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Importance of Land Tenure for Agricultural Development

A Review

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INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

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ABSTRACT

A growing body of research on land tenure shows that tenure security is critical to various development outcomes. Research has also shown complex interactions between tenure and a range of outcomes. In a systematic review of 176 empirical papers encompassing 212 country case studies in Sub-Saharan Africa and South Asia, we synthesize evidence regarding the effects of land tenure on long and short-term technology adoption, productivity, income, climate resilience, food and nutrition security, women's empowerment, migration and livelihood diversification, and conflict in areas with agriculture, pastoralism, and forestry land uses.

Our review shows clear positive patterns between land tenure security and technology adoption, especially for long-term investments. The evidence is also largely positive for productivity, income and food security, and women's empowerment, but there were several negative effects, highlighting the importance of context and nuances of tenure arrangements. Fewer studies addressed migration/ livelihood diversification and conflict. Of those that do, the majority of cases, especially in agriculture land use cases, showed positive effects, but negative links to tenure in some cases points to the need for greater attention, especially for pastoralist land uses.

Among the subset of 66 cases examining tenure-related reforms or interventions (mostly certification/titling, concentrated heavily in Ethiopia), the strongest positive outcomes again appear for long-term technology adoption and productivity in agriculture. Pastoral interventions show both strong positive and strong negative outcomes, especially where demarcation or enclosure fragmented grazing land, increased conflict, and reduced climate resilience through loss of mobility. Less than half of interventions were gender-sensitive; gender-blind interventions were more likely to have negative outcomes for women.

Land tenure is not a panacea, but it is a foundational enabling condition—one that must be tailored to each livelihood system and governance context. Land titling interventions show potential to increase investment, productivity, and incomes in crop production systems, but should be aware of potential negative consequences for certain groups and with presence of other customary systems, especially in contexts with multiple land uses. Instead of individualized titles or subdivision, tenure security in pastoral areas should prioritize mechanisms that allow mobility, negotiated access, and collective governance. Collective tenure is most effective for common pool resources, especially where mobility or accessing different ecological niches is important for livelihoods, or coordinated management is needed to sustain the resource base.

Keywords: Land rights, tenure, technology adoption, productivity, resilience, conflict

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INTRODUCTION

A growing body of research provides evidence that tenure security over land and associated natural resources is critical to a number of development outcomes, especially related to long-term investment that can contribute to agricultural productivity and incomes, maintaining or improving the natural resource base, resilience to climate change, and empowerment of rights holders (Deininger & Goyal, 2024; Holland et al., 2022; Masuda et al., 2022; R. Meinzen-Dick et al., 2019; Tseng et al., 2020). But the research also shows that, as tenure is complex and context-dependent, the interactions between tenure and these outcomes are not straightforward (R. Meinzen-Dick et al., 2025). For example, securing tenure for one group can weaken the rights of others; interventions that secure tenure for men have often disempowered women, whereas gender-intentional interventions can contribute to women's empowerment and a range of other outcomes related to poverty reduction (R. Meinzen-Dick et al., 2019).

An important starting point is to understand what is meant by "tenure" and "tenure security". While there are many aspects to tenure, the concept broadly refers to the institutional relationships, defined through law or custom, with respect to natural resources, which determine who can use the resources, for how long, and under what conditions (FAO, 2002). Key dimensions often relate to the bundles of rights held (especially rights to manage and to sell or bequeath), whether rights derive from statutory or customary authority, whether rights are documented, who is named on the documents, and whether rights are held by individuals, households, or larger groups. Tenure security refers to the likelihood that the resource holder's rights will be upheld, which can include external assurance as well as the rights holders' confidence in their tenure (Arnot et al., 2011; Sjaastad & Bromley, 2000). But the empirical literature uses a wide range of measures and indicators for tenure. Some variation in measures is appropriate, given the wide variety of contexts and research questions, but this variation complicates efforts to synthesize across studies. In particular, certification and other indicators based on content of rights do not necessarily translate into security of tenure, as discussed below (L. Meinzen-Dick et al., 2026).

The literature on tenure identifies its importance for agricultural development as providing authority and incentives to invest in the resource, and may also provide access to collateral for investment (Besley, 1995; Chigbu, 2021; Deininger & Goyal, 2024; R. Meinzen-Dick & Di Gregorio, 2004). Incentives may come from the assurance that the land will not be taken away (security) as well as the ability to realize the benefits of investment when selling or renting out the land, i.e. transfer rights (Besley, 1995). In a systematic review on the adoption of climate-smart agricultural (CSA) practices, Li et al. (2024) find that land tenure security has a consistent positive effect on adoption. We would expect to see a stronger effect of tenure security on long-term investments than on short-term investments that provide returns in a shorter period (Knox et al., 2002; R. Meinzen-Dick & Di Gregorio, 2004; Ruzzante et al., 2021). However, in some cases, investment in the land—such as planting trees or clearing forests—is done in order to secure rights (Place, 2009).

Investment in the resources may, in turn increase productivity and incomes, improve quality of the resource base, providing climate resilience (Descheemaeker et al., 2016). While size and quality of land holding can directly influence agricultural production and incomes, there is less likelihood that the type of tenure will affect these outcomes except as mediated by investment. One exception relates to land rental, where sharecropping can affect productivity, and land rental markets can affect the incomes of both renters and lessors (Deininger et al., 2017; R. Meinzen-Dick et al., 2025).

Land rights are also associated with empowerment, especially of women (Agarwal, 1994; Deere & León, 2001; Grown et al., 2005). As land is one of the most important assets, control over land is a key component of agency-enhancing resources (Kabeer, 1999; Seymour et al., 2024). Land rights can increase bargaining power within the household by improving fallback options (Deere & Doss, 2006; Panda & Agarwal, 2005). At the community and higher levels, land rights are often the basis for access to

government services (R. Meinzen-Dick et al., 2019). But as with investment, the relationship is not unidirectional: those with more power in society are often more able to secure their rights over land.

Tenure can affect food security and nutrition through two main pathways. First, by providing for agricultural production and income, land rights can contribute to food security. Second, when women's land rights strengthen their bargaining power within the household, they take greater roles in decision-making and control over income, and may spend more on food and medical care for the household, especially children, improving food security and nutrition (R. Meinzen-Dick et al., 2019).

Migration and livelihoods are closely linked. This is most clearly seen in pastoralist societies, where migration to access grazing lands is essential for pastoral production systems (Robinson & Flintan, 2022). Agrarian societies are undergoing structural transformations, with widespread migration and diversification of livelihoods. This can be both voluntary migration for better jobs in new places, and distress migration when existing livelihoods are no longer sufficient. Tenure intersects with all of these issues. Where tenure systems provide security, agricultural production, and incomes, they reduce the need for distress migration and may even encourage reverse migration from the cities. Tenure in pastoralist systems focuses on access to resources, which may vary over space and time, rather than rigid boundaries that are sought in many urban and agricultural lands.

Competing land claims are a cause of conflict. The divergent land uses and perceptions of land rights between farmers and herders is a particular source of conflict (Adams et al., 2023). Thus, secure and clearly defined rights can reduce conflict. Conversely, attempts to reform property rights can also exacerbate conflicts, especially if not rooted in a clear understanding of existing tenure arrangements—both statutory and customary.

Thus, tenure has both direct and indirect effects on a range of development outcomes, as indicated in Figure 1. While the effects on investment are relatively direct, the effects on productivity[1] and incomes come largely from investments in the land. Empowerment can be both a direct outcome of tenure arrangements as well as come from control over income. Food security and nutritional outcomes are indirect, mediated by productivity, incomes, and women's empowerment. The links between tenure and conflict are often direct but can be mediated by investments and empowerment. In our review we focus on effects of type and strength of tenure, not holding size alone.

While many of these linkages have been identified based on theory and at least some empirical studies, examining the strength of these linkages between tenure and outcomes and how widespread or consistent they are is important to guide policy and interventions related to tenure. We also note that relationships between tenure and many of these issues are complex, with possible bi-directional linkages. While not illustrated on this figure, we discuss some of the reverse linkages between certain "outcomes" and tenure.

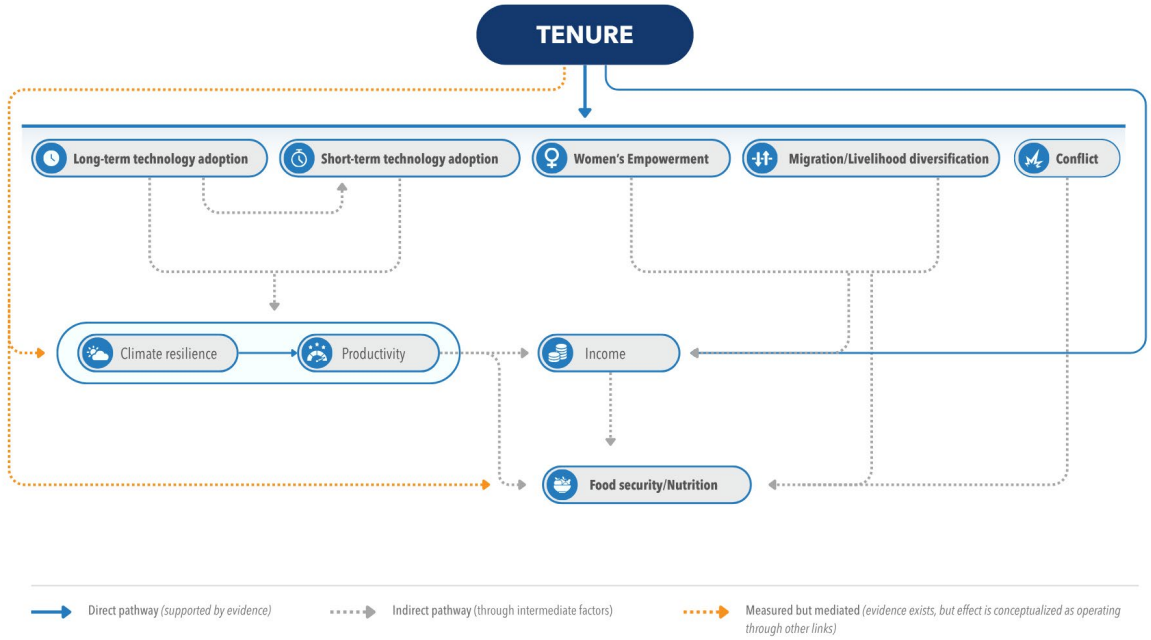
This review explores the relationship between land rights and outcomes related to technology adoption, productivity, incomes, climate resilience, women's empowerment, food security and nutrition, migration or livelihood diversification, and conflict. We do this through a systematic review of the evidence from Africa South of the Sahara and South Asia. Our review covers 212 cases of empirical analysis of the effects of tenure on our range of outcomes from 176 publications between 2000 and 2025.

The following section of this paper discusses the methodology for our review. In presenting the results we first discuss the types of empirical studies to identify the evidence map, noting the high concentration in a few countries, especially Ethiopia, Kenya, Malawi and Ghana, which may skew the overall findings. We also discuss the diverse indicators of tenure across the studies, and the challenges of synthesizing across

[1] While agricultural productivity can be defined to include pastoral and forest production, there are also cases where there are tradeoffs between crop production and output of pastoral or forest systems. This, to avoid confusion, we use the broader term "productivity" in general.

these different types and measures of tenure. We then discuss the evidence on links between tenure and our outcomes of interest—first across all cases, and then in the subset of 66 cases that involve some form of tenure-related intervention. The discussion section looks at the outcome pathways, relationships between intervention types and outcomes, and provides an overall summary.

Figure 1: Conceptual linkages between tenure and development outcomes



We find robust evidence that tenure contributes to adoption of long-term technologies and investments and climate resilience in agricultural, pastoral, and forest production systems, and income in agricultural and forest systems, though not necessarily in pastoral systems, where many interventions to secure tenure have reduced vital mobility. The picture is overall positive, but more mixed for other outcomes. The results for the 66 cases with interventions follow a similar pattern, although with a higher proportion of null or inconclusive results in agricultural systems, showing the difficulty of achieving demonstrable results within the time frame of most evaluations. The cases of reforms in pastoral and agro-pastoral systems show more negative outcomes, indicating the difficulties of appropriate tenure reforms in these complex production systems. The conclusions discuss implications of these findings for policy, programs, and further research.

METHODS

Identifying papers

We conducted a review from Google Scholar and Web of Science in September 2025, using search terms related to tenure, to agriculture (broadly defined to include pastoralism), and to the range of outcomes or impacts identified above (see Appendix 1 for the full list of search terms). We supplemented these with references from review papers, notably Gender Innovation Lab (2024) and Meinzen-Dick et al. (2019).

The criteria for inclusion or exclusion were:

- Published 2000 onwards (capturing 25 years of research).
- Limited to Africa South of the Sahara and South Asia[2].
- Excludes studies that are exclusively about urban areas, mining, marine, or intellectual property rights.
- Includes studies that look at the type of tenure; excludes those that only deal with size of area owned or cultivated.
- Excludes studies that only examine factors affecting tenure type, women's land rights, or uptake of programs without examining the links between tenure and outcomes of interest.
- Includes both qualitative and quantitative studies; quantitative studies with less than 100 observations were excluded, as those with small sample sizes are less likely to have external validity or show statistical significance (Fenske, 2011).

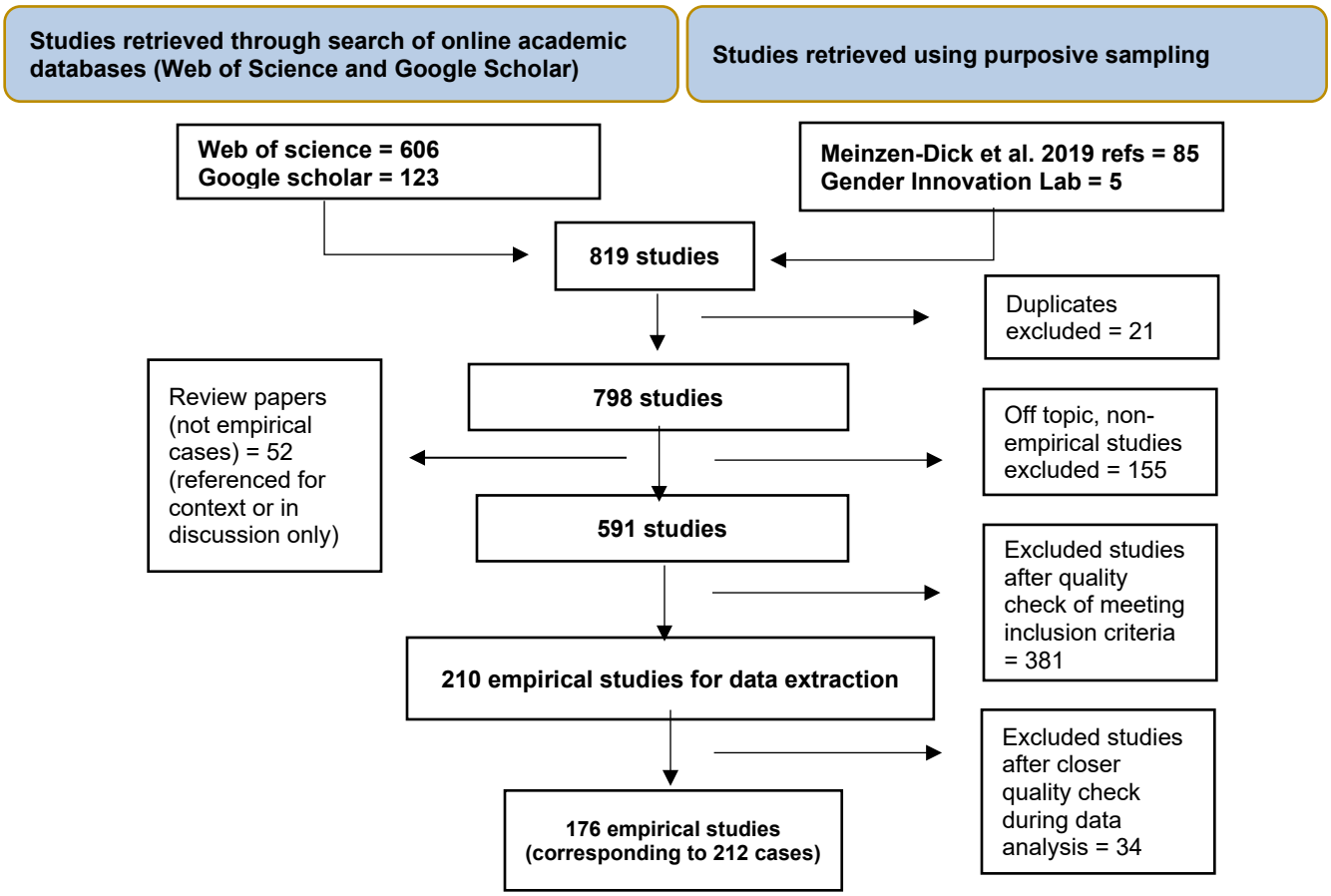
Additional screening criteria focused on whether the publication presented primary empirical results on tenure security and outcomes. Other papers which review the evidence from other papers, but do not provide primary empirical analysis are used to refine the analytic framework and for discussion of our findings but are not included in our formal analysis or final count of cases. Both coauthors screened the papers and discussed any ambiguous cases.

