farmers. Utilizing the lens of agrarian change and deskilling, the study will hope to trace these changes from the colonial period to the Green Revolution to the contemporary moment, when agroecology is being promoted as a solution to the agrarian crisis facing the country. Through analysing two agroecological programmes, the paper will attempt to understand the politics of knowledge production within them, and how this affects the agrarian practices of the farmers to whom these programmes are targeted. The central question which this study will address is: are knowledge dissemination methods within agroecology influenced by past extension models and how does this affect their adoption among farmers?
Keyword	Farmers' knowledge, Aagroecology, Deskilling, Agrarian change, Extension, Green Revolution

Title	Just Fitting in or extending a systemic hope – digital technification of agriculture and its intersectionality with sustainable food futures.
Author	Anupam Kumar (<i>School of Public Policy, IIT Delhi</i>)
Abstract	This study unpacks the discourses and technological frames producing rapid proliferation of digital agtech in India and its implications for sustainable transition in agriculture. Building upon the literature of digital innovation management and philosophy of computational processes, we present a theoretical framework to analyse the research question – is digital technification of agriculture merely being fitted into the sustainability pathways or they really have something substantial to contribute? Findings are discussed to illustrate that the existing agri-digitalization processes and products largely point towards technological lock-ins that simply accelerate the crisis of conventional agriculture which digitalization aims to sort out. Possibly, policy instruments and design choices to reverse epistemic opacity of digital innovation can pave digitally reliable pathways to sustainable food futures.
Keyword	Digital Agriculture, Sustainability Transition, Assetization, Smart farming apps

Title	The Relevance of Rural Aspirations to Sustainable Transitions: A Ground-Up Study.
Author	Aditya Maruvada (<i>WELL Labs, Institute for Financial Management and Research</i>) and Karishma Bhushan (<i>WELL Labs, Institute for Financial Management and Research</i>)
Abstract	A staggering 30% of India’s land is affected by degradation accelerated by input intensive farming practices. These practices also make farming economically unviable and push millions of agriculturalists to the brink of survival. Over the years, governments have launched multiple programs to promote sustainable transitions. The top-down programs can be unreceptive to the aspirations of the people they are supposed to benefit. The current study based in the Raichur district of Karnataka (a South Indian state), is an attempt to understand these aspirations to inform and better implement sustainable programs. The study adopts the ‘rural aspirations framework’ developed by Kai Mausch et.al. and adapts it to an Indian context. The study follows an intersectional approach and covers people belonging to different age groups, genders, and economic standings. The study also tries to contextualize these findings by placing them within existing bio-physical, social and cultural milieus.
Keyword	Aspirations, rural aspirations, sustainability, livelihoods, migration

Title	Reforming Traditional Socio-Technical Barriers to Promote Transition of Coastal Agro-Ecological Systems in Kerala.
Author	Thomson Kaleekal (<i>Centre for social Innovations and Development Studies, Cochin, Kerala</i>), Radhika Kutty Narayanan (<i>Cochin University of Science and Technology</i>) and Satheesan E S (<i>Centre for Social Innovations and Development Studies</i>).
Abstract	<p>Coastal agro ecosystems in Kerala face significant challenges in achieving sustainable food production, economic stability, and livelihoods. Despite the efforts of agricultural scientists and the local state, the ecosystem exhibits low productivity, increasing production costs, food insecurity, biodiversity loss, soil degradation, water quality deterioration, pest outbreaks, and social conflicts. Coastal agriculture in Kerala relies on estuaries, mangroves, and river basins, providing multiple functions and involving various stakeholders, including fishermen and the leisure industry. Many households have abandoned coastal wetland agriculture, and some have opted for outmigration. Traditional water regulating systems that were once the backbone of farming practices are now ineffective due to economic, institutional, and governance issues.</p> <p>Farmers are turning to intensive prawn culture as an alternative to traditional paddy-fish practices, leading to economic benefits but altering the hydro-ecological services and creating uneven social outcomes. The green revolution had limited influence on agricultural practices in Kerala's coastal zones, while the blue revolution presented economic opportunities and transformed the social-ecological fabric. Collective institutions and cultures have played a crucial role in creating and sharing economic values among asset groups and the working class. However, the collapse of coastal agriculture and social tensions indicate the need for new approaches.</p> <p>This study examines the barriers to transitioning coastal agro-ecological systems and how socio-technical networks evolve to address climate-induced challenges. It focuses on the Ernakulam region in Kerala, India, and The study area covers the coastal agro-ecosystem known as <i>pokkali</i> lands in Ernakulam District, Kerala, India. The research combines primary and secondary data collected over 30 years, with recent studies focusing on agro-ecological transitions in the area.</p> <p>Key research questions include the contemporary challenges facing coastal agro-ecosystem transition, the role of traditional socio-technical networks in creating economic value from coastal wetlands, the capability of these networks to address modern challenges, and the co-design of modern actor networks for climate adaptation and modernization benefits.</p> <p>The study employs an agro-ecological approach, building on the concept of integrating science, social movements, and agrarian practices. It develops a conceptual framework based on local transition dynamics and ecological and socio-technical interactions. Major findings emphasise the strengthening traditional and developing larger socio-technical networks, enhancing adaptive capacities, linking mitigation and adaptation strategies, and collaborating with social and environmental movements are vital for successful transitions in the region.</p>
Keyword	Coastal agro-ecological transitions, socio-technical networks, climate challenges, blue economy

Title	Sustainable Agriculture Made Easy: CETARA-NF's Self-Certification.
Author	Rajeshwar Singh Chandel (<i>Dr YS Parmar University of Horticulture and Forestry Nauni, Solan HP India 173 230*</i>), Rohit, Inder Dev*, Gaurav Singh Chauhan*, Ajay Kumar and Ashish Gupta*.
Abstract	<p>The Government of Himachal Pradesh has initiated a natural farming program, Prakritik Kheti Khushaal Kisaan (PK3Y), to support smallholder farmers and promote sustainable agriculture. To overcome the challenge of certifying natural farming produce in the Himalayan terrain, a self-certification system called CETARA-NF was introduced, involving over 80,000 farmers. CETARA-NF focuses on simplicity, sustainability, traceability, and transparency. It prohibits agrochemicals, external inputs, and GMOs, aligning with localized natural farming principles. Farmers are evaluated based on four core practices: Seed Treatment, Inoculation, Mulching, and Soil Aeration. Intercropping, crop rotation, and owning indigenous cows are rewarded. Land area dedicated to sustainable practices is vital. Use of Natural Pest Management: Decoctions and plant extracts for pest management receive positive scores. Separate Storage Facilities: Farmers with separate storage facilities for natural and conventional produce earn additional points for good agriculture practices. Strict Prohibitions on Chemical Inputs: The system strictly bans chemical inputs with significant penalties for violations. CETARA-NF's certification methodology underwent rigorous testing, leading to a well-structured scoring system. CETARA-NF addresses the challenges of existing organic certification systems in hilly regions like Himachal Pradesh by offering a localized, agroecological, and accessible alternative. CETARA-NF's features include self-certification, predefined rating levels, swift certification, individual farmer certification, and peer review, making it a transparent and decentralized system. Over 69,000 farmers, including both male and female, have been certified, with diverse star ratings, empowering consumers and recognizing farmers' dedication to natural farming. CETARA-NF is a groundbreaking certification system that empowers farmers, promotes sustainability, and fosters transparency in Himachal Pradesh's agriculture, setting an example for eco-friendly farming practices.</p>
Keyword	CETARA, Natural Farming, SuSPNF, Certification

Title	Urban Natural Farms: A framework to enable urban food gardens.
Author	Nirzaree Vadgama (<i>CropIn Technology</i>)
Abstract	<p>A framework to enable collaborative action for appropriate greening of urban areas by growing chemical free food for urban residents, mitigate certain impacts of climate change, create micro biodiversity hot-spots in urban areas along with community building. The digital platform (Urban Natural Farms (https://urbannaturalfarms.com/)) would connect individuals and institutions who have land that is vacant or could be repurposed; with individuals who would like to grow their food in vacant land around them. The platform would also be a knowledge base for learning various aspects of growing food, and enable deliberation through Q&A forum. Akin to open source software development frameworks which enable developers worldwide to contribute to the codebase in their capacity and availability; various tasks of the day at the farm sites would be broken down into individual items and communicated on the portal. Individuals within proximity to the farm and having the bandwidth can come and volunteer to complete the task. We envision that leveraging micro moments or short time availability of citizens for volunteering for various tasks at farm sites as well as for relevant digital tasks would result in increased participation, while also giving them a brief albeit hands-on experience of growing edible and pollinator plants. Incentivization of volunteering can be done through various mechanisms.</p> <p>The platform would also display the impact of each active and past sites through appropriate dashboards containing information on parameters such as: 1) improvement in various environmental parameters through the intervention; 2) amount of harvest through the seasons; 3) citizen engagement done. The platform would also host a crowdsourced dynamic directory of urban farmers and practitioners, with the intent of enabling visits to personal and community gardens, sharing of seeds, and learning from the community.</p>
Keyword	Urban food gardens, sustainable cities, civic action, participatory platform, open source, appropriate technology, sustainable transitions

