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Understanding Behavioral Changes Towards Agroecological Transitions: A Case Study from Mandla, India

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DECLARATION

I hereby declare that I, Vikram, Vrindaja, born on 16th January 1999, with matriculation number 985211, completed the master's thesis attached to this declaration independently and solely using the sources listed in the bibliography and that it has not been submitted anywhere else. All passages of the thesis which were taken word-for-word or paraphrased from publications or other sources are marked appropriately.

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Vrindaja Vikram

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ABSTRACT

Transforming agri-food systems towards sustainability and resilience is critical for addressing global challenges such as climate change, food insecurity, and environmental degradation. Achieving such transformations requires understanding how different actors exercise agency within the constraints and possibilities of their local environments. This thesis examines agroecological transition in Mandla District, Madhya Pradesh, India, a predominantly rainfed agricultural region characterized by rice-, wheat-, and pulse-based farming systems.

Grounded in the Agency and Behavior Change (ACT) framework, the study investigates how individual and collective actors engage with emerging agroecological practices, including intercropping, reduced chemical input use, and soil and water conservation and how their actions are shaped by opportunity spaces created through interactions between structural subsystems. These subsystems include resource availability, governance arrangements, market dynamics, and social-relational networks. Particular attention is paid to collective initiatives such as women's Self-Help Groups (SHGs), Community Nutrition Gardens (CNGs), and Community Resource Person (CRP) networks.

The research adopts a qualitative case study design, drawing on 23 semi-structured interviews, four focus group discussions, and participant observation conducted between November 2024 and February 2025. Data were analyzed using an iterative inductive-deductive approach, combining thematic coding with systematic interpretation through the ACT framework and insights from a Vision-to-Action (V2A) multi-stakeholder process.

Findings reveal that agroecological transition in Mandla is not constrained by a lack of motivation or awareness. Environmental concerns, health considerations, and aspirations for family and community well-being strongly motivate engagement across actor groups. However, sustained adoption is limited by structural constraints, particularly water scarcity, delayed wage payments, weak market differentiation for agroecological produce, fragmented governance, and misaligned extension services. The study demonstrates that while individual actors can implement certain practices independently, many critical constraints such as water management, market access, and institutional coordination, require collective action and multi-actor collaboration.

The thesis contributes empirically by showing that agroecological transition is fundamentally a coordination challenge rather than a farmer adoption problem. Conceptually, it advances understanding of agency as a situated and relational process shaped by structural opportunity spaces. The findings highlight the importance of participatory and inclusive interventions that align behavioral drivers with systemic transformation pathways in agroecology.

Keywords: Agroecology, behavioral change, collective action, opportunity spaces, ACT framework, marginalized agriculture, Madhya Pradesh, India, multi-actor transitions, food system transformation

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LIST OF ABBREVIATIONS

ACT	Conceptual Framework on Agency and Behavior Change for Transforming Agri-Food Systems
AEI	Agroecology Initiative
ALL	Agroecological Living Lab
APCNF	Andhra Pradesh Community-Managed Natural Farming
ATSAF	Council for Tropical and Subtropical Agricultural Research (Arbeitsgemeinschaft Tropische und Subtropische Agrarforschung e.V.)
CGIAR	Consultative Group on International Agricultural Research
CNG	Community Nutrition Garden
CRP	Community Resource Person
CSO	Civil Society Organization
DAY-NRLM	Deendayal Antyodaya Yojana – National Rural Livelihoods Mission
ESS	Economic Subsystem
FAO	Food and Agriculture Organization of the United Nations
FES	Foundation for Ecological Security
FGD	Focus Group Discussion
FPO	Farmer Producer Organization
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
GSS	Governance Subsystem
HLPE	High-Level Panel of Experts on Food Security and Nutrition
IFPRI	International Food Policy Research Institute
IPES-Food	International Panel of Experts on Sustainable Food Systems
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
MGNREGS	Mahatma Gandhi National Rural Employment Guarantee Scheme
MSP	Minimum Support Price

NGO	Non-Governmental Organization
NRLM	National Rural Livelihoods Mission
OS	Opportunity Space
PDS	Public Distribution System
PGS	Participatory Guarantee System
PRADAN	Professional Assistance for Development Action
RSS	Resource Subsystem
SDGs	Sustainable Development Goals
SHG	Self-Help Group
SRLM	State Rural Livelihoods Mission
SRSS	Social-Relational Subsystem
TPB	Theory of Planned Behavior
V2A	Vision-to-Action Workshop
ZBNF	Zero Budget Natural Farming

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1. INTRODUCTION

Global agriculture faces an unprecedented challenge: feeding a growing population while operating within planetary boundaries. Current food systems contribute approximately 25-30% of global greenhouse gas emissions, drive biodiversity loss, degrade soil and water resources, and remain the primary cause of deforestation (IPCC, 2019, 2022). Giller et al., (2021) demonstrate that global agriculture exerts heavy pressure on planetary boundaries, with hotspot regions- particularly in Asia, simultaneously transgressing multiple local ecological thresholds. Under strict adherence to planetary boundaries, the present industrial food system could sustainably provide a balanced diet (2,355 kcal per capita per day) for only 3.4 billion people. (Griggs et al., 2013). However, transformation toward more sustainable production and consumption patterns could support 10.2 billion people within analyzed planetary boundaries (Giller et al., 2021; Griggs et al., 2013).

This stark reality underscores the urgency articulated in the Sustainable Development Goals (SDGs), particularly SDG 2 (Zero Hunger), SDG 13 (Climate Action), and SDG 15 (Life on Land) (Giller et al., 2021; IPES-Food, 2016). Achieving these goals requires fundamentally rethinking agricultural production systems moving from input-intensive monocultures toward diversified, ecologically based approaches that simultaneously address food security, environmental sustainability, and social equity. The Intergovernmental Panel on Climate Change (IPCC, 2019) emphasizes that land use and agricultural practices are critical leverage points for climate mitigation and adaptation. Yet, transitioning food systems involves far more than technological fixes; it requires addressing deep-seated institutional arrangements, power relations, market structures, and behavioral patterns that perpetuate unsustainable practices (IPES-Food, 2016).

Agroecology has emerged as a promising approach for sustainable food system transformation (FAO, 2018). The Food and Agriculture Organization defines agroecology as "a holistic and integrated approach that simultaneously applies ecological and social concepts and principles to the design and management of sustainable agriculture and food systems" (*Agroecology Knowledge Hub-FAO)* . Unlike approaches that focus narrowly on input substitution, agroecology represents a fundamental paradigm shift from uniformity to diversity, from linear value chains to circular economies, from extractive to regenerative systems (IPES-Food, 2016).

The High-Level Panel of Experts on Food Security and Nutrition HLPE Report No:14, (2019) identifies thirteen agroecological principles encompassing not only farm-level practices diversity, synergies, efficiency, resilience, and recycling but also systemic dimensions including co-creation of knowledge, human and social values, culture and food traditions, responsible governance, and circular solidarity economy. Implementing these principles requires coordinated action across multiple domains (Bergez et al., 2018; FAO, 2018) such as policies and investments that improve social and environmental outcomes along value chains; shifts in consumer behavior towards nutritious, diversified, locally sourced diets; recognition of farmers adopting agroecological approaches; and facilitation of knowledge co-creation, fairness, connectivity, and participation (HLPE Report 14, 2019; Wezel et al., 2020a).

Beyond environmental benefits, agroecology offers pathways to enhance smallholder livelihoods, strengthen food sovereignty, preserve traditional knowledge, empower marginalized groups particularly women and indigenous communities and build resilience to climate change and market volatility (FAO, 2018). Globally, agroecological movements are gaining momentum, from Latin America's Campesino a Campesino networks (Rosset & Val, 2018) to Africa's agroforestry initiatives (FAO, 2017) to European Agroecology Partnership

(Stone et al., 2025) and Asia's natural farming movements. In India, agroecology holds relevance given the country's agrarian crisis (Jansen, 2015) characterized by declining soil fertility, groundwater depletion, rising input costs, farmer indebtedness, and climate vulnerability affecting over 600 million people dependent on agriculture (Chakraborti et al., 2021). Significant agroecological initiatives have emerged, most notably the Andhra Pradesh Community-Managed Natural Farming (APCNF) program- the world's largest agroecological transition involving over six million farmers-and Zero Budget Natural Farming spreading across multiple states (CGIAR Initiative on Agroecology, 2023; Khadse et al., 2017). Sikkim's transition to fully organic agriculture by 2016 demonstrates state-level commitment to alternative agricultural paradigms (Chandra et al., 2017). These initiatives demonstrate that agroecology is not merely a theoretical concept but a practical, scalable approach adaptable to diverse Indian contexts.

Marginalized regions present unique opportunities and challenges for agroecological transition. Marginalized communities have historically maintained low-input, diversified farming systems with rich traditional ecological knowledge (Leippert et al., 2020; Lugo-Morin, 2020). Yet they face severe marginalization including limited access to resources, markets, and institutional support; high rates of poverty and malnutrition; land degradation; and climate vulnerability (GIZ, 2022). For these communities, agroecology offers a pathway that builds on existing knowledge systems while addressing contemporary challenges through collective action, institutional support, and participatory processes.

Despite growing recognition of agroecology's potential, significant gaps remain in understanding what drives behavioral change among food system actors toward agroecological practices particularly in resource-constrained, marginalized contexts. Most research has focused on documenting practices, measuring agronomic outcomes, or analyzing policy frameworks, while the behavioral and social processes that enable or constrain transitions remain underexplored (Freed, 2024; Voss et al., 2024a). D'Annolfo et al., (2017) identify substantial gaps in understanding the social and economic dynamics of agroecological adoption, including farmer decision-making processes and community-level outcomes. Bridging the gap between agroecological research findings and policy implementation remains crucial for integrating evidence-based practices into agricultural policies (Sabourin et al., 2018).

Various critical gaps are evident: First, while theories of behavioral change (e.g., Theory of Planned Behavior, Social Practice Theory) have been applied to agricultural adoption, their application to agroecological transitions in indigenous, smallholder contexts are limited. Agroecology differs from conventional technology adoption. It requires system redesign, knowledge co-creation, long-term investment, and often challenges existing power structures and market arrangements (Gliessman, 2016; Wezel et al., 2020b). How do motivations, perceptions, and agency shape adoption in such contexts? Second, although participatory approaches are central to agroecology, evidence on how participatory processes influence behavioral change remains thin (Bergez et al., 2018; Méndez et al., 2013). Multi-stakeholder processes aim to co-create action plans and build collective agency, (López-García et al., 2021) but do they shift actors' perceptions, motivations, and practices? What happens after the workshop when actors return to their everyday contexts shaped by resource constraints, institutional inertia, and power asymmetries? Behavioral change literature emphasizes that individual capability and motivation are insufficient without "opportunity spaces"- the physical and institutional conditions that enable or constrain action (Freed et al., 2025b; Michie et al., 2011). Third, collective action is widely recognized as crucial for smallholder transitions, yet the mechanisms through which rural institutions expand these opportunity spaces and mediate individual agency and enable coordinated action to require deeper empirical investigation

(Markelova et al., 2009; Meinzen-Dick et al., 2004). How do these institutions expand opportunity spaces? What power dynamics shape participation and benefit distribution?

This study addresses these gaps by examining behavioral change dynamics among diverse actors (farmers, NGOs, government representatives, market actors) in Mandla District, Madhya Pradesh, India. The research applies the conceptual framework on agency and behavior change for transforming agri-food systems developed by Freed et al., 2024 (hereafter ACT framework) which conceptualizes behavioral change as emerging from interactions between actor agency and contextual opportunity structures across temporal scales. This framework guides inquiry into how stakeholders perceive and engage with agroecological practices, what motivates or constrains behavioral change, and how individual and collective agency operate within structural constraints (Freed, 2024; Freed et al., 2025b; Voss et al., 2024b). The empirical investigation builds on a participatory Vision-to-Action (V2A) workshop, a structured multi-stakeholder process for co-developing context-specific theories of change (Voss et al., 2024a) conducted in October 2023 as part of the CGIAR Agroecology Initiative in Mandla District, which brought together multiple stakeholders to collaboratively identify priority behaviors and enabling conditions for agroecological transition.

Research Objectives and Questions

The overarching aim of this study is to understand the behavioral change dynamics that enable or constrain agroecological transitions in Mandla district, by examining how individual and collective agency is shaped by, and shapes, opportunity spaces across multiple scales of the food system.

1. To understand the motivations, attitudes, and perceived behavioral control of key stakeholders (farmers, NGOs, local institutions, government actors and market actors) toward agroecological practices.
2. To analyze the opportunity spaces and structural constraints that shape actors' capacity to enact behavioral change towards agroecological transitions.
3. To explore the role of collective actions in facilitating behavioral changes towards agroecological Transition among smallholder farmers.

To achieve these objectives, the study addresses the following research questions:

- How do farmers, NGOs, government actors, and market intermediaries understand "agroecology" in the Mandla context?
- What perceived benefits and barriers influence different actors' adoption decisions?
- What socio-economic factors (market access, input availability, land tenure) shape actors' capacity for change?
- What institutional factors (policies, extension systems, governance coordination) enable or constrain transitions?
- Through what mechanisms do collective institutions support agroecological practice adoption?
- What types of collective action are most effective in expanding opportunity spaces for smallholders?
- What enablers and barriers shape the effectiveness of collective action in agroecological transitions?

The study follows a clear structure. It begins with an overview of agricultural sustainability challenges and the potential of agroecology, followed by a literature review on behavioral change, collective action, and the Mandla District context. The conceptual framework- ACT framework approach is then presented, followed by the methodology and ethical

considerations. The results chapter presents both inductive findings on stakeholder perspectives and deductive analysis mapping behaviors to ACT categories. The discussion interprets these findings through the lens of opportunity spaces, multi-actor responsibility, gender dynamics, and extension system redesign. Finally, conclusions, policy implications, and future research directions are provided.

Scope and Limitations

This study is geographically bounded to Mandla District, Madhya Pradesh, India-one of the Agroecological Living Lab (ALL) sites under the CGIAR Agroecology Initiative. Mandla was selected for its predominantly marginalized population, smallholder rainfed farming systems, and ongoing agroecological interventions supported by civil society organizations and government actors. Data collection occurred between November 2024 and February 2025, approximately one year after the Vision-to-Action (V2A) workshop conducted in October 2023. This cross-sectional design captures stakeholder perceptions at a specific moment in the transition process but does not track long-term behavioral change or implementation outcomes. Conceptually, the study employs the ACT framework (Freed et al., 2024) to examine behavioral change dynamics, focusing on motivations, perceptions, and collective action mechanisms. It does not measure agronomic outcomes, economic impacts, or conduct value chain analysis. The research focuses on five stakeholder groups: smallholder farmers, Community Resource Persons, Farmer Producer Organizations, local government representatives, and civil society organizations. Private sector actors and consumers receive limited attention. Key limitations include the qualitative case study design (23 interviews, 4 focus group discussions), which enables depth but limits statistical generalizability. The study captures perspectives of actors already engaged with agroecological initiatives, potentially underrepresenting non-adopters. Translation from Hindi and Gondi to English may have affected nuance, and the researcher's positionality as an international student, who is native to Southern India may have influenced responses. Findings are context-specific to Mandla's agricultural systems and the presence of established civil society organizations like PRADAN. Despite these limitations, the study offers valuable qualitative insights into behavioral change dynamics that can inform similar contexts and future research.

2. LITERATURE REVIEW

2.1. AGROECOLOGICAL TRANSITIONS

Agroecology has emerged as a transformative approach to address the interlinked challenges of food security, environmental degradation, and climate change (Gliessman, 2015, 2016). The Food and Agriculture Organization (*Agroecology Knowledge Hub | FAO*; FAO, 2018) defines agroecology as "a holistic and integrated approach that simultaneously applies ecological and social concepts and principles to the design and management of sustainable agriculture and food systems." This approach seeks to optimize interactions between plants, animals, humans, and the environment while promoting social equity and food sovereignty within agricultural systems (*Agroecology Knowledge Hub | FAO*).

The High-Level Panel of Experts on Food Security and Nutrition (HLPE Report 14, 2019) articulated 13 agroecological principles organized around three interconnected clusters: principles that enhance resource efficiency and ecosystem functioning (including recycling, efficiency, diversity, synergy, and resilience); principles focused on co-creating and sharing knowledge (encompassing co-creation of knowledge, human and social values, and culture and food traditions); and principles ensuring equity and participation (responsible governance, circular and solidarity economy, and participation).[1] Wezel et al., (2020) characterize agroecology as simultaneously a scientific discipline, a set of agricultural practices, and a social movement, a multidimensional nature that enables contributions to multiple Sustainable Development Goals, including food security (SDG 2), climate action (SDG 13), biodiversity conservation (SDG 15), and gender equality (SDG 5) (FAO, 2018b; Wezel et al., 2020) . This triple characterization distinguishes agroecology from narrower technical interventions, positioning it as both a knowledge system and a political project aimed at transforming power relations within food systems (Giraldo & Rosset, 2017).

Understanding how such fundamental changes unfold requires engagement with transition theories. Transitions involve "far-reaching changes along different dimensions: technological, material, organizational, institutional, political, economic, and socio-cultural" (Markard et al., 2012a). While classic socio-technical transitions such as shifts in energy systems or transportation infrastructure, often unfold over multiple decades (Geels, Frank, 2012; Markard et al., 2012b), agroecological transitions exhibit distinct characteristics. They must respond to ecological timeframes shaped by seasonal cycles and soil regeneration periods, operate within existing agrarian structures and land tenure arrangements, navigate volatile markets and policy environments, and frequently challenge incumbent power relations embedded in industrial food systems (IPES-Food, 2016; Levin et al., 2013).

Gliessman (2015) conceptualizes agroecological transitions across five progressive levels: (1) increasing the efficiency of industrial and conventional practices to reduce input use and negative environmental impacts; (2) substituting alternative inputs and practices for conventional chemical-intensive practices; (3) redesigning the agroecosystem based on a new set of ecological processes; (4) re-establishing more direct connections between those who grow our food and those who consume it; and (5) building a new global food system based on equity, participation, democracy, and justice. This framework acknowledges that transformation extends beyond farm-level technical changes to encompass fundamental

restructuring of food system governance, market relations, and knowledge production systems. Critically, it recognizes that while levels 1-3 focus primarily on farm-scale ecological redesign, levels 4-5 require coordinated action across multiple actors and institutional domains, a reality that foregrounds behavioral change not merely among farmers but across entire food system networks (Prost et al., 2023).

Empirical evidence from diverse contexts demonstrates agroecology's potential while revealing implementation complexities. Systematic reviews show that agroecological approaches can improve soil health, enhance agrobiodiversity, build climate resilience, and reduce dependency on external inputs, though outcomes vary significantly by agroecological practice, crop system, initial conditions, and the depth of ecological redesign achieved (Bezner Kerr et al., 2021; IPES-Food, 2016). Meta-analyses indicate that diversified farming systems typically show lower yields than specialized monocultures under optimal conditions but demonstrate greater yield stability under stress, higher nutritional diversity, improved farmer livelihoods when markets reward diversity, and reduced environmental externalities (Tamburini et al., 2020).

In India, large-scale initiatives demonstrate agroecology's potential for transformation while revealing context-specific challenges. The Andhra Pradesh Community-Managed Natural Farming (APCNF) program, reaching over six million farmers by 2023, represents the world's largest state-supported agroecological transition (CGIAR Initiative on Agroecology, 2023). Studies document that participating farmers achieved yields comparable to conventional systems for major crops including rice and cotton while significantly reducing input costs and building soil organic matter, though success varied by crop type, farmer experience, and institutional support quality (Khadse et al., 2017). Similarly, Zero Budget Natural Farming (ZBNF), now rebranded as Subhash Palekar Natural Farming (SPNF), has spread across Karnataka, Himachal Pradesh, and other states, emphasizing input self-sufficiency through on-farm biomass recycling and microbial inoculants (Khadse & Rosset, 2019).

However, indigenous and marginalized regions present distinct transition dynamics. In contexts such as Mandla district, Madhya Pradesh the focus of this study is agroecological transitions build upon existing low-input, millet-based agricultural systems and rich traditional ecological knowledge systems maintained by Adivasi (indigenous) communities (Devi et al., 2024; Focus, 2024; GIZ, 2022). These regions are characterized by structural marginalization: limited market integration, fragmented landholdings, insecure tenure arrangements, degraded natural resources, unreliable rainfall patterns, minimal irrigation infrastructure, and weak institutional presence (GIZ, 2022). Consequently, enabling sustainable transitions in such contexts requires not only technical adaptation but also addressing socio-economic barriers (poverty, indebtedness, seasonal migration), strengthening market linkages that recognize agroecological value, ensuring equitable distribution of benefits and labor burdens, and explicitly addressing gender dimensions of agricultural work and household decision-making (Shiney Varghese & Karen Hansen-Kuhn, 2013)

Realizing these transformations depends fundamentally on participatory approaches that facilitate knowledge co-creation among diverse food system actors like farmers, community resource persons, NGO facilitators, extension agents, government officials, and market intermediaries (Méndez et al., 2013). Unlike conventional agricultural development models characterized by top-down technology transfer, agroecological innovation emerges through

horizontal learning processes. These include farmer-to-farmer knowledge exchange networks that spread context-adapted practices (Holt-Giménez & Altieri, 2012); participatory experimentation that enables farmers to test, modify, and validate techniques under their specific conditions (López-García et al., 2021; Méndez et al., 2013); and community-based natural resource management arrangements that build collective capacity to govern common-pool resources such as water, grazing lands, and seed systems (Sabourin et al., 2018).

However, as Gonzalez de Molina (2019) argues, participatory processes alone are insufficient for sustained transformation (van der Ploeg et al., 2019). Co-creation workshops, farmer field schools, and multi-stakeholder platforms generate new knowledge and temporarily align actor intentions, but translating these into durable behavioral changes requires embedding participatory processes within supportive institutional arrangements, equitable market structures that reward agroecological production, reliable resource flows synchronized with agricultural calendars, and enabling policy environments (López-García et al., 2021). This implementation gap between participatory ideals and the structural realities actors face when returning to resource-constrained, institutionally fragmented contexts remains underexplored in agroecology literature (Bergez et al., 2018).

2.2. BEHAVIORAL CHANGE IN AGROECOLOGICAL CONTEXTS

Understanding agroecological transitions requires examining not only what practices need to change but why actors adopt or resist such changes. While Section 2.1 established the multi-dimensional nature of agroecological transitions, this section delves into the behavioral and psychological processes that drive-or constrain-individual and collective action towards agroecological practices.

The Theory of Planned Behavior (Ajzen, 1991) remains one of the most widely applied frameworks for understanding agricultural adoption decisions. The Theory of Planned Behavior (TPB) postulates that behavioral intentions and ultimately behaviors, are determined by three key factors: attitude (beliefs about outcomes), subjective norms (perceived social pressure), and perceived behavioral control (confidence in one's ability to perform the behavior). In agricultural contexts, Ajzen (1991) argues that farmers are more likely to adopt new practices when they believe the practice will be beneficial (positive attitude), feel encouraged by peers, family, or community (subjective norms), and have confidence in their capacity to implement it effectively (perceived behavioral control). Empirical applications of TPB in sustainable agriculture have demonstrated its relevance. Dessart et al., (2019) found that perceived behavioral control consistently emerges as a strong predictor of adoption intentions, suggesting that farmers' confidence in their ability to manage new practices often outweighs perceived benefits. However, TPB has limitations: it focuses primarily on individual cognition and may underemphasize structural constraints, power relations, and collective dynamics that are central to agroecological transitions (Sampsa, 2016; Shove et al., 2012).