The search results are summarized in Figure 2. Web of Science identified 606 publications, and Google Scholar identified 123 publications in the 2000–2025 timeframe. The Meinzen-Dick et al. (2019) paper had 85 references after 2000, and the Gender Innovation Lab studies had five studies, for a total of 819 studies. Of these, 21 were duplicates, leaving 798 unique studies. Applying the exclusion criteria over several rounds of screening (including by title, by geography, by abstract, by method, etc.) led to 210 studies that were originally included in the database, with variables and summaries extracted and generated for each. Each coauthor made a final round of checks and screenings of the database populated with the studies, which led to exclusion of 34 studies that initially appeared to fit the inclusion criteria but upon further examination met one or more of the exclusion criteria.

Within each study (publication), if there were multiple countries, each was treated as a separate case, except for one paper that analyzed Southern African Development Community (SADC) countries collectively. This gives 212 cases, which are our primary unit of analysis.

[2] Note: we used the following regions instead of the list of individual countries due to character limitations in the search engine: *Central Africa; Sub-Saharan Africa; East Africa; West Africa; Southern Africa; South Asia*. The search with regional search words found articles about individual countries within the region.

Figure 2: Screening diagram from search to final case selection



Analytic methods

For papers that meet the selection criteria, we created an Excel file with variables that capture key aspects of the case, including type of study, measures of land rights, outcomes measured, type of intervention and costs of intervention (where available), and outcomes reported (including productivity, incomes, technology adoption, climate resilience, women's empowerment, any other gender differentiated outcomes, nutrition, food security, and any unanticipated outcomes. The spreadsheet also includes variables for key contextual factors.

To analyze such a large number of cases in a systematic way, we engaged in an iterative process with artificial intelligence (AI). The first step was to identify an appropriate tool that would read the entirety of each paper but only summarize from that paper, to minimize hallucinations. We compared the output of several packages, including Google Notebook LM, Microsoft Copilot, SciSpace, and ChatGPT, and selected Google Notebook LM after verifying that it considers only the papers at hand (including multi-notebook independence), can handle large volumes of data/ prompts (affordably), and minimizes hallucinations.

The next step was to refine the prompts to capture the key aspects for our analysis. We tested the accuracy of the output by comparing the AI generated summary for papers we had already coded by hand or knew well. This iterative exercise led to refining both the AI prompts and our thought processes of what

variables need to be included and what is missing. Initial rounds summarized five papers per Notebook, using a prompt-by-prompt approach, which were manually checked against the summaries in the paper and particularly checking the methods (to verify, in particular, whether there was some form of causal analysis) and manually corrected, where necessary, before being added to the master spreadsheet. We then tried 10+ papers at a time (per Notebook), but the accuracy of the AI summaries fell; we ultimately found that it could summarize seven papers per Notebook with accuracy. The master spreadsheet containing the information was read again by both authors, going back to original articles where something was unclear and correcting the spreadsheet if need be, as well as adding contextual/explanatory notes columns in various tabs. As mentioned above, during this process of analysis, we excluded a number of additional papers based on our criteria upon further screening. For example, studies that were found to use land size as the only indicator of tenure were flagged and excluded at this stage.

The Excel sheet created provided both summary statements and basic descriptive statistics, e.g., of the number of cases with each type of outcome, and whether the outcomes were positive, negative, or null. All assessments of outcome type made by Google Notebook LM were cross checked by the authors. Cases with "technology adoption" include a range of farm and natural resource management practices and land-related investments. These were manually reviewed to distinguish between short-term and long-term technologies or practices, because there is a stronger rationale for why tenure would affect long-term technologies that represent investments in the land. The AI coding of women's empowerment included many sex-disaggregated outcomes that might be considered benefits (or disbenefits) for women, but were not related to empowerment (Johnson et al., 2018). We therefore manually distinguished between these. Because of the complexity of tenure, indicators of tenure, and intervention types (Arnot et al., 2011; R. Meinzen-Dick et al., 2025; Sjaastad & Bromley, 2000), we manually coded these variables. Further cleaning and cross-checks between different tabs in the Excel sheet was done manually to ensure harmonization of the number and order of cases in each row, ensuring they correspond correctly. We used Microsoft 365 Copilot[3] for further analysis of the Excel database and to generate some visualizations, again with manual cross-checks.

[3] Institutional paid version of Microsoft Copilot primarily using authors' files rather than web-based.

RESULTS

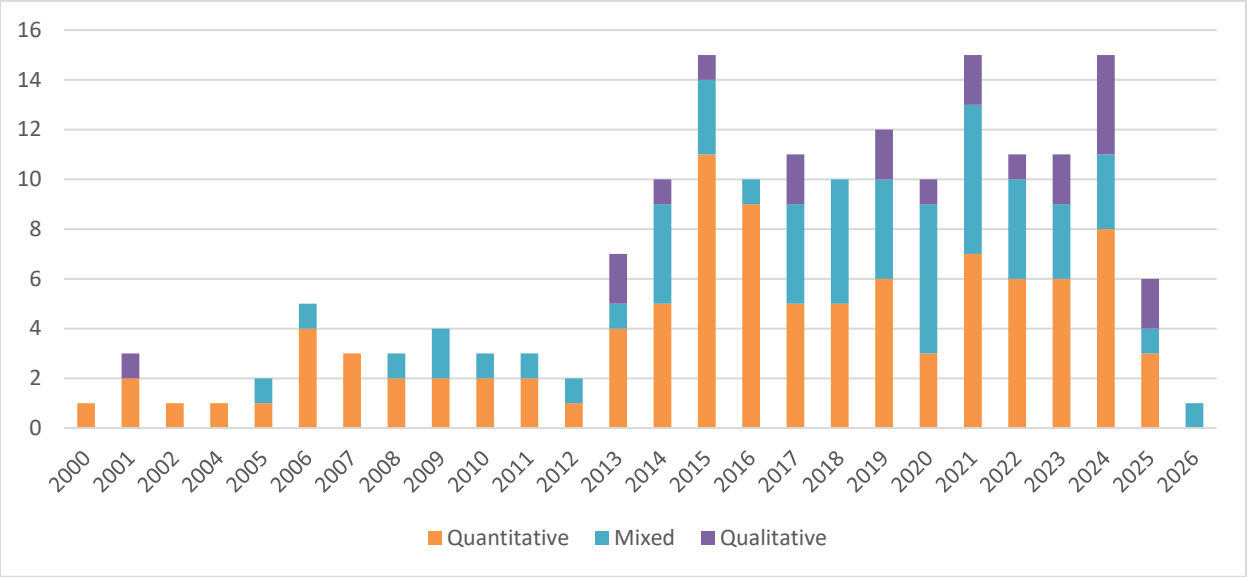
In this section we first provide a descriptive overview of the empirical studies in terms of their coverage and methods, followed by a presentation and discussion of the findings.

Evidence map

Growth in publications

Results show a marked increase in publications per year between 2012 and 2013 (Figure 3). This may reflect renewed interest in land tenure in the wake of waves of large-scale land acquisitions around 2009 (Cotula, 2013; De Schutter, 2009). Although there is a drop-off from 2024 to 2025, this may reflect the screening being done in October, when not all publications were out or listed in Google Scholar or Web of Science.[4]

Figure 3: Number of publications per year (total = 176)



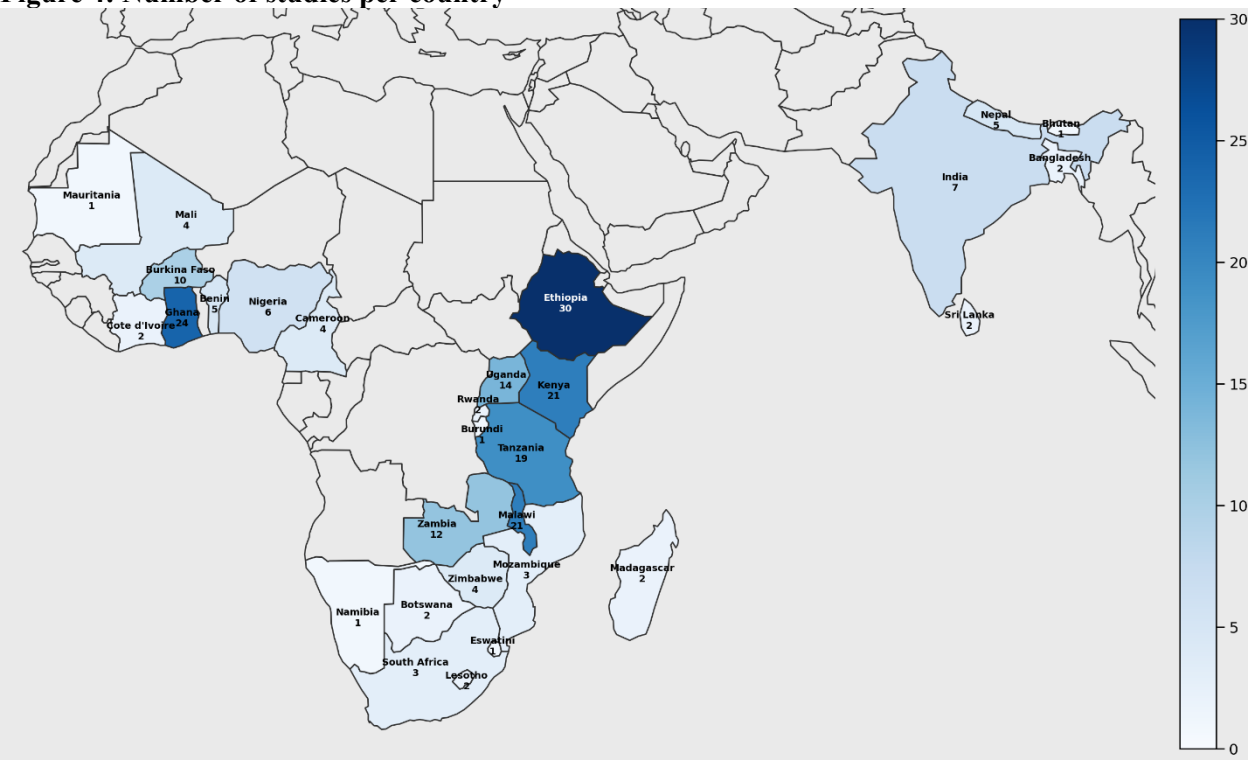
Study countries and methods

While the growth of empirical research on the effects of land tenure is encouraging, the cases remain concentrated in certain countries (Figure 4). The largest number of cases are from East Africa (87), especially Ethiopia (30), followed by Kenya (21). West and Central Africa[5] has 56 cases, with the largest number in Ghana (24). Southern Africa has 52 cases, with 21 in Malawi (Appendix 2). There are only 17 cases from South Asia, which is approximately half as many cases as from Ethiopia alone. This concentration in certain countries needs to be remembered when thinking about the generalizability of findings, especially findings about land tenure interventions, which are even more concentrated in certain countries.

[4] Note: 2026 publication was accepted/ first online 2025 but appearing in a 2026 volume.
[5] Cameroon is the only Central African country with cases, so for regional analysis we group it with West Africa.

Methodologically, there were a total of 25 qualitative cases, 131 quantitative cases, and 56 with mixed methods (qualitative and quantitative) (Appendix 3). Of the quantitative cases, 51 used some form of causal identification.

Figure 4: Number of studies per country



Production systems

Examining the distribution of cases by production system (Table 1, Appendix 4) we see that the great majority (195) address agricultural production in fields (sometimes including agroforestry or agropastoralism). There are 34 with pastoral production systems (which sometimes also include agropastoralism), 37 cases dealing with forestry (which sometimes also includes agroforestry), and 25 others, including irrigation, wetlands, and protected areas (which always also include agriculture, forestry, and/or pastoralism). Note that 79 cases involve more than one type of production or land use. There are major differences between the uses of land and forms of tenure between agriculture, forestry, and pastoralism. In particular, much agricultural land is operated by households, and land use and management rights are held at the individual or household level, although in many customary systems the allocation rights are held collectively by the lineage or other social unit. But in many pastoral and forest areas, the land is operated by some form of group, and management and allocation rights are likely to be held collectively. Further, pastoral production systems that rely on mobility to take advantage of variable water and fodder resources have often adapted flexible boundaries and tenure arrangements, in contrast to fixed boundaries often found in crop lands. We therefore examine outcomes of tenure, and tenure reforms, separately for each system. Although we originally intended to include fisheries and aquaculture, there were not enough cases, so these production systems are excluded.

Table 1: Number of studies, by production system and region

Region	Production System				Total cases
	Agriculture	Pastoralism	Forestry	Other	
West and Central Africa	55	3	12	7	56
East Africa	81	18	11	10	87
Southern Africa	45	10	9	6	52
South Asia	14	3	5	2	17
Total	**195**	**34**	**37**	**25**	**212**

Note: A study case may consider multiple production systems or land use types.

Tenure indicators

While all empirical cases in our final dataset examine relationships between tenure and the outcomes of interest, the specific indicators of tenure vary widely. To some extent this reflects the variety of tenure types being studied: the relevant variables in a customary tenure system that is being formalized would be different from those in an area where almost all land is documented. A study looking at gender differences in land rights might look at differences between land that is registered jointly between spouses compared to that registered in the name of either the husband or wife. A study looking at the adoption of a specific CSA practice may be examining specifically the differences between owners vs. renters. However, the selection of indicators also reflects the perspectives of the researcher. In many cases, what is referred to as "tenure security" is actually measured by a specific form of documentation, or holding specific bundles of rights, which the researchers identify as being important for security.

Already in 2011, Arnot et al. identified a wide range of indicators of tenure in their review of 38 studies (including several studies that did not define their tenure indicators), noting the importance of distinguishing between the assurance of rights and the content of rights (Arnot et al., 2011; Sjaastad & Bromley, 2000). In his meta-analysis of tenure-investment studies in six African countries, Fenske (2011) examined the effects of four different tenure measures: perceived (in)security, mode of acquisition, title or registration, and transfer rights. In classifying the tenure indicators in our studies, we used a combination of inductive and deductive coding, starting with the broad categories of assurance and content of rights, and categories within each of these that have been defined by others. Additional categories were added if tenure indicators from the studies did not fit with one of these categories. Many studies had multiple indicators or fall into multiple categories.