Title	Exploring Agroecological Transitions in India: Present and Future.
Author	Ravindra Adusumilli (WASSAN) and Gijivisha Khattry (WASSAN)
Abstract	<p>Agroecological transitions have seen a spurt in recent times, though not enough to cause a paradigm shift from the established Green Revolution technologies that decide how agriculture is practiced by majority farming population in the country. The paper is an attempt to look at the niche innovations related to agroecology transitions as well as role of the emerging dominant narrative of Natural Farming in these transitions, their effect on the socio-technical regime and finally how these narratives, experiences, the ‘systemic inertia’ of the Green Revolution paradigm and larger macro-economic realities are shaping public policy. Agroecological transitions are complex and their trajectories, pace as well as outreach cannot be explained through ‘linear’ frameworks of technology change. The paper tries to analyse agroecological transitions through the framework of ‘technological trajectories’ and ‘typology of socio-technical transition pathways’. Using these theoretical bases, this paper attempts to develop analytical understanding of the questions raised earlier on agroecological transition in India. The analysis explores evolution of ‘natural farming’ as a dominant articulation of the agroecological transition in India. The differences between the Green Revolution (GR) paradigm and the new emerging agroecological paradigm are outlined.</p> <p>While it is important to further the niche level innovations through grassroots engagement, enabling their alignment leading to making natural farming narratives powerful to influence the S-T regime. Successful examples at the S-T regime level are more important to achieve to influence the landscape levels. In essence, the natural farming narratives need to expand to markets, science and technology, policy development, and industrial re-orientation to the new paradigm.</p>
Keyword	Agroecological transitions, Paradigm shift, Natural farming

Track 2: Building alternative agricultural markets and marketplaces

Title	Decolonising sustainability transitions research: Analysing transitions to alternative protein sources from an Indian perspective.
Author	Anita Pinheiro (<i>Ashoka University</i>)
Abstract	<p>The burgeoning discourse on protein transitions navigates a critical confluence within the spectrum of global nutrition, health, and the environmental impact of contemporary industrial meat production. Amidst the surge of sustainability transitions aimed at diversifying protein sources, the narrative overwhelmingly revolves around fostering 'sustainable diets' to 'save the planet'. While a rich body of literature in transitions research emphasizes these aspects, there is a palpable dearth in addressing social justice concerns and decolonizing transitions research.</p> <p>This research uniquely situates itself by delving into the decolonization of sustainability transitions, scrutinizing the transitioning landscape toward alternative protein sources from an Indian vantage point. This analytical endeavour scrutinizes the implications of these transitions on livelihoods, nutritional regimes, cultural dispositions, and transitions to agroecology and nature-positive agriculture systems in India. The qualitative thematic analysis approach adopted here is pivotal in unravelling the complexity and varied implications embedded within these transitions.</p> <p>The study elucidates the vital need for reshaping the discourse on sustainability transitions by accentuating the necessity of systemic shifts and fundamental changes rather than incremental alterations. The quest to decolonize transitions research, by transcending Western epistemological superiority, underscores the importance of integrating non-Western and marginalized worldviews, thereby fostering sustainable socio-ecological-technological systems.</p> <p>This exploratory analysis presents preliminary findings delineating the cultural, nutritional, economic, livelihood, and agricultural implications of transitioning to alternative protein sources. The research identifies the potential disruptions in traditional agricultural practices, agroecological transitions, and the socio-economic disparities engendered by the protein transitions.</p> <p>Moreover, the study calls for a paradigm shift in the approach to sustainability transitions, urging the disavowal of one-size-fits-all solutions imposed by Western contexts onto regions like India. Instead, it advocates for context-specific and equitable solutions that value local expertise, facilitate collaboration, and are cognizant of cultural nuances. By shifting the discourse to a bottom-up approach, the study seeks to offer a more holistic understanding and foster socio-ecological sustainability in transitioning agri-food systems, specifically in the Global South.</p>
Keyword	Sustainability transitions, protein transitions, alternative proteins, decolonisation of research

Title	Gale mein nahin, dimaag mein phasta hain: Overcoming historical derision and contemporary challenges to forge a community-oriented millet initiative.
Author	Sudha Nagavarapu (<i>SKMS</i>), Richa Singh (<i>SKMS</i>), Dwijendra Nath Guru (<i>The Millet Foundation</i>), Kamal Kishore (<i>SKMS</i>), Rajaram Rajvanshi (<i>SKMS</i>)
Abstract	<p>The agro-ecological landscape in India is evolving with a diverse tapestry of interventions, fundamentally reshaping the dynamics of food production and ecological sustenance. However, these interventions are influenced by hierarchical systems, often reinforcing disparities within communities. The involvement of donors, the state, activist networks, and the rural elite significantly shapes sustainable agricultural endeavours, sometimes reinforcing existing power structures rather than aligning with the needs of marginalized communities. In particular, women carry the disproportionate burden of farming and processing tasks without commensurate involvement in decision-making.</p> <p>The Sehat ka Bardana (SKB) initiative emerged from the efforts of the SKMS collective in western Avadh, UP, with the aim to enhance the resilience of rainfed kharif crops of marginal farmers affected by erratic rains. Focused on millet cultivation, the initiative also highlighted the nutritional significance of these grains, essential in combatting the severe malnutrition prevalent in Sitapur. While initially inspired by successful ecological farming models, SKMS encountered challenges in scaling up these practices among the vast number of marginal farmers.</p> <p>This initiative faced hurdles as farmers were hesitant to embrace sustainable practices, and they perceived minor millets as "poor man's food." These grains were historically linked to marginal lands and necessitated minimal care, in stark contrast to elite crops like paddy and sugarcane. Consequently, the team reframed its goals, understanding that millet cultivation inherently reduced the need for on-farm chemical use. As a result, the imposition of certain conditions like BioSolutions was abandoned, and farmers were encouraged to choose their own methods. The focus shifted to local consumption and the introduction of local millet varieties to bridge the gap between historical reluctance and the need for broader acceptance.</p> <p>Despite the challenges, SKB gradually gained ground, with the millet production exceeding 7 tonnes in the kharif season of 2022. The establishment of a processing unit further cemented this progress, facilitating the production of high-quality millet rice. However, challenges persist concerning the pricing of millet products, reflecting both local and broader market complexities.</p> <p>Sehat ka Bardana represents an innovative community-oriented initiative, emphasizing local participation and equity, with a vision to catalyse a sustainable transition in food and farming practices in the region.</p>
Keyword	Decolonising research, Millets, Western Avadh, Dalit, Marginal farmers, Grounded intervention, Climate change, Erratic monsoons

Track 3: State capacity and policy

Title	Citizen Science and its Impacts on Implementation of Soil Health Card & Good Governance in Gujarat
Author	Diwakar Kumar (<i>Central University of Gujarat</i>).
Abstract	<p>Citizens are defined as public, social groups, and communities, which refers to social actors who are not always professional scientists. The use of citizen science can be an effective strategy for both the inclusion of underrepresented groups and the development of new, citizen-supported evidence-based policy. A wide range of societal issues can be successfully addressed by citizen science, which is not only a participative means to advance scientific knowledge. Citizen science encourages an approach to science that is open and participatory, bridging the gap between science and society and advancing the objective of an inclusive society. Therefore, when contemplating the entire potential of citizen science, attention must be on pinpointing research gaps followed by providing answers to scientific questions on the causes, and consequences of agricultural innovation in society. Particularly clear examples of citizen science's variability can be found in its practical applications. Examining the projects and what is negotiated within them reveals the diversity that, contrary to preconceptions, enriches citizen science as a methodology. Additionally, inclusivity is required for citizen science, which must be consistently requested and attained in terms of practices, content, and methodological approaches. Citizen science makes many scientific endeavors more valuable, connecting scientific discoveries to societal ideals like social innovation, policy influence, and individual development and learning.</p> <p>According to Alan Irwin, soil science ought to be a tool for empowering farmers and addressing productivity issues. The participation of the farmers with agricultural scientists contributes to technological awareness and agricultural advancement. Additionally, citizen science provides novel entry points for innovation and scientific research. At the same time, a wealth of opportunities is presented for the farmers to get involved and impact agricultural science, chemical fertilizers management, environmental concerns, and society at large. This concept heavily relies on citizen science because it involves a research methodology in which every individual, group, and community can participate and share responsibility. Through the use of experiments, citizen scientists interact with civic epistemologies, or the culturally distinct norms for how the public should develop, evaluate, and apply expert knowledge in decision-making. First, public/collective experiments must capture the interest of farmers and productivity challenges, second, farmers must collect soil health card data and depletion of natural resources in the form of in-field research and third, they must extend findings to a broader society by conveying outcomes back into the community in a timely manner.</p>
Keyword	Citizen Science, Soil Health Card, STS, Good Governance

Title	Inclusive and Sustainable: Millet for Millions through lessons from Odisha.
Author	Srijit Mishra (<i>IGIDR</i>)
Abstract	<p>To motivate, the presentation will draw on an inclusive philosophy invoking Ambedkar, Gandhi and Rawls and suggest an emphasis on those left behind from three dimensions or spaces: neglected or orphaned crops, the millets; marginalized lands (largely in rainfed areas, but not limited to that); and vulnerable peoples (small and marginal farmers, Adivasis, Dalits, and Women).</p> <p>A review of millet interventions indicates a supply-demand mismatch (aside: the misplaced totem) that leads to loss in welfare for the consumer and the producer. To address this, a focus has to be from farm to plate, that is, on each aspect of the value chain. At a broad level, the value chain consists of production, processing, marketing and consumption, as in the case of Odisha Millets Mission (OMM). Of course, there are other aspects such as storage, procurement, transport and value-added products among others.</p> <p>An important aspect is the return to the farmer (primarily consisting of the vulnerable peoples) and while they may be willing to experiment, but then their perception is built on what they see matters. They have an innate understanding of treatment-control differences and that needs to be respected.</p> <p>At each level in the value chain, there is a bi-directional transaction. But that is not limited to goods and money. The agroecological lens is equally important. It is here that the Knowledge-Policy-Practice interaction (the KPP \cap) that was taken up at Odisha at a substantive level should be adhered to at each and every level of the value chain. This will have its own challenges, but it does show the possibility that Government, civil society and academia can come together in a continuing engagement for a pro-people initiative.</p> <p>There is potential to scale up and in doing this the recommendations from the people’s convention on millets for million and the innate advantage of millets also sync with a number of the Sustainable Development Goals (SDGS). I rest my case.</p> <p>(Earlier versions have been presented elsewhere)</p>
Keyword	Citizen Science, Soil Health Card, STS, Good Governance

