



Understanding Gendered Innovation Processes in Forest-based Landscapes

**GENNOVATE Report
to the CGIAR Research
Program on
Forests, Trees and
Agroforestry**



GENNOVATE
ENABLING GENDER EQUALITY
IN AGRICULTURAL AND
ENVIRONMENTAL INNOVATION



RESEARCH
PROGRAM ON
Forests, Trees and
Agroforestry

Understanding gendered innovation processes in forest landscapes: Case studies from Indonesia and Kyrgyz Republic

The CGIAR Research Program on Forests, Trees and Agroforestry (FTA) (<http://foreststreesagroforestry.org/>) is the world's largest research for development program to enhance the role of forests, trees and agroforestry in sustainable development and food security and to address climate change. CIFOR leads FTA in partnership with Bioversity International, CATIE, CIRAD, INBAR, Tropenbos International and the World Agroforestry Centre.

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Foreword

GENNOVATE, *Enabling Gender Equality in Agricultural and Environmental Innovation*, is a qualitative comparative research initiative which brought together researchers from 11 of the Phase 1 CGIAR Research Programs (CRPs). Together the GENNOVATE research team is advancing a two-track strategy of building an authoritative qualitative portfolio of research results and second, catalyzing gender-transformative change in international agricultural research for development (AR4D).

This report forms part of a set of GENNOVATE research reports which pull together CRP-specific findings about how gender norms influence local level development dynamics, including the ability of individual men, women and young people to learn about and engage in innovation processes in agriculture and natural resource management. The findings presented in this report are primarily targeted to CRP research managers, scientists and research teams. They are meant to inform theories of change and intervention strategies, and to help identify opportunities for enhancing impact of agricultural research and development through the integration of gender transformative approaches.

Across the broad GENNOVATE initiative, researchers from different CRPs are working, both independently and collaboratively, on additional in-depth analyses of GENNOVATE results. Please be on the lookout for this follow up work in journal papers, books, briefing notes and other outreach products.

We hope you enjoy the report.



Lone Badstue

Chair, GENNOVATE Executive Committee

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Preface

Forests, trees and agroforestry (FT&A) systems are key to achieving 14 of the Sustainable Development Goals (SDGs). With an estimated 1.6 billion people dependent on forests and trees, including trees on farms, for their livelihoods, FT&A systems hold the potential to contribute to reducing poverty, improving food and nutrition security, achieving gender equality, addressing climate change, and contributing to sustainable production and consumption. Yet, important social processes – including gender relations – that shape the livelihood and resource management decisions, governance and the distribution of the benefits, prevent these systems from achieving their full potential.

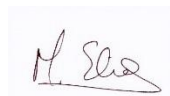
Gender relations and norms, as fundamental organizing structures across cultures and societies, play a pivotal role in shaping opportunities and constraints for people in FT&A systems, and condition the ability of women and men to benefit from, and contribute to, positive development and environmental change processes. This is why the CGIAR Research Program on Forests, Trees and Agroforestry (FTA), the world's largest coordinated research for development program that explores and seeks to enhance the contribution of FT&A systems to sustainable development, has a strong focus on gender and adopts an integrates a gender approach throughout its research portfolio.

This FTA study focuses on how gender norms and agency shape innovation processes in FT&A landscapes. Although the specificity of these norms varies across contexts, their existence is universal and of relevance to all those working, across sectors and disciplines, to effect change in FT&A systems. Fostering innovations – endogenous and externally driven – requires attention to the highly gendered social environment within which people live, and the limitations and opportunities gender norms pose for their ability to manoeuvre within these spaces. This report shows that facilitating beneficial and equitable changes in the world's landscapes critically depends on understanding these norms and creating spaces that unlock both women's and men's capacities to innovate.



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Executive Summary

An estimated 1.6 billion people depend in part or in full on forests and trees outside forests for their livelihoods. Yet, there are important inequities in the distribution of the benefits forests, trees, and agroforests yield to local people. Gender relations and norms, as fundamental organizing structures across cultures and societies, contribute to shaping the opportunities and constraints of women and men in these (agro)forests, and their ability to benefit from, and contribute to, positive development and environmental change processes. Drawing on data from Indonesia and Kyrgyzstan, this report focuses on how gender norms and agency shape innovation processes in forest, tree, and agroforestry landscapes. The capacity to creatively adapt and innovate to build resilience through natural resource-based livelihood practices is unevenly distributed amongst men, women and young people within communities, and may be constrained by shrinking opportunities in the context of wider structural economic and environmental changes. This aim of this report is to provide a better understanding of how men and women might be supported in exercising their agency in pursuing livelihood goals, independently or with others, in the context of rapidly transforming forest and tree-based landscapes.

The case studies reported here form part of ‘GENNOVATE: Enabling gender equality through agricultural and environmental innovation’; a qualitative comparative research initiative engaging 11 of the Phase I CGIAR Research Programs to examine the gender dimensions of innovations – new agricultural and natural resource management technologies, institutions, and practices. Despite significant historical, socio-political and environmental differences, the five case studies in East Kalimantan, Indonesia, and the case from southwest Kyrgyzstan exhibit pronounced and rapid changes in the relationship between people and forests. Both country contexts are marked by shifts in the relationship between rural and urban livelihood opportunities, forest livelihoods increasingly linked to migration and remittances, and commodification processes intensifying people’s integration into tree-based value chains. In the Indonesia cases, recent transformation is being driven by large scale commercial oil palm investment, which is bringing new wage work opportunities, whilst displacing other forms of livelihoods and resource access. In Kyrgyzstan, integration into the market economy and changing forest tenure regimes are resulting in new opportunities and challenges for different groups of forest dwellers.

Our analysis foregrounds the norms that act as structural barriers to gender equality and wider human well-being. Through our findings, we make four key points.

- First, we show how specific patterns of gender norms are associated with socially-differentiated priorities for livelihood innovation, and with the ability to exercise forms of agency required for realizing innovations. For example, in oil palm-dominated landscapes in Indonesia, there are stark contrasts between men’s and women’s priorities, which are cross-cut by access to capital and the social networks necessary to participate in particular forms of innovation.
- Second, our findings show how gender norms shape access to (tangible and intangible) assets, such as land, labor and capital as well as decision-making and information, without all of which the capacity to ride ‘waves of opportunity’ is diminished.
- Third, we demonstrate that the interplay between gender norms and innovation is dynamic: that is, innovation spaces vary for different groups of women and men and over time. Whilst many norms are sticky (e.g. women’s principal responsibility for domestic tasks), some livelihood innovations have, often by necessity, led to adjustments and the renegotiation of the division of labour, knowledge, rights and responsibilities under conditions of rapid socio-ecological transformation.

- Finally, we show how livelihood innovations that benefit some may bring significant harms to others. This is underscored by an interplay between gender norms and access to assets/decision-making as these change over time. For example, livelihoods that are being built around current innovations in smallholder oil palm are driving new processes of land acquisition and limiting the prospects for sustainable and equitable development within landscapes dominated by this crop.

As we show, these results have implications for gender-responsive and transformative design and implementation of FTA projects and policy interventions, namely:

- Interventions that target women must recognize men's role in facilitating (or hindering) women's access to resources, information, and decision-making, and engage men in a process to gain their support in view of improved household well-being. Other channels promoting women's access to the resources they need to innovate should also be explored; for example, through strengthening women's collectives that facilitate access to credit, land or information.
- Care must be taken not to view women or men as homogenous groups, as norms that affect their capacity to innovate vary within gender groups. Precise targeting must be coupled with attention to the norms that apply to particular groups of women (and men).
- Amid rapid rural transformation, the relaxation of certain gender norms can open up spaces for women's (and men's) innovation. Interventions can capitalize upon such openings to expand local innovation spaces by creating a critical awareness and dialogue around norms that restrict women's (and men's) capacity to innovate, to make and act upon strategic life decisions, and to achieve their aspirations can enhance capacities to innovate and bring transformative change in rural areas.
- Champions, including women innovators and the men who support them, can play an important role in unlocking innovation by serving as role models for other members of their community. When a critical mass of such individuals can be achieved, transformation in both livelihoods and gender norms and relations can become a reality.
- At the same time, the innovations of some can enhance their power to exclude. Unless uneven and damaging opportunity structures are attended to, the emblematic livelihood innovations of those in more privileged positions can spell further marginalisation and poverty of the poor and those with insecure resource rights. This calls for explicit attention to the ways new exclusions can emerge, and for ongoing engagement with the reshaping of power relations that (re)produce inequalities in forest landscapes.

1. Introduction

A renewed emphasis has been placed on achieving gender equality in the context of the Sustainable Development Goals (SDGs). The fifth of these goals, SDG5, is a call for gender equality and the empowerment of all women and girls. Realising this is also essential for achieving all the other SDGs. The CGIAR Research Program (CRP) on Forests, Trees and Agroforestry (FTA) contributes to achieving SDG5 by prioritizing a transformative approach to gender equality that focuses on the structural constraints and drivers of change in tree-based and forested landscapes, and how these affect men's and women's capabilities to control and manage assets and resources in sustainable ways, and participate meaningfully in decision-making at household and community levels. The approach taken in this report foregrounds men's and women's agency: their capacity to creatively adapt and innovate to build resilience through natural resource-based livelihood practices in forest and agroforestry contexts. The creativity exercised by forest-based communities in turning external shocks into 'waves of opportunity' has been examined by researchers who note the ways people frequently switch from one income source to another depending on resource availability, seasonality, market prices, outside investments, and so on, as part of an often-innovative resilience-building strategy (Colfer, 2008; Gönner, 2011; Schmidt, 2014; Sagynbekova, 2017). However, the capacity to exercise agency in this way is unevenly distributed amongst men, women and young people within communities, and may be constrained by shrinking opportunities in the context of wider structural changes to economies and ecologies. Our aim here is to arrive at a better understanding of how men and women might be supported in exercising their agency in pursuing livelihood goals, independently or with others, in the context of rapidly transforming forest and tree-based landscapes.

We examine these issues in six case study communities in East Kalimantan, Indonesia (five cases) and the Kyrgyz Republic (Kyrgyzstan) (one case). Despite significant historical, socio-political and environmental differences, both country contexts exhibit pronounced and rapid changes in the relationship between people and forests. Both are marked by shifts in the relationship between rural and urban livelihood opportunities, are contexts where forest livelihoods are increasingly linked to migration and remittances, and where commodification is intensifying people's integration into tree-based value chains. In the Indonesia cases, recent transformation is being driven by large scale commercial oil palm investment, which is bringing new wage work opportunities, whilst displacing other forms of livelihoods and resource access. As tree crops and forest landscapes are valued in new ways, they attract new actors (oil palm entrepreneurs from other parts of the country), leading to changes in social and gender relations. In Kyrgyzstan, integration into the market economy and changing forest tenure regimes are resulting in new opportunities and challenges for different groups of forest dwellers. The combination of these wider forces has created novel spaces in which livelihood innovation might be fostered, but has foreclosed other means by which men, women and youth can exercise their agency within forest-based livelihoods.

The approach we take foregrounds the norms that act as structural barriers to gender equality and wider human well-being. Deep seated gender norms – or societal expectations governing women's and men's daily behaviours and capacities to act – contribute to important differences in the ability of women, men and youth to learn, adapt and innovate within natural resource-based livelihood practices in forest and agroforestry contexts. For example, gender norms govern ideas about which agricultural tasks are associated with men or women, or whether it is appropriate for women to speak up in a public meeting where arrangements for oil palm dividends are being discussed. Specifically, such norms give rise to gender-differentiated capacities to access, control and manage forest and tree

resources sustainably, and thus to move out of poverty whilst navigating the profound changes underway in the governance of forested and tree-based landscapes.

The case studies reported here form part of 'GENNOVATE: Enabling gender equality through agricultural and environmental innovation'; a qualitative comparative research initiative engaging 11 of the Phase I CGIAR Research Programs to examine the gender dimensions of innovations – new agricultural and natural resource management technologies, institutions, and practices. GENNOVATE has been designed to allow for contextually grounded analysis, comparison and identification of patterns across the research contexts and sample groups reached. Given the variations in mission and objectives of the different CRPs involved in GENNOVATE, 'innovation' is defined expansively to encompass agricultural technologies, natural resource management practices, learning opportunities, relationships and institutions which are new for the study communities. Innovations may result from external intervention or have arisen locally. Innovations may be benign and beneficial, but they may also bring substantial harm to specific groups of women or men, and to forest and agro-ecologies. Rather than focusing on the introduction of a specific intervention derived from a CRP, the approach to 'innovation' for FTA within GENNOVATE emphasizes new livelihood practices that have been identified as important within the communities being studied. This includes both exogenous and endogenous innovations that bring both harms and benefits.

Through our findings, we make four key points.

First, we show how specific patterns of gender norms are associated with socially-differentiated priorities for livelihood innovation, and with the ability to exercise forms of agency required for realizing innovations. For example, in oil palm-dominated landscapes in Indonesia, there are stark contrasts between men's and women's priorities, which are cross-cut by access to capital and the social networks necessary to participate in particular forms of innovation. Secondly, our findings show how gender norms shape access to (tangible and intangible) assets, such as land, labor and capital as well as decision-making and information, without all of which the capacity to ride 'waves of opportunity' is diminished.

Thirdly, we demonstrate that the interplay between gender norms and innovation is dynamic: that is, innovation spaces vary for different groups of women and men and over time. Whilst many norms are sticky (e.g. women's principal responsibility for domestic tasks), some livelihood innovations have, often by necessity, led to adjustments and the renegotiation of the division of labour, knowledge, rights and responsibilities under conditions of rapid socio-ecological transformation.

