

---

## What drives capacity to innovate? Insights from women and men small-scale farmers in Africa, Asia, and Latin America

Lone Badstue<sup>1\*</sup>, Diana E. Lopez<sup>2</sup>, Anya Umantseva<sup>1</sup>, George Williams<sup>1</sup>, Marlène Elias<sup>3</sup>, Cathy Rozel Farnworth<sup>4</sup>, Anne Rietveld<sup>2,3</sup>, Esther Njuguna-Mungai<sup>5</sup>, Joyce Luis<sup>6</sup>, Dina Najjar<sup>7</sup> and Vongai Kandiwa<sup>1</sup>

<sup>1</sup>International Maize and Wheat Improvement Center, CIMMYT

<sup>2</sup>Wageningen University & Research

<sup>3</sup>Bioversity International

<sup>4</sup>Pandia Consulting, Independent Consultant

<sup>5</sup>International Crops Research Institute for the Semi-Arid Tropics, ICRISAT

<sup>6</sup>International Rice Research Institute, IRRI

<sup>7</sup>International Center for Agricultural Research in the Dry Areas, ICARDA

### Abstract

What are key characteristics of rural innovators? How are their experiences similar for women and men, and how are they different? To examine these questions, we draw on individual interviews with 336 rural women and men known in their communities for trying out new things in agriculture. The data form part of 84 GENNOVATE community case studies from 19 countries. Building on study participants' own reflections and experiences with innovation in their agricultural livelihoods, we combine variable-oriented analysis and analysis of specific individuals' lived experience. Results indicate that factors related to personality and agency are what most drive women's and men's capacity to innovate. Access to resources is not a prerequisite but rather an important enabling aspect. Different types of women have great potential for local innovation, but structural inequalities make men better positioned to access resources and leverage support. Men's support is important when women challenge the status quo.

**Key words:** Capacity to innovate, gender norms, agency and negotiation, personality traits, diffusion of innovations

### Introduction

Involving diverse segments of the target population in agricultural innovation interventions will permit more inclusive and equitable processes and stimulate local innovation and development outcomes. This paper provides in-depth knowledge on how the characteristics and experiences of individual innovators interlink with the social setting to facilitate or impede innovation.

We consider the capacity of individual women and men to innovate in their rural livelihoods and how this is influenced by gender norms and the ability to exercise agency. The analysis draws on data from 336 individual interviews with rural women and men known in their communities to be "innovative" or "entrepreneurial." Our objective is to discern patterns across innovators from different contexts, while ensuring that our findings remain grounded in real-life experiences. Building on study participants' own reflections on their experiences with innovating in their

agricultural livelihoods, we combine variable-oriented and case-oriented analysis of specific individual agricultural innovators to examine the questions: What are key characteristics of rural innovators? How are the experiences of women and men innovators similar? How are they different? And how does marital status influence this? The data forms part of 84 community case studies from 19 countries under the GENNOVATE research initiative<sup>1</sup>, which examines the interlinkages between gender norms, agency, and innovation in agriculture and natural resource management (NRM). We use Everett Rogers' (2003 (1962)) three broad categories of individual variables related to innovativeness to organize our analysis. Our findings contribute to the emergent literature on gender dynamics in rural innovation processes and to the research on technology diffusion.

We start out with a brief definition of gender norms, agency, and innovation, and then take stock of the literature on the relations between innovation, entrepreneurship, and individual capacity to innovate and how this is related to gender and agricultural development. This is followed by a section on methods and materials, before we turn to our results on factors that enable individuals' innovation. We present variable-oriented findings and illustrations of how these play out in concrete real-life situations, and subsequently discuss capacity to innovate and gender dimensions hereof. We conclude the paper by identifying a set of opportunities to consider for agricultural research and development.

