RURAL SOCIOLOGY / AGRICULTURAL DEVELOPMENT

Rural Social Systems and Agricultural Change

Institutions, Inequality, Innovation, and Just Agrarian Futures



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Preface

Rural Social Systems and Agricultural Change examines how agricultural change is shaped by the relationships through which people gain access to land, labour, knowledge, markets, and public support. Its central argument is that technologies, policies, and economic or environmental pressures acquire their effects through institutions and unequal social positions. Understanding change therefore requires attention to who can act, who benefits, who carries the costs, and how these outcomes alter future opportunities.

The book brings together theoretical perspectives, published empirical research, and guidance on using open evidence. Its Rural Systems Mediation Framework connects drivers of change with social mediators, negotiated responses, differentiated outcomes, and feedbacks. Throughout, the discussion distinguishes individuals, households, farms, organizations, and territories, and asks what each source can establish. Quantitative findings, qualitative accounts, institutional analysis, and spatial evidence contribute different insights; their limits remain part of the explanation.

The five chapters develop this approach progressively. Chapter 1 establishes the concepts, framework, and standards for comparative inquiry. Chapter 2 examines household relations, land, labour, and unequal agrarian trajectories. Chapter 3 considers institutions, networks, collective action, and accountability. Chapter 4 follows knowledge and technology through the uneven processes of innovation. Chapter 5 connects markets, migration, nonfarm work, and care to changing rural livelihoods and territorial policy.

Students and researchers in rural sociology, agricultural development, and related fields can use the book to connect concepts with evidence. Educators, extension professionals, development practitioners, and policy analysts can draw on its diagnostic matrices and practical questions to examine particular settings. These tools encourage explicit assumptions, attention to excluded groups, and scrutiny of competing explanations. Across the chapters, agricultural progress is assessed through livelihood security, agency, working conditions, and ecological consequences alongside production and income. The aim is to support careful analysis and more accountable choices about rural change.

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CHAPTER 01

Seeing the Rural System

Concepts, Change Mechanisms, and an Open-Evidence Strategy

Chapter purpose

A village can be mapped, counted, and photographed. The rural system that sustains it is harder to see. Its boundaries extend along migration routes, commodity chains, canals, digital networks, and administrative jurisdictions. They also pass through less visible relations: those who may inherit land, whose work counts as farming, who can speak in a producer meeting, whose losses a household absorbs, and whose future bears ecological damage. Rural society is therefore not a self-contained place. It is a relational field made and remade through flows of labour, capital, knowledge, authority, care, and biophysical resources.

This chapter asks: **How can rural social systems be defined, explained, and studied in ways that connect agricultural change to institutions, inequality, livelihoods, and environmental conditions?** Its answer begins with mediation. Technologies, markets, policies, demographic shifts, and environmental pressures do not act directly on an undifferentiated population. They pass through property and labour relations, public and customary institutions, social identities, organizations, networks, and uneven ecological exposure. People then adopt, adapt, combine, delay, resist, or exit under unequal constraints. Their gains and losses differ, and those outcomes feed back into the institutions, markets, social relations, and ecosystems from which change began.

Explanation also requires an evidence architecture that respects differences among people, plots, farms, households, communities, firms, regions, and policy regimes. Panels can track welfare yet hide intrahousehold inequality; censuses reveal structure yet miss informal labour; spatial layers locate environmental change but not control; qualitative studies reveal meanings and mechanisms but rarely prevalence. No source can reveal the whole system. Evidence must be connected transparently, rival explanations tested, and confidence stated claim by claim.

The chapter's central contribution is the **Rural Systems Mediation Framework**: drivers → social mediators → negotiated responses → differentiated outcomes → feedbacks. Five sections define the relational system, compare theories, specify change mechanisms, build an open-evidence strategy, and set standards for responsible inference. A practical Rural Systems Evidence Canvas makes that common grammar reusable across the book.

1.1 Rural Social Systems as Relational Fields

From a bounded locality to an open relational system

A village can be mapped, counted, and assigned to an administrative district, but it cannot by itself contain the social system through which rural life is organized. The price received by a cultivator may be set in a distant commodity exchange; the labour available on a farm may depend on migration to a city; rights to a field may be authorized by both a land office and a customary council; and a household's ability to withstand a failed harvest may rest on remittances, public transfers, or obligations among kin. Rural society is therefore better understood as a configuration of actors, relationships, institutions, resources, and places that is continuously made and remade through interaction.

This book calls that configuration a **rural social system**. It is *rural* because land-based production, relatively dispersed settlement, ecological dependence, and distance from services remain consequential. It is *social* because access to land, work, knowledge, markets, and protection is organized through relationships and rules rather than determined by resources alone. It is a *system* because changes in one domain can alter others and generate feedback. The term does not imply consensus, equilibrium, or a smoothly functioning whole. Rural systems contain conflict, exclusion, institutional contradiction, and ecological instability as well as cooperation and adaptation.

Describing this system as a **relational field** makes two further points. First, rural places are constituted partly through relations that extend beyond them. Relational rural scholarship shows how localities are co-produced by local and distant actors rather than sealed containers of social life (Heley & Jones, 2012; Woods, 2007). Second, the relevant boundary is analytical rather than given in advance. A study of irrigation may need to follow water from plots and user groups to a watershed authority and an energy-pricing regime; a study of contract farming may have to follow crops, credit, standards, and risk from households to processors and retailers. Territory still matters, but the system boundary should follow the problem and the relations that make it intelligible.

Actors are positions within relationships

The actors of a rural system cannot be reduced to "farmers" and "government." Individuals occupy differentiated and sometimes overlapping positions: landowners, tenants, sharecroppers, owner-cultivators, hired and unpaid family workers, herders, fishers, forest users, artisans, traders, and migrants. Gender, age, ethnicity or caste, citizenship, disability, and life-course position affect what each person may legitimately do and claim. A woman can be an experienced cultivator yet be represented administratively as a farmer's wife; a young adult can supply substantial labour while lacking authority over crop sales; and a tenant can manage production without possessing a legally secure claim to the land.

The **household** is indispensable but should not be treated as a single actor with one interest. It is an arena in which members combine or withhold income, allocate labour, perform care, negotiate consumption, arrange marriage and inheritance, and decide who migrates. Household cooperation can provide insurance and economies of scale, while unequal bargaining can distribute work, food, mobility, and risk unevenly. Nor is a household synonymous with a farm. The farm or agricultural holding is a production unit; the household is a unit of residence, consumption, and social reproduction. One household may operate several holdings, several households may operate one holding, and farms may employ workers who belong to neither the owner's nor the manager's household. Work by the Food and Agriculture Organization of the United Nations (FAO) on family-farm definitions is valuable precisely because it identifies the variable links among family labour, management, ownership, and reproduction rather than assuming their identity (Garner & de la O Campos, 2014).

Beyond the household are producer organizations, cooperatives, savings groups, water-user associations, labour gangs, customary councils, religious bodies, and village committees. These bodies aggregate interests, enforce rules, pool risk, broker knowledge, and negotiate with outsiders. Rural associative organizations often perform economic, political, social, and environmental functions simultaneously (Ramírez-Gómez, 2023). They should not automatically be read as inclusive community institutions: leadership may be captured, membership costs may exclude poorer producers, and an organization that improves market access for members may worsen the position of non-members.

The system also includes employers and firms: landlords, input dealers, machinery providers, moneylenders, banks, aggregators, processors, exporters, supermarkets, and digital-platform companies whose decisions shape prices, standards, credit, and the distribution of risk. Public actors include elected local government, land and water administrations, courts, extension services, schools, health facilities, environmental agencies, public buyers, and social-protection offices. Universities, research institutes, NGOs, and media organizations produce and translate knowledge. Customary authorities can validate tenure, mediate disputes, and define membership even where the state retains formal sovereignty. Migrants and diaspora members remain actors through remittances, investment, care, information, and political influence, while urban consumers affect rural production through demand.

What gives this list explanatory value is not its length but the relationships among its members. Kinship, marriage, and inheritance connect generations; tenancy, wage labour, contracting, debt, and exchange organize production; patronage, party ties, and administrative encounters mediate public authority; and cooperation, rivalry, trust, and sanction shape collective action. Information also moves relationally. Research in Cambodia, for example, shows that formal extension arrangements and informal farmer practices jointly structure agent-farmer interaction (Tran et al., 2025). Network position matters: brokers who connect otherwise separated groups can be more consequential

for the spread of farming practices than prominent "opinion leaders" (Zhang et al., 2020). A rural system is therefore not just an inventory of actors. It is a patterned distribution of dependence, reciprocity, brokerage, and command.

Institutions, access, and power

Institutions are the rules and expectations through which these relationships acquire regularity. **Formal institutions** include constitutions, land statutes, environmental regulations, subsidy criteria, employment law, registered contracts, and official procedures. **Informal institutions** include customary tenure, gender and generational norms, reciprocal labour, inheritance expectations, moral obligations, patron-client relations, and locally recognized sanctions. Organizations are actors or arenas such as a cooperative or land office whereas institutions are the rules in use. The distinction matters because creating an organization does not ensure that its formal mandate governs actual behaviour.

Formal and informal institutions may reinforce, substitute for, or contradict one another. A statutory title can coexist with competing customary claims. Equal-inheritance law can coexist with pressure on daughters to waive land. A subsidy open to all cultivators can in practice require documents, mobility, or contacts that only some possess. FAO's tenure guidelines accordingly recognize public, private, communal, Indigenous, and customary arrangements and emphasize legitimate tenure rights rather than title alone (FAO, 2012). Institutions are constitutive of the system because they define categories such as owner, worker, household head, member, and beneficiary; allocate authority; and determine which claims can be enforced.

This leads from ownership to **access** and **control**. Property is an enforceable claim, but people may benefit from land, water, credit, technology, or markets through many other mechanisms. Ribot and Peluso (2003) define access around the ability to benefit and direct attention to authority, identity, knowledge, capital, technology, markets, and social relations. A named owner may lack the finance to cultivate; a non-owner may secure use through kinship; a trader may control the terms under which many formally independent farmers reach a market. Power is thus relational: it is the capacity to make or interpret rules, validate claims, set exchange terms, control information, shift risk, or require another actor's compliance.

This approach also prevents romantic accounts of community and social capital. Dense ties can sustain mutual aid and collective resource management, but they can also police gender roles, exclude newcomers, and normalize environmentally damaging practices. Albizua et al. (2020), for instance, show that the structure of farmers' advice networks helps explain the spread of intensive agriculture. The analytical question is not whether a community has "strong networks," but who is connected to whom, for what purpose, under whose rules, and with what consequences.

Agriculture as production, social reproduction, and ecological relation

Agriculture is a productive activity, but treating it only as output obscures much of its social force. Land, livestock, and crops can generate food, income, employment, and assets; they can also organize family continuity, care, status, identity, and claims to place. FAO's working conception of family farming captures this integration: family and farm co-evolve and combine economic, environmental, reproductive, social, and cultural functions (FAO, 2014; Garner & de la O Campos, 2014). **Social reproduction** here means the daily and intergenerational work through which people and social relations are sustained feeding and caring for household members, maintaining labour capacity, transmitting skills, renewing kinship obligations, and enabling a successor generation to live and work.

Agriculture shapes **belonging** through attachment to land, lineage, occupation, and landscape. Ideas of the "good farmer" turn visible practices productive fields, cared-for animals, particular technologies into evidence of competence and moral worth (Burton et al., 2021). Such recognition can generate trust and standing, but it can stigmatize landless workers, pastoralists, women whose work is not recognized as farming, or producers using unfamiliar methods. Agriculture shapes **authority** because control over land, water, machinery, labour, marketing, and technical knowledge gives some actors leverage over others. Customary leaders may allocate land; senior household members may command labour and sales; extension agents may certify valid knowledge; firms may determine quality grades; and creditors may constrain crop choice.

It shapes **inequality** because rights and burdens are distributed through classed, gendered, generational, and ethnic relations. Reviews of gender norms in agriculture show how informal expectations govern productive and reproductive work, mobility, inheritance, resource control, and intrahousehold voice (Hillenbrand & Miruka, 2019). Doss et al. (2018) warn against replacing this complexity with unsupported global slogans about "women farmers": sound analysis identifies who performs which tasks, who owns and controls which assets, and who receives the proceeds. Empirical work in Ghana, for example, finds gendered and spatial inequality in access to agricultural resources and links decision-making power to access (Dwomoh et al., 2023). The wider lesson is not a single numerical gap but a mechanism: nominal inclusion does not guarantee effective command over productive resources.

Agriculture also shapes **livelihood security**. Own-production can support consumption; land and livestock can provide savings, collateral, or a fallback; and labour exchange and kin obligations can buffer illness or crop loss. Yet these protections are differentiated. Evidence from two north Indian villages shows that land ownership affected whether households could "hang in," accumulate, or leave agriculture under deagrarianization (Pritchard et al., 2017). Security therefore depends not on farming in the abstract but on the terms of tenure, labour, markets, public support, and social membership.

Finally, agriculture establishes ecological relations. Soil fertility, water flows, pollination, pests, forests, and climatic variability are not an external backdrop; they enter production and social conflict, while farming alters them. Ostrom's (2009) social-ecological framework is useful because it links resource systems, resource units, users, and governance arrangements across nested levels. Irrigation rules affect withdrawals; withdrawals alter aquifers; ecological decline changes labour and investment; and those responses can prompt new rules or intensify conflict. Nature is therefore both condition and consequence of rural social action.

Rural-urban, local-global, and multi-level relations

Rural-urban linkages make a purely territorial definition untenable. They comprise reciprocal and repeated flows of people, food, inputs, services, money, information, waste, and environmental benefits (Tacoli, 1998; UN-Habitat, 2019). Migration does not necessarily sever rural membership: multilocal households can redistribute labour, remittances, care, risk, and aspirations across settlements. Remittances may finance consumption or farming, while absence may produce labour shortages, greater workloads, or new bargaining positions (FAO et al., 2018). Small and intermediate towns provide markets, schools, clinics, finance, processing, and nonfarm work, creating functional territories that often cross administrative boundaries (Berdegué et al., 2014).

Local-global relations operate through commodity chains, trade rules, investment, certification, media, and digital communication. A plot may be physically remote yet closely governed by an exporter's quality standard, a platform's information architecture, or a global price shock. Urbanization likewise reshapes demand, processing, logistics, and diets across a continuum rather than on one side of a rural-urban divide (FAO et al., 2023). These connections do not make place irrelevant. Distance, roads, ecology, administrative jurisdiction, and histories of identity still condition how flows arrive and who can use them. Nor do flows imply equal exchange: a new market can expand opportunity while enabling a processor, landlord, or better-capitalized producer to capture most gains.

Analysis must consequently move across levels without treating them as interchangeable. At the micro level are bodies, identities, plots, and decisions. At the household level are labour allocation, consumption, care, and bargaining. Community and organizational levels encompass norms, networks, and collective resources. Territorial and regional levels connect settlements, ecosystems, labour markets, and services. Value-chain analysis follows production, finance, and standards across space; national analysis addresses property regimes, fiscal policy, and social protection; and transnational analysis captures trade, migration, climate governance, and corporate power. A national seed subsidy, for example, reaches a plot through budget rules, local administration, dealers, networks, and household bargaining; its ecological effects may

then change yields, groundwater, and later policy. No level supplies the complete explanation.

The practical rule for the book is therefore to begin with a resource, decision, or change process and trace outward: identify everyone able to contribute, authorize, block, broker, appropriate, or bear its consequences; specify the formal and informal rules governing their relations; follow the flows that cross territorial boundaries; and examine feedback across levels. This answers the section's three questions. An explanatory rural system must include differentiated producers and workers, households and farms, market and civic organizations, firms, public agencies, and customary authorities, together with the institutions and ecological relations connecting them. Rural-urban and local-global flows show why residence cannot define the full spatial field of livelihood. Agriculture shapes belonging, authority, inequality, and security through tenure, kinship, labour, exchange, knowledge, collective action, and environmental governance. These propositions provide the common vocabulary from which the Rural Systems Mediation Framework can trace drivers, social mediation, negotiated responses, differentiated outcomes, and feedback.

Reusable vocabulary

Box 1.1. Reusable vocabulary

Concept and working definition	Concept and working definition
Rural social system. An open, changing configuration of actors, relationships, institutions, resources, ecological processes, and places in which rural livelihoods and agricultural change are produced.	**Relational field.** The problem-specific web through which actors acquire positions, capacities, and constraints; its boundaries need not match a village or administrative unit.
Actor position. A differentiated location owner, tenant, worker, broker, official, or migrant that shapes what an actor can do and claim.	**Household.** A unit of residence, consumption, care, livelihood coordination, and negotiation whose members need not share identical interests.
Farm / agricultural holding. A production unit under a form of management; it is analytically distinct from the household.	**Institution.** A formal or informal rule, norm, expectation, or procedure that regularizes conduct and makes some claims more enforceable.
Organization. A collective actor or arena, such as a cooperative, firm, public agency, or customary council, operating through institutions.	**Access.** The effective ability to benefit from a resource, whether or not it rests on formal ownership.
Control. The capacity to determine how a resource is used, allocated, or transferred and who may benefit.	**Power.** Relational capacity to define rules, validate claims, set exchange terms, control information, or shift costs and risks.

Concept and working definition	Concept and working definition
Social reproduction. Daily and intergenerational work that sustains people, labour capacity, households, identities, and social relations.	**Livelihood.** The activities, resources, relationships, and claims through which people secure material and social well-being.
Flow. Movement of people, commodities, money, services, knowledge, care, waste, or ecological effects between actors and places.	**Functional territory.** An interconnected rural-urban space defined by repeated flows and shared services or markets rather than administrative boundaries alone.
Analytical level. A locus of observation individual, plot, household, organization, community, territory, value chain, state, or transnational system.	**Feedback.** A consequence that changes the social, institutional, market, or ecological conditions that produced it.

1.2 Complementary Theories of Agrarian Change

Agrarian change is simultaneously a change in production, a redistribution of opportunities and risks, a reworking of household life, an intervention in an ecosystem, and a process of learning and institutional adjustment. No single theory was designed to explain all five. The useful question is therefore not which theory is universally correct, but which mechanism each identifies, what evidence would support it, and what it makes difficult to see. Agrarian political economy, farm-household analysis, sustainable-livelihoods analysis, social-ecological systems thinking, and agricultural innovation systems can be treated as a division of analytical labour. Their differences should be preserved because they generate rival as well as complementary explanations.

Property, class, and accumulation

Agrarian political economy begins with social relations rather than farms as technical units. Its compact questions are: who owns what, who does what, who gets what, and what do they do with the surplus? These direct attention to property, labour, distribution, and reproduction (Bernstein, 2010; Borras, 2009). Property here is not simply possession recorded in a land register. It includes the enforceable claims and social powers through which people benefit from land, water, labour, credit, technology, or a commodity chain. Legal ownership and effective access may diverge because access also depends on capital, knowledge, markets, authority, identity, and social relations (Ribot & Peluso, 2003).

The principal mechanism is differentiation under changing relations of production and exchange. Commercialization, privatization, new procurement systems, or mechanization do not act on an undivided peasantry. They alter rents, labour demand, entry costs, debt, and control over output. Producers able to finance inputs, survive price falls, and command land or hired labour may accumulate. Others may continue as

petty commodity producers by intensifying family labour, combining a small plot with wage work, becoming tenants or labourers, or leave farming. Political economy therefore predicts that a rise in aggregate production can coexist with land concentration, proletarianization, or deeper dependence on merchants and creditors. It makes landlords, agribusiness firms, financial actors, labour contractors, tenant farmers, migrant and landless workers, and the state visible not merely "farmers." It also places local change within national policy and global circuits of capital. The agrarian question is consequently about both agriculture's transformation and the place of agrarian classes and labour in wider capitalist development (Akram-Lodhi & Kay, 2010a, 2010b).

This lens is strongest on structural power and distribution, but it can become reductive if class location is made to explain every practice. Household life cycles, meanings attached to land, local experimentation, and ecological thresholds do not follow mechanically from class. Gender and unpaid reproductive labour can also disappear if the analysis assumes that relations among classes exhaust relations of power. Political economy is therefore indispensable for setting the field of constraint, but insufficient as a complete account of action within it.

The farm household as producer, consumer, and labour institution

Farm-household perspectives explain why family farms cannot be analysed as profit-maximizing firms alone. In the Chayanovian formulation, the amount and intensity of family labour are shaped by a balance between consumption needs and the drudgery of additional work, while household composition changes across a demographic cycle. Contemporary agricultural household models formalize a related insight: a household may jointly produce food, supply and hire labour, consume part of its own output, and allocate time among farming, care, schooling, wage work, and leisure (Singh et al., 1986; Taylor & Adelman, 2003).

If markets for food, labour, credit, land, or insurance worked fully and at a common price, production decisions could in principle be separated from consumption preferences. Rural markets are often incomplete, costly, segmented, or missing. The household then faces internal or "shadow" prices: the value of an additional day of family labour, for example, depends on family composition, local wages, care obligations, seasonality, and whether reliable workers can be hired. Production and consumption become non-separable. This mechanism explains apparently paradoxical responses, such as a household failing to expand a profitable crop because it cannot finance inputs, cannot risk losing subsistence food, or lacks labour at the critical moment (de Janvry et al., 1991). It predicts heterogeneous responses to the same output price or technology according to whether a household is a net buyer or seller of food, an employer or seller of labour, credit-constrained or liquid, and early or late in its life cycle.

This approach makes family labour, subsistence, risk, consumption, and demographic dependency visible. Yet "the household" must not be converted into a single actor with one preference. Evidence on intrahousehold bargaining shows that control over assets and income affects allocation; joint production does not imply equal voice or equal benefit (Doss, 2013). A unitary model can hide women's unpaid work, children's labour, generational conflict, separate income streams, and violence. Farm-household analysis also tends to place employers, corporations, value-chain governance, and ecological change outside the frame. Its proper contribution is to explain feasible decisions under interdependent production and reproduction, not to erase power inside or beyond the family.

Assets, capabilities, and livelihood portfolios

Sustainable-livelihoods analysis shifts the outcome from farm profit to the capacity to make and sustain a living. It asks how people combine natural, physical, financial, human, and social resources within a vulnerability context, and how policies, institutions, and social relations shape access to them. Assets matter not only as productive inputs but as bases of capability: land may provide food and collateral, but also identity, political standing, and a platform from which to negotiate with the state or market (Bebbington, 1999). The mechanism is the conversion of unequally accessible resources into a portfolio of strategies agricultural intensification or extensification, diversification, wage work, migration, social claims, or combinations of these whose outcomes include security, well-being, reduced vulnerability, and stewardship of the resource base (Scoones, 1998).

This perspective corrects an agriculture-only account of rural life. It makes multi-activity households, migrants, informal workers, reciprocal networks, care, and non-income dimensions of well-being easier to see. It also recognizes agency: people improvise, sequence activities, and protect valued ways of life rather than merely receive an external "impact." Its characteristic prediction is that households with different asset combinations and institutional access will construct different responses to the same shock; diversification can spread risk, but entry into the most remunerative activities usually requires prior assets.

The framework's accessibility is also its danger. An asset pentagon can become a static inventory, "strategy" can romanticize coping under compulsion, and a generic vulnerability context can depoliticize dispossession, labour exploitation, and state action. Assets are neither freely substitutable nor separable from the relations that control them. Later livelihood scholarship has therefore called for more historical, political, relational, spatially disaggregated, and ecologically coherent analysis (Natarajan et al., 2022; Scoones, 2009). Used in that form, livelihoods analysis maps the room for manoeuvre; political economy explains why that room is distributed as it is.

Coupled resources, governance, and thresholds

Social-ecological systems analysis rejects the treatment of nature as a passive stock of inputs. In Ostrom's diagnostic framework, resource systems, resource units, actors, and governance arrangements interact in action situations that generate social and ecological outcomes, which then feed back into the system (McGinnis & Ostrom, 2014; Ostrom, 2009). The relevant mechanism is reciprocal dependence under nonlinearity. Irrigation rules affect withdrawals; withdrawals alter aquifers; declining water tables change the cost and distribution of access; and those changes reshape incentives for cooperation or competitive pumping. Resilience thinking adds disturbance, adaptive capacity, multiple stable states, and thresholds: gradual pressure may produce little visible change until a system crosses a point after which recovery is difficult or requires transformation (Folke, 2006).

This lens predicts that a practice sustainable on one plot or over one season may be damaging when adopted across a watershed or repeated over time. Institutional "fit" matters: rules must correspond to resource mobility, boundaries, renewal rates, monitoring problems, and linkages across levels. The perspective makes common-pool users, customary institutions, downstream populations, non-human processes, long time horizons, and future options visible. It is especially valuable where production and resource governance cannot be separated.

Resilience, however, is not synonymous with justice. An unequal tenancy regime or gender order may be highly persistent. Asking whether "the system" is resilient can conceal whose livelihood is being maintained, who absorbs adjustment costs, and who defined the system boundary. Critics have therefore pressed social-ecological research to incorporate social diversity, history, knowledge, power, and the possibility that desirable change requires breaking rather than preserving existing relations (Cote & Nightingale, 2012; Fabinyi et al., 2014). Political economy identifies the distribution of authority; livelihood and household analysis identify differentiated capacities; social-ecological analysis then shows how their actions accumulate into ecological feedback and constraint.

Networks, learning, and the direction of innovation

Agricultural innovation systems analysis explains why a technically effective seed, machine, digital service, or management practice may fail to spread or may change as it spreads. Innovation is not a finished object transferred from research to passive adopters. It is a co-evolutionary process in which farmers, workers, researchers, extension agents, input suppliers, processors, banks, digital firms, regulators, producer organizations, and intermediaries combine knowledge with finance, infrastructure, standards, and organizational change (Kilelu et al., 2013; Klerkx et al., 2012; World Bank, 2012). The core mechanisms are interactive learning, coordination, institutional alignment, and the building of capabilities. A "system failure" may therefore lie in weak links between research and users, absent repair or credit services, contradictory regulation, exclusion from networks, or incentives that reward the wrong problem.

The approach predicts that adoption depends on complementary services and relationships, not on information or individual attitudes alone. It makes extension workers, service enterprises, innovation brokers, cooperatives, universities, regulators, and farmer experimenters analytically visible. It also treats users as potential co-designers who modify technology and generate knowledge.

Its weakness appears when coordination is treated as politically neutral. Networks contain gatekeepers; participation does not ensure influence; and innovation has a direction as well as a rate. A system may innovate efficiently toward labour displacement, proprietary dependence, or resource-intensive production. Mission-oriented work therefore distinguishes directionality, diversity, distribution, and democracy, asking who selects the problem, which alternatives are supported, who gains or loses, and who can contest the mission (Kok & Klerkx, 2023). Without those questions, tenants, seasonal workers, non-adopters, Indigenous knowledge holders, and people who resist or exit can be recoded as deficiencies in an otherwise functional system.

Table 1.1. Complementary theories as a division of analytical labour

Lens	Primary mechanism	Characteristic prediction	Makes visible and may obscure
Agrarian political economy	Property, class, labour, surplus, accumulation	Commercialization differentiates producers and may concentrate assets even when output rises	Firms, landlords, workers, tenants, the state yet sometimes household diversity, meaning, and ecology

Lens	Primary mechanism	Characteristic prediction	Makes visible and may obscure
Farm-household analysis	Non-separable production and consumption under missing markets, risk, and demographic cycles	Responses vary by net market position, liquidity, labour, care needs, and life cycle	Family labour and subsistence yet sometimes bargaining, firms, and ecological feedback
Sustainable livelihoods	Conversion of assets and claims into portfolios and capabilities	Different asset combinations produce different strategies and security	Diversification, migration, care, agency yet sometimes dispossession and accumulation
Social-ecological systems	Coupled resource use, governance, feedback, nonlinearity, and thresholds	Locally rational actions can produce cross-scale depletion or regime shifts	Common resources, downstream users, long horizons yet sometimes justice and historical power
Agricultural innovation systems	Interactive learning, coordination, capabilities, and institutional alignment	Adoption depends on networks and complementary services, not information alone	Brokers, services, experimenters, co-design yet sometimes direction, exclusion, and labour effects

Integration without conceptual flattening

These approaches can be combined when they are assigned explicit causal work. Agrarian political economy should establish the distribution of property, surplus, labour obligations, and agenda-setting power. Farm-household analysis should explain how production and reproduction, missing markets, risk, and family composition shape feasible choices. Livelihoods analysis should trace the portfolio of activities, claims, and capabilities through which people seek security and meaning. Social-ecological analysis should follow resource dynamics, cross-scale effects, thresholds, and governance feedback. Innovation-systems analysis should explain how knowledge, technologies, organizations, and complementary services are assembled and whose priorities direct them. This is a layered explanation, not a merger of vocabularies.

Five safeguards preserve the theories' differences. First, the analysis must define a common phenomenon, period, and outcome while retaining distinct units plot, person, household, firm, community, resource system, and value chain. Second, it must state mechanisms as propositions rather than attach labels after the fact: did a farmer not adopt because the expected return was low, liquidity was unavailable, a household member withheld labour, the extension network excluded tenants, or the technology threatened a valued resource? Third, power must enter as property, authority, bargaining capacity, and control over knowledge, not as one more "asset." Fourth,

agency must be specified as tactical adjustment, intrahousehold bargaining, collective organization, or attempted institutional transformation. Fifth, outcomes must be disaggregated by class, gender, age, ethnicity or caste, tenure, occupation, and location, and assessed across productive, distributive, reproductive, political, and ecological dimensions.

Every single lens creates characteristic absences. Political economy can compress lived difference into class; household models can hide internal inequality and actors beyond the family; livelihoods frameworks can understate accumulation and historical dispossession; social-ecological models can mistake persistence for a shared interest; and innovation systems can privilege connected participants and measurable adoption. Conversely, an integrated inquiry can ask why technology is available, who can command it, how a household negotiates its use, what it does to labour and livelihood security, how aggregate adoption alters resources, and which feedback change the next round of access. The purpose of theoretical pluralism is not comprehensiveness for its own sake. It is to prevent a gain visible at one level yield, income, resilience, or adoption from being accepted before its costs and distribution are traced through the rural system.

1.3 Drivers, Social Mechanisms, and Feedbacks

Agrarian change rarely has a single cause. A new seed does not reorganize a rural economy by itself; neither does a road, drought, subsidy, price rise, or wave of migration. Each becomes consequential in configuration with other conditions. Mechanization expands when labour costs or seasonal bottlenecks make it attractive, machinery or rental services are available, farms can finance access, land and crop conditions permit its use, and markets reward the additional output. Climate stress produces different changes where irrigation, insurance, public relief, secure tenure, and collective water rules exist than where households must absorb the shock alone. The analytical task is therefore to move from a checklist of "drivers" to sequences in which broad pressures are translated through social mechanisms into differentiated responses and then into feedbacks.

Five interacting driver domains

Technological change alters the feasible combinations of land, labour, capital, knowledge, and ecological processes. Mechanization can reduce drudgery, overcome labour shortages, improve timeliness, and permit larger cultivated areas. It can also displace tasks, raise entry costs, change gendered control over operations, and encourage land consolidation. These effects are not inherent in a machine. They depend on whether access is through ownership or a service market, which operations are mechanized, whether displaced workers have alternatives, how land markets function, and whether regulation limits soil damage or unsafe use. Reviews of mechanization in Africa find neither automatic mass unemployment nor automatic inclusion; effects vary with farming system, labour market, scale, and policy (Daum & Birner, 2020). FAO reaches the same wider conclusion for automation: benefits can include productivity, resilience, resource-use efficiency, and decent work, but inappropriate or inaccessible automation can deepen inequalities, especially for small-scale and women producers (FAO, 2022).

Improved seed, irrigation, digital advice, and knowledge-intensive practices are similarly relational. A higher-yielding variety may require timely fertilizer, water, pest control, labour, storage, and a buyer; the technology is effectively a bundle. Digital advice can reduce information costs and improve the timeliness of recommendations, yet usefulness depends on connectivity, language, literacy, trust, local relevance, control over data, and the ability to purchase the recommended input. Evidence on mobile agricultural advice shows real but context-dependent effects, not the disappearance of extension or material constraints (Fabregas et al., 2019). Technology thus changes capability only when complementary institutions convert technical possibilities into usable access.

Market restructuring changes prices, standards, risks, and the terms on which farms connect to processors and consumers. Urbanization, changing diets, roads, refrigeration, processing, and retail concentration can generate demand for higher-value and more perishable products. They also shift coordination away from anonymous spot markets toward contracts, grades, delivery schedules, traceability, and private standards. Reviews find both smallholder inclusion especially where contracts supply inputs, credit, or technical help and exclusion where farmers cannot meet volume, quality, asset, or location thresholds (Reardon et al., 2009). Contract farming may stabilize a buyer and transfer services, but its welfare effects are hard to infer because firms select participants and contracts distribute price, production, and enforcement risks unevenly (Bellemare & Bloem, 2018). A price increase likewise benefits a net seller differently from a net food buyer, a labour employer differently from a wage worker, and an unindebted producer differently from one forced to sell immediately after harvest. “The market” is therefore a set of governed relationships, not an external signal received equally by all.

State action is constitutive of those relationships. Land reform determines whose claims are recognized and whether redistribution is accompanied by credit, infrastructure, and legal support. Roads, electricity, irrigation, research, extension, procurement, and market regulation determine the location and cost of opportunity. Subsidies change relative prices, but targeting, timing, leakage, fiscal durability, and crowding out of commercial supply affect who benefits. Environmental rules allocate permission to extract water, clear land, or use chemicals. Social protection changes agricultural behaviour when predictable transfers relax liquidity constraints, protect assets during shocks, or allow households to choose a riskier but more productive activity. A review of the agriculture-social-protection interface finds that transfers often support production while agricultural programmes can reduce vulnerability, although evidence is uneven and coordination is frequently weak (Tirivayi et al., 2016). The state can consequently enable smallholders upgrading, socialize risk, favour established firms, or combine these effects. Inclusive transformation is a political accomplishment, not an automatic by-product of growth (International Fund for Agricultural Development [IFAD], 2016; World Bank, 2007).

Demographic and cultural shifts alter both labour supply and the purposes people expect agriculture to serve. Population growth can fragment holdings where non-farm employment is scarce; declining fertility can change dependency ratios and inheritance; aging can reduce available labour while increasing demand for labour-saving services. Education may improve the use of information and strengthen off-farm options, thereby raising the opportunity cost of farm work. Young people's aspirations respond not simply to a cultural rejection of farming but to observed returns, status, land access, working conditions, and the possibility of an autonomous life. Changing diets connect urban demand to crop and livestock choices far beyond cities.

Migration condenses these two-sided effects. The departure of a worker can create a labour bottleneck, but remittances may finance machinery, hired labour, land purchase, livestock, education, consumption, or an exit from cultivation. Which pathway occurs depends on who migrates, who controls the transfer, the reliability of remittances, and local investment opportunities. A systematic review links remittances to intensification, extensification, diversification, degradation, forest change, and no land-use change evidence of mediation rather than a uniform effect (Mack et al., 2023). Rural households also commonly combine farm, wage, self-employment, and transfer income rather than move neatly from "agricultural" to "non-agricultural" status (Davis et al., 2017). Migration may increase women's management of farms without increasing their land rights, control of income, or freedom from unpaid care. Gender, age, caste or ethnicity, and family authority therefore shape the meaning of demographic change; aggregate labels such as "feminization" can obscure quite different arrangements (Doss et al., 2018; FAO, 2018).

Environmental pressures include climate variability, extreme events, water scarcity, soil degradation, biodiversity loss, pests, and interacting hazards. They affect yields and

seasonality, but they are not socially indiscriminate forces. Climate risk arises from the interaction of hazards, exposure, and vulnerability; vulnerability includes sensitivity and limited capacity to cope or adapt. A drought can be a manageable production risk for a farmer with irrigation, savings, insurance, secure tenure, and alternative income, but a trigger for debt, livestock sale, reduced food intake, or displacement for a neighbour without them. Smallholder adaptation is constrained by resources, information, institutions, and policy, while climate risks increasingly interact with non-climatic stresses (Bezner Kerr et al., 2022; Cohn et al., 2017). Environmental change is also endogenous: farming practices alter soils, water, habitats, emissions, and future exposure. Treating "climate" as an outside shock misses half of the causal loop.

Configurations that repeatedly produce change

Across these domains, several configurations recur. First, rising rural wages or seasonal labour scarcity, combined with accessible machinery services, suitable plots, credit, and output demand, tend to induce labour-saving mechanization. Where service markets spread fixed costs, smaller farms may participate; where machinery must be owned and land rental is fluid, better-capitalized farms may expand. The likely outcome is not simply adoption but a reorganization of tasks, cultivated areas, service enterprises, wages, and control over land.

Second, urban demand combined with transport, cold chains, processing investment, procurement standards, and finance tends to generate commercialization and shifts toward high-value products. Farmers with irrigation, working capital, information, producer organization, and a favourable location can enter; households below a compliance threshold may remain in lower-return markets, supply wage labour, or exit the commodity. Food-system growth can create jobs in logistics, processing, and retail, but the quality and accessibility of those jobs depend on labour institutions and territorial investment (FAO, 2017).

Third, environmental stress combined with secure resource rights, extension, infrastructure, social protection, and legitimate collective governance is more likely to produce anticipatory adaptation: crop switching, soil and water conservation, diversified income, altered calendars, or risk-sharing. The same stress combined with insecure tenure, debt, weak services, and conflict is more likely to cause erosive coping distress sales, high-cost borrowing, reduced meals, resource mining, unsafe migration, or forced exit. This is why a hazard of similar physical magnitude can widen inequality.

Fourth, schooling and migration combined with remittances, digital communication, changing gender norms, and restricted inheritance can generate multi-local and part-time farming rather than the disappearance of agriculture. Some households recapitalize the farm; others maintain it as food security, identity, or a fallback while their principal income comes from elsewhere. These configurations show why national

indicators of agricultural employment or value added cannot by themselves reveal how rural reproduction is changing.

Mediation and differentiated responses

The same driver divides outcomes because rural actors begin from unequal positions and encounter thresholds. Relevant positions include the amount and quality of land, water, livestock, savings, health, education, family labour, tools, networks, political recognition, tenure security, and proximity to roads and towns. They also include relational positions: landlord or tenant, creditor or debtor, employer or worker, contract buyer or supplier, cooperative leader or excluded resident. Formal rights do not guarantee the practical ability to benefit. Capital, knowledge, authority, identity, and social connections mediate access (Ribot & Peluso, 2003).

Complementarity creates thresholds. A seed without water, machinery without repair, information without finance, or a contract without transport may have little value. Because wealthier households can assemble bundles, early gains can reflect prior advantage rather than the intrinsic superiority of their decisions. Risk and timing deepen the divide. Households near subsistence may reject an investment with a positive average return if one bad season would threaten food or land. Debt repayment can force sale when prices are low. Life-cycle and intrahousehold bargaining determine whether labour and cash can actually be mobilized. Norms can prevent women or young adults from pledging land, attending training, travelling to a market, or controlling proceeds. Place matters because identical households face different transaction costs and ecologies.

Responses should therefore be understood as negotiated repertoires rather than a binary choice between adoption and non-adoption. Actors may adopt fully, modify a practice, rent a service, share equipment, sequence investment, delay, combine old and new knowledge, change crops, intensify, extensify, diversify, migrate, organize collectively, resist, or exit. One household can pursue several responses, and its members may value them differently. Evaluation must follow not only yields and income but variance, debt, asset change, food security, health, labour time, drudgery, autonomy, distribution of control, dignity, and ecological condition. A productivity gain that raises women's workload, exposes workers to chemicals, depletes groundwater, or transfers price risk to growers is not one undifferentiated "positive outcome."

Feedback: responses become the next drivers

Agrarian outcomes alter the conditions that produced them. Accumulation can finance further innovation, secure contracts, and land acquisition; distress can force sales that make land and labour available to expanding farms. What began as unequal adoption can become concentration, and concentration can generate political influence over subsidies, infrastructure, research, and standards. Conversely, producer organizations, labour action, environmental movements, or electoral pressure can renegotiate contracts and redirect public programmes. Institutions are both mediators and products of prior rounds of change.