Assurance of rights is difficult to measure empirically, because we do not know what challenges might emerge and how well particular rights would withstand those challenges. In this category we group perceived tenure security (as reported by respondents) along with knowledge of rights, evidence of susceptibility to expropriation, and whether there are conflicts over the land which reduce assurance (used as an indicator of tenure, not as the outcome).

Table 2 shows there were 34 cases that used perceived tenure security (see also Appendix 5). Many other publications that said they were measuring "tenure security" actually used documentation, or reported ownership as opposed to rental, or reported ownership as opposed to customary tenure. In fact, these are not the same (L. Meinzen-Dick et al., 2026), so we classified them according to what was actually measured, not the indicator label used in the study. Knowledge of rights was used in two cases. Susceptibility to expropriation was used in eight cases, though the sources of vulnerability ranged from risks of expropriation by the state (for large-scale land acquisitions or land reforms), community

members, or family. Seven cases incorporated conflicts over land in the tenure indicators to explain other outcomes.[6] Notably, all measures of assurance were from Africa; all South Asian cases used content-related indicators.

Table 2: Types of tenure indicators used in empirical cases

Tenure Indicator	Africa South of Sahara	South Asia	TOTAL
Assurance of rights			
Perceived security	34	0	**34**
Knowledge of rights	2	0	**2**
Susceptibility to expropriation	8	0	**8**
Conflict	7	0	**7**
Content of rights			
Ownership	41	5	**46**
Type of tenure	52	1	**53**
Mode of acquisition	31	0	**31**
Bundles of rights	30	2	**32**
Documentation (registration)	74	3	**77**
Demarcation, (not full documentation)	7	1	**8**
Size of holding (area or # plots)	7	2	**9**
Duration of rights	11	0	**11**
Individual/Collective (e.g., community)	26	1	**27**
Individual/Joint (household)	13	6	**19**
Matrilineal/Patrilineal	8	0	**8**

An even wider range of indicators fall under the content of rights. The first category is "ownership" of land (usually self-reported), used in 46 cases. Some authors explicitly distinguished ownership from rental or landlessness; in other cases, it was not clear what ownership was distinguished from. Type of tenure, used in 53 cases, depended on the relevant categories in the country, but often distinguished between customary tenure and other forms.

Mode of acquisition of land (whether by purchase, inheritance, allocation by chiefs or the state, rental, or other means) was found in 31 cases. The specific bundles of rights held, especially transfer rights, were used as tenure indicators in 32 cases. Holding documentation of rights was the most common indicator (77 cases), ranging from full titles to individual or collective certification, and even documentation of paying taxes on the land. Eight cases used demarcation of lands, which is often a step toward documentation, but does not necessarily include documentation. Although we excluded cases that only looked at size of holdings, nine cases included the area owned or cultivated or number of plots as an additional indicator. Eleven cases included duration of rights, either how long the respondent had held the land (where that increased security) or the duration of leases or state-issued land permits. There were 27 cases that compared collective (community or group) with individual land rights. Studies concerned with gender differences in tenure often included indicators of whether the land was held individually or jointly in the household (19 cases, including six in South Asia) or patrilineal vs matrilineal inheritance systems

[6] Conflict is also an outcome studied in other cases, but these studies used indicators related to land disputes to explain other outcomes.

(seven cases from Malawi, one from Ghana). The latter is relevant because approximately 15% of Africans are from societies that traditionally practice matrilineal descent (L. Meinzen-Dick & Zavale, 2025). While studies involving pastoralism tended to look at individual versus collective community control, all intrahousehold indicators (individual/joint and matrilineal/patrilineal) were applied only to agricultural land.

Synthesizing across all these tenure types and indicators is precarious. For quantitative analysis, we take the form of tenure that the study explicitly or implicitly hypothesizes as being stronger, more complete, or more secure. We balance this by giving examples in the text that specify the type of tenure, to show some of the key nuances in tenure.

Tenure reforms

A subset of the cases (66) examine some type of tenure-related reform, either qualitatively or quantitatively, often using some form of causal inference. While there is a wide range of types of reforms and variations in what is included, Table 3 shows that the largest number (24 cases) study some type of land certification or registration at the individual or household level in agricultural land use cases. Note, however, that half of those cases are from Ethiopia. Hence, statements about whether certification leads to certain outputs are likely to be heavily influenced by the Ethiopian experience. Not all registration is full titling; only nine of the cases involve titling on at least a pilot basis (in Ghana, Ethiopia, Kenya, Rwanda, Tanzania, and Madagascar). Five cases studied certification at the community level. Seven cases involved land demarcation, which might or might not lead to certification. Six cases involved allocating land to or reallocating it from larger farmers. Six intervention cases involved irrigation systems, which allocated land with specific tenure rules. In eight cases, the intervention focused on administrative or governance reforms, such as decentralizing land registration bodies. Appendix 6 shows this breakdown

The reforms to pastoral, forest, and other land uses are more varied (Appendix 6). 11 cases examine pastoral tenure reforms. While two Ethiopian cases involve certification of large land areas and one in Kenya includes a conservation partnership, all of the rest involve enclosures, privatization, or individualization of collective tenure which no longer allows pastoralists to move in response to changes in fodder availability.

There are fewer cases of tenure reforms related to forestry: three of community forestry, plus implementation of the Forest Rights Act in India, which involves both community forestry and registration of individual forest lands. Interestingly, in Cameroon, the reforms require forest clearing to establish ownership—the reverse of many forest reforms that require maintaining tree cover (Ordway et al., 2017).

Finally, there are a number of other types of reforms, from urban zoning to land leasing to land consolidation, and large-scale land acquisitions for companies. These may have implications for different types of land use, as discussed below.

Across all types of interventions, less than half (32 of 66) of the studies report that there was any form of gender-sensitive intervention components. However, 14 of those were from Ethiopia's first stage land certification program, which was explicitly designed to enhance gender equality and the bargaining power of women. In Ethiopia, land certificates were issued jointly in the husband's and wife's names in most regions, with their photographs attached, or in the names of female heads of households. Land administration committees (LACs) were required to have at least one female member (Ayalew et al., 2021; Bezabih et al., 2016; Holden et al., 2011; Kumar & Quisumbing, 2015; Persha et al., 2017; Tesfaye et al., 2023).

Table 3: Types of agriculture-focused tenure interventions studied

Region/County	Certification Household	Certification Community	Demarcation/ Certification	Land (Re) Allocation	Irrigation	Admin/ Governance Reforms
West and Central Africa	**3**	**0**	**2**	**3**	**3**	**3**
Benin			2	1	1	
Burkina Faso	1					2
Cameroon						
Côte d'Ivoire						
Ghana	1			1	1	
Mali				1	1	1
Mauritania						
Nigeria	1					
East Africa	**19**	**4**	**4**	**1**	**1**	**4**
Burundi						
Ethiopia	12	3	1			
Kenya	3	1	2			
Rwanda	1					
Tanzania	1			1	1	
Uganda	2		1			4
Southern Africa	**1**	**1**	**1**	**2**	**2**	**1**
Botswana						
Eswatini						
Lesotho						
Madagascar	1					
Malawi						
Mozambique		1	1	1	1	1
Namibia						
South Africa						
Zambia						
Zimbabwe				1	1	
SADC Countries (consolidated)						
South Asia	**1**	**0**	**0**	**1**	**0**	**0**
Bangladesh						
Bhutan						
India	1			1		
Nepal						
Sri Lanka						
TOTAL	**24**	**5**	**7**	**7**	**6**	**8**

Overall, the major gender-sensitive provisions of interventions included requiring titles or certificates to include women's names; reducing fees for registering land in women's names; requiring spousal consent to any land transfers; reforms to family or inheritance law to strengthen women's land rights (Kumar & Quisumbing, 2015; Mishra & Sam, 2016); transferring land directly to women (Coulibaly et al., 2021; Santos et al., 2014); "allowing", "encouraging", or requiring inclusion of women on land and resource

management committees; and outreach or legal literacy campaigns to increase awareness of women's land rights (Zamchiya & Musa, 2023a).

However, many cases note that interventions did not include any gender-sensitive provisions, often with negative consequences (as discussed below). Even when there were formal provisions for women's land rights, they were not always implemented. For example, in Tanzania despite a legal framework of the certification program supporting women's equal rights to property, prohibiting gender discrimination, with the presumption that marital property is co-registered, customary traditions continued to discriminate against women, limiting their de facto land rights (Visser et al., 2024).

Outcomes covered

Table 4 presents the outcomes that studies measured in relation to land tenure.[7] Many studies are coded for both agriculture and pastoralism or agriculture and forest. Some studies coded as forest involve forest–agriculture mosaics, forest access tied to pastoral mobility, forest livelihoods linked to charcoal, non-timber forest products (NTFPs), or beekeeping. Studies coded as pastoralism often also involve agricultural production.

The largest number of cases address technology adoption:.112 cases involving long-term investments such as tree planting, mechanization, CSA, and other natural resource management practices which may contribute to climate resilience, and 31 cases covering a range of shorter-term practices such as use of chemical fertilizers or pesticides. Technology adoption may contribute to productivity, income, or other benefits, but only 69 cases had explicit measures of productivity; 59 measured income effects related to tenure; 49 measured climate resilience outcomes, and 38 measured food security outcomes.

A total of 40 cases measured something related to women's empowerment such as decision-making, intrahousehold bargaining, participation or leadership in community groups. There were also 51 cases that provided some form of sex disaggregation of other outcomes, mostly technology adoption, but also a few cases of income, labor allocation, food security, or children's schooling. Migration or livelihood diversification were covered in 52 cases and conflict in 47 cases; both of these outcomes had a relatively high number of cases from forestry and pastoralism, rather than agricultural production.

[7] Note that one case may cover multiple outcomes, but we only include outcomes that the study identifies as related to land tenure, not all outcomes measured in the study. For example, if income is calculated, but not analyzed in relation to land tenure, it is kept as NA–as consequently there would be no 'positive' 'negative' or 'inconclusive' effects on income to report in relation to land tenure security or change in tenure regime.

Table 4: Outcomes by region and land use type

Land use → Outcome ↓	Africa South of the Sahara			South Asia			Total cases
	Agriculture	Pastoralism	Forest	Agriculture	Pastoralism	Forest	
Long-term technology adoption	108	12	21	1	0	0	**112**
Short-term technology adoption	29	0	2	2	0	1	**31**
Productivity	63	11	5	2	0	1	**69**
Income	49	10	4	2	2	3	**59**
Climate resilience	42	10	7	3	0	0	**49**
Food security / nutrition	28	5	3	8	0	1	**38**
Women's empowerment	33	6	5	5	1	1	**40**
Sex-disaggregated outcomes	47	5	8	3	1	1	**51**
Migration / livelihood diversification	44	18	8	1	0	1	**52**
Conflict	41	16	11	0	1	1	**47**
Total cases	**185** (139 agriculture-only)	**30**	**32**	**14** (12 agriculture-only)	**3**	**4**	**212**

Note: Because one case may cover multiple outcomes and multiple land uses, the total cases column shows the number of cases, not the sum of the row.

Association between land tenure and selected outcomes

We classify the associations between land tenure security (as measured by each paper) and the various development outcomes considered into categories of Positive, Mixed, Negative, No effect or inconclusive, and Not measured.

- **Positive:** The primary land tenure indicator (as measured by the study) is associated with an improvement in the outcome. This is usually an increase (e.g., higher investment, productivity, climate resilience, income, food security, or women's empowerment), but lower conflict is seen as positive, and classification of migration/livelihood diversification depends on what is seen as beneficial in each study context. Some studies find that secure tenure (or its proxies) is associated with improvement, while other studies found insecure tenure associated with worsening of those outcomes, suggesting that with more secure tenure, improvements can be realized. For simplicity, both scenarios are coded as "Positive", to indicate a positive direction for the outcome with land tenure security. However, in the discussion we note where many positive findings are actually double negatives, e.g. that women have less secure tenure and this contributes to negative outcomes.

- **Negative:** An inverse relationship where secure land tenure is associated with a decline or worsening of the outcome. In some cases, specific forms of tenure are associated with worsening of the outcome, such as joint ownership being associated with lower decision-making power.
- **Mixed:** A result that may be positive for specific groups and negative for others, such as land titling leading to security for married women, or conversion to leasehold allowing elite women to own land but dispossessing poor women who rely on customary rights as in Chitonge et al. (2017)).
- **No effect or inconclusive:** The study found no significant relationship or the effect was not clear.
- **Not measured:** The outcome was not measured or analyzed in relation to land tenure in the study.

We also note that some effects are observed/causal, and other expected outcomes/ based on perception or intention, such as willingness to adopt, or outcomes of participatory scenario building exercises with farmers (e.g., (Senda et al., 2020)).

Because of the differences between agricultural, forestry, and pastoral production systems, after reporting the main trends in the full sample, we examine these relationships separately for each type of land use. We also split the analysis by continent, distinguishing between cases in Africa South of the Sahara and cases in South Asia. We begin by reviewing the full set of cases for each production system, then turn to the subset of cases studying land tenure reform interventions.

In our discussion, we give proportionately more attention to the negative cases than to the positive ones because, by challenging our hypotheses that improved tenure leads to positive outcomes, they often reveal complexities of tenure or the limitations of the way tenure is measured, or of how interventions have been designed and implemented.

Relationships across all cases

Table 5 gives a summary of outcomes across all cases. The strongest overall evidence is that secure tenure promotes adoption of long-term technologies and investments; 84% of the 112 cases that examined this found positive associations. Fewer cases (31) examine short-term technology adoption, and there are more negative associations (4 cases, or 13%, compared to 3% for long-term technologies). Fewer cases trace this through to productivity, incomes, climate resilience, food security and nutrition, or women's empowerment, though the preponderance of evidence is of a positive relationship between tenure security and these outcomes for cases that study them. A total of 51 cases disaggregate various outcomes to see whether men and women both benefit from secure tenure; slightly over half of those (28 cases) found a positive association; 9 cases report negative associations for women and 9 had mixed findings. Although the majority of cases studying effects on migration or livelihoods found positive outcomes, the proportion of negative or mixed results was highest for these outcomes (39% for migration, and 32% for conflict).