## **What we know about individual capacity to innovate**

Our perspective is framed by GENNOVATE's focus on the interlinkages between gender norms, agency, and innovation in agriculture and NRM. An overview of how these concepts are employed in the GENNOVATE research initiative, and informed the research design, is provided by Badstue et al. in the introductory paper of this issue. Briefly put, gender norms refer to the socially constituted rules that prescribe men's and women's everyday behaviors (Knight and Ensminger, 1998). Gender norms are subject to change, constantly being reproduced, contested, and negotiated as part of everyday social interaction. Changes in gender norms can furthermore occur as a result of socio-economic or political events (e.g. male out-migration or war), and changes can also revert back (Locke et al, 2017; Marcus and Harper, 2014). Agency refers to "the ability to define one's goals and act upon them" (Kabeer, 1999, p. 438). The exercise of agency can furthermore challenge and, eventually, change the "structures of constraint" underlying inequalities (Kabeer, 2010, p. 106). Innovation is a social construct, reflecting and resulting from the interplay of different actors, sometimes with conflicting interests and objectives, and with different degrees of economic, social, and political power (Berdegué, 2005). As described in the first paper of this issue (Badstue et al. 2018), several authors have emphasized the contextual embeddedness and complexity of innovation processes and their multi-leveled, inter-meshed and evolving nature (e.g. Geels, 2011; Hall, 2007; Klerkx et al., 2012; Leeuwis, 2013; Schut et al., 2014; Schut et al., 2016). Innovation in rural livelihoods can include technical changes in crop or livestock production or produce processing that have been introduced by external entities or that local people themselves have developed or adapted, as well as processes of institutional change, such as new ways to gain access to resources or to organize marketing activities. In this study, innovation does not refer to novelty in absolute terms, but rather to people doing something that is different or new *for them*.

---

Structural and individual factors combine to shape women's and men's engagement with and negotiations of innovation and empowerment (Ahl, 2006; Ahl and Marlow, 2012; Pecis, 2016). Recent research on gender and agricultural innovation analyzes the interconnectedness and mutual shaping of these concepts (e.g. Bossenbroek and Zwartveen, 2014; Drew, 2014; Padmanabhan, 2002; Pyburn, 2014). As Kingiri (2013) sums it up, capacity to innovate is determined by individual skills, actions, and experiences *as well as* by broader institutional, market, policy, and financial domains. A holistic approach to gender-inclusive innovation processes therefore requires investment in the empowerment of individual farmers as well as in structural change to the systems they live and work in (ibid.; Pyburn, 2014).

Innovation and entrepreneurship have been widely researched from a variety of disciplines, including economics, psychology, sociology, and management. While the two concepts are closely linked, they have different meanings. Innovation can be considered an outcome of new thinking, whereas entrepreneurship is about turning an innovation into a business opportunity, and while innovation is based on/requires a passion for inquiry and experiment with creative thinking, entrepreneurship requires planning and management skills, and involves risk-taking (Kubeczko and Rametsteiner, 2002). In this article, we investigate individuals' capacity to pursue and try out, take up, adapt, or adopt new things in agriculture and rural livelihoods. Hence, we are interested in elements related to personality and behavior underlying both of these concepts.

In the last decade, innovation and entrepreneurship have been at the core of a fast-growing body of literature on processes of change and development (Chambers, 2007; Fressoli et al., 2014; Minniti and Naude, 2010; Reynolds et al., 2002; Thompson et al., 2007). As Alsos, Ljunggren, and Hytti (2013) observe, while in entrepreneurship research the focus is on entrepreneurs, in the innovation research literature the focus is largely on innovation processes and systems, which can leave an impression of apparent invisibility of people. As the authors state: "When people are not visible in the discourse, gender easily becomes invisible" (p. 3). However, this does not mean that gender is irrelevant to the study of innovation. On the contrary, gender is embedded in the systems and processes in subtle but impactful ways, and has effects regardless of whether it is measured or not (Thorslund and Göransson in Alsos, Ljunggren, and Hytti, 2013). At this point, linkages between innovation and entrepreneurship and the broader feminist and gender literature have been established, including the recognition that women's innovation activities must be understood in the context of the normative frames and structural factors at play (Alsos, Ljunggren, and Hytti, 2013). However, the knowledge base remains limited with regards to how, and to what extent, gender norms, agency, and agricultural innovation intersect, as well as the role this plays in relation to rural development processes. These considerations are important, as a better understanding of the linkages among the three can enable more effective and informed design of inclusive, culturally appropriate, and transformative interventions.

A core reference point in relation to the study of the uptake of innovations is Rogers' seminal work on the diffusion of innovations (2003 (1962)), which continues to be one of the most influential publications on the topic of how innovations spread. Rogers' theory is based on his synthesis of more than 500 innovation diffusion studies from different disciplines, including anthropology, sociology, and education research. A core principle in his framework is that diffusion, by definition, must be understood as a social process. Rogers characterizes innovation

adopters into five ideal types or categories according to their level of innovativeness, defined as “the degree to which an individual (or other unit of adoption) is relatively earlier in adopting new ideas than other members of a system” (2003, p. 22). Rogers’ adopter categories and their core features are summarized in Table 1.