Recognizing TPB's limitations, researchers have integrated additional constructs. The Norm Activation Model (NAM) incorporates personal norms-internalized moral obligations to act pro-environmentally-which capture ethical motivations beyond self-interest (Schwartz, 1977). Wauters & Mathijs, (2014) found that combining TPB and NAM provided more comprehensive explanations of farmers' pro-environmental behavioral intentions, accounting for both utilitarian and moral motivations. Soini Coe & Coe, (2023) emphasize that "mindset"-

a shorthand for values, beliefs, motivations, and attitudes-is fundamental to agroecological transformation. They argue that mindsets are not merely individual cognitive constructs but are shaped through connection with nature, sense of place, group identity, and self-efficacy. This perspective aligns with environmental education research showing that transformative learning involves shifts in worldviews, not just knowledge acquisition (Sterling, 2011).

Social Practice Theory offers a fundamentally different approach by conceptualizing behavior as embedded in routinized social practices rather than located in individual minds (Shove et al., 2012). From this perspective, practices such as farming methods are constituted by three interconnected elements: materials (physical tools, technologies, infrastructure, and natural resources), meanings (symbolic interpretations, social significance, and cultural understandings), and competencies (embodied skills, tacit knowledge, and practical know-how). Changing agricultural practices thus requires intervening not only in farmers' attitudes but in the broader material infrastructures (tools, seeds, irrigation systems), cultural meanings (what constitutes "good farming", the social status of different crops or techniques), and knowledge systems (formal extension, farmer-to-farmer learning, traditional ecological knowledge) that constitute farming as a social practice.

This approach is particularly relevant for agroecology, where adoption involves not merely substituting chemical fertilizers with organic alternatives, but fundamentally redesigning farming systems based on ecological processes, enhancing agrobiodiversity, and integrating traditional knowledge with contemporary science (Gliessman, 2015). Wezel et al. (2020) document how agroecology principles have evolved over decades to encompass not only farm-level technical practices but also social values (equity, solidarity, food sovereignty), knowledge co-creation processes (participatory research, horizontal farmer-to-farmer exchange), and governance arrangements (territorial food systems, participatory guarantee schemes), suggesting that behavioral change must simultaneously address multiple interconnected dimensions rather than isolated individual decisions.

Agency and Opportunity Spaces: Structural Conditions for Behavioral Change

Agency refers to actors' capacity to make choices and enact them (Giddens, 1984). In agroecological contexts, agency is not simply individual decision-making autonomy but emerges from the interplay between actors' capabilities, motivations, and the structural conditions they navigate (Freed et al., 2024). Amartya Sen's (Sen, 1999) capability approach emphasizes that agency requires not only freedom to choose but also substantive opportunities-access to resources, knowledge, markets, and supportive institutions. Freed et al. (2024) distinguish between ‘individual agency’ (personal decision-making capacity) and ‘collective agency’ (coordinated action by groups). They argue that agroecological transitions often require collective agency, as individual farmers face structural barriers-market volatility, lack of credit, inadequate technical support-that can only be addressed through coordinated action and institutional change.

The concept of opportunity spaces captures the structural conditions that enable or constrain actors' capacity to exercise agency (Freed et al., 2024). Opportunity spaces are shaped by four interacting domains: (1) Mindsets: Values, beliefs, attitudes, and perceived norms that motivate or discourage action. (2) Resources: Financial capital, labor, land, water, inputs, and knowledge (3) Physical Environment: Ecological conditions, infrastructure, climate, and market access (4) Institutional Framework: Policies, governance structures, social networks, and power relations. These domains correspond to (Ostrom, 2009) socio-ecological systems (SES) framework, which emphasizes that outcomes emerge from interactions between resource systems, resource users, governance systems, and broader social-ecological contexts. Freed et al. (2024) extend

this by explicitly linking opportunity spaces to actor agency, arguing that transformation requires both expanding opportunity spaces (removing barriers, providing resources) and enhancing actors' capacity and motivation to act within those spaces.

Perceived behavioral control defined as actors' belief in their capacity to perform a behavior, is central to both TPB and self-efficacy theory (Bandura, 1997). In agricultural contexts, farmers' confidence is shaped by prior experience, peer modeling, technical support, and resource availability (Dessart et al., 2019b). Importantly, perceived control may not align with actual control: farmers may underestimate their capacity due to lack of information or overestimate it due to optimism bias (Burton, 2004). Burton (2004) argues that farmers' adoption decisions are also influenced by identity and symbolic meanings like farming practices signal membership in social groups and adherence to cultural norms. In indigenous contexts like Mandla, where traditional practices carry cultural significance, adopting "new" agroecological practices may require reframing them as continuations of traditional ecological knowledge rather than external impositions (Devi et al., 2024).

Adoption is shaped by dispositional, social, and cognitive factors (Dessart et al., 2019b). Dispositional factors include risk tolerance, environmental concern, and farming objectives. Farmers with strong environmental values adopt agroecological practices even when returns are uncertain (Wauters & Mathijs, 2014). Social factors include descriptive norms (what others do) and subjective norms (expectations). Social learning through peer adoption reduces uncertainty (Dessart et al., 2019b). Social capital like trust, networks, reciprocity, facilitates knowledge exchange and collective action (Pretty & Ward, 2001). Gender dynamics also matter. Women face constraints in accessing land, credit, and decision-making, yet women's collectives can enhance agency (Doss et al., 2018; Rajendran et al., 2016). Cognitive factors include knowledge, perceived costs and benefits and risk perceptions (Doss et al., 2018). Lack of technical knowledge frequently constrains adoption of knowledge-intensive agroecological practices (Mier y Teran G.C. et al., 2018). (Burton, 2004) notes that farming practices also signal identity and cultural membership. In scheduled contexts, "new" practices may need reframing as continuations of traditional knowledge (Reddy, 2018). The Theory of Change approach provides a practical methodology for mapping these multi-actor behavioral requirements (Belcher et al., 2024; Falk et al., 2021). Rather than assuming that desired outcomes will emerge automatically from interventions, Theory of Change articulates explicit causal pathways: who needs to do what differently (behavioral changes), under what conditions (enabling factors), to produce intermediate outcomes (expanded opportunity spaces, enhanced collective agency) that ultimately generate desired impacts (sustainable livelihoods, ecological regeneration, equitable food systems). This approach foregrounds the coordination challenge: even when individual actors possess capability and motivation, misaligned timing (inputs arriving after planting windows close), contradictory incentives (policies supporting chemical inputs while extension promotes organic methods), or broken linkages (farmers producing agroecological products without market access) can prevent transformation (Falk et al., 2021; Laura Becker et al., 2023).

2.3. COLLECTIVE ACTION

While individual motivations and agency are necessary preconditions for behavioral change, they prove insufficient in smallholder contexts where farmers face structural constraints that cannot be overcome through isolated individual action (R. Meinzen-Dick et al., 2004; R. S. Meinzen-Dick & Gregorio, 2004). Resource scarcity, market failures, information asymmetries, weak infrastructure, and policy fragmentation create coordination problems that require collective solutions (R. S. Meinzen-Dick & Gregorio, 2004). Agroecological transitions

particularly depend on collective action, coordinated efforts among multiple actors to manage common-pool resources, co-create and share knowledge, negotiate with market intermediaries and government agencies, pool risks and resources, and advocate for supportive policies (Markelova et al., 2009). This section examines theories of collective action, the role of rural institutions in mediating collective processes, and the specific challenges collective action faces in enabling agroecological transitions.

Elinor (Ostrom, 1990) seminal work on governing common-pool resources challenged the prevailing assumption that communities inevitably overexploit shared resources absent external regulation or privatization. Through comparative analysis of fisheries, irrigation systems, forests, and grazing lands across diverse contexts, Ostrom demonstrated that communities can successfully self-organize to manage shared resources when certain design principles are present: clearly defined boundaries delineating resource systems and user groups; congruence between appropriation rules and local conditions; collective-choice arrangements enabling affected individuals to participate in rule-making; monitoring systems where monitors are accountable to users; graduated sanctions for rule violations; accessible conflict resolution mechanisms; and recognition of rights to organize by external authorities. For complex systems, she identified an additional principle: nested enterprises organizing governance at multiple scales.

Ostrom's (2009) Social-Ecological Systems (SES) framework subsequently provided a diagnostic approach for analyzing how resource system characteristics (size, productivity, predictability), resource unit properties (mobility, growth rates), user attributes (knowledge, norms, social capital), and governance arrangements (property rights, monitoring, sanctions) interact within broader social, economic, and political contexts to shape collective action outcomes (Ostrom, 2009). This framework recognizes that successful governance emerges not from blueprint solutions but from institutional arrangements adapted to specific ecological conditions, social structures, and historical contexts.

However, critical scholarship has identified important limitations in commons theory. (Agrawal & Gibson, 1999) argue that romanticized conceptions of "community" often obscure internal differentiation, power asymmetries, and competing interests. Communities are not homogeneous entities with shared values but are stratified by class, caste, gender, age, and other social divisions that create differential access to resources, decision-making authority, and distribution of benefits. Elite capture where local elites monopolize leadership positions and divert collective benefits to themselves, represents a persistent challenge to equitable collective action (Platteau, 2004). Similarly, exclusion mechanisms may systematically marginalize vulnerable groups, including women, landless laborers, lower castes, and recent migrants, even within ostensibly participatory governance structures (Agarwal, 2001).

Rural institutions encompassing both formal organizations (cooperatives, producer organizations, water user associations, self-help groups, village councils) and informal norms (reciprocity expectations, trust networks, customary practices, social sanctions), structure collective action by defining membership, establishing rules, shaping incentives, facilitating coordination, and influencing power relations (Meinzen-Dick et al., 2004). These institutions mediate actors' access to productive resources (land, water, credit, inputs), create platforms for

knowledge exchange and social learning, enable negotiation with external actors (markets, government programs, NGOs), and construct shared identities and collective agency.

In the Indian context, several institutional forms are particularly relevant for agroecological transitions:

Self-Help Groups (SHGs) are voluntary associations, predominantly comprising women, that originated as microfinance mechanisms but have evolved into multi-functional platforms for collective action. The basic SHG model involves 10-20 women who meet regularly to mobilize savings, provide internal lending, and access external credit through bank linkages (Rajasekhar et al., 2018). Beyond financial services, SHGs increasingly serve as organizational infrastructure for livelihood diversification activities, collective agricultural production and marketing, natural resource management initiatives, nutrition interventions, and social empowerment processes that challenge gendered power relations within households and communities (Doss et al., 2018; World Bank, 2020). The National Rural Livelihoods Mission (NRLM), now reorganized as DAY-NRLM (Deendayal Antyodaya Yojana - National Rural Livelihoods Mission), has federated SHGs into village organizations and cluster-level federations, creating nested governance structures that enhance collective voice and bargaining power (Yasareni, 2024)

Farmer Producer Organizations (FPOs) aggregate smallholder production into collectively managed enterprises, typically organized as producer companies or cooperatives (A. Kumar & Sumit, 2024). By pooling volumes, FPOs enable economies of scale in input procurement (reducing costs through bulk purchasing), processing and value addition (accessing technologies beyond individual capacity), and marketing (reducing transaction costs and improving bargaining power with buyers) (Mangaleswaran et al., 2024; Vinayak Nikam et al., 2024). Well-functioning FPOs can facilitate access to quality inputs at fair prices, create market linkages including direct connections to institutional buyers, provide technical support for adopting sustainable practices through farmer field schools or demonstration plots, and negotiate better terms with value chain actors (Fischer & Qaim, 2014, 2014). However, FPO success depends critically on professional management, adequate capitalization, equitable governance preventing elite domination, and supportive policy environments (Singla & Medhi, 2025).

Community Resource Persons (CRPs) serve as peer educators, knowledge brokers, and local facilitators embedded within farming communities (T. V. Kumar et al., 2009). Unlike external extension agents who visit periodically, CRPs are community members often lead farmers or SHG members, who receive specialized training and then provide ongoing support to their peers. CRPs facilitate horizontal learning through farmer-to-farmer knowledge exchange, contextualize technical information by translating external advice into locally relevant practices, support experimentation and adaptive management by providing close follow-up, and build local capacity for observing, analyzing, and responding to agroecological dynamics (Ellen MacArthur Foundation, 2022). The CRP model recognizes that effective knowledge diffusion requires trusted relationships, cultural understanding, and frequent interaction that formal extension systems often cannot provide (Anderson et al., 2019).

Community Nutrition Gardens (CNGs) represent collective production spaces often on common land or leased private plots where groups, particularly women's SHGs, cultivate diverse vegetables, fruits, and nutritious crops primarily for household consumption and community nutrition improvement (GIZ, 2024). CNGs serve multiple functions: enhancing dietary diversity and micronutrient intake, providing platforms for experimenting with agroecological techniques in low-risk contexts, creating spaces for collective labor sharing and social interaction, and generating surplus production that can be marketed collectively (Ruel et al., 2018). In programs like Madhya Pradesh's Poshan Abhiyan, CNGs integrate nutrition awareness, kitchen gardening promotion, and collective action, explicitly linking agricultural production to nutrition outcomes (GIZ, 2024; Nyathi et al., 2025) .

Customary governance structures, including village councils (Gram Sabhas), traditional authorities, and indigenous decision-making forums, shape land tenure arrangements, resource access rules, dispute resolution mechanisms, and social norms influencing agricultural practices. In marginalized contexts such as Mandla, where formal state institutions and customary indigenous governance systems coexist, understanding how these institutional orders interact, complement, or contradict each other proves essential (Prakash M Philip, 2024). Customary institutions may hold deep legitimacy and enforce norms effectively, but they may also perpetuate exclusions based on gender, lineage, or social status that formal democratic institutions ostensibly challenge.

The effectiveness of these institutions in supporting agroecological transitions depends on several factors: internal governance quality including transparency in decision-making and resource allocation, accountability of leaders to members, and inclusiveness ensuring meaningful participation of marginalized groups; external linkages connecting institutions to input suppliers, output markets, extension services, credit institutions, and policy processes; adaptive capacity enabling institutions to learn from experience, adjust rules to changing conditions, and respond to member needs; and power dynamics determining whether institutions reinforce existing hierarchies or create opportunities for redistributing authority and benefits (Ostrom, 2009; Agarwal, 2001).

Agroecological transitions present distinct collective action challenges that differ from single-technology adoption or management of discrete common-pool resources. First, agroecology involves system redesign requiring coordinated changes across multiple interrelated domains: diversification of crop rotations and intercropping systems; integrated soil fertility management combining organic amendments, biological nitrogen fixation, and nutrient recycling; ecological pest and disease management through habitat manipulation, beneficial organism conservation, and varietal diversity; market arrangements that recognize and reward agroecological attributes; and knowledge systems emphasizing observation, experimentation, and adaptive management rather than standardized prescriptions (Gliessman, 2015). These elements are interdependent diversification without market outlets creates surplus disposal problems; soil building without adequate labor or water limits returns; pest management through beneficial insects requires landscape-level habitat continuity that individual farmers cannot provide alone.

Second, agroecological practices are knowledge-intensive and context-specific, requiring continuous learning and adaptation rather than one-time technology transfer (Mier y Terán

Giménez Cacho et al., 2018). Collective action for knowledge co-creation involves establishing spaces for horizontal exchange where farmers share observations and experiences; supporting participatory experimentation where groups test innovations under varying conditions; documenting local adaptations and their outcomes; and linking local knowledge with scientific understanding through researcher-farmer partnerships. This knowledge dimension requires different institutional arrangements than resource pooling, emphasizing frequent interaction, mutual learning, and trust rather than formal rules and monitoring.

Third, agroecological transitions involve temporal challenges. Many agroecological practices like soil organic matter accumulation, perennial crop establishment, pest-predator equilibria development, generate benefits over multiple years while demanding immediate labor and resource investments (Anderson et al., 2019). This temporal mismatch creates collective action problems: individual farmers face pressure to prioritize short-term returns, early adopters bear disproportionate costs while later adopters capture spillover benefits (such as reduced pest pressure from landscape diversification), and sustaining collective commitment requires maintaining institutional support through periods when benefits remain unrealized. Collective institutions can address these challenges through risk-pooling mechanisms, rotational experimentation where different members test practices in different years, collective marketing that creates immediate income from diversified production, and peer support maintaining motivation during transition periods.

Fourth, power asymmetries and social differentiation shape participation and benefit distribution within collective institutions. Wealthier farmers may dominate FPO decision-making, orienting activities toward crops or markets that serve their interests; men may control SHG livelihood initiatives even when women provide labor; upper-caste members may monopolize CRP positions, limiting knowledge diffusion to marginalized groups; and land-owning households may capture most benefits from common property management while landless laborers remain excluded (Agarwal, 2001; Desai & Joshi, 2014). Addressing these dynamics requires explicit attention to representation mechanisms, benefit-sharing rules, accountability processes, and affirmative inclusion of marginalized groups.

Fifth, agroecological transitions require coordination across organizational boundaries. Individual institutions an SHG focused on savings and credit, an FPO handling output marketing, CRPs providing technical support, a village council managing water resources, often operate in parallel with limited coordination. Effective transitions require bridging these institutional silos: SHGs accessing FPO markets for their agroecological produce; CRPs linking to extension systems for updated technical knowledge; village councils aligning water allocation with cropping calendars; government schemes coordinating input supply, technical support, and procurement timing. This inter-institutional coordination challenge extends collective action theory beyond single-organization analysis to examine governance networks and multi-level coordination (Termeer et al., 2010).

Finally, collective action institutions must navigate relationships with external factors including government bureaucracies implementing schemes, NGOs providing facilitation and capacity building, market intermediaries offering procurement contracts, and researchers conducting participatory trials. These relationships create dependencies institutions may become vehicles for implementing government programs rather than member-driven

organizations, but also opportunities for accessing resources, technical expertise, market connections, and policy influence. Managing these relationships while maintaining institutional autonomy and member accountability represents an ongoing negotiation (Markelova et al., 2009).

Despite extensive research on collective action for natural resource management and market access, understanding of how collective institutions specifically enable or constrain agroecological behavioral transitions remains limited in Mandla. Key gaps include: How do collective institutions expand opportunity spaces for marginalized actors, particularly women and scheduled communities? Through what mechanisms do institutions enhance individual and collective agency for agroecological practice adoption? What institutional arrangements successfully coordinate multi-actor behavioral changes across the value chain? How do power dynamics within institutions shape who participates, what knowledge is valued, and how benefits are distributed? Under what conditions do collective institutions complement versus substitute for inadequate government services or market failures?

This study addresses these questions by examining how diverse collective institutions such as Self-Help Groups, Community Nutrition Gardens, Community Resource Persons networks, and their interactions with village governance structures and government schemes, mediate agroecological transitions in Mandla District. By investigating both enabling mechanisms (resource pooling, knowledge exchange, collective voice) and constraining factors (elite capture, gender exclusion, coordination failures), the research seeks to advance understanding of collective action's role in expanding opportunity spaces and building collective agency for food system transformation in marginalized contexts.

2.4. CONTEXT: MANDLA DISTRICT, MADHYA PRADESH

To operationalize these concepts, this study examines a specific empirical context: Mandla District in Madhya Pradesh, India. This section describes the socio-ecological characteristics, agricultural systems, institutional landscape, and ongoing agroecological initiatives in Mandla, situating the research within the district's particular opportunities and constraints.

Mandla District is in eastern Madhya Pradesh (22°59'N, 80°38'E) covering approximately 5,800 square kilometers. The district is predominantly marginalized, with Scheduled Tribes constituting over 57% of the population, primarily Gond and Baiga communities (*India - Census of India 2011)*. The district lies in the catchment of the Narmada River and its tributaries, with approximately 44% forest cover, making it one of Madhya Pradesh's most ecologically significant regions (Forest Survey of India, 2021) (Jhariya, 2014).

Agriculture remains the primary livelihood for over 75% of households, characterized by smallholding sizes (average 1.2 hectares), rainfed cultivation dependent on monsoon patterns, and cultivation of rice, wheat, pulses, and millets (kodo, kutki) (CGIAR, 2024). The district experiences sub-humid tropical climate with average annual rainfall of 1,200-1,400 mm, concentrated in monsoon months (June-September), followed by prolonged dry periods creating significant water stress (Prakash M Philip, 2024).

Despite rich natural resource endowments, Mandla faces substantial development challenges. In 2006, the Ministry of Panchayati Raj designated Mandla among India's 250 most backward

districts, eligible for Backward Regions Grant Fund Programme support (GoI, 2006). Poverty rates exceed 40%, nutritional indicators remain concerning particularly among women and children, and outmigration for wage labor is widespread (NFHS-5, 2019-2021). Land degradation, declining soil fertility, water scarcity during non-monsoon periods, biodiversity loss, and limited market access compound agricultural challenges (CGIAR, 2024). These conditions create both necessity and opportunity for agroecological approaches that reduce external input dependence, enhance soil and water management, diversify production systems, and strengthen local food security (Debnath & Dasgupta, 2006).

Mandla's agricultural systems reflect adaptation to local agro-climatic conditions and socio-cultural contexts. Traditional farming practices involved mixed cropping, intercropping legumes with cereals, crop-livestock integration, and utilization of non-timber forest products (NTFPs) for nutrition and income (Debnath & Dasgupta, 2006). However, Green Revolution influences, government policies promoting chemical inputs, and market pressures have shifted many farmers toward input-intensive monocultures, albeit constrained by limited purchasing power and credit access. Current farming systems exhibit heterogeneity: some farmers maintain relatively low-input practices resembling organic farming by default, others have partially adopted chemical fertilizers and pesticides, while a few practices input-intensive cultivation on irrigated lands. This diversity creates multiple starting points for agroecological transitions (CGIAR, 2024).

Livelihood strategies extend beyond crop cultivation. Livestock rearing (particularly goats, poultry, and cattle) provides nutrition, manure, and emergency income. NTFP collection including tendu leaves, mahua flowers, sal seeds, and medicinal plants contributes significantly to household income, especially for landless and marginal households (Malaiappan et al., 2024). Seasonal migration for construction or agricultural labor supplements income during lean agricultural periods. Women play crucial roles in agriculture, livestock management, and NTFP collection, yet face systematic disadvantages in land ownership, decision-making authority, and access to extension services (CGIAR, 2024).