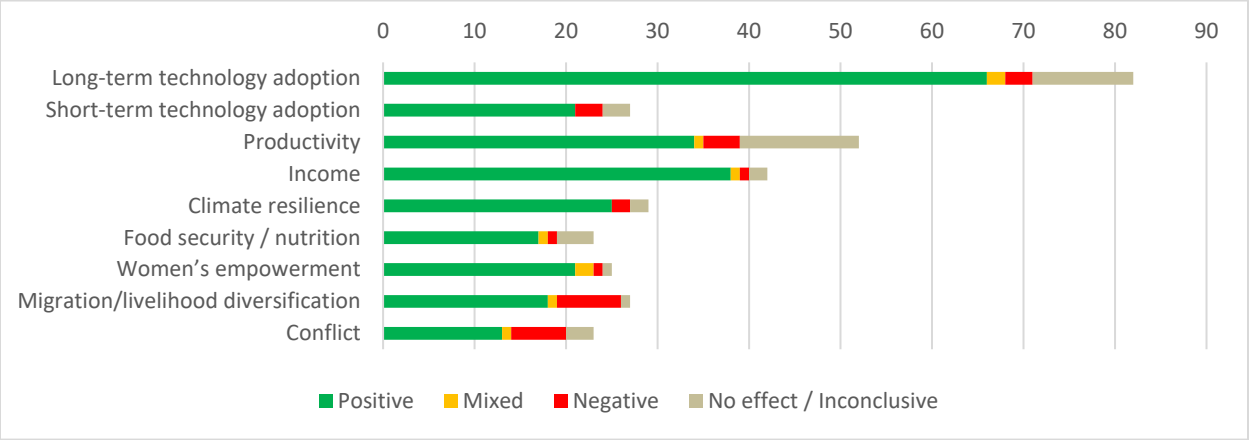
Because the types and functions of tenure differ greatly across contexts, it can be very misleading to aggregate outcomes across this set of over 200 cases, with very different tenure systems and ways of measuring tenure. At a minimum it is necessary to disaggregate by production system and context. Therefore, in Figure 5 (and Appendix 7) we look in more detail at these outcomes for agricultural, pastoral, and forest systems in Africa and in Figure 6 for agriculture in South Asia. This reveals some differences in outcomes, as well as the distribution of studies, indicating gaps—and potential biases—in the data on different outcomes. In particular, the data are concentrated on agricultural production systems in Africa South of the Sahara, with a high concentration of positive outcomes for long-term technology adoption, and fewer studies tracing impacts through to other outcomes.

Table 5: Summary of outcomes across all cases

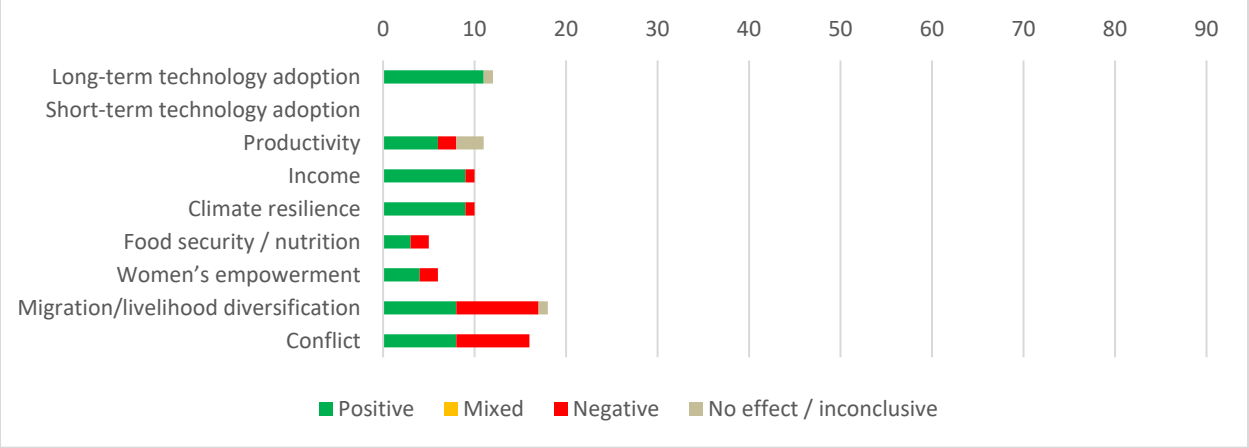
Outcome	Positive	Mixed	Negative	No effect / Inconclusive	Not measured	Total number of cases
Long-term technology adoption	94	3	3	12	100	212
Short-term technology adoption	24	0	4	3	181	212
Productivity	46	1	6	16	143	212
Income	52	2	3	2	153	212
Climate resilience	44	0	3	2	163	212
Food security / nutrition	29	1	3	5	174	212
Women's empowerment	33	2	3	2	172	212
Sex-disaggregated outcomes	28	9	9	5	161	212
Migration / livelihood diversification	30	3	17	2	160	212
Conflict	29	1	14	3	165	212

Figure 5: Association between land tenure and outcomes in Africa South of the Sahara, by production system

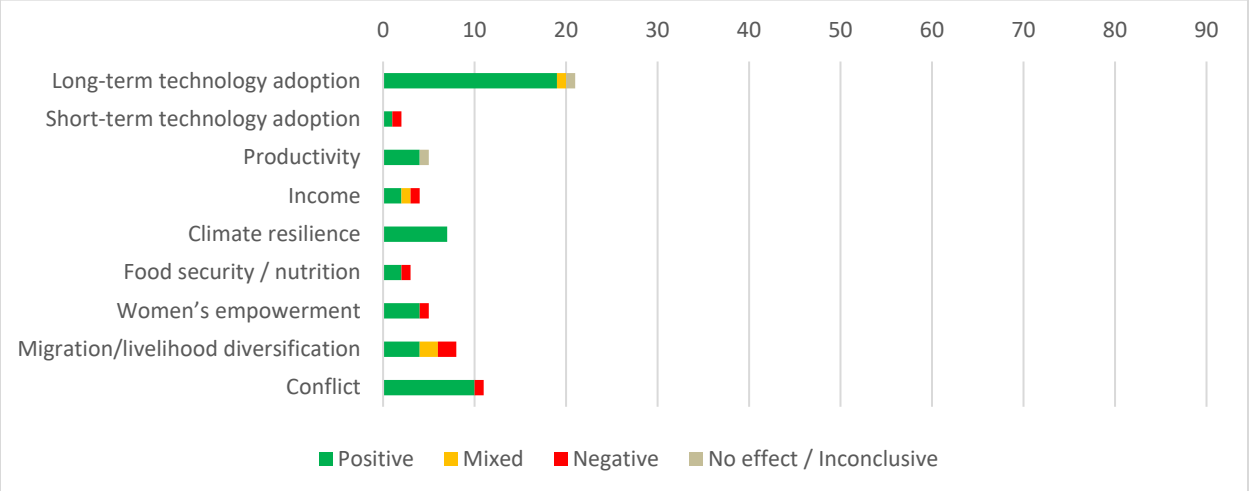
5a. Agriculture. (139 cases; excludes cases with agriculture plus other land uses)



5b. Pastoralism (30 cases)



5c. Forestry (32 cases)



Africa South of the Sahara

Agriculture

Our review shows clear positive patterns between tenure security and development outcomes for cases with agricultural land uses (Figure 5a). The strongest evidence is for long-term technology adoption such as planting trees (Goldstein et al., 2018; Toth et al., 2017), soil and water conservation, crop rotation or other practices classified as "climate-smart" (Chepkoech et al., 2023; Tambo & Mockshell, 2018; Teklewold, 2023a; Tione et al., 2022) or "sustainable" (Mangole et al., 2025; T. F. Maré et al., 2022; Nkansah-Dwamena, 2021b). Conversely, Wahab et al. (2020) found that in Ghana, rented plots face nutrient mining as short-term leaseholders prioritize immediate yield maximization over long-term soil sustainability. The effects of tenure can differ, even within the same case, depending on the type of technology. In Malawi, tenants are significantly less likely to adopt long-term, soil-fertility-enhancing technologies on their rented-in plots compared to their own owner-operated plots because they cannot capture the delayed returns of these investments under short-term tenancy arrangements. However, tenants apply short-term technologies like inorganic fertilizer and herbicides at similar rates on both their rented-in plots and their owner-cultivated plots (Ricker-Gilbert et al., 2019). Similarly in Ghana, farmers with secure rights from long occupancy adopted long-term strategies like agroforestry, while those with less security adopted short-term strategies (Akugre et al., 2022), accounting for some of the negative relationships between tenure security and short-term technology adoption.

Looking at details of tenure is important: in Ethiopia, Malawi, Tanzania, and Nigeria, adoption of CSA practices was most likely when plot management rights (to make farming decisions) overlapped with economic rights (control over the harvest) (Teklewold, 2023a). This suggests that, especially for women, it is not enough to have formal property rights, but to also ensure they have control over the agricultural output.

Some of the negative and inconclusive cases reflect reverse relationships between investment and tenure security, where investment, especially in tree planting, can enhance tenure security, as found in Burkina Faso (Brasselle et al., 2002), Cote d'Ivoire (Bros et al., 2019), Ghana (Awanyo, 2009), or Malawi (Benjamin, 2020). In Cameroon, deforestation was higher on land that was not titled because laws incentivize visible signs of use, including tree clearing (Ordway et al., 2017). Chepkoech et al. (2023) find that Kenyan tenants with less secure tenure were more likely than owners to adopt adaptation strategies like manure, crop rotation, and sowing date changes to maintain their farm income to be able to pay rents. In Uganda, households were 3 percentage points less likely to adopt certain Sustainable Land and Water Management (SLWM) practices on owned plots, despite having secure land rights, potentially due to lacking incentives and resources for those particular practices (Mangole et al., 2025). Thus, tenure is an important condition for long-term investment but is not necessarily sufficient.

While fewer cases trace tenure-related outcomes through to productivity, incomes, climate resilience, and food security, the evidence there is also largely positive. Séogo & Zahonogo (2023) find that formal land rights significantly increased cereal yields in Burkina Faso by increasing investment in manure and chemical fertilizers. In Kenya, titled farmers used more fertilizer and tractors and had higher yields (Owoo & Boakye-Yiadom, 2015). Across five countries, Tambo and Mockshell (2018) find that those with more secure tenure adopt more of the package of CSA practices, leading to higher incomes.

Only 23 agricultural cases tested links between tenure and food security. While most found a positive relationship, in Ghana the shift to individualized tenure, which secured tenure for male heads of households, led to increased cashew planting, depriving women and younger generations of land for food crops.

The majority of the 25 cases addressing women's empowerment found a positive association between more secure tenure and some form of empowerment. The most common association (noted in 15 cases)

was with decision-making; a further four cases mentioned the associated concept of bargaining power; four cases mentioned some form of collective agency; four mentioned economic empowerment; and two related to intimate partner violence or sexual harassment. But note that six of these positive associations were actually double negatives—that women's insecurity of tenure contributed to lower bargaining power, constrained economic outcomes, or increased sexual harassment. The four negative cases were related to processes of formalization or dispossession processes that reduced women's economic empowerment. The mixed case (Chitonge et al., 2017) was similarly about formalization allowing elite women to own land, but dispossessing poor local women.

Buabeng et al. (2024) find a positive relationship between sole land ownership and women's decision-making power regarding farm operations in Ghana, while Poulin and Pierrotti (2025) find that joint titling in Uganda increases women's bargaining power and reduces the fear of land grabbing or expulsion in the event of widowhood. In Benin, formalization had a positive effect on widows' ability to stay in their village and on women's decision-making power (Botea et al., 2026). Bezabieh et al.(Bezabih et al., 2016) find that in Ethiopia, land certification had a positive and significant effect on plot-level productivity, particularly for female-headed households. Land registration in Ghana had no impact on agricultural productivity but positively impacted women's non-farm business profits and encouraged diversification into non-farm activities (Agyei-Holmes et al., 2020).

Malawi is particularly noted for studies of the interaction between matrilineal and patrilineal tenure. Toth et al. (2017) found stronger incentives for men to plant trees in patrilineal areas, but Pircher et al. (2013) found where matrilineal systems shifted to patrilineal land systems, lack of land ownership deterred women, who are typically responsible for legumes, from investing labor to improve soil quality and fertility. Manja et al. (2025) report households under a matrilineal land holding regime are less likely to commercialize than patrilineal households. Women's land rights (in matrilineal systems) are likely to enhance land investments and improve household welfare only if they are supported by intrahousehold cooperation. Commercialization improves food security for matrilineal households if there is more women's bargaining power.

In many cases, there were positive trends for migration and livelihood diversification. For example, tenure security reduced distress migration in Mali (Coulibaly et al., 2021). However, this outcome, along with conflicts, had the highest proportion of negative outcomes of tenure, often in cases where tenure systems were changing. In Zambia, conversion of customary land to leasehold lead to displacement and migration of locals, as only 4% of (resource rich) farmers were able to obtain titles, leading to loss of customary land and weakening traditional authority (Chitonge et al., 2017). It also exacerbated conflicts and dispossessed local women from their previous customary tenure.

The 14 cases with positive association between tenure security and conflict reduction include both double negatives (where tenure insecurity is a major driver for conflict in many cases and thus, security is expected to reduce conflict), as well as cases where tenure security indeed reduced conflicts and disputes. Negative examples are often associated with some change that increases tenure for some, and reduces customary rights of others, as with expansion of cashew cultivation in Ghana leading to individualization of customary land, which increased conflict over land, inheritance, and gender/ inter-generational inequalities in land access (Evans et al., 2015). Privatization, which is often conflated with tenure security, exacerbated conflicts and dispossessed local women and youth from their previous customary tenure (Drew & Knutsson, 2025; Greiner et al., 2013; Greiner, 2017). Strengthening rights for farmers in Kenya and Tanzania was associated with conflicts with pastoralists (Cinderby et al., 2024).

Inconclusive/no effect cases where tenure security was not a statistically significant determinant of outcomes may have reflected low statistical power, or tenure (in)security was not the binding constraint, and other factors at play.

Pastoralism

In African cases with pastoral land use (often including some agriculture), positive associations with tenure security appear especially for long-term technology adoption (11 positive), income (nine positive vs. one negative), and climate resilience (nine positive vs. one negative) (Figure 5b). Many pastoral settings benefit from clearer grazing rights, stronger customary tenure, or improved governance arrangements. Some of the "positive" cases are double negatives, where lack of secure tenure limits investment or income opportunities. However, Djenontin et al. (2022) found that in Malawi, land restoration was most likely where plots were consolidated and secure. Resilience is inferred through measures such as adoption of drought-tolerant practices, herd diversification, and access to dry-season grazing, rather than direct climate resilience indicators, which are often found in cases where agriculture is also a land use and agropastoralism is practiced. However, Descgeenaejer et al. (2016) note that broader systems-level impact studies are needed to assess climate resilience in agropastoral or pastoral systems.

Few studies directly measure food security in pastoral settings, and those that do show both positive and negative outcomes, linked to reduced grazing access and shrinking herds. Pastoralists with shrinking herd sizes related wanting to move into cropping to ensure food security, thus seeking individual land certification to secure tenure for cropping (Senda et al., 2022).

Only six pastoral cases addressed women's empowerment. Four gave an overall positive picture on women's participation in meetings, but men still dominate the decision-making; two cases reported a negative effect on women's empowerment, where formalization and individualization of tenure had negative effects on women (Drew & Knutsson, 2025).

The data also shows important risks, especially related to migration/ livelihood diversification (nearly equal positive and negative counts) and conflict (an even split of positive and negative cases). This reflects a core nuance in pastoral tenure systems. Strengthening individual or group rights can improve investment and stability, but simultaneously increase conflict or reduce mobility that is important for pastoralist production, especially when boundaries become enforced or when competing claims (farmers vs. pastoralists) intensify (L. V. Basupi et al., 2017). Securing individual tenure is at the expense of collective rights, which are often important for migration or critical seasonal access for herds. Negative cases often highlight reduced mobility, increased land pressure, or sedentarization.

Forestry

In African cases with forestry as a land use, Figure 5c shows positive directions dominate, where secure tenure leads to long-term technology adoption (19 positive, one mixed, no negative), climate resilience (seven positive, no negative), and conflict reduction (10 positive, one negative). In many forest-tenure studies, authors focus strongly on governance or environmental outcomes, while socio-economic outcomes (such as resilience, migration, welfare, food security) remain unstated.