Title	Putting under the sustainability transition lens - engagements of Science and Policy with an agricultural sustainability challenge.
Author	Khushboo Khosla (<i>Indian Institute of Technology Delhi</i>)
Abstract	The role of both academia and State in building capacity for transitions has gained importance, especially in recent years, as Indian agriculture has been grappling with a growing number of sustainability challenges. It therefore becomes imperative to take stock of the “capacity developed” by these actors, as the sustainability transition discourse in Indian agriculture gathers steam. The paper contributes to this stock taking by looking at the engagement of academia and State with ‘agricultural soil health’, one of the principles of agricultural sustainability and the deterioration of which, is a major sustainability challenge before the country. The current work investigates the research capacity and policy actions on managing agricultural soils in India over the last 20 years. The aim of the investigation is to gather evidence on the nature of the Science and State’s engagements in the context of sustainability transition in Indian agriculture. The analysis is premised around two arguments, one being that the challenge of deteriorating agricultural soil health in India has received only limited attention. The second argument is that, Science and Policy need to undergo a paradigm shift in the way they engage with sustainability challenges, in order to facilitate sustainability transition. Overall, the analysis, helps in reflecting on the significant shifts and their absence in the policy, values and practices of Indian agriculture in general and soil health management in particular. These findings have significant implications for the sustainability transition trajectory of Indian agriculture.
Keyword	Soil health, research capacity, policy, sustainability transition

Title	Revisiting the Early Debates on Mixed Farming (1920-1980).
Author	Himanshu Upadhyaya (<i>Azim Premji University, Bengaluru</i>)
Abstract	<p>This paper delves into the historical significance of mixed farming in India, drawing from the works of Sir Albert Howard and Bernard Augustus Keen. It examines the interdependent relationship between crop cultivation and cattle rearing in Indian farming, tracing its roots in pre-colonial and early colonial times. The authors highlight the symbiotic nature of this relationship, which was gradually strained as cultivation expanded in the late 19th and early 20th centuries.</p> <p>The paper challenges the prevailing official accounts from the late colonial period in India and emphasizes the importance of recognizing the knowledge and practices of Indian peasants. Sir Albert Howard's ideas on integration and mixed farming are presented as a departure from the era's increasing specialization in agricultural research. Howard and his wife, Gabrielle, advocated for an integrated approach, emphasizing the need for a comprehensive understanding of different sciences, research experience, and practical agriculture.</p> <p>Dr. B. A. Keen, a pioneer British soil scientist, further underscores the importance of mixed farming, stating that it is essential for increasing crop yields. He criticized the lack of innovation in research at Pusa and pushed for its reorganization. However, financial constraints hindered his efforts, and he returned to Rothamsted in 1931. Keen's diagnosis of India's agricultural problems centred on uneconomic landholding, fragmentation, and the misuse of common land and resources.</p> <p>The paper questions why dissenters like Albert Howard and B. A. Keen remain relatively unknown and discusses their struggles against the High Modernist tendencies of the colonial state. Dr. N. C. Wright's advisory report to the Imperial Council of Agricultural Research is mentioned, emphasizing the adoption of mixed farming and the cultivation of leguminous fodder crops to improve soil fertility and reduce milk production costs.</p> <p>Lastly, the paper examines how the Green and White revolution policies in India disrupted the symbiotic relationship between crop cultivation and cattle rearing, leading to greater specialization in both areas.</p>
Keyword	Albert Howard, B A Keen, Mixed Farming

Title	Creating Pathways for Sustainable Future through Collaborative Research between Civil Society Organizations and Academia in India.
Author	Rupsa Ghosh (<i>RCRC</i>)
Abstract	<p>With the turn of century, the impact of climate change on the global ecosystems has been cataclysmic. It's adverse effects on agricultural productivity and the livelihoods of the rural communities in developing economies especially India is worth pondering upon. In this context this paper makes a case for the potential of collaborative research in facilitating transformative change in agriculture and rural livelihoods. Scholars have long advocated the need for innovative and collaborative research methods to challenge the top-down approach in sustainability studies (Lozano 2018, Lassiter 2005, Lin & Yeoh2010). Drawing from a pan-India baseline study led by a coalition of civil society organizations called Responsible Coalition for Resilient Communities (<i>RCRC</i>), this paper attempts to explore the values, complexities and challenges of collaborating with multiple stake holders to work towards sustainability transitions in agriculture and livelihood. <i>RCRC</i>'s work is multidirectional as it spans from evidence generation to creating value chains and program implementation around the themes of agriculture and livelihoods in partnership with academia, civil society organizations and rural communities. Therefore, using <i>RCRC</i> as a case study, the paper attempts to illuminate the importance of collaboration in not only generating knowledge and evidence for sustainable transitions but also in creating pathways for these transitions through capacity building, policy advocacy and interventions. The paper is drafted using primary and secondary research tools and analysis with key research question on exploring the role and scope of collaboration between academia and civil society organization in engaging with state actors and bringing about a paradigm shift for creating a sustainable future.</p>
Keyword	Collaboration, sustainability, state capacity, agriculture, livelihood, resilience

Title	Promoting Agroecological Models for Sustainability: Policy and Institutional Analysis of India’s Organic and Natural Farming Initiatives.
Author	Sukhpal Singh (<i>IIMA</i>).
Abstract	<p>Agro-ecological approaches are gaining prominence across the globe due to the unsustainable nature of the prevalent paradigm of agricultural development and its externalities in the form of climate change, inequality and disconnect with local reality. India, like many other countries, has been encouraging organic farming and processing practices to develop more sustainable value chains for some time now and, more recently, has also embarked upon promotion of natural farming practices and business models in order to help farmers reduce the cost of production and their market dependence. However, there are concerns about the sustainability of these initiatives.</p> <p>It is not clear whether production driven approaches are good enough or if the entire value chain or network which needs to be created and supported which can also create and meet the demand for such sustainable food and fibre products and sustain rural livelihoods. The role of policy and institutions is hardly addressed in various initiatives undertaken in this regard.</p> <p>The paper will assess the various public policies and programs in India for organic and natural farming and the institutional mechanisms through which these models of production and consumption are being attempted to be delivered. It will critically examine the national and the state (provincial) level policies and programs to assess how far these policy initiatives can be successful and if there are any missing links which need to be connected. The paper relies on secondary and government sources of data and published and grey literature including case studies of agri-startups in this domain for both policy and institutional analysis from an institutional economics perspective.</p> <p>The paper will suggest ways forward to amend and/or strengthen various policies and practices on the ground to enable move towards more sustainable agro-sector in the small farmer livelihoods context of India. This can contribute towards concurrent and post facto amendments in policy and programs to strengthen the transition towards agroecological agriculture.</p>
Keyword	natural farming, organic farming, policy, institutions, sustainability, agroecological models

Title	Addressing vulnerability or spreading inequity? State planning of irrigation investments for climate resilience in semi-arid drylands.
Author	Pooja Prasad (<i>IIT Delhi</i>)
Abstract	In the semi-arid, predominantly groundwater-irrigated, shallow basaltic aquifer regions of Maharashtra, the state program on climate resilient agriculture promotes high-value orchards amongst other interventions. Our objective is to unravel how these interventions impact the water distribution across different farmers and meet the stated objectives of enhancing resilience and smallholder income. Using the case of a Marathwada village, we apply a water-budget tool to model irrigation distribution for two scenarios a) baseline scenario for the current cropping pattern, and b) future scenario based on proposed program interventions. We find that 89% of additional water harvested in proposed structures in the program will benefit farmers who already practice irrigation. Rainfed farmers are expected to benefit marginally except those who are granted new wells. Moreover, we show that even a small area under orchards (3%) will use 60% of water available. Year-round horticulture in highly variable agro-climates locks-in farmers' irrigation demand and reduces their adaptive capacity. Thus, we conclude that the program interventions are likely to worsen farmer resilience against droughts and enhance incomes of a few farmers by promoting inequitable access to water for irrigation.
Keyword	Climate Resilience, Groundwater irrigation, distributive justice, water-intensive horticulture