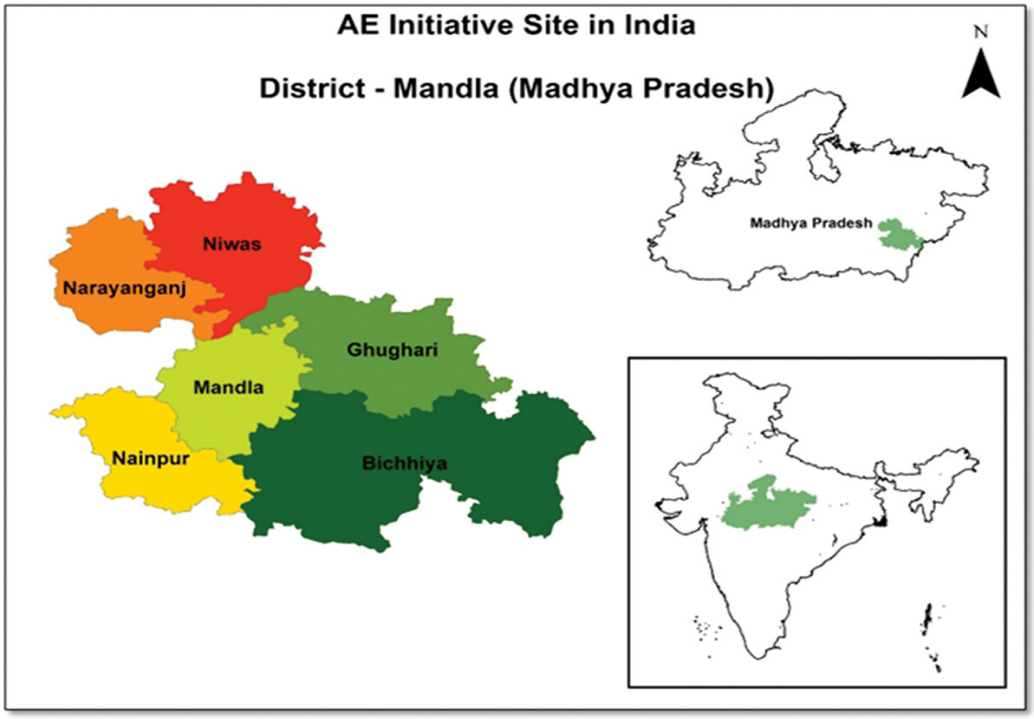

Figure 1: Map of Mandla dictrict with block-wise division (source: Singh et al., 2024)

Women's Self-Help Groups (SHGs), facilitated by organizations like PRADAN (Professional Assistance for Development Action), have emerged as important platforms for women's economic empowerment, collective action, and recently, agroecological initiatives (Malaiappan et al., 2024).

Mandla's institutional landscape comprises multiple actors at various scales: Government departments including Agriculture, Rural Development, Marginalized Welfare, Forest, Fisheries, and Panchayati Raj institutions implement various schemes- National Rural Livelihood Mission (NRLM), Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), Pradhan Mantri Fasal Bima Yojana, Veterinary Department and others. Traditional governance structures, including Gram Sabhas and customary Panchayats, coexist with formal institutions, particularly influencing land and forest resource governance (Krishnan et al., 2024; Singh et al., 2024a).

Civil society organizations, particularly PRADAN and FES, have maintained long-term presence in Mandla since the 1990s, working on livelihoods, SHG formation, natural resource management, and institutional development. PRADAN's approach emphasizes community mobilization, capacity building, and systems thinking aligned with agroecological principles (PRADAN, 2020).

Farmer Producer Organizations (FPOs) and cooperatives aggregate production and facilitate market linkages, though their engagement with agroecology varies. Some FPOs focus on commercial crops with conventional practices, while others experiment with organic certification and diversification. Self-Help Groups (SHGs) constitute the most widespread institutional platform, with thousands of women's groups federated at village, cluster, and district levels under SRLM. SHGs have evolved beyond microfinance to encompass livelihood activities, including Community Nutrition Gardens, collective farming, and value addition.

Community Resource Persons (CRPs) serve as local facilitators, trained by PRADAN or government programs to provide technical support, mobilize communities, and link groups with external resources. CRPs play crucial roles in knowledge dissemination and institutional strengthening. This institutional multiplicity creates both opportunities-diverse entry points for interventions, potential for synergies-and challenges-fragmented efforts, conflicting priorities, power imbalances.

Agroecological Initiatives in Mandla

Several agroecological initiatives operate in Mandla, representing different scales, entry points, and institutional arrangements:

Community Nutrition Gardens (CNGs): CNGs are a multi-sectoral approach linking nutrition education with agroecological production, developed and maintained by women's SHGs (10-15 members) on community land under SRLM (GIZ, 2024). The model promotes year-round diverse food availability for household consumption particularly targeting women and young children, while enabling economic empowerment through surplus sales. Key features include MGNREGA wages for garden maintenance, material inputs through government schemes, agroecological practices, and community mobilization involving men and Gram Panchayats. Established through NRLM and facilitated by PRADAN in Mandla, CNGs are small plots cultivated by landless women's SHGs using organic methods to grow diverse vegetables, greens, and fruits for household consumption and local sale (FES, 2023). CNGs emphasize nutrition security, women's empowerment, and ecological practices including composting, mulching, biopesticides, and water conservation. By 2023, over 500 CNGs were operational across Mandla, demonstrating potential for scaling nutrition-focused agroecology through women's collectives (FES, 2023).

Comprehensive Homestead Model: This approach integrates multiple elements- kitchen gardens, small livestock (poultry, goats), composting, water harvesting structures, and agroforestry, within homestead areas to enhance household nutrition, income diversification, and resource recycling (CGIAR, 2024). The model aligns with agroecological principles of diversity, integration, and efficiency, while being implementable within small land holdings (Singh et al., 2024b).

Natural farming initiatives: Influenced by national Zero Budget Natural Farming (ZBNF) movements, some farmers experiment with indigenous preparations (Jeevamrit, Beejamrit), reduced tillage, mulching, and elimination of chemical inputs. However, adoption remains limited and localized, constrained by knowledge gaps, labor requirements, and uncertain short-term yields (Manoharmayum et al., 2025).

Watershed development and soil conservation: Government-supported programs promote contour bunding, farm ponds, check dams, and tree planting. While not explicitly framed as agroecological, these interventions align with principles of water and soil conservation, creating foundations for sustainable intensification (Watershed Development Component, 2015).

Agroecological Living Lab (ALL): As part of the CGIAR Agroecology Initiative launched in 2022, Mandla was designated an Agroecological Living Lab: a territorial platform for

participatory research, co-design of interventions, multi-stakeholder collaboration, and scaling of agroecological innovations (CGIAR, 2024). The ALL approach draws on living lab methodologies that emphasize user-centered innovation, iterative learning, and real-world experimentation (Schäpke et al., 2018).

The Vision-to-Action Workshop (V2A)

As part of the CGIAR Agroecology Initiative launched in 2022, Mandla was designated an Agroecological Living Lab (ALL), a territorial platform for participatory research, multi-stakeholder collaboration, and co-design of agroecological innovations (CGIAR Initiative on Agroecology, 2023). The ALL approach employs living lab methodologies that emphasize user-centered innovation, iterative social learning, and real-world experimentation embedded within actual community contexts (Bergmann et al., 2021; Schäpke et al., 2018).

The Vision-to-Action (V2A) workshop, conducted over two days (26-27 October 2023) in Mandla, represented a critical milestone in operationalizing this participatory approach (Singh et al., 2023). The V2A methodology is a structured process for identifying and prioritizing behavioral changes required for food system transformation through collaborative stakeholder engagement (Voss et al., 2024). Unlike conventional needs assessment or technology transfer approaches, V2A explicitly centers behavioral change as the unit of analysis, systematically examining who needs to do what differently to achieve desired futures (CGIAR Initiative on Agroecology, 2023). The workshop brought together approximately 40 diverse participants including women Self-Help Group (SHG) members and Community Resource Persons (CRPs), male farmers (both young adults and older farmers), government representatives from multiple departments (Agriculture, Rural Development, Fisheries, Forest, and State Rural Livelihoods Mission), and civil society organizations (PRADAN and Foundation for Ecological Security) (Singh et al., 2023). This multi-stakeholder composition was intentionally designed to capture the full spectrum of food system actors whose coordinated behavioral changes would be necessary for agroecological transition.

The workshop employed participatory methodologies across three integrated phases. First, participants engaged in a visioning exercise using role-play facilitation, where they imagined themselves transported to 2030 and interviewed by a documentary team about the agricultural transformation achieved in their territory (Singh et al., 2023). Groups organized to maintain homogeneity by gender, age, and stakeholder type, articulated their aspirations across social, technological, environmental, economic, and governance dimensions, subsequently linking their visions to the 13 agroecological principles articulated by HLPE (2019). Second, groups systematically identified behavioral changes required to achieve their visions, analyzing who needs to do what differently across individual, collective, and institutional levels. Third, participants collaboratively developed a realistic action plan, specifying target actors, implementing organizations, timeframes, and resource requirements for priority interventions (Singh et al., 2023). Significantly, the workshop employed a gender-responsive design: the first day focused exclusively on women's collectives to create safe spaces for articulating perspectives that might be marginalized in mixed-gender settings, with women representatives then participating in broader multi-stakeholder discussions on the second day (Singh et al., 2023). This approach recognized both women's centrality to agricultural labor and their systematic exclusion from formal decision-making spaces.

The V2A workshop generated several critical outputs that inform this research. Participants articulated a shared vision emphasizing regenerative farming practices, water security infrastructure, income diversification, youth employment opportunities, gender equality in household and community decision-making, and enhanced coordination among food system actors (Singh et al., 2023). They identified priority behavioral changes including adoption of agroecological methods, formation and strengthening of women's collectives, shifts in water use attitudes and practices, cultivation of diverse indigenous crops, and multi-stakeholder coordination. Crucially, participants specified behavioral drivers the enabling conditions required for changes to occur, including training and information on agroecological practices, availability of bio-inputs at local levels, fair pricing and certification for agroecological produce, water conservation infrastructure, and formalized multi-stakeholder platforms for ongoing coordination (Singh et al., 2023).

To systematically analyze the diverse behavioral priorities, target actors, and enabling conditions articulated by participants, the workshop facilitators employed a structured V2A Behavioral Analysis Protocol developed by the CGIAR Agroecology Initiative. This protocol translates stakeholder narratives into a standardized analytical framework by categorizing identified behaviors into seven domains: (1) knowledge and awareness, (2) skills and practices, (3) social norms and gender equity, (4) economic and livelihood opportunities, (5) governance and institutions, (6)technology and infrastructure, and (7)behavior reinforcement, and mapping them to specific actor groups responsible for enacting changes (CGIAR Initiative on Agroecology, 2023; Voss et al., 2024). For each behavioral priority, the protocol identifies target actors across seven categories (individual producers, producer groups, value chain actors, extension agents, communities, governance bodies, and consumers) and specifies which elements of the ACT framework would need to be influenced to enable the desired change.

For this research, the V2A workshop serves multiple functions. Methodologically, it provides the empirical starting point: the behavioral priorities and action plan co-developed during the workshop establish the reference framework against which subsequent adoption processes, enabling conditions, and constraining factors are analyzed. Analytically, the workshop outputs particularly the identification of multiple actor types requiring behavioral change and the specification of structural drivers beyond individual farmer motivations, directly inform the application of the ACT framework to Mandla's agroecological transition. Substantively, examining what transpired after the workshop how actors' perceptions, motivations, and opportunity spaces evolved in the months following this intensive participatory intervention, addresses a critical gap in agroecology literature regarding the translation of participatory ideals into sustained behavioral change within resource-constrained, institutionally fragmented contexts (López-García et al., 2021). The V2A workshop thus represents not merely a data collection event but a transformative intervention whose effects this study seeks to understand and evaluate.

3. CONCEPTUAL FRAMEWORK

The preceding literature review highlights that while agroecological transitions are widely promoted as pathways toward sustainable agriculture, significant gaps remain in understanding how behavioral change occurs in practice, particularly in marginalized and resource-constrained contexts. Existing studies often focus either on farm-level adoption decisions or on policy design, with limited attention to how individual motivations, collective action, and structural conditions interact to shape actors' capacity to engage in transformative practices.

To address these gaps, this study adopts the ACT framework developed by Freed et al. (2025), which conceptualizes behavioral change as emerging from the interaction between individual and collective agency and the opportunity spaces created by structural subsystems. The framework provides an integrative analytical lens to examine not only who needs to act, but under what conditions behavioral change becomes feasible, desirable, and sustained.

3.1. THE ACT FRAMEWORK: CORE PRINCIPLES

The ACT Framework- Agency and Behavior Change Framework for Transforming Agri-Food Systems- was developed within the CGIAR Agroecology Initiative to analyze how actors' agency, behavioral drivers, and structural environments interact to shape possibilities for transformative change (Freed et al., 2025). It responds to a long-standing limitation in agricultural development research: the tendency to treat behavioral change as an individual "adoption decision," while neglecting power relations, institutional constraints, and multi-actor dynamics that determine whether sustainable practices are feasible or desirable.

At the center of the framework is the concept of opportunity space, defined as the range of actions that actors perceive as possible, desirable, and viable within their social, economic, and institutional environment (Freed et al., 2025). Opportunity spaces are not static; they are continuously shaped by structural subsystems and social-relational dynamics and can either enable or constrain transitions toward agroecology.

The ACT Framework conceptualizes behavioral change as emerging from the interaction between:

1. *Individual and collective agency* - actors' capacities to make choices and act upon them.
2. *Individual Behavioral factors* - motivations, norms, identities, aspirations, capabilities, and risk perceptions.
3. *Structural subsystems* - resource access, economic conditions, governance and institutional arrangements, and social-relational power structures.

Together, these dimensions determine whether actors have the ability and willingness to engage in agroecological or other transformative practices.

3.2. ANALYTICAL CONCEPTS

1. **Opportunity Spaces:** Opportunity spaces refer to the conditions under which behavioural change becomes feasible or attractive. For example, even highly motivated farmers may not adopt agroecological practices if water access, credit, extension support, or market incentives are lacking. Expanding opportunity spaces is therefore central to enabling equitable and sustainable transitions.
2. **Agency (Individual and Collective):** The ACT Framework distinguishes between two forms of agency:

1. *Individual agency*: shaped by skills, knowledge, motivations, identities, and perceived behavioural control.
2. *Collective agency*: emerging when groups mobilize shared resources, negotiate power, or act collectively (e.g., through SHGs, FPOs, or community institutions). Collective agency becomes particularly important when structural barriers are beyond the capacity of individuals to overcome-such as water governance, pricing policies, or market regulation.

3. **Structural Subsystems:** Behavior is situated within power-laden structures that extend beyond individual or household control. The ACT Framework identifies four key structural subsystems that shape opportunity spaces (Freed et al., 2025):
    a. Resource subsystem: Encompasses access to and control over land, water, capital, labor, agricultural inputs, and technologies.
    b. Economic subsystem: Includes market structures, pricing mechanisms, livelihood opportunities, value chains, and financial services.
    c. Governance subsystem: Comprises policies, institutional arrangements, procedural rules, legal frameworks, and coordination mechanisms across scales.
    d. Social-relational subsystem: Incorporates social norms, gender relations, power dynamics, networks of belonging, and collective identities.

These subsystems influence not only what is technically possible, but also what is socially acceptable, economically viable, or politically feasible. Transformative change therefore requires attention to how these structures can be reorganized to expand opportunity spaces for diverse actors.

3.3. RELEVANCE OF THE ACT FRAMEWORK TO FOOD SYSTEM TRANSFORMATION

The ACT Framework argues that sustainability transitions cannot rely solely on providing knowledge or incentives to individual actors. Behavioral change will not occur or will not be sustained, if structural barriers remain intact or if actors lack power to influence decisions that affect their livelihoods (Freed et al., 2025). Instead, transformative initiatives must:

1. Identify which actors (beyond farmers) are expected to change behaviors;
2. Understand what specific behaviors are targeted and why these behaviors matter for systemic transformation;
3. Analyze which determinants of agency are being activated or neglected by interventions;
4. Assess whether interventions meaningfully expand opportunity spaces or merely shift responsibilities to already-constrained actors; and
5. Address power relations and institutional coordination mechanisms necessary to enable systemic change.

This systems-oriented perspective shifts analytical attention from individual adoption to multi-actor coordination, from technology transfer to structural reorganization, and from behavioral determinants to opportunity space expansion (Freed et al., 2025).

Freed et al. (2025) applied the ACT Framework across 239 agroecology initiatives and 29 detailed case studies in India, Kenya, Peru, Tunisia, and Zimbabwe. The analysis revealed that many agroecology projects continue to underemphasize governance structures, economic

subsystems, and social-relational power dynamics, focusing instead primarily on technical practices and individual farmer behavior. This focus expands transformative potential, particularly for marginalized groups such as women, landless households, and smallholders in resource-constrained environments. The framework has demonstrated analytical utility in revealing how interventions differentially activate agency determinants, how structural subsystems enable or constrain behavioral change, and where critical gaps exist in multi-actor coordination (Freed et al., 2025). However, the framework remains primarily conceptual, with limited empirical validation in specific contexts. This thesis contributes to operationalizing the ACT Framework through qualitative inquiry in Mandla District, testing its applicability for understanding agroecological transitions in a marginalized, resource-constrained setting characterized by institutional fragmentation and active civil society presence.

This research employs the ACT Framework to analyze agroecological transition in Mandla District, Madhya Pradesh, through three specific applications. First, the framework guides identification of relevant actors beyond farmers, including extension agents, government officials, civil society organizations, community resource persons, and market intermediaries and examines what behavioral changes each actor type must undertake for transition to occur. Second, it structures the analysis of how individual motivations, collective organization (through SHGs, CNGs, and CRP networks), and structural subsystems (water infrastructure, market systems, governance coordination, input supply chains) interact to shape opportunity spaces for agroecological practice. Third, it provides analytical categories for examining how interventions (government schemes, civil society programs, community institutions) activate different dimensions of agency, target different behavioral domains, and address (or fail to address) structural constraints. By applying the ACT Framework to Mandla's context, this study aims to generate empirical insights into the mechanisms through which multi-actor behavioral change occurs in practice, contributing both to theoretical refinement of the framework and to practical understanding of how agroecological transitions can be enabled in similar marginalized, resource-constrained settings. This study operationalizes the ACT framework using the V2A Behavioral Analysis Protocol (Appendices D) employed during the October 2023 workshop (CGIAR Initiative on Agroecology, 2023). During analysis, behavioral changes identified by respondents were systematically coded into seven behavioral domains (knowledge and awareness; skills and practices; social norms and gender equity; economic opportunities; governance and institutions; technology and infrastructure; behavior reinforcement) and mapped to seven actor categories (individual producers, producer groups, value chain actors, extension agents, communities, governance bodies, consumers). For each behavior-actor combination, the analysis identified which ACT elements namely opportunity spaces, action situations, individual behavioral factors (knowledge, motivation), and structural subsystems (resource, economic, governance, social-relational), were influenced or required for change. Critically, the protocol traces both direct effects on target actors and indirect effects on other stakeholders, capturing the interdependencies central to multi-actor transitions. This structured approach enables systematic comparison between workshop-identified priorities and empirically observed adoption patterns while preserving contextual nuance and stakeholder perspectives.

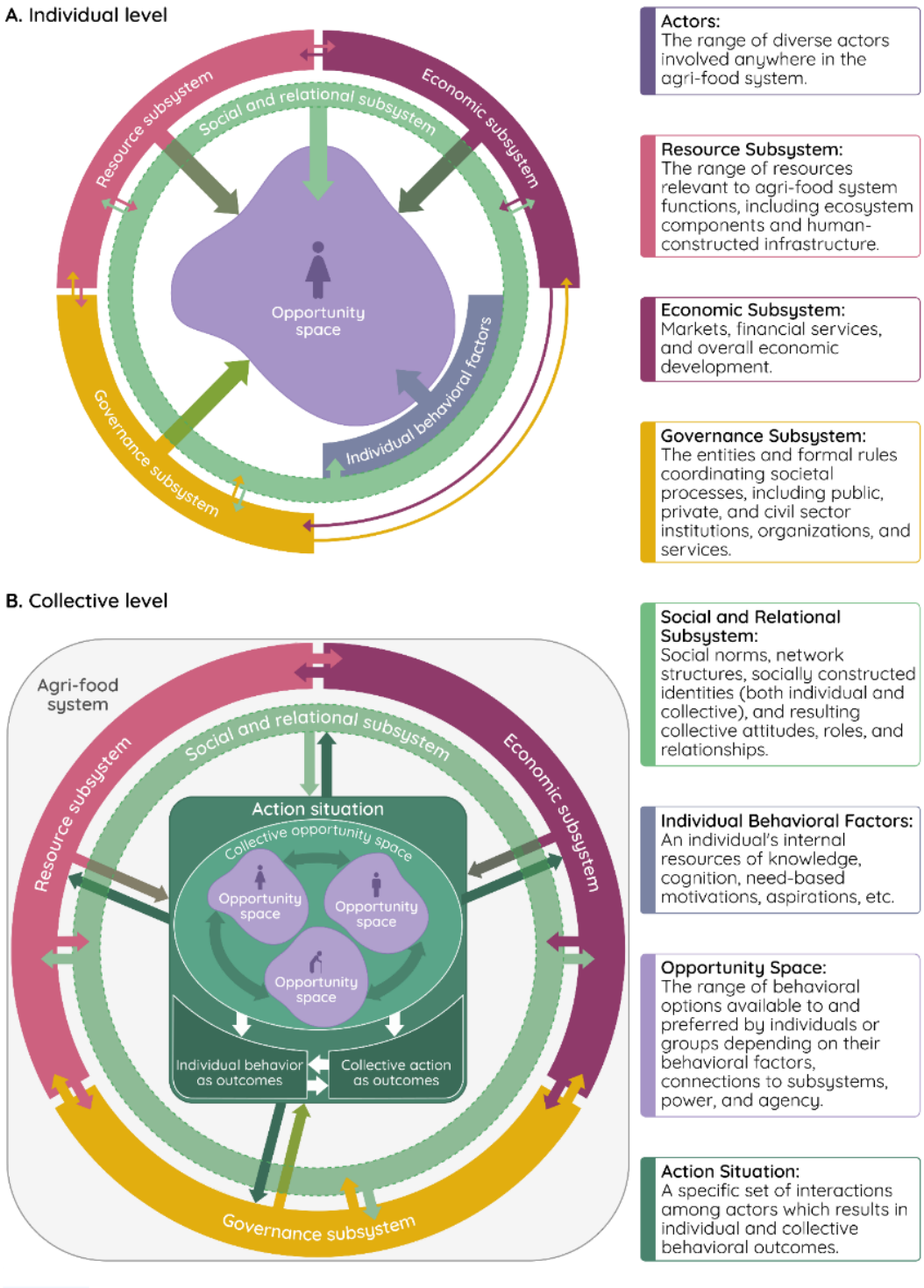

Figure 2: A conceptual framework on agency and behavior change for transforming agri-food systems (ACT) (Source: Freed et al., 2025)

4. METHODOLOGY

4.1 RESEARCH DESIGN

This study employs a qualitative case study design to examine how actors exercise agency and navigate opportunity spaces in agroecological transitions in Mandla District, Madhya Pradesh, India. A qualitative approach was deemed appropriate as it allows for in-depth understanding of perceptions, motivations, constraints, and interactions that shape behavioral change; elements that are difficult to quantify but central to understanding socio-ecological systems (Hollweck, 2016). The case study approach enables an examination of real-world phenomena within their context, which is critical when analyzing complex systems such as agroecological transitions that involve social, institutional, and ecological dimensions. It also allows for the inclusion of multiple stakeholder perspectives; farmers, civil society organizations, government representatives, and market actors whose interactions collectively influence transition pathways (Stake, 1995). Mandla District, one of the Agroecological Living Lab (ALL) sites under the CGIAR Agroecology Initiative, was selected for this study. As detailed in Section 2.5, the district's characteristics predominantly indigenous population, ongoing agroecological initiatives, active institutional presence, and structural marginalization, create conditions where both individual agency and structural subsystems are visibly constrained, and also making it appropriate for operationalizing the ACT framework. Building on the Vision-to-Action (V2A) workshop conducted in October 2023 (described in Section 2.5.1), this research examines actor experiences approximately one-year post-workshop (November 2024–February 2025). The research design thus combines cross-sectional qualitative inquiry with longitudinal perspective, investigating how agency and opportunity spaces evolved following the participatory intervention, what actions were taken or constrained, and how collective institutions mediate individual and systemic change.