Ecological feedback may reinforce or reverse early gains. Irrigation can stabilize production and encourage investment, yet aggregate pumping can lower the water table and exclude households with shallow wells. Fertilizer and pesticides can raise output while changing soils, pest dynamics, biodiversity, and downstream water. Expansion into a profitable crop can increase deforestation; intensification in one place can spare land, displace pressure elsewhere, or stimulate further expansion if profitability rises. Land-system research therefore emphasizes spillovers, cross-scale connections, nonlinear transitions, and context-bounded causal mechanisms rather than universal one-driver accounts (Meyfroidt et al., 2018).

Markets also respond. Widespread adoption increases supply and may lower prices; specialization can create correlated vulnerability; new quality standards can become entry barriers; and successful service models can reduce access costs for later adopters. Migration changes local wages, care arrangements, gender authority, land use, and the aspirations of those who remain. Experimentation produces knowledge that may reshape extension and technology, although whose experience is recorded depends on voice and institutional attention. Feedback can thus be beneficial, harmful, or mixed, and it often appears at a different level or after a longer interval than the initial outcome.

The causal claim appropriate to rural systems is consequently conditional: a driver configuration changes incentives, exposures, or capabilities; institutions and social relations distribute access and authority; actors negotiate among constrained responses; outcomes differ across groups and dimensions; and those outcomes reconfigure assets, rules, markets, population, and ecosystems. This sequence avoids both technological determinism and an opposite error in which structure leaves no room for learning, bargaining, or collective action. It also supplies the organizing logic for comparisons in the chapters that follow.

The Rural Systems Mediation Framework

Table 1.2. Five linked stages of the Rural Systems Mediation Framework

Stage	Guiding question	What to record
1. Driver configuration	What is changing?	Technological, market, state, demographic-cultural, and environmental pressures; timing, intensity, and interaction among them
2. Social mediation	Who is exposed, enabled, or constrained?	Assets and liabilities; tenure and labour relations; rules and norms; class, gender, generation, caste or ethnicity; knowledge, networks, bargaining power, and spatial position
3. Negotiated response	What can actors do, who decides, and what is contested?	Adoption, adaptation, combination, delay, rental, collective action, diversification, migration, resistance, and exit; alternatives that were unavailable
4. Differentiated outcomes	What changes, for whom, where, and over what period?	Production, income, variability, assets, debt, security, labour and care, agency, belonging, participation, and soil, water, biodiversity, emissions, and resilience
5. Feedbacks and spillovers	How do outcomes change the next round of conditions?	Accumulation or depletion; restructured land and labour markets; standards and concentration; political coalitions; norms and aspirations; ecological recovery, thresholds, and displaced impacts

Every application must also specify four coordinates: **unit and scale**, **social group**, **time horizon**, and **evidence strength**. These prevent a result measured for one plot, group, or season from being silently generalized to a household, region, or long-term trajectory.

Framework claim template. Under **[driver configuration]**, actors occupying **[social and spatial position]** encounter **[institutional or relational mediator]**, making **[negotiated response]** feasible or necessary. This produces **[differentiated outcomes]** relative to **[comparison group or prior condition]**, which feeds back through **[institutional, market, demographic, political, or ecological pathway]**.

1.4 Building Open-Evidence Architecture

The Rural Systems Mediation Framework becomes useful only when its concepts can be connected to observations without collapsing the social system into whatever convenient dataset happens to measure. An open-evidence architecture is therefore more than a list of databases. It is a documented chain linking a question to a unit of analysis, an indicator, a source, a comparison, and a defensible kind of inference. Each link matters. A precise yield estimate cannot reveal who controlled the revenue; a household consumption measure cannot establish which member ate less; and a satellite image can register changing vegetation without identifying the rule, investment, or conflict that produced it. The objective is not to force unlike evidence into one metric, but to make unlike evidence answer complementary parts of the same systems question.

Keeping units analytically distinct

Rural evidence is especially vulnerable to unit slippage. A *plot* is a bounded piece of land on which inputs, crops, soil conditions, and management can be observed. A *parcel* may contain several plots. A *farm* or agricultural *holding* is an operational unit that may join dispersed parcels, livestock, equipment, and management under one decision-making arrangement. A *household* is usually defined through residence and shared provisioning, not through ownership of a single farm. One household may operate several holdings or combine farming with wage work, trade, migration, and transfers; one holding may be operated by several households or by a firm. An *individual* possesses labour, knowledge, rights, health, aspirations, and bargaining power that cannot safely be inferred from a household average. A *worker* is connected to a job and an employment relationship, whether or not that worker belongs to the farm household. A *community* is neither the mean household nor merely an enumeration area: it includes services, common resources, organizations, authorities, and relations among residents.

These distinctions determine what can be claimed. Plot-level input and output records support analysis of agronomic productivity, especially when area, crop, and manager are linked. Holding-level data reveal scale, asset concentration, and enterprise organization. Household panels show changes in consumption, income composition, migration, and exposure to shocks. Individual modules are needed for land rights, time use, decision-making, nutrition, and participation. Worker- or job-level records are needed for wages, contracts, hours, hazards, and social protection. Community and organizational data reveal roads, markets, extension presence, collective action, water governance, and customary authority. Regional, value-chain, and national data are required for prices, procurement structures, trade, regulation, and policy.

The architecture should preserve these units through separate identifiers and explicit linkage rules rather than merging them prematurely. Plot observations can be nested

within holdings, individuals within households, and households within places, while firms, labour contractors, producer organizations, markets, and administrative jurisdictions may cross those nests. Time must also be identified: the agricultural season, survey visit, policy period, and environmental observation are not interchangeable. This multi-level design prevents the common error of treating the sex of a reported "household head" as the sex of the farmer, the owner, the plot manager, or the person controlling output.

From concepts to indicator bundles

No single indicator connects farming to welfare, social relations, and institutional participation. The strongest bridge is a coordinated bundle covering production, distribution, security, agency, and ecology. Productive change may be measured through GPS-based cultivated area, crop and livestock portfolios, yields, irrigation, mechanization, purchased inputs, labour intensity, post-harvest loss, sales shares, farm-gate prices, contracts, and input or credit dependence. These measures require clear denominators. "Commercialization," for example, can mean whether anything was sold, the share of output sold, the value of purchased inputs, reliance on a buyer, or exposure to price risk. Each describes a different relationship.

Welfare measures should extend beyond nominal farm income. Real consumption or income per adult equivalent, asset and livestock holdings, debt, food-insecurity experience, dietary diversity, nutrition, housing quality, education, health, and subjective security capture distinct dimensions. Production diversity and market participation can be related to dietary diversity, but the association depends on what is produced, retained, purchased, and controlled; the measures should not be treated as substitutes (Verger et al., 2021). Likewise, composite farm indices can summarize multidimensional performance, yet their weights can conceal a trade-off in which higher revenue accompanies heavier labour, reduced biodiversity, or weaker tenure security (K M & Damani, 2019). Component values should therefore remain visible.

Social relations require indicators that conventional farm accounts often omit documented and perceived tenure rights; the identity of plot managers and owners; control over crop choice, labour, credit, and revenue; paid and unpaid hours; wage and contract conditions; reciprocal labour; care burdens; migration and remittance obligations; conflict and dispute resolution; and membership, attendance, voice, and leadership in producer or water-user organizations. Institutional access should be measured as usable access rather than nominal presence. Relevant indicators include contact with extension and the source and perceived usefulness of advice; distance, cost, eligibility, and actual use of credit, insurance, social protection, veterinary care, storage, transport, and digital services; participation in customary and public decision forums; and success in making claims or grievances. Environmental indicators rainfall and temperature anomalies, water availability and withdrawal, soil condition, erosion, land-cover change, tree cover, toxicity, and shock exposure complete the bundle.

Whenever possible, all domains should be disaggregated by class or asset position, gender, age, ethnicity or caste, tenure status, and location. A mean effect is not a systems result if its distribution is unknown.

A complementary source constellation

Open sources contribute different observational strengths. The Living Standards Measurement Study-Integrated Surveys on Agriculture (LSMS-ISA) combines multi-topic household surveys with detailed agricultural modules and, in several countries, panel rounds. Its linking plots and agricultural activities to socioeconomic status and non-farm livelihoods makes it unusually valuable for tracing welfare trajectories, while questionnaires, codebooks, sampling information, and microdata are publicly documented through country pages and the World Bank Microdata Library (World Bank, n.d.-a). Its coverage is not global, panels face attrition and household reconstitution, and public geographic detail is restricted, so it should not be treated as a universal rural template.

FAOSTAT provides long national and subnational series on production, land, livestock, inputs, trade, food balances, emissions, and other agricultural domains for more than 245 countries and territories (FAO, n.d.-a). It is well suited to locating structural trends and cross-national anomalies, but national aggregates do not identify household mechanisms and may combine official estimates of unequal quality. ILOSTAT, maintained by the International Labour Organization (ILO), adds harmonized labour-force concepts, including employment status, hours, wages, informality, and labour underutilization. Its separation of employment from own-use production under the post-2013 international standards makes subsistence work more conceptually visible, but also means that employment rates alone no longer summarize all productive work (ILO, 2013b). Analysts must check the operative standard, source, coverage, and break in series.

Demographic and Health Surveys provide standardized, nationally representative evidence on household composition, assets, health, nutrition, fertility, and selected dimensions of women's status in many countries. Datasets are available for legitimate research after registration (The DHS Program, n.d.-a). They can connect rural livelihood contexts to nutrition and demographic outcomes, but normally contain less farm detail than agricultural surveys. Their released cluster coordinates are deliberately displaced to protect respondents up to 2 kilometres in urban areas and generally 5 kilometres in rural areas, with a small share displaced farther so naïve joins to a specific village, road, irrigated perimeter, or environmental pixel introduce error (The DHS Program, n.d.-b).

Agricultural censuses supply near-comprehensive structural snapshots of holdings, including size, tenure, land use, irrigation, livestock, labour, and equipment. They can represent large commercial holdings and support small-area denominators and survey frames that household samples miss. FAO's World Programme for the Census of

Agriculture 2030 provides internationally agreed concepts for censuses conducted during 2026-2035 and encourages sex-disaggregated, community, administrative, and geospatial linkages (FAO, 2026). Yet censuses remain infrequent, country questionnaires and thresholds differ, and a holding census is not a population census: landless workers and rural non-farm households may be absent.

Spatial layers add exposures and ecological conditions between survey rounds. CHIRPS provides a long, high-resolution rainfall series suited to drought and rainfall-anomaly analysis (Funk et al., 2014); ESA WorldCover classifies global land cover at 10 metres for 2020 and 2021; WorldPop models population distribution with documented inputs and uncertainty; and FAO's WaPOR provides remotely sensed water-productivity layers with global coverage and finer-resolution products for selected regions. Such products improve environmental timing and spatial coverage but measure pixels or modelled surfaces, not institutions, access, or lived impacts. Resolution, classification error, clouds, model assumptions, coordinate displacement, and mismatched dates must be carried into interpretation.

Table 1.3. What major open evidence types can and cannot show

Evidence type	Strongest contribution	Main limitation in a rural-systems analysis
Repeated cross-sections	Population distributions and trends at successive dates	Cannot track the same units; composition may change
Household or farm panels	Sequences, entry, recovery, persistence, and exit	Attrition, reconstitution, restricted geography, and measurement change
Agricultural censuses	Structural coverage, rare large holdings, small-area frames	Infrequent; variable thresholds; may omit landless and non-farm populations
Administrative records	Programme delivery, registered claims, facilities, and transactions	Reflect institutional reach and registration, not all eligible or affected people
Qualitative studies and syntheses	Meaning, bargaining, informal rules, implementation, and mechanisms	Do not alone establish prevalence or a counterfactual effect
Geospatial layers	Environmental exposure and land or water dynamics across space and time	Pixels do not identify access, authority, or lived impact; linkage error matters

Triangulation gains power from this division of labour. If a survey reports irrigation adoption, administrative records can establish where schemes delivered water, remote sensing can indicate evapotranspiration, and interviews can reveal allocation rules or elite capture. Agreement strengthens a claim; disagreement can expose seasonal mismatch, selective programme records, unequal access, or measurement error.

Triangulation is thus an inquiry into convergence and contradiction, not a vote among sources. Evidence and gap maps can help locate clusters of evaluations and syntheses, but a gap map is an inventory of available research, not evidence that an unstudied intervention is ineffective.

A reproducible workflow

Evidence assembly should begin with a claim protocol rather than a database.

1. **Specify the case and claim.** Record the boundary, period, rural definition, proposed causal sequence, and unit needed for each link.
2. **Log the search.** Record databases and repositories, exact Boolean strings and controlled terms, dates, languages, document types, and forward or backward citation procedures. Searches in AGRIS, CGSpace, DOAJ, institutional repositories, and evidence-map portals should be paired with official data catalogues.
3. **Apply declared inclusion criteria.** Identify the population, geography, farming system or commodity, period, design, outcomes, and minimum reporting requirements. Reviews should show identification, deduplication, screening, exclusions with reasons, and inclusion, adapting PRISMA 2020 or ROSES to the question (Haddaway et al., 2018; Page et al., 2021).
4. **Extract consistently.** At minimum, record a unique source identifier; full citation and stable URL or DOI; data version and access date; funder and institutional author; population and sampling frame; units and levels; dates and season; rural definition; measures and denominators; design; missingness and attrition; estimates and uncertainty; subgroup results; contextual conditions; author-stated limitations; and the precise framework link supported.
5. **Harmonize transparently.** Create a log for currencies and price bases, area and output units, occupational and crop classifications, geographic boundaries, rural definitions, and recoding decisions. Never overwrite original variables; retain a crosswalk and analysis script.
6. **Maintain a claim-by-evidence matrix.** Each empirical generalization should point to the evidence that supports it, identify contrary findings, and state whether support is descriptive, associational, temporal, mechanistic, causal, or transferable.
7. **Preserve provenance.** Save search logs, data dictionaries, code, transformations, and source snapshots where licences allow. Record version changes in survey or international data files, because reproducibility requires reconstructing the evidence actually analysed, not merely returning to a changing portal.

Measurement limits as substantive findings

Open data reproduces the categories and silences of the institutions that collected them. Recall periods can distort labour, input, harvest, and sales reports; survey experiments show that farm-labour estimates are sensitive to reporting design (Arthi et al., 2018). Farmer-reported plot area contains systematic error, especially across plot sizes, making GPS-based area preferable when feasible (Carletto et al., 2015). Proxy respondents may know little about another member's labour or income. Questions addressed only to a household head obscure joint, contested, and individual rights. Seasonal visits may miss temporary migration, hunger periods, multiple cropping, and intermittent wage work.

Sampling frames also make populations disappear. Household surveys may omit institutions, homeless or displaced people, mobile pastoralists, remote settlements, migrant workers living at worksites, and those who have left rural areas altogether. Agricultural surveys and censuses may exclude holdings below a threshold, kitchen gardens, forest and fish gathering, common-property production, landless labourers, and unregistered tenants. Labour statistics can miss informal, unpaid, own-use, secondary, and irregular activities when questionnaires or concepts are narrow. Administrative data privilege registered owners, formal firms, programme participants, documented disputes, and people able to approach the state. Digital traces underrepresent those without devices, connectivity, literacy, or platform membership.

Several relationships remain poorly measured even when people are counted: intrahousehold allocation, care work, coercion, patronage, labour recruitment, caste or ethnic exclusion, customary claims, common-resource governance, trust, knowledge exchange, and control within producer organizations. Firms, traders, processors, landlords, and public officials are often much less visible than farm households, although they structure prices and access. International comparison adds inconsistent definitions of household, holding, worker, and rurality; the Degree of Urbanisation offers a harmonized continuum for sensitivity analysis but is designed to complement, not erase, national definitions (European Commission et al., 2021).

These are not footnotes to be acknowledged after analysis. Missingness, uncertain linkage, definitional breaks, and population exclusions should be reported beside every result and entered into the Evidence Canvas. The architecture is strongest when it shows both what can be known and whose rural system remains outside the frame.

1.5 Comparative Explanation and Responsible Inference

Description is indispensable, but the book's central claims concern why change occurs, through which relations, and for whom. Responsible inference means matching the strength of the language to the design and making the route from evidence to explanation inspectable. Secondary evidence can support causal explanation, but no source becomes causal simply because it is longitudinal, large, quantitative, or repeatedly cited. The task is to assemble temporal, comparative, and mechanistic support while actively testing alternatives.

A causal grammar for rural systems

The Rural Systems Mediation Framework supplies a common causal grammar: **structural driver → social mediator → negotiated response → differentiated outcome → feedback**. Drivers include technologies, prices, procurement systems, regulation, infrastructure, demographic change, and environmental stress. Mediators are the property regimes, class positions, gender and generational relations, credit arrangements, labour institutions, organizations, state capacity, knowledge networks, and ecological conditions through which a driver acquires practical force. Responses adoption, refusal, bargaining, borrowing, crop substitution, labour reallocation, migration, collective action, or exit are negotiated under unequal constraints. Outcomes include production and income but also debt, labour conditions, nutrition, agency, conflict, ecological change, and security. Feedback occurs when those outcomes alter later prices, resource conditions, institutional rules, political coalitions, aspirations, or the composition of the rural population.

This sequence prevents "climate," "markets," or "innovation" from being treated as self-executing causes. A drought does not mechanically generate migration: tenure, savings, social protection, water governance, household labour, and destination networks mediate whether people intensify, borrow, diversify, move, or lose land. The same analytical discipline applies to mechanization or contracting. Every explanatory claim should name the actors, resource or authority altered, response made possible or necessary, outcome observed, and scope conditions under which the sequence is expected.

The book distinguishes six claim types. A *descriptive* claim establishes a pattern. An *associational* claim establishes covariation. A *temporal* claim shows that one event preceded another. A *mechanism* claim identifies a process connecting them. A *causal-effect* claim estimates what would have happened under a credible alternative exposure or intervention. A *transferability* claim argues that an explanation is likely to operate elsewhere. These claims can reinforce one another but are not interchangeable. "Households using irrigation had higher consumption" is not yet evidence that irrigation raised consumption; selection into irrigation, prior wealth, soil, market access, or public investment may explain both.

What secondary evidence can support

Repeated cross-sections can establish aggregate change and distribution at successive dates, but changing population composition prevents them from showing that the same households moved along a trajectory. Panels improve temporal ordering and reveal entry, persistence, recovery, and exit within units. They still face attrition, measurement change, time-varying confounding, anticipation, and feedback between prior outcomes and later treatment. Fixed effects remove only time-invariant unobserved differences. Agricultural and population censuses strengthen denominators, structural comparison, and small-area description, but a sequence of census snapshots does not by itself identify a cause.

Random assignments and well-designed natural experiments can provide a credible counterfactual for an intervention. Quasi-experimental strategies difference-in-differences, regression discontinuity, instrumental variables, interrupted time series, and matched comparisons can also identify effects when their specific assumptions are justified. Staggered policy adoption, for example, requires estimators and diagnostics that allow effects and treatment timing to vary rather than relying uncritically on a single two-way fixed-effects coefficient (Callaway & Sant'Anna, 2021). No design has automatic priority outside the question it answers. Trials may estimate an average effect in a study population while saying little about implementation mechanisms, political selection, long-run feedback, or performance under another tenure or market regime (Deaton & Cartwright, 2018).

Mechanism claims require evidence of the intervening process, not merely a statistically significant coefficient on a mediator. Statistical mediation inherits demanding assumptions about confounding and measurement. More credible support combines association with traces that the proposed entities acted in the proposed order: dated policy and budget records; eligibility and delivery data; price and transaction records; meeting minutes; extension logs; environmental observations; household or worker trajectories; and interviews or ethnographies describing decisions, enforcement, and contestation. Evidential pluralism is useful here: causal assessment normally needs evidence of an appropriate association and of a mechanism capable of producing it (Shan & Williamson, 2021). Qualitative evidence can establish that a rule was interpreted and enforced in a particular way; it does not independently construct the missing counterfactual. Conversely, an effect estimate can show that outcomes changed because of treatment under stated assumptions without revealing which pathway operated.

Comparison without erasing context

Comparison should be designed around theoretically relevant variation, not assembled from whatever country estimates share a label. Before comparing regions, commodities, farming systems, welfare regimes, or degrees of market integration, define a common outcome, comparable units, a defensible time window, and a minimum contextual profile. The profile should record agroecology, land distribution and tenure, labour regime, gender and inheritance institutions, infrastructure, state and customary authority, exposure to conflict or shocks, market structure, and the policy bundle surrounding the focal change. A harmonization table must show where definitions, questionnaires, prices, samples, and seasons differ.

Nested comparison is especially productive. Within a case, compare periods, places, or groups differently exposed to the same driver. Across cases, compare settings with a similar driver but contrasting mediators, and settings with similar outcomes reached through different pathways. At a broader level, test whether the proposed configuration recurs in a larger panel or evidence map. This combination preserves the integrity of cases while supporting analytical not merely statistical generalization. Explicit contextualization creates a common basis for comparison without pretending that context is residual noise (Kosmützky et al., 2020).

Case selection should be stated in advance. Selecting only celebrated success cases exaggerates effectiveness; choosing cases because the outcome occurred cannot test whether the proposed cause distinguishes success from failure. Negative and deviant cases are therefore valuable. Qualitative Comparative Analysis can help with a transparent, medium-N set when the theory predicts conjunctions, equifinality, or asymmetric causation for example, several combinations of secure tenure, credit, extension, and water access producing adoption (Befani, 2013). Its results remain sensitive to case selection, calibration thresholds, limited diversity, and omitted conditions, so set-theoretic patterns still require within-case validation.

Process tracing and rival explanations

Process tracing converts the framework into observable tests. For each link, the analyst specifies what should be found if the mechanism operated, where that trace could appear, when it should appear, and what a rival account would predict instead. A contracting claim might require evidence that a buyer introduced standards and credit; that eligibility or enforcement altered farmers' options; that households reallocated land and labour in response; that gains and risks differed by assets and bargaining position; and that subsequent debt, exit, or producer organization changed the next contracting round. Chronology alone is weak. Diagnostic evidence gains value when it is improbable under a rival explanation (Collier, 2011).

At least three rival families should normally be considered. *Selection* asks whether already advantaged households, farms, or places received the technology, contract,

road, or programme. *Common causes* ask whether weather, prices, conflict, infrastructure, or policy changed both exposure and outcome. *Reverse causation and anticipation* ask whether expected profits, distress, or migration shaped adoption before the recorded intervention. Further challenges include spillovers, displacement, measurement change, attrition, and concurrent programmes.

Secondary analysis can address rivals through pre-treatment balance and trend checks, alternative comparison groups and windows, placebo dates or outcomes, sensitivity to definitions and weights, dose or exposure patterns, negative cases, and explicit modelling of concurrent shocks. Robustness is not the number of regressions reported; it is whether results survive plausible challenges to the identifying story. Process evidence should also seek disconfirmation. A missing trace is informative only if the source would probably have recorded it; silence in an archive that excludes informal bargaining is not proof that bargaining did not occur.

Feedback claims demand the longest horizon. Higher groundwater extraction may initially increase output, then lower water tables, raise pumping costs, concentrate access, and prompt new regulation or migration. Establishing that loop requires aligned production, hydrological, distributional, and institutional observations across enough time for the return effect to occur. Short evaluations should describe such feedback as a hypothesis unless later evidence observes it.

Distribution is part of the explanation

Agrarian change is differentiated by construction. Analysis should therefore report exposure, response, and outcome separately by asset or class position, gender, age and generation, ethnicity or caste where ethically and legally measurable, tenure status, labour status, remoteness, and ecological zone. Intersectional groups should be specified when sample size and disclosure protection allow. “Women-headed households” are not an adequate proxy for women: married women, daughters, widows, female wage workers, and women managing plots within male-headed households may have different rights and burdens.

Distributional comparisons need common metrics and baselines. Report absolute and relative change, uncertainty, and the initial level; a similar percentage gain can leave a much larger absolute gap. Check whether gains arise from improved outcomes among participants, compositional exit of poorer farmers, or displacement of labour and environmental costs onto others. Heterogeneity discovered after extensive subgroup searching should be labelled exploratory. Where open microdata lack power or categories, qualitative evidence can reveal exclusion mechanisms, but prevalence should not be inferred from purposive accounts. Distribution is simultaneously an outcome and a mediator because today’s gains, losses, and exits reshape tomorrow’s assets and bargaining power.

A claim-specific evidence grade

To make uneven evidence visible, this book proposes a **Rural Systems Evidence Grade** as a practical appraisal aid across five dimensions. Each dimension can be scored 0, 1, or 2. The rubric draws inspiration from structured appraisal, including GRADE-CERQual's attention to methodological limitations, coherence, adequacy, and relevance (Lewin et al., 2018), but is an author-developed heuristic rather than a validated extension of CERQual. The table provides guidance for future applications; it does not imply that every empirical claim in this book has received a documented numerical assessment.

Table 1.4. Rural Systems Evidence Grade

Dimension	0: serious weakness	1: partial support	2: strong support
Design adequacy	Evidence is misaligned with the claim or has unaddressed major bias	Appropriate descriptive or temporal evidence with residual threats; plausible but non-diagnostic traces	Credible counterfactual for an effect claim or multiple diagnostic observations for a mechanism claim
Consistency and convergence	One fragile result or unexplained disagreement	Several broadly agreeing results, often sharing a method or source	Independent evidence types or settings converge; contrary and null evidence are incorporated
Contextual fit	Population, period, institutions, ecology, or intervention differs materially	Partial fit with differences made explicit	Actors, units, mechanism, time, and setting align directly with the claim
Transparency and traceability	Opaque sample, instruments, transformations, provenance, or conflicts	Partial documentation	Accessible methods and metadata, reproducible trail, definitions, exclusions, uncertainty, funding, and limitations
Transferability and scope	Unbounded generalization from one setting or unidentified population	Plausible portability to specified comparable settings	Replication across relevant variation or well-supported scope conditions

Totals can help organize appraisal, but no validated thresholds link this rubric's sums to **high**, **moderate**, **low**, or **very low confidence**. Confidence should be justified from the profile of strengths and weaknesses, rather than inferred mechanically from a total. A fatal mismatch between design and claim precludes a strong inference, and serious opacity limits what can be assessed. Scores are assigned to a claim, not permanently to a

source. A census may merit high confidence for the number of registered holdings and very low confidence for the claim that a subsidy caused farm consolidation. A qualitative synthesis may be high-confidence evidence about a recurrent access mechanism and provide no effect-size estimate.

The grade should be accompanied by a one-sentence rationale, the strongest rival explanation, populations not represented, and a language rule. Descriptive evidence "shows" a measured pattern; associational evidence "is associated with"; partial mechanism evidence "is consistent with" or "likely contributed to"; causal language such as "produced" or "caused" requires a credible identification strategy or strong process evidence appropriate to the claim, with assumptions and limitations explicit. An identified effect need not reveal the mechanism that produced it. Confidence can be upgraded by independent replication, precise and temporally ordered evidence, and observed predicted traces, or downgraded by unexplained heterogeneity, publication bias, indirectness, measurement breaks, and institutional conflict of interest.

Responsible inference does not weaken the argument. It distinguishes a durable explanation from a confident narrative. By preserving units, comparing configurations, testing rivals, tracing mechanisms, and grading claims openly, the book can draw wider conclusions while showing exactly where they apply and where uncertainty remains.

CHAPTER 02

Households in Motion

Land, Labor, and Agrarian Differentiation

Chapter purpose

A farm may appear in a survey as a single holding and a household as a single respondent. Neither is a single social actor. The harvest attributed to one "farm household" can depend on several plots held under different claims, the paid work of seasonal migrants, the unpaid work of women and children, remittances earned in a city, reciprocal obligations among kin, and decisions negotiated across generations. Income can rise while nutrition deteriorates, production can expand while debt and time poverty deepen, and a household can leave farming through either chosen mobility or dispossession. To explain these divergent outcomes, land, labour, and household relations must be treated as mechanisms of agrarian change rather than as background characteristics.

This chapter asks: **How do land, labour, and household relations generate divergent agrarian trajectories under changing technological, market, policy, and environmental conditions?** Its answer begins by replacing the unitary farm household with a negotiated institution. Household members coordinate production, consumption, care, inheritance, and mobility, but they do so from unequal positions. Rights to land are layered and socially recognized rather than exhausted by a title. Labour is assembled through family work, hired employment, exchange, tenancy, migration, and care, while much of the work that sustains agriculture remains unpaid or statistically invisible. These relations determine who can take a risk, whose labour is intensified, who captures income, and who has a credible option to refuse, adapt, accumulate, or exit.

Chapter 1 introduced the Rural Systems Mediation Framework as a common causal grammar: **driver configuration → social mediation → negotiated response → differentiated outcomes → feedbacks**. Chapter 2 moves inside its mediating middle. A price rise, irrigation scheme, land-registration programme, machine service, or climatic shock does not encounter households with equal assets, claims, labour power, or bargaining positions. It encounters owners and tenants, employers and workers, senior and junior members, migrants and those who remain, people with liquid savings and people already carrying debt. Responses are therefore negotiated within and beyond households. Their outcomes - asset growth, stable reproduction, adaptive

diversification, intensified exploitation, distress, or exit - then reshape the next round of land access, labour demand, creditworthiness, political voice, and ecological use.

Agrarian differentiation is the name given here to that dynamic redistribution of capacities and positions. It cannot be inferred from farm size alone. A small farm linked to secure nonfarm earnings and a functioning rental market may be more resilient than a larger holding burdened by debt, insecure tenure, and labour scarcity. Renting out land can signal distress, retirement, or strategic specialization; hiring labour can indicate accumulation, but it can also be a temporary response to illness or migration. The analytical task is to interpret combinations and sequences: who controls which land, who hires or sells labour, which assets can be mobilized, what kinds of markets and organizations are accessible, how agency is distributed, and whether apparent gains can be sustained across seasons and generations.

The five sections proceed from the farm household as a site of production and social reproduction, through land claims and intergenerational transfer, to labour regimes, migration, and mechanization. They then explain agrarian differentiation as a process and connect household trajectories to welfare and policy fit. The practical output is an **Agrarian Differentiation Diagnostic Matrix**. It records land access, labour position, asset base, livelihood portfolio, market relations, agency, exposure to risk, likely direction of change, and appropriate policy responses while keeping ambiguity and change over time visible. The aim is not to sort rural people into fixed boxes. It is to identify the mechanisms that make accumulation possible for some, simple reproduction precarious for many, and agricultural exit either enabling or unjust.

2.1 The Farm Household as Production and Social Reproduction

The farm household is neither a miniature firm nor a naturally harmonious family. It is a negotiated institution that coordinates production, consumption, care, inheritance, and mobility across people whose interests overlap without becoming identical. The household must also be kept analytically distinct from the farm or agricultural holding. One household may operate several plots under different tenure arrangements, cultivate crops controlled by different members, maintain livestock, run nonfarm enterprises, and supply workers to other farms or towns. Conversely, a farm may draw labour and capital from more than one residential unit. Treating household, farm, and decision-maker as interchangeable therefore hides precisely the relations through which agrarian change is made unequal.

This distinction brings the Rural Systems Mediation Framework inside domestic life. A driver configuration such as a new irrigation scheme combined with volatile output prices and male out-migration does not act on an undifferentiated “smallholder.” Its effects are mediated by household composition, control of land and income, care obligations, labour calendars, and members’ fallback options. Members then negotiate

responses: intensify a crop, rent out a plot, migrate, hire labour, reduce consumption, or withdraw a child from school. Those responses produce differentiated outcomes within as well as between households, and those outcomes feed back into future bargaining power, health, skills, assets, and the viability of farming.

Beyond the unitary household

Agricultural household models made an important advance by showing that production and consumption decisions can be inseparable where markets for labour, credit, insurance, land, or food are incomplete. A household unable to hire workers at the right moment may choose a crop according to family labour availability; one unable to borrow may finance fertilizer from wage earnings; and one facing high food-market transaction costs may retain land in subsistence production even when another crop offers a higher expected price (Taylor & Adelman, 2003). Yet analytical nonseparability does not imply a single preference function. It tells us that decisions are linked, not that one person makes them or that all members value their consequences equally.

Cooperation is common because household members share dwellings, meals, risks, kinship commitments, and claims on future support. Pooling labour can overcome seasonal bottlenecks; pooling income can insure members against illness or crop loss; and repeated interaction can sustain reciprocal obligations that a spot market cannot provide. Cooperation is especially likely where a decision produces a large joint surplus, members expect the relationship to continue, and distributional rules are seen as legitimate. A couple may agree to devote labour to a cash crop because its revenue will pay school fees; siblings may maintain an inherited plot because it secures food and an anchor in the community; migrants and residents may jointly finance a pump because each expects a share of future benefits.

But cooperation over production can coexist with conflict over work and rewards. Members may disagree about whether to prioritize food crops or cash income, current consumption or farm investment, a young person's migration or continued family labour, or the use of proceeds controlled by one spouse. Empirical work in Côte d'Ivoire demonstrates why separate accounts matter: the composition of household expenditure changed with the identity of the person whose crop benefited from rainfall, even when total expenditure was held constant (Duflo & Udry, 2004). Udry's (1996) plot-level analysis likewise found that productive inputs were not efficiently equalized across men's and women's plots within the same households. These findings do not mean that every household is in constant contest. They show that observed allocations cannot safely be inferred from aggregate household income or explained as the outcome of a benevolent household head.

Bargaining offers a better starting point, provided it is not reduced to an explicit negotiation at a kitchen table. Bargaining power derives from command over assets and earnings, access to information, social support, legal rights, mobility, and the credibility

of living outside a particular arrangement. It is also shaped by norms defining a "good" wife, husband, daughter, son, widow, or elder. Those norms influence which claims can be voiced, which needs count as legitimate, and whether refusal is safe. Extra-household institutions therefore enter domestic allocation: a woman's land rights, a youth's access to employment, the availability of childcare, membership in a producer group, and protection from violence can all alter negotiation inside the household (Agarwal, 1997; Doss, 2013). Power can operate through open disagreement, quiet noncompliance, concealment of earnings, deference, or the internalization of duties. Agreement alone is not evidence of equal agency.

Table 2.1. The farm household as linked decision arenas

Decision arena	Basis for cooperation	Recurring distributional conflict	Evidence needed
Production and plot management	Shared food, income, risk pooling, complementary skills	Crop choice, input allocation, task authority, whose plot receives investment	Plot manager, worker-days by person / task, input use, decision-maker, output destination
Income and enterprise	Liquidity across seasons; finance for farm and household needs	Pooling versus separate accounts; control of sales, wages, remittances, and debt	Income source, recipient, controller, timing, liability, use of proceeds
Consumption and investment	Joint provisioning and intergenerational commitments	Food allocation, health, schooling, savings, farm reinvestment	Individual diet / health / schooling plus expenditure and asset change
Care and social reproduction	Sustains workers, dependents, kin obligations, and future capability	Unpaid workload, time poverty, mobility, rest, and foregone earnings	Time use by person and season, care need, service access, decision participation
Migration, marriage, and succession	Spreads risk and organizes long-term continuity	Who leaves, who remains, who inherits, who bears care, and whose claim survives	Member histories, remittance control, land rights, succession expectations, fallback options

Composition, dependency, and the family life course

Household composition changes both the quantity of available labour and the claims placed upon it. A simple headcount is inadequate. What matters is the number, age, health, skill, and social position of members; the timing of their availability; and whether they can work in particular tasks. A household with several adults may still face a peak-season shortage if those adults are in school, employed off farm, constrained by care, or excluded by gender norms from operating equipment. A high dependency ratio can reduce investible surplus, but dependents are heterogeneous. Small children require intensive care; older children may combine schooling with herding or weeding; older people may contribute knowledge, supervision, land claims, childcare, or pensions even when unable to perform strenuous work.

The household life course links family formation to farm organization. A young household may have abundant ambitions but little land, equipment, savings, or authority. Childbearing can simultaneously increase consumption needs and constrain the labour time of the primary caregiver. In a middle stage, maturing children or additional adults can expand labour supply, make migration possible, and permit cultivation of more land, while school expenses create new cash needs. Later, adult children may leave, send remittances, return with capital, or contest succession. Illness, disability, separation, widowhood, and death can abruptly move a household between these stylized stages. The sequence is not universal: fostering, polygyny, multigenerational residence, circular migration, and households spanning rural and urban locations disrupt any simple nuclear-family cycle.

Life-course effects are therefore relational rather than biological. An older landholder's apparent labour constraint may be eased by adult children, a tenant, reciprocal work, or machinery; a young farmer's energy may not translate into investment without a recognized claim to land. The same demographic event can redistribute vulnerability. When an adult migrates, household cash may rise while the remaining spouse's farm and care workload also rises. When a daughter marries, her labour may leave the natal farm while her land claim remains uncertain. Composition affects production capacity, but institutions determine who may mobilize that capacity and who bears the cost.

Livelihood portfolios: diversification by opportunity and by necessity

Rural households commonly combine own-farm production, livestock, agricultural wages, nonfarm wages, petty trade, processing, transport, services, public transfers, and remittances. Comparable evidence across developing countries finds diversification to be the norm even where agriculture remains central (Davis et al., 2010). These income streams are not simply additive. Wage work can finance seed and irrigation, but it can also remove labour during planting. Livestock can supply manure, traction, food, savings, and status, yet compete for labour and water. Subsistence crops can stabilize food access while a cash crop exposes the household to input debt and price risk. A remittance may relax liquidity constraints, though migration can also narrow who controls cash or shift unpaid work to those who remain.

It follows that diversification is not a synonym for resilience. There is a crucial difference between *pull* diversification into skilled, reliable, high-return activities and *push* diversification into casual work undertaken because farming cannot meet basic needs. Entry barriers in capital, education, transport, and networks often reserve the more remunerative nonfarm economy for better-endowed households, while poorer households diversify into low-paid activities that are exposed to the same local shock as agriculture (Barrett et al., 2001). Portfolio breadth can spread risk only when income sources are not tightly correlated and when the household retains enough labour, capital, and coordination capacity to manage them.

Longitudinal evidence reinforces this dynamic view. In rural Cambodia, most sampled households changed livelihood strategies over four years, but access to more remunerative strategies depended on education, assets, and infrastructure (Jiao et al., 2017). In Nepal, movements into higher-return strategies occurred alongside substantial persistence in low-remuneration positions (Walelign, 2017). Thus, a portfolio must be evaluated by its returns, covariance of risks, labour demands, barriers to entry, control of proceeds, and effects on future capabilities not merely by counting activities.

Agricultural specialization can support accumulation where households possess reliable water, productive assets, market power, insurance, and a margin for failure. It can be hazardous where a single crop concentrates climatic, pest, price, or buyer risk. Conversely, a rising nonfarm share can indicate upward mobility, planned structural transition, or distress. A household investing professional earnings in a commercial farm is moving along a different trajectory from one selling labour after losing land, even if both report “nonfarm income.” Gradual withdrawal from farming is opportunity-led when education and decent work allow members to reallocate labour while preserving welfare and choice. It is distress-led when low returns, debt, ecological decline, or exclusion force the liquidation of productive assets. The direction of change can only be inferred from repeated observations of assets, labour, well-being, and agency.

Social reproduction: the labour that makes farm labour possible

Agriculture depends on social reproduction: the daily and intergenerational work of maintaining people, households, and social relations. Cooking, cleaning, childcare, eldercare, nursing, collecting fuel and water, processing food, maintaining a dwelling, and sustaining reciprocal networks reproduce the labour force that appears in production statistics. Much of this work is unpaid and assigned to women and girls. It is therefore easily recorded as "not working," even though the farm could not operate without it. The Food and Agriculture Organization of the United Nations (FAO) documents how women's agrifood work is more likely to be informal, irregular, labour-intensive, and constrained by heavier unpaid-care burdens (FAO, 2023b).

The analytical consequence is more than a call to recognize hidden contributions. Production decisions can transfer costs into the reproductive sphere. Expanding irrigated vegetables may increase income while adding food preparation, water management, and care work to an already long day. Mechanizing land preparation may reduce a task performed by men without easing women's weeding or postharvest work. A health shock can remove a worker and simultaneously create a patient who requires care. If added burdens reduce rest, nutrition, schooling, participation in organizations, or time on a woman-controlled plot, a project's household-level income gain can coexist with an individual loss of well-being and agency.