Track 4: Exploring power, inclusivity and intersectionality

Title	Creating new possibilities for women's empowerment through natural farming in Himachal Pradesh.
Author	Punam Behl (<i>University of Reading</i>).
Abstract	<p>The notion that the agroecology paradigm strengthens women's agency and decision-making is theoretically logical, however, there is limited research from India to show what benefits are derived. This paper presents a qualitative case study of the transition to natural farming in Himachal Pradesh and seeks to understand how its mechanisms support and empower marginal women farmers. Natural farming (NF) is an agroecological approach that has the potential to address multiple agricultural crises attributed to the industrial model of farming. This paper presents a case study of a natural farming initiative <i>Prakritik Kheti Kisan Khushal Yojana (PK3Y)</i> launched by Himachal Pradesh in 2018. It was based upon a particular set of practices popularised by a farmer promoter, Subhash Palekar. The main objectives were to reduce the cost of cultivation, increase farmer incomes, particularly for small and marginal farmers, grow healthy food, build climate resilience, and improve soil fertility and water holding capacity. The case study asks what processes or mechanisms are being used to support women in transitioning to NF and whether NF can open spaces for women to become more autonomous. The literature suggests that while agroecology's principles and theoretical underpinnings are based on the promotion of equity, its practice does not always reflect this. Therefore, an intentional focus on the process of empowerment for women is required. Empowerment can be understood in terms of gaining a sense of power to shape the lives people want to be able to live themselves and the lives of others. The study examines the processes by which changes occur using a Gender at Work analytical framework. This highlights the need for change to happen at personal, social and institutional levels, for women's empowerment to be achieved.</p> <p>Women's views were sought on whether the mechanisms increased spaces for decision-making, developed capabilities and autonomy. The research found that training in villages, participation in natural farming groups and networks, visits to conferences and model farms, and leadership roles offered new pathways to women farmers to gain in confidence and capabilities. The case-study illustrates how an intentional equity focus in agroecology efforts has the potential to empower women. It can provide women with creative outlets and a variety of decision-making and income-generating roles, spaces for community learning and higher levels of autonomy.</p>
Keyword	Gender aware policies, women's empowerment, changes in restrictive norms

Title	Reflections on agroecology and social justice in Malwa-Nimar
Author	Caroline Fazli (<i>University of Bath</i>)
Abstract	Recent literature has positioned agroecological transitions as a way of healing/repairing the ‘metabolic and epistemic rift’ brought about by industrial agriculture. Deeper appreciation of the interconnectedness and interpenetration between humans and nature has been at the heart of much of thought about agroecology, with agroecology being seen as a way to put into practice this understanding of socio-ecological interconnectedness. Social justice has been incorporated as almost inherent to the definition of agroecology for many involved in theorizing about it worldwide, especially thought coming out of Latin America about ‘emancipatory agroecology’. In view of the historical inequalities in agriculture in Malwa-Nimar, India, along caste, gender and class lines, this research seeks to explore the extent to which agroecology as currently practiced is inherently emancipatory, and what challenges exist to overcoming structural inequalities.
Keyword	Agroecology movements, Social justice, Metabolic and epistemic rift, Emancipatory agroecology

Title	Gendering the Climate Crisis in Rural India; Resilience & Harvesting Traditional Knowledge .
Author	Prarthana Lumba (<i>Project Executive, Research</i>) and Stutilina Pal (<i>Project Director</i>).
Abstract	<p>In times of climate crisis, the genders are differently impacted and face varying challenges of their own. Looking at the gendered nature of such a crisis, we wish to point out how socio-cultural concerns plague women’s proper adaptation to environmental problems. In times of drought, famines and environmental degradation - women are the worst hit. A vulnerable and disproportionately affected group - women face a negligible role in decision-making, with their specific needs receding into the background.</p> <p>Gendered norms make it difficult for women to have adequate access to education, and vocational and technical skills which may help hone their traditional knowledge of the environment. In times of climate crisis, therefore - they are worst affected; facing several drawbacks singlehandedly; landlessness, economic deprivation and vulnerability (lack of access to banking, and credit facilities), increased exposure to violence, poor nutritional health, and exacerbated poor health conditions. It is in this context that we aim to study resilience strategies adopted by women to cope in times of crisis. Food production and consumption impact several groups of women in varying ways. Through means of our research, we wish to uncover the gender-power-environment nexus.</p>
Keyword	climate change, resilience strategies, power dynamics, gendered

Title	Embedded Agroecology -Shifting Cultivation
Author	Soumik Banerjee (<i>Keystone Foundation</i>)
Abstract	<p>Shifting Cultivation (locally called Kurwa, Bewar, Penda, Podu or Ahal) is a traditional system of farming where multiple crops are raised along with native trees and other natural vegetation in a patch for 2 to 3 years and then left fallow to regenerate for several years, while the farmer moves to another patch to start the process all over again. It is estimated that 6.23 lakh mostly Adivasi families practice Shifting Cultivation across 1.73 million ha in some of the remotest regions of India.</p> <p>Even though Shifting Cultivation was one of the best viable livelihoods for Adivasis residing in remote undulating and hilly terrains where conventional agriculture is not possible – it has been vehemently opposed and prohibited since the colonial times and the same mindset continues till date, even though this system has been following all the five principles of Regenerative Farming since millennia.</p> <p>Shifting Cultivation mimics the forests and is rooted in sophisticated local wisdom on soil, crops, weather, and vegetation patterns and well-tuned with the Adivasi way of life. While other conventional systems are struggling to adapt to all the principles of Organic/Natural or Regenerative Farming- Shifting Cultivation practices can offer insights into how conventional systems can transition to such systems in difficult or marginal terrains in the era of Climate Change.</p> <p>Our findings show- Shifting Cultivation Fallows are rich ecosystems with high or comparable Stem Density and Biodiversity as to neighbouring Reserve or Protected Forests in the same region.</p>
Keyword	Shifting Cultivation, Adivasi, Agroecology, Forest, Diversity, Regenerative Farming, Fallow

Title	Agro-Ecology and Equity in India: The Status of and Issues in Soil-Water Conservation across the States
Author	Amita Shah (<i>Centre for Development Alternatives, Ahmedabad</i>), Yagnik Jignasu (<i>Centre for Development Alternatives, Ahmedabad</i>) and Hasmukh Joshi (<i>Centre for Development Alternatives, Ahmedabad</i>)
Abstract	<p>Agriculture, a cornerstone of livelihoods, confronts unprecedented challenges in the face of changing climatic conditions. This paper delves into Integrated Watershed Development Projects (IWDP) in India, seeking to address the pressing need for sustainable solutions to ensure food security. As the climate evolves, the importance of soil-water conservation becomes increasingly apparent. The evolution of IWDP is examined, emphasizing the transition from a technocentric approach to a more holistic one that embraces community involvement and informal institutions. This shift acknowledges the critical role played by informal institutions in supporting formal ones to drive lasting change. The historical significance of the watershed-based approach to soil-water conservation is explored, along with its theoretical and practical aspects and the challenges posed, particularly in the Indian context, where land access has profound implications within diverse social contexts. Soil and Water Conservation (SWC) takes center stage as a critical component of natural resource management. However, its implementation faces multifaceted challenges, including managerial, financial, and socio-political barriers. While Soil Water Development Projects (SWDPs) operate at the meso-level to address these challenges, questions about their long-term effectiveness persist. The paper explores the evolution of SWC strategies, spanning from individual household water conservation to large-scale dam projects, emphasizing the importance of ecosystem services in poverty reduction and climate change mitigation.</p> <p>A comprehensive overview of IWDP's effectiveness and challenges across states and offer a comparative analysis of IWDP during the periods of 2009-2013 and 2021. The changing paradigm of Soil Water Conservation in India emphasises the shift from individual land ownership to communal resource management, crucial for ensuring sustainable non-farm activities that underpin livelihoods. The temporal analysis of IWDP coverage across different states discusses that States with substantial dry and semi-dry cultivated areas exhibit higher coverage, but the correlation between coverage and cultivated land percentage is not straightforward. The study also notes significant variation in IWDP coverage among villages within districts, indicating the program's uneven penetration at the village level.</p> <p>The study elaborates on the centrality of soil-water conservation through IWDP in addressing the complexities of climate change and emphasizes community engagement, informal institutions, and the transition towards community resource management as pivotal drivers for sustainable and equitable agricultural growth.</p>
Keyword	Agro-ecology, Soil-Water Conservation, Integrated Watershed Development Programmes, IWDP

Title	Recognizing the role of gender in managing sustainable transition in Agriculture.
Author	Sumit Soni (<i>Friends of WWB India</i>) and Roshmi Handique (<i>ARIAS Society, Assam</i>)
Abstract	<p>Women in rural India play a crucial role in agriculture, producing the majority of crops and livestock. However, gender inequality persists, limiting their access to resources and opportunities. Gender-responsive strategies can empower women and increase agricultural output, improving food security and reducing malnutrition. Investment in women farmers is crucial to creating higher-quality agricultural output and improving their lives.</p> <p>Rural women farmers are often left out of climate resilience efforts, despite their potential to make significant impacts. They face disproportionate effects of climate change and have limited access to resources. Empowering women-led farm institutions with information and innovations is crucial in fighting poverty, hunger, and climate insecurity. Women are important agents of change and can benefit everyone if given resources and opportunities to lead. Strengthening the role of gender in agriculture and climate change and exploring technology solutions can help women farmers strengthen their say and participation in establishing sustainable agro-ecosystem.</p>
Keyword	Farmer producer organizations, sustainable agriculture, gender, NGOs, ethnographic analysis

Title	Balancing Act: An Empirical Tool for Evaluating Short-term Trade-offs in Agro-ecological Transitions.
Author	Syamkrishnan P Aryan (<i>Well Labs</i>), Anjali Neelakantan (<i>WELL Labs - IFMR-Krea University</i>), Mallika Sardeshpande (<i>Ashoka Trust for Research in Ecology and Environment</i>) and Manjunath G (<i>Well Labs - IFMR</i>)
Abstract	This research addresses the challenge of convincing farmers to adopt agroecological practices, often seen as requiring short-term sacrifices for long-term benefits. To bridge this gap, an evidence-based decision-making tool is developed to assess short-term trade-offs between economic and ecological gains. Agroecology, which integrates ecological and social elements into farming, is recognized for its potential to deliver sustainable agriculture. However, its adoption hinges on understanding trade-offs between water, carbon, and income. To tackle this, the study adapts the production possibility frontiers (PPF) concept to understand the trade-offs between output variables such as farmer net income, water use, and carbon stock. The research involves farmer household surveys and data analysis, creating a user-friendly tool for stakeholders like Civil Society Organisations (CSOs) and farmers to make informed decisions, ultimately fostering sustainable farming practices.
Keyword	Agro-ecological transition, Trade offs, Empirical tool, Planning for transition