4.2 DATA COLLECTION METHODS

Data collection occurred between November 2024 and February 2025, employing three complementary methods: semi-structured interviews, focus group discussions (FGDs), and participant observation.

4.2.1. Semi-Structured Interviews:

A total of 23 in-depth, semi-structured interviews were conducted with key stakeholders representing diverse positions in Mandla's agroecological ecosystem. Purposive sampling ensured variation across actor types, institutional roles, gender, and levels of engagement with agroecological initiatives. Critically, the sample included both V2A workshop participants (n=9) and non-participants (n=14) who are engaged in agroecological or rural development activities, enabling comparison of how participatory processes influence awareness, motivations, and collective action. Table 4.1 presents the complete sample composition disaggregated by actor type, gender, and V2A participation status. Participants were identified through multiple pathways: (1) V2A workshop attendance lists provided by IFPRI and PRADAN and stakeholders mentioned in the V2A workshop; (2) recommendations from PRADAN field staff based on stakeholders' engagement with agroecological initiatives; (3) snowball sampling where interviewees suggested additional relevant actors; and (4) purposive identification of government representatives across relevant departments. Selection prioritized

stakeholders with direct involvement or influence over agricultural practices, resource management, extension services, policy implementation, or market linkages.

Actor Type	Specific Role/Institution	Male	Female	V2A Participant	Non-V2A	Total
Civil Society Organizations (CSO)	PRADAN staff (various roles)	1	3	2	2	4
	FES staff	1	0	0	1	1
	CSO Subtotal	**2**	**3**	**2**	**3**	**5**
Local Government	Agriculture Department	2	0	1	1	2
	SRLM/Block Manager	1	0	1	0	1
	Veterinary Department	1	0	1	0	1
	Fisheries Department	0	1	0	1	1
	Horticulture Department	0	1	0	1	1
	KVK/Soil Science Expert	1	0	1	0	1
	Janpath Block Office	2	0	0	2	2
	Mid-Day Meal/Anganwadi	0	1	0	1	1
	Local Govt. Subtotal	**7**	**3**	**4**	**6**	**10**
Producer (Individual)	CRP Agriculture	0	2	2	0	2
	Organic Farmer/NTFP collector	1	0	0	1	1
	Producer Subtotal	**1**	**2**	**2**	**1**	**3**
Producer Group	FPO Manager	1	0	0	1	1
	CRP Gender	0	1	0	1	1
	CRP/SHG member	0	1	1	0	1
	SHG/CNG member	0	1	0	1	1
	Producer Group Subtotal	**1**	**3**	**1**	**3**	**4**
Private Sector	Market actor/wholesaler	1	0	0	1	1
	Agricultural input supplier	1	0	0	0	1
	Private Sector Subtotal	**2**	**0**	**0**	**1**	**2**
TOTAL		**13**	**11**	**9**	**14**	**23**

Table 1: Interview Sample Composition

Interview Guide: The semi-structured interview guide (Appendix B) was developed based on the ACT framework and V2A action plans, comprising seven thematic sections: (1) introduction and context setting, (2) agroecological perceptions, (3) respondent's own actions, (4) reflections on V2A workshop, (5) actions required by other actors, (6) collective action and support systems, and (7) recommendations. The interview guide deliberately integrated open-ended questions to explore nuanced perspectives and closed-ended Likert-scale statements to systematically assess motivations and constraints across respondents. The guide combined open-ended questions for exploring nuanced perspectives and 17 closed-ended questions on motivations and constraints measured using a Likert-scale (1=Strongly Disagree to 5=Strongly Agree). (Initially, two sets of Likert statements were planned-one for respondents' self-identified actions (Section 3) and another for V2A action plans (Section 4). During early fieldwork, substantial overlap between these categories became evident, leading to adaptive

elimination of Section 3 ratings to reduce redundancy; the final guide retained 17 closed ended questions focused on V2A action plans). Interviews lasted 45-90 minutes, were conducted primarily in Hindi with occasional use of Gondi dialect (facilitated by a translator and PRDAN staffs), audio-recorded with consent, and transcribed verbatim. Translation to English was conducted by the researcher with verification by the bilingual research assistants.

4.2.2. Focus Group Discussions (FGDs):

FGD participants were identified through purposive sampling in collaboration with PRADAN field staff. The selection process involved: (i) mapping existing SHGs, CNGs, and CRP networks within study blocks through PRADAN's operational records; (ii) criterion-based selection ensuring diversity in experiences:- FGD-1 included women from successful CNGs, FGD-2 from struggling CNGs to capture barriers, FGD-3 comprised all available CRPs across different Gram Panchayats, and FGD-4 involved farmers representing varied adoption levels nominated by village elders and PRADAN staff; (iii) cross-verification with Gram Panchayat representatives to ensure representativeness; and (iv) voluntary participation with informed consent and no material incentives. This stratified approach captured variation across success levels, actor types, and gender dimensions critical to understanding multi-actor behavioral dynamics (Barbour, 2018; Krueger & Casey, 2015). FGDs explored shared experiences, local norms, collective strategies, and group dynamics influencing agroecological adoption. Discussions were facilitated in collaboration with PRADAN, audio-recorded, and lasted 60-120 minutes.

FGD	Participant Composition	Participants (n)	Gender	Duration
FGD-1	Women SHG members actively engaged in successful Community Nutrition Garden (CNG)	8	All Female	105 min
FGD-2	Women SHG members from less successful/struggling CNG initiative	7	All Female	90 min
FGD-3	Community Resource Persons (CRPs) - Agriculture and Gender	6	2Male, 4Female	120 min
FGD-4	Mixed farmer group	8	5Male, 3Female	60 min

Table 2: Focus Group Discussions Composition

Discussions were audio-recorded and supplemented with detailed field notes capturing non-verbal interactions, group dynamics, and emergent tensions. A semi-structured FGD guide (Appendix C) provided thematic prompts while allowing flexibility for organic conversation flow. FGDs were conducted in Hindi and Gondi dialects, transcribed and translated to English verbatim.

4.2.3. Participant Observation and Field Notes

Throughout the study period, systematic participant observation was done, and detailed field notes were maintained. Observational activities included: Attending community meetings organized by PRADAN, SHGs, and Panchayats to observe decision-making processes, power dynamics, and stakeholder interactions, Visiting demonstration sites including successful and struggling CNGs, Comprehensive Homestead Models, and natural farming plots to observe practices, ecological conditions, and farmer experimentation, Informal conversations with farmers, women's group members, government officials, and NGO staff during field visits, providing contextual insights beyond formal interviews, observing training sessions and capacity-building workshops conducted by CSOs and government departments to assess pedagogical approaches and farmer engagement. Site conversations and informal interactions were noted in the field notes and later transcribed for analysis, providing contextual depth and triangulation with interview and FGD data.

4.3. DATA ANALYSIS

Data analysis employed an iterative inductive-deductive approach, combining emerging trends inductive coding with deductive application of the ACT framework (Freed et al., 2024). Analysis was conducted using MAXQDA software for systematic coding, memo-writing, and thematic organization. All interview transcripts (23), FGD transcripts (4), and field notes were uploaded to MAXQDA as separate document sets. Each transcript was read multiple times to establish familiarity with the content, identify preliminary patterns, and generate initial analytical memos capturing emergent themes, contradictions, and areas requiring further exploration.

Data analysis consisted mostly of three iteretive coding phases. In the first phase, open coding was conducted using an inductive approach informed by in-vivo coding (Saldaña, 2009), which allowed respondents' own language to guide the early categorisation of meaning. Expressions such as "farming natural way," "land becomes strong," "scared of less production," and "need more support" were retained to preserve contextual and cultural nuance. This phase generated approximately 250 initial codes reflecting a wide spectrum of perceptions, practices, motivations, constraints, institutional interactions, and relational dynamics.

In the second phase, axial coding was undertaken to organise the preliminary codes into conceptually coherent thematic clusters. These clusters aligned broadly with the interview guide and the overarching research questions. The themes covered, among others, perceptions of agroecology; individual actions and practices; motivations related to family well-being, economic considerations, or environmental concerns; constraints such as financial limitations, water scarcity, knowledge gaps, and gendered or cultural barriers; supportive factors deriving from NGOs, self-help groups, and local governance structures; reflections on the Vision-to-Action workshop; roles of other actors; dynamics of collective action; and institutional arrangements influencing behaviour. Through this process, the initial code set was systematically reduced and consolidated into approximately 90 organised thematic codes.

In the third phase, the thematic categories derived were systematically integrated with the domains of the ACT Framework. Interview and FGD material reflecting actors' knowledge, motivations, and cognitive orientations were grouped under *individual behavioural factors*. These included respondents' awareness of agroecological practices, their technical and

traditional ecological knowledge, and the extent of their exposure to training. *Motivational* aspects such as expectations of economic benefits, aspirations for family health and nutrition, environmental stewardship, social recognition, and moral obligation were also placed in this category. Structural conditions identified across the data were subsequently categorised into the four subsystems of the ACT framework. Statements speaking to policies, schemes, rules, and institutional coordination was classified under the *governance subsystem*. This included accounts of government programmes, extension services, bureaucratic delays, policy inconsistencies, and power dynamics shaping participation in decision-making spaces. Narratives describing natural resource conditions and infrastructure were assigned to the *resource subsystem*, including references to soil quality, water availability, biodiversity, climatic risks, irrigation systems, market access roads, and technological or infrastructural deficits. The *economic subsystem* captured respondents' descriptions of market conditions, price realisation, input and output markets, financial services, value-chain intermediaries, and perceived economic incentives or barriers shaping agroecological adoption. The *social and relational subsystem* encompassed cultural norms, gender and caste relations, household decision-making structures, trust networks, SHG and farmer group dynamics, peer learning interactions, and power relations influencing access to resources, information, and institutional support. This subsystem also captured intersectional dynamics, recognising how gender, caste, socio-economic status, and education mediate opportunities and constraints. Finally, the analysis examined *action situations* and forms of *collective action*, which the ACT framework defines as social arenas where behaviours are enacted and collective outcomes emerge. Instances of community meetings, SHG gatherings, V2A workshop engagements, training sessions, demonstration activities, market exchanges, and institutional coordination spaces were coded as action situations. Within these, the analysis identified how individual opportunity spaces interacted to create collective opportunity spaces, enabling or hindering collective mobilisation. Through this deductive integration, the ACT framework served as a structured lens to interpret how agency, behavioural drivers, and structural conditions jointly shape pathways of agroecological transition in the study context.

4.4. ETHICAL CONSIDERATIONS

Ethical principles of informed consent, confidentiality, voluntary participation, and do no harm guided all research activities, adhering to the ethical standards of University of Hohenheim. Participants were informed in Hindi and English about the study's purpose, procedures, data use, and their right to withdraw at any time. Signed consent was obtained from literate participants, while verbal consent was recorded for those unable to sign. All personal identifiers were removed during transcription, and anonymised codes (e.g., R1, FGD-1) were used throughout reporting. Audio files and transcripts were stored securely on encrypted devices and will be deleted after completion of the study. Cultural sensitivity guided all interactions. Interviews and FGDs were scheduled at participants' convenience and conducted in linguistically accessible forms (Hindi or Gondi with facilitation). Special attention was paid to gender dynamics and local social hierarchies to ensure that women and marginalised groups could participate safely and comfortably. No material incentives were offered, and care was taken to avoid creating expectations of project benefits. Reflexive awareness of positionality was maintained throughout fieldwork, acknowledging that the researcher's background and institutional affiliation could influence responses.

5. RESULTS

This chapter presents findings organized around four interrelated questions: How do stakeholders understand agroecology? What behavioral changes are needed and who must act? How does collective action enable these changes? And what structural conditions shape whether changes can occur?

5.1. HOW STAKEHOLDERS UNDERSTAND AGROECOLOGY

Stakeholders across the study area expressed diverse and sometimes overlapping understandings of agroecology. These understandings were shaped by participants' roles within the agricultural system, including their positions as farmers, members of self-help groups, community resource persons, and representatives of supporting organizations. Rather than a single, unified definition, agroecology was described through a range of meanings linked to farming practices, livelihood strategies, ecological values, and social organization. This section presents empirical findings on how agroecology is understood by different stakeholder groups. It first outlines the diversity of definitions articulated by participants, followed by perceived contrasts with traditional and conventional farming systems. It then documents perceived benefits and disadvantages, before presenting quantitative results on motivations and constraints influencing engagement with agroecological practices.

5.1.1. Diverse Definitions: From "Chemical-Free Farming" to "Respecting Old Ways with New Learning"

Farmers and SHG members most often described agroecology in practical, tangible terms linked to soil health, organic inputs, and household well-being:

> *"Agroecology means farming the natural way- no chemicals, using what comes from our own land." (R21) "It's chemical-free farming… my children eat safe food from our garden." (R17) "Traditional farming was also natural, but now we buy seeds from the market and use fertilizers. Agroecology is going back to nature but with new knowledge-like how to make jeevamrit [fermented microbial solution], how to manage pests without sprays." (R18)*

Many contrasted agroecology with current "chemical farming," associating the latter with soil degradation, water contamination, and health risks. For these actors, agroecology largely signified input substitution (organic instead of chemical inputs) and healthier food, rather than a systemic transformation of farming systems.

In contrast, NGO staff and CRPs offered more holistic interpretations that aligned closely with multidimensional agroecology definitions: *"It's about respecting old ways and combining them with scientific learning… diversity, soil health, water conservation, women's empowerment, and fair markets." (R15).* These interpretations reflected long-term engagement with training, networks, and development programs, emphasizing ecology, social justice, and collective action.

Private sector actors-though fewer in number-framed agroecology in market terms: *"Customers want organic, but supply is unreliable and certification is costly… not yet a good business." (R22)*. This highlights a pragmatic tension between agroecological ideals and market realities.

Government officials tended to frame agroecology through policy and certification categories: "*Agroecology is organic farming certified under government standards. Farmers must follow protocols-no synthetic inputs, maintain records, get inspected. It's part of our Paramparagat Krishi Vikas Yojana [traditional agriculture development scheme]." (R2)*. "*We promote natural farming….Zero Budget Natural Farming [ZBNF] as per state policy. Farmers learn to prepare bio-inputs like beejamrit, jeevamrit, use mulching, stop tillage. This reduces cost and improves soil." (R19)*. "*Now so many CSOs [Civil Society Organizations] are working on the ground…..PRADAN, FES, others, they are giving comprehensive homestead garden schemes, kitchen gardens, poultry, composting, all integrated. This makes it easier for people to adopt farming methods as a complete package, not piecemeal. And these organizations are building networks, social relations among women farmers especially through SHGs, which is helping rural development beyond just agriculture." (R4)*. Taken together, the perspectives of government respondents reflect a narrow, scheme-driven and compliance-oriented understanding of agroecology, rooted primarily in certification norms, branded programs (ZBNF, PKVY), and technical extension protocols. While a few officials-especially those collaborating with CSOs-recognized the importance of social facilitation, integrated livelihood approaches, and women's collective platforms, these insights remained the exception rather than the norm. Overall, government interpretations showed limited engagement with agroecology's broader ecological, socio-economic, and political dimensions, and rarely referenced knowledge co-creation, equity, market power, or governance transformations.

5.1.2. Contrasts with "Traditional" and "Conventional" Farming

When asked to compare agroecology with both *traditional* methods practiced by previous generations and *conventional* agriculture, respondents articulated distinctions that reveal how agroecology is simultaneously understood as revival, innovation, and critique.

Many respondents initially equated agroecology with ancestral farming practices characterized by low external input use, mixed cropping, and seed saving. As one participant noted, *"Our grandparents farmed this way-no chemicals, mixed crops, saving seeds. Agroecology is just the old way given a new name." (R21).* However, further discussion revealed that stakeholders did not view agroecology as identical to traditional farming. Instead, agroecology was described as involving a more deliberate and informed application of practices. One respondent explained,*"Traditional was natural, yes, but also limited. Yields were low, knowledge was not scientific. Now with agroecology, we learn why things work-like why crop rotation helps… It's traditional plus science" (R6).* Across respondents, agroecology was therefore framed as traditional knowledge made scientific rooted in ecological principles but strengthened through training, experimentation, and conscious decision-making. This distinction is important because it positions agroecology as progressive rather than backward, countering common stigma that organic or natural farming is outdated or unproductive.

In contrast, respondents drew far sharper boundaries between agroecology and conventional chemical-based agriculture. Conventional farming was consistently associated with dependency, degradation, and health risks. *"Conventional means buy everything from market… Farmers become dependent; costs keep rising. And the land becomes weak." (R5). "Chemical farming gives fast results… but water gets spoiled, soil dies, our health suffers." (R17).* Major identified claims include input dependency and rising costs, soil and water

degradation, health concerns from pesticide exposure, corporate and policy pressures reinforcing chemical use. Agroecology, in this framing, becomes attractive not only because of its benefits but because it is viewed as a resistance to an extractive, input-intensive agricultural model. *"Organic needs more hard work… Who has time? Chemical is easier-one spray, pests die." (R22). "Farmers are scared of less production… it is risky-what if crop fails?" (R9).* These accounts indicate that agroecology is evaluated by farmers in relation to the perceived reliability, labor demands, and institutional support associated with conventional farming systems.

5.1.3. Perceived Benefits: Why Agroecology Matters to Stakeholders

Understanding stakeholders perceived benefits is essential for interpreting why agroecology is considered meaningful in Mandla. When asked what positive outcomes might arise if agroecology were practiced more widely (Interview Question 5), respondents across actor groups identified a broad set of anticipated advantages. These perceived benefits clustered around five thematic domains: soil and ecological regeneration, health and nutrition, economic considerations, environmental services, and social well-being.

- Soil Health and Ecological Regeneration: The most consistently cited benefit concerned improvements in soil quality, mentioned by nearly all respondents. Farmers in particular described soil as a "living" entity that regains vitality under agroecological management: *"Agroecology makes the land strong again… earthworms come back…. when I see earthworms, I know the soil is alive." (R21)* Extension and environmental officials reinforced these perspectives with more technical reasoning, linking organic amendments to improved soil structure, microbial activity and water retention. As one respondent explained: *"Water retention improves with organic matter… this is critical in Mandla where water is scarce." (R7)* Stakeholders thus framed soil health not only in agronomic terms but also in relational and experiential ways. Farmers often relied on observable indicators- texture, smell, visible fauna-while technical actors emphasized ecological processes. This alignment across groups underscores soil regeneration as a shared, foundational justification for agroecology.
- Environmental and Ecosystem Benefits: NGO staff and government officials with environmental portfolios articulated broader ecological benefits such as biodiversity restoration, reduced water contamination, and climate resilience: "Agroecology supports biodiversity… pollinators increase, pest predators balance pests naturally." (R15). These actors linked agroecology to systems-level outcomes beyond the farm, suggesting alignment with national and global sustainability agendas. However, these macro-ecological framings were less pronounced among farmers, indicating a potential disconnect between expert discourses and everyday priorities.
- Health and Nutrition Security: Health-related benefits were especially salient among women respondents, who frequently connected agroecology with household nutrition, food safety, and intergenerational well-being: *"Chemical food is poison… now we eat from our CNG, my daughter is healthier." (R17)* Anganwadi workers and several SHG members highlighted the potential for institutional nutrition programmes to source safer vegetables through community gardens. The emphasized children's health and future generations illustrating how agroecology becomes intertwined with moral

responsibilities of care. These framing positions agroecology as not only an agricultural alternative but also a protective measure for family well-being.

1. Economic Benefits- Cost Savings and Income Potential: Economic motivations were present across respondent groups, though often framed in terms of cost reduction and risk avoidance rather than profit maximisation. Farmers described agroecology as reducing dependency on external inputs: *"Making compost costs nothing. Buying fertilizer costs thousands… for small farmers, this matters." (R1)* Market actors, though fewer in number, viewed agroecology through the lens of premium markets and certification challenges: *"Demand exists in cities, but supply is unreliable and certification is costly."* (R22) Women involved in community nutrition gardens emphasised the significance of small but autonomous income flows: *"Rs. 15,000 is small, but it is our money, controlled by us." (R17)* Overall, economic benefits were conceptualised less in terms of increased yields and more through enhanced autonomy, reduced vulnerability, and diversified livelihood options.
2. Social and Community Well-Being: A recurrent theme across women respondents, CRPs, and NGO staff concerned agroecology's contribution to social cohesion, knowledge sharing, and empowerment: *"Agroecology brings community together… it builds solidarity." (R16)* Agroecological initiatives- particularly CNGs and SHG-based activities were seen as enabling women to speak in public forums, earn income, and participate in decision-making spaces. NGO actors framed agroecology as a vehicle for strengthening social capital and shifting local norms: *"When the whole village adopts organic, it becomes a movement." (R12).* Such narratives illustrate how agroecology is perceived to foster not only agronomic benefits but also enhanced collective identity and participation.

5.1.4 Perceived Disadvantages: Why Hesitation Persists

Alongside perceived benefits, respondents described a range of disadvantages, challenges, and trade-offs associated with agroecological practices. These concerns were expressed by respondents across actor groups, including individuals who were themselves engaged in organic or low-input farming. The reported disadvantages relate to labour requirements, production risk, knowledge demands, market conditions, social norms, and the temporal dynamics of agroecological change.

3. Labour Intensity and Time Burden: The most frequently mentioned disadvantage concerned the higher labour and time requirements of agroecological practices. 17 of the 23 respondents stressed that compost preparation, hand weeding and the production of bio-inputs were substantially more demanding than applying mineral fertilisers and pesticides. As one organic farmer explained, *"organic farming needs more hard work… compost you have to prepare for months; chemical fertiliser you just buy and apply in one day" (R21).* CRPs similarly noted that manual weeding under high temperatures and repeated applications of botanical pesticides are far more labour-intensive than *"one spray and finish"* (R6, R5). This burden is particularly acute for women, who already carry a disproportionate share of unpaid domestic work. One SHG member described a typical day of cooking, caring for livestock, field work, fetching water and childcare before asking, *"when will we make compost and do organic practices?"*

(R17). Respondents also noted that labour constraints are influenced by demographic changes, including outmigration of younger household members and the ageing of the farming population.