Control over time and income is therefore as important as participation. Kabeer's (1999) distinction among resources, agency, and achievements helps prevent a misleading inference from activity to empowerment. A woman may earn cash without controlling it, join a contract-farming scheme without choosing the crop, or receive a tool that increases the amount expected of her. Meaningful agency concerns the capacity to make consequential choices and act on them. For analysis, this requires individual-level questions about ownership, decision-making, workload, mobility, and command over proceeds, alongside household aggregates.

Coping, adaptation, and accumulation under risk

Household responses to shocks should be distinguished by their time horizon and reversibility. *Coping* protects immediate consumption or survival: reducing meals, borrowing, selling livestock, postponing health care, withdrawing children from school, or taking emergency wage work. *Adaptation* changes exposure or sensitivity to recurring risk: altering crops and planting dates, investing in water management, diversifying locations or income sources, or renegotiating labour arrangements. *Accumulation* expands the asset and capability base: improving soil, purchasing equipment, educating members, building a profitable enterprise, or acquiring a more secure land claim. One action can occupy more than one category. Migration may insure consumption, finance investment, or represent involuntary exit; livestock sale may be prudent portfolio adjustment or the start of decapitalization.

The poor often face a harsh intertemporal tradeoff. Informal insurance, savings, and diversified income provide partial protection, but asset lumpiness, correlated shocks, and entry barriers limit their effectiveness (Dercon, 2002). Evidence following disasters in Ethiopia and Honduras shows that households with weaker asset bases can adopt responses that preserve life in the short run while damaging longer-term recovery (Carter et al., 2007). This is where outcomes become feedbacks. Selling an ox reduces present hunger but constrains next season's cultivation; interrupting a daughter's schooling increases care labour now but narrows her later employment options; repaying input debt through land rental may protect creditworthiness while reducing future food production.

The most useful question is consequently not whether a household "adopted" or "diversified," but who authorized the response, who supplied the additional labour, whose assets were protected or sold, and whether the response enlarged or narrowed future choices. A just resilience strategy aims to maintain or restore valued functions without reproducing hidden deprivation. Upward mobility requires gains that survive the next shock and broaden agency; survival through intensified unpaid labour or depletion of land and bodies is not accumulation.

Section synthesis

The household operates cooperatively when interdependence, repeated obligations, risk pooling, and a credible distribution of joint gains align members' interests. Conflict becomes consequential when preferences differ and control over land, earnings, mobility, or legitimacy is unequal; most households contain both processes at once. Composition and life-course stage alter labour supply, investment capacity, and vulnerability, but their effects are mediated by tenure, gender, generation, health, care services, and migration networks rather than fixed by demography alone. Finally, livelihood combinations support resilience and mobility when they join viable farming with sufficiently remunerative, weakly correlated income sources and preserve future assets and agency. The same visible diversification can instead mark constrained coping or gradual agricultural exit. Trajectory, not activity count, is the explanatory object.

2.2 Land Access, Tenure, and Intergenerational Transfer

Land is a biophysical resource, a store of wealth, a source of food and income, a political jurisdiction, an ancestral place, and a basis for social membership. It cannot be reduced to hectares or to a title deed. A relational analysis treats tenure as a bundle of socially recognized claims: to enter, cultivate, graze, gather, plant trees, draw water, exclude others, rent, mortgage, transfer, inherit, and receive compensation. Different people may hold different elements of that bundle at the same time. A lineage may retain authority over alienation, a household may cultivate, a woman may gather fuel, a tenant may harvest a crop, and pastoralists may hold seasonal passage. The decisive issue is not only who is called the "owner," but who can derive benefits, on what terms, for how long, and against whose competing claim (Ribot & Peluso, 2003).

This formulation keeps land access distinct from household membership. A plot listed under a household head may be operated by a spouse, loaned to a relative, rented to a tenant, or subject to communal restrictions. Surveyed area can therefore conceal unequal authority within the same household and overlapping rights beyond it. Under the mediation framework, land relations translate market demand, infrastructure, conservation rules, climate pressure, and demographic change into differentiated capacities to invest, earn, remain, or exit. Tenure is not merely a background institution; it is a mechanism through which agrarian change is allocated.

Table 2.2. Land as a bundle of claims rather than a single title

Claim in the bundle	Benefit or authority conveyed	Typical basis of recognition	Rights most easily erased
Access and withdrawal	Enter, cultivate, graze, gather, fish, or draw water	Membership, custom, permit, tenancy, seasonal agreement	Women's gathering, pastoral mobility, migrant and secondary use
Management	Choose crops, invest, conserve, allocate water, supervise labour	Household authority, lease, organization, public regulation	Junior, tenant, and user knowledge where ownership is privileged
Exclusion	Decide who may use a resource and under what conditions	Title, lineage authority, collective rule, state concession	Commons users and overlapping claims classified as encroachment
Transfer	Lend, rent, sharecrop, mortgage, sell, or bequeath	Statute, custom, contract, family consent	Spousal consent, future heirs, tenants, and collective limits on alienation
Remedy and compensation	Contest loss, inherit, return after displacement, receive compensation	Courts, customary forums, administrative procedure, collective negotiation	People lacking documents, legal aid, political standing, or recognized residence

Legal pluralism and hybrid tenure in practice

Customary, statutory, and market-based tenure are often presented as separate stages of development. In practice they form hybrid legal orders. A transaction may be negotiated through kin, witnessed by a chief, recorded on paper, taxed by a local government, and enforceable only through a mixture of social pressure and court action. Customary authority is not timeless: it responds to migration, land scarcity, commodity prices, elections, and statutory reform. Nor is a land market necessarily evidence that custom has disappeared. "Vernacular" sales and rentals can commodify land while retaining customary languages of belonging and approval (Chimhowu & Woodhouse, 2006).

Hybrid systems can provide flexible and legitimate access. They can also create an "institutional shopping" problem in which stronger actors choose whichever forum favors their claim. A chief may allocate land that a family regards as inherited; a state agency may classify seasonally used rangeland as vacant; a buyer may obtain a formal document without securing the consent of secondary users. Recognition on paper may strengthen a claim against outsiders yet weaken unrecorded rights within the group. The FAO tenure guidelines therefore call for governance that respects legitimate public, private, communal, Indigenous, customary, and informal rights rather than treating only registered private ownership as valid (FAO, 2012).

Power is constitutive of security. In Akwapim, Ghana, politically influential cultivators were better able to leave plots fallow without fear of reallocation and consequently made more fertility-enhancing investments (Goldstein & Udry, 2008). The mechanism was not the simple presence or absence of custom; it was differential command within the customary-political order. Legal pluralism must thus be mapped empirically: which institution recognizes each claim, whose testimony counts, what evidence is accepted, how disputes are resolved, and whether women, tenants, migrants, pastoralists, or junior lineage members can use those forums safely.

Distribution, fragmentation, rental, and consolidation

Farm structure changes through inheritance, purchase, rental, state allocation, debt, marriage, urban investment, and land-use conversion. Concentration refers not only to unequal titled ownership but also to control through leases, concessions, contract terms, water access, or machinery services. Fragmentation likewise has several meanings: a holding divided into many parcels, ownership split among heirs, or operational control separated from ownership. Tiny and dispersed plots can raise travel costs, obstruct irrigation and mechanization, and complicate conservation. Yet fragmentation can also spread climatic risk across microenvironments, provide access to different soils and water points, and embody an intentional risk-management strategy (Bentley, 1987). Consolidation is therefore not inherently efficient or just; its consequences depend on who chooses it, which rights are exchanged, and whether people can refuse.

The global farm structure is highly unequal. Most farms are small and family operated, while farms below two hectares control only a modest share of agricultural land (Lowder et al., 2016). National averages conceal simultaneous subdivision at the bottom and concentration above it. In Ghana, Kenya, Tanzania, and Zambia, repeated surveys documented a rising land share under medium-scale holdings in several countries, often associated with acquisitions by urban-based professionals or influential rural people using nonfarm capital (Jayne et al., 2016). Such farms may introduce services, marketed output, and technical change, but can also tighten local land scarcity and influence policy priorities. The relevant inquiry is not whether "medium" is good or bad; it is how entry occurred, what prior claims were displaced, which linkages were created, and how gains and costs were distributed.

Rental and sharecropping can reallocate operational land without permanent sale. They may allow land-poor, labour-rich households to expand, older or labour-constrained holders to retain an asset, and migrants to preserve a return option. Six-country evidence from sub-Saharan Africa suggests rental markets can transfer land toward land-poor and more productive cultivators, but participation varies greatly and is constrained by policy, tenure insecurity, gender, and transaction costs (Deininger et al., 2017). Sharecropping may share risk where credit and insurance are missing, yet tied credit, labour obligations, and unequal contract enforcement can transfer a large share of value to the landholder. Observing that a market exists does not establish that entry is affordable or bargaining is equal.

When security induces investment and when it does not

Tenure security has legal, social, and perceptual dimensions. A person may hold a document but fear expropriation, or lack a title while enjoying a locally legitimate and durable claim. Security can encourage investment through several pathways: confidence in capturing future returns, reduced time spent defending a claim, greater ability to rent land to others, and sometimes improved collateral value. The mechanism depends on the investment. Annual fertilizer requires a shorter horizon than a terrace, orchard, or irrigation structure; conservation may also require coordination beyond the plot.

The evidence rejects a universal titling-to-credit-to-productivity sequence. A systematic review found generally positive effects of tenure-recognition interventions on productivity, income, and investment, with marked regional variation and limited high-quality evidence; it found no support for credit access as the general mechanism and identified risks to women and poor users (Lawry et al., 2017). Ethiopian land registration and certification was associated with greater productivity and adoption of soil-fertility management, consistent with an assurance pathway (Melesse & Bulte, 2015). By contrast, a randomized certification intervention in Zambia improved perceived security but did not increase fallowing, agroforestry, or other investment in the following season, even when a cross-randomized agroforestry extension

intervention relaxed financial and technical constraints (Huntington & Shenoy, 2021). The Zambian result cautions against assuming that tenure insecurity is always the binding constraint or explaining every null result by missing complementary inputs. Across settings, expected profitability, liquidity, labour, knowledge, water, output markets, and exposure to price or climate risk still require investigation.

Stronger security is most likely to stimulate socially desirable investment when rights are durable and legitimate, returns are attainable, complementary services exist, and reform does not make transfer or dispossession easier for powerful actors. Inclusive design matters: participatory adjudication before registration; accessible maps and records; joint or individual documentation reflecting actual claims; public notice; affordable correction and inheritance procedures; independent appeal; legal aid; and safeguards against coerced sale. Recording only a household head or primary cultivator can convert negotiable, overlapping claims into a single exclusionary right. Formalization can then raise one person's security by lowering another's.

Common and mobile resource systems require particular care. Pastoral production depends on corridors, dry-season reserves, water points, and flexible access that may look "unused" at a single visit. Forest and wetland users may hold seasonal gathering or fishing rights without cultivating. Parcel-by-parcel registration can interrupt this spatial portfolio. Security in such settings may require protecting collective jurisdiction, mobility, and negotiated reciprocity rather than fixing every right permanently to an individual polygon.

Inheritance, marriage, and generational opportunity

Inheritance is both a transfer of wealth and a reorganization of authority. It links the household life course to agrarian structure: the timing and form of succession determine whether younger people can establish farms, whether older people retain bargaining power and care, and whether holdings fragment, consolidate, or leave agriculture. Rules commonly interact with marriage, residence, lineage, birth order, and gender. A statutory rule of equal inheritance may coexist with social pressure on daughters to renounce land; a widow may cultivate but lack authority to rent or bequeath; a son may be named successor yet wait decades for effective control.

Individual-level evidence shows why household ownership measures mislead. In Uganda, many respondents described land as jointly owned, but women were less likely to appear on documents and held fewer rights over the same land (Doss et al., 2014). Life histories from Uganda also show men were much more likely than women to report acquiring land through inheritance (Doss et al., 2012). The gender problem is therefore not solved by counting female-headed households. Women living with men may have weak claims, while some female heads have secure land; what matters is each person's right to use, decide, transact, inherit, and retain land after widowhood or separation.

Young people confront a related but distinct generational problem. Delayed inheritance can keep them as unpaid family workers or push them toward rental and migration. Subdivision may provide a nominal plot too small or dispersed for a viable livelihood. Young women can face both generational delay and gendered exclusion. Yet "youth aversion to farming" should not be assumed from exit. The opportunity space is shaped by access to land while young, expected returns, services, social status, and the possibility of combining agriculture with other work (White, 2012). A youth programme offering credit without land access or land without water, skills, and market connections misidentifies the constraint.

Land markets can partly loosen inheritance-based inequality. Purchase or rental may allow a skilled tenant, migrant returnee, or land-poor household to gain operational land. But markets can also amplify initial inequalities where buyers have cheaper credit, better information, political connections, or the capacity to wait through a dispute. Distress sales during illness, drought, or debt transfer land under very different conditions from voluntary portfolio adjustment. A transaction should therefore be assessed by price, consent, alternatives, information, enforcement, and post-transfer livelihood not classified as efficient merely because money changed hands.

Displacement, conversion, and the erasure of secondary rights

Land-use change can exclude without a conventional sale. Infrastructure, mining, urban expansion, plantations, conservation areas, and carbon or biodiversity projects may convert land and revalue claims. Large-scale acquisitions connect global finance, agribusiness, food and energy strategies, and state authority to local tenure; their effects depend on the contracts and political processes through which land is assembled (Cotula, 2012). Conflict and climate stress can also empty land temporarily, after which absence is interpreted as abandonment. Compensation focused on titled owners may omit tenants, sharecroppers, pastoralists, laborers, gatherers, and spouses whose livelihoods depended on the resource.

These are feedback processes. Displacement can increase labour supply and depress rural wages; concentration can strengthen large holders' influence over infrastructure and subsidy decisions; insecure secondary users may avoid conservation investments; and migration can weaken the day-to-day defense of a claim. Conversely, legitimate collective mapping, enforceable consent, tenure protection for tenants and spouses, and accessible dispute resolution can convert external investment into negotiated change rather than dispossession. The object of policy is not maximum transferability. It is a tenure system in which legitimate claims are secure, resources can be used productively and ecologically, and reallocation does not depend on silencing those with the least documentary or political power.

Section synthesis

Customary, statutory, and market tenure interact as hybrid systems: transactions and claims move through several forums at once, and outcomes depend on their alignment, legitimacy, and accessibility. Stronger tenure security encourages investment when it protects a sufficiently long and credible claim, profitable opportunities and complementary services exist, and recognition covers the full bundle of legitimate rights. It can intensify exclusion when a single title erases women's, tenants', communal, pastoral, or seasonal claims or makes distress transfer easier. Inheritance and land markets likewise have conditional effects. They can provide entry and operational flexibility, but under unequal credit, norms, information, and authority they reproduce or deepen disadvantage for women, youth, tenants, and smallholders. The explanatory task is therefore to follow claims and powers not hectares alone across generations, transactions, and land-use change.

2.3 Labor Regimes, Gender, Generation, and Migration

Agricultural labour is not simply a quantity of worker-days available to a farm. It is a **labour regime**: a historically specific arrangement through which work is recruited, allocated, supervised, valued, and rewarded. A single holding may combine the labour of spouses and children, reciprocal work groups, tenants, permanent employees, casual harvesters, machinery operators, and migrants whose remittances pay for hired workers. These contributors occupy different social positions and hold unequal claims on the product. "Family labour" may therefore express cooperation, obligation, or coercion; "self-employment" may conceal dependence on an unpaid spouse; and a daily wage may coexist with tenancy, debt, patronage, or caste. Conventional surveys often miss this occupational multiplicity and the short spells of wage work that matter most to land-poor households (Oya, 2013).

This relational view also prevents the household, farm, and holding from being treated as interchangeable. The household supplies some labour to its own plots, sells some to other farms or firms, and allocates some to nonfarm work and social reproduction. The holding may hire workers who live elsewhere; household members may farm plots under different tenure arrangements; and migrants may remain participants in production decisions without being resident. Labour is consequently both a productive input and a social mediator. In the chapter's causal grammar, technology, markets, demographic change, and environmental stress alter the demand for particular tasks; land relations, gender norms, skills, and bargaining power mediate who performs them; household members and employers negotiate substitution, intensification, or exit; outcomes are differentiated by class, gender, and generation; and those outcomes feed back into wages, migration networks, machinery markets, and the future supply of farmers.

Assembling labour across the agricultural calendar

Agricultural work is episodic. Land preparation, planting, weeding, irrigation, herding, harvesting, processing, and marketing have different timing, skill, and strength requirements. Rainfed systems can compress planting into a few days; perishables can make harvest delay ruinous; livestock require continuity even when crop demand is low. A household may appear to have abundant labour when measured annually and still confront a binding bottleneck in a particular week. Conversely, members may be underemployed between seasons while unable to leave for distant work because they must remain available for the next operation.

Households assemble labour through four broad arrangements. First, **family labour** offers flexibility and avoids a cash payment at the point of use, but its cost is real: a daughter may miss school, a spouse may forgo an enterprise, or an older person may work despite poor health. Second, **reciprocal labour** pools workers among kin or neighbors, spreading peak demand without immediate wages, but access depends on reputation, reciprocity, and the ability to return labour later. Third, **hired labour** ranges from permanent workers to casual day labour, piece-rate gangs, and contractor-supplied crews. It allows expansion beyond family capacity, yet often transfers production volatility to workers through irregular employment and low or delayed pay. Fourth, **labour-service markets** bundle labour with machinery, transport, spraying, or harvesting. They can make technology accessible without ownership, although late service during a congested season may erase its advantage.

Table 2.3. Labour arrangements as relations of production and risk

Labour arrangement	Why it is used	Distributional question
Family or unpaid contributing labour	Flexible; no immediate cash outlay; task-specific knowledge	Who controls the product, and whose opportunity cost is ignored?
Reciprocal or exchange labour	Pools labour at peaks; embeds mutual insurance	Who can mobilize a group and who is excluded from reciprocity?
Casual, seasonal, or piece-rate labour	Expands rapidly for time-critical tasks	Who bears weather, injury, wage, and employment risk?
Permanent hired labour	Retains skills and continuity for livestock, irrigation, or high-value crops	Are housing, pay, safety, and freedom to leave protected?
Machinery or labour-service contractor	Substitutes capital and specialized skill for manual work	Who receives timely service and who is displaced or deskilled?

Commercialization usually changes this mix rather than simply increasing or decreasing labour. Higher-value crops may require more exacting planting, grading, and post-harvest work; scale expansion may increase hiring even when output per worker rises. Supermarket or contract specifications can create jobs in sorting and packing while also imposing uncompensated quality-control work on family members. A price collapse can reverse the movement: a household dismisses workers, intensifies unpaid family labour, or sends members to sell labour elsewhere. Casual wage labour is therefore not residual to "smallholder" agriculture. It is often what resolves crop-specific seasonal bottlenecks and what reproduces land-poor households that farm a little while selling their labour to others (International Labour Organization [ILO], 2019a; Oya, 2013).

Diversification introduces competing calendars. A reliable salaried job may finance seed and fertilizer but remove a skilled worker from the farm. Petty trade may fit the slack season; construction or transport may collide with land preparation. The decisive issue is not the number of activities but whether their cash-flow, labour, and risk profiles complement one another. Better-resourced households can choose remunerative activities, hire substitutes, and wait for payment. Poorer households often accept low-return, easily entered work precisely when their own plots need labour. Thus the same label "diversified" can describe accumulation or a fragmented struggle for reproduction.

Gendered work, value, and time

Gender shapes tasks, but task divisions are neither universal nor fixed. What counts as men's or women's work varies by crop, technology, marital status, class, and locality. Plot-level data from six African countries, for example, estimated women's average share of crop-production labour at about 40 percent, with wide country variation rather than the often-repeated claim that women provide 60-80 percent everywhere (Palacios-López et al., 2017). The lesson is methodological as well as substantive: aggregate employment status cannot reveal who weeded which plot, who processed output, or who combined farm work with care.

Recognition and reward are separate. Women may contribute labour without being named as farmers, represented in a producer organization, paid a wage, or authorized to sell the crop. When a product becomes profitable, men or senior relatives may take over marketing and income control even if women's workload remains. Women are also overrepresented in informal and insecure agrifood employment, while constraints in land, finance, mobility, services, and organizational voice limit the returns to their work (Food and Agriculture Organization of the United Nations [FAO], 2023b). Gender gaps are therefore not adequately described by hours alone. Analysis must ask who selects the activity, controls tools, directs other workers, receives income, and can refuse the task.

The agricultural day rests on **social reproduction**: cooking, cleaning, child and elder care, collecting water and fuel, maintaining health, and sustaining reciprocal relations. These tasks replenish the labour force but are rarely charged to farm accounts. A new commercial crop can raise revenue while worsening well-being if it adds weeding, processing, or marketing to an unchanged care burden. Time poverty also restricts participation in extension meetings, organizations, education, and paid work. Labour-saving technology is consequently gender-equitable only when it reduces a binding burden or expands agency not merely when it raises output on a task conventionally controlled by men.

"Feminization of agriculture" should likewise be disaggregated. It may mean a higher female share of agricultural employment, greater responsibility for managing a family farm, concentration of women in casual work, or increased visibility of work that was always performed. Male out-migration may open decision space and income control, but it may instead leave women with additional work and obligations while major assets remain under absent men's authority. Longitudinal and mixed-method studies show movement into and out of agriculture over the life course and caution against a linear narrative in which male departure automatically produces women's empowerment (Baada & Najjar, 2020; Farnworth et al., 2023).

Generation, succession, and the politics of skill

Generation is a relation of authority, not just an age category. Senior household members may control land, livestock, machinery, credit, and the timing of inheritance long after younger members provide substantial labour. Young adults can therefore be indispensable workers yet unable to make production decisions or establish independent farms. Education can raise technical and managerial capability while also increasing the opportunity cost of farm work. Aspirations are formed in this institutional setting: aversion to agriculture often reflects insecure land access, unpaid subordinate labour, weak services, and low social status rather than an intrinsic dislike of farming (White, 2012).

Aging does not mechanically create a "farm labour crisis." Older farmers may command knowledge, hire services, rent out land, or reorganize toward less labour-intensive activities. But aging becomes constraining when health declines, heirs are absent, machinery services arrive late, and rental markets are insecure. Succession can then be deferred until the successor has already built a livelihood elsewhere. The result may be fallowing, informal leasing, or a sudden transfer without the skills and capital needed for continuity. Conversely, timely intergenerational transfer combined with training, finance, and voice can turn youth from unpaid helpers into farm managers. A serious account of succession must thus follow both material assets and authority.

Migration and the reorganization of work

Migration is best understood as a negotiated reallocation of labour across a spatially extended household. It can relax a cash or insurance constraint when remittances finance inputs, machinery services, debt repayment, health care, or education. It can spread covariate risk because urban wages do not always move with local rainfall. It can also transmit knowledge and create market connections. Evidence from rural Bangladesh shows how costly international migration and modern input adoption can be complementary for households able to meet migration's entry costs, while poorer households rely on lower-return domestic migration (Mendola, 2008). This is selection into migration, not a universal remittance effect.

The missing worker can also be the scarce input. Effects depend on who leaves, for how long, at what point in the calendar, and whether substitutes exist. In Northeast Thailand, remittances were associated with the monetization of farm labour, consistent with their financing hired workers; the study did not find support for labour loss alone as the driver (Hull, 2007). Elsewhere, remittances may be too small, irregular, or earmarked for consumption, and local workers or machinery may be unavailable. Those remaining then cultivate less land, switch crops, delay operations, or intensify the labour of women, older people, and children. Reviews consequently find mixed production effects: remittances may release liquidity, while absence withdraws labour and care (FAO, 2018; Mendola, 2012).

Migration relaxes constraints when the remittance is reliable relative to the lost worker's contribution; replacement labour or services are accessible at the needed time; decision rights permit those remaining to spend and manage; and care obligations are redistributed. It creates shortages or heavier unpaid work when the migrant performed a non-substitutable task, local labour markets are thin, remittances are delayed, or gender norms assign the residual workload without transferring authority. The relevant comparison is therefore not "migrant versus non-migrant household," but the configuration of migrant type, remittance, labour market, calendar, household composition, and bargaining relations.

Mechanization as labour redistribution

Mechanization changes the task structure rather than erasing labour. A tractor can loosen a land-preparation bottleneck and permit timely planting; a thresher may reduce drudgery; irrigation can create new rounds of cultivation and more harvesting work. Effects vary by operation and scale. Ownership tends to favor capitalized farms, whereas rental and service models can broaden access. Yet machinery may displace workers concentrated in a particular task, shift demand toward operators and repair technicians, or allow an accumulating farmer to expand area and hire more workers later.

Evidence does not support a universal proposition that mechanization simply causes rural unemployment. Outcomes depend on factor prices, cropping intensity, new demand, service-market organization, and opportunities outside farming (Daum & Birner, 2020; FAO, 2022). Nor is a machine automatically gender neutral: design, ownership, scheduling, training, and cultural restrictions determine whose drudgery is reduced and who loses income. Inclusive automation therefore requires attention to affordable services, operator training for women and youth, worker transition, safety, and the labour conditions in expanded downstream activities.

The answers to this section's three questions can now be stated compactly. **First**, commercialization, diversification, mechanization, and demographic loss alter labour by changing task timing, skill, and financing; households respond by recombining family, reciprocal, hired, migrant, and machine services, not by following one linear substitution path. **Second**, migration relaxes constraints only where remittances and accessible substitutes outweigh the loss of labour and care; otherwise it transfers bottlenecks and unpaid work to those who remain. **Third**, gender and generation determine recognition, reward, and displacement through control over assets, income, time, occupational labels, and succession. Labour outcomes are therefore negotiated distributions of opportunity and burden and feedback from those distributions shapes the next round of migration, technology adoption, and agrarian change.

2.4 Agrarian Differentiation and Unequal Development Pathways

Rural populations do not enter agricultural change from a common starting point, nor do they remain in fixed "small," "medium," or "large" boxes. **Agrarian differentiation** is the continuing process through which households and individuals acquire unequal capacities to command land, labour, capital, knowledge, markets, and political influence. Some expand production and appropriate a surplus; some reproduce a family farm without sustained accumulation; some combine a small plot with wage labour; and some lose effective access to farming altogether. Class positions are relational: an employer requires workers, a tenant's access is linked to a landlord's claim, a borrower's margin may become a lender's return, and the expansion of one holding can restrict another's access. Farm size is an outcome and indicator of these relations, not an adequate explanation by itself (Bernstein, 2010).

Applying the Rural Systems Mediation Framework makes the process observable. A driver configuration rising output prices, a new road, irrigation, a contract scheme, subsidy reform, drought, or mechanization changes prospective returns and risks. Access to land, liquidity, family labour, care, information, and organizations mediates who can respond. Households negotiate investment, borrowing, hiring, migration, rental, and consumption. Outcomes diverge in assets, debt, income control, nutrition, and ecological condition. Those outcomes feed back: profits purchase land and influence, distress sales release assets, worker dependence weakens bargaining power,

and commercial expansion reorganizes input and output markets. Differentiation is thus not a one-time sorting exercise but a recursive movement across agrarian positions.

Positions are bundles of relations, not farm-size classes

Several ideal-typical positions are useful if treated as hypotheses to be tested rather than labels imposed from acreage alone.

- **Accumulating commercial farmers** generate a reproducible surplus, reinvest in land quality, irrigation, equipment, livestock, storage, skills, or marketing, and commonly hire net labour. Some expand from family farming; others enter with salaries, businesses, public office, or urban capital.
- **Stable family farms** meet consumption and replacement needs across ordinary seasons, retain productive assets, and may hire and sell labour at different points. They reproduce their position but have limited capacity to absorb a major shock or finance a lumpy investment.
- **Constrained smallholders** command land but not enough complementary labour, capital, water, or market access to realize its potential. Their apparent low productivity may reflect missing services and adverse terms rather than an intrinsically "nonviable" scale.
- **Semiproletarian households** combine own-account production with substantial wage or informal nonfarm work. The plot may subsidize low wages by providing food and housing, while wages finance farm inputs. Neither relation can be understood separately.
- **Land-poor or landless workers** depend chiefly on selling labour, often casually and seasonally, while using commons, gardens, livestock, tenancy, or sharecropping to supplement reproduction.
- **Exiting households** reduce or cease cultivation. Exit may be opportunity-led, with secure employment and an advantageous lease of land, or distress-led through debt, displacement, labour loss, or ecological decline.

These are positions in motion. A household can accumulate livestock while losing land; rent in land but finance it by selling labour; report high crop sales while drawing down soil fertility; or exit cultivation yet retain land as insurance. Members may also occupy different positions: one becomes an urban professional, another manages the farm, and a third works seasonally for a larger neighbor. The proper unit of diagnosis may therefore be the person, plot, enterprise, or labour relation, depending on the claim.

Thresholds, complementarities, and the capacity to take risk

Accumulation rarely follows from a single asset. It depends on **complementary bundles**. Good land without water, working capital, labour at the critical week, or a buyer may yield little surplus. A pump without secure water rights or repair services can become stranded capital. Education may unlock salaried income but also remove labour from cultivation. Producer membership may reduce transaction costs, but only for members able to meet volume and quality standards. The analytic task is to identify which combinations make an activity feasible and who controls them.

Thresholds matter because many investments are lumpy and markets are incomplete. A household below a minimum asset position may choose a safe, low-return activity, not because it lacks ambition, but because failure would threaten consumption or the asset base. Carter and Barrett's (2006) asset-based approach distinguishes transitory income loss from structural poverty in which a household cannot generate a recovery path. The "threshold" is not necessarily a universal hectare or livestock count. It may be the conjunction of irrigable land, savings, an able worker, collateral, social connections, and a credible buyer. It shifts with prices, ecology, public services, and household composition.

This insight sharpens the difference among accumulation, simple reproduction, diversification, and distress. Accumulation is signaled by rising *productive* assets and retained earnings, but also by strengthened capacity to hire labour, survive a bad season, negotiate with buyers, and invest without sacrificing nutrition or schooling. Simple reproduction replaces tools and maintains soil, livestock, and consumption without a persistent upward or downward trend. Diversification is adaptive when activities have complementary calendars and returns high enough to build capabilities; it is distress diversification when members scatter into low-entry work to cover a recurrent farm deficit. Distress appears in repeated consumption loans, overdue input credit, livestock or land sales, withdrawal from school, skipped maintenance, and declining control over output. A one-year income measure cannot reliably distinguish these paths.

Commercialization: opportunity filtered through inequality

Commercialization is a ratio or relationship, not a destiny. It can mean selling a larger share of output, purchasing more inputs, specializing, producing under contract, or integrating into a quality-differentiated chain. It may increase cash income, support investment, and connect producers to services. In Kenya, commercialization was associated with improved intake of several nutrients through higher income and purchases, while the study also found an association between commercialization and reduced female control over farm revenue evidence that welfare channels can diverge within the same household (Ogutu et al., 2020).

Whether commercialization narrows or widens differences depends on entry, terms, risk, and spillovers. Households with irrigation, storage, transport, working capital, and information can choose when and where to sell and withstand rejection or delayed payment. Those needing cash immediately after harvest face lower prices. A new buyer may raise local demand for everyone, or impose certification and volume thresholds that exclude poorer producers. Input-intensive production can lift yields but exposes borrowers to correlated production and price risk. When land, credit, and insurance markets are unequal, identical price incentives yield unequal feasible responses.

Contract farming illustrates this conditionality. Contracts can bundle credit, inputs, technical advice, and a market, thereby relaxing missing-market constraints. But firms select participants, set quality rules, and may shift production risk to growers. A Campbell systematic review found that the published evidence on income was affected by selection, publication, and survivor bias; relatively better-off farmers were more often included, while failed schemes and dropouts were poorly represented (Ton et al., 2017). Reviews therefore caution against treating participation as randomly assigned or a positive average among survivors as proof of universal benefit (Bellemare & Bloem, 2018). Distributional analysis must include rejected applicants, dropouts, workers, noncontract growers, and household members who supply unpaid labour.

Commercialization can narrow differences when public infrastructure lowers fixed costs, transparent grades reduce buyer discretion, organizations strengthen bargaining, finance does not require exclusionary collateral, and risk protection lets poorer producers make productive investments. It widens them when early entrants capture scarce land or water, subsidies are proportional to farm size, firms select the already capitalized, debt amplifies shocks, or political influence steers services toward larger farms. Medium-scale farm growth in several African countries demonstrates both sides: it has attracted trading and mechanization services in some areas, while urban and rural elites' land acquisition has also increased concentration and constrained local access (Jayne et al., 2016, 2019). The correct question is thus not whether commercialization is "good," but which configuration changes whose command over resources and on what terms.

Reading movement through land, labour, credit, and nonfarm income

Four relational indicators reveal movement better than farm size alone, but none has a single meaning.

Labour hiring and selling. Persistent net hiring, especially when financed from retained farm earnings and accompanied by supervisory capacity, often indicates accumulation. Persistent net labour selling commonly signals land or capital constraint. Yet a family farm may hire a harvest crew and sell skilled labour in the dry season; an indebted employer may hire workers while nearing failure. Record timing, task, wage

relation, and the balance between labour bought and sold. Also ask whether family members' unpaid labour makes apparent employer status possible.

Land rental. Renting in can enable an able but land-constrained producer to expand without purchase. Renting out can provide a secure return to an older household or finance a successful nonfarm transition. It can also be a distress response to illness, debt, labour loss, or inability to finance inputs. Direction alone is insufficient: duration, rent burden, renewal security, bargaining power, land quality, and the use of rental income determine the trajectory. Where rental and sales markets deepen alongside unequal finance, capitalized actors may consolidate control even without formal ownership.

Credit and debt. Productive credit bridges the interval between expenditure and harvest and can finance lumpy assets. Its developmental meaning depends on price, maturity, collateral, insurance, and the borrower's control over revenue. Repeated short-term borrowing for food or medical costs is different from affordable investment finance. Input credit tied to one buyer may solve liquidity while narrowing marketing autonomy. After a covariate shock, compound interest and collateral enforcement can transform a production problem into land loss. Agrarian finance is embedded in social reproduction and multi-level financial institutions; it cannot be reduced to a binary "access to credit" variable (Green, 2022).

Nonfarm earnings. High-return salaries, enterprises, transport, or processing can capitalize farming and spread risk. Jayne et al. (2016) found that nonfarm income financed the later-life entry of many medium-scale farmers in four African countries. By contrast, poorly paid casual work may be required because the farm cannot reproduce the household; it may also draw labour away at the worst agricultural moment. Barrett et al. (2001) therefore distinguish diversification enabled by assets from diversification driven by constraint. Analysts should record returns, entry barriers, stability, calendar fit, and whether earnings build farm assets, human capabilities, or merely meet current consumption.

Taken together, these indicators reveal class relations. A household that rents in land, makes net labour purchases, obtains affordable investment finance, and channels high-return nonfarm income into productive assets plausibly moves toward accumulation. One that rents out under pressure, becomes a net labour seller, rolls over consumption debt, and enters precarious nonfarm work is moving toward semiproletarianization or distress. Mixed signals require longitudinal inquiry rather than forced classification.

Table 2.4. Relational signals of agrarian movement and their rival readings

Observed signal	Possible accumulation reading	Rival reading	Evidence needed to distinguish them
Net labour hiring	Expansion financed from retained surplus	Temporary substitution for illness, migration, or care shortage	Multi-season balance of labour hired and sold; wage terms; source of finance
Renting land in or out	Renting in expands a viable enterprise; renting out finances chosen transition	Rent burden undermines returns; renting out is compelled by debt or labour loss	Contract length, rent-to-return ratio, renewal security, land quality, use of proceeds
Borrowing and input credit	Affordable finance supports productive investment	Consumption debt, tied marketing, compound arrears, or collateral risk	Purpose, price, maturity, repayment source, collateral, control of crop revenue
Nonfarm earnings or remittances	Stable earnings capitalize farming and spread risk	Precarious work compensates for an unreproductive farm and removes peak labour	Net return, stability, calendar fit, entry cost, control and use of earnings
Rising commercial sales	Higher productivity and investible surplus	Distress sale, food deficit, adverse contract, or ecological depletion	Net margin, timing, own-consumption, debt, soil / water condition, control of proceeds

Distress, dispossession, and unequal exit

Bad harvests do not automatically cause exit. Their effects are mediated by savings, insurance, kin, social protection, creditor rules, and land rights. Better-resourced households can smooth consumption and retain productive assets; poorer households may sell livestock, tools, or future crop claims at adverse prices. Once a critical complement is lost, the farm's remaining assets may generate too little return to recover. Distress thus becomes cumulative, and individual responses reshape the local system: land transfers toward buyers with liquidity, wage labour supply rises, bargaining weakens, and political voice may concentrate.

Exit must be evaluated by destination and reversibility. Moving from farming into secure, productive employment with portable benefits can be upward mobility. Renting land out voluntarily while retaining a recognized claim may provide insurance. By contrast, Li (2010) shows how losing land before a viable alternative exists can create a population dependent on irregular labour that expanding agriculture does not fully absorb. Deagrarianization may similarly represent broader opportunity or the relegation of farming to a low-return fallback; research in Africa shows that livelihood

multiplexity has often accompanied declining agricultural returns and deepened differentiation rather than a smooth transition to stable jobs (Bryceson, 2002).

The section's research questions therefore have relational answers. **First**, accumulation, reproduction, diversification, and distress are best distinguished by trajectories in complementary assets *and* relations: control of land and output, net labour position, debt terms, ability to bear risk, quality of nonfarm work, and capacity to maintain consumption and the resource base. **Second**, commercialization narrows differences where institutions lower fixed costs, distribute risk, and strengthen weaker actors; it widens them where initial assets govern entry, contracts select the better-off, debt transfers risk, and land or political influence cumulates. **Third**, hiring labour, renting land, borrowing, and earning outside agriculture reveal movement only when their direction, terms, timing, and purpose are observed together over time. Agrarian position is not what a household owns on the survey date. It is the evolving pattern of who controls productive conditions, who works for whom, who bears loss, who captures surplus, and whether today's response expands or contracts tomorrow's feasible choices.

2.5 Household Trajectories, Welfare Outcomes, and Policy Fit

Agricultural change matters because it changes lives, but neither a larger harvest nor a higher cash income is, by itself, evidence of a durable improvement. A household may sell more grain because yields rose, because food needs fell after a member migrated, or because debt forced it to liquidate stocks before the lean season. Likewise, withdrawal from cultivation can represent a chosen move into secure employment, a temporary response to illness, or dispossession. The relevant object of explanation is therefore a **trajectory**: a sequence of changes in resources, relationships, work, security, and well-being, not a household's location in a single-year income distribution.

This emphasis applies the Rural Systems Mediation Framework at household level. A driver configuration such as a new road, an input subsidy, a drought, or supermarket procurement encounters a social mediation structure made up of land claims, labour obligations, care responsibilities, bargaining power, credit relations, and organizational access. Members then negotiate responses: intensify a crop, rent land, hire workers, migrate, borrow, draw down livestock, change diets, or leave farming. These responses produce differentiated outcomes and, through feedback, alter the household's position when the next driver arrives. "Household," "farm," and "holding" must remain distinct throughout. One household may operate several plots under different rights, several households may work one holding, and individual members may control separate incomes or make contradictory livelihood moves.

From an outcome to a trajectory

A defensible assessment uses several welfare domains over more than one season. Production and net farm income matter, but so do income volatility, food security across the agricultural calendar, dietary quality, productive and precautionary assets, debt terms, schooling, health, time use, decision-making power, and subjective security. The distinction between a flow and a stock is especially important. A good harvest raises a flow; retaining livestock, soil fertility, savings, skills, or enforceable land rights may expand the capacity to generate future flows. Conversely, a household can maintain consumption briefly by selling animals, mortgaging a crop, withdrawing a child from school, or increasing women's unpaid work. Such coping protects the present by weakening the future.

Longitudinal evidence is indispensable because income is volatile and thresholds can be path dependent. Asset-based poverty analysis distinguishes transitory shortfalls from structural poverty in which inadequate assets and repeated shocks prevent recovery (Barrett, 2005; Carter & Barrett, 2006). Yet an "asset threshold" is not a universal quantity of hectares or cattle. Its location depends on land quality, ecology, prices, public services, kin relations, discrimination, and the terms on which finance and markets are accessed. A pump can be productive where groundwater and repair services are reliable but a stranded, debt-financed asset elsewhere. The appropriate question is not simply whether assets increased, but **which assets, controlled by whom, acquired on what terms, and capable of doing what under foreseeable conditions**.