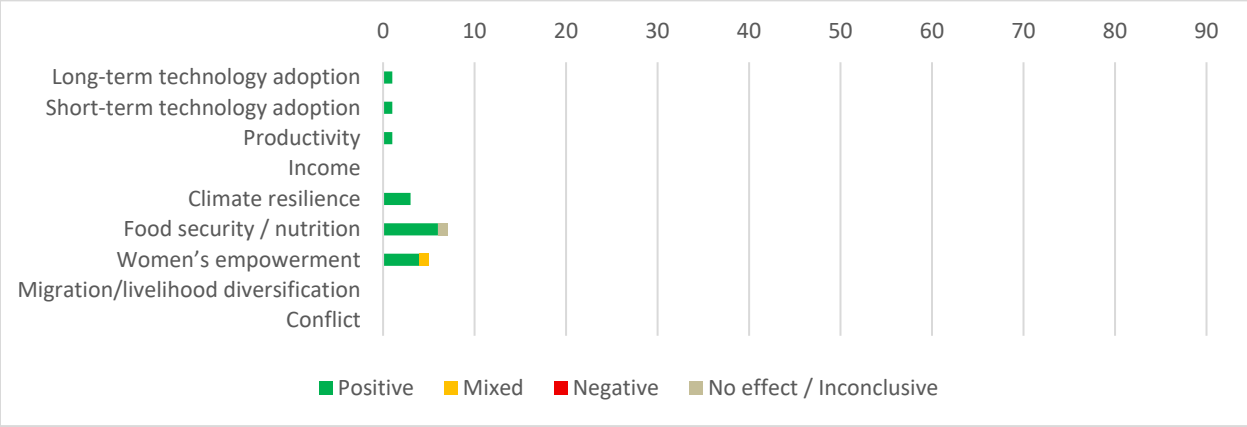
Numerous studies document that forest tenure clarity, community forest rights, and stronger governance institutions increase investment, collective action, and long-term stewardship, leading to more adoption of improved forest or agroforestry practices and enhanced resilience. We see an overall positive relationship between formalization of customary group rights and women's empowerment in four cases, with emphasis on collective agency.

However, some outcomes show balanced or negative signals—especially for migration and women's empowerment. For livelihood diversification, the few negative effects often related to restrictions on forest access or loss of flexible livelihood strategies for land-poor households. In Ghana's forestry areas, women's access to land is lowered when customary systems are replaced with commercial tenure, especially due to lack of affordability (Asaaga & Hirons, 2019).

South Asia

Only 12 South Asian cases focus on agriculture as the sole land use, and even fewer on pastoralism (three cases) and forestry (five cases). In agricultural settings, outcomes focus on food security and women's empowerment, with few cases focusing on adoption, resilience, and productivity, and none on income, migration, or conflict (Figure 6).

Figure 6: Association between land tenure and outcomes in South Asian agriculture (12 cases)



Food security shows positive evidence: across Bangladesh, Nepal, and Sri Lanka, land ownership contributed to a reduction in household food, nutrition, and health vulnerability, while helping households build climate resilience (Bandara et al. 2024). In Nepal, children of women who own land were less likely to be severely underweight (Allendorf, 2007). Women's empowerment shows four positive but also one mixed outcome: land ownership significantly increased women's productive workload and reduced their leisure time, acting as a penalty not observed for men (Khed & Krishna, 2023).

With only a handful of pastoralist- and forest-related studies in South Asia, we cannot support generalizations. These cases are often mosaics of landscapes, with pastoralism cases also including forestry, and few outcomes measured in relation to land tenure. Forestry cases show mostly positive effects on income. Secure land rights over common lands significantly increased tree cover and reduced encroachment-related conflicts (Hughes et al., 2024). In Indian tribal villages, lack of land rights and titles negatively impacts agricultural investment, productivity, and food security, particularly for tribal farmers who mostly lack secured land rights owing to slow implementation of the Forest Rights Act (Reddy et al., 2020).

Relationships in intervention studies

The full set of cases establish that tenure security contributes to a range of development outcomes, or that problems with tenure limit these outcomes. The next key question is what can be done to strengthen tenure, especially for women or groups who are most tenure insecure. For that, we turn to the subset of studies evaluating or examining interventions. These cases are mostly in Africa (Appendix 8), with only six of the 66 interventions studied in South Asia. Most intervention cases include measures on long-term technology adoption (32), with few (five) measuring short-term adoption. Around half measure productivity and conflicts (31) in relation to tenure. Fewer cases include measures on income (25), migration and livelihood diversification (24) and sex-disaggregated outcomes (21). Even fewer measure women's empowerment outcomes (18), food security (13), and climate resilience (eight).

Africa South of the Sahara

Out of the 54 intervention cases in Africa South of the Sahara that look at agriculture, 38 consider agriculture land use, without other land uses. We look at those cases to isolate the effects of interventions in agriculture only (Figure 7a), compared to cases with multiple land uses, which we discuss below when looking at pastoralism (Figure 7b) and forest land use cases (Figure 7c).

Agriculture

The strongest positive outcomes appear in long-term technology adoption and productivity in agriculture, consistent with certification and titling programs encouraging soil conservation, tree planting, and long-term investment. For example, in Ethiopia, land certification increased adoption of soil fertility management, which had robust positive effects on farm productivity (Bezabih et al., 2016; Melesse & Bulte, 2015) and per-capita consumption (Ayalew et al., 2021). Certification also increased incomes by allowing participation in land rental markets as a source of income for land owners and increasing land access for land-poor farmers (Ayalew et al., 2021). However in Mali, reforms did not increase tenure security or reduce poverty; farmers lost land to sales and expropriation (Coulibaly et al., 2021).

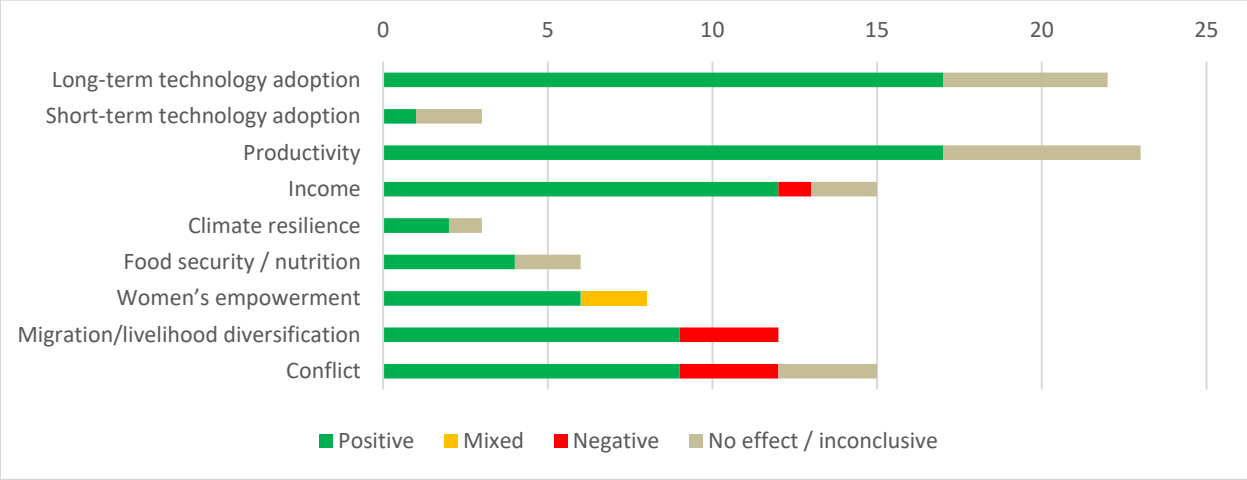
The studies that looked at effects of reforms on women's empowerment all show positive outcomes, largely driven by household level certification in Ethiopia, and to some extent Uganda, and Tanzania. However, the intervention studies also find negative effects, particularly on conflict and migration/livelihood diversification. In Uganda, Deininger & Castagnini (2006) find that the government's 1998 Land Act (which did not include joint ownership by spouses) failed to reduce land conflicts, with female-headed households and widows more affected by such conflicts; these conflicts in turn negatively affected land productivity. Rwanda had mixed results: land titling increased security for married women but negatively affected land rights for unmarried women (Ali et al., 2014). Demarcation in Benin, Kenya, and Uganda contributed to dispossession of women or increased gender inequality in land access (Drew & Knutsson, 2025; Goldstein et al., 2018).

Pastoralism

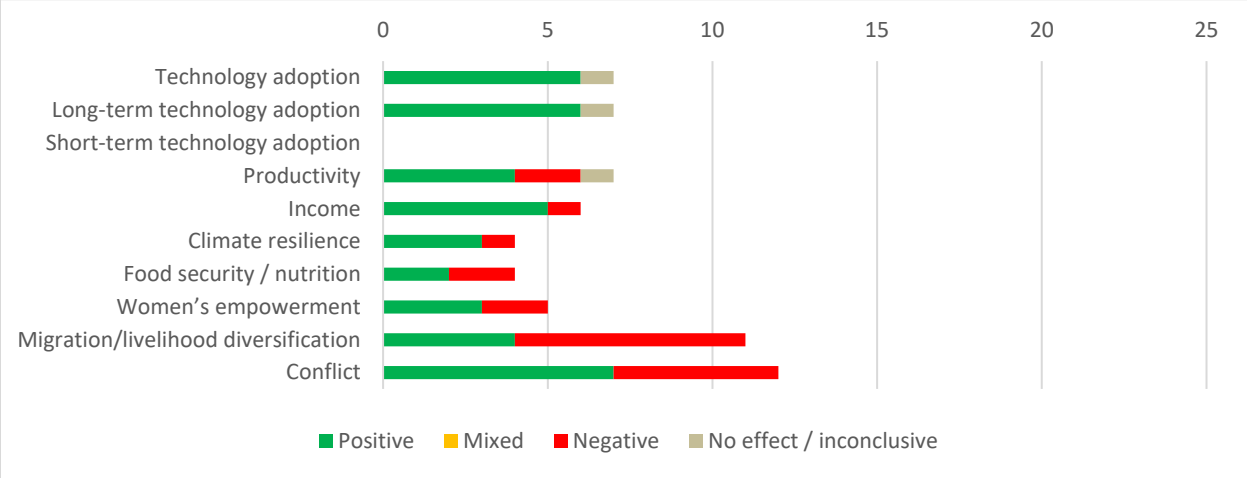
Intervention cases related to pastoral land use show both strong positive and strong negative outcomes, reflecting the complex role of tenure interventions in rangeland systems or where agropastoralism is practiced (Figure 7b). Mobility is central to pastoral adaptation, and interventions that reduce mobility (e.g., titling, enclosures, sedentarization) can have both positive and negative effects simultaneously. Literature shows that they can intensify conflicts especially due to farmer–herder tensions, resource scarcity, and mobility restrictions (L. Basupi et al., 2017).

Figure 7: Outcomes of interventions in Africa South of the Sahara

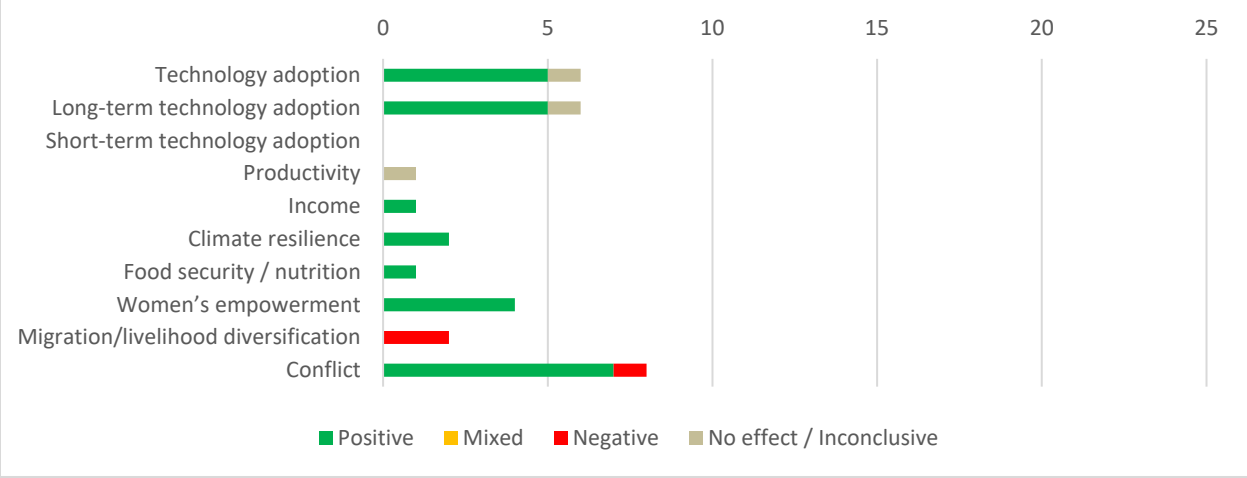
7a.Agriculture land use only (38 cases)



7b. Pastoralism land use (15 cases, including agricultural interventions with strong influence on pastoralism)



7c. Forestry land use (12 cases)



The seven cases that examined long-term technology adoption had generally positive findings but some of these reflected investment in agriculture leading to income gains for elites but reduced pastoral production (Homewood et al., 2001). The record on productivity was more mixed: four positive, two negative, and one inconclusive case. Of six cases examining income effects, there were five positive and one negative case. Botswana's national policy emphasizing privatization of communal land curtailed access to land, water ponds, and veld products, narrowing of livelihood options, increasing rural poverty and dependence on government aid (Magole, 2009). Climate resilience, women's empowerment, and food security outcomes were measured in only four or five cases, and then about half the studies found negative outcomes. Most studies of reforms in pastoral land use areas focused on migration and conflict, rangeland condition, and other outcomes such as governance. Of those, eight found reductions in migration and livelihood diversification and five found increases in conflicts (both negative outcomes). Mwangi et al. (2018) find that the shift from group ranches with recognized collective rights to individualized tenure facilitated the expansion of mechanized agriculture in Kenya. Further, the creation of private enclosures catalyzed technology adoption, where pastoralists adopted artificial reseeding of high-yielding grasses to establish cut-and-carry fodder systems, but reduced communal grazing, leading to tenure insecurity and conflict (Wairore et al., 2015). Formal land certificates can also provide households with the security to invest in expanding crops alongside livestock keeping (Senda et al., 2022).

In Kenya, the subdivision and privatization of communally managed group ranches from 1985–2003 led to intensive expansion of large-scale mechanized agriculture into customary pastoral rangelands. While this improves technology adoption and agricultural productivity, it also led to a significantly fragmented grazing landscape and deforestation (H. M. Mwangi et al., 2018).

More pronounced negative outcomes are associated with individualized tenure and enclosures. In Botswana, the national rangeland policy resulted in land privatization and fencing. This led to a decline in land productivity and reduced coping mechanisms to climate change due to restricted mobility with enclosures and loss of communal land, as well as increased conflict, while failing to halt land degradation (L. Basupi et al., 2017). Magole (2009) found similar negative effects with the privatization of communal land as a result of the policy, noting that livelihood options have also been negatively affected and women's adaptive capacity particularly reduced with lack of land titles.

Tenure changes have polarized effects on climate resilience. On one hand, private enclosures have led farmers to rehabilitate degraded land, improve soil cover, and manage dry-season fodder reserves in those areas, thereby enhancing local ecological resilience (Mangole et al., 2025; Wairore et al., 2015). On the other hand, tenure interventions that fragment the landscape pose a threat to overall pastoral climate resilience by destroying the critical component of livestock mobility (L. Basupi et al., 2017; McPeak & Little, 2018; Senda et al., 2020). Fences, administrative boundaries, and wildlife zones cut pastoralists off from vital dry-season grazing reserves and permanent water sources (L. A. German et al., 2017; Thornton et al., 2006). This drastically increases vulnerability to droughts and disease, threatening food security. Landscape fragmentation in Kenya and sedentarization were the issues of highest concern for local stakeholders in consultation workshops (Thornton et al., 2006). Further, modeling of the group ranches show that subdivision of communal land and loss of access to dispersed grazing did not support large herds, which forces households to sell off more of their remaining livestock to buy food.