Title	The Sustainable Rice NDC Alliance
Author	Francesco Carnevale Zampaolo (<i>SRI-2030</i>)
Abstract	<p>Rice is a vital food source for almost half of the global population, but its cultivation is currently responsible for over 10% of global methane emissions and uses 40% of the world's irrigation water. The System of Rice Intensification (SRI) and other methods have proven potential to reduce green-house gases (GHG) emissions at scale as well as multiple co-benefits such as optimising the use of water while maintaining or increasing yields and enhancing the climate resilience of global rice production. National governments can play a pivotal role in promoting sustainable approaches to rice cultivation and their commitments in the Nationally Determined Contributions (NDCs) accelerate the adoption of mitigation and adaptation strategies for sustainable rice production. Already 13 countries list SRI methods as a strategy for climate change mitigation and/or adaptation, but only 32 out of 117 countries with rice farming activities have integrated sustainable rice production strategies into their NDCs. This year, NDCs have and are being reviewed and will be updated before 2025, paving an important opportunity for major rice-producing countries to include SRI and other sustainable methods in their commitments. SRI-2030 is seeking to support those nations including SRI in their NDCs by establishing the Sustainable Rice NDC Alliance with the purpose of promoting meaningful collaboration and dialogue among member countries and organisations. Through the Sustainable Rice NDC Alliance partner countries are expected to collaborate with a network of experts for implementing their NDCs commitments, accessing climate finance and engaging non-country stakeholders. The Sustainable Rice NDC Alliance also serves to demonstrate best practices for rice producing nations without rice-related NDCs commitments and to indicate the advantages of sustainable rice production. The coordinated efforts of farmers, scientists, governments, NGOs and the private sector can advance sustainable rice production, ultimately contributing to the agroecological transition for the mitigation of methane and other GHG emissions while ensuring food security for both current and future generations.</p>
Keyword	Rice, Nationally Determined Contributions (NDC), Methane, Policy

Title	Convincing in the farmers: the role histories and aspirations in the hard work of sustainable agriculture
Author	Alexa Russo (Stanford University)
Abstract	As a solution to agrarian crisis, many in India have suggested a transition to sustainable agriculture through the creation of farmer producer organizations (FPOs). Furthermore, with the feminization of agriculture and the ubiquity of self-help groups (SHGs) across rural India, women are providing significant labour and leadership in the making of these alternatives. Through an ethnographic analysis of all-women farmer producer organization working in sustainable agriculture in Madhya Pradesh, this paper will explore the (gendered) relations between the “social” and “economic” through the intertwined institutions of the NGO, which supports sustainable agriculture practices, and FPO, that aggregates and markets production. This paper suggests, while the worlds of “seva” and “business” are made separate by these distinct institutions, the NGO and FPO are simultaneously reliant on and made vulnerable by each other’s kin-like interconnections and deemed separation, with gender becoming a key instrument of the dis/entanglement of these worlds.
Keyword	Farmer producer organizations, sustainable agriculture, gender, NGOs, ethnographic analysis

Title	What women want: Engendering transition intermediaries through enabling women's empowerment in Farmer Producer Organisations.
Author	Deborah Dutta (<i>Institute of Rural Management Anand</i>) and Shambu Prasad Chebrolu (<i>Institute of Rural Management Anand</i>).
Abstract	Farmer Producer Organisations (FPOs) have increasingly been promoted as vehicles for improved agrarian livelihoods, especially for smallholder farmers, through offering better market access, benefits of scaling, improved social capital and techno-financial aids. However, its potential to empower women farmers and reshape the dynamics of agricultural systems has been relatively underexplored. Delving into the multifaceted dimensions of women's participation in FPOs through examining its drivers, challenges, impacts, and broader implications for equitable and sustainable food systems can help design relevant ecosystems to nurture women-driven producer collectives. This paper attempts to characterize some opportunities and barriers in running women-led FPOs through illustrative case studies of seven organisations across India. The analysis reveals the need for gender-sensitive capacity-building programmes, access to sustainable agriculture training programmes, legal recognition of women as landholders and farmers, progressive socio-cultural norms, and inclusive markets as some of the factors contributing to a supporting ecosystem for women's participation.
Keyword	Gender inclusivity, women empowerment, producer organisations, transition intermediaries

Track 5: Valuing Agroecology

Title	Re-assessing agriculture’s contribution to the national GHG inventory: A just transitions approach.
Author	Sudhindra Seshadri (<i>Independent</i>)
Abstract	The Green Revolution, which significantly increased agricultural productivity and GDP, brought forth ecological challenges. The economics of agricultural carbon ecology has become pivotal in the fight against climate change. Global agencies are emphasizing a greater focus on agricultural carbon removal (CDR). However, the inconsistent application of the Green House Gas (GHG) Protocol to National GHG Inventories disproportionately penalizes agriculture by overlooking CDR re-emission through human metabolism, leading to substantial underreporting. In India alone, this omission amounts to 756 MtCO _{2e} per year. The unacknowledged value of India's agricultural climate services stands at \$98.4 billion annually (INR 8.1 lakh crore), approximately INR 52,000 per hectare. The establishment of CDR carbon funds to compensate for these climate services can enhance farmer incomes and mitigate food inflation. A compelling case is presented for a just transition, shifting from the long-standing single-instrument policy of grain productivity to encompass a carbon ecology policy with equitable compensation. This approach not only benefits vulnerable populations but also addresses the pressing issue of climate change.
Keyword	National GHG Inventory, GHG Protocol, CDR, Climate Services, Just Transitions

Title	Reimagining Pastoral Production Systems: A Comprehensive Ecosystem Development in the Desert Bioregion of India.
Author	Aakriti Srivastava (<i>Bahula Naturals, Rajasthan</i>), Prerna Agarwal (<i>Samakhya Sustainable Alternatives</i>) and Jaya Kritika Ojha (<i>Central University of Rajasthan</i>)
Abstract	<p>The pastoral communities of India, known as 'Maldharis,' have long preserved a unique way of life closely connected to nature. In arid regions such as Rajasthan, Gujarat, and Haryana, their practice of mobile grazing holds the key to carbon sequestration, a crucial element in climate change mitigation. The research explores questions surrounding the adaptation of traditional pastoral practices to evolving socio-economic and ecological dynamics, the socio-cultural factors supporting resilience, and strategies for creating sustainable market links. Using a qualitative case-study approach in Western Rajasthan, the study delves into a comprehensive intervention that enhances pastoral incomes through market diversification.</p> <p>The intervention asserts that pastoralism is not just a livelihood but an ecosystem-enriching practice. It leverages the socio-cultural traditions, biodiversity knowledge, and market acumen of 'Maldharis' to promote sustainable development. Traditionally marginalized, pastoralists face economic and social discrimination, resulting in wastage of pastoral fibres. The initiative strives to create a resilient and interconnected ecosystem, reversing this trend. It mobilizes pastoralists, infuses resources, upgrades technology, and establishes diverse value chains.</p> <p>The findings indicate that the program has successfully penetrated markets with pastoral milk and animal fibre products, boosting pastoralist incomes. Social enterprises like Bahula Naturals promote a direct connection between pastoralists and consumers, emphasizing the economic ecosystem's alignment with changing regional dynamics. The Magra Model enhances pastoral fibre production systems and value chains, creating opportunities for community members, especially women and youth. This intervention has led to a paradigm shift in community dynamics, revitalizing ancestral pastoral routes and bolstering economic and socio-cultural aspects. It safeguards indigenous breeds, promotes effective land management, and counters the misconception that pastoralism degrades the land.</p> <p>It offers a blueprint for sustainable pastoralism worldwide, combining traditional knowledge, modern technology, and innovative market linkages to secure the future of 'Maldharis' and their vital contributions to India's ecological tapestry.</p>
Keyword	Desert Bioregion, Communities, Intervention, Maldharis, Pastoral Production Systems, Ecosystem Development

Title	Leveraging Carbon Funding to Scale Natural Farming – Opportunities and Challenges.
Author	Srajesh Gupta (<i>Aga Khan Rural Support Programme India</i>) and Siddhartha Dabhi (<i>Aga Khan Rural Support Programme India</i>)
Abstract	Voluntary offset markets are set to become a \$ 50 bn market by 2030. In the past 4-5 years there has been an increased interest in nature-based solutions (NbS) for carbon offsetting. NbS covers a wide array of projects like regenerative agriculture, agroforestry, plantations, biochar production and others. In India too, various project developers are approaching farmers, rural communities and grassroots organisations to onboard farmers on to their projects to generate NbS carbon credits. These projects come with big promises of emissions reductions and income generation. This paper explores the opportunities and challenges presented by carbon markets.
Keyword	Natural Farming, Carbon Markets, Carbon Credits, Payment for Ecosystem Services, Ecosystem Valuation, Regenerative Agriculture, Voluntary Offset Markets