The familiar language of "hanging in," "stepping up," and "stepping out" is useful if treated as a set of provisional process descriptions rather than a development ladder (Dorward et al., 2009). Hanging in may be successful livelihood reproduction under harsh conditions, or slow erosion concealed by stable income. Stepping up may mean reinvestment in farming, but expansion based on unpaid family labour, soil mining, or predatory debt is not durable accumulation. Stepping out may be an aspirational move into skilled employment while retaining land as security; it may also be forced exit into casual work. Studies in north India show that land can remain a source of security, identity, and bargaining power even as earnings shift away from cultivation (Pritchard et al., 2017). A two-period panel in Malawi similarly found that commercialization and initial durable assets were associated with some upward trajectories, while crop diversification was associated with less dropping out yet could leave households merely hanging in; the same strategy did not have one meaning or result for all households (Matita et al., 2022).

What produces durable improvement?

Durable trajectories share no single livelihood formula. They are more likely where gains are retained across shocks; essential consumption is not purchased by asset depletion; soil, water, and health are not sacrificed; and women, youth, tenants, and workers gain effective voice rather than only additional duties. Three broad combinations recur.

First, **productive accumulation with risk-bearing capacity** can raise yields and returns when households have secure enough access to suitable land, working capital that does not impose destabilizing repayment, labour at the right time, knowledge, water or other complementary infrastructure, and a remunerative outlet. Market connection alone is insufficient. A systematic review of 262 output-market interventions found small-to-moderate average improvements across several agricultural and welfare outcomes, with substantial variation, thin subgroup evidence, and a large share of studies at high risk of bias (Marion et al., 2024). Contract farming illustrates selection particularly clearly: estimated participant income gains can be sizeable, yet better-resourced farmers are overrepresented and the literature suffers from survivor and publication bias, so observed participants cannot stand for all rural households (Ton et al., 2018). Durable commercialization requires fair grading, transparent prices, dispute resolution, viable producer organization, ecological safeguards, and room to withstand a failed season.

Second, **complementary diversification** can stabilize consumption and finance investment when activities have different risk profiles and reasonably high returns. A salary, enterprise, remittance, or livestock activity may supply cash between harvests or prevent distress sale of crops. But diversification is stratified. Households with education, transport, liquidity, and networks can enter more remunerative work; poorer households often combine multiple low-return activities because no one activity is sufficient (Barrett et al., 2001). Cross-country evidence also cautions against assuming a uniform exodus from agriculture: farming remains central to many rural African income portfolios, especially where agroecological potential is favourable, even as nonfarm earnings expand (Davis et al., 2017). The analytical contrast is therefore not diversified versus specialized, but **opportunity-led portfolios that expand choice versus distress portfolios assembled under compulsion**.

Third, **protected reproduction and adaptive capacity** can be a meaningful gain even without rapid accumulation. Predictable transfers, health coverage, childcare, water access, labour-saving services, and accessible schooling may prevent households from selling productive assets or overloading particular members. Reviews find that social protection can relax liquidity and risk constraints and sometimes support productive investment, while agricultural programmes can reduce vulnerability; effects are uneven, but the case for deliberate coordination is stronger than the case for treating the sectors separately (Tirivayi et al., 2016). Reproduction is not a residual category.

Maintaining nutrition, health, care, soil quality, and the next generation's capabilities is part of agrarian development.

Short-lived gains can be detected through discordant indicators. Rising sales accompanied by rising high-cost debt, falling own-food consumption, worsening soil condition, or lost control over income signal fragility. Higher total household income alongside women's greater time poverty or children's school withdrawal shows that benefits and costs are distributed internally. A review of interventions to increase household food production found more consistent improvements in dietary practices than in measured nutritional status among women and young children; weak study designs limited confidence in the findings (Girard et al., 2012). Income and food availability are also mediated by care, health, allocation, and programme design. FAO's synthesis likewise shows that gender-transformative approaches must address structural constraints, not merely add women to existing activities (FAO, 2023b). Durable welfare therefore requires both persistence through time and a distributional test across members.

Land, labour, and portfolios as programme mediators

Agricultural programmes do not act directly on welfare. **Land relations** determine whether a recipient can use an input, retain the resulting value, and make a long-horizon investment. Plot area alone misses soil quality, water, fragmentation, common-property access, rental terms, and the difference between use and control. A subsidy captured by an owner may not benefit a tenant who bears the labour; a conservation payment may be inaccessible to users whose claims are undocumented; land appreciation following a road project may induce rental expansion, eviction, or conversion. Land can thus transmit a programme's benefit, block it, or transfer it to another actor.

Labour relations determine feasibility and incidence. Labour-intensive extension advice may fit a household with underemployed working-age members but fail where illness, migration, ageing, or care responsibilities create a seasonal bottleneck. Mechanization may relieve drudgery, displace wage workers, or transfer control of an operation to the person who owns the machine. A household-level yield gain can coexist with lower wages, hazardous work, or intensified unpaid labour. Programme evaluation must therefore trace who performs added tasks, who loses employment, who controls the return, and whether reproductive work is redistributed. Decent work - rights, adequate remuneration, safety, social protection, and worker organization - is a welfare outcome, not an external consideration (ILO, 2019a).

Livelihood portfolios shape both eligibility and capacity to respond. Timely wage or remittance income can finance inputs before harvest, whereas low-paid casual work may compete with weeding precisely when farm labour is most valuable. A programme requiring co-finance will systematically favour households with liquid nonfarm income.

Insurance may be less useful than predictable cash for a labour-constrained household that cannot cultivate; extension cannot substitute for secure access to land; credit cannot correct an unremunerative output price. These interactions explain why average treatment effects conceal distinct mechanisms. They also show why a package is not merely several interventions delivered together. Its components must be sequenced: protect minimum consumption and rights, relax the binding constraint, then enable investment or transition.

Matching policy to trajectory without fixing people in types

Policy fit begins with the direction and cause of change, not with a static farm-size threshold. **Accumulating commercial farmers** may benefit from infrastructure, research, producer services, working capital, and market coordination, but public support should be conditional on fair labour practices, sustainable resource use, transparent contracts, and limits to subsidy capture or land concentration. Their constraint is often coordination or risk, not an undifferentiated lack of credit.

Stable but constrained producers need a combination of enforceable tenure and common-resource rights, accessible extension, water and storage, risk management, producer organization, care infrastructure, and, where justified, grants or smart subsidies. Evidence reviews of input subsidies find higher input use, yields, and farm income in studied settings but limited evidence on poverty reduction and significant targeting and governance problems (Hemming et al., 2018). This makes an input entitlement one component of a package, not a universal route out of poverty.

Labour-dependent and semiproletarian households require policies centred on employment quality: wage enforcement, occupational safety, freedom of association, gender-equal pay, portable social insurance, predictable public works outside peak farm periods, childcare, and routes into skills and better nonfarm jobs. Giving such households a seed package while ignoring their landlessness and dependence on wages mistakes the farm for the livelihood. **Households undergoing distress or dispossession** need rapid and predictable social assistance, debt mediation, legal aid, tenure protection, nutrition and health services, and restoration of productive capacity where desired. Productive programmes cannot substitute for protection when a household is below the minimum asset and labour base needed to use them.

For **households leaving agriculture**, policy should distinguish chosen transition from expulsion. Voluntary exit can be supported through quality education, transferable skills, enterprise services, transport and digital connection, affordable housing, recognition of credentials, and portable benefits. Land leasing arrangements and retained residence or common rights can provide security during transition. Involuntary exit calls first for rights, remedy, compensation, and viable alternatives not offered after uncompensated displacement. Inclusive rural transformation consequently

combines support to family farming with territorial investment in small towns, services, and decent nonfarm employment (IFAD, 2016; Losch et al., 2012).

Mistargeting occurs when a proxy is treated as a diagnosis. Farm size ignores land quality and rights; "female-headed" households conceal women's position in male-headed households; crop sales can be distress sales; nonfarm income can be either a platform for accumulation or badly paid coping; technology adoption can conceal debt; and exit can conceal dispossession. Household-head indicators also erase members with separate plots, earnings, and aspirations (Doss, 2013). The remedy is not an ever more elaborate typology administered once. It is periodic, member-sensitive diagnosis with an appeals route, transparent criteria, and the capacity to change support as trajectories change.

Feedback: why today's outcome changes tomorrow's treatment effect

Positive and negative outcomes reshape the next round of mediation. Surplus retained as savings, healthy livestock, soil fertility, education, or reliable relationships can expand collateral, information, organizational voice, and political influence. Those advantages can lower future transaction costs and increase the probability of entering contracts or capturing public programmes. At the other pole, crop loss can trigger expensive borrowing, distress land rental, livestock sale, migration, school interruption, and weakened bargaining power. Such feedback makes inequality cumulative even when households face the same nominal policy.

Feedback also travels beyond the household. Expansion by some farms changes local wages and rental prices; widespread migration changes care burdens and labour markets; commercial specialization changes water use and biodiversity; organized producers may improve market governance or exclude nonmembers. Responsible policy therefore monitors distributional and ecological effects alongside participant averages. A durable trajectory is one in which expanded options survive foreseeable shocks without transferring unacceptable costs to less powerful household members, workers, neighbours, or future resource users.

Practical chapter output: Agrarian Differentiation Diagnostic Matrix

The matrix is a **repeatable diagnostic**, not a classification of fixed identities. Complete it at baseline and at agreed intervals; record disagreement among household members; verify key claims at plot, worker, and community levels; and retain mixed or uncertain classifications. The two parts share the same trajectory rows and together record every required field.

Table 2.5A. Agrarian Differentiation Diagnostic Matrix structural position and livelihood relations

Provisional trajectory	Land access	Labour position	Asset base	Livelihood portfolio and market relations
Accumulating commercial farm	Secure ownership or long lease; often renting in; adequate quality / water; monitor concentration and secondary rights	Regularly hires labour while retaining managerial / family work; may face seasonal skill bottlenecks	Productive equipment, livestock, irrigation, savings and skills expanding; debt service manageable	Farm sales generate investible surplus; multiple buyers or fairly governed contract; nonfarm income complements investment
Stable family-farm reproduction	Sufficient but possibly fragmented claims; security depends on customary / statutory recognition and succession	Mainly family and reciprocal labour, with occasional hiring; care and peak-season burdens may be hidden	Maintains rather than expands productive assets; modest buffer stock; conservation condition matters	Farming remains central; diversification buffers seasonality; market participation regular but margins modest
Constrained smallholder / hanging in	Small, low-quality, fragmented or insecure plots; may rent out / in under weak terms; common rights important	Family labour constrained by care, illness, ageing or migration; may both hire and sell labour in different seasons	Thin asset base; limited liquidity; tools and livestock vulnerable to shock	Low-volume sales, weak bargaining, high input / transport cost; diversification often low-return or defensive
Adaptive diversified household	Retains or leases land as income, food, identity, or insurance; cultivation intensity may fall	Allocates labour across farm, enterprise, wage work and migration; substitution and care effects must be checked	Human, financial and social assets increasing without productive decapitalization	Complementary, reasonably remunerative income sources; remittances or enterprise finance farm / care needs; market dependence spread
Semi-proletarian / labour-dependent household	Landless or insufficient access; may cultivate a home plot or insecure rental	Net seller of labour; casual, seasonal, piece-rate or migrant work central; weak voice and high occupational risk	Few productive assets; human capacity may be high but credentials / transport constrain returns	Wages dominate; farm sales minor; employer / contractor dependence and informality shape welfare

Provisional trajectory	Land access	Labour position	Asset base	Livelihood portfolio and market relations
Distress, decapitalizing, or dispossessing	Claims threatened, mortgaged, converted, rented out under pressure, or lost; eviction / conflict possible	Labour withdrawn through illness, displacement or care; forced migration or adverse labour terms	Livestock, tools, savings and soil condition declining; arrears and high-cost debt rising	Distress sales, food purchase on credit, emergency work and transfers; adverse tying to buyer, lender or landlord
Negotiated exit or new entry	Exit: leases, transfers or retains land by choice with enforceable terms. Entry: gains viable land / common rights without displacing others	Exit: labour moves to secure nonfarm work. Entry: sufficient skills / labour or affordable services	Exit: education, savings and portable protection support transition. Entry: start-up assets do not impose destabilizing debt	Exit: viable employment / enterprise, not only casual work. Entry: tested market / service access and realistic farming plan

Table 2.5B. Agrarian Differentiation Diagnostic Matrix direction, agency, risk, and policy response

Provisional trajectory	Agency and distributional test	Dominant risk exposure	Likely direction to test not assume	Suitable policy response
Accumulating commercial farm	Who controls surplus and contracts? Are workers and secondary land users represented?	Price / input shocks, leverage, buyer power, water / climate stress, labour conflict	Reinvestment and influence may compound; could overextend or externalize costs	Infrastructure / R&D, plural finance, producer services and dispute resolution; condition support on labour standards, competition, resource stewardship and non-displacement
Stable family-farm reproduction	Are consumption, care and succession negotiated fairly? Can women / youth retain gains?	Illness, one failed season, succession disputes, soil / water decline	Reproduction can become gradual accumulation or erosion	Tenure and inheritance protection, extension, storage / water, climate services, care infrastructure, organizations, health / social insurance

Provisional trajectory	Agency and distributional test	Dominant risk exposure	Likely direction to test not assume	Suitable policy response
Constrained smallholder / hanging in	Can members refuse risky debt or added unpaid work? Who is excluded from services?	Liquidity and labour bottlenecks, insecure tenure, volatile prices, repeated shocks	May stabilize with binding constraint removed; otherwise decapitalization or distress exit	Predictable protection plus grants / smart subsidies, legal tenure support, accessible extension, low-cost risk tools, nutrition / care services, collective marketing where viable
Adaptive diversified household	Is diversification chosen and are earnings controlled by those doing the work?	Covariant shocks, migration separation, enterprise failure, care transfer	Upward mobility if returns and capabilities grow; “busy poverty” if all activities remain low-return	Skills, rural enterprise and financial services, transport / digital links, childcare, portable protection; preserve viable farm options and monitor workload
Semi-proletarian / labour-dependent household	Can workers bargain, organize, migrate safely, and control wages / remittances?	Informality, wage theft, injury, unemployment, recruitment debt, housing insecurity	Better employment can enable mobility; precarious work can reproduce landlessness	Wage / OSH enforcement, worker organization, equal pay, portable benefits, safe migration, seasonally timed employment guarantee, skills and childcare
Distress, decapitalizing, or dispossessing	Is exit truly voluntary? Whose land / assets are being sold and who consents?	Hunger, eviction, predatory debt, violence, health / climate shock	Downward spiral unless loss is halted; recovery possible if rights and minimum assets restored	Immediate food / cash / health support, debt mediation, legal aid, land and secondary-rights protection, disaster response, asset restoration; remedy and compensation for displacement

Provisional trajectory	Agency and distributional test	Dominant risk exposure	Likely direction to test not assume	Suitable policy response
Negotiated exit or new entry	Do all affected members have real alternatives and voice? Are youth / women's claims independent of household head?	Exit: job loss, benefit discontinuity, failed enterprise. Entry: start-up debt, land conflict, climate / market risk	Chosen mobility or viable renewal; risk of involuntary proletarianization or failed entry	Exit: education, transition income, enterprise / employment services, housing, portable benefits and fair leasing. Entry: transparent land access, mentorship, start-up grants / finance, extension and staged risk review

Minimum use protocol

1. **Establish the unit and time window.** Link household roster data to each farm, plot, worker, income stream, and rights-holder; use at least two comparable observations and the agricultural calendar.
2. **Record levels, control, and terms.** For every asset or income, note who owns, uses, decides, performs work, receives returns, and bears liability.
3. **Separate signals from explanations.** Classify the observed direction, then test rival mechanisms such as life-cycle change, price movement, policy exposure, illness, climate shock, and local land or labour-market change.
4. **Apply a durability and distribution test.** Check persistence, volatility, assets and debt, food and nutrition, schooling/health, soil and water, time use, agency, and subjective security disaggregated within the household and among workers.
5. **Match and revise.** Identify the binding constraint and a sequenced policy package; document uncertainty, allow appeal, and update the diagnosis after major shocks or programme participation.

Using the matrix with open evidence

The diagnostic can be populated without assuming that one dataset contains a trajectory. The Living Standards Measurement Study-Integrated Surveys on Agriculture (LSMS-ISA) is a strong starting point because its household rosters, individual employment modules, agricultural labour records, plot files, crop production, livestock, nonfarm enterprise, consumption, and asset modules can often be linked within a round and, in panel countries, over time (World Bank, n.d.-a). The linkage must remain person- and plot-sensitive. A plot reported under one household may have a different manager, rights-holder, and labour force; a household total may combine incomes controlled by different members. Analysts should preserve the survey identifiers and document household splits, mergers, attrition, and changes in questionnaire wording before describing movement.

Agricultural censuses and FAOSTAT locate household trajectories within changes in farm-number and size distributions, irrigation, livestock, production, and land use, while ILOSTAT provides harmonized evidence on employment status, hours, wages, informality, and labour underutilization (FAO, n.d.-a; ILO, n.d.). These sources establish context and possible feedback, but national trends cannot identify household mechanisms. Administrative records can add land transactions, extension contact, social-protection receipt, school attendance, or disaster exposure, subject to coverage and access. Spatial layers can characterize rainfall, travel time, land cover, water, and hazards, but they do not reveal who controlled an affected resource.

The most important gaps are substantive. Household-head responses commonly understate separate plots, earnings, rights, and aspirations. Short labour recall periods miss irregular work; long periods magnify recall error. Unpaid care, reciprocal labour, piece-rate work, in-kind payment, secondary tenure, pastoral mobility, and the claims of migrants or people displaced between rounds are routinely incomplete. A credible classification therefore triangulates survey sequences with legal and policy documents, village or value-chain context, and qualitative syntheses that can reveal bargaining, coercion, meaning, and rival explanations. Missing evidence stays visible in the matrix; it is not converted into a confident household type.

Every trajectory claim should carry the evidence discipline established in Chapter 1. State whether it is descriptive, associational, mechanistic, or causally identified; specify the person, plot, holding, household, worker group, place, and period to which it applies; test a plausible rival explanation; and grade confidence by design adequacy, consistency, contextual fit, transparency, and transferability. A stable correlation between commercialization and income is not yet proof that commercialization caused mobility, and a qualitative mechanism observed in one tenure regime is not automatically transferable to another. The matrix organizes inquiry; it does not manufacture certainty.

CHAPTER 03

Rules and Relationships

Institutions, Networks, and Collective Action

Chapter purpose

Rural people do not encounter agricultural change as a set of neutral opportunities. They encounter it through rules about who may use land and water, relationships that determine whose knowledge is trusted, organizations that aggregate produce or distribute services, and authorities able to recognize a claim or refuse it. A seed subsidy, irrigation scheme, contract, digital advisory platform, or conservation rule therefore enters an already organized field. Its effects depend not only on technical quality but also on who interprets the rule, who controls information, who can bear the costs of participation, and who can demand an account when promises are not kept.

This chapter calls that field the **relational infrastructure** of rural agriculture. It links the household trajectories examined in Chapter 2 to wider systems of governance and exchange. Institutions are understood as lived rule systems rather than policy text alone; networks as channels of trust, learning, influence, and exclusion; and collective action as a political and organizational achievement rather than an automatic expression of community. The guiding question is: **under what institutional and relational conditions can rural actors coordinate agricultural change while limiting exclusion, elite capture, and unequal distribution of benefits?**

The answer developed here is conditional. Coordination is more likely to be effective and just when rules are intelligible, enforceable, and open to contestation; when networks combine trusted local ties with bridges to diverse knowledge and public authority; when organizations deliver benefits that justify members' costs; and when representation, information, leadership, and grievance systems prevent a small group from monopolizing decisions. None of these conditions is sufficient by itself. A transparent cooperative can still fail in a hostile market. A technically competent water association can reproduce gendered exclusion. A well-connected broker can widen access or charge a private toll. Governance quality must therefore be assessed across legitimacy, capability, distribution, and ecological effect.

The Rural Systems Mediation Framework introduced in Chapter 1 remains the organizing logic:

Driver configuration → institutional and network mediation → negotiated response → differentiated outcomes → feedbacks

Institutions and networks occupy the mediating position, but they are also outcomes of previous struggles. A drought may change water rules; a successful marketing group may gain political influence; repeated exclusion may weaken trust; and digital platforms may create new intermediaries. The chapter develops this recursive argument in five steps: institutional ecology; networks and knowledge; collective action; power and accountability; and institutional adaptation. It concludes with an Institutional-Network Action Map that turns the analysis into a practical diagnostic.

3.1 The Institutional Ecology of Rural Agriculture

Institutions are rules; organizations are actors

An institution is a rule, norm, or shared expectation that structures behaviour. An organization is a bounded group of people and resources acting within, interpreting, or enforcing those rules. The distinction is elementary but analytically decisive. A cooperative is an organization; the membership criteria, voting formula, delivery obligation, audit requirement, and informal expectation that leaders consult elders are institutions. An irrigation agency is an organization; the permit regime, rotational schedule, fee rule, and locally negotiated exceptions constitute institutions. Conflating the two encourages a familiar error: creating a committee and calling the governance problem solved.

Rural agriculture is governed by an **institutional ecology** rather than a single rulebook. Property law, customary tenure, contracts, inheritance, labour regulation, water allocation, grazing norms, environmental restrictions, religious obligations, and market standards may all apply to the same field or livelihood. State administrators, customary authorities, courts, extension services, traders, banks, producer organizations, water-user associations, and households interpret these arrangements from different positions. Their mandates overlap, their reach varies, and their decisions do not carry equal force.

The practical question is therefore not simply *what does the law say?* It is *which claim is recognized by whom, under what circumstances, with what evidence, and at what cost?* Ribot and Peluso's theory of access is useful here because it distinguishes a legal right from the effective ability to benefit from a resource. Formal ownership may be undermined by lack of credit, labour, water, information, or political recognition. Conversely, a household without title may cultivate through lineage membership, tenancy, sharecropping, seasonal permission, or a negotiated informal market (Ribot & Peluso,

2003). The Voluntary Guidelines on the Responsible Governance of Tenure similarly emphasize legitimate tenure rights including customary and informal rights rather than treating registration as the sole source of legitimacy (FAO, 2012).

Rules in use and the production of actual access

Formal rules matter because they authorize enforcement, structure public budgets, and shape the terms on which claims enter courts and markets. Informal practices matter because they translate general rules into everyday allocation. Inheritance law may formally protect daughters while kinship pressure induces them to relinquish claims. A grazing statute may recognize communal use while local gatekeepers privilege established lineages. An irrigation schedule may be written as equal rotation while upstream users take more water at night. A contract may specify a price formula while grading practices, delayed payment, and indebtedness determine the real bargain.

Actual access emerges from interaction among four elements:

Recognition: whether a claim is socially and legally intelligible.

Capability: whether the claimant has labour, finance, information, mobility, and time to use it.

Authority: whether an institution can monitor and enforce the claim.

Countervailing capacity: whether a weaker actor can challenge denial, delay, or abuse.

This formulation prevents two opposite mistakes. Legal determinism assumes that changing statutes automatically changes practice. Cultural determinism treats custom as coherent and unchanging. In reality, statutory and customary rules are interpreted through bargaining. Custom may protect flexible secondary rights, or it may legitimate patriarchal control. Registration may clarify claims, or it may convert negotiable overlapping rights into exclusive ownership held by the best informed. The distributional effect depends on process: whose claims are documented, who receives notice, whether tenants and pastoralists are heard, and which appeal routes remain available.

The gap between written policy and implementation is not merely administrative weakness. It may be produced by ambiguous mandates, insufficient budgets, distance, discretionary enforcement, corruption, or political incentives. Frontline officials often exercise substantial interpretive power. So do customary authorities, traders, and organization leaders. Their discretion can make rigid rules workable, but it can also turn public authority into selective favour. A credible analysis therefore traces a rule through the whole governance chain: formation, communication, interpretation, monitoring, sanction, dispute resolution, and revision.

Legal pluralism: flexibility and conflict

Legal pluralism describes the coexistence of multiple normative orders in the same social field. Rural examples include statutory title alongside customary allocation; national water law alongside rotational practice; labour codes alongside patron-client obligations; and environmental regulations alongside local rules about forests, fisheries, or pasture. Pluralism is not an exceptional residue waiting to disappear. It is a normal feature of layered governance.

Overlap can support adaptation when different rule systems provide complementary functions. A customary forum may settle a boundary dispute quickly, while a statutory registry provides public documentation. A local water group may revise rotations during drought within limits established by basin regulation. Informal reciprocity may mobilize maintenance labour that a district agency cannot supply. Multiple centres of authority may also create redundancy: if one organization fails, another can respond.

The same overlap creates uncertainty when jurisdictions conflict, decisions are not mutually recognized, or powerful actors engage in **forum shopping**, selecting the authority most likely to validate their preferred claim. Ambiguity is particularly dangerous for secondary-right holders: women cultivating family land, tenants with oral agreements, mobile pastoralists, migrant workers, or collectors of forest products. They may have a socially understood claim but lack the documentation, membership, or political connections required in another arena. Institutional multiplicity thus becomes adaptive for some and exclusionary for others.

The test is not whether overlap exists but how it is coordinated. Productive overlap has visible jurisdictional boundaries, referral procedures, minimum rights that no forum may violate, and means for recording negotiated decisions. Destructive overlap permits contradictory rulings, hidden exceptions, coercive venue choice, and indefinite delay. Polycentric governance, the presence of multiple formally independent but interacting decision centres, can improve learning and fit across scales when those centres exchange information, monitor one another, and remain accountable (Ostrom, 2010). Multiple decision centres do not, by themselves, guarantee effective coordination.

Credible enforcement and accessible justice

Rules become credible when actors expect compliance to be monitored and violations to bring proportionate consequences. Yet enforcement that is merely severe is not necessarily legitimate or effective. Smallholders may avoid a court that is distant, expensive, slow, linguistically inaccessible, or socially intimidating. Informal mediation may be accessible but biased toward elders, men, landowners, or dominant groups. The design problem is to combine enforceability with procedural fairness.

Accessible dispute resolution has several features: entry points close to users; information in understandable language; predictable time and cost; permission for representation or accompaniment; written records; protection against retaliation; and an

appeal to a forum with greater independence. Minor disputes often benefit from mediation, but settlement should not be coerced where violence, severe power asymmetry, or fundamental rights are involved. Legal aid, paralegal support, mobile tribunals, and public-interest organizations can lower the capability threshold for weaker claimants.

Graduated sanctions are often more credible than an all-or-nothing punishment. A late irrigation payment may first trigger notice and a repayment plan; repeated theft of water may warrant suspension. Monitoring is more legitimate when users participate, evidence is auditable, and monitors themselves are supervised. The objective is not constant punishment but a shared expectation that obligations apply to leaders as well as ordinary members.

Table 3.1. Institutional arenas, rules, and evidence of credibility

Institutional arena	Rule in use to examine	Organization or authority	Distributional question	Evidence of credibility
Land and inheritance	Recognition of ownership, use, rental, secondary and succession claims	Registry, customary authority, court, local administration	Whose claims are documented or extinguished?	Decisions recorded; notice given; appeals usable
Water and commons	Allocation, maintenance, seasonal restriction, exclusion and sanctions	User association, resource committee, basin or district agency	Who receives water or access in scarcity?	Monitoring visible; sanctions proportionate; conflicts resolved
Labour and contracts	Recruitment, wages, safety, grading, delivery and payment	Employer, contractor, cooperative, labour office, buyer	Who bears delay, risk, and enforcement costs?	Terms intelligible; records retained; remedy timely
Services and markets	Eligibility, queueing, fees, procurement and quality standards	Extension office, bank, platform, trader, producer organization	Who can satisfy entry requirements?	Criteria public; refusals explained; complaints tracked

The first research question can now be answered directly: formal rules and informal practices jointly determine access because law supplies categories and authority while everyday relationships determine recognition, interpretation, capability, and enforcement. Institutional overlap enables adaptation when jurisdictions are complementary, rights floors are protected, and referral and accountability are clear; it produces uncertainty when contradictions can be exploited by stronger actors.

Enforcement becomes credible for weaker actors when it is local enough to use, independent enough to challenge power, transparent enough to audit, and connected to an appeal with real authority.

Studying an institutional ecology with open evidence

Institutional analysis requires evidence at several levels because no single source captures rules in use. Legal texts and policy manuals establish formal authority, but they should be paired with implementation evaluations, administrative budgets, court or mediation records, organization bylaws, meeting minutes, and qualitative accounts of actual encounters. Household and plot surveys can show who reports secure rights, pays fees, receives extension, or belongs to an organization; they rarely reveal how a disputed claim was negotiated. A small number of carefully documented cases may therefore provide stronger evidence about mechanism than a large cross-section containing only a tenure-status variable.

A reproducible institutional profile can be built in five passes. First, identify the decision arena and all relevant rule sources. Second, trace the organizations that communicate, monitor, enforce, and review those rules. Third, compare formal procedure with observed practice, recording recurrent exceptions rather than dismissing them as “informality.” Fourth, disaggregate access and dispute outcomes by social position. Fifth, examine change over time: did a new statute alter behaviour, create an additional forum, or merely change the language through which existing authority is justified?

Evidence of an implementation gap should be interpreted cautiously. Low compliance may indicate weak capacity, but it may also show that a rule lacks legitimacy, conflicts with livelihood realities, or imposes costs greater than the benefit it protects. Likewise, frequent dispute can signify institutional failure or increased confidence that claims may safely be voiced. The appropriate outcome is not the absence of visible conflict but a pattern in which conflicts are addressed without violence, retaliation, indefinite delay, or systematic bias.

This approach connects institutional evidence to the book's wider causal method. A reform is not treated as an input with a direct outcome. It changes categories, incentives, information, and forums; actors interpret those changes through unequal capabilities; they comply, bargain, evade, or contest; and the resulting pattern alters future legitimacy and enforcement. Institutional ecology is therefore both a map of governance and a mechanism within agrarian transformation.

3.2 Social Networks, Knowledge, and Agricultural Coordination

Connectivity is structured, not uniformly beneficial

Agricultural knowledge rarely moves as a broadcast from expert to isolated farmer. It travels through kin, neighbours, work groups, traders, extension agents, input dealers, demonstration farmers, savings groups, researchers, and digital platforms. Networks shape what information arrives, how it is interpreted, whether experimentation appears socially acceptable, and whether complementary inputs can be coordinated. They also shape silence: people at the periphery may never hear about a programme, may hear too late, or may distrust the messenger.

Three ideal types help distinguish network functions. **Bonding ties** connect people with similar identities or close relationships. They support trust, mutual aid, rapid verification, and the sharing of locally specific knowledge. **Bridging ties** connect different groups and expose actors to nonredundant information, technologies, or markets. **Linking ties** connect rural actors vertically to institutions with authority and resources, such as government departments, banks, research organizations, buyers, and political representatives. A robust innovation system normally needs all three. Bonding without bridges can become closure; bridging without trust can produce shallow contact; linking without accountability can reproduce patronage.

The value of a tie changes across an innovation process. During awareness, weak or bridging ties may introduce unfamiliar options. During evaluation, trusted peers help interpret performance under local conditions. During experimentation, close ties may share labour, seed, equipment, or risk. During adaptation, links to extension and research help diagnose problems, while farmer-to-farmer exchange translates formal advice into practice. During scaling, brokers coordinate standards, finance, logistics, and market access. During abandonment, trusted networks help identify failure rather than encouraging continued investment to protect an intermediary's reputation.

Social learning, homophily, and unequal diffusion

Observing another farmer can reduce uncertainty, but observation is not automatic learning. The observer must know enough about the demonstrator's plot, resources, and management to judge relevance. Research on pineapple production in Ghana shows that farmers adjust inputs in response to the experience of people in their information networks, not simply their geographic neighbours (Conley & Udry, 2010). Extension contacts can widen the informational field, while peer networks help translate recommendations. The combination is often more useful than either alone.

Homophily, the tendency to form ties with similar people, can support communication through shared language, experience, and trust. It can also reproduce inequality. Better-off farmers may exchange information with other landowners, men may dominate public meeting networks, and settled cultivators may exclude mobile users. If

programme designers select "lead farmers" from already central positions, public resources reinforce existing visibility. The apparent efficiency of reaching central actors can therefore be purchased at the cost of distributional bias.

Network centrality can provide early information and repeated contact. Brokerage provides control over connections between otherwise separated groups. A broker can be a public-good intermediary, translating knowledge and creating access. The same position can support gatekeeping: charging fees, favouring relatives, withholding price information, or presenting private interests as community consensus. The relevant question is not whether brokers exist, since they are often necessary, but whether brokerage is contestable, transparent, and plural.

Network interventions should consequently identify **peripheral actors**, not only influential ones. Useful measures include who receives information first; who is named as a trusted adviser; who connects clusters; whose advice is acted upon; and who has no link to extension, finance, or buyers. These measures should be disaggregated by gender, age, caste or ethnicity, tenancy, disability, location, and wealth. Attendance lists are weak evidence because they reveal presence, not influence or information flow.

Intermediaries and the politics of translation

Extension agents, traders, veterinary workers, input dealers, community facilitators, and demonstration farmers translate between knowledge systems. Translation is not neutral. Intermediaries decide which problem is legible, which technology is promoted, and which farmer counts as innovative. They may privilege standardized packages because these are easy to report, even when local adaptation would be more appropriate. Traders can provide timely market intelligence and credit, yet tie advice to input sales or exclusive delivery. Public extension may be less commercially conflicted but under-resourced and unevenly distributed.

A capable intermediary performs at least four functions: connects actors; translates vocabularies; helps negotiate competing interests; and feeds local experience back into organizations with authority. The fourth is frequently missing. One-way dissemination treats farmers as recipients; a learning system treats observations of failure, labour burden, gendered effects, and ecological change as evidence that may alter the recommendation.

Demonstration can reduce uncertainty, but selection matters. A technology proven on an irrigated, well-capitalized plot may mislead rainfed or labour-constrained farmers. Multiple demonstration sites, transparent reporting of costs and failures, and farmer-managed trials improve contextual fit. Compensation for lead farmers should be disclosed so advice is not mistaken for independent endorsement.

Digital channels as a hybrid layer

Mobile messages, call centres, video, social media, remote sensing, and platform-based advisory services can reduce communication costs and increase communication speed. Digital tools can send weather alerts, market prices, pest warnings, and reminders at a scale impossible for face-to-face extension. They may also enable two-way reporting and connect dispersed communities of practice. Evidence from mobile extension in India indicates that digital services can stimulate rather than crowd out peer information exchange (Fernando, 2021).

Complementarity is most likely when digital channels are embedded in trusted offline relationships. Farmers need a person or institution able to interpret a generic message, diagnose exceptional cases, and accept responsibility for harmful advice. Hybrid systems use digital communication for repetition and reach, and interpersonal contact for diagnosis, demonstration, negotiation, and repair. They maintain multiple channels, including voice, text, local-language materials, group meetings, radio, and extension visits, because literacy, device access, network coverage, and control of phones are unequal.

Digitalization also creates new institutional questions. Who owns farm data? Can advice be audited? Is a platform recommending inputs from a commercial partner? What happens when an algorithm misclassifies a plot? Can users move their records to another provider? Platform dependence can replace a local monopoly with a remote one. Misinformation travels rapidly when emotionally persuasive claims outrun verification. Trusted groups can correct false claims, but tightly bonded networks may also amplify them.

Table 3.2. Network ties, coordination, and inclusive design

Stage	Most valuable ties	Coordination function	Inequality risk	Inclusive design response
Awareness	Bridging and linking	Introducing nonredundant options and public programmes	Peripheral groups hear late or not at all	Map information gaps; use multiple entry points
Evaluation	Bonding plus credible expert links	Compare claims with local experience	Homophily narrows evidence; prestige substitutes for proof	Diverse trials; publishing costs, failures, and conflicts
Experimentation and adaptation	Trusted peers, extension, research links	Share risk and diagnose contextual problems	Resource-poor farmers cannot afford trials	Small grants, shared equipment, accessible technical support

Stage	Most valuable ties	Coordination function	Inequality risk	Inclusive design response
Coordination and scaling	Brokers, organizations, market and state links	Align standards, finance, logistics, and services	Central actors capture connections and rents	Multiple brokers; transparent fees; rotation and oversight
Continued use or abandonment	Peer feedback and accountable advisory links	Detect performance, harm, and changing fit	Sunk-cost pressure suppresses reports of failure	Safe feedback channels; independent evaluation

Different ties are therefore useful at different stages: bridges and links broaden awareness; trusted bonding ties interpret and test; accountable brokers coordinate scaling. Network position, homophily, and brokerage reproduce inequality when central actors monopolize public contacts or when similarity confines marginalized people to information-poor clusters. Digital channels complement interpersonal relations when they extend reach while leaving interpretation, feedback, trust, and remedy anchored in accessible human institutions.

Reading network evidence responsibly

Network diagrams can create a misleading impression of precision. A measured network depends on how ties are defined, whose names are elicited, the time period considered, and whether respondents can report sensitive relationships. A question about "who gives agricultural advice" produces a different network from questions about borrowing, marketing, labour exchange, political influence, or emotional trust. Coordination frequently depends on multiplex ties: the same trader may be a creditor, buyer, relative, and political intermediary. Treating that relationship as a single line hides both leverage and dependence.

Good network evidence therefore combines structure with content. Degree and centrality indicate position, but interviews or transaction records clarify what flows through a tie and under what obligation. Longitudinal data distinguish stable brokerage from a temporary project role. Whole-network studies are valuable in bounded groups; ego-network questions are more feasible in large surveys but may miss indirect paths. Digital traces reveal communication while excluding unrecorded conversation and people without devices. Consent and confidentiality are essential because publishing a network can expose critics, informal users, or politically vulnerable brokers.

For programme design, the most useful comparison is often not "connected versus unconnected" but alternative portfolios of ties. A farmer with many close neighbours may have high local support but little price information. Another with one reliable

extension link and a buyers' group may have fewer ties but greater reach. Resilience comes partly from diversity and substitutability: losing one broker should not sever access to an entire service. Monitoring should therefore track concentration, redundancy, reciprocity, and the distribution of linking ties, not merely the number of contacts.

3.3 Collective Action for Production, Markets, and Commons

Cooperation is an institutional accomplishment

Collective action arises when people coordinate contributions toward a shared benefit that would be difficult to secure individually. Rural examples range from maintaining an irrigation canal to marketing grain, managing pasture, operating a savings group, sharing machinery, monitoring a forest, or negotiating a contract. The existence of a shared problem does not guarantee cooperation. People must believe that others will contribute, leaders will not appropriate the returns, rules will be enforced, and the expected benefit exceeds the costs of meetings, dues, labour, delay, and lost autonomy.

Durable cooperation is associated with recognizable conditions: boundaries that identify users and resources; rules fitted to local conditions; participation in modifying rules; monitoring accountable to users; graduated sanctions; low-cost conflict resolution; recognition of the right to organize; and nesting where resources cross scales. Comparative work on commons governance finds broad support for these design principles, while also showing that no single blueprint determines success (Ostrom, 1990; Cox et al., 2010). They are diagnostic propositions, not a checklist guaranteeing harmony.

Group boundaries are especially important. If benefits are open to everyone while costs fall on members, free riding becomes likely. Yet exclusion can be unjust where a "community" boundary erases mobile, seasonal, or secondary users. Boundaries must therefore be socially legitimate and ecologically appropriate. A watershed, grazing route, or fishery rarely conforms neatly to administrative borders. Nested arrangements are needed when local decisions create upstream-downstream or cross-boundary effects.

Commons, services, and market coordination

Collective action serves different purposes, and design must follow purpose. Commons organizations regulate withdrawal and maintenance. Savings groups pool funds and enforce repayment. Machinery groups schedule a divisible asset during narrow seasonal windows. Cooperatives aggregate produce, procure inputs, provide services, or process commodities. Producer organizations may also represent members politically. Combining too many functions can overload management, while separating them can fragment accountability.

Commons governance depends on ecological feedback. Water rotations must respond to flow; grazing rules to forage and mobility; fisheries rules to stocks and seasons. Local knowledge is valuable because users observe change continuously, but local governance alone may be unable to address basin-wide extraction, commercial encroachment, or climate trends. Public authority is necessary to recognize group rules, protect boundaries, supply information, and sanction outsiders. Community management should not become a rationale for state withdrawal.