4. Yield Anxiety and Production Risk: Concerns related to yield stability and production risk were also commonly reported. Sixteen respondents, especially smallholders with limited land holdings, described agroecology as a risky experiment especially during the transition period. Hybrid seeds and fertiliser were perceived as offering "*guaranteed results*" *(R4)*, "*…whereas organic cultivation was associated with uncertainty, at least in the transition years(R6)*. Farmers worried that *"if we try organic and yield drops, what will the family eat?" (R21).* Some respondents also referred to social reactions to early adoption:*"early adopters were sometimes ridiculed when crops appeared smaller or more pest-damaged than the ones on their neighbours' fields" (R18)*. These accounts highlight that yield-related concerns are shaped by both material conditions and social perceptions.
5. Knowledge and Skill Gaps: Fourteen respondents pointed to substantial gaps in knowledge and skills as a barrier to deeper agroecological engagement. Farmers reported uncertainty about how to prepare and dose compost, design crop rotations or control pests using non-chemical methods. Extension officers and researchers, many of whom were trained in Green Revolution paradigms, acknowledged their own limited expertise in agroecological approaches and in Mandla-specific organic management. As one horticulture officer observed, *"in conventional farming, they spray chemical and pests die immediately. In organic, they need to understand pest life cycles… this requires knowledge they don't have" (R11)*. Respondents described these knowledge gaps as occurring at multiple levels, including farm households, extension services, and local institutions. Such gaps were frequently mentioned in connection with difficulties in experimentation and adaptation during the transition process.
6. Market Access and Price Realization: Thirteen respondents, especially those linked to marketing and FPOs, highlighted the absence of reliable price premiums for agroecological produce. In local markets, organic and conventional vegetables are typically sold together at the same price, meaning that *"buyers don't care whether it's organic-they choose based on appearance and price"* (R17). Several respondents noted that this limits smallholders' ability to capture price premiums. Intermediated value chains were also mentioned as a constraint, with middlemen often capturing any premium available in urban markets while farmers remain price-takers at the village level (R22). Respondents further noted that fragmented production and irregular supply make it difficult to engage institutional buyers such as schools or hospitals. Together, these factors were described as influencing farmers' assessments of the economic viability of agroecology.

- Cultural Resistance and Social Norms: Women reported that their husbands often dismissed agroecological practices as "*kitchen- garden work"* rather than serious farming (R17). These accounts illustrate how agroecological practices may be interpreted differently depending on gender roles and local understandings of agricultural status. Respondents noted that such perceptions can affect the social recognition of agroecological work within households and communities.

- Slow Results and Delayed Gratification: A further concern relates to the temporal dynamics of agroecological change. Nine respondents noted that improvements in soil health, yield stability and ecosystem functioning often occur gradually over several seasons, whereas the visible effects of mineral fertilisers and pesticides are immediate. One KVK scientist summarised this temporal mismatch: "*fertiliser gives results in one season; soil restoration through organic matter takes years" (R10)*. For respondents managing limited incomes and food security constraints, practices with delayed returns were described as difficult to adopt, particularly when yields may decline during the transition period. The absence of transition support mechanisms, such as temporary subsidies, credit access, or guaranteed procurement, was mentioned as limiting farmers' capacity to absorb short-term losses.

5.1.5. Quantitative analysis of Motivations and Constraints

To complement the qualitative narratives presented in the preceding sections, respondents were asked to rate their agreement with seventeen statements (Interview Guide Q17.1–Q17.17) on a five-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). The first six statements (Interview Guide Q17.1–Q17.6) measured personal motivations for engaging in agroecological actions, while the remaining eleven (Interview Guide Q17.7–Q17.17) assessed perceived constraints, grouped into resource-based constraints and external environmental barriers. This quantitative component enables systematic comparison across actor types, gender, and V2A participation status

Personal Motivations: - *Figure 3* presents the overall motivational profile across all the interview respondents (n=23). Mean scores indicate strong agreement with statements related to environmental, societal, and moral motivations. Three items reached the maximum mean score of 5.0: "good for the environment," "good for society," and "the right thing to do." Items related to safety ("makes life safer," mean ≈ 3.9) and social recognition ("social praise," mean ≈ 4.0) occupied intermediate positions on the scale. In contrast, "hope for economic benefit" received a lower mean score (≈ 3.1), positioning it closer to the neutral midpoint of the scale.

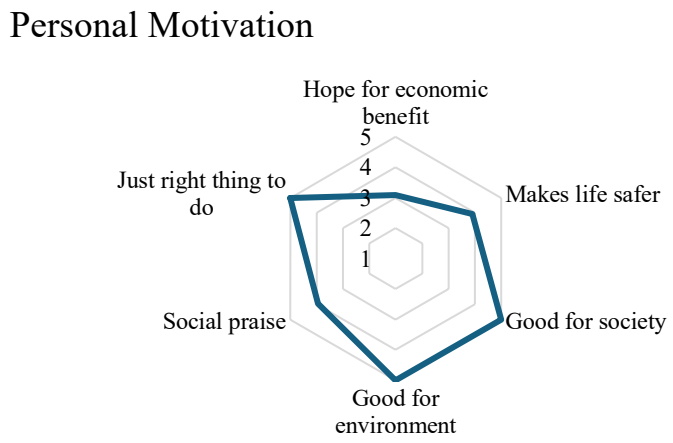

Figure 3: Radar Chart showing Personal Motivation profile

Variation across actor groups was observed, with producers and producer-group representatives rating economic motivations higher than respondents from government, civil society, and private-sector organizations. Gender-disaggregated results showed small differences for safety and social recognition items, with women reporting slightly higher mean scores than men; however, these differences were modest relative to the consensus on environmental and societal motivations.

Perceived Constraints: *Figures 4 and 5* present mean scores for perceived constraints, disaggregated into resource-based constraints and external environmental barriers across all interview respondents (n = 23). In contrast to the more differentiated motivational profile, constraint scores were relatively high across multiple dimensions. As shown in *Figure 3*, resource-based constraints related to tools and machinery received the highest mean score (≈4.7), followed by financial constraints (≈4.2). Constraints related to time, skills, and access to land and water were rated closer to the midpoint of the scale, while lack of networks received the lowest mean score (≈2.8). These results indicate that respondents perceive limitations related to physical resources and equipment as more constraining than those related to skills, time availability, or social connectivity.

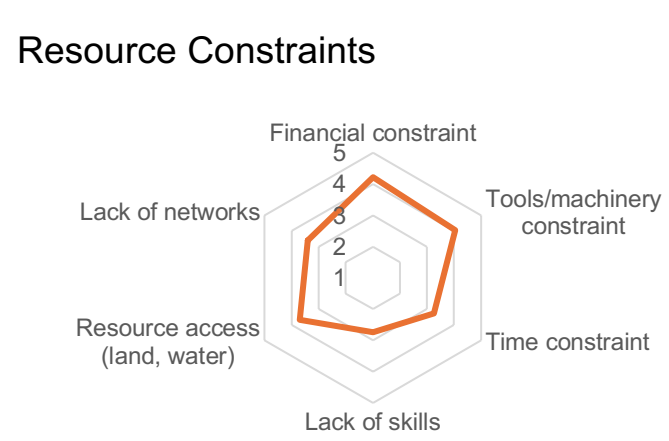

Figure 4: Radar Chart showing Resource Constraints Profile

Figure 5 shows that external environmental barriers were also perceived as substantial. Market barriers emerged as the highest-rated constraint (mean = 4.35), with 83% of respondents scoring this item as 4 or 5. Climatic and natural barriers, infrastructure constraints, and cultural norms were rated at similar levels, while laws and regulations were perceived as comparatively less restrictive (mean ≈3.3). Gender-disaggregated results indicate differences in perceived constraint levels for selected dimensions, particularly cultural norms. Given the small subsample size, these differences are reported descriptively and without statistical inference.

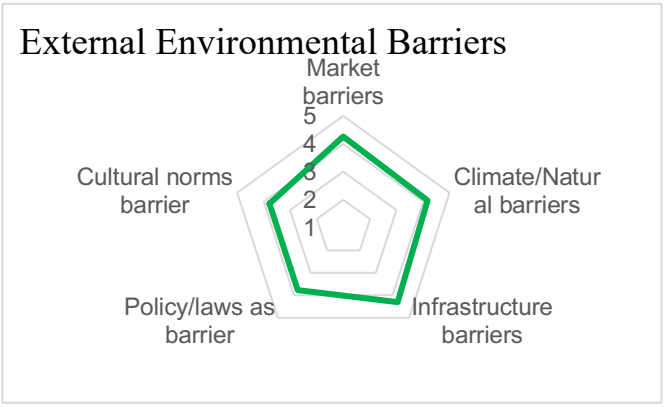

Figure 5: Radar Chart for External Environmental Barriers Profile

5.2. BEHAVIORAL REQUIREMENTS FOR AGROECOLOGICAL TRANSITION

This section begins with inductive findings from open-ended questions ('Who needs to change behavior for agroecology to scale?'), revealing actors' own perceptions of responsibility and motivational drivers. These emergent themes are then systematically analyzed through the ACT framework lens, mapping how behavioral factors and contextual subsystems shape opportunity spaces for different actor types. Respondents consistently described agroecological

transition as requiring changes that extend beyond individual farmers' practices. When asked who needs to change behaviour for agroecology to expand and become sustainable, participants did not frame transition as a matter of individual choice alone, but as a process shaped by interactions among multiple actors, institutional arrangements, and incentive structures. Across interviews and focus group discussions, respondents linked behavioural change to broader conditions such as access to support, coordination among actors, and the distribution of responsibilities within the agricultural system. Rather than identifying a single point of intervention, respondents highlighted interconnected changes involving farmers, institutions, organizations, and markets.

5.2.1 Critical Actors Beyond Farmers

While farmers were widely recognised as central actors in implementing agroecological practices, respondents emphasised that farmers alone cannot drive transition under existing conditions. Across stakeholder groups, participants identified a range of actors whose behaviour was seen as critical to enabling or constraining agroecological change. When asked who needs to change behavior, respondents spontaneously identified multiple actors. Across the coded responses, government actors were mentioned most frequently - with local government (Panchayat, Gram Rozgar Sevaks) identified by 18 of 23 interview respondents and state/district government by 15. Civil society organizations followed closely (14/23), then producers and producer groups (12/23). Market actors and traders were mentioned by 10 respondents, financial institutions by 8, and consumers least frequently (4/23). This pattern suggests that while producers are recognized as important change agents, respondents perceive the enabling environment - shaped by government policy, civil society support, and financial access -as equally or more critical for transition.

Several interviewees emphasized that farmers' efforts depend on an enabling environment: *"Farmers are ready to do scale up agroecological principles……, but without government support- proper markets, without certification help, without subsidy for bio-inputs- how can they succeed? Government must create the environment." (R14).* Producers themselves were also identified as key change agents, but mostly in combination with other actors: *"We farmers can change our practices, but we cannot build roads or fix market prices. That part is not in our hands." (FGD 2)*. Overall, responsibility for agroecological transition was seen as distributed across the system, with government holding a special role in setting incentives and providing infrastructure, and CSOs and extension services acting as intermediaries between policy and practice.

5.2.2 Domains of Behavioral Change and Distribution of Responsibility Across Actors

Respondents articulated a wide range of behavioral priorities spanning to multiple levels of the agri-food system. The V2A (Vision-to-Action) workshop conducted in October 2023 generated a structured action plan identifying 53 behavioral changes across seven categories, mapped to target actors and targeted ACT elements. The behaviors identified during interviews, focus group discussions, and field notes were grouped into seven broad behavioral categories using the V2A Behavioral Analysis Protocol applied during analysis (Appendix D). These domains reflect empirically identified types of actions considered necessary for agroecological transition, with responsible actor groups linked specific types of behavioral change. The following sections therefore present each behavioral domain together with the

distribution of responsibility across actor types, reflecting how participants themselves associated change requirements with institutional, organizational, and social actors.

1. **Knowledge and Awareness:** Knowledge and awareness related change emerged as a foundational behavioral domain across interviews, FGDs, and the V2A workshop outputs. Respondents emphasized that agroecological transition requires not only technical understanding of practices, but also improved awareness of institutional processes, value chains, and ecological relationships. Farmers frequently described the role of trainings and demonstrations in shaping their understanding of agroecology. Several respondents explicitly referred to exposure through government departments and NGOs as central to their learning: *"I feel more trainings and demonstration class from Agricultural department and also from PRADAN helped in knowing about AE, community nutrition, organic farming, integrated pest and disease management, water management…" (R18).* Knowledge was described not only as abstract information, but as practical, experience-based learning. Information tools such as seasonal calendars were mentioned as particularly useful in aligning practices with local climatic conditions: *"Seasonal agricultural calendar from PRADAN." (R14)*. Beyond agronomic practices, respondents highlighted limited understanding of agroecological value chains and government schemes as persistent gaps. Several farmers expressed frustration about fragmented or inaccessible information on public programs: *"Many farmers don't know about the Yojanas. If there was one place online or even one government person who can explain all schemes, it would be helpful." (R3).* In terms of the distribution of responsibility, responsibility was most often attributed to government institutions, followed by extension and education actors, and civil society organisations, particularly about training provision, information dissemination, and awareness-building around agroecological principles and practices. Producer groups and community-based organisations were viewed as playing a complementary role by facilitating peer learning and local knowledge diffusion, while individual producers were more commonly positioned as recipients of formal knowledge rather than as primary initiators of information flows.

2. **Skills and Practices:** The second behavioral domain identified by respondents concerns skills and practices, referring to the concrete on-farm and community-level actions required to operationalize agroecological principles. Across interviews and focus group discussions, stakeholders emphasized that while awareness of agroecology is growing, the transition ultimately depends on farmers' ability to apply specific practices such as preparing organic inputs, diversifying cropping systems, conserving soil and water, and reviving indigenous crop–livestock interactions. Farmers frequently described learning-by-doing processes through which new skills were acquired, often supported by NGO-led trainings and demonstrations. One producer explained: *"Earlier we used DAP and urea without knowing much… now we make jeevamrut and cow-dung based mixtures. Mainly classes from PRADAN and agriculture officers helped us" (R17)*. Others highlighted changes in cropping practices following training exposure: *"Before they used to grow just paddy, but now after learning from training, they try mustard and pulses too" (R14)*. These accounts indicate that skill acquisition is closely linked to experiential learning rather than abstract instruction. At the same time, extension agents and government officials noted uneven adoption of recommended practices, particularly where perceived economic or market risks

persist. A government agriculture officer observed: *"We advise farmers to rotate crops and intercrop with legumes for soil health, but many still continue mono-cropping because they don't want to risk the market".* This reflects how technical skills alone are insufficient when market and livelihood uncertainties remain unresolved. The distribution of responsibility within this domain reveals a hybrid pattern. Individual producers were consistently identified as the primary actors responsible for adopting and sustaining agroecological practices, particularly those related to organic inputs, crop diversification, intercropping, and regenerative farming. However, respondents simultaneously stressed that producers cannot enact these changes independently. Government agencies were viewed as responsible for enabling conditions such as funding for soil and water infrastructure, timely input provision, and alignment of schemes with agroecological practices while extension actors and CSOs were expected to provide continued technical support, demonstrations, and follow-up. Producer groups and community institutions played an intermediary role by facilitating collective learning and practice diffusion. For example, CRPs described reviving traditional millet seeds in selected villages, noting that farmers were more willing to adopt these practices when they observed peers succeeding under water-scarce conditions. In contrast, consumers and value-chain actors were rarely positioned as direct agents of change in this domain, reinforcing the perception that skills and practices remain largely a production-side responsibility, albeit one shaped by structural support systems.

3. **Social Norms and Gender Equity:** The domain of social norms and gender equity emerged as one of the most sensitive and complex areas of behavioral change. Respondents, particularly women, clearly identified gendered constraints affecting agroecological engagement, yet responsibility for changing these norms was far less clearly assigned than in other domains. Women respondents frequently described how agroecological practices intersect with entrenched household and community norms, shaping who controls land, labour, and decision-making. Several narratives pointed to gradual but uneven shifts: *"Before, women didn't even know the land was in their name. Now some are asking about patta and ownership." (FGD1*). Participation in SHGs was widely cited as a key entry point for such change, enabling women to build confidence, share knowledge, and engage in collective action: *"We formed SHGs because women were feeling isolated. Now we meet, discuss farming and savings, and speak openly." (R6).* At the same time, respondents emphasized that social norms often constrain agroecological practices indirectly, for example by limiting women's control over time, mobility, or crop choices. As one woman noted *"Before, my husband decided what to grow. Now we discuss together… since joining the Community Nutrition Garden group, I plant vegetables and millets myself." (FGD 1)* Despite these clearly articulated constraints, the V2A mapping reveals a notable pattern: no single actor group was consistently identified as responsible for changing gender norms. While CSOs were most frequently associated with this domain reflecting their role in gender training, SHG facilitation, and community mobilization respondents also pointed to households, communities, and governance bodies as relevant but without clear ownership. The findings therefore indicate that social norms function as a cross-cutting constraint within the ACT framework, primarily located in the social-relational subsystem but interacting strongly with governance and economic subsystems. Changes in women's participation, decision-making, and visibility often occurred indirectly, through collective

Who is expected to act? Target actors identified for behavioral change

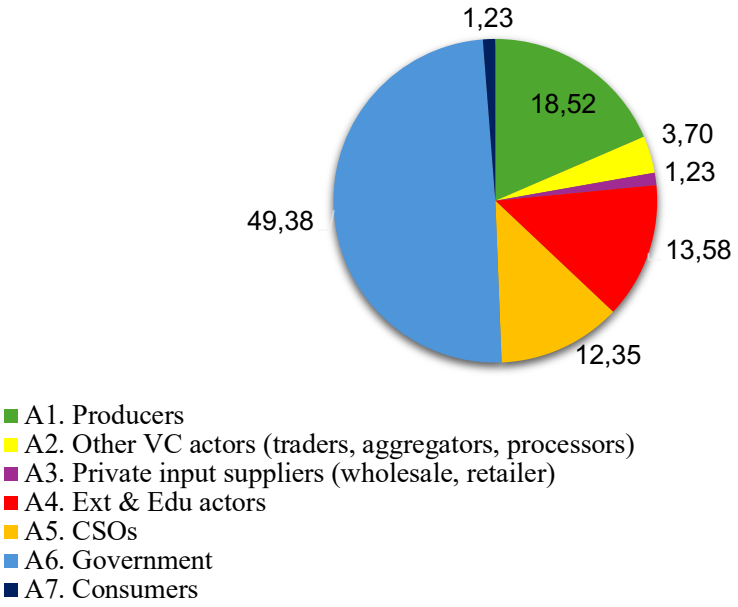

Figure 6: Pie chart with percentages shows the share of the 53 behavioral sub-categories for which each actor type was identified as a target.

action spaces such as SHGs, CNGs, and Gram Sabha participation: *"Now women go to Gram Sabha and ask questions. We also talk about schemes and who got what." (R1)*.

4. **Economic and Livelihood Opportunities:** Economic and livelihood opportunities emerged as a major area of concern across interviews and focus group discussions, even though respondents were often less explicit about who should act to address these challenges. Unlike domains such as skills and practices or knowledge and awareness, where responsibilities were more clearly attributed, economic issues were frequently described as structural problems that farmers experience but do not directly control. Respondents repeatedly raised concerns related to youth unemployment, lack of income opportunities within villages, weak market access, unfair pricing, and difficulties in marketing agroecological produce. These issues were often discussed as background conditions shaping agricultural decision-making rather than as behaviors that individual actors could easily change. Youth employment was commonly framed as a pressing problem, linked to outmigration and declining engagement in agriculture. Participants noted that farming alone does not offer sufficient or attractive livelihoods for young people unless it is combined with complementary income-generating activities: *"If there is no work in the village, youth will go outside. Agriculture alone is not enough." (FGD)*. the responsibility for creating employment opportunities, whether through agroecology-linked enterprises, value addition, or non-farm activities, was implicitly assigned to government programmes and institutions, particularly those responsible for rural development, skills training, and enterprise support. Market-related challenges were among the most frequently mentioned economic concerns. Farmers and producer-group members described difficulties in securing fair prices, dependence on intermediaries, and the absence of reliable demand for agroecological produce. While collective marketing was often mentioned as a potential

solution, respondents emphasized that such arrangements require coordination, infrastructure, and institutional support: *"Alone, farmers cannot bargain. Together we can try, but support is needed." (Producer group member)*. Overall, this domain is characterized by a strong articulation of problems and constraints, but a less explicit identification of change agents. Where responsibility was specified, it was overwhelmingly directed toward government actors, followed by CSOs and private value-chain actors.

5. **Governance, policy, and institutions:** Governance-related change priorities were overwhelmingly assigned to government actors, reflecting respondents' view that policy incentives, programme design, and institutional coordination sit largely outside farmers' direct control. Stakeholders repeatedly highlighted the need for more conducive policies, especially price and risk-support measures to make agroecological options viable: *"Farmers should get a support price for millets and pulses like for paddy from Government." (R1)* and *"If there are small incentives for natural farming, more people will adopt it." (R2)*. A second emphasis was on institutional coordination and implementation capacity. Respondents argued that more consistent advice and delivery would require better inter-departmental collaboration and regular multi-actor platforms, building on the positive experience of the V2A workshop: *"During the Vision to Action workshop, it was good that all actors sat together. Such joint meetings should happen regularly…" (R12). Capacity constraints were also framed as a structural bottleneck: "We have many schemes but too few field officers. One person covers several villages…" (R3).* Overall, this domain positions government actors as the primary change agent, with other actors playing supportive roles, while institutional gaps like staffing, coordination, and policy alignment shape whether agroecology can scale beyond isolated initiatives.

6. **Technology and infrastructure:** Technology and infrastructure were consistently highlighted but externally dependent enablers of agroecological transition. Respondents across actor groups expressed strong interest in adopting improved methods such as better irrigation systems, soil and water conservation tools, and storage facilities, but emphasized that these changes were beyond their individual capacity to achieve without institutional support. As one farmer put it, *"We can make compost and manage our fields, but we cannot build roads or storage on our own."* Infrastructure-related constraints identified in both qualitative interviews and quantitative data were among the highest-rated external barriers. Poor road connectivity, unreliable transport services, and limited storage facilities were described as directly affecting marketing and post-harvest management. *"Rainfall is causing problems during harvest season; Government should build more storage facilities,"* one respondent noted, underscoring the dependence on public investment for basic logistical support. Access to electricity, cell phone, and internet connectivity also emerged as persistent challenges es, particularly in remote or hilly villages where network coverage is weak. Limited digital access not only restricts farmers' ability to obtain market or weather information but also hampers extension follow-up and scheme awareness. Respondents identified both government and extension and education actors as the key change agents responsible for improving these enabling conditions. While some improvements such as solar irrigation or mobile-based advisory systems were discussed during workshops as promising, their adoption remained limited due to cost and

accessibility barriers. This pattern reinforces quantitative findings showing that infrastructure- and technology-related constraints score among the most significant external barriers. Overall, this domain demonstrates that while farmers display readiness to learn and adopt agroecological technologies, structural deficits in connectivity, logistics, and basic infrastructure continue to restrict what is practically possible. Respondents viewed progress in this area as primarily contingent on government investment, improved coordination among technical departments, and proactive extension delivery.

7. **Behavior reinforcement:** Respondents emphasized that for agroecology to become a lasting system rather than a short-term project, both everyday routines and institutional mechanisms must reinforce desired behaviors across multiple actor groups. At the household level, farmers and women's groups described efforts to make the use of bio-inputs and consumption of diverse, nutritious crops habitual rather than exceptional. As one respondent explained, *"People should consume more diverse and leafy vegetables so that nutrition improves locally it has to become a routine part of their farming system."* Regular SHG meetings for seed exchange and local marketing were also cited as examples of emerging collective practices: *"We, the SHG members, are already meeting once a month for our group discussions. Now we also try to bring seeds or products for exchange and marketing during these meetings."* Institutional reinforcement was discussed mainly in relation to public food and nutrition programmes, particularly the inclusion of locally produced agroecological foods in school meals. Several respondents mentioned ongoing discussions with Panchayats to make such linkages systematic: *"We want the millet and vegetables grown here to be used in school meals……., the Panchayat must approve and include them in the local program."* Unlike earlier domains where responsibility was concentrated among specific actors, this category showed the most even distribution of responsibility. Consumers, producers, CSOs, and government actors were all seen as playing interdependent roles. Farmers and SHGs in maintaining production and local supply; consumers in sustaining demand for diverse, healthy food; CSOs in awareness and mobilization; and government institutions in formalizing reinforcement through procurement and nutrition schemes.