Notable negative outcomes occur when tenure reforms allow elite capture (Homewood et al., 2001), restrict pastoral mobility or intensify boundary claims. In Kenya and Uganda, Drew and Knutsson (2025) show that demarcation intensified conflicts by triggering land raids, elite capture, and evictions. Further, although Wairore et al. (2015) find positive effects on long-term technology adoption, they simultaneously find that enclosures fragmented communal grazing, noting negative effects on migration, conflict, and food security.

McPeak and Little (2018) find that in Ethiopia, newly imposed boundaries and land enclosures restricted pastoral mobility, which is essential to their livelihood, negatively impacting resilience and productivity.

Local stakeholders in Ethiopia ranked systems that increase free and flexible livestock mobility and reduce of conflicts highest, reflecting that the need for livestock mobility outweighs other considerations of tenure security, especially to accommodate fluctuations in forage and water availability (Senda et al., 2020).

Even reforms that are not directed at pastoralism can affect the tenure of pastoral groups, as seen in the Ugandan case of de-gazetting protected areas, which re-opened land to pastoralists with historic claims (Drew & Knutsson, 2025); on the negative side, large-scale land acquisitions for agricultural production in Tanzania displaced pastoralists (Nkansah-Dwamena, 2021b).

Assessing the positive and negative outcomes of pastoral tenure reforms underscores the importance of understanding pastoral production as systems: "Pastoralism is a complex land use system that converts often poor-quality natural resources erratically distributed across a landscape into food and other livestock products" (Robinson & Flintan, 2022, p. 2). Mobility and customary systems of resource access allow herders to make use of these spatially and temporally variable resources. Formal, exclusive tenure often converts the high-value components of the pastoral landscapes to agricultural production (reflected in the long-term technology adoption and productivity indicators), but at the expense of overall livestock productivity under mobile customary systems. Instead of conventional tenure reform models that subdivide landscapes into exclusive tenure niches, appropriate tenure interventions in pastoral systems could recognize collective, often overlapping rights that accommodate mobility (Robinson & Flintan, 2022).

Forestry

Forestry cases measure few agricultural and food security outcomes, focusing more on forest governance, resource rights and ecological health (Figure 7c). The outcomes with the strongest positive signals in interventions where forestry is a land use are long-term technology adoption (five positive), women's empowerment (4 positive), and conflict reduction (7 positive, 1 negative). Long-term technology adoption is tied to community forestry strengthening rules that incentivize tree planting or sustainable harvesting. For example, in Ghana, lack of formal titling discourages decisions for long-term investment like reforestation (Baker et al., 2018).

Umar and Nyaga's (2023) study of the agriculture-focused tenure reform of Customary Land Certification in Zambia shows some of the complex, even conflicting effects. Certification enhanced land tenure security, which increased investments in agroforestry, tree conservation, and tractor hiring and reduced land conflicts, particularly boundary disputes between neighbors. Certification also improved security for women, particularly widows, who reported feeling secure from eviction by in-laws or opportunistic relatives. But it negatively affected pastoralism/ livestock rearing due to certification promoting individualism, ending communal grazing. Conversely, also in Zambia, Unruh et al. (2005) found migrants perceived their land tenure security to be low and tended to clear more forests in an attempt to increase claims on the land.

In Ghana, co-creating tenure arrangements that blends state land titling registration and customary tenure systems improved women's access to land and tenure security, with food security benefits and potential to benefit from REDD+ schemes (Dugasseh et al., 2021). However, long-term security depends on women's relationship with the grantor and is threatened by various clauses (including related to cultural norms) that can lead to termination of the agreement.

Conflict reduction is found when tenure reforms clarified boundaries and strengthened community rights, for example, delimitation in Mozambique (Effective Development Group, 2014). In group ranches with forest cover in Kenya, securing a formal title reduced certain conflicts but raised others as titling led to a new parallel governance structure, which eroded the authority of customary norms (L. A. German et al., 2017).

South Asia

Our sample only includes 6 studies of land tenure interventions in South Asia. They often display multiple land uses: four cases with agriculture land use, four with forestry, and three that include pastoralism. Only two cases are agriculture-only cases. Overall agriculture land use cases show a positive direction. Women's empowerment (two cases measured) show positive effects under India's homestead land allocation program (Santos et al., 2014) and Nepal's inheritance reforms, which explicitly strengthened female rights to land (Mishra & Sam, 2016). Santos (2014) find that in India, the land allocation and registration program explicitly promoted putting women's names on the land titles, which significantly increased women's participation in intrahousehold decision-making regarding food, agriculture, and whether to take out loans. The program also increased households' investments in agriculture and use of improved inputs.

Most outcomes, however, remain unmeasured due to the small sample size and the composition of South Asian land-use studies, which tended to focus on community forestry rather than agriculture. Positive examples linked to forest rights in South Asia include reductions in conflicts and encroachment with tenure security on commons (Hughes et al., 2024). With only three pastoralism-related cases in South Asia in our dataset (India, Nepal, Bhutan) which are also corresponding to forestry/multiple land use, only a couple of outcomes show directionality. The community forestry program in Bhutan was found to be equitable: poor households and women received more timber than richer/male members. Women were also well-represented in the Community Forestry Management Group committees (holding 58% of committee positions) (Buffum et al., 2010).

DISCUSSION

In this section we step back from the detailed findings to look at the pathways from tenure to various outcomes and how interventions shape outcomes, before presenting an overall summary.

Outcome pathways, synergies, and tradeoffs

The cases show tenure security affects some outcomes directly and others through mediators or intermediary outcomes, reflecting different mechanisms or pathways. For example, owning land may lead to an increase in women's household bargaining power, which leads to likelihood of commercialization which leads to higher food security (Manja et al., 2025). Securing customary land rights in CREMAs allowed women in Ghana to plant economically valuable trees (a form of technology adoption), which led to climate adaptation benefits and ability to use tree fruits for supplemental nutrition (Dugasseh et al., 2021). Tambo and Kirui's (2021) study in Zambia found tenure security drove the adoption of the technology that in turn improved yield, but the effect of land tenure on yield increases was not significant, reflecting other intervening factors.

Although many studies, and the data tables above, collapse multi-step pathways into single outcomes, Table 6 specifies which outcomes were reported as mediated. Consistent with our conceptual framework in Figure 1, long and short-term technology adoption is usually a direct effect of having secure land tenure. Technology adoption, in turn, may lead to productivity, income changes, and climate resilience, which are often indirect outcomes. Although conceptually the effect of tenure on income is likely to be mediated by investment and technology adoption within agriculture, Agyei-Holms et al. (2020) found that in Ghana, increased tenure security from land registration had a direct effect on income by allowing households to reduce "guard labor" on farm and reallocate it to non-farm activities. Various forms of improvement or losses in women's empowerment as well as conflict (reduction or exacerbation) are also often directly related to land tenure.

Table 6. Number of cases where outcomes are indirectly affected in relation to land tenure

	Cases where outcome is measured in relation to land tenure security	Subset of cases where this observed outcome is an indirect effect of tenure security
Long-term technology adoption	112	15
Short-term technology adoption	31	6
Productivity	69	39
Income	59	45
Climate resilience	49	21
Food security / nutrition	38	26
Women's empowerment	40	6
Migration / livelihood diversification	52	19
Conflict	47	2
Total number of cases	**212**	

There is also some interdependence between certain outcomes, notably among technology adoption, productivity, and income. Conversely, we should be cautious of cases where outcomes are interdependent

but in opposing direction, with tradeoffs between positive and negative outcomes within the same case. For example, Boubacar and Nene (2024) find market-based land reform (willing seller-willing buyer model) increased agricultural productivity, agricultural GDP, and long-term technology adoption (land development/ irrigation) in SADC countries, but also increased conflict, noting that these reforms were associated with higher civil unrest and displacement. Goldstein et al. (2018) find that while land demarcation (securing tenure) increased investment in long-term crops like trees, it led to reallocation of women's attention from demarcated lands in the village to protect their claims on insecure land, resulting in lower yields on women's titled lands.

Although not illustrated on Figure 1, there are also cases of feedback or reverse linkages between some of these outcomes and tenure. Investment in planting or clearing trees can establish or strengthen tenure claims. Other possible reverse linkages, less clearly documented, would be where income affects land purchase or security of rentals; where women's empowerment in other domains might increase their tenure security; or where migration or conflict reduce security of tenure.

Relationships between intervention types and outcomes

Individual or household-level certification (including titling) is the most common type of tenure reform in our studies, especially in agricultural land uses, but there is a variety of other approaches (see Table 3 above). Such certification is strongly associated with long-term technology adoption, productivity, and income. However, the privatization of land that accompanies certification can undermine collective land management authorities (Deininger & Castagnini, 2006). The individualization of tenure is associated with some negative effects in terms of conflict and migration. Reforms that introduce transferability do not necessarily translate into tenure security, especially for the poor or less powerful who are susceptible to dispossession through distress sales or "land grabs"—whether from local individuals, wealthy outsiders and companies, or the state.

Land allocation or redistribution reforms can improve the welfare, including income and food security, for those who obtain land, but it may take years for tenure to stabilize (Chirwa, 2008; Mendola & Simtowe, 2015; Santos et al., 2014).

Almost half (five of 11) reforms affecting pastoral or agropastoral land uses involved subdivision, enclosure, or privatization, especially in Kenya, which is associated with investment in some of the land, but also with elite capture, restrictions in mobility and increased conflicts. Some reforms designed for agricultural areas also affect pastoral or agropastoral production, often negatively if the specificities of grazing are not accounted for.

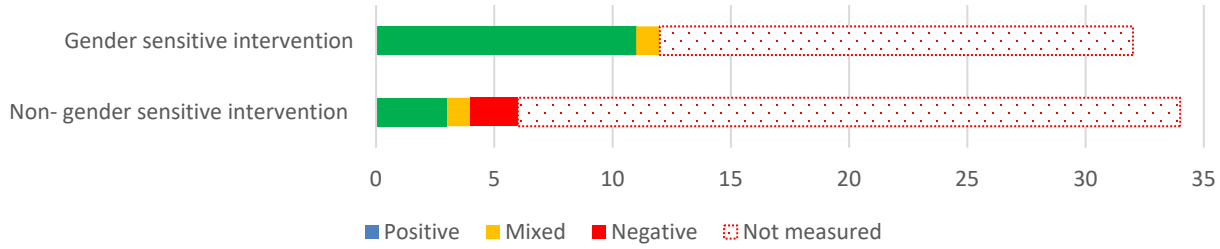
Interventions in forest areas were more likely to involve community forestry or the possibility of collective land rights recognition, which may account for the stronger positive results on conflict reduction compared to agricultural or pastoral tenure interventions. Overall, community certification and devolution reforms showed positive governance effects with reduced conflict, except in Ethiopia where border changes reduced pastoral mobility and undermined traditional authorities (McPeak & Little, 2018), and Kenya where conservation-linked reforms increased livestock predation and governance conflicts (L. A. German et al., 2017).

When examining the gendered outcomes of interventions, it is essential to note the selection bias in which studies examine gendered outcomes. Less than half (32 of 66) of the intervention cases included any mention of any gender-sensitive interventions. Of the 32 gender-intentional cases, 12 measured women's empowerment outcomes and 15 measured sex/disaggregated outcomes more generally; of the 34 gender-blind interventions, only 6 measured women's empowerment outcomes and 4 measured more general sex-disaggregated outcomes (Figure 8; Appendix 9). While it is encouraging that 11 of the gender-sensitive cases found positive outcomes for women, only 3 of 6 gender-blind interventions had positive outcomes for women's empowerment, and none of them found positive sex-disaggregated outcomes for women.

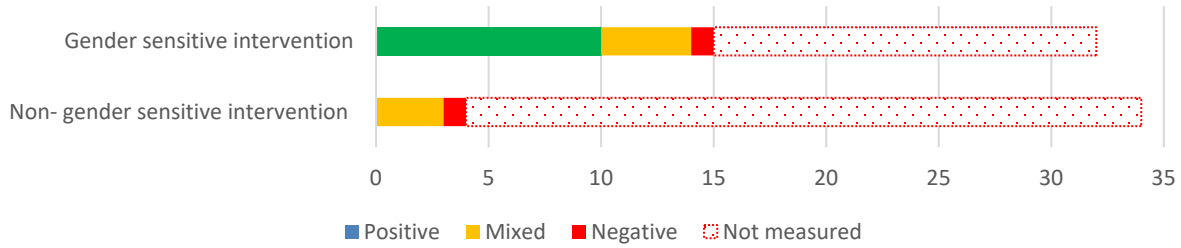
This underscores the importance of including gender-sensitive provisions in all interventions, and of measuring outcomes for women across all projects to ensure that they are not undermining women's tenure security or other aspects of wellbeing.

Figure 8: Women's empowerment and sex disaggregated outcomes of gender-sensitive (n=32) and non-gender-sensitive (n=34) interventions

8a. Women's empowerment outcomes



8b. Other sex-disaggregated outcomes



Evidence summary

We summarize our findings on relationships between tenure and development outcomes in an evidence assessment table based on the amount of evidence and the level of agreement (Table 7). For amount of evidence, we classify having 30 or more cases that test for that outcome as "high", 20-29 as "medium", and less than 20 cases as "low." For level of agreement, we designate "high agreement" if at least 80 percent of the cases that test for an outcome find a positive result; "medium" for 60-79 percent of cases, and "low" if less than 60 percent of cases find a positive outcome. We distinguish between patterns in agricultural, pastoral, and forest land uses to reflect the different types of tenure and implications in these different land use systems.

There is strong evidence linking tenure security with long-term technology adoption in agriculture, especially investments like tree planting and soil and water conservation, but only medium level of evidence and agreement for adoption of short-term technologies like improved seed varieties or inorganic fertilizer. Although there are fewer cases studying outcomes for pastoral and forest land uses, those that do find relatively high agreement that stronger tenure is associated with long-term technology adoption.

In agriculture, there is also strong evidence that tenure translates into increased incomes and climate resilience. Although there is relatively high agreement and evidence associating tenure with women's empowerment in agriculture, many of these are from "double negatives"—where women's *lack* of tenure rights contributes to their *dis*empowerment in some way. There is only medium level agreement (two thirds of the cases that tested for it) that improved tenure translates into productivity in agriculture, largely because of 13 cases that found no effect, indicating that it may take more than tenure to improve outputs.

Similarly, there is a medium level of agreement that tenure security translates into food security or nutrition gains.

Table 7: Evidence Assessment Table

		Amount of Evidence for Agriculture		
		High	**Medium**	**Low**
Level of Agreement	**High**	Long-term technology adopt. Income Climate resilience Women's empowerment		
	Medium	Productivity Food security/nutrition	Short-term technology adopt. Migration/livelihood diversification	
	Low		Conflict	
		Amount of Evidence for Pastoralism		
		High	**Medium**	**Low**
Level of Agreement	**High**			Long-term technology adopt. Income Climate resilience
	Med-ium			Food security/nutrition
	Low			Short-term technology adopt. Productivity Women's empowerment Migration/livelihood diversification Conflict
		Amount of Evidence for Forestry		
		High	**Medium**	**Low**
Level of Agreement	**High**		Long-term technology adopt.	Productivity Climate resilience Conflict
	Medium			Short-term technology adopt. Income Food security/nutrition Women's empowerment
	Low			Migration/livelihood diversification

Although there are fewer studies on tenure outcomes in pastoral land uses, there is high agreement among them that better tenure is associated with greater income and climate resilience, but only medium agreement on food security or nutrition, and low agreement on productivity and women's empowerment.