Market organizations can reduce transaction costs by aggregating volume, standardizing quality, negotiating prices, and coordinating transport. They may provide credit, extension, storage, or inputs that an individual smallholder cannot obtain. Collective marketing can strengthen bargaining power, but it also introduces agency problems: leaders negotiate on behalf of members, handle money, and control information about price and grade. Delayed payment may be tolerable for a larger farmer but impossible for a cash-constrained household. Evidence from producer marketing groups in Kenya illustrates this double edge: groups could secure higher prices and improved seed access, while payment delays and benefits linked to marketed surplus reduced attractiveness to poorer farmers (Shiferaw et al., 2009).

Member welfare improves when the organization solves a binding constraint, delivers a reliable net benefit, and distributes that benefit according to rules members can inspect. Gross price is not enough. Analysis should subtract dues, rejected produce, transport, waiting time, compliance labour, credit charges, and delayed payment. It should examine who joins, who remains, who delivers through side channels, and who exits. Selection into membership means that a positive association between membership and income does not by itself establish organizational impact.

Heterogeneity, trust, and leadership

Heterogeneity is not inherently fatal. Diverse groups can combine complementary resources and wider networks. Problems arise when interests diverge sharply, costs and benefits are opaque, or powerful members can shift burdens. Landowners and tenants may value a water schedule differently; commercial producers may prioritize grading and export links while subsistence-oriented members value input access or food reserves. Durable organizations make these differences discussable and specify how decisions and benefits respond to them.

Trust lowers transaction costs but cannot substitute for accountability. Organizations often begin with charismatic or respected leaders, yet dependence on personal integrity creates fragility. Leadership must be institutionalized through defined authority, term limits or rotation, records, separation of approval and payment functions, and procedures for removal. Competence matters: bookkeeping, logistics, quality control, negotiation, and conflict management are learned capabilities. Democratic form without

managerial capability can produce failure; managerial competence without member control can produce capture.

External support is often necessary at formation. Donors and governments may fund registration, storage, staff, training, or working capital. Support strengthens autonomy when it builds systems members can finance and govern. It undermines autonomy when groups are created to meet project targets, leaders answer upward to funders, activities continue only while allowances are paid, or the organization adopts a purpose its members did not choose. A responsible exit strategy begins at entry: disclose subsidy duration, build member revenue, transfer records and skills, and avoid equipment that cannot be maintained locally.

Failure and organizational learning

Collective action fails through several interacting mechanisms. Free riding erodes contribution; weak records enable suspicion; political interference turns benefits into patronage; donor dependence distorts purpose; adverse buyers exploit sunk investments; and excessive meeting burdens exclude people with care or wage obligations. Side-selling may appear disloyal but can be a rational response to delayed payment or an unattractive price. Sanctioning members without diagnosing organizational performance treats symptoms as moral failure.

Failure need not imply dissolution. Organizations can narrow their purpose, federate for specialized services, contract professional management under member oversight, or revise contribution rules. Monitoring should include organizational health, not only outputs: member retention, concentration of sales, payment delay, participation by group, unresolved grievances, audit timeliness, and the share of revenue from members versus donors.

Table 3.3. Conditions for durable collective action

Design condition	Why it supports durability	Warning signal	Corrective lever
Clear, legitimate boundaries	Aligns contributors, users, and resource or service	Hidden exclusion; free riding; ecological mismatch	Re-map users and benefits; recognize secondary users
Rules fitted to purpose and context	Makes obligations feasible and understandable	Imported bylaws; rules ignored in practice	Participatory revision; simple operating procedures
Visible net member benefit	Sustains contribution and loyalty	Side-selling, dropout, meeting fatigue	Reduce delay and costs; disclose full price calculation

Design condition	Why it supports durability	Warning signal	Corrective lever
Accountable monitoring and sanctions	Builds expectation of reciprocity	Selective punishment; leaders exempt	Independent checks; graduated sanctions; appeal
Capable, replaceable leadership	Combines competence with member control	Founder dependence; opaque accounts	Succession, rotation, training, separation of functions
Complementary external support	Supplies missing capital and authority	Project-created group; subsidy dependence	Time-bound support; revenue plan; public recognition

The most consistent conditions for durable collective action are thus not generalized solidarity but legitimate boundaries, usable rules, credible monitoring, low-cost conflict resolution, capable accountable leadership, and benefits exceeding differentiated participation costs. Producer organizations improve welfare when they solve real coordination failures and make price, timing, service, and risk transparent. Benefits concentrate among larger or better-connected farmers when entry thresholds, delivery volumes, liquidity demands, or leadership networks favour them. Purpose, composition, and external support affect survival by determining whether the organization is member-owned in practice, technically capable, and financially viable beyond a project cycle.

Evaluating collective action without romanticizing membership

The effects of collective action should be evaluated against a plausible alternative. Members may have higher income because the organization improved prices or services, because already productive farmers self-selected into membership, or because both processes occurred. Strong evaluations compare similar members and nonmembers, use panel or experimental variation where available, and examine heterogeneous effects. Qualitative process tracing remains necessary to identify why a result emerged: bargaining, learning, credit, input quality, political influence, or a change in risk.

Organization-level averages are particularly deceptive. A cooperative can increase total turnover while losing poorer members. A water association can improve average delivery while tail-end users experience greater scarcity. A forest committee can reduce extraction while transferring unpaid monitoring work to women. Evaluation should therefore follow a distributional chain: eligibility, joining, contribution, service use, decision influence, gross benefit, full cost, control of proceeds, and retention over time.

The time horizon also matters. A newly subsidized group may report rapid membership growth and high participation because benefits are immediate. Durability becomes visible after leadership turnover, a bad season, a buyer dispute, or the

withdrawal of project staff. Repeated observations of accounts, delivery volumes, grievances, and member exit are more informative than a one-time satisfaction survey. Failure should be recorded, not filtered from evidence maps; otherwise the literature overrepresents organizations that survived long enough to be studied.

Collective action can also produce public and political effects not captured in farm income. Organizations may improve recognition of customary rights, create leadership experience for women, negotiate infrastructure, or coordinate ecological restoration. They may equally intensify surveillance, discipline members for buyers, or displace informal mutual aid. A complete assessment includes economic performance, organizational autonomy, distribution of voice, labour and time costs, and effects on the resource base.

Finally, organizational support should be treated as a portfolio rather than a single training intervention. Governance reform without working capital may leave a cooperative transparent but commercially irrelevant. Credit without member oversight may magnify capture. Infrastructure without maintenance finance may create a stranded asset. The most credible support packages sequence legal recognition, inclusive rule design, managerial capability, finance, market relations, and accountability according to the organization's binding constraint.

Collective action across scales and sectors

Many rural coordination problems are misdiagnosed because the organization and the problem occupy different scales. A village committee cannot regulate upstream extraction across a basin; a national agency cannot schedule turns in a tertiary canal with current knowledge of every user. A marketing group may aggregate enough produce for a local trader but not enough to negotiate with a processor. Scale should therefore be treated as a functional question: at what level can information be gathered, external effects contained, bargaining power assembled, and accountability maintained?

Nested organizations distribute these functions. Local groups manage repeated operational decisions and observe compliance. Federations pool services, insurance, storage, legal representation, and market intelligence. Public agencies establish rights floors, regulate actors beyond member authority, and coordinate infrastructure. The architecture is successful when information travels upward without surrendering all decision power and when higher-level support travels downward without bypassing member control.

Cross-sector coordination is equally important. A producer organization cannot solve a market problem caused by an impassable road, a monopolistic buyer, or an absent payments system. A savings group may absorb modest losses but cannot reliably cover a widespread drought through members' contributions alone. A water association cannot maintain ecological flows if agricultural policy rewards unrestricted expansion.

Organizations should be held accountable for functions they can reasonably perform, while policy analysis identifies complementary failures elsewhere.

Interorganizational networks can spread learning and reduce isolation, but they also create representation problems. Delegates may become professional intermediaries whose incentives diverge from local members. Mandated positions, recall procedures, public reports, and rotation help preserve the chain of authorization. Federations need their own audits and grievance routes; they are not automatically more democratic because their members are organizations.

The temporal scale of cooperation matters too. Emergency collective action can mobilize rapidly through trusted ties but may concentrate discretion. Long-term resource governance requires predictable finance, records, succession, and ecological monitoring. Transitional arrangements should specify when exceptional powers end and how emergency decisions are reviewed. Otherwise a crisis response becomes a durable reduction in member authority.

These scale questions reinforce the chapter's central warning against blueprint governance. The appropriate institutional form follows the configuration of resource, market, authority, and social difference. The aim is not to maximize the size or number of organizations, but to create a connected system in which each level performs a justified function, remains answerable to affected actors, and can learn from consequences at other levels.

3.4 Power, Inclusion, and Accountability

From membership to effective voice

Participatory institutions are often evaluated by whether excluded groups are formally represented. This is necessary but insufficient. A member may be listed but uninformed, attend but remain silent, speak but be ignored, vote on an agenda set elsewhere, or receive a nominal benefit controlled by another household member. Inclusion has at least five levels: eligibility, presence, voice, influence, and control over benefits. Each level requires distinct evidence.

Women may be members through a household account while men control produce and payment. Tenants may attend water meetings but avoid challenging landowners. Youth may supply labour without voting rights because landholding defines membership. Persons with disabilities may face inaccessible venues and communications. Migrants and remote households may miss meetings scheduled around settled residents. Caste, ethnicity, lineage, and political affiliation can shape whose speech carries authority even under formally equal voting.

This is why power belongs at the centre of institutional analysis. Power operates through agenda setting, categories, timing, language, expertise, information, and the

threat of social or economic sanction. It can be visible in a disputed vote, hidden in which options reach the agenda, or internalized when marginalized members judge their own knowledge unworthy. An institution may be orderly precisely because unequal expectations suppress contestation.

Elite capture as a process

Elite capture occurs when actors with superior economic, social, or political power appropriate a disproportionate share of decision authority or benefits intended for a wider group. It is not limited to theft. Leaders may selectively recruit members, monopolize programme information, tailor eligibility criteria to their assets, allocate contracts to allies, manipulate weights and grades, or use organizational visibility to build political patronage.

Capture is more likely when benefits are scarce and discretionary; information is concentrated; leadership is difficult to challenge; accounts cannot be verified; and members depend on leaders outside the organization. Decentralization can move authority closer to users, but it may also move resources closer to local hierarchies. Community knowledge does not automatically equal community accountability.

Capture should be diagnosed distributionally. Who knew about the programme before registration? Who helped write the beneficiary list? Which households received high-value assets? Who holds multiple offices? Who supplies the organization or transports its produce? Whose complaints are resolved? Network analysis can reveal whether formal offices and informal brokerage are concentrated in the same cluster.

Not every unequal outcome is capture. Larger producers may receive more payment because they deliver more. The question is whether the rule is legitimate, known, and compatible with the organization's public purpose. If a cooperative exists partly to include smaller farmers, a volume-only benefit rule may defeat that purpose even when applied consistently. Accountability therefore involves justification, not only procedural compliance.

Safeguards with proportionate participation costs

Safeguards can themselves become burdens. Frequent meetings exclude wage workers and carers; complex audits favour educated insiders; rigid quotas may produce token positions without authority. The objective is a **proportionate accountability bundle** that targets the actual capture pathway.

Transparency is foundational: publish eligibility, membership, prices, deductions, procurement decisions, minutes, and audit findings in accessible formats. Yet information without capacity to act is disclosure, not accountability. Members need time to review, rights to question, and an authority obliged to respond. Independent audits are valuable for finance, while social audits and public verification can test whether assets and benefits reached intended groups.

Elections create contestability when nominations are open, ballots are secret where intimidation is possible, terms are limited, and office does not control the voter list. Rotation can spread experience but may sacrifice competence; staggered terms and trained committees balance continuity and renewal. Quotas or reserved seats can change presence, but meaningful influence may require leadership positions, caucus space, mentoring, childcare, accessible venues, translation, and rules preventing one person from speaking for an entire category.

Grievance systems need several channels because complaints against a leader cannot safely be submitted only to that leader. Anonymous options, time limits, non-retaliation provisions, appeal, and public reporting of aggregate outcomes increase credibility. External oversight should be triggered by material risk rather than inserted into every minor decision.

Table 3.4. Diagnosing substantive inclusion

Dimension of inclusion	Diagnostic question	Common false positive	Stronger indicator
Eligibility	Can the person legally or organizationally join?	Inclusive wording in bylaws	Membership rates among eligible groups and reasons for non-joining
Presence	Can the person receive information and attend?	Name on a register	Timely notice, accessible venue, attendance over time
Voice	Can the person speak without retaliation?	One consultation event	Speaking turns, proposals submitted, dissent recorded
Influence	Does participation alter decisions?	Vote held after agenda is fixed	Proposals adopted, budgets changed, reasons given for rejection
Benefit control	Can the person use or decide over the benefit?	Benefit assigned to a household	Individual receipt, control of payment or asset, reported agency

Countervailing power and the role of external actors

Internal safeguards may be insufficient where social and economic dependence is severe. Countervailing organizations, including women's groups, unions, tenant associations, federations, legal-aid providers and disability organizations, together with investigative media and links to responsive public agencies, can reduce the cost of challenge. Federations allow local groups to bargain with buyers and governments while supplying an appeal beyond local leadership. They may, however, create another distant elite; upward representation must be mandated and reported back.

External actors strengthen marginalized voice when they expand capabilities and protect contestation without deciding substantive preferences on members' behalf. Useful roles include funding independent facilitation, translating information, supporting caucuses, providing legal literacy, enforcing rights floors, and conditioning public funds on transparent procedures. Harmful roles include selecting compliant "representatives," paying allowances that distort participation, imposing organizational templates, or bypassing local deliberation because it is slow.

The appropriate principle is **supported autonomy**. Local ownership is not the absence of outside influence; rural organizations already operate within markets, law, and public programmes. It means that members retain authority to define purpose, revise rules, select leaders, and refuse an intervention, while external institutions ensure that this autonomy does not license coercion or exclusion. Facilitation should have an exit path, records should belong to the organization, and capacities should be distributed rather than vested in one counterpart.

Formally included but substantively powerless groups are those whose membership does not cross the thresholds of information, voice, influence, and benefit control; these often include women, tenants, landless workers, youth, migrants, lower-status ethnic or caste groups, persons with disabilities, and remote households. Safeguards reduce capture when they make information public, authority contestable, finance auditable, complaints safe, and representation consequential without imposing excessive meeting or paperwork costs. External actors preserve ownership when they strengthen these capabilities and rights while leaving agenda-setting and rule revision genuinely negotiable.

Accountability as a relationship of answerability and consequence

Accountability is stronger than transparency and broader than an audit. It is a relationship in which an actor must explain and justify conduct to a forum able to question the explanation and impose a consequence or require correction. This definition directs attention to the full chain. Information must be produced, reach an appropriate audience, be intelligible, prompt a response, and connect to remedy. A noticeboard full of accounts has little effect if members cannot verify entries or remove a treasurer.

Different forums address different failures. Members hold elected leaders accountable for mandate and performance. Regulators protect statutory rights and public funds. Courts or tribunals review legality. Buyers answer to contractual standards, competition rules, and organized suppliers. Media and civil society create reputational consequences. Federations provide peer discipline and appeal. Redundancy is useful because one forum may be captured, but overlapping oversight should not permit every actor to deny responsibility.

Accountability can be upward, downward, horizontal, and diagonal. Project organizations often become highly accountable upward to funders through reports while remaining weakly accountable downward to members. Horizontal checks divide power among committees or agencies. Diagonal arrangements connect citizen monitoring to a public authority able to sanction. Reform should examine where the strongest reporting obligation currently points and realign it with the people bearing risk.

The distribution of participation costs is itself an accountability issue. If consultations require repeated unpaid travel, better-off participants become the de facto electorate. Scheduling, childcare, transport support, remote participation, and compensation for lost wages may be necessary, but payments must be designed so they do not purchase compliance or create a professional participant class. A proportionate design distinguishes routine member governance from intensive public consultation and pays attention to who can afford each.

Safeguards should be tested under stress. A secret ballot matters when a leader faces opposition, not when all positions are uncontested. A grievance channel matters when a complainant challenges a buyer or elder. A quota matters when a representative advances a proposal opposed by dominant members. Scenario exercises and retrospective review of actual disputes expose whether formal safeguards carry practical consequence.

3.5 Institutional Adaptation and Actionable Governance Reform

How institutions change

Institutions rarely change through complete replacement. Actors reinterpret ambiguous rules, add new layers, redirect existing organizations, allow old provisions to decay, or combine familiar practices with new demands. **Institutional bricolage** describes this recombination of available norms, relationships, and organizational forms (Cleaver, 2012). It explains why reforms on paper often yield hybrid outcomes: people make new arrangements workable by attaching them to established authority and meaning.

Mahoney and Thelen (2010) distinguish four forms of gradual institutional change. **Layering** adds a new rule or organization beside an old one; a water-user association may be added to customary authority. **Conversion** redirects existing rules to a new purpose; a group reinterprets its savings rules to finance collective input procurement. **Displacement** occurs when a new rule supplants an old one. **Drift** occurs when rules remain formally unchanged while environmental or market conditions alter their effect. Reinterpretation can expand inclusion, but it can also preserve privilege beneath new language.

Shocks accelerate these processes. Drought makes allocation rules politically salient; conflict changes who can enforce claims; migration alters labour and leadership; price

collapse tests a cooperative's liquidity; and digital technology creates new data and advisory authorities. A shock opens a window but does not determine the reform. Powerful actors may use urgency to centralize control, while marginalized groups may lack time and resources to defend claims.

Adaptability without arbitrary discretion

Constructive adaptation requires capacity to detect change, deliberate, experiment, mobilize resources, and revise rules. Institutions become rigid when rules cannot be changed without prohibitive cost, leaders benefit from the status quo, feedback is suppressed, or failure is blamed on users rather than design. They become arbitrary when flexibility is concentrated in unchecked discretion. The goal is **bounded adaptability**: explicit authority to make temporary adjustments, requirements to document reasons, sunset or review dates, and routes for affected groups to contest the change.

Ecological governance illustrates the need. A drought contingency rule can specify thresholds, priority uses, temporary restrictions, monitoring, and review after the season. This is more adaptive and more accountable than either an inflexible normal-year rotation or ad hoc allocation by an official. Diversity and redundancy, attention to slow variables and feedbacks, learning and experimentation, participation, and polycentric governance are recurrent principles for social-ecological resilience (Biggs et al., 2012).

Learning requires records that connect decisions to outcomes. Organizations should retain not only financial accounts but also rule changes, complaints, participation patterns, ecological indicators, and reasons for abandonment. Reflection must include rival explanations. A cooperative's declining sales may reflect weak leadership, a buyer's price, harvest failure, or members' liquidity needs. Reform aimed at the wrong mechanism can worsen the problem.

Accountable state-community-market interfaces

No single sector supplies accountable rural governance. States provide legal recognition, protection, taxation, redistribution, infrastructure, and sanctions beyond local reach. Community organizations provide contextual knowledge, repeated interaction, and user monitoring. Markets coordinate exchange, investment, and specialized services. Each also has characteristic failure modes: bureaucratic distance and political discretion; local hierarchy and limited resources; and exclusion by purchasing power or monopoly.

Accountable combinations divide functions according to comparative capability while preserving mutual checks. In extension, the state can finance public-good advice and set standards; producer organizations can articulate demand and monitor service; private providers can supply specialized inputs under conflict-of-interest rules. In contract

governance, firms coordinate quality and purchase; organizations aggregate and negotiate; public authority enforces disclosure, competition, labour, and dispute standards. In commons governance, users make operational rules; public agencies protect boundaries and supply science; markets remain subject to extraction limits.

Co-production succeeds when responsibilities are explicit. Vague "partnership" language often hides who bears risk. Agreements should specify financing, data ownership, maintenance, performance indicators, grievance routes, and what happens when a partner withdraws. Accountability must travel in every direction: community leaders to members, firms to producers, public officials to citizens, and organizations to ecological limits.

Scaling through principles, federation, and modularity

Successful local arrangements are often asked to scale. Replicating a fixed blueprint can erase the relationships and contextual knowledge that made the original work. Refusing all standardization can leave groups isolated, administratively weak, and unable to influence larger markets or policies. The solution is to scale **functions and principles**, not every local form.

Federation is one route. Local units retain operational decisions while higher levels provide audit, training, legal representation, market intelligence, insurance, or bargaining. Subsidiarity assigns decisions to the lowest level capable of handling their effects. Standardization should be limited to what interoperability and rights require: core accounting fields, minimum safeguards, data protocols, or product grades. Local rules can vary where ecology, culture, and livelihood make variation valuable.

Scaling should be modular and reversible. Pilot a function in diverse settings; document necessary conditions; permit adaptation; compare outcomes across groups; and expand only when the organization can sustain finance and accountability. Peer exchange is often more respectful of tacit knowledge than one-way training. Experienced members can explain not only what a rule says but why it evolved and where it fails.

A governance reform test

A feasible reform should be judged against seven criteria:

Legitimacy: affected actors recognize the authority and procedure.

Inclusion: marginalized users can enter, speak, influence, and benefit.

Adaptability: rules can respond to evidence and shocks without arbitrary power.

Transaction cost: compliance and participation are proportionate to expected benefit.

Enforcement: obligations are monitored, sanctions credible, and appeal accessible.

Distribution: gains, costs, risks, and decision authority are not hidden in averages.

Ecological performance: rules maintain the resource base and attend to cross-scale effects.

A reform that scores well on efficiency but poorly on legitimacy may invite evasion. One that is inclusive in meetings but lacks enforcement may produce disappointment. One that raises current income while degrading water or soil shifts costs into the feedback loop. These criteria are therefore evaluated together.

Institutions adapt constructively when they have diverse information, accountable leadership, room for experimentation, rights-protecting public authority, and procedures for revising rules. They become rigid or exclusionary when incumbents suppress feedback, authority is monopolized, or adaptation costs are shifted to weaker groups. Accountable governance most often combines public rights and enforcement, community knowledge and monitoring, and market capability under transparent contracts and mutual oversight. Local arrangements expand without erasure when federated systems preserve subsidiarity, standardize only necessary functions and safeguards, and treat adaptation as evidence rather than deviation.

Sequencing actionable reform

Institutional reform begins with a mechanism, not an organizational fashion. If tail-end irrigators lack water because monitoring is absent, creating a federation may add distance without solving the allocation problem. If monitoring exists but sanctions are blocked by political patrons, a local training course will not create countervailing authority. The first task is to locate the break in the chain: recognition, information, coordination, capability, enforcement, or remedy.

Low-regret reforms make existing authority more legible and contestable. They include publishing rules and fees, recording decisions, clarifying referral pathways, disclosing conflicts of interest, establishing response times, and disaggregating benefit data. These changes do not require institutional replacement, yet they create evidence for deeper reform. Where exclusion is entrenched, stronger measures, such as rights recognition, independent appeal, redistribution of authority, reserved representation, or competition policy, may be necessary.

Reform should be staged with explicit hypotheses. A first phase might predict that transparent grading and same-day payment will increase deliveries by cash-constrained members. Monitoring would compare delivery and exit across wealth and gender groups, while interviews test rival explanations such as harvest volume or buyer prices. A review point would determine whether to expand storage, revise credit, or abandon the approach. This makes adaptation disciplined rather than improvised.

Political feasibility must be distinguished from technical simplicity. A rule may be easy to write but threaten actors who profit from ambiguity. Reform coalitions need beneficiaries, implementers, and authorities capable of sustaining change. Countervailing groups may require protection during transition. Compensation can

sometimes reduce resistance, but it should not reward rights violations or lock in unequal claims.

Finally, reform has to survive ordinary administration. Pilot projects often depend on exceptional staff, short reporting lines, and external finance. Before scaling, designers should estimate recurring costs, specify who maintains data and infrastructure, prepare for leadership turnover, and test the arrangement during a difficult season. Institutionalization is achieved when a rule remains usable, revisable, and accountable after the founding project and its champions have departed.

Practical Chapter Output: The Institutional-Network Action Map

The Institutional-Network Action Map is a structured way to move from a broad claim, such as "institutions are weak" or "farmers need organization," to a testable diagnosis. It should be prepared for a specific decision arena: irrigation access, cooperative marketing, extension delivery, contract enforcement, grazing management, input distribution, or another bounded problem. The map records both official architecture and lived practice.

Part A: Diagnose the relational infrastructure

Table 3.5. Institutional-Network Action Map: diagnosing relationships

Field	What to record	Core diagnostic question	Possible evidence
Rule arena	Formal rules, informal norms, eligibility, obligations, sanctions, appeal	Which rule is actually used, by whom, and with what exceptions?	Law, bylaws, contracts, minutes, cases, interviews
Organizations and authority	State, customary, market, community, membership and judicial actors	Who can decide, enforce, fund, or block?	Mandates, budgets, staffing, decision records
Influential actors	Officeholders, landowners, buyers, advisers, political patrons	Does formal authority match practical influence?	Reputational mapping, transaction and meeting records
Ties and flows	Bonding, bridging, linking, formal and informal communication	How do information, money, produce, labour, and claims move?	Network survey, communication logs, value-chain tracing
Brokers	People or organizations connecting otherwise separate groups	Does brokerage widen access or extract a toll?	Referral paths, fees, concentration, conflict disclosures

Field	What to record	Core diagnostic question	Possible evidence
Excluded or peripheral groups	Gender, age, caste / ethnicity, disability, tenure, migration, poverty, remoteness	Who is eligible yet unable to reach voice, influence, or benefit control?	Disaggregated membership, attendance, speaking, benefit data
Coordination failure	Missing service, free riding, conflicting jurisdiction, delayed payment, information asymmetry	Which mechanism prevents a mutually beneficial response?	Process tracing, grievance records, outcome comparison
Accountability risk	Capture, retaliation, opacity, monopoly, donor or platform dependence	Who can act without explanation or review?	Audit trail, office concentration, complaints and appeals

Part B: Design and monitor reform

Table 3.6. Institutional-Network Action Map: designing and monitoring reform

Reform lever	Responsible actor	Immediate output	Distributional safeguard	Monitoring indicator	Feedback trigger
Clarify or recognize rules	Legislature, agency, customary forum, organization	Accessible rule and jurisdiction map	Protect legitimate secondary and mobile rights	Awareness and claim recognition by group	Rise in unresolved cross-forum disputes
Diversify information channels	Extension, producer group, platform, media	Hybrid advisory and referral system	Local language, disability access, device-neutral options	Reach, response time, trust and use by group	Persistent peripheral clusters or misinformation
Make brokerage accountable	Organization, buyer, regulator	Disclosed role, fee, conflict and referral standards	Multiple brokers and appeal	Fee dispersion, referral concentration, complaints	Single actor controls critical flow
Strengthen organization governance	Members, federation, registrar, funder	Records, elections, audits, grievance process	Consequential representation and safe complaint	Payment delay, audit timeliness, voice and benefit control	Capture indicators or member exit rise

Reform lever	Responsible actor	Immediate output	Distributional safeguard	Monitoring indicator	Feedback trigger
Build adaptive review	Resource group, public agency, research partner	Thresholds, temporary rules, review calendar	Participation of high-risk users	Rule changes tied to ecological and social evidence	Threshold crossed or harms concentrated
Federate or scale a function	Local groups, federation, state, service provider	Shared service with subsidiarity agreement	Local mandate, recall, transparent cost sharing	Service quality, local autonomy, distribution of gains	Administrative growth outpaces member value

The map should be read horizontally as a causal proposition. If a proposed reform is to improve market access, for example, it must specify which rule changes, which organization acts, how information and produce flow, which broker is affected, which group may remain excluded, and which indicator would reveal capture or failure. It should also be updated. Outcomes feed back into institutional capacity and network position: a successful organization gains resources and influence; an exclusionary one may lose trust; an ecological shock may invalidate its operating rule.

CHAPTER 04

Uneven Innovation

Knowledge, Technology, and Power

Chapter purpose

An innovation is never only an object. A drought-tolerant seed, mobile advisory service, tractor-hire platform, index-insurance product, soil sensor, farmer field school, or new crop-management practice arrives with a theory of the problem, an account of whose knowledge matters, requirements for complementary resources, and an allocation of risk. It is introduced through organizations and relationships that make it visible to some rural actors before others. It may be tried on one plot, altered, combined with familiar practices, used intermittently, or abandoned. Even when it raises aggregate production, it can reorganize labour, debt, authority, ecological pressure, and control over data in ways that are not captured by an adoption rate.

This chapter reframes agricultural innovation as a **socially organized capability process**. Innovation includes the creation, recognition, translation, trial, adaptation, sustained use, and possible discontinuation of a novel practice, service, relationship, or technology. Its effects depend on who can define the problem, participate in design, access advice, finance complementary inputs, absorb failure, repair equipment, interpret information, and demand redress. The guiding question is: **How do rural knowledge relations and unequal capabilities shape participation in agricultural innovation, the distribution of its benefits, and its long-term fit with local livelihoods and environments?**

Chapter 3 showed that institutions and networks form the relational infrastructure through which agricultural change is coordinated. Chapter 4 follows knowledge and technology through that infrastructure. The Rural Systems Mediation Framework continues to provide the book's causal grammar:

Innovation driver and mission → knowledge, institutional, and resource mediation → staged and negotiated use → differentiated outcomes → technical, social, and ecological feedbacks

This sequence replaces the adopter/non-adopter binary. Awareness is not access; access is not trial; trial is not competent use; current use is not persistence; and discontinuation is not necessarily failure. A farmer may rationally reject a profitable-looking package because the downside threatens subsistence, the required labour arrives at the wrong season, or the market and repair services are unreliable. Another may be recorded as an

adopter while using only part of the package, on only part of the farm, or under project subsidy. A third may adapt the innovation so extensively that official monitoring no longer recognizes it, even though the modified practice fits better (Glover et al., 2019; Pannell et al., 2006).

The chapter develops five arguments. First, agricultural knowledge is a plural ecology, and epistemic authority determines which observations enter research agendas. Second, extension is a system of brokerage and feedback rather than a one-way transfer channel. Third, digital agriculture reorganizes infrastructure, market power, and data relations as well as information. Fourth, innovation use is a staged, reversible capability process conditioned by assets, institutions, household authority, and exposure to loss. Fifth, responsible innovation requires participatory mission-setting, distributional and ecological assessment, accountable scaling, and meaningful exit. The practical output is an **Uneven Innovation Diagnostic** for examining these relations before and during intervention.

Four distinctions organize the analysis. **Invention** refers to the creation of a novel option; **innovation** to the social process through which an option is combined with knowledge, institutions, and practice; **diffusion** to changes in its visibility and circulation; and **scaling** to deliberate efforts to expand use, effect, or institutionalization. These processes can proceed separately. A technology can diffuse widely as an idea yet remain inaccessible in practice. An innovation can generate important local change without large numerical reach. Scaling can expand a service while weakening its quality or legitimacy.

The chapter also distinguishes technical performance from **local fit**. Technical performance asks whether an option can produce an intended effect under stated conditions. Local fit asks whether those conditions can be assembled without unacceptable cost, dependency, inequality, or ecological harm. Fit is dynamic: climate, prices, household composition, and service networks change. An innovation that fits during a subsidized pilot may not fit after recurrent costs become visible; one rejected initially may become feasible after a rental market or public infrastructure develops.

Evidence is assessed accordingly. Laboratory and station experiments identify mechanisms and potential; on-farm trials reveal heterogeneity; randomized and quasi-experimental studies estimate effects under specific implementation conditions; panels reveal persistence and abandonment; qualitative histories identify meaning, negotiation, and adaptation; network evidence shows information structure; and institutional analysis explains authority, standards, and remedy. No design alone answers whether innovation is just or sustainable. The chapter triangulates these forms while distinguishing demonstrated effects from plausible mechanisms and governance principles.

Finally, **responsibility** does not mean eliminating uncertainty. Agricultural development necessarily involves experimentation under changing conditions. It means

that uncertainty and downside are disclosed, voice is consequential, risk is not transferred silently to weaker actors, monitoring can change the intervention, and exit remains possible. This converts innovation governance from promotional delivery into a continuing public and relational obligation.

4.1 Knowledge Ecologies and the Politics of Expertise

Agricultural knowledge is plural and situated

Agriculture depends on several forms of knowledge that cannot be reduced to a single hierarchy. **Tacit knowledge** is embodied in skilled performance: judging soil moisture by touch, recognizing a distressed animal, timing cultivation from changing weather, or handling seed without an explicit formula. **Experiential knowledge** accumulates through observation, comparison, error, and memory. **Local knowledge** is produced within a place and its social relations. **Indigenous knowledge** is connected to collective identity, territory, law, language, spirituality, and intergenerational responsibility; it should not be treated merely as a catalogue of useful techniques available for extraction. **Codified scientific knowledge** is produced through formal methods, measurement, modelling, controlled comparison, and peer scrutiny. Commercial advice adds product tests, customer data, and supply-chain intelligence, while public agencies hold regulatory, meteorological, and surveillance knowledge.

These forms differ in how they establish validity. A station trial isolates variables and estimates average effects under specified conditions. A farmer judges whether a practice performs across soil patches, labour bottlenecks, household priorities, and uncertain seasons. Indigenous knowledge may evaluate effects across longer ecological and cultural time horizons. None is intrinsically complete. Station science can identify causal processes invisible to observation, while local experience can reveal interactions excluded by experimental design. The relevant question is not which knowledge system wins, but what each can know, where it travels reliably, and how disagreements are adjudicated.

The idea of a **knowledge ecology** emphasizes interaction. Knowledge is produced through seed selection, experimentation, storytelling, work, extension encounters, markets, migration, media, and collective memory. It is also lost: through displacement, language decline, youth exclusion, ecosystem change, or research institutions that record outputs without the conditions and meanings that sustain them. Recognition is therefore both an analytical and political act.

Farmer experimentation and learning through practice

Farmers experiment continually, though their experiments may not resemble formal trials. They compare varieties on small plots, alter planting dates, combine organic and purchased inputs, observe neighbours, preserve seed from unusual plants, and adjust practices after pests or rainfall. The objective may be robust performance rather than maximum mean yield. A household can prefer a variety that stores well, matures during a hunger period, provides fodder, or can be harvested with available labour even when it yields less under station conditions.

Farmer experiments are embedded in production and therefore constrained. Treatments may not be randomized; record-keeping varies; and a bad season may end a trial. Yet embeddedness is also their strength: the experiment tests labour, taste, storage, cash-flow, livestock, and market fit simultaneously. Formal research can complement this process by improving comparison, measuring hard-to-observe mechanisms, and widening the range of material available. Farmer research networks create an institutional bridge when they allow many farmers to test options under diverse conditions while retaining local questions and interpretation.

Learning is social. Observation of a neighbour reduces uncertainty only when the observer knows enough about the plot, inputs, and household to judge relevance. Intergenerational transmission combines instruction with participation in work; it can preserve complex ecological knowledge, but it can also reproduce authority that discounts young people's experience. Migration and schooling introduce new knowledge while sometimes devaluing farming competence. The supposed opposition between “traditional elders” and “innovative youth” is therefore misleading. Both groups hold partial knowledge shaped by tasks, mobility, technology, and position.

Problem framing and epistemic authority

Innovation begins before a prototype. It begins with the authority to name a problem. If low productivity is framed as a seed deficit, improved varieties become the obvious solution. If farmers identify unreliable water, debt, storage loss, or buyer power as the binding constraint, a seed intervention may be secondary. Recognizing farmer and Indigenous knowledge broadens the frame from isolated technical performance to livelihood, territory, culture, and ecological relations. It can make visible crops, traits, foods, or landscape functions that formal breeding and commodity statistics ignore.

Authority is unevenly distributed within “the community.” Men may be recognized as crop decision-makers while women possess detailed knowledge of seed, processing, nutrition, and unpaid labour. Landowners may be invited to research platforms while tenants and workers understand implementation costs. Pastoralists, fishers, forest users, and collectors can be excluded by a sedentary crop-farm definition. Dominant languages determine who can speak directly rather than through translation. Large commercial farmers may appear more expert because they interact frequently with

researchers and firms, while smaller producers' cautious experimentation is read as resistance.

Epistemic exclusion occurs when people are denied credibility, when their categories cannot enter the research process, or when participation is limited to supplying data for questions defined elsewhere. It may be subtle. A meeting can include women but schedule discussion when care responsibilities prevent attendance. Researchers can solicit local indicators and later translate them into variables without returning results or recognizing ownership. A lead farmer can speak for a socially diverse area while representing the priorities of landholders like himself.

Uncritical romanticization creates a different error. Local knowledge is not static, uniformly shared, or automatically sustainable. It can contain mistaken causal beliefs, reflect unequal authority, and become poorly fitted as climate or markets change. Scientific evidence is not simply external domination; vaccination, diagnostics, breeding, and weather science can materially expand capability. Respectful co-production therefore subjects all claims to transparent testing while recognizing that validation criteria themselves require negotiation.

Table 4.1. Knowledge forms, validation, and governance safeguards

Knowledge form	Particular strength	Common blind spot	Appropriate validation	Governance safeguard
Tacit and experiential	Fine-grained timing, skill, whole-farm fit	Difficult to articulate or transfer	Observation, repeated practice, farmer comparison	Credit practitioners; document conditions, not only technique
Local ecological	Place-specific interactions and historical change	May not travel beyond its ecology	Multi-season local trials and ecological monitoring	Keep interpretation with local users; protect sensitive knowledge
Indigenous	Long-duration biocultural relations, collective memory and responsibility	Can be extracted or reduced to decontextualized “tips”	Community-defined evidence and consent plus complementary science	Collective authority, prior consent, attribution, benefit sharing
Scientific and codified	Controlled comparison, causal identification, measurement and portability	Experimental conditions may exclude livelihood constraints	Replication, peer review, multi-environment and on-farm testing	Publish assumptions, uncertainty, conflicts, and negative results

Knowledge form	Particular strength	Common blind spot	Appropriate validation	Governance safeguard
Commercial and platform	Product performance, logistics, large transaction datasets	Conflicted incentives, proprietary evidence, selective disclosure	Independent trials, audit, post-market monitoring	Conflict disclosure, data access, liability, competition

Co-production beyond token participation

Farmer-scientist collaboration produces locally adapted innovation when rural actors exercise influence across the research cycle: problem definition, option selection, experimental design, interpretation, modification, and decisions about scaling. Participation only at dissemination is consultation after the consequential choices have been made. The depth of influence can be tested by asking whether farmer priorities changed the research question, whether negative results could stop the project, and whether local modifications are treated as evidence rather than protocol violations.

Co-production needs material support. Travel, translation, childcare, seasonal scheduling, compensation for time, accessible venues, and small trial resources determine who can participate. Representation should include variation in tenure, gender, age, livelihood, location, and farm scale. Separate deliberative spaces may allow marginalized groups to formulate positions before mixed meetings, but these spaces must connect to actual decision authority.

The ownership of knowledge matters. Agreements should specify who controls samples, recordings, digital data, genetic resources, and publication. Indigenous and community knowledge may be collectively held and subject to restrictions that individual consent cannot waive. Returning findings in usable language and formats is a minimum reciprocal obligation. Co-authorship or acknowledgement, benefit sharing, and community review of sensitive material can be appropriate, but they are not substitutes for continuing authority.

Recognition alters problem framing by making livelihood and ecological functions visible, challenging productivity-only missions, and widening the solution set. Collaboration becomes substantive when farmers can revise questions, methods, interpretations, and continuation decisions; when participation costs are covered; and when knowledge rights are protected. Epistemic authority remains stratified by gender, generation, ethnicity, occupation, language, and scale because these positions shape whose observation is heard, whose categories are codified, and who enters research institutions. A knowledge ecology becomes innovative not when difference disappears, but when different claims can meet under fair procedures and shared tests.

A multiple-evidence approach to disagreement

The relationship between knowledge systems is often imagined as integration, as if all observations could be merged into one neutral database. Integration can erase important differences in purpose, evidence, and authority. The **multiple evidence base** approach offers a more careful sequence: each knowledge system develops and evaluates evidence through its own institutions; different knowledge holders then identify complementarities and contradictions; and joint decisions are made without requiring scientific validation to be the sole gateway (Tengö et al., 2014). This recognizes parity without claiming that every proposition is equally supported.