Title	Enabling an Equitable Transition Towards Regenerative Agriculture: A ‘Ladder Economics’ Approach.
Author	Karishma Bhushan Shelar (<i>WELL Labs - IFMR - KREA University</i>) and Syamkrishnan Aryan (<i>WELL Labs - IFMR - KREA University</i>)
Abstract	<p>Conventional monoculture agricultural practices not only lack ecological sustainability but are also growing economically untenable. While they may generate short-term profit, evidence demonstrates that monoculture systems place an economic burden on households and contribute to the degradation of our natural resources.</p> <p>In contrast, a shift towards integrated farming systems based on agroecological principles offers an alternative for ensuring intergenerational livelihood security while safeguarding our natural capital. This paper establishes the economic rationale and value of such an agroecological transition using the 'ladders of transition' approach.</p> <p>We present evidence from a variety of on-farm agricultural practices to support this proposition. This novel framework allows us to assess the implications for both short-term and long-term household economics and the environment. Our analysis indicates that such a transition is economically viable, especially when financial, institutional, and policy incentives are appropriately aligned.</p>
Keyword	agroecology, regenerative, transition, valuation, economics

Title	Understanding the farm economics of farmers under different stages of transition from conventional farming toward agro-ecological farming in Madhya Pradesh.
Author	Siva Muthuprakash Km (<i>VikasAnvesh Foundation</i>), Amit Kumar Mishra (<i>SRIJAN</i>), Kirti Ahirwar (<i>SRIJAN</i>), Vinay Debral (<i>National Coalition for Natural Farming</i>), Piyuli Ghosh (<i>National Coalition for Natural Farming</i>), Neha Bhadbhade (<i>Society for Promoting Participative Ecosystem Management (SOPPECOM)</i>), Sidharth Patil (<i>Advanced Centre for Water Resources Development and Management (ACWADAM)</i>), Om Damani (<i>IIT Bombay</i>), Tarak (<i>SOPPECOM</i>) and Mihir Shah (<i>National Coalition for Natural Farming</i>).
Abstract	A comprehensive baseline survey of 1776 farmers were conducted as part a program to scale up natural farming practices to over 50000 farmers across 11 agro-ecological zones in Madhya Pradesh. This gave us the opportunity to study farms in various stages of transition including conventional farms, non-pesticide management farms, organic and natural farms. While the cost of cultivation, yield and income reflects the past studies and experience, the study offers fresh insights with respect to the impact of quantity of organic inputs on yield parameter. The trends indicate that the normalized yield of organic farms is matching or exceeding the counterparts at a particular range in almost each of the organic input used. However, majority of organic farms are using organic inputs lesser than this range. Further, the study helps in understanding the magnitude of subsidy offered to chemical farming at unit farm level.
Keyword	Socio-economic indicators, Farm input, Fertilizer subsidy, Cost of cultivation, normalized yield, Net income, Organic inputs

Title	Creating alternative marketplaces for smallholder farmers: Lessons from the case of warehouses.
Author	Gopi Sankar Gopikuttan (<i>Azim Premji University</i>), Gopal Naik (<i>IIM Bangalore</i>)
Abstract	Agricultural marketing reforms in India have promoted creating alternative marketplaces as a strategy for reducing marketing risks of smallholder farmers. A recent initiative has been to recognize agricultural warehouses as alternative marketplaces, where farmers can undertake transactions without having to transport their produce to other markets. In this paper, we study the relatively lesser understood case of “warehouses” as alternative marketplaces using a triadic framework: how does the (mis)alignment among infrastructure, institution, and incentive affect the promotion of warehouses as alternative marketplaces? We undertake content analysis of relevant policies, analyse publicly available secondary data on warehouses, and carry out qualitative interviews of five types of stakeholders – farmers, warehousemen, collateral managers, banks, and WDRA – to answer the question. This is supplemented with insights drawn from a few specific case studies. We find that while the policy and institutional initiatives improve the infrastructure, they fail to create appropriate incentives for stakeholders.
Keyword	Agricultural markets, alternative marketplace, warehouse, institution, infrastructure, incentive

Title	Enabling agro-ecological transition: On-farm and off-farm income diversifications for incentivising small-holder farmers.
Author	Syamkrishnan P Aryan (<i>Well Labs</i>), Karishma Shelar (<i>WELL Labs - IFMR-Krea University</i>) and Aditya Maruvada (<i>WELL Labs</i>).
Abstract	<p>This article addresses India's critical agricultural crisis characterised by land degradation and declining farmer incomes. Approximately 30% of India's total geographical area consists of degraded land, of which nearly 37 million hectares are rain-fed agricultural land. One of the major drivers of this degradation is unsustainable land management practices, particularly chemical-intensive monoculture. As a result, farmers struggle to maintain economically viable agricultural production, leading to distress and migration.</p> <p>The central argument of the article is that to enable sustainable transitions, smallholder farmers must be incentivised through increased profitability. The authors propose that improved return on investment can be achieved by supplementing agricultural revenues with off-farm value addition and on-farm livelihood diversification activities. Three crop diversification variants are analysed: traditional intercropping, rainfed multilayer agroforestry, and hybrid agroforestry. The article assesses the impacts of off-farm value addition and on-farm livelihood diversification activities on these practices based on profitability index and transition finance requirements, offering insights into viable strategies for scaling up sustainable agricultural transitions.</p>
Keyword	Sustainable Transitions, Incentivising farmers, Off farm value addition, On farm livelihood diversification, Profitability Index, Transition finance, Net Present Value, Return on Investment

Track 6: Theorising Social Movements

Title	Can networks drive a social movement for agroecological transition? Experiences of the Rajasthan Natural Farming Alliance (RNFC).
Author	Aneesh Mohan (<i>Institute of Rural Management Anand</i>), Shubha Khadke (<i>Institute of Rural Management Anand</i>) and Shambu Prasad Chebrolu (<i>Institute of Rural Management Anand</i>).
Abstract	The Government of India in its recent thrust towards promoting natural farming has indicated the need for a social movement, albeit led by the state. As a result, several Indian state governments are undertaking Natural farming through a combination of central programmes and a few state specific programmes. However, mobilizing a social movement solely through traditional means might not be sufficient to catalyse the widespread adoption of agroecological practices. Investing in the knowledge and agency of farmers requires conscious efforts to avoid ‘transfer of technology’ and ‘top-down’ implementation models. This paper explores the role of grassroots networks and intersectional coalitions in supporting social movements for agroecological transitions. A longitudinal reflection of coalition efforts in Rajasthan is discussed as a case study to characterise opportunities and challenges in sustaining ground-level movements.
Keyword	learning alliances, social movements, network, coalition

Title	Civil Society Collaborations for Scaling Out of Agro-Ecology.
Author	Kavitha Kuruganti (<i>Alliance for Sustainable & Holistic Agriculture (ASHA Kisan Swaraj)</i>)
Abstract	<p>The spread of agro-ecology in India has seen a multifaceted evolution, with distinct pathways of "Scaling Out" led by non-state actors and "Scaling Up" directed by state policies. This article delves into the intricate dynamics of this movement. In India, the agro-ecology journey began in the 1980s with voluntary efforts in Gujarat and later crystallized into the Akhil Gujarat Sajiv Kheti Samaj. Pioneers like Dr. Nammalvar and Subhash Palekar played pivotal roles. The movement predominantly shunned synthetic agro-chemicals, monocropping, and GMOs, initially spearheaded by individuals and NGOs before academic institutions joined the fray.</p> <p>Various agro-ecological approaches, such as organic farming, permaculture, and natural farming, were adopted and promoted. Additionally, traditional seed diversity restoration, especially in millet-based cropping systems and paddy, became a significant facet. The early 2000s witnessed the emergence of pan-Indian networks and platforms working towards transitioning farmers away from chemical-intensive agriculture. Diverse organizations, including the OFAI, RRA-N, ASHA and the NCNF, collaborated to support the agro-ecology movement. Donor organizations, CSR foundations, philanthropies, and start-ups also contributed to its growth, marking distinct phases in civic action.</p> <p>For a sustainable transition in scaling out agro-ecology, certain critical aspects are highlighted: mission-mode work, continuous support, grassroots engagement, integration of seed and livestock systems, market interventions, scientific knowledge, community institution building, and the leadership of marginalized farmers and women.</p> <p>However, the authors caution that state-led scaling-up initiatives pose a risk of eroding the critical components of scaling out. There is a need for an expanded and deeper civic action to protect and promote the values of scaling out, ensuring that the transition remains sustainable. As civic action converges with state-led efforts, future actions may involve some actors staying out of state-led initiatives, while others engage in collaborative arrangements to preserve the essence of scaling out.</p> <p>This paper provides a detailed account of civic action's role in scaling out agro-ecology, drawing on the experiences of two individuals involved in multiple efforts over the decades. It also proposes a tentative agenda for future civic action based on the developments and activities over the past 35 years. The paper attempts to retrace the agro-ecology movement in India, describes its key components and distinctive features, assesses current collaborations, and offers insights into a future action plan.</p>
Keyword	learning alliances, social movements, network, coalition

Title	Decolonising Sustainability Transition research.
Author	Ramasubramanian Ob (<i>Samanvaya Social Ventures Pvt Ltd.</i>), Subashini Sridhar (<i>Valanaadu Organic Farmers Company</i>) and Baskar Arumugam (<i>Nammalvar Multiversity</i>).
Abstract	<p>The emergence of the local supply chains during pandemic across Indian landscape had an important lesson – it proved that such supply chains are quickly created and easily managed locally within the existing systems of food aggregation, processing, storage, and distribution. Apart from satisfying the immediate pressure of having to ensure food and nutrition security for a large population, it also resulted in creating additional jobs in the rural sector. Benefits included, lessened food miles and faster farm to fork reach, apart from faster realization for the farmer. While empirical studies exist on such an emergence in several instances across India, such an emergence of local low-carbon supply chain has not entered the discourse on agroecological research or sustainable transition. The carbon obsessive western form of climate change thinking and its techno-centric responses have come to dominate Indian academia and research organizations.</p> <p>A cursory glance at the areas of research being pursued by the premium agricultural university will validate the same. In this paper, we argue that the underlying challenge for Indian academia and researchers is the deep-rooted colonial structural and functional past. We also propose a possible new transdisciplinary approach that can provide diverse pathways for agroecological research through the incorporation of traditional wisdom, plant intelligence science apart from self-sustaining localized supply chains that create robust food security regions. Specifically, we focus on two local ventures that have worked on such solutions in Tamil Nadu as an example, one that has formed into a formal structure of Farmer Producer Company and another that has remained an informal natural farmers group. In examining their models and processes, we highlight both the potential and the gaps in the agroecological research in Indian condition today.</p>
Keyword	farmers' knowledge, agroecology, deskilling, agrarian change, extension, Green Revolution