Finally, we show how livelihood innovations that benefit some may bring significant harms to others. This is underscored by an interplay between gender norms and access to assets/decision-making as these change over time. For example, livelihoods that are being built around current innovations in smallholder oil palm are driving new processes of land acquisition and limiting the prospects for sustainable and equitable development within landscapes dominated by this crop.

As we show, these results have implications for gender-responsive and transformative design and implementation of FTA projects and policy interventions. These range from the need to engage men to support women's capacities to innovate, to supporting collectives that facilitate women's access to resources, and improving targeting strategies by recognizing the diversity of women (and men) and the unevenness of gender norms operating among differentiated groups. Interventions to expand local women's innovation spaces can capitalize upon ongoing rural transformation to create a critical awareness and dialogue around norms that restrict women's (and men's) capacity to innovate, to make and act upon strategic life decisions, and to achieve their aspirations can enhance

capacities to innovate and bring transformative change in rural areas. Efforts to support champions, including women innovators and the men who support them, can play an important role in unlocking innovation, as these individuals can serve as role models for other members of their community. When a critical mass of such individuals is achieved, profound transformation in both livelihoods and gender norms and relations can become a reality.

The report is organised as follows. We begin by outlining the conceptual framework and research methodology adopted for this study. The study focuses on the perceptions and voices of people within communities, and how they articulate gender norms and their interplay with livelihood innovation. This is followed by a discussion of the opportunity structure for livelihood innovation in each case study. We contextualize our cases in times of rapid landscape (ecological, socio-economic) change, amid which there are winners and losers. The remaining sections of the report set out our key findings – themed around the ways in which gender norms shape priorities for FTA livelihood innovations; how factors that support—and conversely, hinder—innovation are linked to gender norms shaping access to assets, decision-making and information; and finally, how innovation spaces vary for different groups of women and men and over time. To conclude, we turn to the implications of our findings for policies, programmes, and initiatives concerned with enhancing women’s and men’s capacities to innovate in forest and agroforest landscapes.

1. Methodology

GENNOVATE (“Enabling Gender Equality in Agricultural and Environmental Innovation”) explores the interplay between gender norms and livelihood innovation processes. The approach combines contextually-grounded, comparative and collaborative research strategies guided by the following study questions:

- How do gender norms and agency advance or impede innovation capacity in natural resource based livelihoods across different contexts and social structures?
- How do innovations affect gender norms and agency across different contexts, and under what conditions can these do harm?
- How are gender norms and women’s and men’s agency changing, and under what conditions do these changes catalyse innovation that is equitable and inclusive? What contextual factors influence this relationship?

Across most rural contexts worldwide, it is still more common and acceptable for a man than a woman to display agency, including taking the initiative to become knowledgeable about and test a new tree crop or forest management practice. Moreover, the ability to benefit from innovations is uneven across communities. A growing body of literature is finding that new agricultural and NRM technologies and practices which do not incorporate a gender analysis risk worsening the poverty, workload, and wellbeing of poor rural women and their families (e.g. Cornwall and Edwards, 2010; Okali, 2011; 2012; Kumar and Quisumbing, 2010). A better understanding is needed of the conditions under which both women and men participate in, benefit from or are harmed by livelihood innovations in agrarian or forest and tree-based landscapes. Thus, a central question guiding the study is how gender norms, or the daily roles and behaviours expected of each gender, differentially shape men’s and women’s capacities to innovate in their rural livelihoods. We also ask how gender norms are themselves potentially altered by peoples’ engagement in agricultural and NRM innovation processes.

The comparative analysis in this report employs the concepts of agency and gender norms, and important regularities in their interactions, to enhance understanding of the socially uneven impacts

of and engagement in livelihood innovation processes on the ground. Box 1 defines the key study concepts, and annex 1 elaborates in greater detail the research objectives and protocols.

Box 1. Key Study Concepts: Gender Norms, Agency and Innovation

Gender norms refer to the gender dimensions of social norms, or the societal expectations of how men and women ought to behave in their everyday affairs. Social norms also “structure social interactions in ways that allow social actors to gain the benefits of joint activity. And they determine in significant ways the distribution of the benefits of social life” (Knight and Ensminger 1998, page 105).

As Ridgeway (2009, p.145) further explains, “Gender is a primary cultural frame for coordinating behavior and organizing social relations.” Despite technological and institutional change in a society, “gender-framing” persists in shaping social life—e.g. stereotypical beliefs of men’s greater authority and competence than women are often “reinscribed into new organization procedures and rules that actors develop through their social relations in that setting” (p. 152).

Agency is “the ability to define one’s goals and act upon them” (Kabeer, 1999, p. 438), either independently or jointly with others. GENNOVATE’s conceptual framing positions agency as a process which is mainly embedded in and conditioned by local formal and informal institutions, although the agency and empowerment of disadvantaged groups can also transform constraining institutions and their rules.

Innovation in this study is defined expansively to encompass agricultural technologies, natural resource management practices, learning opportunities, relationships, and institutions which are new for the study communities sampled. These innovations may be locally devised or externally introduced. Our understanding of innovations and innovation systems is also informed by Berdegue’s (2005, p. 3) definition of innovation as “social constructs, and as such, they reflect and result from the interplay of different actors, often with conflicting interests and objectives, and certainly with different degrees of economic, social, and political power.”

GENNOVATE brings together a collaboration of 11 of the Phase I CGIAR Research Programs (CRPs). Field teams travelled from mid-2014 to mid-2016 to 137 agricultural and forest communities spread across 26 countries of Asia, Africa, and Latin America. This report draws on the subset of 6 village-level case studies from two countries (one case from Kyrgyz and five from Indonesia) that were sponsored by the Forests, Trees and Agroforestry (FTA) CRP.

The individual case studies were purposively selected to enable exploration of innovation processes in contrasting settings. As discussed in annex 1, the GENNOVATE sampling procedures call for cases that differ significantly in economic dynamism and gender gaps in assets and capacities within the study countries. The Indonesia cases were selected according to the mode of incorporation into oil

palm systems (see box 2) and according to ethnic profile in order to follow an intersectional approach (see box 3). In general, international comparisons across national development indicators show that both the Republic of Kyrgyzstan and Indonesia are low middle income countries with economies based on commodity export, and where migrant remittances are playing an important part in economic development. However, the communities themselves have relatively low economic dynamism and there is a significant proportion of households considered to be in poverty.

GENNOVATE's qualitative methodology prioritizes learning systematically from people's own perceptions and lived experiences with agriculture and the management of natural resources. In gender-specific focus groups and semi-structured individual interviews, the study engaged equal numbers of women and men in reflecting on questions relating to new livelihood practices, gendered life histories and movement out of (or into) poverty, and the social context of livelihood innovation.

Field teams applied a standardized package of six different data collection instruments in each research community. The instruments feature semi-structured questions as well as selected pre-coded questions. Some topics and questions, such as those related to new farming practices, are repeated in different instruments, while others appear only once, such as those for youth about education.

Box 2: sampling gender gaps in Indonesia and Kyrgyzstan – an intersectional approach

Cases from both countries are considered to have a low gender gap when international comparisons are drawn across GENNOVATE case studies. The approach taken in this report is to highlight ways in which gender intersects with other social categories. Case studies in Indonesia were selected to represent different ethnic profiles and include Dayak, Javanese, Bugis and Melayu (coastal Malay) dominated communities in which it was hypothesized that gender norms would play out differently. In Indonesia, gender can best be understood through its intersection with other social categories such as age, position in the sibling birth order and marital status. Ethnicity, sometime analysed as *adat* or custom, is key in shaping gender norms, kinship practices and property relations, and it is within this intersection that critical gender concerns emerge. Researchers have noted that in mainly Dayak communities, social relationships are not ordered by a fundamental code of gendered differentiation, and there is limited evidence of norms restricting or enabling activities purely on the basis of gender. Women and men have historically been able to inherit plots of land (e.g. fruit gardens), the mutability of gender roles has historically been shaped by men's travel for work or hunting forays, and women play a central role (symbolically and materially) in swidden rice cultivation (Colfer, 2008). However, ethnicity cannot be easily reduced to a customary 'origin' due to cultural flows associated with European colonialism and global capitalism, and for Dayak groups generally, Christianity. For other groups in the study, e.g. local Melayu (sometimes self-identifying as orang Berau) or Bugis (originating from South Sulawesi), cultural flows associated with Islam intersect with gendered adat practices and discourses. The intersection of gender with ethnicity is significant because ethnicity is more than an identity position: it is associated with a historical relationship with the state, and through this, with particular kinds of resource access. The Kyrgyzstan case study is also considered to have a low gender gap, but in this instance, gender intersects with age or generation and the political system. National data show that despite the remnants of a Soviet-era discourse of gender equality, there are significant differences in the opportunities available to men and women.

The data were gathered in standardized formats, cleaned, and systematically coded. The data analysis approach involved in-depth analysis of the key study questions in individual case studies; and

comparative analysis on particular topics across the different cases. Thus, some broad patterns could be detected without losing their grounding in local contexts and realities.

In each research community, or “case study”, field teams conducted two single sex focus groups with young (ages 16 to 24) women and men, and four single-sex focus groups with adult (25 to 55) women and men from poorer and better off households in their communities. In addition, semi-structured individual interviews were conducted with local agricultural innovators (2 women, 2 men) and with individuals representing different trajectories of wellbeing, or movements out of and into poverty according to measures derived from local focus groups (2 women, 2 men). Annex 1 provides an overview of key protocols which guided the study’s sampling, data collection, and analysis.

Box 3: sampling strategy: economic dynamism and incorporation into oil palm systems

Cramb and McCarthy (2016) show how oil palm investments are characterized by a range of modes of production, including large scale private or state-owned estates and smallholder investments. The latter comprise a number of different modalities, including those incorporated within the corporate sector as ‘outgrowers’ (*petani sawit plasma*), local smallholders investing in oil palm independently of corporations (*petani sawit mandiri*), and migrants who acquire frontier land in order to participate in the oil palm boom. The definition of ‘outgrower’ has also shifted in recent years where private sector corporate investment is through a partnership (*‘kemitraan’*) arrangement through which companies take control of 80% of the development area, assuring smallholders a 20% share in the form of a ‘dividend’ from the estate (usually the equivalent of the production benefit from a two-hectare allocation, which is referred to as ‘plasma’) (McCarthy and Zen, 2016). Independent smallholders may include farmers who switch from other tree crops to grow oil palm, but also includes independent migrant investors. Whilst individual oil palm smallholdings among this ‘independent’ migrant group may be relatively small in size, incrementally these account for a significant element in land acquisition in some localities. Indonesian cases were selected to represent a variety of modes of incorporation into oil palm systems, as shown in Table 2.

The GENNOVATE cases target agri-food systems or intervention domains of relevance to the CRPs involved, and they are meant to help inform present and future research for development in these areas. The quality of the fieldwork is greatly enriched by being able to draw on existing relationships with and knowledge of many of the research sites. These relationships, however, may also prompt concerns for bias in the findings due to factors such as an underrepresentation of difficult places, or study participants being courteous, overstating benefits or downplaying difficulties, or expecting some kind of reward. These concerns are not unique to qualitative research strategies and researchers involved in the GENNOVATE studies have applied social science techniques of critical self-reflection to reduce bias in interpretations and findings. GENNOVATE’s large comparative dataset, which asks many of the same or similar questions to different population groups within the same community, provides numerous opportunities to cross-check data which may be partial, confusing or contradictory.

2. Changing opportunity structures and transformations in people-forest relationships

2.1 Opportunity structures and rural transformation: Kyrgyzstan

Kyrgyzstan, which houses part of the Tien Shan mountain range, is a global biodiversity hotspot (Myers et al., 2000) and centre of domestication for a number of temperate fruit tree species including walnut (*Juglans regia*), apple (*Malus spp.*), plum (*Prunus spp.*), and pear (*Pyrus spp.*) (Kolov, 1998; Hemery and Popov, 1998; Harris et al., 2002; Juniper and Mabberley, 2006; Orozumbekov, 2011). The mountain village of Talas where this study was conducted is located near Jalal-Abad, the administrative and economic centre of Jalal-Abad Region in southwestern Kyrgyzstan (Figure 1).¹ The village is nestled in mixed walnut-fruit forests that are of exceptional conservation importance (Olson et al. 2001) as reservoirs of fruit tree genetic diversity and for water regulation for irrigation of the densely populated Fergana Valley (Musuraliev, 1998; Orozumbekov et al., 2009).



Figure 1. Forests of Jalal-Abad region

Source: adapted from the National Forest Inventory in the Kyrgyz Republic, 2008-2010, and the Nations Online Project (<http://www.nationsonline.org/oneworld/map/kyrgyzstan-administrative-map.htm>)

The history of settlement in the village is recent. Before being annexed to the Soviet Union in 1924, semi-nomadic Kyrgyz settlements were located in valleys in the Sugan Tash and Ak-Tash mountain ranges, where people lived in extended families or groups of closest relatives (Schmidt, 2012). As herders, they sought the availability and quality of pastures for grazing sheep and cattle. According to *Ayil Okmotu* statistics, 55% of the village population lives in poverty or extreme poverty. Suzak rayon (administrative division) where the village is located has had negative poverty level indicators since the year 2000 (UNDP, 2013). This is even though the local population lives in forests and can thus draw on sources of income beyond farming and cattle raising. Today, local residents, who are largely mono-ethnic Kyrgyz, maintain semi-nomadic lifestyles, farming small (one hectare) plots and home gardens in the winter in Talas, and migrating to the high plains (*Jailoo*) with their animals in the summer. Cattle raising remains at the centre of local culture and sustenance. As noted by others working in the region (Schmidt, 2012), local people are also highly dependent on nut and fruit collection for subsistence and sale. These include walnuts, mushrooms, apples and plums (which may be dried prior to sale), and

¹ The names of all communities (Kyrgyz and Indonesian) are pseudonyms.

medicinal herbs. Beekeeping and temporary migration to Russia, Kazakhstan or to Bishkek (the capital) or Jalal-Abad is common for men and to a lesser extent for women, with remittances representing an important source of income for family members who stay behind.