Disagreement can be productive. Farmers may report that a new variety "fails" because it performs poorly in storage or weakens straw, while breeders define failure through grain yield. The dispute reveals different outcome functions rather than ignorance. Researchers may detect that a familiar pesticide causes health or ecological harm not observable in one season. A transparent process states the competing claims, identifies what evidence could distinguish them, and specifies who bears the cost of further testing.

Participation methods should be selected for the decision, not for symbolic inclusion. Collaborative priority setting, citizen science, participatory breeding, farmer research networks, and community-led monitoring confer different powers. Neef and Neubert (2011) caution that more participation is not automatically better; a burdensome process can waste time or transfer research labour to farmers without influence. The meaningful test is whether participation changes the distribution of decision rights and improves the relevance, credibility, or legitimacy of evidence.

An **epistemic authority audit** can follow six questions: who possesses relevant experience; who is invited; who can speak in the working language; whose statement is believed; who interprets results; and who controls the resulting publication, product, genetic material, or data. Repeating this audit at each stage exposes shifts that a single attendance measure misses. It also helps protect against elite representation, where a socially prominent participant gains authority to speak for people whose work and priorities differ.

4.2 Extension, Intermediaries, and Rural Learning Networks

From transfer to pluralistic advisory systems

The conventional technology-transfer model imagines research producing a finished technology, extension carrying it outward, and farmers deciding whether to adopt. This model can work for bounded messages, but it poorly describes innovations that require diagnosis, adaptation, complementary services, or collective coordination. It also suppresses feedback: failure is attributed to farmer conservatism rather than to an unsuitable recommendation, missing input, or unstable market.

Contemporary rural advisory systems are **pluralistic**. Public agencies, universities, NGOs, cooperatives, producer organizations, private consultants, input dealers, buyers, veterinary workers, lead farmers, media, and digital services all provide advice. Pluralism can increase specialization, responsiveness, and reach. It can also fragment responsibility, duplicate messages, leave unprofitable clients uncovered, and make conflicts of interest difficult to see. The objective is not maximum provider diversity but a coordinated system in which functions, incentives, feedback, and public obligations are explicit (Birner et al., 2009; Bitzer et al., 2016; Sulaiman et al., 2022).

Public extension retains distinctive roles. It can finance advice with public-good benefits, maintain coverage where private demand is weak, respond to emergencies, link farmers to regulation and research, and protect against misleading claims. Its weaknesses often include low staffing, limited operating budgets, hierarchical targets, and political influence. Private providers can offer timely specialized services and connect advice to inputs, machinery, finance, or markets. Their incentives favour paying customers and products from which they earn revenue. NGOs may reach marginalized groups and experiment with participatory methods, but short project cycles and donor reporting can undermine continuity. Producer-led services can be accountable to users, provided organizational leadership is itself inclusive.

Intermediation, demonstration, and social learning

Intermediaries do more than transmit messages. They translate among scientific, administrative, commercial, and farmer categories; assemble partners and complementary services; negotiate conflict; and return practical experience to organizations capable of changing the innovation. An intermediary's credibility depends on competence, relationship, and incentive. Trust can be earned through repeated useful interaction, but familiarity can also conceal patronage or commercial dependence.

Demonstration plots make performance observable. Their evidentiary value depends on representativeness and disclosure. A well-irrigated demonstration managed by project staff may show biological potential while concealing labour, finance, and risk. Farmer-managed comparative trials across diverse sites reveal a wider performance distribution. Reporting cost, failure, uncertainty, and who supplied the inputs prevents promotional demonstration from masquerading as independent evidence.

Farmer field schools replace brief instruction with season-long experiential learning and group analysis. A systematic review reported gains in knowledge, practices, yields, income, and pesticide management in short-term pilot evaluations, but found no studies at low risk of bias. Evaluations of national programmes more than two years after implementation showed no positive effects, and evidence of diffusion to nonparticipants was limited (Waddington et al., 2014). The finding is important for two reasons. First, complex knowledge may not spread through casual contact as easily as a

simple message. Second, scaling a facilitator-intensive model can dilute capability and fidelity. The correct response is not to reject field schools but to match their depth to problems that require observation and reasoning, and to treat facilitator quality as a core input.

Peer effects depend on networks. Central farmers can spread information rapidly, and learning through observed peers can depend on the structure and informational content of social ties (Conley & Udry, 2010). Network-based targeting has also increased diffusion in some settings (Beaman et al., 2021). Yet centrality and legitimacy are not identical. Selecting prominent landowners may reproduce homophily: well-resourced farmers speak mostly to similar peers, while women, tenants, minority groups, or distant hamlets remain peripheral. A multi-seed strategy, working with diverse, trusted connectors in different clusters, may sacrifice some speed while increasing coverage and contextual translation.

Accountability and the last mile

The "last mile" is not merely geographic distance. It includes language, literacy, disability, gendered mobility, timing, device control, and organizational reach. A service technically available in a district can remain practically unavailable when meetings require travel at unsafe hours, written materials use a dominant language, demonstration equipment cannot be used by persons with limited mobility, or advice is addressed to a male household head who does not perform the task.

Product-linked advice poses a conflict: an input dealer can supply valuable local knowledge while benefiting from higher sales. Safeguards include disclosure, prescription standards, independent diagnostics, complaint routes, and separation of public recommendations from procurement. Buyers may finance quality advice but promote practices that shift compliance costs and rejection risk onto producers. Project services may reach excluded groups temporarily yet disappear at funding close. Sustainability requires a financing and institutional home beyond the pilot.

Fragmented mandates create a referral problem. An extension agent may identify a pest but lack diagnostic support; a farmer may receive agronomic advice without credit, irrigation, or a buyer; a digital service may issue a warning without a pathway to obtain the recommended input. Advisory quality therefore includes **completion**: whether the system can connect a user from problem recognition to a feasible response and feedback.

Table 4.2. Advisory providers, contributions, and accountability

Provider configuration	Comparative contribution	Recurring exclusion or accountability risk	Design condition for complementarity
Public core with plural partners	Universal mandate, public goods, emergency response, research and regulation links	Underfunding, hierarchy, political targeting	Stable public finance, service standards, open referral and feedback
Private or buyer-linked service	Specialized expertise, timeliness, inputs, finance and market coordination	Profitable-client bias, conflicted advice, lock-in	Conflict disclosure, competition, independent verification, public oversight
NGO or project service	Participatory methods, experimentation, targeted inclusion	Short cycles, parallel structures, allowance dependence	Co-design with permanent institutions, handover and recurrent financing
Producer-led advisory	User accountability, contextual knowledge, peer learning	Elite capture, limited technical depth, exclusionary membership	Inclusive governance, external technical links, member-controlled data
Hybrid digital-human system	Reach, repetition, personalization, two-way reporting	Device and literacy divides, generic or unauditable advice	Multiple channels, human diagnosis, local language, grievance and audit

What sustains broad learning

Broad access and sustained learning emerge from a configuration rather than a single provider. A credible system combines a publicly financed rights and public-goods layer; diverse specialist services; producer and peer organizations capable of articulating demand; and referral, quality assurance, and feedback across providers. It maintains non-digital options and funds outreach to groups markets will undersupply. Staff incentives reward problem resolution and learning, not only contact counts or product distribution.

Monitoring should distinguish reach from use and use from learning. Useful indicators include repeat contact, response time, comprehension, capacity to diagnose a novel case, successful referral, changes in practice, distribution of access, trust, complaints, and whether user feedback changed a recommendation. Contact with an extension agent is a weak proxy if the encounter is brief, irrelevant, or inaccessible to the person who performs the work.

Network position, trust, and homophily determine who receives information first and whose interpretation circulates. Trusted close ties support evaluation; bridging and linking ties introduce novel information and resources. Homophily can improve communication within groups while trapping marginalized actors in information-poor clusters. Private and project services complement public extension when they add

capability, coverage, and specialization under shared standards and referral. They intensify exclusion when ability to pay, commercial value, location, or project eligibility determines access and no public system carries the residual obligation.

Designing learning networks for reach and feedback

Network targeting presents a real trade-off. Working with highly central farmers can accelerate aggregate diffusion, particularly when people need reinforcement from several contacts. Beaman et al. (2021) found such effects in Malawi. But a central person in one network, whether land, politics, irrigation, marketing, or kinship, may be peripheral or distrusted in another. Centrality calculated from an incomplete list can simply reproduce the provider's existing contacts.

Similarity also cuts in two directions. Farmers may act on advice from people with comparable land, gender, language, or agroecology because the example appears relevant. BenYishay and Mobarak (2019) show that social similarity and incentives can affect experimentation and communication. Yet homophilous networks leave information inside social boundaries. A robust strategy therefore uses several communicators selected across clusters, gives them resources to demonstrate rather than merely repeat messages, and builds deliberate bridges to excluded groups.

Learning networks need a return channel. Farmer feedback is often collected by frontline agents but stops in administrative reports. A functioning system records recurring problems, adaptations, and negative results; routes them to research, regulation, or service providers; communicates the response; and revises advice. Brokers should be evaluated by completed connections and changes achieved, not by the number of meetings convened.

Advisory accountability includes liability and epistemic humility. Providers should distinguish established evidence from experimental recommendation, disclose uncertainty and commercial interest, and specify what a user should do if advice fails. Independent diagnostic capacity is especially important for pesticide, veterinary, credit, and insurance advice, where harmful recommendation can produce health, debt, or animal-welfare losses.

Evaluation should compare learning capacity, not only message recall. Can users diagnose a case not shown in training? Can they explain why a practice works, adapt it to new conditions, and recognize when it should not be used? Can they find a competent referral and challenge an implausible recommendation? These outcomes are harder to count than contacts, but they distinguish temporary compliance from durable capability.

4.3 Digital Agriculture, Platforms, and Data Relations

Digitalization as infrastructure and power

Digital agriculture includes mobile advisory, electronic payments, digital credit and insurance, e-commerce, farm-management software, sensors, drones, remote sensing, automated machinery, predictive analytics, and artificial intelligence. These tools change the speed and granularity of information, but their social significance lies in infrastructure and control. A platform sets eligibility, visibility, ranking, data, and transaction rules. An algorithm converts observations into recommendations or scores. A device connects a farm to a service ecosystem whose terms may be difficult to negotiate (Bronson & Knezevic, 2016).

Digital services can reduce search and communication costs. Weather and pest alerts arrive quickly; remote diagnosis extends scarce expertise; electronic records support traceability; digital finance can shorten payment; and platforms can match producers with inputs, buyers, transport, or machinery. Reviews of digital advisory interventions find that timely, actionable, context-specific information can improve decisions, though effects on yields and income vary across interventions and settings (Aker, 2011; Fabregas et al., 2019). Information cannot resolve missing credit, water, input quality, market power, or insecure tenure.

Different digital services favour different users. Voice and radio can reach people without smartphones or advanced literacy. Smartphone farm-management and precision tools require devices, connectivity, data, skill, reliable electricity, and enough production value to justify use. Remote sensing may support public monitoring without any device on the farm, but it can also create decisions about farmers without their knowledge. Digital credit expands access while potentially using opaque scores and automatic collection. E-commerce improves price discovery only if logistics, quality standards, payments, and bargaining are workable.

Compounded digital divides

The digital divide is cumulative. Coverage does not equal an affordable, reliable connection; a household device does not equal individual control; literacy does not equal ability to assess a recommendation; and registration does not equal continued beneficial use. Barriers interact. A woman in a remote area may face weaker signal, less income for data, shared-phone access, restricted mobility to recharge, lower literacy in the service language, and less confidence to contact support. Older farmers and persons with disabilities may confront inaccessible interfaces. Minority-language users may receive translated words without locally meaningful agronomy.

Digital access differs across rural and urban areas and across gender and other social groups (FAO, 2023a). These aggregate gaps enter agricultural outcomes through timing. A delayed weather warning or inability to complete a digital payment at harvest can be

more consequential than ordinary inconvenience. Offline functionality, asynchronous messaging, voice interfaces, local-language content, human assistance, disability access, community devices, and transparent pricing are therefore production infrastructure, not optional inclusion features.

Digital literacy includes critical judgment. Users need to recognize advertising, verify identity, understand permissions, compare recommendations, and protect accounts. Training that teaches button sequences without explaining data and commercial relations creates functional dependence. Hybrid services can combine the reach and repetition of digital tools with human diagnosis, negotiation, and remedy (FAO, 2023a, 2023c; Kansiime et al., 2022).

Platform governance, interoperability, and lock-in

Platforms create network effects: users join because buyers, suppliers, or advisers are already present. This can reduce fragmentation but also make exit costly. Vendor lock-in arises when farm records, equipment, digital identities, finance, and market access depend on one provider or proprietary format. A farmer may nominally own data while lacking a usable copy or the ability to transfer history to a competing service. Machinery may work only with authorized software and repair.

Interoperability allows systems to exchange data and services through documented standards. It can reduce duplicate entry and support provider choice. It also expands data flows, increasing privacy and security risk if permissions are weak. Open standards are not identical to open data: interoperability can operate with controlled access, and sensitive farm information should not be made public merely because a format is open.

Competition policy matters where platforms become gateways to markets, credit, or public benefits. Exclusive dealing, self-preferencing, nontransparent ranking, and tying one service to another can shift value toward the platform. Public procurement can counter this by requiring portability, open interfaces, auditability, accessibility, and continuity plans. Public digital infrastructure may provide identity, payments, maps, weather, and registries on which multiple services operate, but public systems also require rights, security, and appeal.

Farm data as a relationship

Farm data include land boundaries, crop and livestock records, yields, practices, finances, location, biometrics, transactions, images, sensor streams, and inferred scores. “Ownership” alone does not resolve governance because several parties may hold legitimate interests and law may treat data differently from property. A more complete rights bundle covers notice, consent, access, correction, purpose limitation, security, retention, sharing, portability, benefit, and remedy (Jouanjean et al., 2020).

Where consent is used as the basis for data processing, it should be informed, specific, affirmative, and capable of withdrawal under clear terms. A long take-it-or-leave-it contract is weak protection when refusal means losing credit or market access. Producers should know what is collected, which inferences are made, who receives data, how long they are retained, and whether they influence prices, eligibility, insurance, or enforcement. Consent for one service should not silently authorize unrelated reuse.

Contestability is essential where data drive consequential decisions. Farmers need access to the record and logic relevant to a denial, grade, premium, or compliance finding; a practical method to correct error; human review; and protection from retaliation. Automated accuracy at population level does not justify unappealable error for an individual. Remote-sensing evidence should be combined with ground verification when clouds, intercropping, small plots, or tree cover make classification uncertain.

Data can generate collective value. Aggregated records may improve disease surveillance, weather services, research, and bargaining. Benefit sharing can take the form of improved services, cooperative analytics, revenue, or public investment. Farmer organizations and data cooperatives can negotiate terms, but representation and technical capacity must be credible. Privacy-preserving aggregation, data minimization, and independent trustees can reduce risk.

Table 4.3. Digital layers, capabilities, and protective rules

Digital layer	Potential benefit	Capability threshold	Power and exclusion risk	Protective rule
Information and advisory	Timely weather, pest, input and management guidance	Relevant content, device or channel, literacy, trust	Generic or conflicted advice; misinformation	Independent validation, source disclosure, hybrid support
Finance and insurance	Faster payments, credit, risk transfer	Identity, transaction history, reliable access	Opaque scoring, surveillance, automatic exclusion	Explainability, correction, proportional data use, appeal
Markets and logistics	Price discovery, matching, traceability, transport	Volume, quality, fulfilment, payments	Ranking control, fees, exclusivity, rejected produce	Transparent terms and ranking, competition, collective bargaining
Precision and automation	Input efficiency, monitoring, labour saving	Capital, connectivity, skills, maintenance, suitable scale	Lock-in, rebound use, labour displacement	Interoperability, repair rights, environmental and labour monitoring

Digital layer	Potential benefit	Capability threshold	Power and exclusion risk	Protective rule
Data and analytics	Benchmarking, research, public planning	Reliable records and governance capacity	Unconsented reuse, asymmetrical valuation, remote control	Access, consent, portability, purpose limits, benefit sharing, remedy

Digital services improve decisions when information is timely, locally accurate, actionable, trusted, and connected to resources. Market and financial services can improve livelihoods when they reduce genuine transaction failures without introducing opaque exclusion or monopoly. Users with devices, literacy, connectivity, commercial volume, and organizational support benefit first; compounded barriers exclude those missing several capabilities. Transparent and beneficial data relations require a rights bundle, not a slogan of ownership: meaningful notice and consent, access and correction, limited purpose and retention, portability, security, contestability, benefit sharing, and enforceable remedy.

What the empirical evidence does and does not show

Digital advice has a plausible low-cost pathway to scale, but effect sizes depend on message and context. Fabregas et al. (2019) synthesize evidence that digital advice can raise recommended input use and produce modest yield gains. These averages do not imply profitability for every user. Messages with weak local specificity, poor timing, or no feasible response option may change neither practice nor welfare. Low willingness to pay can coexist with social value, supporting public finance where information improves public goods or where commercial advertising would bias content.

Market information alone is often insufficient. In India, SMS-based information affected some grading and arbitrage behaviour but did not produce statistically significant average improvements in prices or farm outcomes (Fafchamps & Minten, 2012). By contrast, internet kiosks linked to an alternative procurement channel improved soybean market outcomes in Madhya Pradesh (Goyal, 2010). The comparison clarifies the mechanism: information becomes bargaining power when it changes credible outside options, logistics, payment, or competition.

The global digital divide maps closely onto agrarian inequality. Using the coverage data available for their study, Mehrabi et al. (2021) found much lower 3G/4G coverage among very small farms than very large farms, with poor coverage also concentrated in food-insecure and climate-stressed areas. A separate potential risk is that a service trained mainly on data from connected commercial farms may perform best for those farms, reinforcing both access and model-quality gaps. Diversified plots, intercropping, customary tenure, pastoral mobility, and women's informal production may be underrepresented in training data and misclassified as anomalies.

An inclusive service can be designed as a cumulative access chain:

Reliable electricity and signal are available at the relevant time.

The user controls an affordable device, account, and payment method.

The interface is accessible in language, literacy mode, and disability design.

Content fits the crop, place, season, and decision window.

The source, uncertainty, and commercial interest are intelligible.

Inputs, finance, labour, transport, or human support make action feasible.

Errors, automated decisions, and data practices can be challenged.

Failure at one gate can nullify all earlier access. This is why registration and message-delivery statistics exaggerate inclusion. Monitoring should record active use, comprehension, implemented recommendations, error, outcome, and retention by social group, together with the time and cost of human support.

Blockchain and digital twins illustrate the need for evidence discipline. An immutable ledger cannot make inaccurate data true, create freely given consent, or distribute value fairly. A digital twin can support sophisticated simulation but remains highly demanding in data quality, calibration, connectivity, and skill. Both may be useful components; neither should be presented as demonstrated smallholder livelihood improvement without context-specific evaluation.

Collective data governance and accountable models

Individual consent is not sufficient for every agricultural dataset. Parcel imagery, disease reports, water use, genetic resources, and Indigenous knowledge can concern a community, territory, or shared ecosystem. One person's disclosure may expose neighbours or enable commercial extraction from collectively governed knowledge. The CARE Principles for Indigenous Data Governance add collective benefit, authority to control, responsibility, and ethics to technically oriented data-management principles (Carroll et al., 2020). They foreground who has authority, not only whether a dataset can be found and reused.

Collective institutions can improve bargaining. Cooperatives, producer organizations, and data trusts may negotiate terms, pool analytics, and ensure that value returns to members. They also create agency risks: leaders may approve uses members do not understand, and technical vendors may dominate the contract. Credible governance requires a defined mandate, representative authorization, independent advice, regular reporting, and member rights to access, question, and revoke delegated authority.

Artificial-intelligence systems introduce accountability across a model lifecycle. Training data may omit small or diversified farms; labels can embed past discrimination; prediction quality may drift as climate and practices change; and

deployment may connect an uncertain score to a consequential decision. Providers should document intended use, training context, subgroup performance, uncertainty, known failure conditions, and update history. High-impact applications need independent audit and human review.

Explainability must be practical. A farmer denied credit does not need the source code but does need the decisive data, an intelligible reason, a way to correct error, and review by someone authorized to change the outcome. For agronomic advice, the user needs assumptions, confidence, and an escalation path where local observation contradicts the model. Contestability turns transparency from passive disclosure into capability.

Public agencies face a parallel obligation. Remote sensing and linked administrative databases can improve programme delivery and environmental enforcement, while enabling surveillance without awareness. Data collected for subsidy administration should not automatically be repurposed for unrelated enforcement or commercial development. Purpose limitation, notice, proportionality, ground verification, and appeal are necessary whether the decision-maker is a firm or a state.

The value of agricultural data should be assessed beyond direct payment. Producers may benefit through better public weather services, disease surveillance, market intelligence, or cooperative bargaining. But vague claims of future social value cannot justify unlimited extraction. A fair arrangement identifies the anticipated value pathway, shares usable outputs, reports actual recipients and outcomes, and revises terms if benefits do not materialize.

Public digital infrastructure, security, and continuity

Digital agricultural services often depend on foundational systems that no single farmer or provider can efficiently build: rural connectivity, electricity, identity, payments, weather observation, geospatial reference data, registries, and secure data exchange. Treating these layers as public or regulated infrastructure can lower entry costs for multiple service providers and prevent each project from building an incompatible silo. Public provision does not require a single state platform; it can support a federated ecosystem under common standards and rights.

The design of public infrastructure has distributional consequences. A land-linked digital identity can streamline service while excluding tenants, sharecroppers, pastoralists, or users with overlapping customary claims. A farm registry can make producers visible to subsidies and simultaneously expose them to taxation, enforcement, or land acquisition. Registration should therefore distinguish administrative convenience from legal adjudication and provide notice, correction, representation, and appeal.

Cybersecurity is also a production and rights issue. Compromised accounts can divert payments, manipulate machinery, reveal commercially sensitive records, or corrupt

disease and traceability data. Small producers cannot individually evaluate complex vendor security. Providers and public agencies need minimum security standards, access controls, encryption, tested recovery, breach notification, and clear allocation of loss. Data minimization reduces both privacy exposure and the attack surface.

Continuity planning is essential because agricultural decisions are time-bound. A failed platform during planting or payment can cause losses that later service restoration does not repair. Contracts and procurement should specify uptime, backup channels, local data copies, transition assistance, escrow or open release for essential software where appropriate, and an orderly process if the provider exits. Essential public benefits should never become inaccessible solely because a proprietary application closes.

Digital procurement can create leverage for inclusive design. Governments and development financiers can require local-language and disability accessibility, offline functionality, documented interfaces, exportable records, independent security testing, human review, complaint response times, and non-exclusive service bundles. Evaluation should include switching exercises: can a farmer or cooperative actually move records and continue service, not merely download an unreadable file?

These provisions make resilience relational. A robust digital system is not the one with the most advanced interface but the one that preserves essential function across network failure, provider exit, error, and dispute. Redundancy through radio, voice, paper receipts, local advisers, alternative payments, and portable records can appear inefficient in normal conditions but becomes valuable during shock. The appropriate infrastructure combines innovation at the service layer with stability, rights, and substitutability underneath.

4.4 Adoption as Differentiated Capability

A staged and reversible process

Adoption is often recorded as a binary response to whether a household used an input during a survey reference period. This collapses a sequence of qualitatively different states: **awareness, evaluation, access, trial, adaptation, partial or combined use, sustained use, pause, abandonment, and possible re-entry**. Each state has different determinants. Information may generate awareness; liquidity allows trial; learning supports adaptation; repair and market services sustain use; a shock can interrupt it.

The staged model changes interpretation. A non-user may not know about innovation, may lack access, may have evaluated and rejected it, or may have abandoned it after harm. These positions imply different policies. More promotion is irrelevant where repair is absent and dangerous where debt causes abandonment. A current user may be experimenting on a small area rather than committing. Intensity and duration matter, as does modification.

Abandonment is not always failure. A farmer may stop using an unsuitable or environmentally harmful product after learning, shift to a superior option, or pause because of a temporary constraint. Conversely, persistence can reflect sunk costs, tied credit, contract obligation, or lack of alternatives. Evaluation should ask whether use is voluntary, competent, beneficial, and reversible.

Capability, complementarities, and exposure to loss

Innovation capability combines assets, access, authority, and services. Liquidity finances the initial outlay and the interval before returns. Credit can relax this constraint but increases downside if repayment is fixed and production uncertain. Tenure affects whether long-term investment can be recouped. Infrastructure determines whether output, information, electricity, water, and repair arrive when needed. Labour availability and timing condition practices that appear land-saving but demand concentrated skilled work.

Complementarity is central. Improved seed may require water, fertilizer, pest control, knowledge, storage, and a remunerative buyer. Machinery requires suitable fields, fuel or power, an operator, spare parts, and enough timely demand. Digital tools require connectivity, data, devices, and human interpretation. Missing one complement can make the focal innovation appear ineffective. Packages can solve coordination failures, but they also raise entry cost, dependency, and ecological risk.

Indivisibilities favour better-resourced farms when equipment, irrigation, certification, or storage requires a minimum scale. Rental and service markets can divide access: a small farm buys tractor hours rather than a tractor. Yet service timing and bargaining matter; large clients may be served first during narrow windows. Cooperatives can pool assets, but governance and maintenance become new capabilities. Subsidies can expand trial, while sustained use depends on the post-subsidy cost and service ecosystem.

Risk is distributional. A wealthy farm can diversify, self-insure, and learn from failure. A constrained household may rationally prefer a lower expected return with a safer downside. Demonstrations that report average gain without the variance, worst-case loss, payment schedule, and labour peak do not provide adequate decision evidence. Social protection, insurance with credible terms, staged finance, warranties, and small reversible trials can expand capability without forcing risk onto those least able to bear it.

Negotiation within households and social groups

The household does not adopt as one person. An innovation can raise household revenue while intensifying one member's labour, reducing control over output, or shifting risk to a plot managed by another. Mechanization may reduce arduous work or displace hired workers; its effect depends on task, crop, machine, and labour market (Daum & Birner, 2020). A labour-saving technology can free women's time, permit expansion that recreates the workload, or transfer control to the person who owns the machine.

Gender, age, caste or ethnicity, tenancy, and class shape asset rights, extension contact, mobility, finance, and authority to experiment. Youth may have digital skill but no land or credit. Women may perform a task yet lack cash or permission to attend training. Tenants may avoid soil or water investment without secure recoupment. Minority producers may distrust public programmes shaped by past discrimination. Measuring only household use hides these mechanisms.

Innovations narrow inequality when constraints faced by marginalized users are deliberately removed; design reduces rather than assumes complementary requirements; benefits accrue to the people supplying labour; and new capability creates stronger fallback options. They widen inequality when subsidies capitalize into land or equipment values, lumpy technologies reward scale, data and markets become proprietary gateways, debt socializes downside, or labour displacement occurs without alternative employment and protection.

Table 4.4. Capability stages, exclusion, and responses

Capability stage	Necessary condition	Common point of exclusion	Evidence to record	Appropriate response
Awareness and framing	Trusted, intelligible, relevant information	Peripheral networks, language and gendered contact	Source, comprehension, problem relevance	Diverse channels and participatory problem definition
Access and evaluation	Product / service availability and credible performance evidence	Remote location, eligibility, price, bias in demonstrations	Full cost, variance, eligibility, reason for rejection	Independent trials, transparent terms, outreach
Trial	Liquidity, small divisible option, permission and risk capacity	Lumpy investment, tenure, household authority	Scale of trial, financing, decision-maker, downside	Small grants, rental / service models, risk protection

Capability stage	Necessary condition	Common point of exclusion	Evidence to record	Appropriate response
Adaptation and combination	Skills, feedback, complementary inputs and freedom to modify	Protocol rigidity, missing water / repair / market	Modifications, complements, labour and ecological effects	Co-design support, repair, coordinated services
Sustained use	Net benefit, maintenance, finance, market and institutional fit	Cost after subsidy, service failure, debt, exclusion	Duration, intensity, profitability, control of benefit	Longitudinal support and competition; revise package
Pause, abandonment, or re-entry	Exit rights, alternatives, learning and remedy	Tied contract, sunk-cost pressure, stigma	Reason, loss, recovery, later re-entry	Grievance, debt / work transition, redesign or withdrawal

From adoption metrics to trajectory evidence

Cross-sectional adoption rates are weak measures of innovation success. Stronger evidence records time of awareness, trial size, intensity, adaptation, discontinuation, reason, re-entry, and the changing bundle of complements. Panel data distinguish temporary subsidy-driven use from persistence. Plot and individual modules identify who manages, works, decides, pays, and controls output. Qualitative histories explain why two apparently similar households diverge.

Outcome measurement should include productivity and profit, but also variance, debt, labour by person and task, time poverty, wage employment, food security, agency, ecosystem effects, and control over data and income. Counterfactual analysis must address selection: better-resourced farms often adopt first, so their superior outcomes cannot automatically be attributed to technology. Heterogeneous effects matter more than an average where capability differs sharply.

Initial trial becomes sustained or adapted use when users obtain a reliable net benefit, learn to fit the innovation to their system, and can secure complementary services across bad as well as good seasons. Indivisible equipment and input packages favour better-resourced farms through scale, liquidity, collateral, priority access, and ability to absorb loss. Innovation narrows inequality when design and policy redistribute those capabilities and protect labour and resource rights; it widens inequality when scale, debt, proprietary infrastructure, or unequal intra-household authority concentrates benefit and externalizes risk.

Learning from movement, modification, and disadoption

Longitudinal studies demonstrate why trajectories matter. Moser and Barrett (2006) distinguish first use, expansion, and disadoption of the System of Rice Intensification in Madagascar. Labour demands, seasonal liquidity, and learning shaped movement between stages. Suri's (2011) estimates suggest that Kenyan farmers could rationally decline hybrid maize when acquisition costs associated with poor infrastructure reduced net returns, even where estimated gross returns were high. The "adoption gap" can therefore contain rational heterogeneity, not simply a missing information treatment.

Innovations can also change willingness to invest in complements. Flood-tolerant rice reduced downside risk in India and encouraged other investments, including cultivated area, fertilizer, labour-intensive planting, and credit (Emerick et al., 2016). This is a beneficial complementarity when users can access the additional resources. It also illustrates why technology's effect is not separable from the system it induces. Where complements are costly or environmentally intensive, the same crowding-in mechanism can create exclusion or rebound.

Capability analysis should identify the **weakest required link**. If a solar pump is affordable but groundwater governance is absent, private benefit can generate collective depletion. If a precision service is subsidized but records cannot move to another provider, the post-pilot constraint is the cost of exit. If improved seed performs but output markets penalize its colour or taste, agronomic success is insufficient. Removing the wrong constraint can increase exposure without enabling benefit.

Gender analysis likewise needs task and control specificity. Doss and Morris (2001) found evidence that gender-linked differences in maize-technology use in Ghana reflected unequal access to land, labour, extension, and other complementary resources. Afridi et al. (2023) found that mechanized tillage in India reduced women's farm labour more sharply than men's, principally by reducing subsequent demand for weeding, a task often performed by women; women's nonfarm employment did not rise to compensate. A machine can reduce drudgery for an owner and remove wages from a worker at the same time.

The policy implication is to support **adaptation and exit capability** alongside entry. Users should be able to trial at divisible scale, obtain independent advice, modify packages, pause during stress, return equipment, transfer data, refinance or restructure debt, and seek compensation for defect or misrepresentation. Programmes that reward only continued use create pressure to conceal failure and mistake lock-in for success.

4.5 Governing Inclusive and Responsible Innovation

Mission-setting and representation

Responsible innovation begins with the mission. Funding calls, procurement rules, intellectual property, performance metrics, and career incentives determine which problems are pursued before participation occurs. A mission defined as maximizing output per worker will favour a different portfolio from one defined as securing nutritious livelihoods within water limits. Neither technology nor scaling is neutral with respect to these choices (Rose & Chilvers, 2018).

Participatory problem definition should establish who experiences the problem, who benefits from its current arrangement, and which alternatives are foreclosed by the proposed frame. Tenants, women, youth, landless workers, pastoralists, Indigenous and minority communities, persons with disabilities, and remote users require direct representation where their interests differ from landowning household heads. Representation must carry decision rights, resources for participation, and safe avenues for dissent.

The principles of responsible innovation are often summarized as anticipation, inclusion, reflexivity, and responsiveness (Stilgoe et al., 2013). **Anticipation** explores plausible benefits, harms, and distribution before investment locks in a path. **Inclusion** brings affected knowledge and interests into consequential decisions. **Reflexivity** makes researchers, firms, funders, and governments examine their assumptions and incentives. **Responsiveness** changes direction when evidence or values warrant it. This chapter also emphasizes **reversibility**: users need practical exit, while ecological thresholds make it important to identify harms that cannot readily be undone.

Ex ante capability and distributional assessment

Before a pilot, designers should map the full capability bundle: land and tenure, capital, recurrent costs, labour and skill, water and energy, connectivity, repair, organization, market, regulatory approval, and data. This reveals likely early users and systematic exclusions. The assessment should trace benefit and risk to individuals and groups, not only households or farms.

Distributional questions include who owns the asset; who supplies paid and unpaid labour; who loses employment; who controls output and data; who bears debt, compliance, or environmental exposure; and who can refuse. Environmental assessment should consider input rebound, energy, water, biodiversity, soil, waste, and landscape-scale effects. A precision tool that reduces input per hectare may enable expansion that increases total use. A high-yield variety can protect land or stimulate commercialization and specialization.

Ex ante assessment is not prediction with false precision. It is a structured identification of assumptions, plausible failure pathways, and monitoring triggers. Scenario

comparison, small reversible trials, and independent review are valuable where uncertainty or irreversibility is high. A public register of assumptions and conflicts makes later learning possible.

Table 4.5. Governance criteria for investment and scaling

Governance criterion	Question before investment or scaling	Indicator beyond adoption or yield	Trigger for review
Knowledge legitimacy	Whose problem and evidence define the innovation?	Share of priorities changed through participation; community validation	Affected groups dispute the frame or evidence
Inclusion and capability	Who can reach each capability stage and who cannot?	Trial, sustained use, abandonment and reason by social position	Exclusion or burden concentrates in a group
Distribution and labour	Who gains income, authority, time, employment, and assets; who bears loss?	Net benefit, debt, labour/time, wages, control of proceeds	Displacement, debt distress, or unpaid workload rises
Ecological fit	How does use affect slow variables and rebound at scale?	Water, soil, biodiversity, input and energy trends per output and in total	Threshold or cumulative harm approached
Data and market power	Who sets terms, holds data, ranks users, and controls switching?	Consent, portability, error correction, fees, market concentration	Lock-in, opaque exclusion, or unremedied error
Adaptability and exit	Can users modify, contest, pause, and leave safely?	Locally approved adaptations, grievance resolution, exit cost	Harm persists or modification is prohibited

Public policy for an innovation ecosystem

Public investment should supply research and infrastructure where social value exceeds private return, while preventing public subsidy from creating proprietary dependence. Procurement can require open standards, interoperability, accessibility, security, repairability, transparent pricing, and data portability. Contracts should preserve public and farmer access to knowledge produced with public resources. Intellectual property incentives must be balanced with seed rights, competition, humanitarian use, research exemptions, and affordable licensing.

Competition policy is innovation policy. Concentrated input, machinery, platform, and data markets can suppress experimentation by controlling interfaces and switching. Interoperability and repair rights allow complementary providers to emerge. Public

extension and independent testing counter information asymmetry. Social protection and transition assistance are necessary when public policy promotes labour-displacing change.

Data governance should be built into procurement and regulation, not added after collection. Minimum requirements include data minimization, explicit purpose, security, user access and correction, portability, auditable automated decisions, non-discrimination, retention limits, breach response, and accessible remedy. Collective data institutions can increase bargaining, but they need transparent mandates and member control.

Ecological safeguards should be performance-based where possible, measured across the relevant scale and time. Bans or strict limits are justified where harm is severe or irreversible. Elsewhere adaptive regulation can set thresholds, require monitoring, and tighten or relax conditions as evidence accumulates. Regulatory sandboxes may support experimentation, but participation must not waive labour, environmental, privacy, or consumer rights.

Adaptive scaling and continuing rural influence

Scaling is commonly treated as replication of a successful pilot. Yet pilots often receive exceptional staff, subsidies, attention, and user selection. Scaling changes the innovation itself: service quality, governance, market structure, and political stakes shift. The question is not simply whether an innovation can reach more users, but which functions should scale, through what institutions, and with what consequences (Wigboldus et al., 2016).

Meaningful rural influence persists when farmer and worker organizations retain seats and votes in governance; local units can modify implementation within protected standards; monitoring data are returned in usable form; funding supports continued deliberation; grievance, audit, and appeal remain independent of the provider. Federated structures can aggregate bargaining while preserving subsidiarity. Participatory breeding and farmer-managed seed systems show how local selection can continue after formal release rather than ending at dissemination.

Adaptive scaling proceeds through diverse sites, explicit contextual assumptions, and comparison of variation. It treats modification as learning, not fidelity failure. Independent monitoring follows inclusion, service quality, labour, debt, ecological indicators, data practices, market concentration, and abandonment. Stop, redesign, and exit rules are specified before expansion. Providers should plan data and service continuity if a platform closes.

The indicators that best capture inclusion and fit are trajectories: who becomes aware, can trial, adapts, sustains, abandons, and re-enters; who controls benefit; which complementary costs arise; how labour and ecological burdens change; and whether users can contest and exit. Adoption rate and aggregate yield remain useful but

subordinate. Policy balances experimentation and investment with affordability, data rights, and ecology by making public support conditional on open and accountable infrastructure, protecting rights floors, sharing downside, preserving competition and repair, and revising scale when feedback reveals concentrated harm.

Decision gates for responsible scaling

Responsible scaling can be organized through four explicit gates. The **problem-framing gate** compares technical and nontechnical alternatives and records whose priorities define success. The **pilot gate** requires a capability, labour, distribution, ecological, and data assessment before exposure expands. The **scaling gate** examines performance across diverse sites, readiness of complementary services, and unresolved harms. The **continuation and exit gate** reviews post-subsidy performance and authorizes redesign, compensation, suspension, or orderly withdrawal.

Each gate needs an independent forum and a decision rule. The team promoting an innovation should not be the sole judge of its safety, inclusion, or readiness. Farmer and worker organizations, relevant Indigenous authorities, regulators, technical experts, and affected service providers can contribute distinct evidence. Conflicts should be disclosed, minority positions recorded, and the reasons for continuation published in accessible form.

Citizen science and decentralized trials can preserve local variation at larger scale. Farmer-managed variety trials across Ethiopia, India, and Nicaragua combined simple on-farm comparisons with climatic analysis to generate geographically differentiated recommendations (van Etten et al., 2019). Such methods expand the evidence base, but meaningful influence also requires authority over data use, varietal release, future priorities, and benefit. Participation in measurement alone is not governance.

Scaling readiness belongs to an **innovation package**, not an object. The weakest component, whether repair, finance, regulation, extension, market coordination, or organizational legitimacy, can determine performance (Sartas et al., 2020). Woltering et al. (2019) distinguish reaching many people from sustainable systems change: beneficiary counts can rise while service quality, local ownership, or ecological performance declines. Scaling budgets should therefore finance the enabling system and independent monitoring, not only additional units.

International principles reinforce this distributional view. The CFS Principles for Responsible Investment in Agriculture and Food Systems place food security, tenure, decent work, gender equality, youth, environmental sustainability, consultation, and impact assessment inside responsible investment (Committee on World Food Security [CFS], 2014). These are not peripheral safeguards. They define whether an innovation contributes to a just agrarian future.

A programme preserves rural influence after pilot when participation is institutionalized: representative bodies have recurring budgets and decision rights;

monitoring data return to communities; adaptations can be approved locally within rights floors; procurement and intellectual-property terms remain contestable; and grievance and exit do not depend on the provider's goodwill. Influence must survive the charismatic facilitator and the demonstration season.

Practical Chapter Output: The Uneven Innovation Diagnostic

The Uneven Innovation Diagnostic can be applied to a technology, service, practice, or package before pilot, during trial, and at scaling review. It begins from a specified innovation and context rather than from a claim that a technology is universally appropriate. The diagnostic should be completed with affected users and updated as feedback changes the innovation.