Forest land uses also have fewer cases than agriculture, but those that do examine productivity and climate resilience find high agreement that tenure contributes to positive outcomes in those areas, with medium agreement on income, food security or nutrition, and women's empowerment.

The outcomes on migration or livelihood diversification and conflict show a less optimistic picture. There is only medium amount of evidence and medium agreement for agriculture on migration or diversification, and low evidence and low agreement in pastoral and forest cases. However, what this means in practice also differs by land use type. In agriculture, reducing migration and livelihood diversification can be a positive outcome where agricultural livelihoods become more stable, reducing the need to migrate or diversify. But in pastoral areas where migration is an integral part of the production system, reforms that break up the overall territory into pieces in the name of "securing" the land, a la agriculture, can undermine livelihoods. Increased conflict arises where changes to "secure" the rights of some reduce the customary or secondary rights of others.

Forest land uses are the only set of cases with high agreement linking tenure with reduced conflict. In agricultural and pastoralism cases, there is low agreement on reduction in conflict, indicating a need for more attention to conflict reduction.

The evidence on what kinds of tenure interventions can strengthen tenure security in ways that contribute to these outcomes is much more limited (66 cases, strongly concentrated in Ethiopia and a few other countries) and mixed. We especially see tenure reforms having negative effects on pastoral production and inducing or exacerbating conflict if they are not designed with a good understanding of the types of tenure pastoralists need (e.g., flexibility is key for pastoral adaptation).

There is also variability in the extent to which women benefit from reforms. Not all formalization programs ensure that women are included, meaning that women may even lose their customary rights; those reforms that do include women often benefit married women more than widows or women in informal unions. Joint ownership with spouses increases women's security but doesn't always increase their control of land and its produce, especially where customary norms remain strong. This underscores the need to carefully examine how existing tenure arrangements and reforms affect different types of women as well as men.

CONCLUSIONS

The growth in studies of land tenure in this century allows us to identify 212 case that relate aspects of land tenure to a range of development outcomes—195 in Africa South of the Sahara, but only 17 in South Asia. These were concentrated in agricultural production, with a smaller number in pastoral and forest or mixed land uses. Over 40% were from East Africa, with 30 cases from Ethiopia alone. This distribution of studies is important to keep in mind, because they shape—and potentially bias—any quantitative analysis of results. The range of methods and tenure indicators provides richness but also create risks for summary and generalization. In this section we review the high-level findings about tenure across the full set of cases, then turn to findings from the studies of tenure reforms and interventions. We then discuss the implications for policy and programs, and for research to address the gaps and imbalances in tenure-related studies.

Overall effects of tenure

There is much evidence that stronger tenure—variously defined across the studies—contributes to many development outcomes. **The strongest evidence is that secure tenure promotes adoption of technologies involving investment in the land, such as soil and water conservation, tree planting, and sustainable land management.** However, the mechanism for this is highly contingent on local institutional arrangements and the type of investment (short or long term, visible or invisible). In some places formal rights designated by titles or certificates increase security, but in other places, especially in Africa, strong customary arrangements provide enough security for investment, and formalization can undermine this. In some contexts, those with insecure tenure may make visible investments to strengthen their claims on the land. And tenure security may not lead to investment if there are other binding constraints like lack of awareness, labor, infrastructure or market conditions for the technology or practices.

Although fewer studies follow this investment through to productivity and income, the findings of those that do are overall positive. Many of the studies found that as those with secure tenure adopted technologies or practices such as soil and water conservation, tree planting, improved varieties, crop rotation, and input intensity, they had increased yields. But the effects were heterogeneous, because productivity is jointly determined by tenure, markets, labor, and environmental conditions. **Thus, tenure security is often a necessary but not sufficient condition for productivity and income gains and requires complementary services.**

Even fewer studies related tenure to climate resilience, but those that did found generally positive relationships. Even when the studies did not explicitly measure climate resilience, many of the long-term investments such as tree planting, soil conservation, crop rotation, water management and other long-term "climate smart" technologies and practices would contribute to resilience.

Gendered land rights profoundly shape development outcomes. There is generally positive evidence that women's land rights improve bargaining power and decision-making, child nutrition and health, and resilience to climate shocks. But gender gaps persist across most countries: women own fewer plots, manage smaller areas, and lack transfer rights.

Relatively few studies trace the links between tenure and food security, but the evidence is generally positive, likely mediated by productivity or increased bargaining power of women.

The links between tenure and migration or livelihood diversification are more mixed. If tenure security encourages people to concentrate in agriculture, it can reduce migration and diversification, but that may be seen as a good thing. But where tenure reforms reduce migration of pastoralists, it can undermine their livelihoods and food security.

Tenure-conflict links are also mixed. Clear tenure can reduce conflicts, especially in forest areas and some agricultural contexts, but reform processes or claims on land can also increase conflicts.

Land tenure is not a silver bullet, but it is a foundational enabling condition—one that must be tailored to each livelihood system and governance context. Agricultural development projects (including those working on pastoral or forest areas) would benefit from careful attention to existing formal and informal tenure arrangements, along with the biophysical, socioeconomic, and governance context in which they operate.

Effects of tenure reforms

While tenure-related reforms have taken place throughout history, the increase in careful study of reforms in the last 30 years allows comparison of effects across countries and types of reforms. While causal, quantitative studies have received the greatest attention, qualitative studies raise a range of critical issues to be considered.

Across countries, even the same type of reform (e.g., titling) can have divergent outcomes. Key considerations include whether reforms align with or override customary norms and practices, the state capacity to implement reforms, and whether local elites capture the process. **Tenure reform is inherently political, and outcomes depend on governance, power dynamics, and elite behavior—not just legal design.**

A consistent theme is that tenure security plays a crucial role, but tenure reforms alone rarely delivers transformative impacts. Effectiveness of land rights interventions depends on complementary services, such as extension services, including awareness of rights, access to credit, infrastructure, gender inclusion, and conflict resolution mechanisms.

Certification (including titling or other forms of land registration) is the most common type of reform in the studies. Certification is most effective where baseline tenure insecurity is high, as it was in Ethiopia when first stage land certification began, or land disputes are common. In those cases, certification can reduce conflict or fear of expropriation. Certification does not work well when customary systems already provide strong security. It is also effective when it stimulates land rental markets, improving allocative efficiency. But certification—and accompanying privatization—also risks creating elite capture and accelerating distress sales. Titling often strengthens elites, especially male customary authorities, while monetization of customary land excludes women and youth.

Reforms have had mixed effects on women. Certification can improve women's land rights and gender equality when designed appropriately, including provision for documentation to be routinely given in women's names, as in Ethiopia, accompanied by awareness campaigns and inclusion of women in land administration committees, and programs address not just legal rights but local norms and intra-household dynamics. Certification programs that do not explicitly provide for women to be jointly registered, with accompanying awareness programs, can even undermine the customary rights women have had (Asaaga & Hirons, 2019; Chitonge et al., 2017; Evans et al., 2015). Thus, strengthening women's land rights can improve welfare and empowerment, but reforms must explicitly address marital status, inheritance rules, and social norms to be effective.

Certification and privatization undermines collective rights in pastoral and forest landscapes where livelihoods depend on access to multiple ecological niches, and lead to environmental degradation. **Communal forest and pastoral systems need different approaches to tenure compared to agricultural land.** Formalizing individual rights can unintentionally worsen conflict and reduce ecological resilience, especially in pastoral areas, where fragmentation of the land and undermining customary access reduces mobility and worsens rangeland degradation.

Tenure security in pastoral areas should prioritize mobility, negotiated access, and collective governance, not individualized titles. Customary systems often outperform village-level administrative boundaries in balancing mobility and security (Senda et al., 2020). Even in predominantly agricultural landscapes, areas of common property can be important for livelihoods and ecosystem services (Hughes et al., 2024). Community forestry in South Asia shows high levels of equity and effectiveness.

Customary tenure should not be assumed to be insecure tenure. Where customary systems are strong, formal titles add little. Where customary systems exclude women, migrants, or youth, reforms can improve welfare—but only if designed inclusively. Even where customary systems have operated effectively, increasing population pressures and interactions with outsiders can undermine the security of customary tenure, creating pressures for state-sanctioned tenure arrangements.

Certification need not always involve individualization and privatization of land; certification or other reforms can also strengthen collective tenure. In general, individual (or household) certification is preferable when investments are plot-specific and long-term, such as bunding and soil fertility management, or where land rental markets could offer income to land holders and improved land access to renters. Collective tenure is key for common pool resources, especially where mobility or accessing different ecological niches is important for livelihoods, or coordinated management is needed to sustain the resource base.

Implications for policy and programming

Appropriate tenure is critical for many aspects of agricultural production, income, climate resilience, women's empowerment, food security and nutrition. **The strong evidence that tenure shapes long-term investment indicates that examining tenure arrangements should be part of the feasibility assessment for programs promoting "climate-smart" or other long-term investments in agriculture.** Understanding local tenure requires considering de facto as well as de jure rights of different groups to identify whether tenure is likely to be a constraint to uptake, impact, or equity of outcomes from the programs. Any intervention in mixed land use systems (including agriculture and rangelands or forests) should consider the mosaic of land uses and the effects of reforms on all users, rather than adopting privatization approaches based on agricultural fields alone.

While tenure is fundamental, tenure alone is not sufficient. Complementary resources such as information, infrastructure, and finance are also needed for investment. Many other factors come into play in whether this translates into productivity, income, climate resilience, and food security. **Thus tenure-related interventions should be developed in conjunction with broader programs to address these constraints**.

If tenure is likely to be a constraint, legal reforms such as titling are not necessarily the best response. The factors that determine tenure security and insecurity are very specific to context, and to different actors, such as women, youth, etc. (Larson et al., 2023). That means that **efforts to address insecurity also need to be tailored to the context, depending on land use and livelihood system, the diversity of resource users, the strength of customary and state institutions.** The aim should be tenure security, not documentation per se. This may mean clearer laws or policies on inheritance or marital property to strengthen tenure of women or youth. Strengthening collective institutions may lead to more effective resource management than individualization, but this often requires going beyond tenure reform to also support formal and informal collective governance institutions (Hughes et al., 2024).

The frequency of conflicts underscores the importance of recognizing that "securing" the rights of some often comes at the expense of cutting off rights of others, hence the need to consider how tenure changes create winners and losers, and for interventions to be conflict-responsive.

All reforms should be gender sensitive in their design and implementation, to avoid reducing women's land rights (as has happened too often), and to help reduce gender inequalities. This may involve addressing family law and inheritance, not only land policy. It also requires looking at markets to ensure that women have control over the proceeds (economic rights). While there are numerous guidelines for strengthening women's land rights (Stanley & Lisher, 2023) a key principle is to design and test programs with women, but also engage men.

Legal literacy or awareness programs, legal aid or dispute resolution may help strengthen tenure. Governments are not the only actors; there are often civil society organizations to partner with to address tenure issues.

Implications for research

Despite the growth in the literature demonstrating the links between tenure and a range of development outcomes, several key gaps remain.

The concentration of studies in East Africa, especially Ethiopia, risks that policymakers and program developers will generalize from that limited base. **A broader set of cases is needed with broader geographies (e.g., Latin America and other parts of Asia), and with careful documentation of the contextual conditions, to build our understanding of how environmental, social, economic, and political conditions affect tenure, and especially how that might affect tenure reforms.** Expanding from a systematic review to a realist synthesis (Lawry et al., 2023) that explicitly addresses contextual factors and mechanisms through which tenure (and especially tenure reforms) translate into changes would help to fill these gaps.

The literature also mostly focuses on individual tenure in farmlands, with much less known about collective pastoral or forest systems, although rangelands cover over half of earth's land surface, and forests cover another 30% (FAO & UNEP, 2020; ILRI et al., 2021). Many of the studies that we identified for pastoral or forest land uses were qualitative, which allows to examine the complexity of tenure. However, there were relatively fewer quantitative studies, especially those which can be considered "causal" for these land uses. More studies of reforms related to tenure in pastoral, forest, and other collective production systems would be valuable to identify what works, for whom, in different contexts.

Even within agricultural production systems, the interface with urban and periurban areas merits greater attention in terms of the pressures and opportunities this creates. This would include more on credit access, who participates in land markets (for sale or rental) with special attention to the gender dimensions and possibilities for elite capture. Effects of tenure security on credit access, land markets and market participation, as well as effects on natural resources, land use, and resource sustainability are important outcomes to explore in future research, which were outside of the scope of this study.

Qualitative and especially participatory studies can raise a broader set of issues than might be anticipated and measured in quantitative studies, but this evidence often carries less weight in policy circles compared to quantitative studies. Even in agricultural land uses, there is strong qualitative evidence on the risks of privatization creating elite capture, and risks of reducing land rights of women, youth, and the poor through distress sales, these issues have not been included in many quantitative or causal studies, indicating a major evidence gap with important policy implications, because such outcomes will not appear in meta-analyses of effect sizes. And difficulty in publishing null results may also limit or bias the evidence on results of tenure.

The fact that not all cases document all outcomes also leaves gaps in our understanding and potential biases in the evidence. For example, the fact that most of the positive findings about the outcomes of reforms on women come from gender-sensitive interventions, and that studies of

interventions without explicit attention to gender did not measure the outcomes for women is likely to bias the picture on the gender outcomes of reforms, leaving hidden the negative (or possibly, positive) outcomes from reforms that are not gender-sensitive. This paper identifies the range of outcomes. It would be good if more studies covered all of these outcomes, especially in studies of interventions, to capture any negative outcomes.

The variability in indicators used to measure tenure or proxy for tenure security limits comparability across studies. To some extent this reflects the variability of types of tenure being studied, but it also reflects assumptions of the researchers. Perceptions of tenure security, documentation, transfer rights, and legal rights are often conflated, although these can vary considerably: those with documentation do not necessarily secure, for example (L. Meinzen-Dick et al., 2026). It would be useful if more studies included some of the standardized measures of tenure, such as those developed for monitoring the Sustainable Development Goals (SDGs).