Track 7: Building alternative agricultural markets and marketplaces

Title	Coexisting with the ‘mainstream’: challenges of managing ‘alternative’ producer organisations in agricultural production and marketing.
Author	Abhishek Saxena (<i>IRMA</i>), Pallavi GL (<i>IRMA</i>) and Shambu C. Prasad (<i>IRMA</i>)
Abstract	The scholarship on sustainability transitions has surprisingly few studies on agriculture and food systems especially from emerging economies such as India. Within India the framing of transitions, especially of farmer collectives, has been more for their social and economic dimensions of the ‘alternative economies’ and establishing alternative production and alternative marketing networks within the local agrifood context. The large number of Farmer Producer Organisations (FPOs) that have been set up in the last decade have largely focused on enabling agrochemical input supply with little attention on enabling farmers to transit towards sustainable agriculture. Through three FPO case studies that engage in and promote sustainable agricultural practices we suggest that a useful direction for FPOs of the future is to envision themselves as sustainable “transition intermediaries”. The hybrid management and the challenges faced while acting as sustainable transition intermediaries are highlighted with a few design elements of collective enterprises for the emerging spread of natural farming initiatives and sustainable food systems in India delineated.
Keyword	Food systems, producer organisations, transition intermediary, sustainable agriculture, case studies

Title	Rice Nursery Entrepreneurship” for climate adaptation: Managing localised sharing economies in the Eastern Indo-Gangetic plains
Author	Arnab Chakraborty (<i>International Maize and Wheat Improvement Center (CIMMYT)</i>), Subhajit Patra (<i>CIMMYT</i>), Madhulika Singh (<i>CIMMYT</i>), Anurag Kumar (<i>CIMMYT</i>), Pankaj Kumar (<i>CIMMYT</i>), Deepak Kumar Singh (<i>CIMMYT</i>), Ajay Pundir (<i>CIMMYT</i>) and Sugandha Munshi (<i>International Rice Research Institute</i>)
Abstract	Climate change presents a growing challenge to agriculture worldwide, and its impacts are particularly pronounced in regions heavily dependent on rain-fed agriculture, such as the Eastern Indo-Gangetic Plains (IGP). This paper examines the role of localized sharing economies in fostering climate adaptation, with specific focus on a local innovation: - "Rice Nursery Entrepreneurship" (RNE). RNE represents a sharing economy model that holds promise for resource-use optimization by enhancing the resilience of most vulnerable farmers in the face of climate-related uncertainties. In this mixed-method study we use the data from on-farm experiments conducted across the region to show how these practices are leading to economic advantages and resource optimization, along with experiences of farmers and extension agents involved in this process, collected through in-depth interviews. We go on to show, how such innovations play a crucial role in climate adaptation by leveraging networks and platforms which facilitate these.
Keyword	Sharing Economy, Climate adaptation, Community-based enterprise, Socio-ecologically embedded markets, Rice nursery enterprise, Knowledge convergence networks

Title	Interlinkages of farms and forests through NTFP commodity chain: A case study of the Sahariya Adivasi in central India.
Author	Sonam Mahalwal (<i>Ambedkar University Delhi</i>)
Abstract	<p>In the rural forested regions of central India, the well-being of the Sahariya Adivasi community is intricately tied to the interplay between farming and forest resources. Previous literature has typically focused on either farms or forests, examining aspects such as forest access, environmental income, agrarian changes, marginal farming, productivity, and their role in poverty alleviation. However, this study aims to unravel the nuanced market relations that connect these two essential components of rural life.</p> <p>This research draws on theoretical foundations from studies on forest dependence, commodity chains, sustainable livelihoods, and dryland farming. Key themes explored in this research include the significance of forest access, different stages of commodity chains, the opportunities and constraints of dryland farming, and the role of livelihood diversification.</p> <p>The Sahariya community maintains a diverse livelihood profile, which involves collecting and selling Non-Timber Forest Products (NTFPs), farming, and wage labor. While they are the primary collectors of NTFPs in the region, they rely on local markets for selling their collections, land tenure arrangements, and borrowing money. However, the local markets are predominantly controlled by upper-caste NTFP aggregators and crop merchants, who influence prices and terms, ultimately affecting the Adivasi's subsistence. This study delves into the intricate market relations between the Sahariya Adivasi and these local aggregators, focusing on the village of Agara in Madhya Pradesh, situated on the edge of Kuno National Park.</p> <p>The research examines the opportunities and constraints within the NTFP commodity chain, specifically focusing on the gum-resin of <i>Boswellia serrata</i>. The Sahariya people have customary rights to collect this gum-resin, which becomes part of the commodity chain at the village level.</p> <p>The findings reveal that the Adivasi receive limited returns from selling their gum-resin as they typically sell it in raw form without value addition. One reason for this is the lack of alternative credit sources which forces the Adivasi to accept the market prices dictated by local moneylenders and NTFP traders, which are typically the lowest in the commodity chain. Additionally, limited access to market information and contact with NTFP traders outside the local area restrict the Adivasi harvesters from ascending the commodity chain. These factors ultimately contribute to the demand for credit to cover the cost of cultivation.</p>
Keyword	Farms, Forests, Interlinked markets, Livelihoods

Title	Connecting Small Holder Organic Farmers to export Markets
Author	Ekta Jaju (<i>ONganic Foods Pvt Ltd</i>)
Abstract	<p>The paper addresses the pressing issue of climate change affecting agricultural productivity, particularly in the context of smallholder farmers in India. Climate change is causing reduced crop yields, lower nutritional quality of major cereals, and decreased livestock productivity, impacting the income of farmers. Smallholder farmers constitute a significant portion of India's agricultural sector, but their profitability is dwindling, with the average monthly income per agricultural household being a mere Rs 10,218, according to the SAS 2021.</p> <p>Recognizing the challenges faced by smallholder farmers, the paper highlights a sustainable agricultural model implemented in Nadia, West Bengal. This model focuses on organic rice production and establishes an end-to-end value chain connecting small farmers with export markets. The Switch ON Foundation initiated an organic farmer producer company called ON Farm Fresh, comprising 500 smallholder farmers in 2013. In addition to rice, these farmers grew other crops for consumption and sale. The foundation also established ONganic Foods, a for-profit social enterprise, to support farmers with certification, processing, and market access.</p> <p>This hybrid structure fosters a sustainable and scalable ecosystem, with Switch ON's involvement in creating farmers' collectives, organic agriculture training, and research and development. ON Farm ensures adherence to organic standards, timely payments to farmers, and distribution of seeds and inputs. ONganic focuses on market intelligence, contract farming, quality assurance, and marketing to various domestic and international brands.</p> <p>The paper reports significant increases in farmer incomes through this model, with farmers adopting indigenous crop varieties and producing their own bio-fertilizers and bio-pesticides. An independent study by Upaya Social Ventures revealed a 37% increase in farmer incomes after transitioning to organic farming with ON Farm, ONganic, and Switch ON.</p> <p>However, the paper acknowledges several challenges in this model. Scalability beyond a niche market can be difficult, and the rigorous requirements for organic certification for exports pose challenges for smallholder farmers. The documentation, technical data, and cost of NPOP/NOP certifications have become prohibitive. Additionally, the PGS certification lacks consumer credibility, and traceability is a significant concern.</p> <p>In conclusion, the research paper presents a promising model for sustainable agriculture focused on smallholder farmers while addressing the challenges for sustainable long-term impact.</p>
Keyword	Organic, smallholders, exports, hybrid, certification, income, climate change

Title	Soil Moisture: Socio-Cultural Contexts and Material Perceptions in Indo-Gangetic Plains.
Author	Nidhi Sehrawat (<i>Development Alternatives, New Delhi</i>).
Abstract	<p>The irrigated rice-wheat (RW) cropping system in northwest India is essential for the country's food security. However, agricultural production has faced numerous challenges, including soil degradation, pest and disease outbreaks, labor scarcity, salinity, waterlogging, and, most notably, groundwater depletion in RW regions. This depletion has led to increased depths to groundwater in many areas since the 1970s, affecting soil fertility and overall agricultural sustainability. The article discusses the pressing need to address these issues and emphasizes the importance of soil moisture for effective land management.</p> <p>Soil moisture is a critical factor for rainfed agriculture, and understanding its significance at different plant growth stages is crucial for mitigating water-related challenges. The study delves into the relationship between soil moisture and crop planting, emphasizing the need for timely planting and soil conservation practices. Soil fertility information, encompassing chemical, physical, and biological aspects, is vital for enhancing soil productivity and sustainable land management. Additionally, the article highlights the importance of indigenous knowledge, accumulated through generations, in shaping local soil management decisions.</p> <p>The cropping patterns in the region have evolved significantly due to factors like irrigation availability, new seed varieties, fertilizers, and market demands. The study underlines the influence of these factors on agricultural practices and the need to consider them in policy decisions.</p> <p>To address these challenges, ethnopedology is proposed as a trans-disciplinary approach to understanding soil moisture perceptions among both scientists and farmers. The research aims to explore how these perceptions have evolved over the past century and how they differ between the two communities. The study includes discussions with farmers in the Karnal-Panipat paddy belt, focusing on canal-irrigated and technologically advanced sub-regions, to gain insights into groundwater-dependent agriculture and its impact on soil moisture.</p> <p>The paper emphasizes the need for a more holistic approach to agricultural research that includes the insights of local stakeholders and the reinstitutionalisation of agricultural research institutes in India. This comprehensive perspective is essential to address the challenges facing the agriculturally stressed Indo-Gangetic plains, particularly in Punjab-Haryana, and to ensure the sustainable management of soil and water resources.</p>
Keyword	Soil moisture, policy, indigenous, soil science research, institutional reforms