Part A: Map knowledge, capability, and power

Table 4.6. Uneven Innovation Diagnostic: knowledge, capability, and power

Diagnostic field	What to record	Central question	Open evidence source
Problem and knowledge base	Problem frame; farmer, Indigenous, scientific, commercial and regulatory evidence; uncertainty	Who defined the problem and which evidence was excluded?	Participatory records, trials, reviews, local histories
Innovation and complements	Components, recurrent inputs, labour, skills, water, energy, connectivity, repair, finance, market	What must work together for benefit to occur?	Technical specifications, service maps, cost and value-chain data
Capability stages	Awareness, access, evaluation, trial, adaptation, intensity, duration, abandonment, re-entry	Where do different users fall out of the process and why?	Panel, plot and individual surveys; user histories; service records
Early and excluded users	Likely users and nonusers by gender, age, class, caste / ethnicity, tenure, occupation, disability and location	Which existing advantage is converted into innovation advantage?	Disaggregated reach, eligibility, network and asset data
Benefits, costs, and risk	Yield, profit, variance, debt, labour, time, jobs, agency, nutrition, ecology	Who controls benefit and who bears downside?	Impact studies, time use, labour, welfare and ecological monitoring
Data and platform relations	Data collected and inferred, purposes, actors, terms, portability, automated decisions, remedies	Can producers understand, contest, benefit from, and exit the data relationship?	Contracts, privacy notices, system audits, complaint records

Part B: Govern adaptation and scaling

Table 4.7. Uneven Innovation Diagnostic: adaptation and scaling

Action field	Responsible actors	Required safeguard	Monitoring indicator	Decision trigger
Co-design and validation	Farmer / worker organizations, Indigenous authorities, researchers, extension	Consequential representation, consent, reciprocal knowledge rights	Priorities changed; locally validated performance; participation by group	Problem frame or evidence rejected by affected users
Capability support	Public agencies, finance, advisory and service providers	Divisible trial, risk sharing, repair, referral, accessible formats	Stage transitions and dropout reasons by group	Trial fails for missing complement rather than technical performance
Labour and distribution	Labour agencies, organizations, firms, social protection	Worker voice, safety, transition support, control of benefits	Employment, wages, unpaid time, debt, asset and income control	Displacement or burden concentrated without remedy
Data and competition	Regulator, platform, public procurer, data cooperative	Consent, access, correction, portability, interoperability, audit and appeal	Switching cost, correction time, fees, concentration, grievances	Lock-in, opaque score, breach, or systematic error
Ecological performance	Users, environmental agencies, researchers	Baselines, thresholds, cumulative and rebound assessment	Water, soil, biodiversity, input, energy and waste trends	Threshold approached or total harm rises despite efficiency
Adaptive scaling and exit	Funders, implementers, public agencies, affected organizations	Local modification, independent monitoring, stop / redesign and continuity plans	Quality at scale, adaptation, abandonment, grievance resolution	Service dilution, harm, exclusion, or loss of local influence

The diagnostic's central output is not a score. It is a causal and distributional account of what the innovation requires, which relationships authorize it, how it can be adapted, and what evidence would justify continuation, redesign, or withdrawal. It turns the Rural Systems Mediation Framework into an innovation-specific monitoring strategy.

CHAPTER 05

Markets on the Move

Mobility and the Recomposition of Rural Livelihoods

Chapter purpose

A harvest does not become a livelihood at the farm gate. It becomes one through roads, storage, grades, prices, credit, contracts, processing, transport, and the power to refuse an unfavorable sale. Nor does a rural household earn and reproduce itself in one place. Its members may cultivate land, trade food, provide services, work on other farms, commute to a town, migrate seasonally, send money home, supervise production by telephone, and share care across generations and borders. The farm remains consequential, but it is embedded in a wider system of markets and mobility.

This chapter examines that system as a process of **livelihood recomposition**: the reorganization of income sources, work, assets, authority, care, and social obligations across activities and places. Recomposition is more precise than diversification. A household can add an income source without changing who controls earnings or performs unpaid work. Migration can increase cash while transferring farm management and elder care to those who remain. Commercialization can raise gross revenue while increasing debt, rejection risk, or dependence on a single buyer. A road can connect producers to markets while also accelerating land conversion and the exit of local enterprises. The analytical question is therefore not whether households market, diversify, or migrate, but how these processes alter their capabilities and dependencies.

The guiding question is: **How do changing market relations and mobility recompose rural livelihoods, and under what conditions do they expand agency rather than deepen precarity and dependence?** Agency here means more than participation. It includes the practical ability to choose among buyers and occupations, negotiate terms, control income and assets, move safely or remain without penalty, sustain care, withstand shocks, and exit harmful arrangements. Precarity is likewise relational. It arises when households carry production, price, employment, migration, and care risks without adequate assets, rights, information, bargaining power, or social protection.

The chapter extends the book's causal argument. Chapter 2 replaced the unitary farm household with a negotiated institution and traced unequal agrarian trajectories. Chapter 3 examined the rules, networks, and organizations that govern access and coordination. Chapter 4 showed that innovation is a staged capability process whose benefits depend on knowledge authority and complementary resources. Chapter 5

follows crops, people, money, work, and care across the connections created by those institutions and technologies. It asks where value is retained, where risk is deposited, and whose absence or labor makes a new livelihood arrangement possible.

The Rural Systems Mediation Framework can be specified for this task as a **Livelihood Recomposition Sequence**:

Market and mobility pressures → infrastructures, institutions, assets, and power → negotiated portfolio and movement decisions → differentiated income, work, care, and ecological outcomes → household and territorial feedbacks

The sequence prevents markets and migration from appearing as external forces with uniform effects. A price increase is mediated by land, surplus, storage, debt, market information, transport, and bargaining position. A new buyer is mediated by grades, volume requirements, contract enforcement, and alternative outlets. A migration opportunity is mediated by recruitment costs, documentation, gender norms, household composition, destination rights, and the capacity to replace labor and care. The resulting response - selling, storing, contracting, diversifying, commuting, migrating, renting land, mechanizing, or withdrawing - is negotiated within households and institutions. Its outcomes then reshape the next round of opportunity by changing assets, expectations, labor supply, market concentration, land use, and political influence.

From market access to governed exchange

"Market access" is often represented as distance to a road or market. Distance matters, but reliable participation requires several linked capabilities. Physical access concerns roads, transport, storage, electricity, water, and communications. Informational access concerns prices, grades, demand, weather, and the credibility of advice. Financial access concerns working capital, payment timing, insurance, and the capacity to wait rather than sell under distress. Logistical access concerns aggregation, packaging, cold chains, delivery schedules, and handling losses. Institutional access concerns recognized identity, enforceable agreements, transparent weights and measures, dispute resolution, competition, and membership in organizations. If one element fails at the wrong moment, a nominally connected household can remain an episodic or adverse participant (Barrett, 2008).

Markets are therefore governed relationships, not neutral meeting places. Traders and brokers may exercise power, but they also finance, aggregate, transport, store, grade, and bear search or default risk in settings where public and financial services are thin. Eliminating an intermediary does not eliminate these functions; it reallocates them. Digital marketplaces can make prices visible and reduce search costs while leaving transport, quality verification, payment, and platform power unresolved. The appropriate comparison is the **net farm-gate return** after fees, rejected output, compliance, finance, labor, delay, and risk, rather than the posted price alone.

Standards and contracts similarly combine opportunity and control. Quality, safety, and traceability rules can support higher-value markets and protect consumers. They can also impose fixed compliance costs and transfer rejection risk to producers least able to absorb it. Contract farming may coordinate inputs, credit, advice, and purchase, yet the contract also allocates authority over production and marketing. A systematic review found positive income effects among surviving contract schemes but cautioned that publication, survivor, and participant-selection biases make general optimism unsafe; participating farmers were often better resourced than nonparticipants (Ton et al., 2017). The relevant policy task is to examine price formulas, grading, input debt, side-selling rules, force majeure, dispute resolution, and the availability of an outside option.

From diversification to stratified portfolios

Rural nonfarm work is not the residue left after agriculture. Processing, transport, construction, trade, repair, tourism, public employment, care, and household enterprise form part of the rural economy and often connect agriculture to nearby towns. Cross-country evidence shows that households commonly combine multiple activities across rural and urban spaces, although the composition and returns vary sharply by development path and region (De La O Campos et al., 2023). “Farm” and “nonfarm” therefore describe activities, not sealed household types.

Livelihood portfolios are stratified. Some households diversify by **pull**, entering skilled wage work or profitable enterprise and using the return to invest, insure risk, or choose farming on better terms. Others diversify by **push**, assembling irregular, low-paid activities because land, yields, or farm income cannot sustain them. The same household may do both across time. Education, finance, electricity, roads, digital connectivity, social networks, location, gender, and initial assets shape which part of the nonfarm economy is accessible. Entry barriers create a paradox: households most in need of a high-return alternative are often least able to finance or reach it.

Farm and nonfarm activities can be complementary or competitive. Nonfarm earnings may finance seed, livestock, machinery, or irrigation, permit delayed sale, and smooth consumption between harvests. Farm output may supply raw material and demand for local services. But nonfarm work can also draw labor away during critical agricultural periods, and a weak farm can subsidize an unproductive enterprise. What matters is the timing, return, risk covariance, and control of each activity, not the number of sources in a portfolio.

From migration event to translocal household

Migration is often measured as a change of residence or a remittance receipt. Rural livelihood organization requires a wider view. Seasonal workers can move with agricultural calendars; circular migrants maintain repeated links between origin and destination; commuters cross a rural-urban boundary daily; international migrants confront documentation and border regimes; displaced people may have little choice over movement; and return migrants bring altered skills, savings, expectations, and claims. The **translocal household** coordinates resources and responsibilities across these sites even when co-residence has ended.

Financial remittances are only one flow. Migrants also send information, contacts, practices, political ideas, and expectations, while families at origin sustain land claims, children, elders, and the possibility of return. The household may invest remittances in agriculture, education, housing, enterprise, or debt reduction, but these uses cannot be ranked mechanically. Food and health spending can preserve productive capacity; housing can provide security or rental income; debt repayment may be the condition for future agency. Productive investment is more likely when remittances are regular enough, complementary opportunities exist, property and financial arrangements are credible, and the household can bear enterprise risk. Where these conditions fail, consumption smoothing is not evidence of irrationality; it is often the central welfare function of remitting.

Absence also has a balance sheet. Migration can relax liquidity constraints and reduce dependence on a local employer or buyer. It can create farm-labor bottlenecks, lead to land rental or crop change, increase the demand for labor-saving services, and transfer unpaid care to women, older people, or girls. The person who manages the farm may not gain ownership or control over revenue. The person who remits may gain a stronger claim over investment despite limited knowledge of daily production. Migration thus redistributes authority as well as labor.

A distributional and territorial test

This chapter evaluates livelihood recomposition at four connected levels. At the **transaction level**, it asks how prices, grades, fees, contracts, and remedies allocate value and risk. At the **household level**, it traces income, labor, care, assets, decision authority, and seasonal exposure. At the **labor-market and corridor level**, it examines recruitment, wages, safety, legal status, portability of benefits, and the vulnerability of movement routes to shocks. At the **territorial level**, it asks whether infrastructure and food-system growth retain value locally, generate decent employment, sustain ecosystems, and expand public services or instead produce displacement and concentration.

The distributional test is deliberately stronger than aggregate growth. An increase in output or market turnover is not inclusive if smallholders lose land, tenants lose access,

women's unpaid time rises, migrants lack remedy, or environmental costs undermine future livelihoods. Conversely, agricultural exit is not necessarily failure. A voluntary, rights-protected move into secure and productive work can expand capability. The failure lies in distress exit without assets, skills, services, or social protection.

Evidence must match these distinctions. FAOSTAT and trade data can locate production, price, and commodity shifts; labor and migration statistics reveal employment status and movement; panels show portfolio and asset trajectories; time-use and individual modules reveal work and control hidden by household aggregates; value-chain studies follow standards and margins; and qualitative research explains bargaining, care, aspiration, and coercion. Each source has blind spots. Remittances are underrecorded when informal; seasonal and circular migration are often missed by residence-based surveys; women's subsistence and care work are undercounted; and gross sales conceal compliance and transaction costs. The chapter therefore treats triangulation as part of explanation rather than a final robustness exercise.

Five sections develop the argument. Section 5.1 follows value chains and examines reliable market incorporation, unequal standards, contracts, cooperation, and digital exchange. Section 5.2 analyzes rural livelihood portfolios and the differentiated nonfarm economy. Section 5.3 treats migration as translocal organization of labor, money, land, knowledge, and care. Section 5.4 makes visible the redistribution of paid work, unpaid care, authority, and rights across gender and generation. Section 5.5 moves from household adaptation to territorial strategy. The practical output - a **Livelihood Recomposition Map and Policy Matrix** - turns these relationships into a diagnostic for matching interventions to activities, seasons, actors, places, and risks.

5.1 Market Incorporation, Value Chains, and Unequal Exchange

Market incorporation is often described as though it begins when a farmer sells a crop. That threshold is too low. A household may sell maize once after an unusually good harvest, accept the only trader's offer during a cash emergency, or deliver to a buyer that disappears the following season. None of these transactions establishes dependable access. Reliable participation means that producers can plan for exchange across seasons: they know what quality is required, can reach or summon more than one credible buyer, can obtain working capital and inputs on tolerable terms, can store or transport output without prohibitive loss, can verify prices and weights, and have some recourse when agreements fail. The relevant contrast is therefore not subsistence versus sale, but **episodic exchange versus reproducible market capability**.

This distinction changes both explanation and measurement. "Distance to market" cannot stand in for market access because physical, informational, financial, logistical, and institutional access vary independently. Kenyan panel evidence, for example,

found weak correlations among alternative indicators of access and showed that the conduct of marketing agents could matter as much as proximity to roads or towns (Chamberlin & Jayne, 2013). A village may lie beside an all-weather road yet have no storage, grading service, bankable receipt, functioning scale, or competing buyer. Conversely, an apparently remote producer organization may coordinate bulking and transport well enough to negotiate repeated sales. Market access is thus a configuration rather than a location.

From gross sales to net farm-gate returns

At the farm gate, the visible price is only the beginning of the distributional story. The analytically relevant measure is the net return retained by the farm household after purchased inputs, interest, packaging, certification and grading, transport, storage loss, commissions, rejected output, and, where the purpose is to compare livelihood options, the opportunity cost of family labor are considered. Payment timing and default risk also matter. A high quoted price paid months late may be worth less than a lower immediate payment when a household must service costly debt or buy food during the lean season. Likewise, a premium for a high-value crop may not improve welfare if the producer absorbs new chemical, irrigation, record-keeping, or rejection costs.

Transaction costs help explain why households facing the same output price behave differently. Fixed costs of finding a buyer, learning standards, arranging transport, or opening an account are regressive: spread over a small surplus, they consume a larger share of revenue. Variable transport and handling costs then interact with scale, perishability, timing, and remoteness. Poorer households may also be net buyers of the staple they sell at harvest, repurchasing it later at a higher seasonal price. In this setting, a price rise is not unambiguously beneficial, and the same household can occupy the positions of producer, consumer, worker, and borrower. Barrett's (2008) synthesis therefore treats productive assets, organization, and lower intermarket commerce costs as jointly important; the Kenyan maize evidence similarly shows that transaction costs shape both the decision to enter the market and the quantity sold once a household enters (Alene et al., 2008).

Reliability also concerns exposure to time. Producers make input and labor commitments before harvest prices are known, whereas buyers may purchase after observing aggregate supply and quality. Storage can transfer sale to a better month but exposes the household to loss, fees, and the need to finance consumption in the meantime. Forward prices or minimum-price clauses can reduce uncertainty, yet they may also cap gains or be rendered ineffective by ambiguous quality deductions. Consequently, price transmission should be examined in both directions: how rapidly retail or export increases reach the farm gate, and how quickly declines are passed back to producers. A chain that communicates losses immediately but shares gains slowly is formally integrated while remaining substantively unequal. Repeated participation is most plausible when households possess some combination of liquidity, storage, staged

sales, insurance, diversified buyers, or transparent price formulas that keeps a single bad season from forcing exit.

Infrastructure has to be read as a chain. Feeder roads without passable bridges, transport services, fuel, collection points, and maintenance may reduce nominal distance without making a sale reliable. Electricity matters through cold storage, milling, lighting, communications, and digital payment. Warehouses can let producers avoid harvest-time distress sales only if receipts are trusted, quality is preserved, fees are affordable, and finance providers accept the stored commodity as collateral. Telecommunications improve search, but information has bargaining value only when a farmer can delay sale, reach another outlet, aggregate enough volume, or credibly threaten to exit. These complementarities can limit benefits when a single-component project leaves a binding constraint unresolved.

Traders and brokers should not be treated as a residual category of unnecessary middlemen. They assemble dispersed volumes, assess quality, advance cash, organize transport, bear spoilage and price risk, and cultivate buyer relationships. The distributional question is whether these services are contestable and transparently priced. Where entry is difficult, scales and grades are opaque, or input credit ties a farmer to one buyer, an intermediary can convert a useful service into market power. Where several traders compete and farmers possess price information, storage, or collective negotiation, brokerage may lower the total cost of exchange. The goal is therefore not the indiscriminate removal of intermediaries but a marketing system in which their margins reflect valuable services rather than captive supply.

Price information illustrates this conditionality. The spread of mobile coverage across Niger's grain markets was associated with a 10-16 percent fall in spatial price dispersion, with larger effects where transport costs were high (Aker, 2010). Internet kiosks paired with procurement warehouses in central India raised soybean prices and expanded soybean cultivation; the pairing is crucial because the intervention provided both information and an alternative channel (Goyal, 2010). In northern Ghana, a mobile market-information service increased prices received for maize and groundnuts among participating farmers, consistent with improved bargaining against itinerant traders (Courtois & Subervie, 2015). These studies do not imply that an app by itself creates a market. They show that information becomes consequential when joined to commercial options, organizational capacity, and physical movement.

Standards, contracts, and the allocation of risk

Grades, traceability systems, food-safety rules, and sustainability certification can make quality legible to distant processors and retailers. They may open remunerative channels, reduce uncertainty, and reward process improvements. Yet the costs of legibility are not socially neutral. Record keeping, separate storage, approved inputs, protective equipment, audits, and delayed certification impose fixed and recurrent costs. Better-capitalized farms can spread these costs over larger volumes and survive rejection; smallholders, tenants, and producers with insecure water or land rights may be screened out before any premium is earned. Women may perform the additional compliance labor while contracts and payments remain registered to men. Hired workers on small farms can remain invisible even when a scheme monitors conditions on plantations.

The best synthesis supports caution rather than a verdict for or against certification. A Campbell systematic review of 43 quantitative and 136 qualitative studies found some improvement in certified-product prices and income from certified production, but no clear increase in total household income; effects on workers' wages were not positive, and context and study quality sharply limited generalization (Oya et al., 2017). A standard can therefore raise one chain indicator while leaving household welfare or labor conditions unchanged. A sound evaluation records who pays for compliance, what share of output is actually sold as certified, how rejected produce is marketed, whether the premium persists, and how benefits are divided between landholders, workers, and household members.

Contract farming makes the allocation of rights and risk especially visible. A contract may bundle a guaranteed outlet with seed, fertilizer, credit, extension, transport, and a quality protocol. These services can solve interlocking failures that spot markets leave unresolved. But the buyer may also specify production while leaving weather and yield risk with the farmer, deduct inputs at a price the farmer cannot verify, reject output using unilateral grading, delay payment, or set a price formula that transmits downside movements more readily than upside gains. Farmers may side-sell when spot prices rise; buyers may ration procurement after a glut. These are not simply failures of trust. They reflect incomplete contracts, asymmetric enforcement, and unequal ability to withstand loss.

The evidence is heterogeneous in precisely the ways this framework predicts. Ton et al.'s (2017) systematic review found substantial income gains among the surviving schemes studied, but also serious publication and survivor bias; in roughly three-fifths of the reviewed cases, participating farmers had more land or assets than comparison farmers. Nationally representative evidence from six countries later found higher contract-farmer income in only some settings, although demand for hired labor was often higher among contract farmers (Meemken & Bellemare, 2020). "Contract farming" is therefore not one treatment. The crop, buyer concentration, price formula, service

package, farmer selection, duration, exit rights, and dispute mechanism determine its effects.

Contracts are more likely to distribute value fairly when several protections operate together: terms are available in accessible language before planting; grades, weights, deductions, and price formulas are independently verifiable; delivery and payment dates are enforceable; catastrophic production risk is shared or insured; farmers can organize and obtain advice not financed by the buyer; and low-cost mediation exists before litigation. Public agencies can register contracts, publish benchmark prices, inspect scales, and prohibit abusive clauses without dictating every transaction. Producer organizations can reduce per-farmer coordination costs, but they need the competence and accountability to negotiate rather than merely transmit buyer instructions.

Table 5.1. Market arrangements as allocations of function, value, and risk

Arrangement	Coordination function	Potential gain	Main risk and diagnostic safeguard
Open spot market	Flexible sale and rapid price discovery	Low commitment and ability to switch outlets	Thin or collusive demand; compare net prices, weights, fees, and number of credible buyers
Trader or broker relationship	Aggregation, cash advance, grading, transport, and buyer search	Lower transaction burden and timely liquidity	Tied credit or opaque margins; disclose deductions and preserve an outside option
Contract or outgrower scheme	Inputs, advice, finance, quality control, and prearranged purchase	Coordinated production and access to a remunerative channel	Unilateral grading, debt, and downward risk transfer; require verifiable formulas, shared force-majeure rules, and remedy
Cooperative or producer organization	Bulking, storage, services, delayed sale, and collective negotiation	Scale economies, learning, and bargaining	Elite capture, late payment, and exclusion; audit accounts, member benefit incidence, and leadership representation
Digital marketplace	Buyer matching, listings, records, payments, and logistics coordination	Wider search, faster settlement, and price transparency	Fees, ranking control, lock-in, data extraction, and offline exclusion; monitor full transaction cost, portability, appeals, and buyer concentration

When collective and digital marketing improve bargaining power

Cooperatives and producer organizations can turn numerous small consignments into a commercial lot, coordinate quality, operate storage, reduce repeated search, obtain transport quotations, and make delayed sale feasible. They may also create indirect gains through extension, input procurement, and peer learning. Evidence from Kenyan banana groups found positive income effects for active members even though collective-marketing price advantages were modest; information and innovation functions were important channels (Fischer & Qaim, 2012). In Rwanda, average benefits of cooperative membership were driven by particular organizational types rather than cooperative status alone (Verhofstadt & Maertens, 2014). These findings shift attention from the label "cooperative" to what the organization actually does.

Collective marketing is not automatically inclusive. Entry fees, minimum volumes, meeting time, distance, land requirements, and social connections can exclude the poorest. Ethiopian evidence found that poorer farmers were less likely to participate and, when members, could remain marginal to decision-making; commercial performance and inclusion sometimes involved trade-offs (Bernard & Spielman, 2009). A group can also become a monopsony at village level, delay payment, conceal accounts, or allocate contracts to leaders. The relevant safeguards include transparent grading and patronage payments, audited accounts, member access to transaction records, leadership rotation, meaningful representation of women and tenants, and the right to sell outside the group under stated conditions.

Digital marketplaces can widen buyer search, standardize listings, document transactions, and speed payment, but they do not eliminate grading, aggregation, transport, working capital, or dispute resolution. Nor do they erase unequal device ownership, literacy, language, connectivity, and data control. A platform improves net farm-gate returns when it creates **contestable demand** - credible additional buyers or better terms - while keeping onboarding, commission, transport, payment, and rejection costs below the additional revenue. It can reduce bargaining power when one platform controls visibility, ranks sellers opaquely, locks users into proprietary payments or logistics, or turns data about harvest and indebtedness into an advantage for counterparties.

A recent systematic review of output-market interventions finds small-to-moderate average improvements across market participation, production, and welfare outcomes, but also a large share of studies at high risk of bias and sparse evidence on intervention costs and nutrition (Marion et al., 2024). The review also found that multicomponent interventions were not necessarily more effective than single-component approaches. Reliable participation may require a context-specific combination of usable transport and storage; timely, intelligible information; finance that does not compel distress sale; multiple credible outlets; transparent standards; enforceable agreements; and organizations through which weaker producers can negotiate. The policy test is not

whether more produce passes through a "modern" channel. It is whether different farmers can repeatedly retain higher risk-adjusted net returns without surrendering excessive autonomy or shifting hidden costs onto workers, women, or the environment.

5.2 Beyond the Farm: Livelihood Portfolios and the Rural Nonfarm Economy

The rural economy does not begin and end at the plot boundary. Processing, transport, construction, repair, retail, food preparation, public employment, wage labor, household enterprise, pensions, and transfers are not leftovers from an agricultural system; they are part of the system through which agriculture is financed, serviced, consumed, and transformed. The scale of this rural nonfarm economy is substantial, but its contribution to poverty reduction depends on access to growing, productive niches rather than the proliferation of low-return work (Haggblade et al., 2010). A farm household may simultaneously produce food for home use, sell a cash crop, operate a shop, process grain, work seasonally on another farm, send a member to a construction site, and receive a public transfer. **Pluriactivity** names this combination of activities; a **livelihood portfolio** adds the assets, relationships, timing, and risk allocation that hold it together.

This perspective guards against two errors. The first is to call any movement out of farming development. A household that enters precarious casual work because its harvest failed has diversified, but it has not necessarily gained capability. The second is to treat nonfarm earnings as evidence that agriculture no longer matters. Farm income can generate demand for local trade and services, while nonfarm income can finance seed, irrigation, livestock, or hired labor. The important question is not how many income sources a household reports but what functions they perform and what trajectory they make possible.

Push, pull, and the quality of diversification

The distinction between **push** and **pull** diversification is useful if treated as a continuum. Push factors include land scarcity, crop loss, volatile prices, illness, debt, seasonal hunger, and too little farm work to employ household labor. They propel people toward activities with low entry barriers - casual labor, petty trade, charcoal making, or very small services - often precisely because those activities require little capital or certification. Pull factors include attractive wages, growing urban food demand, profitable processing, skilled public or private employment, and enterprises that exploit a genuine market niche. Such options generally require education, equipment, savings, mobility, or networks.

The same activity may be push-driven for one person and opportunity-driven for another. A food stall entered after a drought may initially smooth consumption, later accumulate capital, and eventually become the household's main enterprise. A salaried

job may finance the farm at first but induce gradual exit as the opportunity cost of farm labor rises. Motivation must therefore be inferred from constraints, returns, and sequence, not from sector alone. Ellis's (1998) foundational account emphasizes diversification as a portfolio process, while Alobo Loison's (2015) review of sub-Saharan Africa shows why outcomes are mixed: better-endowed households are generally more able to exploit high-return opportunities and synergies.

Diversification strengthens resilience when income streams have different seasonal and shock profiles, when at least one source is liquid during the agricultural lean season, and when activities are sufficiently remunerative to prevent depletion of land, livestock, health, or schooling. A shop whose receipts continue during a localized crop failure, a public salary paid through the dry season, or processing that earns a margin after harvest can stabilize consumption and protect productive assets. Diversification can also improve farm productivity when nonfarm cash relaxes credit constraints, permits timely input purchase, or finances equipment whose returns arrive only after a delay.

It fragments labor when activities compete at the same time, require repeated travel, or depend on the same covariate shock. Harvest work, market trading, and care obligations may peak together. A household with many low-return activities can appear diversified in survey data while remaining chronically time-poor, especially if women and older children absorb unpaid substitution. Management attention can become a scarce input: missed weeding or delayed veterinary care may reduce farm output even when total cash income rises. The resilience test must therefore consider covariance, timing, returns per hour, control over earnings, and the burden of coordination, not a simple count or diversity index.

Unequal entry into the rural nonfarm economy

The rural nonfarm economy contains at least two broad segments. A lower-return segment offers accessible self-employment and casual work, often with little capital, weak protection, and intense competition. A higher-return segment includes skilled wage employment, larger enterprises, processing with equipment, transport, and public-sector jobs. Movement between the segments is constrained by thresholds. Multicountry evidence using nationally representative data links education and infrastructure most strongly to nonagricultural wage employment, while land access remains closely associated with agricultural pathways (Winters et al., 2009). Cross-country income data likewise show that rural households combine agricultural wages, farm self-employment, nonfarm wages, enterprises, and transfers in proportions that vary sharply with national and local opportunity structures (Davis et al., 2010).

At household level, useful entry assets include literacy, technical and business skills, working capital, collateral, tools, transport, a phone, health, and enough labor to release a member without undermining farming or care. Networks provide job referrals, apprenticeships, customers, supplier credit, and information about demand. Household

composition matters: an adult may take wage work only if another member can manage crops, livestock, children, and older relatives. Land and livestock can support risk-taking by serving as collateral or a fallback, yet households with very small holdings may be pushed into low-paid labor rather than pulled into enterprise.

Territorial assets determine the returns to household assets. Reliable roads expand the radius of employment and reduce input and product costs. Electricity makes refrigeration, welding, milling, digital services, and longer business hours possible. Broadband and mobile payments can lower search and transfer costs, but only with affordable devices, literacy, and trustworthy providers. Schools, vocational institutions, health services, childcare, finance, and proximity to a town shape whether a person can convert effort into a high-return livelihood. The same education has different value in a stagnant village economy and in a diversified corridor with growing firms.

Panel evidence makes the resulting stratification visible. In rural Ethiopia, initial assets and access to savings and credit helped households enter higher-return nonfarm work, while wealth or liquidity shocks could push them into lower-return activities (Bezu & Barrett, 2012). A related panel study found that the initial share of nonfarm income was associated with subsequent consumption growth, with a stronger growth association for wealthier households (Bezu et al., 2012). Across eight African sites, Musumba et al. (2022) found considerable diversity and movement among crop, livestock, and nonfarm combinations; credit and farm size were important correlates, while reported drought was associated with lower livelihood diversity. These are not merely differences in individual enterprise. They are cumulative processes in which initial assets govern opportunity, returns build further assets, and shocks force less-protected households down a lower-return ladder.

Gender is part of that segmentation, not an additional variable to be appended later. Comparative evidence from Bangladesh, Ethiopia, Indonesia, and Sri Lanka found female-owned rural nonfarm firms smaller and less productive in all of those countries except Indonesia, largely because women were sorted into different sectors and scales rather than because of a uniform deficit in ability or effort (Rijkers & Costa, 2012). Restrictions on mobility, unequal asset ownership, unpaid care, and weaker commercial networks narrow the set of activities women can enter. Young people may possess more schooling or digital familiarity yet lack capital, premises, land, and recognized experience. Disability, ethnicity, caste, and migration status similarly shape whether nominally open opportunities are usable.

Table 5.2. Livelihood portfolio patterns and their likely trajectories

Portfolio pattern	Distinguishing configuration	Likely pathway	Evidence needed for diagnosis
Accumulating diversification	Profitable farm plus skilled work or scalable enterprise; investment and risk buffers	Asset growth and greater choice across sectors	Net returns, enterprise survival, asset change, labor hiring, and control of earnings
Adaptive com plementarity	Counter-seasonal activity finances inputs or protects consumption without undermining farm tasks	More stable reproduction and resilience	Seasonal cash flow, input timing, shock covariance, food security, and work hours
Seasonal smoothing	Short-duration wage or trade income covers the lean season but yields limited accumulation	Stable but vulnerable reproduction	Months of adequate income, debt cycle, distress sale, and repeated reliance on the same temporary work
Distress frag mentation	Several low-return activities, long travel, competing labor peaks, and asset depletion	Time poverty, underinvestment, and downward mobility	Return per hour, missed farm operations, care transfer, schooling, debt, and asset sales
Managed transition or exit	Nonfarm activity becomes primary under secure work, transferable assets, and social protection	Voluntary movement away from farming	Employment quality, housing and benefit security, land-transfer terms, subjective choice, and option to return

Reinforcement, crowding out, and trajectories over time

Farm and nonfarm activities are linked through labor, capital, demand, and risk. Reinforcement occurs when farm profits create demand for transport, repair, construction, processing, and retail; when local enterprises add value to agricultural output; and when nonfarm earnings finance inputs or stabilize consumption long enough for a farmer to avoid distress sale. These are household and territorial multipliers. FAO's agroterritorial account emphasizes that rising food demand in towns can support production, processing, logistics, and services along rural-urban continua rather than only in distant metropolitan centers (FAO, 2017). Cross-country evidence also associates movement into the "missing middle" of rural nonfarm activities and secondary towns with more inclusive poverty reduction than concentration in mega-cities, while stopping short of a simple causal claim (Christiaensen & Todo, 2014).

Crowding out occurs when off-farm work withdraws labor at critical agricultural moments, when commuting increases fatigue and care deficits, or when the safest investment is to move capital away from an increasingly risky farm. The Mexican evidence captures this ambiguity: off-farm income reduced family labor and farm output but increased purchased inputs and produced a small efficiency gain (Pfeiffer et al., 2009). Mechanization or hired labor may substitute for the absent worker, allowing

the farm to become less labor-intensive without becoming less viable. Alternatively, untimely labor loss may lower yields, encourage land rental, or begin a managed exit. A decline in farm labor is thus not, by itself, evidence of either success or distress.

The interaction also changes over the household life course. Younger adults may use nonfarm earnings to establish a farm, while established farmers use enterprise income to educate children who later leave agriculture. A household can move from coping to adaptive diversification and then to accumulation or reverse direction after illness, job loss, or climate shock. Nagler and Naudé's (2017) multicountry analysis of rural nonfarm enterprises in sub-Saharan Africa underscores both their ubiquity and their constraints: enterprises are commonly small and informal, while the study's exit data from Uganda identify low profitability, limited finance, and household shocks as important reasons for closure. The policy objective cannot be maximal enterprise entry; it must be durable access to activities with learning, productivity, and protection.

Measurement should follow these trajectories. Cross-sectional correlations between nonfarm income and welfare are vulnerable to reverse causality: wealth enables high-return diversification, even as successful diversification creates wealth. Annual income shares hide agricultural seasons, simultaneous jobs, unpaid family work, irregular transfers, enterprise depreciation, and business failure. Household totals can also conceal who supplied the labor and who controls the return. Panels, seasonal calendars, individual labor and earnings modules, enterprise accounts, time-use data, and shock histories are needed to distinguish opportunity from distress and complementarity from displacement.

This evidence supports a differentiated answer to the section's three questions. Diversification is most likely to strengthen resilience and productivity when activities are counter-seasonal or weakly correlated with farm risk, yield adequate returns per unit of labor, and provide liquidity or services that protect productive assets. Entry into higher-return work depends on a bundle of household capabilities - education, health, capital, labor availability, assets, and networks - and territorial conditions - roads, electricity, communications, finance, services, and accessible towns. Farm and nonfarm earnings reinforce one another when cash, demand, knowledge, or services circulate between them; they crowd one another out when labor peaks conflict, care is displaced, or returns induce capital and authority to leave farming.

Policy should therefore avoid both farm-only programming and an indiscriminate celebration of diversification. Productive farming, local processing, services, and mobility require coordinated investment. Flexible finance must be paired with infrastructure and skills; enterprise promotion with market demand and social protection; and transport corridors with labor standards, care services, and safeguards against displacement. Support should be portable across mixed livelihoods rather than conditioned on a household fitting a single occupational box. The central evaluative question is whether the portfolio increases the household's command over time,

income, assets, and future choices or merely spreads insufficient labor across a wider field of insecurity.

5.3 Mobility, Remittances, and the Translocal Household

Migration does not simply remove a person from a rural household. It stretches the household across places. A member may work in a nearby town, follow a harvest circuit, spend several years in a national capital, cross an international border, or return after an unsuccessful or completed spell away. Money, labor, information, care, obligations, and claims to land continue to move among these locations. The resulting unit is best understood as a **translocal household**: a social and economic arrangement whose members coordinate livelihoods across distance while remaining unequally positioned within it. Residence is dispersed, but belonging, responsibility, and bargaining do not disappear.

This perspective corrects two common simplifications. The first treats migration as a one-time move from a rural origin to an urban destination. In practice, rural mobility includes commuting, seasonal and circular movements, rural-to-rural labor migration, internal displacement, international migration, and return. The second assumes that migration is a unified household strategy. Households often help finance travel and expect remittances, but the migrant may also pursue an education, marriage, occupational identity, or independence that conflicts with family plans. Migration is therefore both a livelihood strategy and a field of negotiation over who may move, who must stay, who bears the cost, and who controls the returns.

Mobility as a differentiated capacity

The ability to migrate is itself unequally distributed. Travel costs, recruitment fees, identity documents, education, health, social networks, and freedom from care obligations determine which routes are feasible. The poorest may be unable to finance a promising move and instead enter short-distance, low-paid, or debt-financed circuits. Better-connected households can often send a member to a higher-return destination and absorb a period without remittances. Gender, age, ethnicity or caste, marital status, and legal status shape safety, wages, occupational sorting, and the credibility of claims against recruiters or employers. What appears in a survey as the same event - one absent household member - may therefore represent opportunity for one person, constrained survival for another, and forced displacement for a third.

Duration and timing matter as much as distance. Seasonal migration scheduled after harvest may earn cash without removing labor at a critical farm stage. The same journey during land preparation or weeding can create a costly labor bottleneck. Circular migration can maintain close involvement in farm decisions, but repeated departures may make care and management permanently provisional. Longer-distance and international migration may yield larger transfers, yet generally requires more capital

and exposes migrants to recruitment debt, irregular status, border controls, currency risk, and prolonged family separation. Return is likewise heterogeneous: it may bring savings, skills, and contacts, or follow injury, deportation, job loss, or debt.

Table 5.3. Mobility configurations, livelihood functions, and distributional risks

Mobility configuration	Typical livelihood function	Possible gain at origin	Principal distributional risk
Daily or weekly commuting	Combine farm residence with town work	Regular cash while retaining farm labor and care ties	Long travel time, transport cost, and workday extension
Seasonal rural-rural or rural-urban movement	Match slack farm season to temporary labor demand	Consumption smoothing and reduced seasonal underemployment	Conflict with peak farm work; broker dependence and unsafe work
Multi-year internal migration	Build a nonfarm income stream or occupational career	Larger, more regular transfers; urban information and networks	Persistent care gaps, weakened farm management, and destination precarity
International migration	Access large wage differentials and diversify national risk	Potentially substantial remittances and asset formation	High entry cost, debt, legal vulnerability, family separation, and corridor shocks
Forced displacement	Secure safety when livelihood or life is threatened	Protection from immediate harm	Loss of land, assets, documents, community ties, and freedom to choose return
Return migration	Reunite the household or redeploy savings and skills	Enterprise formation, renewed cultivation, and knowledge transfer	Failed migration debt, contested authority, or poor local reintegration

FAO's global synthesis emphasizes that rural migration is not only rural-urban: rural-rural and temporary movements remain important, and policy must distinguish voluntary mobility from movement compelled by conflict, environmental stress, or the absence of viable livelihoods (FAO, 2018). This is not a semantic distinction. Where migration is costly but chosen among credible alternatives, it can expand agency. Where it is the only route away from hunger, violence, debt, or ecological collapse, the transfer of labor may stabilize a household while revealing a prior failure of rural development.

Remittances: reproduction, risk management, and investment

Financial remittances are the most visible connection between migrant and origin, but they are only one component of a wider exchange. Migrants also send goods, information, skills, contacts, technologies, and new expectations about work, gender, education, and consumption, often termed social remittances. Origin households provide care for children and older relatives, maintain land and housing, preserve membership and inheritance claims, and sometimes subsidize migrants during unemployment. The flow is therefore reciprocal, although not necessarily balanced.

The familiar opposition between "consumption" and "productive investment" is too crude for evaluating remittance use. Food, medicine, school fees, housing repair, and debt repayment reproduce labor and protect assets; during a drought or illness they may prevent distress sales and preserve a household's future capacity to farm. Expenditure on education or health is an investment in capabilities even when it does not raise farm output immediately. Housing can combine security, status, and productive use. Consumption smoothing is therefore not evidence that migration has failed. It is often the first return households seek because migration is partly an informal insurance arrangement in places where credit, health protection, and formal social security are weak.