**Table 1: Adopter categories according to Rogers**

<b>Adopter category</b>	<b>Core features</b>
<b>Innovators:</b> <i>Key word:</i> <i>Venturesome</i>	Social relationships outside of local circle of peer networks. Prerequisites include: control of substantial financial resources, ability to understand and apply complex technical knowledge, ability to cope with high degree of uncertainty
<b>Early Adopters:</b> <i>Key word:</i> <i>Respect</i>	Focused on and more integrated in local social system compared to innovators, high degree of local opinion leadership, others seek them for advice and information, function as local role model. The early adopter is respected by his or her peers and is the embodiment of successful, discrete use of new ideas.
<b>Early Majority:</b> <i>Key word:</i> <i>Deliberate</i>	Frequent social interaction with peers but seldom hold position of opinion leadership; they follow with deliberate willingness in adopting innovations but seldom lead.
<b>Late Majority:</b> <i>Key word:</i> <i>Skeptical</i>	Adopt new ideas just after the average member of a system. Adoption motivation may be both an economic necessity and increasing peer pressures; innovations are approached with a skeptical and cautious air, and not adopted until most others in the system have already done so. The weight of system norms must favor an innovation before the late majority is convinced to adopt.
<b>Laggards:</b> <i>Key word:</i> <i>Traditional</i>	No opinion leadership, most “localite” of all the adopter categories, point of reference for the laggard is the past, suspicious of innovations and change agents. The laggard’s precarious economic position forces the individual to be extremely cautious in adopting innovations.

*Source:* Rogers (2003)

Rogers (2003) summarizes individual variables related to innovativeness into three broad categories: 1) aspects related to personality traits and behavior patterns (“personality values”); 2) communication behavior and social relations (“communication behavior”); and 3) socioeconomic characteristics. In the first category, Rogers includes aspects such as open-mindedness, ability to engage with abstract thinking and cope with uncertainty, rationality, aspirations, self-efficacy, and other elements related to people’s perception of agency<sup>ii</sup>. The second category concerns the nature of a person’s network of social relations and level of interconnectedness with the social system, including the degree to which the person is oriented

outside of her local social system or inwards towards it. Furthermore, this category concerns knowledge and information-seeking behavior, including use of change agent contacts and mass media; and the individual's level of opinion leadership. The third category of socioeconomic characteristics relates to level of education and social status, as well as financial and productive resources, such as land, livestock, irrigation, and level of financial ability to bear risk.

Research to understand processes of innovation and innovation diffusion has taken different approaches depending on the sector or field of study. For research on capacity to innovate of individuals in corporate environments, for instance, the emphasis has often been on the relation between personality traits (e.g. self-motivation, commitment, or altruism) and the ability to innovate (e.g. Hölzle, Mansfeld, and Gemuenden, 2011; Patterson, Kerrin, and Gatto-Roissard, 2009). In a number of cases, this has been the focus in relation to research on marketing and technology acceptance, as in a 2013 study by Behrenbruch et al. of how emotional stability, extraversion and openness, and technology anxiety influence the use of online social networks, or Sriyabhand and John's (2014) study about the role of personality traits in adopting information technology.

The relevance of personality traits in relation to innovation and change processes is recognized in studies related to business development, entrepreneurship, and organizational change. A number of works on women's entrepreneurship show that strong self-perceived agency can help women overcome structural constraints. Jumali (2008) identifies three main constraints for women's entrepreneurship initiatives in developing countries: 1) balancing of work and family life; 2) societal attitudes and access to capital; and 3) lack of access to networks and government support. However, women overcome these obstacles by deploying their agency. They express this through referring to their personality traits such as passion, determination, hard work, perseverance, ambition, motivation, responsibility, self-confidence, self-efficacy, and autonomy (ibid.). In a study of factors contributing to the success of women agricultural entrepreneurs, Narayanan, Singh, and Chahal (2016) find achievement motivation along with general, perceived self-efficacy, collective efficacy, proactive attitude, and self-esteem, to be key factors of positive influence. Kumar and Bharadwaj (2016) emphasize the importance of self-esteem, confidence, and related aspects. They consider poverty as not only the reality people live in, but also a state of mind brought about by a variety of deprivations. The authors make a case for the need to change this state of mind and promote "novelty-seeking attitude and fervor" to stimulate the innovation processes of the poor (p. 76). These points resonate with Zulkosky's (2009) analysis of the concept of "perceived self-efficacy," which, she finds, facilitates cognitive processes and performance, increases motivation, and allows people to approach challenges instead of avoiding them. Zulkosky suggests that levels of self-efficacy depend on social experiences: a successfully completed task, observing another person doing something successfully, or being verbally encouraged help gain a sense of self-efficacy.