Since Kyrgyz independence in 1991 and the move to a market economy, forest products have become increasingly commercialized, with the sale of walnuts now representing one of the main sources of income. Forest dependence and cultivation of small land plots have also increased due to large-scale loss of employment from the collective enterprises since the fall of the Soviet Union (Undeland, 2011). Concerns have thus arisen over unsustainable harvesting of NTFPs and wood for charcoal and timber leading to forest degradation and loss and an ageing of walnut trees (Herold, 2005). Haymaking in forest clearings, forest conversion to other land-uses, fires, pests and diseases, and overgrazing by livestock are also blamed for degradation, as nearly as many animals as humans live in the walnut fruit forests (Cantarello et al., 2014).

A remnant of the Soviet period, forest management over delineated areas is regulated by *leshozes* (state Forest Enterprises), whereas other socio-economic aspects of village life are relegated to the *Ayil Okmotu* (local self-governing authorities). *leshozes* are responsible on the local level for forest protection and implementations of forestry management plans. After years of totalitarian control over the local forests and people, the *leshoz* continues to be perceived as a foreign and ‘policing’ entity (fieldwork data). It grants access to forest products; access into nut forests to harvest wood, and access to land plots to harvest hay and pick nuts and fruits for sale. This, through a new model of Participatory Forest Management (PFM), is being promoted through medium-term leases of forest land (*arendas*) to local households. Coupled with new markets for forest products, this model has generated innovation opportunities conditioned by gender and age, among other factors, in the study village (Figure 2).

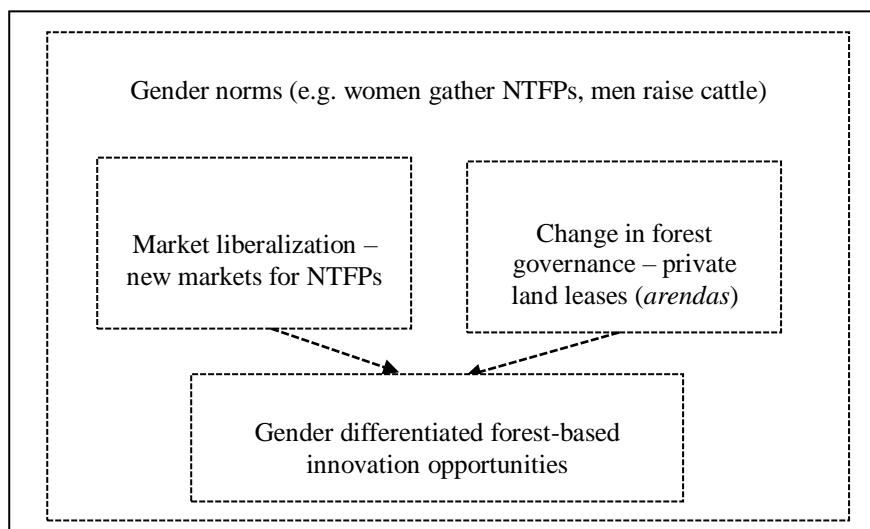


Figure 2: The opportunity structure of forest-based innovations in Talas, Kyrgyzstan

Although the discourse around gender relations in Kyrgyzstan has been influenced by communist ideals of equality, important inequalities remain. Data from the National Statistics Committee’s Demographic and Health Survey (DHS) (2013) for Jalal-Abad *oblast* (administrative region), where the study village is located, show that whereas men and women have equal access to education, only about 23% of women versus 77% of men were employed in the 12 months preceding the survey. Women are also far less likely to occupy governmental positions than men, and command less decision-making authority at household level than their husbands. DHS data show that only 73% of

women can decide on their own whether to visit their family or relatives, and only 77% are consulted when making major household purchases. In Talas village, women used to play significant roles during Soviet times, being *leshoz* specialists and active leaders of the local self-governing authorities. Today, they are insignificantly represented among activists of civil society movements, and among *leshoz* and *Ayil Okmotu* specialists, and are almost absent among local deputies (GENNOVATE ‘community profile’ data). Moreover, although bride kidnapping (young women’s focus group data) and domestic violence are decreasing, they remain a concern for women in the study village (poor women’s focus group data, various interviews).

2.2 Opportunity structures and rural transformation: Indonesia

In Indonesia, the five case study communities are located in the province of East Kalimantan, four in Berau district (of which three are in the Upper Segah river basin, and one is in a coastal area), and one in East Kutai district (Figure 3).

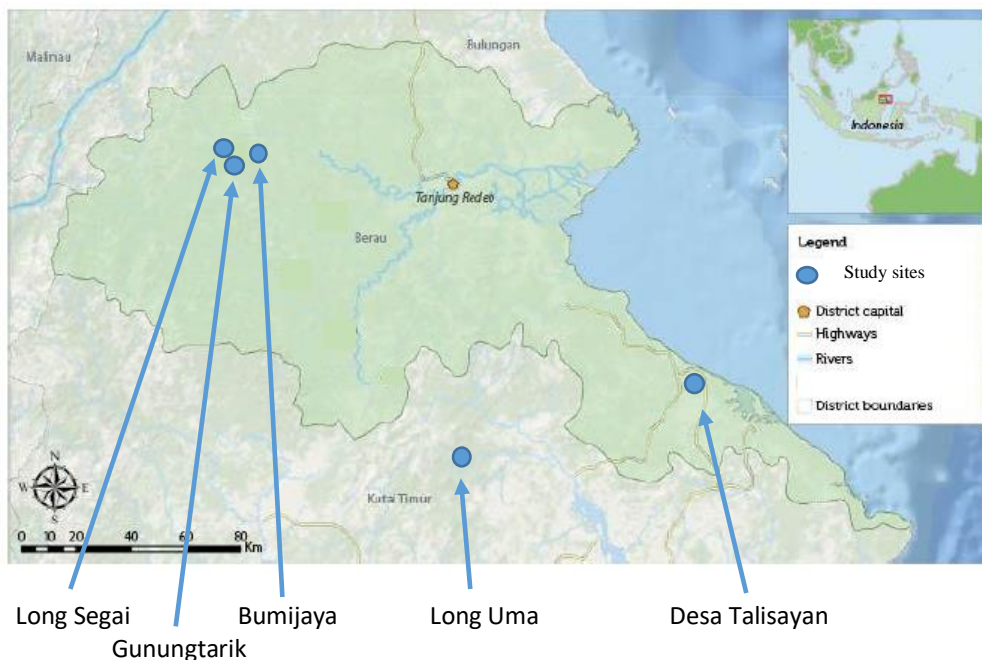


Figure 3: Study sites in East Kalimantan

Source: adapted from Anandi et al., 2014, figure 21.1.

Situated in the province of East Kalimantan, the districts of Berau and East Kutai are rich in natural resources and represent the challenges of balancing environmental protection with economic development. This landscape has been marked since the colonial era by successive waves of large scale resource extraction (logging, coal mining and timber plantations) and the opening of transmigration resettlement sites (Deddy, 2006; Colfer, 2008, Gönner, 2011). Coal mining, forestry and agriculture contribute significantly to each district’s economy. Annual population growth is 4% for Berau and 5% for East Kutai (2015), which reflects a combination of outmigration of local people, and the arrival of migrants from other towns, districts and provinces seeking employment opportunities. An important arm of this changing population relates to oil palm, which has been a major draw for migrant workers and investors, particularly into Berau district.

Most of the land in Berau falls under the jurisdiction of the Ministry of Forestry (*kawasan hutan*) and is zoned as either protection forest or production forest (1.7 million hectares in total). A smaller

proportion of land (0.5 million hectares) is designated for non-forest uses, and is under the jurisdiction of the district government. The landscape thus comprises a mosaic of timber, plantation and mining concessions, along with state-sponsored transmigration settlements inhabited by those resettled from Java and other Indonesian provinces (Casson et al., 2015).

Although much of the forest area is designated for these uses, indigenous and local groups of farmers inhabit many areas. Upland Long Segeh and Long Uma, and coastal Desa Talisayan are indigenous Dayak communities where traditional agriculture and forest-based livelihoods are practised, coupled with smallholder tree cropping. Gunung Tarik is a local Berau Malay community, also marked by traditional agriculture and forest-based livelihoods. Neighboring Bumijaya is a transmigration settlement established by the government for timber production, but now increasingly involved in smallholder oil palm. Part of Gunung Tarik includes an area originally designated for transmigration, but when this programme was suspended in the District, the land was made available to a substantial number of returning cross-border migrants who have moved to the area in search of land to cultivate independent smallholder oil palm.

There is a significant governance challenge of balancing green growth initiatives (including corporate Zero Deforestation pledges), with the economic imperatives set out in the Indonesian government’s Master plan: Acceleration and Expansion of Indonesia Economic Development (2011–2025), which seeks to expand plantations (timber, oil palm and food crops) and natural resource extraction (particularly logging and mining) (Casson et al, 2015). Oil palm investment features heavily in the changing governance landscape, and this provides a focus for the case studies in this report.

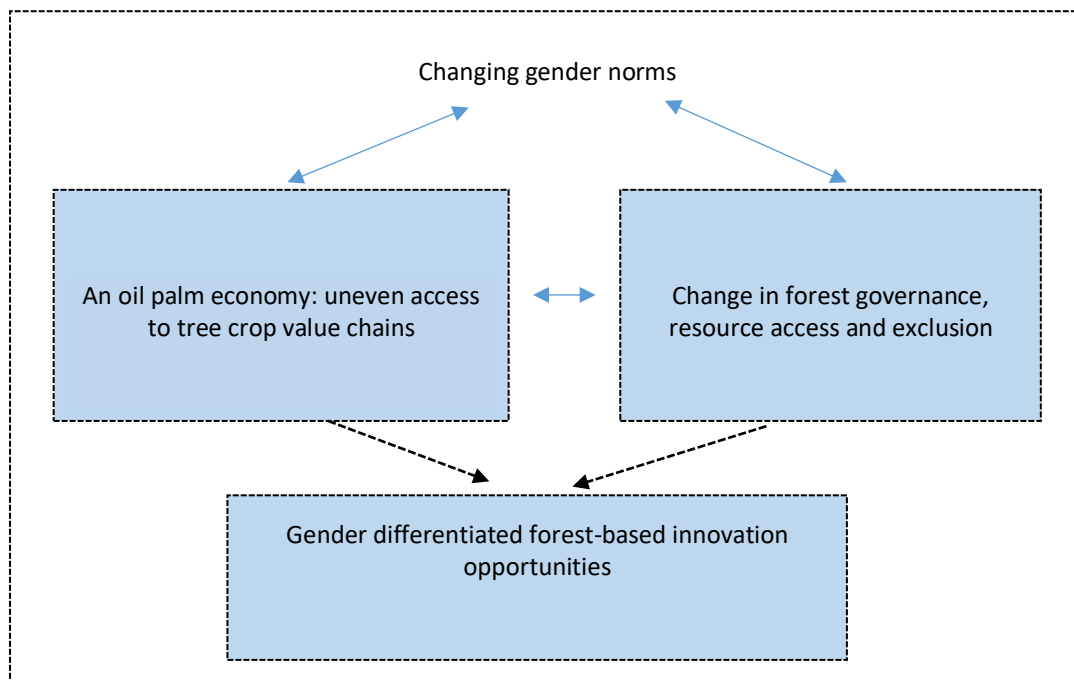


Figure 4. The opportunity structure of forest-based innovations in East Kalimantan, Indonesia

Oil palm investment began in the early 2000s when large scale transnational companies began to take over former logging concessions that had been granted on land over which the state claimed primary authority but which were also underlain by local customary use and tenure practices (Obidzinski et al., 2014). Two principal business models for oil palm feature in the cases: first, a nucleus-plasma model, whereby companies establish a dividend distribution (plasma) scheme with communities surrounding

the plantation. This is effectively the allocation of profits from two hectares of plasma land per recipient, once the cost of land clearing, planting, crop maintenance and other operational costs have been deducted. Such a model predominates in Long Segah, Desa Talisayan, Long Uma, and to an extent, in Gunung Tarik. Households in the transmigration area of Bumi Jaya were not regarded as 'local communities' and no such arrangement existed: people's incorporation into large scale oil palm systems was as wage workers. The second model is independent smallholder production which is flourishing in parts of Gunung Tarik and Bumi Jaya due to a specific set of circumstances that provided these communities with access to social networks, capital and knowledge that enabled engagement with this type of production.

Changing natural resource governance and the political economy of oil palm investment provides the broader context in which each of the cases is situated, and this shapes the opportunity structure of livelihood innovations in each community. Table 1 gives an overview of the Indonesia case study communities, principal sources of livelihood and the way in which the community has been incorporated into oil palm systems and value chains.

Table 1: Case Study Communities, Indonesia

	Community characteristics	Livelihood	Mode of incorporation	GENNOVATE sample strategy
Long Segai located in Segah subdistrict, Berau District, East Kalimantan	Mostly Christian Ga'ai Dayak in upland area of Segah river basin.	Swidden rice, gaharu collection, hunting, mixed trees cultivation, small-scale gold mining, wage work on nearby oil palm plantations.	Corporate 'leasing' of community land under inti-plasma model; ² compensation for forest products from incorporated land is distributed amongst community.	Low gender gap, low economic dynamism
Gunungtarik located in Segah subdistrict, Berau District, East Kalimantan	Muslim Berau Malay and local people, alongside Bugis migrant returnees from Malaysian oil palm work. upland area of Segah river basin.	Swidden rice (at a distance), independent oil palm cultivation, wage work on nearby oil palm plantations.	Mix of plasma incorporation (of local people) and independent smallholder investment by migrants.	Low gender gap, high economic dynamism
Bumijaya located in Segah subdistrict,	Transmigration settlement est. in 1982 close to Gunungtarik. Mostly Muslim	Rain-fed rice fields, mixed food cropping, small animals, wage	Some independent smallholder investment in oil palm.	Low gender gap, high economic dynamism

² The 'plasma' model, or *plasma-inti rakyat* now involves 20% of the plantation area distributed back to community members as planted plots from which they receive profits once fees and costs have been deducted (Cramb and McCarthy, 2016).