At the same time, remittances are more likely to finance equipment, irrigation, livestock, land improvement, or a nonfarm enterprise when several conditions align: transfers are sufficiently regular and exceed urgent needs; the recipient can control or jointly plan their use; tenure and market conditions make investment credible; complementary infrastructure, labor, repair services, and finance exist; and the household expects some future return to the locality. Lower transfer fees and accessible savings products can increase the investible surplus, but financial inclusion alone cannot create profitable opportunities. The guide developed under IFAD's remittance programme treats payment systems, savings, financial capability, enterprise support, and partnerships as complementary parts of an inclusive remittance service (ACCESS Advisory, 2019).

Empirical findings reinforce the importance of context. In Guatemala, remittance-receiving households allocated more at the margin to education and housing, demonstrating that transfers can alter investment in human and physical capital (Adams & Cuecuecha, 2010). Evidence from rural Mexico links international migration to agricultural asset accumulation, but not uniformly across assets; another study found higher land productivity and per capita income in migrant-sending households rather than generalized withdrawal from production (Böhme, 2015; Taylor & López-Feldman, 2010). Such results do not establish a universal remittance effect. Migration and remittance receipt are selective, and households that can send migrants differ from those that cannot. Reviews repeatedly warn that causal estimates must

address this selection and that effects vary by livelihood, destination, and institutional setting (Adams, 2011; Mendola, 2012).

The most defensible conclusion is conditional. Remittances become productive capital when they relax a binding constraint in an environment where the household has an investible project and sufficient authority, services, and security to carry it through. Otherwise they may appropriately finance everyday reproduction, diversify savings, or support exit from farming. A transfer used to educate a daughter who later enters skilled work can be transformative without ever purchasing a pump.

Absence reorganizes land, labor, and crops

Out-migration creates a labor-loss effect before any transfer arrives. Remaining members can respond by working longer, hiring labor, calling on reciprocal exchange, mechanizing selected operations, renting land out, reducing cultivated area, or shifting toward less labor-intensive crops and livestock. Which response is possible depends on local wages, machinery markets, plot fragmentation, tenure rules, and the timing and reliability of remittances. A household with irrigated land and regular transfers may substitute hired services for the absent worker. A land-poor household with irregular transfers may require an older person, spouse, or child to absorb the work. The same migration opportunity can therefore raise productivity on one farm and produce under-cultivation on another.

The evidence does not support a single story of either agricultural decline or remittance-led modernization. A systematic review of forty-four studies found immediate labor loss, changes in livelihood and land use, and differentiated longer-term movement up the income distribution or away from agriculture; effects varied sufficiently to produce both winners and losers among migrant and nonmigrant households (Obi et al., 2020). Research in Albania found migration associated with lower farm labor and nonlabor inputs, consistent with a pathway out of agriculture rather than productive reinvestment (Miluka et al., 2010). By contrast, the Mexican evidence cited above identified higher land productivity. In Nepal, a recent systematic review records coexisting “use,” “substitution,” “offset,” and “neglect” effects: remittances may support consumption and investment while workforce loss, labor substitution, or land abandonment unfolds in the same community (Koirala & Bashyal, 2025).

Land arrangements mediate these responses. Temporary migrants may retain plots as insurance and leave them with spouses or relatives under informal management. Longer absence can encourage rental, sharecropping, consolidation, or abandonment, but weak rental institutions and fear of losing claims may leave land idle. Where women manage land without recognized rights, they may be unable to rent it, pledge it, alter tree crops, or contract machinery. In Indonesia, Mulyoutami, Lusiana, and van Noordwijk (2020) show that migration connects origin and destination land use through

gendered flows of labor, knowledge, and networks, while successful returnees may reinvest in farms and community infrastructure. This illustrates why the origin farm should not be examined apart from the migrant's destination and expected return.

Care and authority across distance

Migrant absence also reallocates social reproduction. Cooking, water and fuel collection, childcare, eldercare, illness management, and ceremonial obligations cannot be remitted in cash alone. They are reassigned among spouses, grandparents, older daughters, siblings, or paid carers. Grandparents may enable the migration of working-age adults while taking on intensive care; adolescents may combine school with farm and domestic work. These arrangements can protect children and sustain migration, but they can also generate time poverty, interrupted schooling, or emotional strain.

Authority does not automatically follow presence. A migrant who supplies cash may retain decisive influence through mobile communication, while the resident manager performs daily work with limited discretion. Conversely, prolonged absence may expand a spouse's practical authority over cropping, purchases, and community relations. Control may be temporary and renegotiated when the migrant returns. Translocal research in Thailand demonstrates that remittance practices are shaped jointly by gender, generation, class, filial obligations, and the migrant's position at destination; money also maintains belonging and future claims, not merely purchasing power (Porst & Sakdapolrak, 2020). Household surveys that record only the recipient and amount miss who requested the transfer, who decided its use, what unpaid services traveled in the opposite direction, and whether authority changed.

The distribution of benefits and costs therefore depends on a configuration, not on migration alone. Seasonal mobility can be highly compatible with farming when calendars align; prolonged absence is more likely to induce durable changes in land and care. International destinations may yield higher earnings but impose greater debt and legal risk. Women migrants may remit reliably yet face segregated and unsafe work; male out-migration may increase women's farm responsibility without changing land rights. Youth migration can finance parental farming while weakening succession, or it can build skills for a later return. Irregular status and employer-tied recruitment reduce the migrant's bargaining power and make household income vulnerable to deportation or injury. Migration expands agency when people can choose whether, when, and where to move; when those who remain have resources and voice; and when rights and services connect origin and destination. It deepens dependence when livelihood survival rests on an unsafe corridor or on the unrecognized labor of family members left behind.

5.4 Reworking Labor, Care, and Intra-household Power

Commercialization and mobility do not merely add new income sources to an unchanged household. They redistribute paid work, unpaid work, asset control, and responsibility. Who weeds, harvests, travels to market, supervises hired workers, cares for dependents, receives payment, and authorizes investment may all change, but not in the same direction. A credible account must therefore distinguish **work**, **management**, **ownership**, and **control over income**. Collapsing them into a single indicator of participation turns heavier responsibility into apparent empowerment.

Feminization of labor is not necessarily feminization of power

The "feminization of agriculture" can mean an increase in women's absolute farm labor, an increase relative to men, a larger share of women workers in agriculture, more female management, or greater public recognition of work that was always present. These are different processes. Measurement also matters: a rise may reflect improved enumeration of women's work rather than a recent transfer of tasks. Farnworth et al. (2023) consequently argue for methods that track changing labor, decision-making, norms, and identities rather than inferring a single process from headship or employment shares.

Male out-migration often increases women's responsibility for day-to-day farming, especially in labor-intensive and dryland systems, but the consequences are contingent on remittance flows, household wealth, tenure, age, and social norms. The systematic review by Baada and Najjar (2020) finds that migration-related feminization is mediated by gendered and generational relations and can involve both increased burdens and new room for negotiation. The broader literature likewise rejects an automatic progression from responsibility to empowerment (Doss et al., 2021). Three tests are essential. Can a woman make consequential decisions without seeking an absent man's approval? Does she have enforceable rights to land, livestock, equipment, or group membership? Can she retain or direct the income generated by her work?

The answers often diverge. In matrilineal Malawi, relatively strong women's claims to land did not by themselves secure control over labor, income, or strategic household decisions; land rights operated within a wider institutional and political context (Andersson Djurfeldt et al., 2018). Across eight agricultural projects, household assets generally increased, yet only a subset improved women's ownership or control and only one showed a reduced gender asset gap (Johnson et al., 2016). These findings make a central point: an intervention can improve farm performance while leaving intra-household distribution unchanged.

Commercialization can amplify this divergence. As a crop becomes valuable, men or better-connected actors may enter marketing and control revenue while women continue production and processing. Yet male takeover is not inevitable. Women may retain control where they possess secure claims, direct buyer relationships, collective

organization, accessible transport, and recognized authority over the crop or enterprise. A mixed-method systematic review of value-chain interventions found small positive effects on women's income, assets, mobility, decision-making, and organizational leadership, but confidence in many estimates was limited and economic gains did not consistently transform power within families and communities (Malhotra et al., 2024). Programs should therefore measure control over revenue and workload alongside sales and yield.

The care economy and the lengthening workday

Agricultural labor is sustained by social reproduction: meals are prepared, workers recover from illness, children are raised, water and fuel are collected, and older or disabled relatives receive care. This work is economically necessary even when national accounts and farm budgets assign it no price. Migration and commercialization can increase cash income while lengthening the total workday if unpaid tasks remain fixed. Women may add farm management, wage work, or market travel without a corresponding reduction in cooking, cleaning, and care. Older women and girls may absorb tasks released by a migrant's spouse; older men may take on field supervision without comparable domestic redistribution.

Time is therefore a productive asset and a welfare outcome. Time poverty constrains attendance at extension meetings, entry into distant markets, rest, civic participation, and the capacity to experiment with a new enterprise. It can also undermine nutrition if food preparation or breastfeeding is compressed, and it can expose people to exhaustion and injury during peak seasons. FAO's synthesis on women in agrifood systems emphasizes that unequal norms, asset access, employment conditions, and unpaid care jointly shape women's opportunities; simply raising labor demand does not close these gaps (FAO, 2023b). ILO's care framework similarly calls for recognizing, reducing, and redistributing unpaid care and for rewarding and representing paid care workers (Addati et al., 2018).

The relevant policy set extends beyond labor-saving farm technology. Nearby water and energy, all-weather transport, childcare, school meals, health and eldercare, safe public space, and services designed around agricultural calendars can release time and reduce the penalty attached to mobility. Technologies should be assessed by whose task they save and who controls the saved time. Mechanizing a male-coded operation while leaving post-harvest processing and water collection untouched may raise measured productivity without reducing the household's binding labor constraint.

Youth, aging, and intergenerational authority

Mobility also reorganizes relations between generations. Rural youth do not judge farming only by expected income. They assess whether it offers autonomy, status, manageable risk, access to land and technology, and a credible path to adulthood. Parents may rely on young people's labor yet postpone land transfer and major decisions, leaving them responsible without authority. Young women commonly face an additional barrier when inheritance and succession favor sons or when marriage is expected to relocate them. Under these conditions, migration may be less a rejection of agriculture than a search for independence from a blocked agrarian position.

The resulting "generation problem" is not solved by encouraging youth to appreciate farming. It concerns the terms on which land, knowledge, assets, and authority pass between generations (White, 2015). Evidence from South India shows that parent and youth aspirations may diverge and that succession depends on gender and access to livelihood capitals, not on attitude alone (Nandi et al., 2022). Where working-age adults leave, older farmers may maintain land with less labor, adopt service-based mechanization, rent plots out, or reduce cultivation. Remittances can support them, but cannot substitute for reliable care or a legitimate successor. Policy should enable gradual and secure transfer through documented inheritance, joint titles, youth-accessible rental markets, apprenticeships, and finance while respecting that a viable choice may be skilled nonfarm work rather than farm succession.

Casualization and migrant farm labor

At destinations, agricultural change is frequently sustained by workers whose own livelihood security is weak. Commercial farms, plantations, contractors, and labor-intensive value chains assemble labor through seasonal migration, labor brokers, casual hiring, piece rates, and subcontracting. These arrangements give employers numerical flexibility and shift the risks of weather, variable harvests, travel, waiting time, illness, and accommodation onto workers. Migrants may be excluded from minimum-wage coverage in practice, paid by output without transparent measurement, housed by employers, exposed to pesticides and heat, or unable to complain because work authorization, transport, and debt are tied to a recruiter.

Informality is not an inherent property of seasonal work. It is an institutional outcome produced when labor law excludes agricultural categories, inspection cannot reach dispersed workplaces, responsibility is obscured through intermediaries, and workers lack organization or secure status. ILO guidance documents pervasive deficits for migrant agricultural workers, including weak income security, social protection and benefit portability, exposure to occupational hazards, discrimination, and risks of forced labor and unethical recruitment (ILO, 2019c). These conditions are especially severe for women migrants, whose occupational segregation may combine with harassment, unsafe housing, and unpaid reproductive work.

A just market strategy must therefore examine labor standards along the value chain, not only prices at the farm gate. Core measures include written contracts in a language workers understand; no worker-paid recruitment fees; transparent piece-rate conversion to a legal wage floor; equal treatment regardless of nationality or migration status; occupational safety, sanitation, housing and transport standards; freedom of association; accessible grievance and remedy; and adequately resourced labor inspection. Lead firms and contractors should not be able to evade responsibility by inserting labor brokers between themselves and the workforce. Joint or chain liability, public disclosure of recruiters, and worker-led monitoring can make accountability follow economic control.

Protection fitted to multi-activity livelihoods

Conventional social insurance often assumes one formal employer, a stable monthly wage, and continuous residence. Rural livelihoods frequently combine self-employment, unpaid family work, casual wage labor, migration, and seasonal farm income. Protection built around a single employment relationship will exclude many of the people who need it most. FAO and ILO recommend combining tax-financed guarantees with contributory schemes adapted to heterogeneous rural employment, while addressing geographic, administrative, financial, and information barriers (FAO & ILO, 2021).

Five design principles follow.

Guarantee a universal floor. Health coverage, child and disability benefits, maternity protection, and old-age income should not disappear when a worker changes crop, employer, district, or employment status. Tax-financed minimum guarantees are crucial for landless workers, unpaid family workers, and those with earnings too low or irregular to contribute consistently.

Adapt contributions to seasonality. Flexible payment schedules, subsidized contributions for low earners, simplified registration, and the ability to combine contributions from multiple employers or self-employment can accommodate fluctuating income without reducing rights to a residual program. Digital registration can help, but assisted and offline access remains necessary.

Make rights portable. Benefits and contribution records should move across employers and internal jurisdictions. For international migrants, equality of treatment, bilateral or multilateral social-security agreements, and mechanisms to aggregate contribution periods are needed so that mobility does not erase pension, health, maternity, employment-injury, or survivor rights (ILO, 2019b, 2024).

Integrate labor and care policy. Minimum wages, collective bargaining, safety enforcement, childcare, eldercare, paid leave, and maternity protection address different parts of the same livelihood system. Cash transfers cannot compensate for

unlimited working hours or an absent care service; care infrastructure alone cannot correct wage theft.

Build collective voice and enforceability. Rural unions, migrant associations, women's groups, cooperatives, legal-aid organizations, and local governments can help workers register, document violations, negotiate schedules, and reach dispersed farms. Grievance channels must be independent of recruiters and accessible without jeopardizing immigration status or future employment.

Table 5.4. Labor, care, authority, and social-protection diagnostic

Diagnostic question	Warning sign	Institution or policy response	Indicator of substantive change
Who performs additional farm work?	Women, older people, or children absorb peak labor without relief	Labor services, appropriate mechanization, school protection, and time-saving infrastructure	Total paid and unpaid hours by sex and age; school attendance in peak season
Who manages, owns, and controls revenue?	Female responsibility rises while titles, contracts, accounts, and sales remain male-controlled	Joint or individual rights, direct payment, representative producer groups, and household dialogue	Decision authority, asset rights, and income control not participation alone
How is care reorganized?	Care is silently transferred to girls or grandparents	Childcare, eldercare, health, water, energy, and transport services	Care hours, rest time, service access, and caregiver well-being
On what terms are workers hired?	Verbal contracts, opaque piece rates, recruitment debt, unsafe housing	Enforceable contracts, fair recruitment, wage floors, inspection, and joint liability	Net wage after fees, injuries, complaints resolved, and contract coverage
Does protection follow the worker?	Coverage ends with a season, move, or change of status	Universal floors, flexible contributions, portable records, and bilateral agreements	Effective coverage across jobs and places; benefit continuity after movement
Can youth acquire authority?	Long-term unpaid labor with delayed or discriminatory succession	Secure transfer, joint titles, rental access, skills, finance, and mentoring	Age and gender of rights holders; timing of transfer; viable chosen transitions

The guiding questions can now be answered directly. Greater female responsibility translates into authority only when work is accompanied by recognized rights, access to organizations and markets, and control over decisions and income; it is not an automatic consequence of male absence. Migration and commercialization redistribute paid and unpaid work through existing gender and generational norms, so gains in

earnings can coexist with intensified time poverty or delayed succession. Finally, the institutions most compatible with multi-activity livelihoods are those that attach rights to persons rather than to a single stable job: universal guarantees, adaptable insurance, portable benefits, enforceable labor standards, care services, and collective representation. These measures do more than cushion market change. They determine whether mobility and commercialization enlarge a household's range of choices or reproduce agricultural growth through the concealed transfer of risk and work to migrants, women, youth, and older people.

5.5 Territorial Strategies for Inclusive Livelihood Recomposition

Households do not diversify, migrate, or enter markets in a spatial vacuum. Their options are organized by the territory in which farms, settlements, secondary towns, transport corridors, labor markets, ecosystems, and public services are connected. A road changes a livelihood only through what it connects: a producer to a buyer, a worker to an employer, a patient to a clinic, or a child to a school. A town becomes developmentally important not because it has crossed an administrative population threshold, but because it concentrates demand, services, finance, processing, knowledge, and political authority that its hinterland can reach. The appropriate unit for policy is therefore often a **functional rural-urban territory** - a field of recurring movements of food, labor, money, care, water, waste, information, and public authority - rather than either the village or the city treated alone (OECD et al., 2016; HLPE-FSN, 2024).

This shift in scale changes the central policy question. The objective is not simply to increase mobility, marketable output, or the number of nonfarm enterprises. It is to make the recomposition of livelihoods more secure, voluntary, remunerative, and ecologically viable. Territorial development is inclusive when people with different land, labor, gender, generational, and migration positions can convert connectivity into capabilities; when gains circulate through local wages, demand, services, and reinvestment; and when those who bear transition costs possess enforceable rights and credible alternatives. Growth accompanied by dispossession, deteriorating work, excessive care burdens, or ecosystem depletion is not inclusive merely because aggregate production rises.

From household portfolios to functional territories

Territorial analysis begins by replacing the rural-urban binary with a continuum of sites and relations. A household may cultivate in one locality, trade in a market town, receive income from construction in a regional center, rely on care from relatives elsewhere, and purchase services through a digital platform headquartered abroad. Its livelihood is simultaneously rural in its resource base, urban in part of its demand and employment, and translocal in its organization. Administrative data commonly separate these activities, obscuring the way they are jointly managed. A functional-territory approach instead asks where each activity occurs, who controls the associated income or asset, how long and costly the journey is, and which institutions govern access.

Secondary towns and service centers can occupy a particularly consequential position. Panel evidence from Tanzania and cross-country comparisons suggests that rural nonfarm diversification and movement to secondary towns may produce broader poverty reduction than metropolitan migration because they are accessible to more poor people, even when the consumption gains of successful big-city migrants are larger (Christiaensen et al., 2013; Christiaensen & Todo, 2014). Research across Chile, Colombia, and Mexico similarly finds that small and medium urban centers may contribute to territorial growth and poverty reduction, but also warns that effects on inequality are variable and mechanisms are country-specific (Berdegué et al., 2015). Evidence from Ethiopia shows that distance to cities and city type shape farm prices and intensification, with weaker effects near secondary towns than near primate cities, illustrating that "urban demand" is not a uniform force (Vandercasteelen et al., 2018).

These findings support investment in the "missing middle," but not a universal secondary-town prescription. A town connected to its hinterland by affordable transport, competitive trading, services, and accountable government can widen opportunity. A town organized around a monopsonistic processor, land speculation, or politically allocated infrastructure may instead extract value and intensify exclusion. The relevant test is relational: who can reach the hub; at what monetary and time cost; to sell, buy, work, learn, or claim a public service; on what terms; and with what effect on people and ecosystems outside the hub?

Investments that create linked multipliers

A farm-nonfarm multiplier arises when an initial gain generates further demand and production rather than leaking quickly out of the territory. Higher and more stable farm income may increase expenditure on repairs, transport, food processing, construction, retail, and education. Local enterprises may purchase crops and labor, while their wages support other services. Processing can reduce perishability and move a larger share of post-farm value creation closer to producers. Yet none of these linkages is automatic. If equipment, inputs, skilled labor, ownership, and profits are external, a facility can raise gross territorial output while retaining little local value. If land prices rise faster than rural wages, connectivity can enrich asset owners while displacing tenants and informal users.

Territorial investments often depend on **complementary services and** institutions. Feeder roads require maintenance, safe and affordable transport, storage, market information, and competitive buying arrangements. Electricity becomes productive when firms can afford connections and equipment and when repair services and finance are available. Digital connectivity requires devices, literacy, language-appropriate services, consumer protection, and interoperable payment systems. Irrigation or cold chains require water and energy governance, technical capacity, and environmental safeguards. Education and health services expand the usable labor and enterprise capability of a territory, while childcare and water infrastructure release time otherwise absorbed by unpaid work. FAO's agroterritorial approach places connected towns, agro-industrial development, and infrastructure within a single food-system strategy; IFAD likewise argues that policy must fit distinct pathways and stages of rural transformation rather than reproduce one model everywhere (FAO, 2017; IFAD, 2016).

Sequencing matters. A diagnostic should identify the binding constraint for each group, not the most visible infrastructure deficit. A paved road cannot resolve exclusion from procurement rules; credit cannot compensate for an insecure tenancy that makes investment too risky; training cannot create a viable enterprise where power and logistics are unreliable. Conversely, building every component simultaneously is rarely feasible. An actionable package establishes a minimum viable set of complements, phases later investments against verified demand, and uses explicit "stop or redesign" triggers when benefits concentrate or environmental thresholds are approached.

Financing and maintenance are part of the causal mechanism. A capital project that local government cannot operate after donor or national funding ends is a temporary service, not durable territorial infrastructure. Appraisal should therefore combine construction cost with recurrent expenditure, staffing, tariff affordability, climate exposure, and a credible maintenance compact. Fiscal transfers can equalize the capacity of poorer jurisdictions, while user charges may fund upkeep only where they do not ration out low-income users. Publishing life-cycle costs and service standards

allows residents to distinguish ribbon-cutting from reliable provision. Territorial investment portfolios should also reserve resources for connective "soft" institutions - market inspection, extension, labor enforcement, dispute resolution, enterprise advice, and data systems - whose absence often makes a physical asset less usable for weaker actors.

Retaining value through processing, procurement, and clusters

Local processing, enterprise clusters, and public procurement can anchor demand and deepen linkages. Shared facilities - quality testing, cold storage, water treatment, packaging, repair workshops, wholesale space, or renewable energy - can lower fixed costs for small firms. Business associations and producer organizations can coordinate supply and training. Territorial agro-industry tools have potential to add value and employment, but their purposes and requirements differ; an industrial park, cluster, corridor, and geographical indication are not interchangeable instruments (Gálvez-Nogales & Webber, 2017). Cluster policy should therefore begin with actual product flows, capabilities, and environmental limits, not with a vacant industrial site.

Public purchasing by schools, hospitals, and other institutions can convert recurrent public expenditure into predictable territorial demand. Well-designed procurement may widen smallholder access, support diverse foods, and connect agricultural, nutrition, and local-employment objectives (FAO et al., 2021). Its inclusion effects depend on operational details: lot size, payment delay, delivery schedule, quality requirements, aggregation arrangements, and whether women, tenants, or remote producers can register. Preferences for local suppliers are ineffective if working-capital needs and late payment exclude them. Useful safeguards include smaller lots, transparent tender calendars, prompt-payment rules, proportionate standards, aggregation support, public disclosure of awards, and limits on dependence on a single public buyer.

"Local" should not become a closed-border doctrine. External trade can expand demand, introduce knowledge, and diversify risk. The objective is strategic articulation: retaining a fair share of value and decision-making capacity locally while using wider markets where they improve resilience and welfare. The indicator is not the fraction of all inputs sourced locally at any cost, but the **net** local wage bill, procurement, taxes, and reinvested surplus generated without degrading labor conditions, affordability, or ecosystems.

Mobility, protection, and a genuine option to remain

Inclusive territorial policy supports mobility without making migration the price of accessing a livelihood. Safe transport, fair recruitment, recognition of skills, affordable remittance channels, and portable health and social-security entitlements can improve the returns to movement. At the same time, investment in nearby services, decentralized employment, land and tenancy protection, and local enterprise creates a genuine option to remain or to circulate rather than migrate permanently under duress. The target is not to suppress movement but to expand the set of feasible choices.

This requires differentiated policy. Commercializing smallholders may need aggregation, storage, standards assistance, and working capital; constrained producers may need tenure protection, risk-sharing, extension, and social protection; landless and migrant workers need enforceable wages, occupational safety, freedom of association, and benefits that are not lost when jobs or locations change. Women's participation depends not only on training or credit but on land and asset rights, control over earnings, safe mobility, and care services. Youth require credible routes into ownership, skilled employment, enterprise, or further education. Households leaving farming need transition support rather than programs designed to keep every participant in low-return production. The FAO evidence base treats social protection and agricultural investment as complementary: transfers can protect consumption and relax constraints, while productive and territorial investments create opportunities through which protection can become capability (FAO, 2015; Correa et al., 2023). ILO standards add that coverage, adequacy, non-discrimination, and social dialogue matter alongside employment quantity (ILO, 2012, 2013a).

Rights must travel with investment. The Voluntary Guidelines on the Responsible Governance of Tenure provide a baseline for recognizing public, private, communal, customary, Indigenous, and informal tenure and for protecting vulnerable users (FAO, 2012). Prior mapping of primary and secondary claims, accessible grievance procedures, transparent compensation, and monitoring of post-project livelihood restoration are essential where corridors, processing zones, urban expansion, conservation, or energy projects change land use. Counting legally compensated owners alone will miss tenants, pastoralists, sharecroppers, workers, and people whose livelihood depends on common resources.

Governing the territorial interface

No single organization controls a functional territory. Local governments govern land use, markets, roads, waste, and many services; national agencies control standards, transfers, major infrastructure, and labor or competition law; producer organizations aggregate supply; worker organizations represent employment interests; firms invest and coordinate chains; customary and community institutions govern land, water, and social obligations. Territorial governance must therefore be polycentric but accountable. Its core tasks are to align sectoral budgets, negotiate trade-offs, disclose who gains and loses, and make decisions contestable.

A practical architecture has three levels. First, a representative territorial forum diagnoses flows and bottlenecks, with separate and supported representation for women, youth, tenants, migrants, landless workers, minority groups, and remote settlements. Second, a small delivery unit aligns public works, procurement, enterprise support, environmental management, and social protection, assigning named responsibilities and timelines. Third, an independent monitoring and grievance function publishes distributional and ecological results. Local knowledge is indispensable, but localism does not guarantee inclusion: external labor inspectorates, courts, competition authorities, and fiscal transfers can provide countervailing capacity where local elites dominate. Contemporary food-system assessments similarly emphasize multilevel and multi-actor governance across food, water, energy, land, and mobility systems (HLPE-FSN, 2024).

Measuring inclusive recomposition rather than output alone

Yield and gross value added reveal only part of the trajectory. A credible territorial dashboard combines five types of evidence. **Economic** measures include real net income, volatility, local wage and procurement shares, enterprise survival, and the distribution of value added. **Work and care** measures include annualized full-time-equivalent employment, earnings, informality, safety, hours, unpaid care, and seasonal underemployment. **Access and agency** measures include travel time and cost to markets and services, tenure security, control over income and assets, organizational voice, and freedom to move or remain. **Well-being** measures include food insecurity, diet quality, schooling, health access, debt stress, and subjective security. **Ecological** measures include water balance, soil condition, habitat, chemical risk, waste, and emissions.

Existing tools provide components rather than a single definitive index. The ILO decent-work framework prevents job counts from concealing poor wages or unsafe conditions; the Women's Empowerment in Agriculture Index distinguishes participation from decision authority and includes time allocation; and FAO's Tool for Agroecology Performance Evaluation joins economic, social, governance, health, nutrition, climate, and environmental criteria (ILO, 2013a; Alkire et al., 2013; FAO, 2019). All indicators should be disaggregated by sex, age, tenure, class or asset position,

ethnicity or caste where relevant, disability, migration status, and remoteness. Repeated measurement is essential because a road or processing investment may generate early income gains followed by land concentration, resource stress, or enterprise failure.

The standards for inference should be equally explicit. "Multiplier" claims require evidence of additional local transactions rather than gross sales; before-and-after change should be compared with plausible rival explanations; and displacement must include loss of access, work, housing, or care, not only physical eviction. An inclusive territorial strategy has succeeded when gains are broad and durable, entry remains open, labor and care burdens become fairer, mobility is safer and more voluntary, livelihood restoration accompanies unavoidable displacement, and natural-resource stocks remain capable of supporting future livelihoods. That is a more demanding test than growth, but it is the test that connects markets and mobility to just agrarian futures.

Table 5.5. Territorial levers, causal pathways, distributional risks, and indicators

Territorial lever	Intended causal pathway	Main distributional or ecological risk	Priority indicators
Feeder roads and transport services	Lower travel time and spoilage; connect farms, workers, and services	Land-value capture, unsafe transport, bypassing remote settlements, accelerated extraction	Door-to-market time / cost by group; farm-gate-retail spread; crash rate; land rental / price change; remote-settlement access
Electricity, digital access, storage, and cold chain	Enable processing, information, payments, longer selling windows, and enterprise entry	Unaffordable connections, platform lock-in, energy or water stress, concentration in larger firms	Connection and use by firm / household type; downtime; storage loss; digital-price gap; energy / water intensity
Secondary-town service and market hubs	Concentrate demand, finance, health, education, repair, and public administration within reachable distance	Hub-centered inequality, rent inflation, congestion, exclusion of informal traders	Service travel time; rents; enterprise starts / survival; poverty and income change by hinterland zone; informal-vendor access
Local processing and enterprise clusters	Capture post-farm value; create wage work and demand for inputs and services	Enclave ownership, monopsony, low-quality jobs, pollution, displacement	Local procurement and wage shares; net value retained; buyer concentration; job quality; effluent / waste; tenure losses
Public food procurement	Provide predictable demand; link production, diets, and public spending	Large contracts, late payment, political allocation, supplier dependence	Smallholder / women / youth supplier share; payment days; tender concentration; product diversity; delivered cost and quality

Territorial lever	Intended causal pathway	Main distributional or ecological risk	Priority indicators
Skills, finance, health, childcare, and social protection	Relax linked entry and risk constraints; sustain labor and enterprise capability	Capture by better-connected groups; debt stress; exclusion through documentation	Participation and completion by group; credit cost / default; care hours; benefit coverage / adequacy; income and asset change
Territorial institutions and organizations	Coordinate investments, resolve conflict, aggregate voice, monitor distribution	Elite capture, unfunded mandates, meeting burdens, weak enforcement	Representation and speaking share; grievance resolution; budget execution; audit disclosure; member / worker benefit incidence
Land, water, and ecosystem governance	Protect livelihood bases and prevent investment from externalizing costs	Dispossession, loss of secondary rights, depletion, pollution	Rights recorded by type; displacement / livelihood restoration; water balance; soil condition; habitat; exposure to pollutants

Practical chapter output: Livelihood Recomposition Map and Policy Matrix

The two instruments below translate the chapter's argument into a repeatable case diagnostic. Complete them with a clearly stated reference period, ideally one full agricultural year; record differences among social groups rather than a single "average household"; and mark each entry with its evidence source and confidence. Update the map after a major market, migration, policy, or climate shock.

Part A: Fillable Livelihood Recomposition Map

Case header: Territory/case: _____ | Functional boundary and reason: _____ | Reference year/seasons: _____ | Comparison period: _____ | Groups disaggregated: _____

Table 5.6. Livelihood Recomposition Map (fillable)

Mapping layer	What to record	Case entry (fillable)	Evidence and confidence
Actors and positions	Farming households by trajectory; tenants; landless workers; traders; processors; transporters; employers; migrants; care providers; producer / labor organizations; public agencies	_____	Source: _____ Confidence: H / M / L

Mapping layer	What to record	Case entry (fillable)	Evidence and confidence
Seasonal income portfolio	For each group and season: farm sales, own consumption, agricultural wages, nonfarm wages, enterprise income, transfers, remittances; gross and net value; controller of income	_____	Source: _____ Confidence: H / M / L
Labor and care calendar	Paid / unpaid hours by person, task, season, and place; peak bottlenecks; substitution after migration; childcare, eldercare, water / fuel collection	_____	Source: _____ Confidence: H / M / L
Origin-destination flows	Goods, people, money, information, and care moving among plots / commons, village, service hub, secondary town, city, and international destination; frequency, cost, direction, and decision-maker	_____	Source: _____ Confidence: H / M / L
Market relations	Buyers / suppliers, contracts, grades, prices, payment delay, credit, logistics, digital platforms, bargaining and exit options; net farm-gate return	_____	Source: _____ Confidence: H / M / L
Mobility relations	Migration form / duration / status, recruiter / employer, travel and documentation cost, wages, remittance channel, return pattern, portability of benefits, exposure to coercion	_____	Source: _____ Confidence: H / M / L
Territorial capabilities	Roads / transport, power, connectivity, water, storage, finance, skills, health, education, childcare, social protection; effective travel time, price, reliability, and eligibility	_____	Source: _____ Confidence: H / M / L
Shocks and transmission	Seasonal price or employment shock, buyer failure, border restriction, illness, climate event, conflict, service outage; first exposure, coping action, onward effects	_____	Source: _____ Confidence: H / M / L
Group-specific barriers	Constraint, affected group, mechanism, intersection with tenure / gender / age / ethnicity / disability / remoteness, responsible institution	_____	Source: _____ Confidence: H / M / L

Mapping layer	What to record	Case entry (fillable)	Evidence and confidence
Outcomes and feedbacks	Income stability, food security, debt, assets, agency, job quality, care burden, migration choice, land access, local value retention, ecological condition; direction and distribution	_____	Source: _____ Confidence: H / M / L

Flow sketch (complete for the case):

[Plots / commons] ⇄ [Household and village] ⇄ [service hub / secondary town] ⇄ [city / migration destination]

Above the arrows, record **food, inputs, labor, money, knowledge, and care**; below them, record the **price, time, risk, rule, and actor controlling each flow**. Mark broken or one-sided links and identify who cannot use them.

Part B: Differentiated Territorial Policy Matrix

Table 5.7. Matched interventions, safeguards, accountability, and redesign triggers

Diagnostic position or barrier	Matched policy bundle	Safeguard against exclusion or harm	Lead and accountable partners	Outcome, distributional indicator, and redesign trigger
Commercializing smallholders with unreliable market access	Feeder transport; storage / cold chain; aggregation; market information; working capital; standards assistance; competitive procurement	Publish fees / prices; smaller procurement lots; prompt payment; open membership; monitor buyer concentration	Local government + roads / market agency; producer organizations; competition authority	Net farm-gate return and volatility by farm scale / sex; **redesign if** fees or late payment erase price gains
Constrained smallholders and tenants	Tenure / rental protection; extension; risk finance; shared equipment; climate services; social protection; accessible grievance system	Eligibility not tied only to formal title; recognize secondary / customary rights; cap collateral exposure	Land administration + agriculture / social-protection agencies; customary bodies; legal aid	Investment, food security, debt, and retained land access; **redesign if** arrears, distress sales, or exclusion rise

Diagnostic position or barrier	Matched policy bundle	Safeguard against exclusion or harm	Lead and accountable partners	Outcome, distributional indicator, and redesign trigger
Landless, casual, and migrant workers	Wage and safety enforcement; transparent recruitment; worker organization; portable benefits; transport / housing standards; skills and placement	Firewall labor complaints from immigration enforcement where lawful; multilingual channels; joint liability in subcontracting chains	Labor ministry / inspectorate + local government; unions; employer bodies; social-security agency	Real earnings, injury, contract coverage, benefit portability; **redesign if** informality or recruitment debt rises
Women and people constrained by unpaid care	Child / elder care; water and energy services; safe transport; joint asset registration; direct payment and accounts; leadership support	Track control, not nominal receipt; meeting times and locations compatible with care and safety; confidential grievance routes	Local / social-service agencies + women's organizations; producer bodies; finance providers	Paid / unpaid hours, income control, asset rights, voice; **redesign if** workload rises without authority or earnings
Youth, new entrants, and successors	Vocational and business skills; apprenticeships; land-rental facilitation; start-up / lease finance; digital and repair services	Transparent selection; staged finance; avoid debt-only packages; include nonfarm and exit pathways	Education / labor / agriculture agencies + firms; youth groups; finance institutions	Durable employment / enterprise survival and asset control; **redesign if** placement is unpaid, temporary, or debt-stressed
Migrant-sending and translocal households	Affordable remittance channels; financial advice; remote land / contract services; return recognition of skills; portable health / social protection; care support	Protect nonmigrant decision rights; avoid compulsory "productive" remittance use; monitor recruitment and transfer fees	Migration / labor / social-security agencies + local government; regulated providers; migrant associations	Remittance cost, consumption stability, investment, care burden, voluntary return; **redesign if** fees, coercion, or care deficits rise

Diagnostic position or barrier	Matched policy bundle	Safeguard against exclusion or harm	Lead and accountable partners	Outcome, distributional indicator, and redesign trigger
Local processors, traders, and service microenterprises	Reliable power / water; shared facilities; waste treatment; business services; supplier finance; cluster and procurement links	Environmental permits; open access to facilities; anti-monopoly rules; disclosure of public support; worker protections	Local government + enterprise / environment agencies; chambers / cooperatives; utilities	Local procurement / wage share, survival, job quality, pollution; **redesign if** subsidies create an enclave or environmental breach
Remote, Indigenous, pastoral, or comm ons-dependent groups	Mobile / decentralized services; connectivity tailored to movement; recognition of collective and seasonal rights; negotiated corridor access; ecosystem co-governance	Free, prior, and informed consent where applicable; map seasonal / secondary rights; accessible compensation and appeals	Relevant public authorities + representative customary / community institutions; rights bodies	Travel cost, service use, resource access, conflict, ecological condition; **redesign if** access loss or conflict increases
Households choosing or forced to leave farming	Skills recognition; transition income; housing and service access; job placement; pension and health coverage; debt / land-sale advice	Voluntary participation; independent counseling; prevent predatory acquisition; retain return and inheritance options where possible	Social-protection/l abor / housing agencies + local government; legal aid; worker organizations	Employment quality, housing security, debt, subjective security; **redesign if** exit becomes displacement or homelessness

Conclusion: From Connected Livelihoods to Just Territorial Change

Markets and mobility do not simply add opportunities to a rural household. They reorganize the household and its relations. Reliable marketing depends on infrastructures, services, rules, organizations, and credible alternatives, not on physical proximity alone. Standards and contracts can coordinate higher-value exchange while depositing compliance, rejection, and debt risks on producers with the weakest buffers. Cooperatives and digital platforms improve bargaining only when they perform costly functions, remain accountable, and widen rather than close outside options.

Nonfarm activity is likewise neither an automatic route out of poverty nor evidence that agriculture has become irrelevant. Higher-return wage work and enterprise can stabilize consumption, finance farming, and create mobility. Low-return diversification can instead reveal land pressure, underemployment, and fragmented labor. The difference lies in entry assets, territorial opportunity, seasonal fit, rights, and who controls the return. Migration can provide liquidity, knowledge, and autonomy while creating absence, recruitment debt, care deficits, and exposure to distant shocks. Its balance cannot be read from the remittance total alone.

Across these processes, responsibility is frequently redistributed without authority. Women may manage farms without acquiring land or income control; older people and girls may absorb care; youth may supply labor while waiting for inheritance; migrant and casual workers may carry occupational risk without social protection. A just account therefore measures ownership, decision power, time, employment quality, and remedy alongside income and output.

Territorial policy provides the necessary scale of response. Farms, towns, processing enterprises, service centers, labor markets, transport corridors, social protection, and ecosystems operate as connected systems. Investments produce inclusive multipliers when they lower coordinated bottlenecks, support locally rooted enterprises and organizations, improve employment quality, protect secondary rights, and retain enough value to finance local services. They produce displacement-led growth when land, contracts, platforms, or infrastructure increase turnover while weakening the capacity of less powerful residents to remain, move safely, or share in benefit.

The practical implication is to govern **portfolios and connections**, not a model household. Policy must be differentiated but coordinated: fair market rules and storage for sellers; labor rights and portable protection for workers and migrants; finance and skills for viable enterprise; care and public services for those sustaining translocal livelihoods; tenure protection and transition support for households under pressure; and ecological safeguards for the territories on which all activities depend. Monitoring must follow net returns, variance, assets, debt, time, control, job quality, food security, displacement, and ecological condition by social group.

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