Figure 6 summarizes how responsibility for behavioral change is distributed across actor groups within the seven behavioral domains identified through the V2A Behavioral Action Protocol. Government actors were most frequently identified (≈ 49%), followed by producers (≈ 19%), extension and education actors (≈ 14%), and civil society organizations (≈ 12%). Value chain actors and input suppliers were mentioned less often, reflecting their more indirect but still relevant roles in facilitating market and input-related transitions.

Figure 7 further disaggregates this distribution by behavioral domain. Government actors dominate governance, policy, and institutional domains, as well as technology and infrastructure-related behaviors, indicating that structural enablers of agroecological transition are widely perceived to lie within the public sector's mandate. Producers are primarily targeted in skill and practice changes, while extension and CSO actors play bridging roles in knowledge dissemination, awareness building, and gender-norm transformation. The distribution

highlights the recognition that agroecological transition requires coordinated action across multiple actor types.

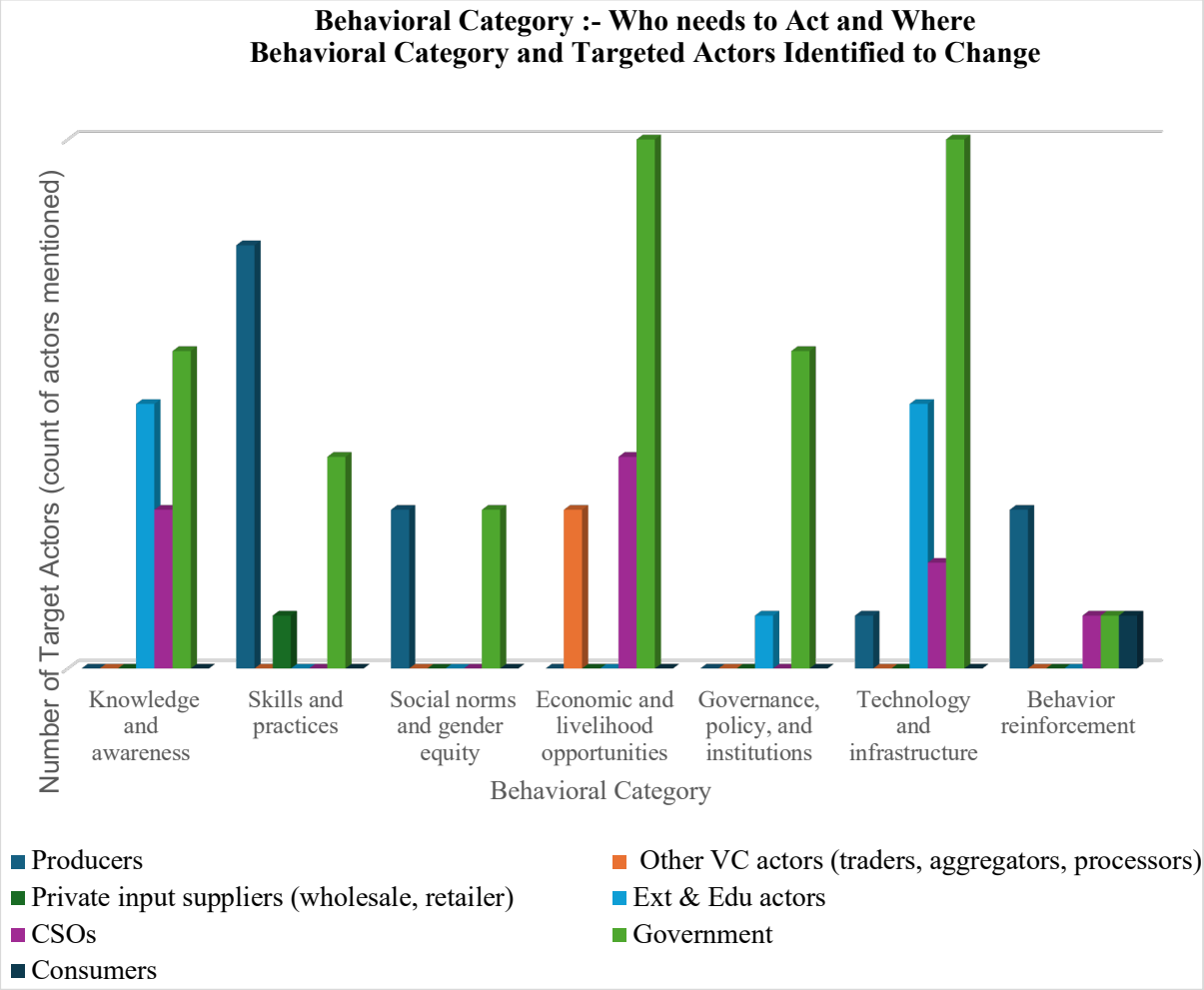

Figure 7: Bargraph shows the number of V2A behavioral categories for which each actor type was identified as a target within each behavioral domain.

5.2.3. Motivational Factors Influencing Change

When respondents reflected on why different actors might change their behaviour to support agroecological transition, they described a mix of intrinsic and extrinsic motivations. Across interviews and FGDs, motivations were rarely framed as purely individual; instead, they were linked to household well-being, community recognition, institutional mandates, and perceptions of economic risk. Intrinsic, normative motivations were very strong across all groups. Many respondents framed agroecology as a moral and environmental obligation: *"Soil is getting weaker year by year. We now know that we have to take care of the soil like our own health." (FGD-1)*. Women frequently connected agroecology with caring for their families' health and future generations, while NGO staff emphasised social justice and community well-being. Extrinsic motivations were more actor-specific. For producers, potential economic benefits (mainly lower input costs and some income opportunities) and recognition within the community were important. For women, new agroecological roles (e.g. as CRPs) also provided visibility and voice: *"Now I am CRP, I teach other women about organic farming. People listen to me." (R6)*. For government staff, motivations were more closely linked to scheme targets and departmental mandates. At the same time, some actors, especially private market

actors and a few officials, expressed skepticism that agroecology could become economically viable at scale, citing unreliable supply and weak consumer demand. Producers, in turn, highlighted risk aversion given uncertain yields and markets, many prefer to stay with familiar conventional practice

Actor Group	Specific Actions Required	Key Motivations	Key Barriers
Local Government (Panchayat, Gram Rozgar Sevaks)	Water infrastructure development; scheme monitoring and coordination; training and knowledge dissemination; local market linkages	Scheme targets; departmental mandates	Fragmented coordination; limited resources
State/District Government (Agriculture Dept, SRLM)	Organic input supply; policy incentives; MSP for agroecological produce; certification support; bio-input subsidies	Policy mandates; scheme implementation targets	Inter-departmental fragmentation; competing priorities
NGOs/CSOs (PRADAN, FES)	Training and capacity building; community mobilization; facilitation between policy and practice; knowledge intermediation	Social justice values; community well-being; normative commitment to sustainability	Funding dependence; limited scale
Producers/ Producer Groups	Adopt agroecological practices; organize collectives; share knowledge with peers; soil and water conservation	Lower input costs; health of family and soil; community recognition; intergenerational responsibility	Risk aversion; uncertain yields; market uncertainty; limited agency over structural factors
Market Actors/ Traders	Fair pricing; reduce intermediaries; create demand for agroecological produce; reliable procurement	Economic returns	Skepticism about viability; unreliable supply; weak consumer demand
Banks/Financial Institutions	Easier credit access; subsidized loans for agroecological inputs	Mandate fulfillment; portfolio targets	Risk perception; lack of agroecology-specific products
Consumers	Willingness to pay premium; awareness about agroecological products	Health consciousness; environmental concern	Low awareness; price sensitivity

Table 3: Actor groups, frequency of mentions, and summary of actions required for agroecological transition in Mandla

5.3. COLLECTIVE ACTION FOR AGROECOLOGICAL TRANSITION

Across interviews, FGDs, and field observations, respondents repeatedly described agroecological practices and related livelihood changes as being organized and sustained through collective structures. These included Self-Help Groups (SHGs), Community Nutrition Gardens (CNGs), Farmer Producer Organizations (FPOs), and Community Resource Person (CRP) networks. Rather than positioning behavior change as the responsibility of a single actor group, participants depicted collective action as a process that brings multiple stakeholders into interaction community groups, local governance institutions, NGOs, and government departments, often through routine meetings, joint implementation arrangements, and shared responsibilities.

5.3.1 Collective Mechanisms in Practice

Self-Help Groups (SHGs) emerged as the most referenced platform through which women collectively engage with agriculture, schemes, and local institutions. Beyond savings and credit, SHGs were described as spaces for information exchange, peer support, and coordinated engagement with Panchayat actors and government services. Women associated SHG participation with increased confidence and voice in public spaces: *"Before the group, I never spoke in front of others. Now I go to Panchayat meetings, I ask questions, I know my rights… at least some of them." (FGD-1)*. Respondents emphasized that the routine nature of meetings (often weekly or fortnightly) enables repeated interaction and shared decision-making around farming and livelihood issues.

Community Nutrition Gardens (CNGs) were described as a more structured collective model in which multiple actors contribute complementary roles. Respondents explained that land access is enabled through arrangements with Gram Panchayats, allowing landless women SHG members to obtain multi-year use rights to common lands (e.g., five-year tenure agreements). Within these gardens, women reported collective decision-making over what to grow, how to manage the plot, and how to use and sell outputs: *"This is our garden. We decide together… what vegetables, how much for home, how much to sell. Nobody tells us what to do." (FGD-1).* Technical support was frequently attributed to PRADAN and government departments (e.g., agriculture and horticulture) in the form of training and inputs, while nutrition linkages were sometimes described through Anganwadi workers and related local services. Respondents described these interactions as a combination of community leadership and external support rather than a single organization directing activities.

Farmer Producer Organizations (FPOs) were primarily described in relation to marketing and price realization, particularly for major crops such as paddy. Some respondents noted that while FPOs can support selling and bargaining, explicit alignment with agroecological practices was not always perceived: *"FPO helps with selling, getting better price for paddy. But they don't say grow organic or natural… they want quantity, whatever method." (R23)*. This indicates that participants often distinguished between collective action for market access and collective action for agroecological practice change.

Community Resource Persons (CRPs) were described as intermediaries connecting farmers and groups with institutional processes. CRPs were reported to support knowledge-sharing, mobilization, and scheme navigation, including helping community members understand processes and complete documentation. In FGDs, CRPs also described constraints affecting

their ability to support communities consistently, including workload and resource limitations. CRPs also identified constraints on their effectiveness: - inadequate remuneration, limited technical training, high workload relative to areas covered, and sometimes ambiguous relationships with both government departments and NGOs.

5.3.2. Reported Enablers of Collective Action

Participants identified several factors that, in their view, help collective mechanisms function effectively.

Peer learning and everyday reinforcement were repeatedly described as important in group settings, where members observe practices, exchange experiences, and gain confidence through seeing outcomes in nearby plots: *"When I saw xxxx didi's garden… so many vegetables, no chemicals…. I thought, if she can do it, why not me?" (FGD-1)*. In some cases, respondents described group participation as creating shared expectations that encourage continued involvement and adherence to decisions.

Division of roles and pooling of capacities were emphasized in accounts of how groups manage tasks. Respondents described distributing responsibilities such as record keeping, procurement, garden labor, and marketing based on members' skills and time: *"Alone, how can I do everything… keep records, go to market, work in garden? But together, each person does what they know best." (FGD-1)*. Such descriptions framed collective action to manage workload and combine different forms of knowledge.

Collective representation in local governance spaces was also highlighted. Women described attending Gram Sabha or Panchayat meetings as a group and perceived this as increasing their ability to raise demands and receive responses: *"Now we go to Gram Sabha together… ten, fifteen women. They have to listen. One woman alone, they ignore. Many women together, they cannot ignore." (FGD-2)*.

Reported changes in household decision-making were linked by participants to learning and confidence gained through collective participation. Some women stated that group involvement increased their role in agricultural decisions within the household*: "Earlier, my husband decided everything… what to plant, when to sell. Now I also give suggestions. He listens because I learned from the group, I know things." (FGD-2).*

5.3.3. Reported Frictions and Constraints

Respondents also described frictions within groups and constraints arising from institutional and resource conditions.

Internal group dynamics were presented as a source of challenge, particularly in accounts from a struggling CNG. Participants described misunderstandings about responsibilities, unequal labor contribution, and leadership tensions: *"Some women don't come regularly but want same share. This creates problems. We argue, then nobody wants to work." (FGD-2).* These accounts show that collective platforms do not operate uniformly across contexts and may vary based on participation patterns and decision-making processes.

Delayed or inconsistent institutional support was repeatedly described as undermining collective efforts even when groups were motivated. Respondents referred to delays in

MGNREGA wage payments, late delivery of seeds or saplings, and difficulties sustaining labor when households face immediate income needs: *"We did everything right… prepared land, planted on time. But water didn't come, wages didn't come. How long can we work without payment? … Our families need to eat." (FGD-2).* Water scarcity and limited irrigation infrastructure were also described as constraints that groups cannot resolve on their own.

Inter-departmental fragmentation was described by respondents across actor types as limiting convergence. A government respondent noted: *"Different departments work on the same issues… but don't talk to each other…" (R4).* Participants described agroecology-related efforts as spanning multiple sectors (agriculture, horticulture, livestock, water, forestry, nutrition), while coordination across these departments was often perceived as insufficient or ad hoc.

Extension and dissemination gaps were also raised in relation to the reach of trainings and demonstrations, especially for remote villages. One respondent described the distance and costs that discourage smallholders from accessing research or demonstrations: *"University research should come to fields, do demonstration plots, work with farmers." (R7)*. Several respondents observed that NGOs partially address these gaps through sustained facilitation but also noted limitations of coverage and staff capacity.

5.4. INTERPRETING RESULTS WITH THE ACT FRAMEWORK

5.4.1. Individual Behavioral Factors

The ACT framework identifies knowledge, motivations, and cognitive characteristics as individual-level determinants of behavior.

Knowledge

Knowledge emerged as both enabler and constraint. Respondents credited training from PRADAN and government departments for expanding their understanding: *"I feel more trainings and demonstration classes from Agricultural department and also from PRADAN helped in knowing about agroecology, community nutrition, organic farming, integrated pest management, water management" (R17, R18).* Farmers described acquiring specific technical knowledge, preparing jeevamrit, crop rotation benefits, soil health indicators, that expanded their perceived capacity to act.

However, knowledge gaps persist. Many respondents lacked awareness of government schemes*: "Many farmers don't know about the Yojanas. If there was one place online or even one government person who can explain all schemes, it would be helpful" (R3)*. Understanding of value chains remained limited: *"We don't know where to sell organic produce for better price. The middleman takes everything"* (FGD-4). The V2A mapping identified six knowledge-related changes (B1.1-B1.6) requiring action from extension actors, CSOs, and government, reflecting that knowledge constraints are structural rather than individual deficits.

Motivations

Intrinsic and normative motivations were universally strong. Statements like "agroecology is good for society," "good for the environment," and "the right thing to do" received near-unanimous agreement (mean ratings approaching 5.0). As one CRP expressed: *"We know this*

is the right way. Our grandparents farmed like this. It's about bringing back what we lost" (R15).

Economic motivations varied by actor position. Producers rated economic benefit expectations moderately (mean 3.33), while government officials rated them lower (mean 2.60) reflecting different structural relationships to outcomes. As one official noted: *"For us it's our job, our scheme target……For farmers it's their whole life, their family's food" (R2*).

Social recognition motivated action unevenly. Women SHG members particularly valued community acknowledgment: *"When other women see our CNG garden, they respect us. We are known now as the ones who grow good vegetables" (FGD-1).*

Perceived Behavioral Control

Perceived capacity varied dramatically by structural position. Producers expressed confidence in technical practices preparing bio-inputs, diversifying crops, composting but felt powerless regarding structural constraints: *"I can make jeevamrit, I can rotate crops. But water? Markets? Roads? That I cannot control" (R20)*. This disjuncture between technical self-efficacy and structural powerlessness indicates that the transition bottleneck lies not in individual cognition but in structural subsystems.

5.4.2. Structural Subsystems

The ACT framework identifies four structural subsystems- resource, economic, governance, and social-relational, that shape opportunity spaces.

Resource Subsystem

Water scarcity emerged as the dominant constraint, with respondents describing how water availability overrides all other considerations in agricultural decision-making. Financial limitations further constrained adoption, as agroecological transition involves short-term costs before long-term benefits materialize a temporal mismatch that cash-poor households struggle to absorb. Delayed MGNREGA wages compounded these cash constraints. Input access showed mixed patterns: seeds and saplings often arrived late, missing optimal planting windows, while gaps in tools, machinery, and storage infrastructure limited practice adoption.

Economic Subsystem

Market access barriers pervaded narratives, with producers consistently describing sales at unfavorable prices due to weak bargaining positions. Physical isolation compounds these difficulties, as transportation challenges waste time and reduce returns. Price uncertainty discouraged diversification, while MSP exists for paddy, millets and pulses lack equivalent price floors. Value chain disconnection limited returns, though collective marketing through FPOs offered a potential pathway to improved prices. The behavioral mapping concentrated economic changes with government and value chain actors rather than producers.

Governance Subsystem

Policy fragmentation characterized institutional arrangements, with multiple departments working on overlapping issues without coordination, resulting in inconsistent advice reaching farmers. Staffing inadequacy limits implementation, as field officers cover multiple villages without capacity for proper follow-up. Multi-stakeholder coordination remains episodic rather

than institutionalized, and policy incentives specifically supporting agroecological practices remain nascent.

Social-Relational Subsystem

Gender norms simultaneously constrain and are transformed through collective initiatives. Participation in SHGs and CNGs is reshaping household decision-making patterns, shifting from male-dominated choices toward joint deliberation. Women's visibility in public governance spaces has increased, with growing participation in Gram Sabha meetings and scheme monitoring. Caste and religious differences shape group dynamics subtly, while rarely foregrounded explicitly, pre-existing hierarchies influence leadership patterns and benefit distribution. Peer networks enable observational learning, as successful demonstrations by neighbors motivate adoption.

6. DISCUSSIONS

This chapter interprets the empirical findings in relation to the ACT framework and relevant literature to explain how agroecological transitions unfold in Mandla District. The discussion is organized around five analytical themes that emerged as central to behavioral change dynamics: (1) the interplay between agency and opportunity spaces, (2) mechanisms that expand or constrain transition possibilities, (3) how responsibility for change is distributed across actor types, (4) gendered pathways of transformation, and (5) implications for reimagining extension systems for systems-level change.

6.1. AGENCY AND OPPORTUNITY SPACES: UNDERSTANDING THE COORDINATION CHALLENGE

The empirical findings are consistent with the ACT framework's central premise that agroecological transition is fundamentally a multi-actor coordination challenge, in which behavioral change emerges from interactions between individual and collective agency and broader structural subsystems (Freed et al., 2025). The Mandla case illustrates how motivations, perceived behavioral control, and structural conditions interact to shape what actors perceive as possible, desirable, and viable.

6.1.1. Strong Motivations Meet Constrained Control

As reported in the Results (*Section 5.1.5, Figures 3-5*), environmental motivations, social motivations, and moral obligations received consistently high mean scores across respondents, indicating widespread normative commitment to agroecological principles. These finding challenges deficit-oriented narratives that attribute slow adoption to farmer ignorance, insufficient environmental awareness, or weak motivation (Gliessman, 2016; Prost et al., 2023). While knowledge gaps persist, particularly regarding government schemes, value chain dynamics, and certain technical practices, these are increasingly being addressed through SHG platforms, CRP networks, and NGO facilitation, as documented in the Results.

Instead, the findings indicate that constraints lie less in motivation or knowledge per se and more in perceived behavioral control over factors that extend beyond individual farm boundaries, including water availability, market access, input supply timing, and institutional responsiveness. As one producer articulated: *"I can make jeevamrit, I can rotate crops. But water? Markets? Roads? That I cannot control" (R20)*. This disjuncture between technical self-efficacy as confidence in performing specific agroecological practices and structural powerlessness limited influence over enabling conditions, suggests that the primary transition bottleneck operates at the systemic rather than the individual cognitive level. This pattern aligns with Dessart et al.'s (2019) meta-analysis, which identifies perceived behavioral control as a key predictor of adoption intentions in sustainable agriculture contexts. However, the Mandla case extends this literature by demonstrating that perceived control is not uniform but bifurcates into practice-level control (e.g. composting, diversification, non-chemical pest management) and system-level control (e.g. access to water, markets, and timely institutional support). Interventions that focus primarily on the former such as training programs premised on knowledge deficits risk overlooking the structural constraints that ultimately determine whether newly acquired practices can be sustained over time (Méndez et al., 2013; Wezel et al., 2020).

6.1.2. Opportunity Spaces as Outcomes of Structural Interactions

Within the ACT framework, opportunity spaces are understood as the range of actions actors perceive as feasible and worthwhile within their structural environment (Freed et al., 2025). The Mandla findings demonstrate that these opportunity spaces emerge from interactions across multiple structural domains rather than from any single enabling or constraining factor.

The consistent emphasis on water scarcity across interviews and FGDs (detailed in Sections 5.1.4 & 5.4.) exemplifies how resource constraints override other considerations. As articulated by multiple respondents, water availability determines fundamental cropping decisions regardless of technical knowledge or environmental motivations. This structural reality suggests that resource availability functions as a strong conditioning factor for practice adoption, consistent with Ostrom's (2009) framework emphasizing biophysical conditions in collective action outcomes.

Financial constraints, particularly the temporal mismatch between agroecology's upfront costs and delayed benefits, compound resource limitations. The documented delays in institutional support described in Section 5.4.3 exacerbate cash constraints precisely when households need liquidity most, creating pressure to abandon labor-intensive practices. This temporal dimension highlights why transition support cannot be episodic but must provide sustained resource flows aligned with agricultural calendars.

The findings also reveal how governance fragmentation with multiple departments operating without coordination, creates what might be termed coordination failures by design: seeds arriving after planting windows, wage payments delayed for months, scheme announcements occurring mid-season. As documented in Results (Section 5.4.3), these temporal mismatches systematically undermine even well-designed programs, illustrating how implementation capacity, not policy design alone, determines whether supportive frameworks translate into expanded opportunity spaces (López-García et al., 2021).

Rather than examining each structural subsystem in isolation, the key insight for understanding agency structure interactions in Mandla is that improvements in any single subsystem are insufficient when others remain constraining. Agroecological transformation requires synchronized changes across resource availability, market arrangements, governance coordination, and social relations, a coordination challenge that exceeds the capacity of individual farmers and, in many cases, even community-level collective action alone.

6.2. MECHANISMS THAT EXPAND AND CONSTRAIN OPPORTUNITY SPACES

Building on the agency–structure framework established above, this section examines the concrete mechanisms through which opportunity spaces for agroecological transition are expanded or constrained in Mandla. The findings reveal both enabling pathways and systemic vulnerabilities that help explain why transition processes unfold unevenly across contexts, groups, and actor types.

6.2.1. How Structural Subsystems Shape Possibilities

The four structural subsystems identified in the ACT framework namely resource, economic, governance, and social-relational, interact in ways that can either enable viable pathways for behavioral change or systematically block them.