Berau District, East Kalimantan	Javanese and Sundanese origin, recent Muslim migrants from Nusa Tenggara Barat (Lombok).	labour on oil palm plantations.		
Desa Talisayan located in Talisayan subdistrict, Berau District	Mixed community comprising a mix of Baloy Dayak, Bugis (South Sulawesi) and Nusa Tenggara Barat people. Coastal location, relatively accessible to urban areas.	Swidden rice, tree crops (kebun), kemiri (candlenut), peppers, cocoa and maize, wage labour on oil palm plantations.	Corporate 'leasing' of community land. Some independent smallholder investment in oil palm, partially implemented plasma-inti arrangements.	Low gender gap, low economic dynamism
Long Uma Located in Telen subdistrict, East Kutai district	Mostly Christian Kenyah Dayak established around 1962 following downstream migration from upland plain.	Swidden rice, rubber, tree crops (kebun), wage labour on oil palm plantation.	Corporate 'leasing' of community land. Some independent smallholder investment in oil palm, partially implemented plasma-inti arrangements.	Low gender gap, low economic dynamism

For historical reasons, gender hierarchies are relatively unpronounced, although gender inequalities are evident in many aspects of life. The relative lack of gender hierarchy and the structural importance of women in Indonesia relates historically to prevailing economic and social conditions such as the availability of frontier land and women as pioneers in land development, low population densities in some places (as was previously the case in East Kalimantan) meaning that women's agricultural work was a household essential, rice-based agrarian systems in which women are dominant, the relatively late development of a centralised state encouraging a distance between the patriarchal state and local culture, the predominance of bilateral kinship, inheritance of land and other resources by daughters, and women's control over money and management of family finances (Colfer, 2008, Atkinson and Errington 1990; Van Esterik 1982).

However, in everyday life, the overall prestige and power enjoyed by men typically exceeds that of women, and in contrast to the *discourse of gender equality* found in Kyrgyzstan, this reflects the ways that gender practices and relations are also shaped by *patriarchal gender discourses* and practices of the Indonesian state. State gender ideology is reflective of a particular social positioning of a stereotypical urban middle class, and comprises an ideal pattern of gender centering on a household in which men exercise power over women. Many state-led development interventions carry this ordering of gender, and its associated definitions of appropriate gender roles: usually, a male bread-winning household head, and a female care-giver. Whilst the origins of this ideology are generally

placed within the New Order government (1966-1998), this kind of ideology continues to pervade both private- and state-led development initiatives and interventions, not least those associated with access to land and property, such as the way land is allocated in transmigration resettlement (e.g. in Bumi Jaya) and in the allocation of plasma dividends in the oil palm sector. Thus, the interests of women are buried in state resource control, where simplifying state gender norms override more complex local norms of gender.

3. Gender norms shape priorities for livelihood innovations

In the Kyrgyz and Indonesian case studies, gender and other factors of social differentiation shape women’s and men’s innovation priorities. Table 2 shows the top-ranked innovations for the 2005-2015 period cited by different groups of Kyrgyz participants. Men’s unanimous vision about the most important innovations contrasts with the non-uniform vision of different groups of women.

Table 2. Most important new agricultural and NRM practices in Talas, 2005-2015

Focus group		#1 ranked for own gender group	#2 ranked for own gender group
Men	Poor	New breed of bees	Drying apparatus
	Middle-income	New breed of bees	Drying apparatus
	Young	New breed of bees	Drying apparatus
Women	Poor	Growing cherries	Growing raspberries
	Middle-income	Making jam	Making armored milk
	Young	Growing fruits and vegetables in garden	Sharecropping arrangement for picking nuts

The reasons men advanced for prioritizing innovations relate to increased profits, whereas women refer to improving profits, home consumption and reducing labour. The poor women’s group specified that preferred innovations are those reserved for women, and poor and middle-income men considered that beekeeping is ‘men’s work’ and can help them make money. **The many different innovations women cited and the multiple reasons why they prioritized these attest to the diverse livelihood strategies they pursue to fulfil their myriad roles and responsibilities.**

Changes in the opportunity structure, such as policy changes resulting in forest plot leases and new markets for walnuts and other tree products, have **opened up a space for NRM innovations.** As what used to be products for the household – nuts, jams, dried fruit, and shelled nuts –have gained monetary value, women’s income from their sale has increased.

The ability to capture emerging opportunities is linked to norms that shape how different social groups, defined by gender, age, socio-economic and other factors that interact, engage with each other and with their environment. In Talas, although women are responsible for milking cows and retain their milk, men are symbolically associated with cattle. The number of livestock men own is taken as a marker of household prosperity. In turn, women are symbolically associated with domestic responsibilities and subsistence production. For instance, when asked to describe a good husband and a good wife, poor men’s and women’s groups described a good man as a breadwinner, hardworking, and able to create good life conditions for his family. Poor men particularly focused on material and economic criteria, whereas women also valued affective and social attributes: dignity and respect,

decisiveness, sensitivity and understanding. Middle-income men linked a man's authority within his home to his income, stating: "Nowadays the more money you make the more authority your words have." A poor male participant adds that, "Unemployed men do what their wives say due to a desperate situation." In contrast, both men and women considered a good woman a guardian of the hearth, who performs all the housework, takes care of family members, and is caring, compassionate, hardworking, and level-headed.

As forest products in Talas were historically collected for consumption purposes, they were associated with women's food processing and domestic responsibilities. During Soviet times, the private sale of forest products was strictly prohibited. In contrast, the current village economy revolves around walnut sales, which now represent the primary source of income for most women and their households in the study site (Box 1). Walnut income is used to reimburse the large debts households incur for rituals such as a man's father's wake (*ash*) or the marriage of daughters. It serves to build houses and pay for other life expenditures. Yet, this income is both seasonal and fluctuating, as it depends on the production cycles of an uncultivated tree.

Cattle, in turn, has the value of a bank deposit that can be liquidated during years of poor nut yields. Yet, **insofar as household prosperity is considered linked to cattle, and cattle to men, men's cattle raising activities command greater symbolic value than women's income from forest products.** The lower recognition and value associated with nut collection and sale can thus be understood in light of the local value system and orientation towards cattle raising, as well as with the instability of forest income due to seasonal fluctuations. **This has maintained a space for women in the walnut and forest product trade.**

Box 4: Forest-based products and innovations can enable women to move out of poverty

Access to forest products and related innovations (new collection, processing and marketing arrangements) can play a critical role in enabling women to move out of poverty and in giving them a sense of power and freedom. A female innovator explains her move from the lowest level of well-being relative to other community members 10 years ago to a mid-level now by detailing how she has been collecting and storing nuts, selling them for a profit and using the money to repay credits. Another woman, 49 years old, indicates that the highest point (+5, on a relative scale from -5 to +5) in her life's economic history was when her children grew up and were able to pick all the nuts available on their *arenda*. She then earned enough money to marry off her daughter without incurring any debt. And a 38 year old widow notes that the most important asset she has acquired in her life is her 5 ha of rented nut forest plot. She explains how she has no cattle, but uses her nut income to purchase food, build her house:

Two years in a row I sold nuts, during the first year I made the house foundation on the earned money. To be honest nobody helped me, neither my relatives nor my [deceased] husband's. I bought construction materials with the saved money, I hired a local craftsman. The next year, having collected nuts again, I bought the roof for the house with this money.

With their improving economic situation, these participants paid for their children's education and became active members of the village: the widow became a member of the Village Health Committee and the 49-year old teacher became the leader of a women's group and received training and a grant to purchase equipment for making jams. Government loans played an important role in these women's lives; and nut sales are what then allowed them to settle their debts.

Whether men are breaking with ‘traditional’ gender norms and moving to pursue some of the more remunerative ‘female’ activities, as has frequently happened with crops in other contexts (Dolan, 2001; Elias and Carney, 2007; Njuki et al., 2011), requires further research attention. Narratives around men’s (lack of) involvement in forest product gathering were somewhat conflicting across focus groups. In some families, men are involved in gathering, and men’s listing of a forest product ‘drying apparatus’ as one of the top innovations for men (Table 1) suggests that they are interested in forest product-related activities. The dryer mentioned is a large-scale, collectively managed technology introduced by a development project. **Because of its monetary value, its location (some distance from most homesteads), and its introduction via an NGO through (male-controlled) community channels, it is precisely the type of technology that would normatively fall under men’s control, even though the activities it is meant to support (drying nuts and fruits) are typically performed by women.** The technology may facilitate men’s entry (normatively and materially) into the nut selling business, engendering competition with women’s self-managed enterprises. In this way, **innovations may contribute to shifting gender norms, whether deliberately or unintentionally, and in favour – or not – of specific interest groups.**

In East Kalimantan, Indonesia the dominance of large-scale oil palm investments over the past 10 years underpins the importance granted to this tree crop among all groups in the study. However, as was the case with the Kyrgyz participants, women’s selection of oil palm is generally as a second place innovation. In most communities, women’s top-rated innovation reflects an adaptation linked to a new subsistence strategy that involves the cultivation of vegetables. Table 3 shows the top-ranked innovations for the 2005-2015 period cited by different groups of participants in the East Kalimantan cases.

Table 3. Most important new agricultural and NRM practices in East Kalimantan cases, 2005-2015

Focus group		#1 ranked for own gender group					#2 ranked for own gender group				
		<i>Talisayan</i>	<i>Long Segeh</i>	<i>Gunung Tarik</i>	<i>Bumi Jaya</i>	<i>Long Uma</i>	<i>Talisayan</i>	<i>Long Segeh</i>	<i>Gunung Tarik</i>	<i>Bumi Jaya</i>	<i>Long Uma</i>
Men	Poor	Rice	Logging and construction	Oil palm	Oil palm	Oil palm worker	Clean water	Oil palm worker	Rice	Inter-cropping	Rubber
	Middle	Oil Palm	Oil Palm	Oil Palm	Wet rice paddy	Oil palm	Peppers	Rubber	Oil Palm	Oil Palm	Rubber
	Young	Oil Palm worker	Road and Motor Bike	Fertilizer for oil palm	Cattle	Rubber	Peppers	Oil Palm	Grow vegetables	Oil Palm	Oil Palm
Women	Poor	Peppers	Grow vegetables	Rice	Oil palm	Rubber	Grow vegetables	Oil Palm	Oil palm	Oil palm worker	Oil palm worker
	Middle	Vegetables	Grow vegetables	Rice	Oil palm	Oil palm	Oil palm	Oil palm worker	Oil palm	Cattle	Veg- etables

	Young	Oil palm worker	Grow vegetables	Oil Palm	Veg- etables	Oil palm worker	Peppers	Rice	Oil Palm	Agric college	Fishing
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The reasons men advanced for prioritizing oil palm as an innovation relates to the long-term income it generates with relatively low labour input, whereas for women, innovation is in cultivating vegetables for household provisioning. Innovation in smallholder oil palm among men is among middle and younger groups in Dayak communities, but more widely shared among men in the migrant community of Gunung Tarik and the transmigrant settlement of Bumi Jaya. However, free text comments in FGDs with poor men and women in Dayak communities illustrated peoples’ struggle to identify innovations and instead, discussion focused on how the removal of forest resources in the wake of large scale oil palm investments had restricted opportunities for innovating and responding to changing conditions.

The innovations prioritized by women attest to diverse livelihood strategies, with a focus on food security, but this plays out differently in Dayak and in migrant communities. The emphasis on vegetable cultivation by women was marked for both middle and poor women in Dayak communities that prior to large scale land acquisition for oil palm, had gathered vegetables from the forest (e.g. in Desa Talisayan, Long Segeh and Long Uma). **Replacement of forest by oil palm had ended women’s gathering activities, but at the same time, new markets for vegetables had opened up.** In one of the youth focus groups (Long Segeh), one participant mentioned that for a time, diets were very narrow as the forest diminished but new emphasis on vegetable cultivation and overland access in and out of the community was bringing better diversity. Migrant women in Gunung Tarik also emphasise food cropping, but their top innovation is rice *“because it is our staple”*, reflecting the fact that prior to settling in East Kalimantan, these women had been landless oil palm workers in Malaysia. Thus, having access to land for swidden rice is regarded by them as an important livelihood innovation.

Oil palm is also identified as an important livelihood innovation by women, but in different ways, depending on the way the community has been incorporated into oil palm systems. In the Dayak communities of Desa Talisayan, Long Segeh and Long Uma, **labor opportunities on oil palm plantations are noted as an important livelihood innovation** that has emerged in the last 10 years. This was noted particularly for poor and young women: money from oil palm work enables women to pay for education and daily needs, including clean water, as water sources have been degraded by deforestation and plantation establishment. Opportunities to earn cash from plantation wage work is identified by women as having made an important contribution to household finances in the last 10 years. In both poor men’s and poor women’s FGDs, plantation wage work was given as a reason why people have been able to move above the community’s self-defined poverty line over the last decade. *“Ten years ago, there weren’t any oil palm companies. But since the company arrived, there are no more families below the poverty line”*, said a poor woman participant in Talisayan. It is important to place this in context, however. Women’s work on plantations is casualised, and carries other kinds of risks. The comparison that study participants were making was with a situation where forests (and forest gathering opportunities) were being diminished by commercial logging, and where there were very limited wage opportunities for women (Colfer, 2008).