Finally, there is little long-run evidence on the effects of tenure, or especially how different types of tenure enable people to respond to climate shocks. While there are a few exceptions (Ajefu & Abiona, 2020) **it would be valuable to have more long-term panel studies to be able to study resilience and responses to economic transitions.**

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SUPPLEMENTARY MATERIALS

Appendix 1: Search terms

1. **Words related to tenure:** "Tenure" OR "Property rights" OR "Land rights" OR "Rights to land" OR "Resource rights" OR "Land ownership" OR "Land titl*"

AND

2. **Words related to agriculture (broadly defined):** "Agriculutur*" OR "Pastoral*" OR "Farm*" OR "Smallholder*" OR "Indigenous" OR "Rural" OR "Aquacult*"

AND

3. **Words related to outcomes or impacts:**
   "Adopt*" OR
   "Climate adapt*" OR
   "Climate re*" OR
   "Credit" OR
   "Diet*" OR
   "Effect*" OR
   "Empowerment" OR
   "Environment*" OR
   "Food security" OR
   "Impact" OR
   "Income*" OR
   "Investment" OR
   "Irrigation" OR
   "Livelihood*" OR
   "Livestock" OR
   "Nutrition*" OR
   "Outcome*" OR
   "Poverty" OR
   "Practices" OR
   "Production" OR
   "Productivity" OR
   "Soil*" OR
   "Tree*" OR
   "Wellbeing" OR
   "Welfare" OR
   "Yield" OR

AND

4. **In specific regions:**
   "Sub-Saharan Africa" OR "Central Africa" OR "East Africa" OR "West Africa" OR "Southern Africa" OR "South Asia"

Appendix 2: List of cases, by region and country

Region/Country	References
West and Central Africa	
Benin	(Botea et al., 2026; Djagba et al., 2014; Djenontin et al., 2022; Goldstein et al., 2018; Yegbemey et al., 2013)
Burkina Faso	(Bambio & Agha, 2018; Brasselle et al., 2002; Dossou-Yovo et al., 2019; Etongo et al., 2015, 2018; Gardiner, 2020; Gray & Kevane, 2001; Linkow, 2016; T. Maré et al., 2022; Séogo & Zahonogo, 2023)
Cameroon	(Gyau et al., 2012; Nkamleu & Adesina, 2000; Ordway et al., 2017; Tabe-Ojong et al., 2022)
Côte d'Ivoire	(Bros et al., 2019; Fenske, 2011)
Ghana	(Abdulai, 2024; Agyei-Holmes et al., 2020; Akugre et al., 2022; Ankrah et al., 2024; Antwi-Agyei et al., 2015; Asaaga et al., 2020; Asaaga & Hirons, 2019; Awanyo, 2009; Baker et al., 2018; B. Boateng et al., 2024; E. Boateng et al., 2025; Buabeng et al., 2024; Bugri, 2008; Donkor et al., 2023; Dugasseh et al., 2021; Evans et al., 2015; Goldstein & Udry, 2008; Hashmiu et al., 2022; Kugbega & Aboagye, 2021; Maguire-Rajpaul et al., 2025; Nchanji et al., 2023; Tambo & Mockshell, 2018; Wahab et al., 2020)
Mali	(Brottem, 2016; Coulibaly et al., 2021; Doss et al., 2014; Dossou-Yovo et al., 2019)
Mauritania	(García-Bolaños et al., 2011)
Nigeria	(Dossou-Yovo et al., 2019; Ibrahim et al., 2022; Kehinde et al., 2021; Lynch et al., 2001; Tambo & Mockshell, 2018; Teklewold, 2023a)
East Africa	
Burundi	(Ouma et al., 2010)
Ethiopia	(Abule et al., 2005; Aguilar et al., 2015; Akpalu & Bezabih, 2015; Ayalew et al., 2021; Bedo et al., 2024; Beyene & Koch, 2013; Bezabih et al., 2016; Deininger & Jin, 2006; Fors et al., 2019; Ghebru & Holden, 2015, 2019; Hagos & Holden, 2006; Holden et al., 2009, 2011; Kassie et al., 2015; Mangole et al., 2025; McPeak & Little, 2018; Mekonnen et al., 2013; Melesse & Bulte, 2015; Moreda, 2018; Ng'ang'a et al., 2016; Nguru et al., 2021; Persha et al., 2017; Quisumbing & Kumar, 2014; Senda et al., 2020, 2022; Tambo & Mockshell, 2018; Teklewold, 2023b; Teklu et al., 2023; Tesfaye et al., 2023)
Kenya	(Alobo Loison, 2019; Autio et al., 2021; Chepkoech et al., 2023; Cinderby et al., 2024; Drew & Knutsson, 2025; Duker et al., 2022; L. A. German et al., 2017; Greiner, 2017; Greiner et al., 2013; Homewood et al., 2001; Kassie et al., 2015; Minjauw et al., 2024; Muchomba et al., 2014; H. Mwangi et al., 2017; Njoroge et al., 2024; Nyamasoka-Magonziwa et al., 2021; Owoo & Boakye-Yiadom, 2015; Tambo & Mockshell, 2018; Thornton et al., 2006; Tione et al., 2022; Wairore et al., 2015)
Rwanda	(Ali et al., 2014; Ouma et al., 2010)

Tanzania	(Cinderby et al., 2024; Doss et al., 2014; Faße & Grote, 2013; Homewood et al., 2001; Kassie et al., 2015; Mangole et al., 2025; Minjauw et al., 2024; Mutabazi et al., 2015; Mwamakamba et al., 2017; Nkansah-Dwamena, 2021b, 2021a; Peterman, 2011; Rashid, 2021; Ripkey et al., 2021; Sulle & Dancer, 2020; Tambo & Mockshell, 2018; Teklewold, 2023a; Visser et al., 2024; Wagner et al., 2019)
Uganda	(Deininger et al., 2008; Deininger & Castagnini, 2006; Drew & Knutsson, 2025; Hazelton et al., 2013; Larson et al., 2023; Mangole et al., 2025; Martiniello et al., 2022; Meier Zu Selhausen, 2016; Mwesigye et al., 2017; Mwesigye & Matsumoto, 2016; Poulin & Pierotti, 2-25; Tambo & Mockshell, 2018; Tione et al., 2022; Yami & Van Asten, 2018)
Southern Africa	
Botswana	(L. Basupi et al., 2017; Magole, 2009)
Eswatini	(Minjauw et al., 2024)
Lesotho	(Minjauw et al., 2024; Motsoari et al., 2015)
Madagascar	(Bellemare, 2013; Jacoby & Minten, 2007)
Malawi	(Ajefu & Abiona, 2020; Asfaw & Maggio, 2018; Benjamin, 2020; Benjamin et al., 2021; Bhaumik et al., 2016; Chirwa, 2008; Doss et al., 2014; G. German et al., 2009; Kassie et al., 2015; Kilic et al., 2015; Lovo, 2016; Mangole et al., 2025; Manja et al., 2025; Mendola & Simtowe, 2015; Pircher et al., 2013; Ricker-Gilbert et al., 2019; Ricker-Gilbert et al., 2022; Tambo & Mockshell, 2018; Teklewold, 2023a; Tione et al., 2022; Toth et al., 2017)
Mozambique	(Effective Development Group, 2014; Mwamakamba et al., 2017; Tambo & Mockshell, 2018)
Namibia	(Kamwi et al., 2017)
South Africa	(Conradie et al., 2019; Kepe & Tessaro, 2014; Murugani et al., 2014)
Zambia	(Ajayi, 2007; Chisanga et al., 2019; Chitonge et al., 2017; G. German et al., 2009; Mumba et al., 2024; Nkomoki et al., 2018; Smith, 2004; Tambo & Kirui, 2021; Tambo & Mockshell, 2018; Umar & Nyanga, 2023; Unruh et al., 2005; Zamchiya & Musa, 2023b)
Zimbabwe	(Mavhura, 2019; Minjauw et al., 2024; Mwamakamba et al., 2017; Nyathi, 2025)
SADC Countries (consolidated)	(Boubacar & Nene, 2024)
South Asia	
Bangladesh	(Bandara et al., 2024; Harris-Fry et al., 2015)
Bhutan	(Buffum et al., 2010)
India	(Banerjee et al., 2014; Doss et al., 2014; Hughes et al., 2024; Khed & Krishna, 2023; Reddy et al., 2020; Santos et al., 2014; Vu et al., 2021)
Nepal	(Allendorf, 2007; Bandara et al., 2024; Mishra & Sam, 2016; Oli et al., 2016; Pradhan et al., 2019)
Sri Lanka	(Bandara et al., 2024; Woodbury et al., 2024)

Notes: Cameroon was the only country from Central Africa, so for further analysis we group it with the adjacent countries in the West Africa region.

Appendix 3: Number of cases, by country and type of study

Country	Methods				Total cases
	Qualitative	Mixed (Qualitative + Quantitative)	Quantitative (Observational or Causal)	Quantitative Causal	
West and Central Africa	**4**	**22**	**30**	**15**	**56**
Benin	0	3	2	2	5
Burkina Faso	0	3	7	5	10
Cameroon*	0	1	3	0	4
Côte d'Ivoire	0	0	2	1	2
Ghana	3	12	9	5	24
Mali	0	2	2	0	4
Mauritania	0	1	0	0	1
Nigeria	1	0	5	2	6
East Africa	**11**	**21**	**55**	**30**	**87**
Burundi	0	0	1	1	1
Ethiopia	1	5	24	12	30
Kenya	2	10	9	2	21
Rwanda	0	0	2	2	2
Tanzania	3	4	12	7	19
Uganda	5	2	7	6	14
Southern Africa	**9**	**10**	**33**	**16**	**52**
Botswana	1	1	0	0	2
Eswatini	0	0	1	0	1
Lesotho	0	0	2	0	2
Madagascar	0	0	2	2	2
Malawi	1	3	17	9	21
Mozambique	1	1	1	1	3
Namibia	0	0	1	0	1
South Africa	1	1	1	0	3
Zambia	2	4	6	3	12
Zimbabwe	3	0	1	0	4
SADC Countries (consolidated)	0	0	1	1	1
South Asia	**1**	**3**	**13**	**3**	**17**
Bangladesh	0	0	2	0	2
Bhutan	0	1	0	0	1
India	0	2	5	2	7
Nepal	1	0	4	1	5
Sri Lanka	0	0	2	0	2
TOTAL	**25**	**56**	**131**	**64**	**212**

Notes: Causal is a subset of quantitative studies

*Cameroon was the only country from Central Africa, so for further analysis we group it with the adjacent countries in the West Africa region.

Appendix 4: Number of studies, by production system

Region/Country	Production system				Total number of cases
	Agriculture	Pastoralism	Forestry	Other	
West and Central Africa	**55**	**3**	**12**	**7**	**56**
Benin	4	0	0	1	5
Burkina Faso	10	0	1	1	10
Cameroon	4	0	3	0	4
Côte d'Ivoire	2	0	0	0	2
Ghana	24	2	8	3	24
Mali	4	1	0	1	4
Mauritania	1	0	0	0	1
Nigeria	6	0	0	1	6
East Africa	**81**	**18**	**11**	**10**	**87**
Burundi	1	0	0	0	1
Ethiopia	28	5	5	1	30
Kenya	20	9	1	4	21
Rwanda	2	0	0	0	2
Tanzania	18	3	3	4	19
Uganda	12	1	2	1	14
Southern Africa	**45**	**10**	**9**	**6**	**52**
Botswana	0	2	0	2	2
Eswatini	0	2	0	2	1
Lesotho	1	0	0	0	2
Madagascar	2	0	0	0	2
Malawi	2	0	0	1	21
Mozambique	22	1	3	0	3
Namibia	3	0	1	0	1
South Africa	1	0	1	0	3
Zambia	2	1	0	0	12
Zimbabwe	11	4	4	1	4
SADC Countries (consolidated)	1	0	0	0	1
South Asia	**14**	**3**	**5**	**2**	**17**
Bangladesh	2	0	0	0	2
Bhutan	0	1	1	0	1
India	6	1	2	2	7
Nepal	5	1	1	0	5
Sri Lanka	1	0	1	0	2
TOTAL	**195**	**34**	**37**	**25**	**212**

Note: A study case may consider multiple production systems or land use types.

Appendix 5: Types of tenure indicators by land use type

Tenure Indicator	Agriculture (only)	Pastoral	Foresty	TOTAL
Assurance of rights				
Perceived security	21	3	10	**34**
Knowledge of rights	1	1	1	**2**
Susceptibility to expropriation	6	2	1	**8**
Conflict	5	1	2	**7**
Content of rights				
Ownership	40	2	5	**46**
Type of tenure	28	14	14	**53**
Mode of acquisition	26	1	5	**31**
Bundles of rights	25	2	6	**32**
Documentation (registration)	54	13	13	**77**
Demarcation, (not full documentation)	2	4	2	**8**
Size of holding (area or # plots)	7	0	2	**9**
Duration of rights	6	1	4	**11**
Individual/Collective (e.g. community)	6	19	4	**27**
Individual/Joint (household)	19	0	0	**19**
Matrilineal/Patrilineal	8	0	0	**8**
Total	**151**	**34**	**37**	**25**

Note: A study case may consider multiple production systems or land use types and may use multiple tenure indicators.

Appendix 6: Types of pastoral, forestry, and other tenure interventions

	Pastoral reforms	Pastoral reforms (specify)	Community forestry	Forestry: other	Other reforms (specify)
West and Central Africa					
Cameroon				Forest clearing to establish ownership	
Ghana					Urban zoning; Community Resource Management Area (CREMA) for collective lands2
East Africa					
Ethiopia	3	Certification at large area (2); New administrative borders (1)			Require land management to maintain tenure of pastoral lands
Kenya	5	Enclosures, privatization (2); Group ranch subdivision (2); Conservation partnership (1):			Conservation partnership
Tanzania					Large-scale land acquisitions (2)
Uganda	1		1		Sensitization program to prepare for systematic adjudication; De-gazetting protected areas
Southern Africa					
Botswana	2	Fencing, privatization (2)			
Lesotho					Block farming program grouping farmlands and increasing credit
Zambia					Individualization: convert customary land to leasehold (3)
SADC Countries (consolidated)					Land reform/ reallocation of farms (expropriation and willing-seller)
South Asia					
Bhutan			1		
India				Forest Rights Act	Strengthen community ability to claim collective rights to commons
Nepal			1		Family law reform--inheritance
TOTAL	**11**		**3**	**2**	

Note: Omits countries without pastoral, forest, or other tenure reforms

Appendix 7: Association between land tenure and outcomes in Africa South of the Sahara

Outcome	Agriculture					Pastoralism					Forestry				
	+	+/-	-	0/?	NA	+	+/-	-	0/?	NA	+	+/-	-	0/?	NA
Long-term technology adoption	66	2	3	11	57	11	0	0	1	18	19	1	0	1	11
Short-term technology adoption	21	0	3	3	112	0	0	0	0	30	1	0	1	0	30
Productivity	34	1	4	13	87	6	0	2	3	19	4	0	0	1	27
Income	38	1	1	2	97	9	0	1	0	20	2	1	1	0	38
Climate resilience	25	0	2	2	110	9	0	1	0	20	7	0	0	0	25
Food security/ nutrition	17	1	1	4	116	3	0	2	0	25	2	0	1	0	29
Women's empowerment	21	2	1	1	114	4	0	2	0	24	4	0	1	0	27
Migration / livelihood diversification	18	1	7	1	112	8	0	9	1	12	4	2	2	0	24
Conflict	13	1	6	3	116	8	0	8	0	14	10	0	1	0	21

Notes: + Positive effect; +/- Mixed effect; - Negative effect; 0/? No effect or inconclusive; NA not measured

Appendix 8: Outcomes reported in cases with tenure interventions by region and land use type

	Africa South of the Sahara			South Asia			
Land use → Outcome ↓	**Agriculture**	**Pastoralism**	**Forest**	**Agriculture**	**Pastoralism**	**Forest**	**Total cases**
Long-term technology adoption	31	7	6	0	0	0	**32**
Short-term technology adoption	3	0	0	2	0	1	**5**
Productivity	28	7	1	1	0	1	**31**
Income	19	6	1	3	2	3	**25**
Climate resilience	5	4	2	0	0	0	**8**
Food security / nutrition	10	4	1	2	0	1	**13**
Women's empowerment	14	5	5	3	1	1	**18**
Sex-disaggregated outcomes	17	2	4	2	1	1	**19**
Migration / livelihood diversification	19	11	2	1	0	1	**24**
Conflict	25	11	8	1	1	1	**31**
Total number of cases	54	15	12	4	3	4	**66**

Appendix 9: Gender sensitive interventions and gender-related outcomes

	Gender sensitive intervention	Non- gender sensitive intervention
Number of cases	32	34
Women's empowerment measured	12	6
Women's empowerment positive outcome	11	3
Women's empowerment mixed outcome	1	1
Women's empowerment negative outcome	0	2
Women's empowerment not measured	20	28
Sex disaggregated other outcomes measured	15	4
Sex disaggregated other outcomes positive	10	0
Sex disaggregated other outcomes mixed	4	3 (1 inconclusive)
Sex disaggregated other outcomes negative	1	1
Sex disaggregated other outcomes not measured	17	30

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