Resource Subsystem Constraints

As documented in Results (Section 5.4.2.), water scarcity emerged consistently across all data sources and received among the highest constraint ratings in quantitative assessments. The findings suggest water availability acts as a particularly binding constraint because it determines fundamental cropping decisions regardless of other factors. Financial constraints compound these resource limitations, with the temporal mismatch between agroecology's upfront costs and delayed benefits creating challenges for cash-poor households. The documented delays in MGNREGA wage payments exemplify how resource subsystem failures even when policies exist on paper can force premature abandonment of practices.

Economic Subsystem Barriers

Market-related constraints manifested through multiple channels: absent price differentiation for agroecological produce in local markets, weak collective bargaining power relative to middlemen, and limited processing infrastructure. As shown in the V2A behavioral mapping (Figure 7, Section 5.2.2), respondents concentrated economic-domain changes with government procurement agencies and value chain actors rather than producers themselves. This distribution pattern suggests recognition that market structures lie beyond individual farmer control, aligning with IPES-Food's (2016) argument that agroecological transitions require fundamental restructuring of market arrangements, not merely better farmer education about market opportunities.

Governance Subsystem Fragmentation

The documented pattern of institutional fragmentation with agriculture, horticulture, livestock, forestry, and water departments operating without coordination creates what might be termed systematic coordination failures. The temporal mismatches described in Results illustrate how implementation capacity determines whether supportive frameworks translate into expanded opportunity spaces (López-García et al., 2021). When seeds arrive after planting windows or wage payments delay for months, even well-intentioned policies fail to expand farmers' opportunity spaces.

Social-Relational Subsystem Dynamics

The social-relational subsystem operates with complexity in Mandla. On one hand, Results (Section 5.4) documented how SHGs, CNGs, and CRP networks create new opportunity spaces through resource pooling, peer learning, and collective voice. On the other hand, pre-existing social hierarchies continue to shape participation patterns, knowledge validation, and benefit distribution. The findings suggest women's SHGs may experience somewhat different dynamics than mixed-gender organizations, possibly due to greater internal solidarity and clearer targeting, though elite capture risks persist (Agarwal, 2001; Meinzen-Dick et al., 2004).

These subsystem interactions illustrate the ACT framework's systems perspective: improvements in one domain (e.g., providing better seeds) generate limited impact when other subsystems remain constraining (e.g., when water scarcity makes improved varieties irrelevant).

6.2.2. Opportunity-Expanding Mechanisms

Institutional convergence around Community Nutrition Gardens (CNGs) exemplifies how coordinated multi-actor support can expand opportunity spaces. The CNG model integrates multiple elements simultaneously: (i) land access negotiated through Gram Panchayats, often via five-year tenure agreements on common land; (ii) wage support through MGNREGA for garden establishment and maintenance; (iii) input provision via agriculture and horticulture departments; (iv) technical training facilitated by PRADAN and government extension; and (v) nutrition linkages through Anganwadi workers. This convergence addresses multiple constraints like land, labor, inputs, and knowledge, thereby creating viable pathways for landless women to engage in agroecological production.

However, the CNG model's success depends critically on sequencing and reliability. When land tenure remains insecure, women hesitate to invest labor; when wage payments arrive late, households cannot sustain participation; when inputs miss planting windows, the entire season fails. As one struggling CNG member described: *"We did everything right... prepared land, planted on time. But water didn't come, wages didn't come. How long can we work without payment? Our families need to eat" (FGD-2).* This illustrates that convergence alone is insufficient; institutional responsiveness timely, predictable, aligned support determines whether convergence creates sustainable opportunity spaces or temporary, fragile arrangements.

Peer demonstration and observational learning emerged as powerful mechanisms for risk reduction and practice diffusion. The CRP model enables community members to observe agroecological practices under local conditions, ask questions in vernacular languages, and receive follow-up support within walking distance. As one farmer explained: *"When I saw [neighbor's] garden... so many vegetables, no chemicals... I thought, if she can do it, why not me?" (FGD-1).* This dynamic aligns with social learning theory's emphasis on vicarious reinforcement and modeling effects (Bandura, 1997), demonstrating that seeing peers succeed reduces perceived risk more effectively than external expert advice alone.

However, the social learning mechanism functions unevenly. Successful demonstrations require (i) sufficient similarity between demonstrator and observer (socio-economic status, land type, water access) to ensure perceived transferability; (ii) visible, timely results that contradict skeptics' claims about inevitable yield losses; and (iii) trusted relationships enabling honest discussion of challenges, not just successes. When these conditions align, peer networks accelerate diffusion; when they fragment, due to caste divisions, wealth disparities, or gender exclusions learning remains localized (Pretty & Ward, 2001).

Task division and risk pooling within collective groups enable labor-intensive agroecological practices to become viable. As one SHG member explained: "Alone, how can I do everything... keep records, go to market, work in garden? But together, each person does what they know best" (FGD-1). This functional specialization allows groups to access skills (literacy for record-

keeping, numeracy for accounting, marketing savvy for price negotiation) that individual members may lack. Simultaneously, collective arrangements distribute risk: if one household faces a health emergency forcing temporary withdrawal, others can cover; if one crop fails, diversified production across members buffers overall group returns.

6.2.3. Opportunity-Constraining Mechanisms

Temporal mismatches between agricultural calendars and institutional timelines emerged as a particularly systematic constraint. As documented in Results (Section 5.4.), these coordination failures such as seeds arriving post-sowing, work approvals delayed, scheme announcements occurring mid-season compound regardless of farmer motivation or technical capacity. This structural rigidity illustrates how governance subsystems organized around administrative convenience rather than agronomic logic actively contract opportunity spaces (Gluns, 2019).

Market failures manifest through multiple channels documented in Results. While respondents identified government procurement (Mid-Day Meal schemes, ICDS, PDS) as potential solutions, current practice rarely sources from local agroecological producers. This disconnect represents what might be termed a structural opportunity gap: public institutions purchase precisely the foods that agroecological systems produce (vegetables, millets, pulses) yet procure through conventional channels that reward volume and uniformity over nutritional diversity or ecological production methods (Ruel et al., 2018). The absence of certification infrastructure for agroecological produce further constrains opportunities. While Participatory Guarantee Systems (PGS) theoretically offer low-cost certification, implementation in Mandla remains nascent. Without credible quality assurance mechanisms, the familiar cycle persists urban consumers hesitate to pay premiums; without premiums, producers lack economic incentives to maintain labor-intensive practices; without consistent supply, markets fail to develop, preventing market differentiation despite stated consumer preferences for organic products (IPES-Food, 2016).

Coordination failures across organizational boundaries limit the potential of otherwise well-designed institutions. As documented in Results, SHGs focused on savings-credit, FPOs handling marketing, CRPs providing technical support, and Gram Panchayats managing water and land often operate in parallel with limited coordination. The findings suggest that successful transitions require bridging mechanisms that connect these organizational silos. The V2A workshop temporarily created such bridging, but as respondents noted, sustaining multi-stakeholder coordination beyond episodic events remains challenging (Termeer et al., 2010).

6.3. REDISTRIBUTION OF RESPONSIBILITY ACROSS THE FOOD SYSTEM

The V2A behavioral mapping (Figure 6 & 7) empirically validates a core ACT framework principle: expecting producers alone to drive transformation is unrealistic when structural changes lie beyond their control (Freed et al., 2025). Across the 53 identified behavioral changes, government actors were assigned responsibility for 49%, producers for 19%, extension and education actors for 14%, and civil society organizations for 12%. This distribution highlights how responsibility for transition is unevenly allocated across domains and actor types.

6.3.1. Structural Changes Require Institutional Actors

For governance, technology and infrastructure, and economic systems, government actors emerged predominantly as primary change agents in the V2A mapping (Appendix D). This pattern reflects respondents' recognition that policies, procurement systems, infrastructure, and inter-departmental coordination sit beyond producer capacity to influence directly. However, the findings suggest that current governance arrangements often invert this logic. Producers are expected to "adopt improved practices" while the structural enablers like reliable water, fair markets, synchronized support, remain unaddressed. This misalignment between responsibility and capacity creates what might be termed a predictable implementation gap: motivated producers attempt adoption, encounter structural barriers, abandon practices, and subsequently face narratives about "lack of willingness to change" an attribution pattern that obscures systemic failures (Gliessman, 2016).

The ACT framework directs analytical attention toward sequencing: structural changes that expand opportunity spaces should precede or accompany behavioral changes that require those expanded spaces. The Mandla findings suggest prioritizing: (i)"outside-in enablement": institutional actors establishing irrigation access, procurement guarantees, synchronized input supply, and coordinated extension before scaling practice adoption; followed by (ii) "inside-out diffusion": peer learning, group norms, and household decision-making processes scaling practices once enabling conditions exist. Reversing this sequence, demanding practice change without structural support, may produce limited, fragile adoption concentrated among resource-endowed households able to absorb transition risks (Prost et al., 2023).

6.3.2. Knowledge Systems Require Bridging Actors

For knowledge and awareness and skills and practices, (responsibility in the V2A mapping distributed across extension agents, civil society organizations, and producer groups. This multi-actor configuration reflects agroecology's knowledge-intensive, context-specific character that resists standardized technology transfer approaches (Mier y Teran G.C. et al., 2018).

The CRP model, as documented in Results (Section 5.3.1), represents what might be understood as a bridging mechanism: community members trained and supported by NGOs/government become embedded knowledge facilitators. This hybrid model appears to leverage both formal extension knowledge and experiential local knowledge, creating what Méndez et al. (2013) term "transdisciplinary knowledge spaces" where scientific and traditional ecological knowledge potentially co-create solutions. As documented in Results (Section 5.3.), CRP effectiveness depends on adequate support: compensation enabling sustained engagement, continued technical training, recognition by formal extension systems, and manageable coverage areas. When these conditions erode, the model's functioning appears to weaken.

6.3.3. Social Norm Change Requires Distributed Responsibility

Social norms and gender equity showed the most diffuse responsibility patterns in the V2A mapping, with no single actor group consistently identified as primary change agent. This pattern reflects the complexity of normative change, which the findings suggest operates simultaneously at household (intra-family decision-making), community (public recognition of women's agricultural contributions), and institutional (policy frameworks supporting

women's land rights, extension access, credit access) levels. As documented in Results women's SHGs and CNGs appear to function as spaces where alternative norms can develop with some protection from dominant patriarchal structures. Within these spaces, women practice capabilities that gradually influence household dynamics. However, the findings also indicate that this transformation remains conditional and contested, a point elaborated in Section 6.4.

6.4. GENDERED PATHWAYS: FROM PARTICIPATION TO DECISION-MAKING

The findings reveal how women's collective action through SHGs and CNGs creates pathways toward empowerment, while simultaneously exposing structural fragilities that leave women vulnerable when external support fails.

6.4.1. Collective Platforms as Sites of Transformation

Women's SHGs function as more than microfinance mechanisms; they create organizational infrastructure through which women access land (via Panchayat negotiations), inputs (through scheme convergence), knowledge (via training and peer exchange), markets (through collective selling), and public voice (joint Gram Sabha participation). This multi-functionality distinguishes successful SHG models from narrower interventions targeting single dimensions (World Bank, 2020). CNGs specifically link agricultural production to household nutrition and women's decision-making authority. By situating vegetable production on collectively managed plots, CNGs circumvent some patriarchal controls over household farmland while demonstrating women's technical competence. The emphasis on nutrition provides culturally legitimate justification for women's agricultural engagement: "feeding children properly" carries moral authority that "increasing farm income" may not in contexts where men traditionally control cash crops (Ruel et al., 2018).

Collective representation amplifies voice: *"Now we go to Gram Sabha together... ten, fifteen women. They have to listen. One woman alone, they ignore. Many women together, they cannot ignore"* (FGD-2). This strategic use of numbers overcomes individual marginalization, creating pressure for institutional responsiveness. Some women described shifts in household decision-making where SHG participation-built confidence subsequently exercised at home: *"He listens now because I learned from the group, I know things" (FGD-2)*.

6.4.2. Conditional Empowerment and Structural Vulnerability

Yet the findings indicate this transformation remains structurally conditional. As documented in Results (Section 5.3.3), when MGNREGA wages arrive on time, CNGs provide dignified income and nutrition; when payments delay for months, women work unpaid while facing family criticism. When adequate water exists, vegetable production validates women's agricultural knowledge; when borewells fail, gardens wither and women's efforts may appear futile. When surplus produce finds markets, economic returns justify time reallocation; when markets don't differentiate organic vegetables, women's labor generates minimal returns. This conditional empowerment reveals a tension that may be inherent in development interventions: they position women's collective action as both means (pathway toward broader agroecological transition) and end (intrinsically valuable for gender equity). When structural support systems function, these objectives potentially align to successful CNGs simultaneously advance agroecology and women's empowerment. When structural systems fail, trade-offs may emerge:

should women continue labor-intensive agroecological practices despite minimal returns? Should SHGs redirect efforts toward more immediately remunerative activities?

The findings suggest that sustainable empowerment may require not just creating spaces for women's collective action, but ensuring those spaces are undergirded by reliable structural support: (i) time-saving technologies accessible through collective procurement, reducing labor burden; (ii) transparent remuneration through direct benefit transfers rather than delayed payments; (iii) predictable procurement allowing women to plan labor allocation; and (iv) institutional recognition of women's agricultural knowledge and contributions. These considerations may be not merely equity issues but instrumental conditions for adoption sustainability (Sachs et al., 2016).

6.4.3. Intersectionality and Differentiated Experiences

Within the category "women," substantial heterogeneity exists. Landless women accessing CNGs on common land face different constraints than landed women with household plots. Scheduled Tribe women navigate distinct cultural norms and development marginalization than upper-caste women. Younger women with education encounter different household negotiations than elderly women with traditional authority. These intersecting identities shape who participates, whose knowledge gets valued, what practices get adopted, and how benefits distribute (Agarwal, 2001).

The findings provide limited systematic analysis of such intersectionality, reflecting methodological limitations of small sample sizes and abbreviated fieldwork periods. Future research should explicitly examine how caste, class, age, education, and landholding status mediate women's experiences of collective action and agroecological engagement in marginalized contexts like Mandla.

6.5. FROM TRAINING TO TRANSFORMATION: REIMAGINING EXTENSION SYSTEMS

The findings suggest that a fundamental reorientation of extension systems is required from a narrow focus on “training farmers” toward a broader role of “organizing systems.” Conventional extension approaches primarily target individual knowledge deficits through linear technology transfer (Anderson & Feder, 2007). However, the Mandla case demonstrates that such approaches are insufficient when adoption constraints lie not in farmer awareness, but in market structures, water infrastructure, policy coordination, and institutional responsiveness.

6.5.1. Four Core Functions for Systems-Oriented Extension

1. Brokerage and Scheduling

Rather than functioning solely as technical advisors, extension actors emerge in the findings as potential brokers who can convene multi-stakeholder platforms at village and block levels to align institutional resource flows with agronomic calendars. This role requires facilitation and coordination skills such as managing multi-actor meetings, negotiating priorities, and building consensus, alongside technical expertise. Concrete activities include mapping crop calendars, tracking scheme delivery timelines, identifying temporal mismatches (for example, seed distribution occurring after sowing periods), negotiating adjustments with relevant departments, and establishing regular coordination reviews. Several respondents noted that the

V2A workshop temporarily fulfilled this brokerage function: *"During the Vision-to-Action workshop, it was good that all actors sat together. Such joint meetings should happen regularly, not just once" (R12)*. The challenge, as the findings indicate, lies in institutionalizing such coordination beyond project-based or one-off events and embedding it within routine governance structures (Belcher et al., 2024).

2. Territorial Coordination

The evidence further suggests the limitations of sectoral extension models, in which agriculture, horticulture, livestock, and fisheries operate independently. Households in Mandla pursue diversified livelihood strategies that require integrated support across sectors. A territorial approach to extension would therefore emphasize cross-departmental coordination, identification of complementarities (for example, linking livestock manure to compost production), reduction of contradictory advice (such as simultaneous promotion of organic practices and chemical fertilizer subsidies), and support for households navigating multiple schemes coherently. The Madhya Pradesh State Rural Livelihoods Mission (SRLM) emerged in the findings as a potential institutional anchor for such coordination, given its existing relationships with SHGs, village organizations, and block administrations. However, the current SRLM focus on microfinance and livelihood diversification could be expanded to encompass agroecological transition coordination, function extension systems rarely perform but which the evidence suggests is increasingly critical (HLPE, 2019).

3. Evidence Generation for Adaptive Management

Agroecology's context-specific and knowledge-intensive character requires continuous observation, experimentation, and adaptation rather than fixed technical prescriptions (Gliessman, 2016). The findings indicate that extension systems could play a facilitative role in participatory monitoring using simple, locally meaningful indicators. Examples include soil cover duration (mulching effectiveness), water retention after rainfall (soil health), input cost trajectories (organic versus chemical expenditures), pest-predator ratios (biological control), and crop diversity measures (system resilience). Several CRPs described early forms of such practices: *"We started marking which plants get less pest attack… then we try to understand why… and we share with other farmers" (R15).* Scaling these efforts would require training in basic observation protocols, simple data recording, collective interpretation spaces, and recognition of farmers as knowledge producers rather than passive recipients (Méndez et al., 2013).

4. Value Chain Literacy

The findings also highlight the need for support beyond production, particularly in navigating complex value chains. Producers require assistance in interpreting quality standards (including organic certification), understanding seasonal price dynamics, negotiating contract terms, and accessing reliable market information. Extension's role, as suggested by the data, includes demystifying market processes, strengthening negotiation capacity, and linking producer groups with institutional buyers. As one FPO member explained: *"We didn't understand why urban buyers want certain size vegetables, reject others. Now PRADAN explained to us, we adjust planting to meet market preference" (R23)*. This form of value chain literacy differs markedly from classic production-focused extension and requires market knowledge, business skills, and facilitation capacities, areas where civil society organizations currently play a

prominent role, and where public extension systems remain comparatively weak (Markelova et al., 2009).

6.5.2. Capacity Implications

Reimagining extension systems toward a systems-organizing role implies a shift in required competencies. The findings point to the importance of facilitation skills (multi-stakeholder convening, conflict mediation, consensus building), systems thinking (understanding interdependencies and feedback loops), institutional navigation (knowing which departments control which resources and how to access schemes), market knowledge (value chains, quality standards, price formation), and participatory methods (farmer-led experimentation, community monitoring, and horizontal learning) (HLPE, 2019). Current extension training, which emphasizes technical agronomy, leaves many agents ill-equipped for these broader functions. Respondents themselves articulated this gap clearly: *"Extension officer shouldn't just tell farmers what to do. They should connect farmers to resources, to each other, to markets. They should organize, not just advise" (R6)*. Together, these insights suggest that extension reform is not merely a technical challenge, but an institutional and professional transformation aligned with the systemic nature of agroecological transitions.

6.6. LIMITATIONS AND METHODOLOGICAL REFLECTIONS

This study has several limitations that should be acknowledged when interpreting the findings. Reflecting on these limitations is essential not to weaken the results, but to clarify their scope, validity, and potential directions for future research.

6.6.1. Temporal and Design Limitations

The study employed a cross-sectional qualitative research design, capturing agroecological transition dynamics at a single point in time, approximately one year after the Vision-to-Action (V2A) workshop. While this design enabled in-depth analysis of perceptions, motivations, and institutional interactions, it limits insights into temporal processes. It cannot fully capture how motivations and constraints evolve across multiple agricultural seasons, whether early adopters influence wider diffusion over time, or how structural changes such as policy reforms and infrastructure investments reshape opportunity spaces. Agroecological transitions are inherently long-term and nonlinear processes, often involving delayed ecological and social feedback. Longitudinal research tracking the same households, collective groups, and institutional arrangements over three to five years would provide richer understanding of behavioral trajectories, learning dynamics, and feedback loops (Markiewicz-Keszycka et al., 2025).

6.6.2. Sampling and Generalizability Constraints

Purposive sampling was used to prioritize actors already engaged with agroecological initiatives, including farmers, SHG members, CRPs, NGO staff, and government officials. While this approach was appropriate for exploring transition processes in depth, it may underrepresent the perspectives of non-adopters or disengaged actors whose views could reveal additional barriers, resistance dynamics, or alternative framings of agroecology. The sample size (23 interviews and 4 FGDs) enabled analytical depth and triangulation but limits statistical generalizability. Instead, the findings offer theoretical and analytical transferability to contexts sharing similar characteristics—such as marginalized or marginal regions with limited market integration, fragmented institutional support, and active civil society facilitation. They should

not be mechanically extrapolated to contexts with fundamentally different structural conditions, including peri-urban areas, regions with strong commercial market integration, or settings lacking NGO involvement (Yin, 2014).

6.6.3. Actor Coverage Gaps

Although the study engaged a wide range of stakeholder categories, it did not systematically include consumers, input suppliers, or private market intermediaries. These actors play important roles in shaping market incentives, price formation, and demand for agroecological produce, yet they often operate beyond Mandla's immediate locality. The relatively limited identification of consumers and private actors as change agents in the V2A behavioral mapping (Figure 7) may therefore reflect both a sampling limitation and the current peripheral positioning of these actors within local agroecological transition efforts. Future research could address this gap through value-chain analysis, consumer studies, or multi-sited ethnographic approaches that trace agroecological products from production to consumption (Mockshell et al., 2026).

6.6.4. Translation and Positionality Effects

Interviews and FGDs were conducted primarily in Hindi and Gondi and subsequently translated into English. Despite careful verification and cross-checking, some nuance, emphasis, or culturally embedded meanings may have been altered in translation. The researcher's positionality as an international student from southern India may also have influenced data generation, particularly in relation to politically sensitive topics such as caste relations, government scheme performance, or intra-group conflicts. While efforts were made to mitigate these effects through reflexive practice, prolonged field engagement, and triangulation across interviews, FGDs, participant observation, and document review, such influences cannot be fully eliminated (Hollweck, 2016). Acknowledging these dynamics is essential for transparent interpretation of the findings.

7. CONCLUSION

This thesis examined the behavioral dynamics underlying agroecological transition in Mandla District, Madhya Pradesh, using the ACT framework as an analytical lens. Drawing on 23 semi-structured interviews and four focus group discussions with farmers, community resource persons, extension agents, civil society organizations, and government officials, the study addressed three central questions: what motivates or constrains actors' engagement with agroecology, who the critical change agents are beyond farmers, and how collective action shapes transition pathways.

7.1. CORE FINDINGS

The findings demonstrate that agroecological transition in Mandla is fundamentally a multi-actor coordination challenge, rather than a problem of farmer motivation or awareness. Across actor groups, environmental and social motivations were consistently strong, indicating broad normative support for agroecological principles. However, adoption and sustained practice were constrained primarily by structural conditions beyond individual farm boundaries, including unreliable water access, delayed wage payments, weak market differentiation for agroecological produce, fragmented governance arrangements, and misaligned institutional timelines.