In a context where norms concerning what makes a good wife and a good husband hinge on notions of cooperation, **working for a wage is thus interpreted as women ‘helping’ the household economy, but their employment pushes against gender norms around rice cultivation, domestic labor and care.** Women note that engagement in oil palm wage work has brought challenges for combining

employment with normative responsibility for rice cultivation and family care work. According to poor women FGD participants in Desa Talisayan, *“It is difficult for us because we have to take care of small children”*.

Others point out that this labor ‘windfall’ is likely to be short-lived as it is associated with age-related gender norms: according to one Dayak man in Desa Talisayan: *“In this life, there are easy moments and difficult moments. For those who have land there is hope for their future. Our future will not be good if we keep on working at the company, because we grow old every day, and the company doesn't hire old people.”*

Investment in independent smallholder oil palm is a primary innovation for men, and a second innovation for women in migrant communities (Gunung Tarik and Bumi Jaya) and in middle income Dayak groups in Long Uma, Long Segeh and Desa Talisayan. Oil palm cultivation is valued for its income-generating potential and limited labor demand, and has enabled some people to rapidly ascend in terms of wealth and empowerment. This has been particularly the case for migrants in Gunung Tarik, and for a very small number of wealthy individuals in Dayak communities. In both these categories, local definitions of wealth (i.e. the top rung of a metaphorical ladder of power and freedom) are associated with independent investments in oil palm. A female oil palm innovator from Gunung Tarik was clear about how oil palm had moved her from the bottom of the ladder to close to the top: *“I bought this house using the money I get from oil palm. I bought the car also from oil palm. I eat everyday also because of oil palm.”*

In two of the youth FGDs, participants mentioned **innovations that focused on geographical and class mobility**: having better transport links that enable people to move outside the community (for young men) and going to agricultural college (for young women). The first of these is linked to a common Indonesian concept of *merantau* – migration for ‘experience’, which is associated with young men, and **an emerging norm around young women’s participation in formal education** so they can delay or avoid field-based employment.

Although large-scale oil palm investments are seen as being detrimental to many communities, due to forest loss and impacts on customary tenure, there have been accompanying changes in the opportunity structure for livelihood innovation. Specifically, changes include the establishment of processing mills that well-connected smallholders can potentially access for their oil palm, new road infrastructure enabling better market access, the arrival of migrant workers from elsewhere in Indonesia (creating a demand for agricultural produce), and off farm labor opportunities in oil palm plantations. For women, what used to be gathered products for the household – fruits, vegetables – are now cultivated for sale to the new markets that a large pool of imported plantation migrant workers represents. Wage opportunities have enabled women to participate more fully in the cash economy and engagement in smallholder oil palm has brought benefits to some households also, notwithstanding the caveats that these opportunities may be short-lived. Together, these factors have enabled many people in the communities to regard themselves as having moved out of poverty.

As with the Kyrgyzstan case, the ability to capture emerging opportunities is linked to norms that shape how different social groups, defined by gender, age, ethnicity, socio-economic and other factors that interact, engage with each other and with their environment. In the Dayak communities of Long Segeh, Long Uma and Desa Talisayan, women are strongly symbolically associated with swidden rice cultivation. An issue, particularly for women in the poor category in these communities, is the challenge of combining necessary plantation wage work with swidden rice cultivation. As a poor Dayak woman in Long Segeh noted: *“The disadvantage is that if we don't work [on the oil palm plantation],*

we won't get money. In the past the prices of goods were cheaper than today. And it was easier to get money. Now, if we don't work we won't have anything."

In all the Indonesia cases, **gender norms position women as managers of the household economy, whilst men are positioned as the main breadwinners.** For instance, when asked to describe a good husband and a good wife, poor men's and women's groups described a good man as hardworking, diligent, tenacious and responsible. Poor men focused on material and economic criteria, whereas women also valued social attributes of honesty, openness and kindness. Poor men in Dayak communities also focused on men being creative in the face of adversity: *"He should be able to read the situation when he should plant, which plant should be grown, which one with a good prospect."* Poor men's descriptions of livelihoods emphasizes some of the "waves of opportunity" that men have ridden, in logging and construction, in rubber cultivation (Long Uma, Long Segeh), and in growing peppers (Desa Talisayan).³

The emergence and growth of a local market for vegetables and fruit has created a space for women as cultivators (and in some communities, traders) of these products even as oil palm takes over the landscape. This is despite vegetable cultivation having limited recognition and value in the cases, despite this being recognised as important for household food security and diversity of diets. For example, in the Javanese transmigration settlement of Bumi Jaya, prevailing gender norms associate women with managing household finances and in trading vegetables and other food items. Women have been able to successfully innovate as small-scale traders and shop owners, supplying indigenous Dayak communities where subsistence food production is being replaced by a market economy, enabled by Dayak women's engagement in oil palm plantation wage work.

The normative value attached to men's ability to seize opportunities and adapt is one of the reasons why investment in smallholder oil palm is seen to be so important for men, and partly explains how oil palm is being discursively positioned as 'a man's crop'. There is, however, the potential for dissonance around masculinity norms and oil palm cultivation as the cost and knowledge barriers for engaging in this innovation make it difficult for poor and young men to live up to this emerging gender norm. In poor men's FGDs in Dayak communities, participants saw the arrival of the oil palm company narrowing the range of livelihood opportunities open to them. Removal of the forest is seen as restricting the capacity to innovate, particularly for communities once dependent on forest-based livelihoods. Vestiges of forest-based innovation remain, for example, in processing construction materials or in collecting gaharu (eaglewood), both of which are practices associated with men. These kinds of innovations are notable in that they do not rest on any kind of external intervention, or access to capital or credit.

4. Factors that support—and conversely, hinder—innovation are linked to gender norms that shape access to assets, decision-making and information

³ Gönner (2011) describes 'waves of opportunities' for communities who would frequently switch from one income source to another, depending on resource availability, market prices, seasonality and so on, regarding this as a resilient strategy for coping with external shocks.

The factors reported to encourage innovation varied across genders. **In the Kyrgyzstan and Indonesian cases, middle-income women considered that family support and financial means were both necessary to encourage innovation. In Indonesia women felt they had family support but not financial means, whereas in Kyrgyzstan, women felt both aspects were typically lacking in their lives.** In this respect, they were also the top-cited factors hindering their ability to innovate. **Other factors deemed to support women's innovation included access to information, help from their children, and personal drive.** In relation to this latter point, middle income women in several of the Indonesia cases described innovators as being determined, energetic, curious and unafraid of failure.

The importance of family support can be understood in light of the ways women access the assets, spaces and information they require to innovate. In Kyrgyzstan, rented forest plots, for example, are typically available to the household but registered in men's name. Women lose access to these lands in the event of a divorce; a factor cited as causing women to fall into poverty. **Husbands mediate women's access not only to forest plots, but also to financial resources,** as they are the primary decision-makers over family budgets. As an older middle-income participant states, *"even decisive women look towards their husbands"*; a sentiment echoed by other focus group members. The poorer female focus group participants explained that despite the obviousness of women's labor input in the household economy, the right to manage the finances and material resources justly belongs to a man. Women necessarily get advice and 'authorization' from their husbands before making expenses because the status of a man as a household head is taken for granted. Adult women did not perceive the inability to make decisions about household expenses as discriminatory or as evidence of inequality. One poor woman justifies this as follows: *"I collect kurut [butter] from jailoo. Why, am I forced? I am not forced. I ask my husband. It is not because I am afraid, it is respect."* A middle-income woman adds that young wives cannot even make their own decisions about picking nuts in their husband's family's plots. **Young women** believed that *"in big things, for example, while buying a house, cattle, it is the man who decides; a woman decides when doing everyday housework."* They explained that they are **thus dependent on their husbands, husband's parents, and their own parents to make decisions. These factors, as well as women's high dependence on their children's labour, helps explain why women consider family support a key factor supporting innovation.** The affective dimension of this support was not explicitly discussed, but likely also factors into the equation and merits further attention.

Similar sentiments are expressed in FGDs from the Indonesian cases, where women are seen as day-to-day managers of household budgets and decision-making. **Women's perception was that their husbands made the decisions around innovations, although men's perception was that decisions were made together.** One Dayak man, who previously worked a river boat (ketinting) transporting logging crews around the area before an accident limited his activity to growing daily food crops, described his power and authority in making decisions within his household: *"I have to compromise with my family before I do anything. If I don't compromise and my wife doesn't agree with my plan then my family could be ruined"*.

In the Indonesian cases, a strong norm of collective decision-making within households can be a support to women but it can also serve to limit women's independent innovations to being in line with what others in the community are doing. Thus, women's innovations are within certain boundaries of acceptability. In the case of women's wage work, its framing as an extension of household provisioning has brought it within current norms of appropriate activities for women. Similarly, women's innovation with vegetable cultivation is an extension of women's role as food providers, and support from family is in this regard, rather than as a 'business venture' per se. In all of the communities, apart from lack of money, the main obstacle to innovation cited by women was *"lack of husband's support"*.

In Kyrgyzstan and in the Indonesia cases, certain activities do offer women more decision-making authority than others, however, and these **female domains of decision-making and activity can offer women a space to innovate**. For example, in Kyrgyzstan, the poor women's group indicates that *"when we, women, plant vegetables we make the decision on our own"*, whereas some middle-income women believe that decisions over home garden products are made jointly by the spouses. Women's decision-making ability in relation to vegetable gardening, which is echoed in other parts of the world (Howard, 2003; Wilson, 2003; Wooten, 2003), suggests a domain where they may have more autonomy to innovate. The innovations poor and middle-income women cited for women also map onto spheres of activity and decision-making that are typically 'female', such as food processing (Table 1). Even though some aspects of vegetable gardening are new for Dayak women in the Indonesia cases, a similar gendered mapping of this as a woman's innovation space is evident.

Box 5: Women innovate in smallholder oil palm where there is family support.

For women, several factors need to align for successful innovation in smallholder oil palm. Ibu Lulu, a 29-year-old Javanese woman from the transmigration community Bumi Jaya, began planting oil palm in 2011, having seen the success of migrant oil palm plantation workers who had become oil palm farmers in a neighboring community. She suggested to her husband that they plant oil palm, and he supported her decision. It was through him that she was able to access land, she drew on his personal networks with the oil palm cooperative that had been set up by the migrants, and accessed the necessary know-how through his friends. Ibu Lulu attributes her success to having had good support from her family: *"Without family we will be nothing. Their support and motivation are the ones that make me who I am today. We can find money or material everywhere. But love and family we cannot find them from anybody else, only from our family"*. In the Dayak community Long Uma, Ibu Lina, a 36-year-old Kenyah Dayak woman, narrates a similar story of success, but in her case, this has been based on financial and knowledge inputs from her children, who work as laborers at the oil palm company close to their village. However, Ibu Lina's own assessment of her success is tinged by local gender norms: *"I don't understand anything about oil palm, my husband does....we don't have big capital, we just try....my children support me"*.

By contrast, in the Indonesian cases, innovation in smallholder independent oil palm does not easily constitute a space for women to innovate, as shown in Box 5. Where women have been able to innovate, this has been where women are directly supported in their efforts by husbands and by their wider family. **For middle-income men**, the presence of and **access to material resources, above all, forest products, and human resources** (hard but also knowledgeable labor) provides a basis for innovation; a point reiterated in the poor men's groups. For example, in Desa Talisayan, Indonesia, middle income men said they wanted to invest in smallholder oil palm but due to the impact of large scale oil palm investments, no longer had access to land on which to cultivate, no longer had access to labor (to do the heavy work of harvesting) and found it difficult to access a market, as independent smallholder oil palm needs to meet the quality standards required by the companies. In Long Segeh, middle income men said that most people wanted to invest in smallholder oil palm: *"At present, less than 20% of the people of this kampung grow oil palm. It's just the capital that's missing, everyone has the will to grow it."*

Personal interests and aspirations were also mentioned as important factors supporting women's innovation in the Kyrgyzstan case, whereas a lack of financial resources and of knowledge and skills, as well as the long and cold winter, were considered key barriers. Innovators were described as being materially and spiritually well-off, not living in need, but striving to gain profit, having acquired skills by working with and in projects. In all the Indonesian cases, the acquisition of oil palm cultivation skills through engagement with oil palm companies was listed as a factor that supports innovation, not only by men, but as a joint venture within households (see Box 2).

Lack of knowledge was a thread running through the focus group discussions in Kyrgyzstan and Indonesia. In the former, men repeated that it is not enough to receive materials and equipment; one also needs to have knowledge and know how to put those into practice. A male middle-income FGD participant stated that, *"Due to lack of knowledge we cannot launch and grasp the work of the dryer [brought through the Flora and Fauna project] well. This is also a barrier [in spreading innovation]."* In the poor men's focus group, there was a feeling that: *"There must be work conducted to support [those least well off in the village]. If they take a credit or borrow money they could become poorer because they would not have enough knowledge to properly use the credit. And if you teach them to use the new practice they would be able to work in the future."*

In Indonesia there is no formal extension activity directed towards smallholder oil palm cultivation in the case study communities. Access to knowledge comes through the engagement of people with local oil palm companies through wage labour opportunities, and secondly, through people's engagement as migrant oil palm labourers working in Malaysia before coming to settle in East Kalimantan. In Long Segeh, a male oil palm innovator stressed that: *"I will learn faster if there's someone who teaches me. A few months ago, there were three assistants from MIP [an oil palm plantation company], I paid them to show me about the spacing of the seedlings."*

In Kyrgyzstan, the women's FGD referred to a lack of knowledge about the existence of projects hindering their ability to participate in these. What is more, a female innovator interviewed stressed that to innovate, *"There must be information [...] at Ayil-Okmotu [local administration] and learning from each other about the methods of planting trees, which vegetables it is possible to grow, during which time to dry wild fruits/berries."* She later reiterated the importance of being *"in touch with those who have information"*.