Title	Transitions from Socio-Technical Interactions in Smallholders' Farms: Learnings from the Experiences of System of Crop Intensification and Natural Farming from the Rainfed Regions of India.
Author	Debashish Sen (<i>People's Science Institute</i>), Vinod Niranjana (<i>People's Science Institute</i>), Prabhakar Adhikari (<i>Pragati</i>), Puran Bartwal (<i>People's Science Institute</i>) and Shambu Prasad (<i>Institute of Rural Management Anand</i>).
Abstract	<p>The study delves into the transitions observed in smallholders' farms in the rainfed regions of India, focusing on the System of Crop Intensification (SCI) and Natural Farming (NF) as alternative agro-ecological approaches. It addresses the need to enhance food and livelihood security for farmers grappling with the adverse impacts of climate change and the fallout of the Green Revolution (GR). The research objective centres on characterizing the nature of adaptations made by farmers when integrating SCI and NF into their existing farming practices. It explores how these introduced practices are interpreted, adjusted, and integrated into local agro-ecological arrangements, highlighting the social and technical challenges faced by farmers and variations in transition patterns across regions.</p> <p>The study employs the socio-technical systems (STS) theory to analyse the complex interactions within farming systems, considering heterogeneous actors, institutions, materials, and infrastructure. It identifies socio-material drivers and their interactions in reshaping farming systems following the introduction of SCI and NF. Using a multiple case-study design across three distinct agro-climatic regions, the research combines qualitative and quantitative methods to investigate the impact of SCI and NF on farming practices. Findings reveal that farmers who had prior experience with SCI found it easier to experiment with NF practices. They integrated these approaches in the same plots, valuing their combined effects.</p> <p>The study highlights the emergence of Master Trainers (MTs) and Community Resource Persons (CRPs) who supported fellow farmers, contributing to social structural changes. It uncovers smallholders' adaptive capacities to reconfigure practices, social formations, and procedures, maximizing agro-ecological niches and minimizing uncertainty in farm production.</p> <p>The implications of this research raise questions about the suitability of a uniform set of practices across diverse farm conditions. Sustainable agriculture transitions require adjustments in socio-technical configurations. Flexibility in adaptations, considering local socio-material contexts, is crucial when introducing new interventions. Capacity building exercises should focus on creating task groups that can effectively promote agricultural innovations and provide managerial support. The research helps in understanding how agro-ecological interventions need to be studied as socio-technical systems and therefore be promoted in flexible ways for sustainable transitions.</p>
Keyword	Smallholder Farmers, System of Crop Intensification, Natural Farming, Socio-technical Interactions, Transitions, Rainfed farms of India, Agro-ecology

Title	Understanding the Context and Complexities in De-centralised Small Millet Processing: Learnings from an Action Research
Author	Swaran V (<i>Watershed Support Services and Activities Network (WASSAN), Hyderabad</i>), Smrutimayee Sarangi (<i>WASSAN</i>), Gijivisha Khattry (<i>WASSAN</i>), Ravindra Adusumilli (<i>WASSAN</i>) and Srijit Mishra (<i>Indira Gandhi Institute of Development Research (IGIDR), Mumbai</i>)
Abstract	This study reports baseline survey results from action research in which desktop dehullers were provided to 25 nano-entrepreneurs in villages of Sri Satya Sai and Alluri Sitharama Raju districts of Andhra Pradesh and Malkangiri district in Odisha. Fifteen households were surveyed through random sampling from the village of each nano entrepreneur to understand the existing and past crop mix, small millet consumption, production and processing mechanisms. Results show that more than the non-availability of mechanized processing, lack of market for their produce, decreasing yield and bird/animal attacks are reported to be the major reasons for discontinuing small millet cultivation in the recent past. Given that the staple small millet in each region differs, this could affect the portability of the desktop dehuller calibrated for dehulling foxtail and little millet. The survey and the ongoing intervention suggest that pathways from intervention to desired outcomes are complex and deeply contextual.
Keyword	Small millets, dehulling, decentralised processing, action research, market access, Andhra Pradesh, Odisha

Title	Pace Layers for designing alternative markets and marketplaces. .
Author	Venky Ramachandran (<i>Independent Researcher</i>)
Abstract	<p>If the American theologian Reinhold Niebuhr were alive today to write a Serenity Prayer for the future of Agriculture, he perhaps might have written</p> <p>"Grant me the serenity to accept the agricultural markets that I cannot change, courage to design the agritech marketplaces that can change those markets, and wisdom to know the difference between markets and marketplaces."</p> <p>We need to think holistically to move beyond the industrial green revolution paradigm and transition towards sustainable agroecological paradigms. In a continuously evolving domain like agriculture whose history dates back to human civilization, some components respond faster to change and some do not. The key here is to understand which is fast and which is slow.</p> <p>As a snowclone to Stewart Brand's Pace Layers model, I propose six significant levels of pace and size in the working structure of a robust and adaptable system of agriculture. From fast to slow the levels are: Marketplaces; Markets; Infrastructure; Policies; Culture; Nature</p> <p>In this paper, I will elaborate on how this conceptual model can be leveraged to design alternative marketplaces, design suitable policy instruments for agroecological transitions, and rethink incentives for consumers, retailers and markets to prioritize diverse, nutrition-dense foods.</p>
Keyword	Pace layers, agroecological transitions, systems thinking, agritech, market design, policy piloting

Track 8: Pedagogy of transitions, pedagogy for transitions

Title	An Innovative Co-created curriculum for Natural Farming: Experiences of collaboration of the Gujarat Natural Farming Coalition
Author	Ankit Kumar (<i>Institute of Rural Management Anand</i>), Asmita Chaudhari (<i>Institute of Rural Management Anand</i>), Sonal Chaudhari (<i>Institute of Rural Management Anand</i>) and Aditya Min (<i>National Coalition for Natural Farming (Gujarat Chapter)</i>)
Abstract	Bringing behavioural change among farmers to switch to or adapt towards sustainable agriculture requires building capacities of farmers as master trainers at the village level. While there is significant knowledge among various Civil Society Organizations (CSOs) on practices and a scientific understanding of the principles of natural farming amongst the research community, there are few examples of collaboration between the two in India and Gujarat in particular. Emphasising the need and possibilities of collaborations, this paper presents the case of an innovative curriculum to train women farmers as master trainers. The institutional context of the initiative is explored, along with the design of the curriculum with the Gujarat Natural Farming and Organic University and its rollout with 27 farmers over 3 sessions. Interviews with the participants and key resource persons and facilitating agencies indicate the need to recognize and specifically engender training methods, combine science and practice through designing the program to suit the requirements of the trainees, and the potential of these trainees to become key resource persons for rollout of natural farming in the state.
Keyword	learning alliance, sustainable agriculture, Civil Society Organizations, natural farming, pedagogy

Title	Uncertainties in paddy stubble burning prevention: rethinking modernization amid climate change in Indian agriculture
Author	Nikhil Agrawal (<i>University of California, Los Angeles</i>)
Abstract	Farmers in Haryana are increasingly vulnerable due to climate change and industrial agriculture. This vulnerability is compounded by focusing on preventing paddy stubble burning to control Delhi's air pollution crisis. Using participant observation of the stubble management workshop organised by the Department of Agriculture, Haryana, shadowing farmers and ag-tech rural marketing agents involved in paddy stubble management, and interviews with agricultural scientists, this paper points out the uncertainties implicit within proposed techno-solutions for paddy stubble management, challenges their suitability, and demonstrates the existence of multiple “ontologies of change” within those uncertainties. It shows that the ground-level officials responsible for implementing stubble management solutions are themselves aware of the uncertainties involved in suggested solutions which reflects in their participation in the stubble management programs. In doing so, this paper challenges the dominance of “modern” agricultural science, which is yet to truly acknowledge the increasing variabilities in ecological systems.
Keyword	Industrial Agriculture, Sustainability, Modernization, Stubble Burning, Uncertainty

Title	Agricultural Education: Time for Transition
Author	Ramanjaneyulu Gv (<i>Centre for Sustainable Agriculture</i>).
Abstract	<p>Education is a great equalizer in modern societies, and it plays an important role in social change. Higher education is seen as an important means of reducing socio-economic inequalities, in addition to providing human resources for the developmental needs of society. In India where more than 54% of the population depend on agriculture for livelihoods directly and indirectly, role of agricultural education becomes critical. The increasing crisis in agriculture is the result of the collapse of agriculture research and education systems.</p> <p>Higher Education in agriculture is failing to prepare students to take up roles to delivers required outputs. Similarly, extension services, primary and secondary education need to undergo complete transition to make it relevant to the current situation.</p>
Keyword	Agricultural education, sustainable transitions, agroecology, organic and natural farming