Applying the ACT framework revealed that opportunity spaces for agroecology are structurally produced. Even highly motivated and knowledgeable producers were unable to sustain practices when institutional support failed or arrived too late. This confirms that behavioral change emerges from the interaction between agency and context, rather than from individual choice alone. A second key finding concerns the redistribution of responsibility across actor types. The V2A behavioral mapping showed that while producers are central to on-farm practice changes, most required behavioral changes relate to governance, infrastructure, markets, and knowledge systems, domains largely controlled by government institutions, civil society organizations, and extension systems. Expecting farmers to drive transformation without corresponding structural reform risks reinforcing implementation gaps and attributing failure to individual actors rather than systemic constraints. Third, the study demonstrates that collective action is central to agroecological transition. Platforms such as Self-Help Groups, Community Nutrition Gardens, and Community Resource Person networks expanded opportunity spaces by pooling resources, sharing risk, enabling peer learning, and amplifying collective voice in governance arenas. These collective structures partially compensated for deficits in markets, infrastructure, and extension. However, their effectiveness remained conditional on reliable institutional support, highlighting the fragility of grassroots initiatives in the absence of coordinated state action.

Finally, the findings highlight gendered pathways of transformation. Women's participation in SHGs and CNGs enhanced decision-making power, public visibility, and confidence, linking agroecology to nutrition and household well-being. At the same time, women disproportionately absorbed the costs of institutional failure, such as delayed payments or water scarcity. Gendered empowerment thus emerged as both a real achievement and a structurally contingent outcome.

7.2. THEORETICAL AND METHODOLOGICAL CONTRIBUTIONS

This thesis contributes to agroecology and behavioral change literature in three ways. First, it empirically operationalizes the ACT framework in a low-resource, marginalized context, demonstrating its value for analyzing food system transitions as coordination challenges rather than adoption problems. Second, it extends behavioral scholarship by showing that perceived behavioral control differs between practice-level capabilities and system-level constraints, with the latter emerging as the primary bottleneck. Third, it demonstrates the analytical value of combining inductive qualitative inquiry with structured behavioral mapping to capture multi-actor interdependencies. Methodologically, the study highlights the importance of multi-stakeholder sampling in transition research. Including government actors, civil society organizations, and community intermediaries alongside farmers revealed interdependencies that would remain invisible in farmer-centric studies.

7.3. LIMITATIONS AND FUTURE RESEARCH

The study's cross-sectional design captures transition dynamics at a single moment, limiting insight into longer-term trajectories and feedback loops. The focus on engaged actors may underrepresent perspectives of non-adopters, while limited inclusion of consumers and private market actors constrains analysis of demand-side dynamics. Future research should adopt longitudinal and comparative designs, incorporate value chain actors, and explore how institutional reforms alter opportunity spaces over time.

7.4. CONCLUDING REMARKS

Agroecological transition in Mandla is neither a technical problem nor a motivational one. It is a coordination problem that requires aligning institutions, markets, resources, and collective capacities. The findings underscore the need to shift the analytical and policy question from how to change farmers to how to change the conditions under which farmers act. By illuminating the behavioral and structural dynamics shaping agroecological transition, this thesis contributes empirical evidence and analytical tools to inform more just, effective, and sustainable food system transformation efforts.

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APPENDICES

Appendix A: Consent Form

Informed Consent for Participation in the Study "Understanding Behavioral Change and Collective Action in Agroecological Transitions in Mandla"

Hello, my name is Vrindaja Vikram. I am an intern at the International Food Policy Research Institute (IFPRI), conducting this study as part of my internship and master's thesis research at the University of Hohenheim, Germany. This research is in collaboration with IFPRI and the ATSAF-JST program. This study aims to understand stakeholders' perceptions, motivations, and barriers to agroecological transitions. It also explores the role of collective action in facilitating these changes. The research involves interviews with farmers, community groups, and other key stakeholders in Mandla. You have been selected to participate because of your role as a stakeholder in Agroecology in this region. Your participation will help us gain valuable insights into how agroecological practices can be promoted and supported in Mandla.

- The interview will take approximately 1–1.5 hours of your time.
- During the interview, we will ask about your experiences, perceptions, and opinions regarding agricultural practices and agroecological transitions.
- Your participation is entirely voluntary, and you may withdraw at any time without any consequences.
- The interview may be recorded to ensure accuracy.
- All collected data, including recordings, will be stored securely and used only for research purposes.
- Your responses will remain confidential, and your identity will be anonymized in any reports or publications.
- Photos or other materials may also be collected but will only be used with your permission.
- Do you have any questions about this study?

Consent Form

1. Do you consent to participate in this study?

[ ] Yes [ ] No

2. Do you consent to the recording of this interview?

[ ] I authorize the recording of the interview.

[ ] I do not authorize the recording of the interview.

Consent Declaration:

By signing below, you agree to participate in the study and confirm that you have understood the purpose, process, and voluntary nature of your participation.

Participant's Name: _____
Participant's Signature: _____
Date: _____
Interviewer's Name: _____
Interviewer's Signature: _____

Withdrawal of Consent: If you wish to withdraw consent, please complete the form below:
I, _____, wish to withdraw from the study.
Signature: _____
Date: _____

Appendix B: Interview Guide

Guiding Questions for Stakeholder Interviews: (Note: These questions are only guiding questions. In the actual interview, the questions and sequence will depend on the respondent's answers and follow-up questions.)

Section 1: Introduction and Context Setting

1. Could you please introduce yourself.
2. Name:
3. Age group:
4. Gender:
5. Can you tell me about your role in the agricultural sector in Mandla?
6. Have you participated in the Vision to Action (V2A) Workshop (2023)?
7. Explain what V2A Workshop is: for Sec 4.

Section 2: Understanding Agroecological Perceptions

8. As per the definition provided, how do you view the differences between agroecological practices and traditional agricultural methods?
9. If agroecology were practiced more broadly in Mandla, would you see any benefits related to it?
10. If yes, which benefits do you see?
11. If agroecology were practiced more broadly in Mandla, would you see any disadvantages or costs related to it?
12. If yes, which specific disadvantages or costs do you see?
13. Which actions do you take that contribute to changing agriculture in Mandla towards what we described as agroecology?

Section 3: Understanding Own Actions Identified by the Respondent

1. What are your main motivations for taking these actions?
2. Do you feel constrained or hampered in your efforts to take these actions?
    i. If yes, do you lack any resources (financial, tools, skills, or knowledge)?
    ii. Which contextual factors most strongly support or hinder your efforts?
3. Closed Questions on Motivations and Constraints: Please tell me how far you agree or disagree with the following statements (on a scale from 1 = Strongly Disagree to 5 = Strongly Agree):
    i. I hope to gain tangible economic benefits from the *actions outline above* contributing to agroecological changes in Mandla.
    ii. I believe, taking the *actions outline above* it makes my life safer to take actions contributing to agroecological changes in Mandla.
    iii. I believe it is good for society to take the *actions outline above* contributing to agroecological changes in Mandla.
    iv. I believe it is good for the environment to take the *actions outline above* actions contributing to agroecological changes in Mandla.
    v. I believe that people who matter to me would praise me for taking the *actions outline above* actions contributing to agroecological changes in Mandla.
    vi. I just think it is the right thing to do to take the *actions outline above* actions contributing to agroecological changes in Mandla.
    vii. I feel constrained by financial resources to take the *actions outline above* actions contributing to agroecological changes in Mandla.
    viii. I feel constrained by the lack of tools, machinery, or equipment needed for taking the *actions outline above* agroecological practices.

ix. I feel constrained by limited time to take the action outlined above actions contributing to agroecological changes in Mandla.
x. I feel constrained by a lack of knowledge or skills to implement agroecological practicestake the *actions outline above*
xi. I feel constrained by limited access to natural resources (e.g., land, water) needed for agroecological practices to take the *actions outline above*.
xii. I feel constrained by a lack of connections to other actors or networks supporting agroecological changesto take the *actions outline above*.
xiii. The overall economic situation and market environment make it difficult to adopt agroecological practicestake the *actions outline above*.
xiv. The natural environment (e.g., soil, climate) poses challenges for adopting agroecological practicest aking the *actions outline above*.
xv. Public infrastructure constraints make it difficult to adopt agroecological practicestake the *actions outline above*.
xvi. Existing laws and regulations create barriers to adopting agroecological practicestake the *actions outline above*.
xvii. Cultural norms and values make it difficult to the *actions outline above.*

Section 4: Reflections on the Vision to Action Workshop

1. In 2023, different stakeholders met to discuss a future vision for agriculture in Mandla (modify if the respondent did not participate).
    a. In this workshop, it was mentioned that [your actor group] should do [*specific action*].
    b. Do you agree that this is a meaningful action for agroecological change in Mandla? Why or why not?
    c. Have you taken any actions aligned with the proposed action since the workshop?
2. What progress have you observed in implementing these action plans discussed in the Vision to Action Workshop?
3. Could you provide specific examples or initiatives you have seen in the community?
4. Do you have any suggestions for improving the action plans or the process of their implementation based on your experience?
5. What are your main motivations for taking these actions?
6. Do you feel constrained or hampered in your efforts to take these actions?
    6.1 If yes, do you lack any resources (financial, tools, skills, or knowledge)?
    6.2 Which contextual factors most strongly support or hinder your efforts?
7. Closed Questions on Motivations and Constraints: Please tell me how far you agree or disagree with the following statements (on a scale from 1 = Strongly Disagree to 5 = Strongly Agree):
    7.1 I hope to gain tangible economic benefits from the *actions outline above* contributing to agroecological changes in Mandla.
    7.2 I believe, taking the *actions outline above* it makes my life safer to take actions contributing to agroecological changes in Mandla.
    7.3 I believe it is good for society to take the *actions outline above* contributing to agroecological changes in Mandla.
    7.4 I believe it is good for the environment to take the *actions outline above* actions contributing to agroecological changes in Mandla.
    7.5 I believe that people who matter to me would praise me for taking the *actions outline above* actions contributing to agroecological changes in Mandla.
    7.6 I just think it is the right thing to do to take the *actions outline above* actions contributing to agroecological changes in Mandla.
    7.7 I feel constrained by financial resources to take the *actions outline above* actions contributing to agroecological changes in Mandla.
    7.8 I feel constrained by the lack of tools, machinery, or equipment needed for taking the *actions outline above* agroecological practices.
    7.9 I feel constrained by limited time to take the *actions outline above* actions contributing to agroecological changes in Mandla.
    7.10 I feel constrained by a lack of knowledge or skills to implement agroecological practicestake the *actions outline above.*

7.11 I feel constrained by limited access to natural resources (e.g., land, water) needed for agroecological practices to take the *actions outline above.*

7.12 I feel constrained by a lack of connections to other actors or networks supporting agroecological changesto take the *actions outline above*.

7.13 The overall economic situation and market environment make it difficult to adopt agroecological practicestake the *actions outline above*

7.14 The natural environment (e.g., soil, climate) poses challenges for adopting agroecological practicest aking the *actions outline above*.

7.15 Public infrastructure constraints make it difficult to adopt agroecological practicestake *actions outline above*.

7.16 Existing laws and regulations create barriers to adopting agroecological practicestake the *actions outline above*.

7.17 Cultural norms and values make it difficult to the *actions outline above.*

Section 5: Actions Required by Other Actors

8. In your opinion, which actor (e.g., local government, market actors, public, CSO) is most critical for driving agroecological transitions in Mandla?
9. What specific actions should *this actor* take to facilitate agroecological change?
10. What could motivate this actor to take the action you named?
11. What challenges might this actor face in implementing these actions? *(External barriers)
    - 11.1 Do you think she may lack any resources (financial, tools, skills, or knowledge)?
    - 11.2 Which contextual factors could most strongly support or hinder the actors efforts?

Section 6: Collective Actions and Support Systems

12. How could collaboration between your group and theirs improve the likelihood of success?
13. How do community groups (e.g., women's self-help groups, Community Nutrition Gardens) contribute to facilitating behavioural changes towards agroecology?
14. Do you think that (CNGs) /CHMs / SHG/ FPO contribute to a change towards agroecology in Mandla? If yes, how?
15. How do relations between critical actors affect the change process towards agroecology?
16. Which relations between actors need to change to support this transition?
17. What role do local institutions, NGOs, and market actors play in supporting agroecological transitions in Mandla?

Section 7: Recommendations and Closing

- Is there anything else you would like to share about your experiences or perspectives on agroecological practices?
- Can I follow up with you if I have additional questions after analysing this interview?

Appendix C: FGD Guide

SECTION A: CURRENT PRACTICES AND EXPERIENCES

1. Can you briefly describe your main farming or livelihood activities?
2. What changes have you observed in farming practices in your village over the past five years?
3. How did your group start engaging in agroecological or natural farming practices?
4. What has been working well so far, and what challenges have you faced?
4. What are your main roles and activities as a Community Resource Person?
5. What changes have you observed in farmers' practices since you began this work?
6. Who among you has tried agroecological or organic practices? What motivated or discouraged you?

SECTION B: DECISION-MAKING AND INFLUENCE

1. How are decisions made regarding what crops to grow and how to cultivate them?
2. Probes: Who participates in these decisions? Whose opinion is most influential?
3. Within your household or group, who usually has the final say on farming decisions?
4. Probes: Has this changed over time? What roles do women, men, elders, or youth play?
5. Which external actors influence your farming decisions?
6. Probes: Extension agents, NGOs, CRPs, government officials, traders, fellow farmers.

SECTION C: ACTORS AND THEIR ROLES

1. Which people or organizations have supported agroecological farming in your area?
2. What type of support have you received from different actors?
3. Who do you consider the most important enablers of agroecological farming in your area? Why?
4. Are there any actors who should be more involved but are currently missing or inactive?

SECTION D: BARRIERS AND CONSTRAINTS

1. What are the main challenges in adopting or continuing agroecological practices?
2. What broader system-level barriers exist beyond the farm?
3. Are there specific challenges women face compared to men?
4. Have you ever wanted to adopt agroecological practices but were unable to do so? What prevented it?

SECTION E: CHANGES NEEDED AND FUTURE DIRECTIONS

1. What changes are needed to make agroecological farming easier and more attractive?
2. Which actors need to change their approach or behavior?
3. If you could change one thing that would make the biggest difference, what would it be?
4. What role can collective action (SHGs, CNGs, farmer groups) play in addressing current challenges.

Closing Remarks- Thank participants for their time and valuable contributions.

Reiterate confidentiality and provide contact details for follow-up.

Appendix D: Behavioural Change maping with the help of V2A mapping sheet and Protocol.

Behavior Category	Behavior/ Action No.	Behavior sub-category	Behaviour Sub-category special actions	Target actor(s) who needs to change this behavior							Which ACT elements would be influenced for the target actor(s) with this behavior change? Influencing which ACT elements could motivate or enable the target actor(s) (D to J) to change this behavior (C)?							
				A1. Producers	A2. Other VC actors (traders, aggregators, processors)	A3. Private input suppliers (wholesale, retailer)	A4. Ext & Edu actors	A5. CSOs	A6. Government	A7. Consumers	E1. OS	E2. AS	E3.1 IF-Knowledge	E3.2 IF-Motivation	E4. RSS	E5. ESS	E6. GSS	E7. SRSS
B1. Knowledge and awareness	B1.1	Training and awareness generation on AE (includes developing a package of practices)					x		x		x	x	x				x	
	B1.2	Information sharing (weather, cropping, AE produce health benefits)					x	x	x		x	x	x	x			x	
	B1.3	Understand AE value chains					x		x		x	x	x				x	
	B1.4	Promotion of diverse and nutritious crops (e.g., millets, Nutri-gardens)					x	x	x		x	x	x	x			x	
	B1.5	Online portal on govt. schemes							x		x	x	x				x	
	B1.6	Awareness of sustainable NRM					x	x	x		x	x	x				x	
B2. Skills and practices	B2.1	Organic inputs/Bio-inputs (making and using)		X		x					x	x	x	x	x			
	B2.2	Crop diversification		x							x		x	x	x			
	B2.3	Crop rotation		x							x		x	x				
	B2.4	Intercropping		x							x		x	x	x			
	B2.5	Cultivation of indigenous varieties, nutritious crops and coarse grains		x							x		x	x	x	x		
	B2.6	Regenerative/Natural farming practices		x							x	x		x	x			
	B2.7	Soil/water conservation (bunds, rainwater harvesting)		x					x		x	x	x	x	x		x	
	B2.8	Increase population of indigenous animal species		x					x		x	x	x	x	x		x	
	B2.9	Convert common lands into grazing grounds							x		x	x	x	x	x		x	x
	B2.10	Serve meals with a diversified diet to children in school meals							x		x	x	x	x	x		x	
B3. Social norms and gender equity	B3.1	Equal rights for women and men / boys and girls (including property rights)																
	B3.2	Gender-equitable household practices (Boys/men involvement in household chores, strengthening women's decision-making power in household decisions)																
	B3.3	Participation in SHGs		x							x	x	x	x		x		x
	B3.4	Encouraging girls' education		x					x			x	x		x		x	x
	B3.5	Delaying marriage																
	B3.6	Engaging youth and women in governance and advocacy							x			x	x		x		x	x
	B3.7	Employment opportunities for women and girls							x		x	x	x		x		x	x
	B3.8	Increased decision-making for women in agriculture (which crop to grow, where to sell, etc.)		x							x	x	x	x	x	x		x
B4. Economic and livelihood opportunities	B4.1	Youth employment							x									
	B4.2	Better employment opportunities within the village			x				x									
	B4.3	Collective marketing			x			x	x									
	B4.4	Fair pricing							x									
	B4.5	Marketing AE produce and indigenous varieties among consumers			x			x	x									
	B4.6	Certification of AE produce						x	x									
	B4.7	Govt. schemes to support small businesses							x									
	B4.8	Better financial services							x									
	B4.9	Employment opportunities for women and girls							x									
	B4.10	Promote poultry/goatry/fisheries/beekeeping						x	x									
B5. Governance, policy, and institutions	B5.1	Better governance and conducive policies (Minimum Support Price, incentives such as compensation for yield loss, policies restricting/discouraging in-organic input use)							x		x	x	x	x		x	x	
	B5.2	Improved stakeholder coordination, support and information sharing among FSAs					x		x		x	x	x					
	B5.3	Multi-stakeholder platforms (to facilitate mechanisms for dialogues among stakeholders)							x									
	B5.4	Adequate staffing in Govt. departments							x									
	B5.5	Making farm policies based on soil type							x									
	B5.6	Women's empowerment (including property rights), with special focus on women from disadvantaged groups							x									
B6. Technology and infrastructure	B6.1	Advanced technological tools (drip, sprinkler, forecasting)					x		x		x	x	x	x		x	x	
	B6.2	Improved access to inputs (seed banks, irrigation, bio-inputs)							x		x	x	x	x		x	x	
	B6.3	Better roads and connectivity							x		x	x	x	x		x	x	
	B6.4	Better processing and storage facilities					x	x	x		x	x	x	x		x	x	
	B6.5	Electricity access							x		x	x	x	x		x	x	
	B6.6	Cell phone and internet access		x			x	x	x		x	x	x	x		x	x	
	B6.7	Improved transport services							x		x	x	x	x		x	x	
	B6.8	Better financial services					x		x		x	x	x	x		x	x	
	B6.9	Improved health, school, housing, and water infrastructure							x		x	x	x	x		x	x	
	B6.10	Establish bio-resource centers for disseminating scientific evidence on bio-based farming approaches					x		x		x	x	x	x		x	x	
B7. Behavior reinforcement	B7.1	Consumption of diverse and nutritious crops		x						x								
	B7.2	Bio-inputs preparation as routine practice		x														
	B7.3	Regular SHG participation for marketing or seed exchange		x				x										
	B7.4	Inclusion of AE foods in school meals (institutional reinforcement)							x									
Additional Indicator 2.	% of each actor group expected to act	How often where different actor groups mentioned as the ones who need to take actions?		18,52	3,70	1,23	13,58	12,35	49,38	1,23	31	29	32	25	13	14	24	6
									40		57,40740741	53,703704	59,259	46,2963	24,0741	25,9259	44,4444	11,11

Appendix E: Declaration on the use of generative AI systems in dissertations and habitation theses

Title of the work: Understanding Behavioral Changes Towards Agroecological Transitions: A Case Study from Mandla, India

Name of the author: Vrindaja Vikram

In the preparation of the work, I or my co-authors have used systems based on generative artificial intelligence (AI).[1,2,3] (Please select exactly one of the following fields)

☒ Yes

☐ No

If you have selected "Yes", complete the rest of the form. If you have selected "No", simply fill in the place, date and signature below.

I have used the following generative AI based systems in the creation of this thesis:[2,3]

1. ChatGPT (OpenAI)
2. Perplexity
3. Claude AI
4. Uni-Hohenheim GP Talk

I further declare that I

☒ have actively informed myself about the capabilities and limitations of the above-mentioned AI systems to the extent that I can use them responsibly,

☒ have labelled the content taken from the AI systems listed above with my details in the table below,

☒ have verified that the content generated by the above-mentioned AI systems and adopted by me is factually correct,

☒ am aware that, as the author of this work, I am responsible for the information and statements made in it.

☒ am aware that the violation of the disclosure of the use of generative AI in my work is a deception and leads to an evaluation with an insufficient grade.

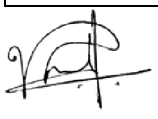
I have applied the above-mentioned AI systems as indicated below.

[1] If parts of the work are written jointly with co-authors, this declaration also refers to their use of generative AI, insofar as this concerns work steps to which you have also made a contribution. In the case of joint work with co-authors, you must also submit a co-authorship declaration with your dissertation or habilitation thesis. In this declaration, you indicate the areas of contribution of a scientific article to which you have contributed. In the following, you must state to the best of your knowledge and belief whether and how generative AI was used in these areas of contribution in relation to your examination. To do this, you must obtain information from your co-authors. If scientific articles in your thesis contain areas of contribution in which you were not involved according to the co-author declaration, no declaration on the use of generative AI must be submitted for these contribution areas.

[2] This declaration does not apply to the use of basic widely used tools for checking spelling and grammar, translating texts and improving software quality for data analysis and software prototypes.

[3] If you are unsure whether an IT system used is a generative AI system and/or whether you need to declare it, declare it.

Areas of contribution	AI system(s) used	Description of the manner of use and compliance with good scientific practice, if necessary, separately by chapter of the work
Development and conception of the research project	None	
Collection and evaluation of literature sources	2, 3	Used for paraphrasing and clarifying terminology in the literature review (Chapter 2) and for understanding complex concepts where needed. All literature sources were independently identified, read, critically evaluated, and cited by me.
Elaboration, collection and/or procurement of data	1, 2, 3	used to assist with translation support and clarification of terminology during qualitative data interpretation, particularly when relating empirical findings to the ACT framework in Chapters 5 and 6.
Processing of data	1, 4	AI systems were used for linguistic support during verbatim translation of interview excerpts, in conjunction with a human field translator, to improve English phrasing without altering meaning.
Selection of methodology	None	
Programming	1,4	Used for clarifying the use of certain MAXQDA software functions (e.g. tool explanations), without generating code or analytical results.
Analysis/evaluation of the data/sources	1,3	Used to support the naming and refinement of thematic codes and to clarify terminology during thematic analysis.
Interpretation of the analysis/evaluation and derivation of conclusions	1	To improve clarity and structure when articulating interpretations and conclusions in Chapters 5 and 6.
Writing of the manuscript: Creation of visualizations	None	
Writing of the manuscript: Structuring the text	3, 4	AI assistance was used to develop initial structural outlines for Chapters 2 and 6
Writing of the manuscript: Formulation of text	None	
Writing of the manuscript: Revision of text	1, 3	AI tools were used for linguistic refinement and stylistic editing (“copy-editing”) across the thesis. Chapters 1, 2, 5, and 6 were revised for clarity, coherence, and academic language. No new content, data, or interpretations were generated by AI.
Further contributions		



11- January 2026, Stuttgart