In Talas, **access to information is highly gendered**. The local community finds itself in transition: old collective entities have fallen apart and the spread of information now relies on informal networks. **Men's communication channels are more active and wide ranging than women's**. Throughout their lives, men multiply their social connections. The majority of older inhabitants solidify their clan and kinship ties, and the very division of the village into sections is based on clan belonging. It is also customary for men to maintain close relationship with classmates. When they marry, their wives become included in this male network and a large *"klastashtar sherine"* [classmates *sherine*] is formed.⁴ Same-age solidarity cohorts can become kinship-like, sustaining close relationships for decades. Friends/classmates are not only groups to pass leisure time, but a circle of mutual support. Such solidarity is typical for villagers of middle and younger ages, whereas older men's networks gradually center on their neighbors and relatives acquired through their children's marriage (in-laws). Solidarity groups can act as a resource for promoting innovative practices by providing various forms of support, ranging from financial resources to moral support and technological information. Men gather on a regular basis for joint meals with classmates or other friends, and street conversations among groups of men are common, especially in the village centre around the *Ayil Okmotu* office.

⁴ A *sherine* is a traditional system and network of mutual assistance in Kyrgyzstan. The synonym 'Yntymak' translates as 'solidarity'.

In contrast, upon marriage, young women are essentially displaced from their social environment and do not maintain their pre-marital social connections, except with their family and closest relatives. New connections appear when women get married; a small circle of sisters-in-law and other daughters-in-law in the household or in relatives' households. In an informal interview, an elder woman notes that women's *sherines* occur on a regular basis and provide an opportunity for a mother-in-law to observe her daughter-in-law's behavior. Such networks tend to be hierarchical, and entertain only a limited range of discussion topics, which do not necessarily promote the spread of new resource management approaches and technologies. Unlike men, women rarely meet in the village centre, as their daily activities are in closer proximity to the home; explaining why ties with immediate neighbours can be particularly strong. Moreover, norms expressed by poor men's and women's groups that a 'good wife' should not visit others or gossip, which do not equally apply to men, maintain women in isolation relative to men. **The physical and social distance that separates women results in a limited circulation of information among them.**

What information is shared among women circulates through relatively narrow channels of female friends, relatives and neighbors. For example, a woman specialized in grafting used her garden as a demonstration site for her women neighbors. Yet, women were often unaware of innovations that occurred in neighbourhoods (clusters of houses) other than their own. Limited information sharing limits the spread of innovations. It may also partly explain the different perceptions of the most important innovations expressed by women from different socio-economic and age groups.

Other factors hinder the spread of knowledge, and thus of innovations, across the village. Although **labour migration** to Russia and elsewhere **may bring new ideas and resources** into the community, the out-migration of innovative individuals **also drains local knowledge**, reducing local capacities to innovate. For example, of a small group of villagers that learned a grafting method, only one neighbor of a woman innovator interviewed continues to graft trees on his neighbor's and relatives' plots, as the others who practiced the technique have all migrated.

Moreover, whereas some innovators are more forthcoming in terms of knowledge sharing, others are guarded. For instance, a 60-year-old woman shared her plum drying 'secret' with fellow village women only once, during a meeting with researchers, when she demonstrated the marketable properties of her product. And a poor, 38 year old female interviewee revealed that access to information around projects, which inject rare resources into a resource-poor community, is guarded by better connected households, demonstrating **a lack of information sharing across socio-economic groups**. She states:

I generally do not hear when trainings are conducted. Nobody invited me to these trainings, I have heard about a project from my neighbour and asked her why she doesn't invite me. This project is only meant for people who have connections, kinship. Here things happen only due to acquaintance, kin relations. For example, if one person wins a project they recruit their relatives to work in this project. Nobody looks at people like us. Having heard about projects, if you go there they won't take you into consideration.

Nor is intergenerational transfer of knowledge and technologies complete. For instance, one man interviewee explained that his father knew how to store and preserve apples, but neither he nor other members of the household know his father's 'secret' storage method, which was lost when he passed away. Other such examples abound. A pronounced sense of **privacy and even secrecy, conveyed by both women and men**, was also reflected in the difficulty of recruiting participants for the study, and may be a legacy of the Soviet era. Hence, **unless specific knowledge sharing mechanisms are in place, information runs the risk of being lost when the individuals with whom it rests are unable or unwilling to transmit it.**

In the Indonesian cases, **access to smallholder oil palm innovation networks is contingent on existing social networks** (which frequently overlap with ethnic distinctions and shared kinship) and which link or exclude particular groups of people from oil palm companies and collective arrangements for managing and marketing oil palm. In Gunung Tarik, transfer of oil palm knowledge and technologies rests on peoples' experience as migrant workers in oil palm plantations in Malaysia. Independent oil palm cultivation was established in Gunungtarik by former oil palm workers who formed part of an ethnic-based network of migrants originally from Sulawesi. Extended kinship networks linking this group with government officials enabled them to access land and inputs in the area and bring the skills they had learned in Malaysia in order to begin oil palm cultivation. *"I learned how to grow oil palm from my experience in Malaysia"*, explained a male innovator. Another added: *"We knew first from seeing people growing it, we learned from people who had experience in Malaysia – that is almost 30% of people in this community"*. More recently, the group has developed its own oil palm farmer group to support each other, and there is also a more formal cooperative for independent smallholders that enables access to nearby companies and the supply chain. Middle income men in stressed a number of times that the farmer cooperative was what had facilitated their success in this venture. Innovators in the neighboring transmigration settlement of Bumijaya, raised oil palm as an important innovation, but further discussion suggested this was restricted to only the wealthiest or well-connected (see Box 2).

In the Kyrgyzstan case, women's access to information is also limited by gender norms that restrict their contact with external agents. For instance, asked if women learn from agricultural extension agents, middle-income women responded that *"if women ask male agricultural specialists, men would perceive it badly; people around would also perceive it badly."* In contrast, men's typical dominance in public affairs such as development projects and extension provides them with 'outside' information that women cannot directly access. As a participant from the women's middle-income group stated, *"to ask for advice from them [extension agents] we send our husbands."* In this way, **husbands can mediate access to the information women need** to stimulate innovation.

Other norms hinder women's ability to participate in certain physical and social spaces of innovation. Middle-income women, while generally supportive of women's economic activity, consider that a mobile and economically active woman goes against local norms. They foresee the risks for the family and the conjugal relationship as *"Different [negative] rumors would be spread [about a female seller in a bazaar] in the society."* They link this **stigma** to men's concern that women who earn money may become arrogant and assume headship of the household.

Young women agree that society would criticize a woman who wants to be economically independent, and pressure her husband not to help or support his wife: *"They [husband's friends] would say: put a kalpak [traditional men's hat] on your wife's head. Friends would reject him, would exclude him from their circle. Conflict is possible."* In practice, however, cases are reported of women working at the market, demonstrating that such norms are not rigid. This is especially the case when women are pushed into markets by economic necessity. Young men specify, **society would not agree to women providing income for their family unless their husband could not provide enough.** This contrasts with middle-income men, who believed that the purposeful, rational behavior of women entrepreneurs, who are striving to 'help' improve family wellbeing and wealth, would be supported not only by their husbands but also by their community. Whether or not that is the case, women's perception that such behavior would be condemned can dissuade them from pursuing such activities.

However, **this is not the situation in the Indonesian cases, where a very strong line of family cooperation brings generally positive attitudes towards women's economic activity** despite some suggestion that a 'good woman' is one who obeys her husband. In the FGDs, male participants noted

that it was 'normal' for women to be involved in farming and in selling at the market. Some young men articulated a sense of gender complementarity – the point of marriage is to bring together men's roles and women's roles. Role complementarity and some flexibility in this relates strongly to the idea of households riding "waves of opportunity" – whether it is men or women that ride the waves seems to matter less than failing to ride them at all. As a young Dayak man from Desa Talisayan put it: "*Some women work just like men. Men then also do women's work.*"

In Kyrgyzstan restrictive norms around women's mobility can further limit women's access to physical and social spaces of innovation (e.g. markets, meetings). Young men believed that women were constrained in their physical movements (with fewer than 4 out of 10 women moving about freely on their own in the public spaces of their community), whereas young women estimated that 6 out of 10 women had freedom of movement. They stressed, however, that young women—daughters-in-law—can be completely deprived of freedom of choice and movement, and that moving around the village would require asking her husband's and mother-in-law's permission. Other young women believed that despite losing rights upon marriage, women could still choose in matters of mobility, even beyond the village.

In the Indonesian cases, **there are few restrictive norms around women's mobility that are articulated verbally**. Young men and young women felt they had almost full freedom to move around the community (in all cases, FGD participants estimated that 9 out of 10 women had freedom of movement), and providing there was family support and sufficient funds, migrating away from the village was permissible too. For young men (in Desa Talisayan): "*many men get out of the kampung to find jobs and look for higher wages. The advantages are broadening horizons, making new friends and gaining agricultural experience*". Notably, participants in this FGD highlighted an emerging disadvantage to mobility in that out-migration would mean not being included in the oil palm company's plasma dividend scheme. However, in practice, within Dayak communities, women were less likely to undertake long distance work-related migration. This was not the case for Javanese or Bugis women however, where migration for work was what had brought them to the area in the first place, in some instances, ahead of a spouse (but normally accompanied by a male relative).

Women's access to innovation information is, however, via a husband or male relative and this is where gender norms have influenced engagement in smallholder oil palm cultivation, and other kinds of innovation interventions. There are **no normative restrictions on women physically attending meetings with male extension agents or plantation companies, but women noted that when they do attend, they prefer not to speak**. In addition, women complained that they **missed meetings because of their responsibilities**, which were non-negotiable. For example, a middle income Dayak woman in Desa Talisayan said: "*Sometimes we are invited, but if our work is not finished yet, then we cannot attend*". Instead, women were heavily reliant on **men as conduits of information**. In relation to smallholder oil palm, the **informality of innovation networks** seems to carry particular gendered consequences, and this is evident in the Gunung Tarik case, where successful innovation in smallholder oil palm hinges around the activities of a small group of well-connected men who meet informally on porches of houses, often at night and over coffee and cigarettes to discuss formal business matters. Such spaces are **not women's spaces** and prevailing norms mean it would be unusual for women to sit with them.

The gender dynamics in such arrangements point to an **intersection of gender with social class** (in terms of connections to powerful individuals) **and ethnicity** (where this maps on to communities of origin and kinship networks), although not, as it turns out, religious identity. Women's engagement in these arrangements is contingent on their husbands or other male relatives as the 'spaces' in which such relationships are fostered are male spaces. Thus although women play a critical role in inserting

smallholder oil palm into diversified household livelihoods, their capacity for voice and influence is muted when confronted with the workings of male-dominated networks that feed into the workings of the cooperative with which they must work if they are to have access to oil palm processing and markets.

In sum, **concerns and stigmas around women's economic activity and interactions with male extension agents vary between places** – they are marked in Kyrgyzstan but less visible in Indonesia. These can hinder women's ability to innovate. In the Kyrgyzstan case, restrictive norms around women's mobility exacerbate this, being more pronounced among certain groups of women, such as young daughters-in-law. A different dynamic exists in the Indonesian case studies, where independent smallholder oil palm is being heralded as a livelihood innovation that can bring prosperity. Here, 'innovation' is restricted to those with capital and connections, and exclusions are based on economic status and ethnicity rather than gender per se, given the existence of a strong norm of gender complementarity and sharing of responsibilities. However, in both Kyrgyzstan and Indonesia, **men's role in mediating access to innovation spaces, in being conduits of information from extension and other agencies, in facilitating women's access to resources and in endorsing their efforts help explain why women consider family harmony a key factor enabling them to try new ways of using or managing natural resources and farming.**

5. Innovation spaces vary for different groups of women and men and over time

Norms that shape women's and men's ability to innovate vary not only across gender groups, but also within them. As described above, **gender intersects with other factors of social differentiation, such as age, socio-economic and marital status to shape innovation spaces and opportunities.** Several examples illustrate this point.

In the Indonesian cases, there is particular disadvantage for women from Dayak communities, whose access to innovation spaces and opportunities relating to independent smallholder oil palm cultivation is particularly limited. In Long Uma, Long Segeh and Desa Talisayan, replacement of forest resources with oil palm concessions and women's incorporation into oil palm systems as casual wage workers rather than smallholders has not catalysed successful livelihood innovation, whether in food crops or, more specifically in smallholder oil palm. In FGDs, women from these communities suggested that although ten years ago everyone was below the poverty line, today only half had advanced slightly up the ladder. Their responses point to a lack of forest resources, but also to the failure of benefits from oil palm investment. Older women are particularly vulnerable as they are excluded from the oil palm plantation wage work, which many women are using to fill livelihood gaps created by the removal of the forest.

In Kyrgyzstan, when the *arenda* system was initiated, the totality of forest land was allocated to resident households. This resulted in a lack of forest land for new families formed over the years. Hence, according to the poor and the young men's and women's groups, **young families are the least well-off in their community** as they do not have their own rented forest land nor access to the livelihood (and innovation) opportunities it offers. Residents without *arendas* are considered to live below the poverty line. They must enter into arrangements with wealthier villagers to pick nuts from their plots for a share of the harvest. This helps to explain young women's perception that new sharecropping arrangements, which allow them to collect walnuts from other people's *arendas* for a

payment in kind, are the most significant innovation for them. As mentioned above, the poor women's group also indicated that ***“there are many [women] who got divorced in this group [of poorest community members]”*** because they lose access to forest plots rented in men's name upon divorce.

The poor women's group additionally specified that women may be trapped in poverty despite having access to a forest plot, if they do not personally collect or let others pick nuts from their land for an in-kind payment. Hence, having an *arenda* is not sufficient to escape poverty; participants suggest that a capable woman must work hard and know how to exploit her forest plot, enlisting the labour of others if needed. Hence, **within a given enabling environment (normative, institutional, physical, financial, etc.), the adoption of innovations, and related livelihood outcomes, differ according to individual aspirations and agency** (i.e. the power to make one's own life decisions and to act upon them (Kabeer 1999)).

The ability to make decisions about one's life and livelihood, and to try out new ways of farming and managing natural resources, also increases with age. Middle-income women and men both believe that their respective gender group has greater power and freedom today than it did 10 years ago. This is especially the case among women, several of whom reported the lowest degree of power and freedom—a virtual powerlessness—when they were a decade younger. They explained that what made them weak in the past – having many dependent children – today became their strength, as adult children support and respect their mother. Times have changed since they were young daughters-in-law and could not even make their own decisions about picking nuts in their husbands' families' plots. A middle-income woman explains that, *“all of us went through these steps when we just got married, we passed them from the beginning, young wives are at the first [lowest] step [in terms of power and freedom].”* **For Indonesian women, greater freedom comes after marriage – youthfulness is experienced as a kind of tyranny, and for many of the women in the study, they had felt disempowered by a need to defer to parental authority (and elder respect). Marriage provides access to resources (land, and in some cases, access to a husband's labor and social networks) and this is highlighted as a source of power and freedom.**

Although middle-income women's agency in Kyrgyzstan increases throughout their lives, they specified that they do not gain full decision-making authority over important household decisions even as they age, as this authority rests with their husband. The picture in Indonesia was more nuanced – if women owned the land, decisions over its use were jointly made, and vice versa.

Young men in Indonesia were baffled by the question about decision-making power in the household. When asked why a woman had been the one to make a planting decision, the young man in the FGD responded: “because she bought the seeds”. In Kyrgyzstan, young women considered that their dependence on their husbands, husband's parents, and/or their own parents prevent them from making independent decisions. Young men in both Indonesia and Kyrgyzstan also describe a limited sense of agency, as important decisions are made under the authority of their parents and relatives. Insofar as innovation partly hinges on access to resources and decision-making authority, **women's and men's capacity to innovate may expand as their ability make decisions and control resources – including grown-up children's labor—grows with age.**

Gender norms affecting innovation processes may also be rigidly applied based on a woman's origin. In Talas, for example, endogamous marriages (wherein the marriage partner comes from within a limited space of the village or nearby villages, from one's own ethnic group) are more common and considered more harmonious. **Non-local women may be socially excluded, but also better able to escape restrictive gender norms that hinder innovation.** A middle-income man noted that unlike local women, women who come from 'outside' the village strive to take the reins in the household. A local

schoolteacher describes the local integration of wives from other areas (*oblasts*) as a long and confrontational process, which entails both drawbacks and advantages. She may experience social exclusion from local groups, which limits her access to information and social support, but may be more economically active, able to take initiative and to assume leadership roles as it is considered *a priori* that she does not conform to the local 'mentality.' In the case of the schoolteacher, who experienced this first-hand, her ability to operate outside the bounds of local norms opened up a space for her to innovate. In Indonesia, no such restrictions exist, but it is notable that migrant women (in Gunung Tarik and Bumi Jaya) have been best able to exert their agency, and this is partly due to the agency that is acquired through mobility.

As mentioned above, in Kyrgyzstan economic necessity may also push some women to carry out activities typically reserved for men. This is the case for widows, who have no choice but to take up activities that are typically frowned upon for women. Hence, **norms may relax out of necessity, and this can open up a space for innovation.** In fact, despite the fact that shops are considered 'men's domain', the poor men's group explains that, *"Some widows through hard efforts build houses, raise children, do things. One could say that widows run all our stores."*

Not only do certain gender norms differ in nature or in their application across groups of women and men, they are also dynamic over time. **Norms are changing due to rapid socio-economic and political shifts, information technologies, formal education, migration and other drivers of rural transformation.** For instance, poor women and men agree that the incidence of domestic violence has (slightly) decreased, partly because women "know their rights well" (poor men's group). Older poor women note that morals and attitudes have changed, as "Ten years ago we got beaten; but now in our community we do not have "red whips" [furious men]. Now young wives are not beaten; they get divorced." And middle-income women speak of changes in the world's outlook as they may now opt not to live with their in-laws, which affords them more freedom. A middle-income man refers to other changes in inter-generational relations: 10 years ago the "parents' decision was significant, but now men who own their home make the majority of decisions in their lives." The current lack of employment opportunities for men in Talas also enhances the acceptability of women's income-generating pursuits out of necessity. As we have demonstrated above, this, coupled with a transition to the market economy and access to the forest through forest land leases (*arendas*), has **opened up new spaces for innovation and new financial opportunities for women in Kyrgyzstan.**

In Indonesia, a transition to the market economy has been accompanied by diminished access to forest lands for Dayak communities as large scale oil palm takes over the landscape. Relatively flexible gender norms have facilitated this process, as they allow and enable women's plantation wage work, which in effect provides material support for households undergoing livelihood transition and the reduction in opportunities for men to continue forest-based innovations. The terms of the opportunities available to women are limited: plantation work is casualised, not well paid and is restricted to younger women. For women from migrant communities, there has been some opportunity for innovation in smallholder oil palm systems, but this is only achievable through good mutual support and role complementarity with husbands due to gender norms in informal innovation networks. A key point to make is that one person's innovation can be another person's diminished opportunity: in East Kalimantan, the rapid expansion of migrant-driven investments in smallholder oil palm are seen as threatening the opportunities of neighboring communities (either Dayak or Melayu). This again illustrates the need to think of gender in intersectional terms: ethnicity and positioning vis-à-vis private companies and the state is a critical dimension of opportunity structures and through this, shapes the circumstances when innovations bring harms, in this instance, specific modes of incorporation and exclusion from oil palm systems.

6. Implications for FTA and Conclusion

In sum, we have shown some of the ways in which *a gender perspective is critical for understanding innovation processes in FTA landscapes*. We have argued that: 1) local priorities for FTA innovation are linked to gender norms; 2) factors that support—or conversely, hinder—innovation are linked to gender norms that shape access to (tangible and intangible) assets as well as decision-making and information; and 3) innovation spaces vary for different groups of women and men and over time. Our findings are underpinned by a recognition that gender should always be considered as intersectional: our case studies have shown that age, ethnicity (which is often linked to social networks or relationship with the state) and socio-economic status shape how gender norms are embodied and practiced by specific men and women.

That gender norms shape **innovation priorities** carries important implications for FTA research and practice. It signals that these priorities **must be re-examined across contexts, as norms stipulating how women and men should be and act change over time and space**. We note from Kyrgyzstan that whereas women may collect specific non-timber forest products in a given locality, men may gather them in another. Overlooking how gender-specific priorities vary across contexts may result in low adoption of innovations introduced through external interventions that do not conform to local norms and values. Alternatively, it may foster the adoption of externally-driven innovations among groups that were not intended beneficiaries. For example, better resourced men rather than poor women may be normatively entitled to capture specific types of economic opportunities within their community. Explicit measures must be put into place to reach intended beneficiaries with market-oriented interventions, failing which may actually exacerbate inequalities across gender, socio-economic or other groups. When norms against women's (or men's) participation in certain activities strongly preclude them from pursuing these, norms may need to be explicitly addressed as part of an intervention to achieve intended outcomes.

The Indonesian case points to differences in the innovation priorities of different categories of men and women, but the overwhelming dominance of oil palm in the landscape has narrowed the range of options for creative and diversified livelihood strategies ('riding waves of opportunity') and is now positioning independent smallholder oil palm as an aspirational innovation for many. However, access is contingent on belonging to the right social networks, and having access to the necessary capital, credit and know-how. Poorer men and women, and those from local Dayak communities are least likely to participate in livelihood 'innovations' associated with smallholder oil palm. On the other hand, women themselves have been innovating around the cultivation of food crops for an expanding local market: efforts that have gone relatively unnoticed amidst an oil palm dominated landscape.

We have shown that factors that support or hinder innovation are linked to gender norms that shape women's access to resources, information, and decision-making; and that this access is often mediated by men. **Interventions that target women must therefore recognize men's role as gatekeepers and engage them in a process to gain their support** in view of improved household well-being. **Other channels promoting women's access to the resources they need to innovate should also be explored**; for example, through strengthening women's collectives that facilitate access to credit, land or information. Gender-specific information networks and women's more limited access than men to information emanating outside of their community imply the need for gender-responsive communications measures to reach women with critical information. These findings are relevant for recent efforts to enable access to resources for communities wishing to engage in sustainable

independent smallholder oil palm as a means of achieving a more equitable distribution of economic benefits from this boom crop. However, there is also an urgent need to support other forms of innovation that some women are engaging in within the interstices of large-scale and independent smallholder oil palm cultivation.

Care must be taken not to view women or men as homogenous groups, as norms that affect their capacity to innovate vary within gender groups. **Precise targeting must be coupled with attention to the norms that apply to particular groups of women (and men).** Measures must respond to the specific constraints or opportunities these sub-groups face.

Amid rapid rural transformation, the relaxation of certain gender norms can open up spaces for women's (and men's) innovation. At this critical juncture, interventions can capitalize upon such openings to expand local innovation spaces. **Interventions explicitly designed to create a critical awareness and dialogue around norms that restrict women's (and men's) capacity to innovate, to make and act upon strategic life decisions, and to achieve their aspirations can enhance capacities to innovate** as well as bring transformative change in rural areas.

Finally, within a given opportunity structure, and the gender norms it embeds, the agency of individuals—manifest in their motivation to innovate, their hard work, and more—can play an important role in unlocking innovation. **Champions, including women innovators and the men who support them, can serve as role models** for other members of their community. When a critical mass of such individuals can be achieved, profound transformation in both livelihoods and gender relations can become a reality. At the same time, the innovations of some can enhance their power to exclude: as we have shown, unless uneven and damaging opportunity structures are attended to, the emblematic livelihood innovations of those in more privileged positions can spell further marginalisation and poverty of the poor and those with insecure resource rights. This calls for explicit attention to exclusions and engagement with the power relations that (re)produce inequalities in forest landscapes.

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Annex 1. Overview of GENNOVATE Sampling, Data Collection and Analysis Protocols

The development of GENNOVATE’s conceptual framework, sampling framework and field instruments began at an October 2013 research design workshop. The final methodology package reflects extensive reviews of literature and lessons and tools from previous field studies⁵; two rounds of field pilots in February and April 2014 and feedback from experts and study participants on the instruments; ongoing technical advisory support and capacity building for PIs; and strong training and supervision for the field teams. In this note we present highlights of the study approach and protocols.⁶

1.1 Study questions and conceptual framework

GENNOVATE’s design is guided by the following study questions:

- How do gender norms and agency advance or impede innovation capacity and technology adoption in agriculture and natural resource management across different contexts and social structures?
- How do new agricultural technologies affect gender norms and agency across different contexts? Under what conditions can technologies do harm?
- How are gender norms and women’s and men’s agency changing, and under what conditions do these changes catalyze innovation and adoption, and lead to desired development outcomes? What contextual factors influence this relationship?

To address the study questions, GENNOVATE employs a conceptual framework which is informed by selected discourses on agency and structure interactions in feminist literature (e.g. Wharton 1991, Kabeer 1999, Ridgeway, 2009). The study questions require exploring interactions between gender norms, agency and agricultural innovation in specific contexts, or local opportunity structures. The notion of structure refers to the “the rules that shape social actions and the resources that furnish agents with the power that makes it possible (to varying extents) for them to act” (Lane, 2001: 297). GENNOVATE pays particular attention to gender norms as an important dimension of the local opportunity structure. Gender norms refer to the socially constituted rules that prescribe men’s and women’s daily behavior. These norms are upheld across generations by internalized psychological beliefs about men’s higher status and competence and appropriate gender behaviors, and by processes of social interaction and sanctions of one’s “reference group” through social approval and disapproval (e.g. Ridgeway, 2009, Bicchieri, 2006).

Depicted in figure 1, GENNOVATE’s conceptual framework conceives of empowerment and other dimensions of improved wellbeing (the far right of the figure) as products of the interaction between men’s and women’s capacities for agency and innovation (in the center), on the one hand, and on the

⁵ It was, in fact, a presentation of the World Bank’s global qualitative studies which sparked the idea for GENNOVATE. These studies include: *On Norms and Agency: Conversations about Gender Equality with Women and Men in 20 Countries* (Muñoz Boudet, Petesch and Turk 2013), *Voices of the Poor* (Narayan and others, three volumes: 2000, 2000a, 2002), and *Moving Out of Poverty* (Narayan and others, four volumes: 2007, 2009, 2009, 2010).

⁶ For a fuller discussion of the study rationale, key questions, conceptual framework, and related literature, please see Badstue et al. (forthcoming); and for fuller discussion of the study sampling and data collection methods and experiences, see Petesch et al (forthcoming).

other, the opportunities for and barriers to innovation in their local opportunity structure (with key dimensions depicted on the left).

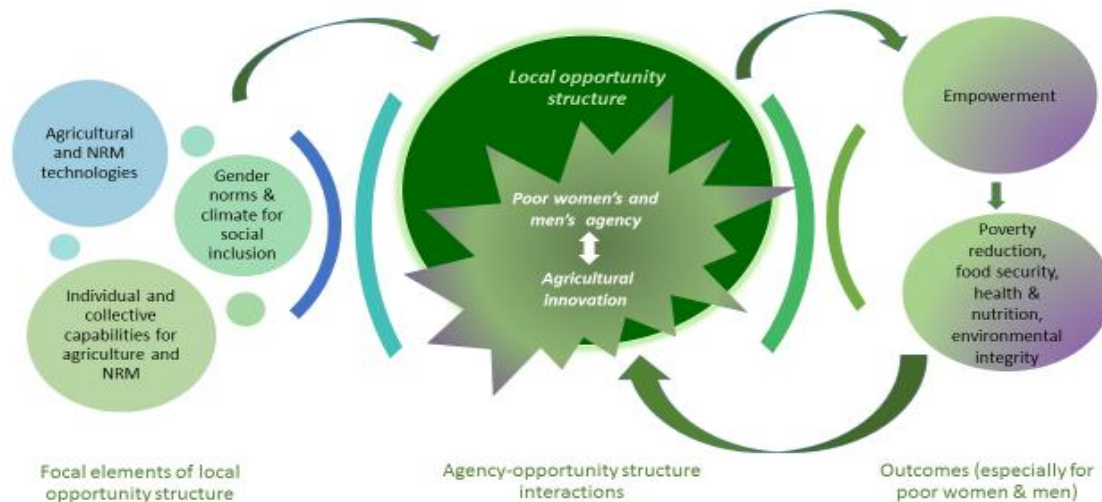


Figure 1. GENNOVATE conceptual framework

Drawing on this conceptual framework, GENNOVATE’s methodology addresses concerns for:

- i) *contextual* influences on, or the embeddedness of social action and lived experience;
- ii) *comparative* research strategies which offer cross-site learning and permit cautious generalizations to wider settings while remaining attentive to local specificities; and
- iii) *collaborative* research processes between the researcher and study participants, and among the study’s large research team, which strengthen the quality, relevance and reach of the research (also see Badstue and others forthcoming).

1.2 Sampling

A GENNOVATE case refers to a social group living in a single locality that the inhabitants call their village, community, neighborhood or hamlet. The cases were selected purposively to introduce variance on two dimensions considered important for understanding gender differences in innovation adoption:

- i. *economic dynamism*, here understood as the existence and nature of competition over agriculture or NRM resources important for livelihoods in the village; infrastructure development that indicates change in the local economy such as penetration of roads or connectivity; changes in the market orientation of small-holder farmers; changes in the sophistication of processing technologies for key commodities; the relative percentages of buyers and sellers (sex-disaggregated if information is available) in local input and output markets; changes in on and off-farm employment opportunities; changes in the local diversification of livelihoods or the potential for this diversification.

- ii. *gender gaps in assets and capacities*, such as the share of girls completing primary school compared to boys; the extent to which women hold important leadership positions (civic and political) in local organizations, and the broadly accepted norms in the village about women's freedom of movement.

The two axes for stratification are similar to those applied in *On Norms and Agency* (Munoz Boudet, Petesch and Turk, 2013) and reflect an empirical literature finding associations between countries with greater gender equality and higher levels of economic growth (e.g. World Bank, 2011). For substantive as well as practical reasons, the protocols provided PIs with some flexibility in how they stratify their samples along the two dimensions (see Petesch forthcoming for further discussion).

Table A1.1 presents the countries, crops and CGIAR Research Programs spanned by GENNOVATE's fieldwork. Asia contains the largest number of cases (74), followed by Africa (53 cases) and Latin America (10). The regional concentration in Asia and Africa reflects current research priorities in the CGIAR system.

Table A1.1. GENNOVATE countries, target crops and systems, and CRPs

<i>Countries</i>	<i>Target crop and system</i>	<i>CGIAR Research Program (CRP)</i>
<ul style="list-style-type: none"> • Asia: Afghanistan, Bangladesh, India (Andhra Pradesh, Bihar, Haryana, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Uttar Pradesh), Indonesia, Kyrgyz Republic, Nepal, Pakistan, Philippines, Uzbekistan, Vietnam 	<ul style="list-style-type: none"> • Banana • Cassava • Chickpeas • Groundnuts • Maize 	<ul style="list-style-type: none"> • Roots, Tubers and Bananas (RTB) • Humidtropics • Agriculture for Nutrition and Health (A4NH) • Grain Legumes (GL) • MAIZE
<ul style="list-style-type: none"> • Africa: Burkina Faso, Burundi, Democratic Republic of the Congo, Ethiopia, Kenya, Malawi, Mali, Morocco, Niger, Nigeria, Rwanda, Tanzania, Uganda, Zimbabwe 	<ul style="list-style-type: none"> • Millet • Pigeonpea • Potato • Rice 	<ul style="list-style-type: none"> • Dryland Cereals (DC) • GRISP • WHEAT
<ul style="list-style-type: none"> • Latin America: Colombia, Mexico 	<ul style="list-style-type: none"> • Sorghum • Sweet potato • Wheat • Aquaculture • Tree-based systems • Humid tropical systems 	<ul style="list-style-type: none"> • Aquatic Agricultural Systems (AAS) • Forests, Trees and Agroforestry (FTA) • Dryland Systems (DS)

The sample includes major food crops such as rice, wheat, maize, cassava, sweet potato, banana, millet, sorghum and several grain legume crops. In terms of coverage of different agricultural systems, the dryland agro-ecosystems of Africa and Asia are well represented in the study, as are the sub-tropical and tropical systems of Asia, which included aquaculture cases. Cases from Indonesia and the Kyrgyz Republic include contexts where tree products and agro-forestry systems are important.

Figure A1.1 presents the broad distribution of cases along the dimensions in the sampling framework, indicating a cross-site sample with good coverage of all four sampling contexts in the priority regions.

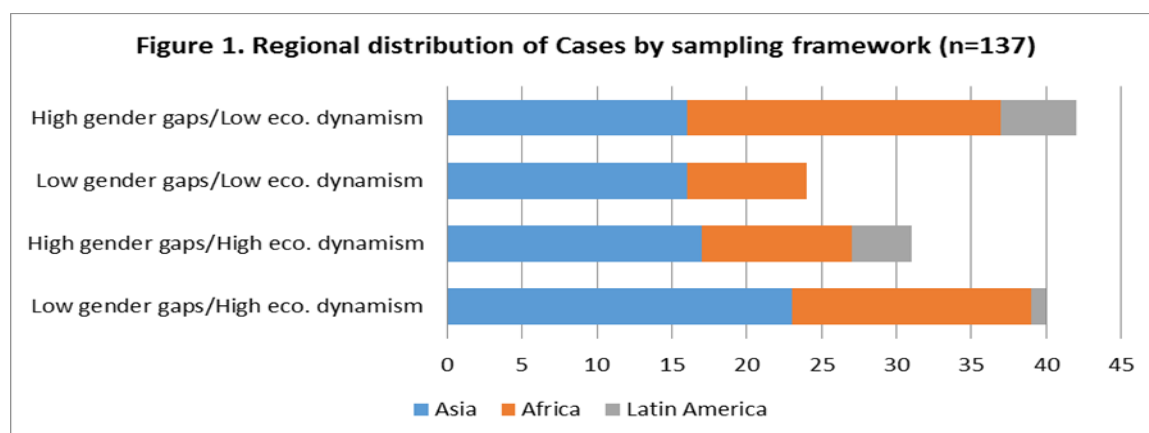


Figure A1.1. Broad distribution of cases by sampling framework

1.3 Data collection

The methodology package features 15 data collection activities for each research village (table A1.2). The first of three focus group instruments was conducted separately with poor women and men (activity C, table A1.2), the second with middle class women and men (activity D), and the third with young women and men (activity E; and six groups in total). The data collection also includes nine *semi-structured interviews* guided by three instruments: i) a community profile (to gather background demographic, social, economic, agricultural and political information about the case (one interview requiring key informants of both genders), ii) an innovation pathways interview with successful adopters of a new technology or practice⁷ (two men, two women), and iii) life story interviews (two men, two women).

Table A1.2. Overview of GENNOVATE Data Collection Instruments

Tool	Purpose	Respondents
Activity A. Literature review	– To situate the case in a wider context by providing general background information about the case study area and relevant findings from recent studies, particularly about the innovations of interest and their gender dimensions.	(Principal investigator)
Activity B. Community profile	– To provide social, economic, agricultural, and political background information about the community	– 1 or 2 male key informants – 1 or 2 female key informants
Activity C. Focus group: Ladder of Life (with poor adults)	– Gender norms and household and agricultural roles – Labor market trends and gender dimensions	– 1 FGD of 8 to 10 adult females, ages 30 to 55

⁷ Pls could frame the selection criteria to focus on successful adopters of either a specific CRP innovation, or of one or more innovations of local significance.

	<ul style="list-style-type: none"> – Enabling and constraining factors for innovation, and their gender dimensions – The culture of inequality in the village, factors shaping socio-economic mobility, poverty trends—and their gender dimensions – Intimate partner violence 	<ul style="list-style-type: none"> – 1 FGD of 8 to 10 adult males, ages 30 to 55
Activity D. Focus group: Capacities for innovation (with middle class adults)	<ul style="list-style-type: none"> – Agency – Community trends – Enabling and constraining factors for innovation, and their gender dimensions – Gender norms surrounding household bargaining over livelihoods and assets – The local climate for agriculture and entrepreneurship, and their gender dimensions – Social cohesion and social capital 	<ul style="list-style-type: none"> – 1 FGD of 8 to 10 adult females, ages 25 to 55 – 1 FGD of 8 to 10 adult males, ages 25 to 55
Activity E. Focus group: Aspirations of youth (with older adolescents and young adults)	<ul style="list-style-type: none"> – Gender norms, practices, and aspirations surrounding education – enabling and constraining factors for innovation, and their gender dimensions – Women’s physical mobility and gender norms shaping access to economic opportunities and household bargaining – Family formation norms and practices 	<ul style="list-style-type: none"> – 1 FGD of 8 to 12 female youth, ages 16 to 24 – 1 FGD of 8 to 12 male youth, ages 16 to 24
Activity F. Semi-structured interview: Innovation pathways	<ul style="list-style-type: none"> – To explore in-depth the trajectory of individual experiences with new agricultural and NRM practices, and the role of gender norms and capacities for innovation in these processes. 	<ul style="list-style-type: none"> – 2 male innovators – 2 female innovators
Activity G. Semi-structured interview: Individual Life Stories	<ul style="list-style-type: none"> – To understand the life stories of different men and women in the community who have moved out of poverty, fallen into deeper poverty, or remained trapped in poverty, and how gender norms, assets and capacities for innovation in agriculture/NRM, and other assets and capacities shaped these different poverty dynamics. 	<ul style="list-style-type: none"> – 2 males – 2 females

PIs prepared for fieldwork by conducting a review of literature and secondary data from their research villages and regions; mobilizing and training their field team; and refining, translating and validating the data collection instruments. Each field instrument contains a standardized semi-structured interview guide to ensure comparability in the data collection and documentation across the research villages. PIs also tailored sections of the interview guides to address innovations and other issues of importance to their CRPs or the specific case.

The data collection tools draw directly from participatory rural appraisal techniques (PRA) and feature many visual activities and probing questions to support and deepen the study participants' own interpretations and analyses of study topics and to encourage rich discussion among study participants. The trainings to prepare for fieldwork engaged team members in long hours reviewing, discussing and practicing—question-by-question—the data collection instruments to ensure common understanding and ease with facilitation. The team also reviewed the quality of the translation of each question, making sure that it not only captured the intent of the English version, but that the phrasing used common, everyday terms rather than a more formal translation. Trainings also required a field practice and clearance by the study's expert advisor of the practice documentation of field notes.

1.4 Data analysis

The analysis strategy combines two procedures: i) inductive case-oriented (or thick description) techniques; and ii) deductive variable-oriented (or thematic) techniques (e.g. Miles, Huberman and Saldaña, 2014). Case-oriented analytic techniques provide the building blocks for GENNOVATE's major findings and conclusions. These approaches require a focus on a single case to explore the interplay of gender norms, agency and innovation capacities in specific localities, and over time, which can explain these processes in the wider set of cases.

This case-oriented work is complemented with variable-oriented analysis aided by pre-coded questions during data collection (from focus group rating exercises and community profile pre-coded questions) as well as data coding with NVivo using 150 common codes broken into 15 topic areas. This supports systematic triangulation of findings across types of respondents and communities and identification of recurring themes which cut across GENNOVATE's cases and subsamples (for example, the experiences of poor vs. middle class women in cases with different levels of economic dynamism). To ensure sound case study management during the data coding and analysis phase, significant investments were made in capacity building of PIs; in supervision and collaboration among the data coders; and in the preparation of detailed protocols, one elaborating data coding procedures and another analysis (or "query") procedures with the software.

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GENNOVATE's qualitative comparative methodology and large sample mark a first in the CGIAR, as well as, the collaboration of principal investigators from nearly all CGIAR Research Programs worldwide.

Executive Committee members: Lone Badstue, CIMMYT (Chair); Gordon Prain, International Potato Center (CIP); Amare Tegbaru, International Institute of Tropical Agriculture (IITA); Marlène Elias, Bioversity International; and Paula Kantor (in memoriam). GENNOVATE Expert Advisor, CIMMYT: Patti Petesch.

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and Health



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Aquatic
Agricultural
Systems



RESEARCH PROGRAM ON
Dryland Cereals



RESEARCH PROGRAM ON
Dryland Systems



RESEARCH PROGRAM ON
Forests, Trees and
Agroforestry



RESEARCH PROGRAM ON
Grain Legumes



RESEARCH PROGRAM ON
Integrated Systems
for the Humid
Tropics



Research Program on
Rice
Global Rice
Science
Partnership



RESEARCH PROGRAM ON
Maize



RESEARCH PROGRAM ON
Roots, Tubers
and Bananas



RESEARCH PROGRAM ON
Wheat