Compared to the aforementioned fields, in the field of rural development, research on adoption of new agricultural and NRM technologies in the Global South predominantly focuses on adoption rates and their correlation with the socioeconomic characteristics of individuals and households. These characteristics include farmers' level of education, age, sex of respondent / household head / plot manager, marital status, household size, size of cultivated land, interaction with extension services, and so forth (e.g. Adesope et al., 2012; Ali and Erenstein, 2017;

Katengeza et al., 2012; Legese et al., 2010; Okwoche and Obinne, 2010; Oluwasusi and Akanni, 2014).

Overall, there is very little research on the influence of personality aspects, such as motivation and grit, on the capacity of farmers to innovate. This study is therefore an important step towards filling this research gap and bridging innovation studies across disciplines. More research emphasis on personality traits of poor and rural innovators, and how these are gendered, can offer valuable insights into innovation processes. Despite the acknowledgment of the important role of local institutions in relation to innovation processes, gender relations and gender norms remain scarcely treated in the literature on agricultural innovation systems (Pyburn, 2014). Combining analysis of socioeconomic factors and personality traits of rural innovators with a social-relational and gender perspective helps draw a fuller picture of obstacles to innovation success and the ways resource-constrained innovators overcome them.

## Methods and materials

We draw on data from 336 individual interviews with rural men and women known in their communities to be “innovative” or “entrepreneurial.” The interviews were conducted between April 2014 and March 2016 as part of 84 GENNOVATE community case studies across 19 countries (Table 2). The selection of study communities was based on purposive, maximum diversity sampling guided by a 2x2 matrix with four variables: wide gender gaps or narrow gender gaps on one axis; and on the other, high or low economic dynamism understood as including markets, infrastructure and services, transport and communication, as well as the quality of the local natural resource base. The case studies involved the application of seven different data collection instruments (see Petesch et al (a). on GENNOVATE’s field methodology, elsewhere in this special issue). In this paper, we focus on the individual innovation trajectory interviews with two men and two women in each case study community. These study participants were recognized by others in their community as doing farming in novel ways and as always trying out new things.

**Table 2: Spread of community case studies by region and country (84 case study countries)**

Africa (total: 33)		Asia (total: 45)		Latin America (total: 6)	
Country	# case studies	Country	# case studies	Country	# case studies
Burundi	1	Afghanistan	4	Mexico	6
Ethiopia	10	Bangladesh	6		
Malawi	2	India	12		
Morocco	3	Kyrgyzstan	1		
Nigeria	4	Nepal	6		
Rwanda	1	Pakistan	7		
Tanzania	7	Philippines	3		
Uganda	1	Uzbekistan	4		
Zimbabwe	4	Vietnam	2		

The purpose of the individual innovation trajectory interviews is to explore individual experiences with new agricultural practices or related entrepreneurial initiatives. Questions include: How have the interviewees' thinking in relation to farming practice changed over time? What encourages men and women to innovate? How do they learn about and try out, adopt, or adapt new things in their farming activities or related entrepreneurial enterprises? How do they interact with wider institutional structures to push forward their agendas? And how do they work with and around gender norms to develop their projects for change?

Interviews open with an exercise called the Ladder of Power and Freedom, referred to below as the "ladder" (For more detail see also Petesch and Bullock, 2018, and for the full collection of GENNOVATE data collection instruments, see Petesch et al., (2018a). Interviewees are asked to rate on a scale from 1-5 their current ability to make important decisions in their lives, including about their working life, starting/maintaining an income-generating activity, their use and control of productive resources, and whether to start or end a relationship. A score of 1 represents very little decision-making power, while 5 represents the ability to make most major life decisions. The interviewee is then asked to think back and locate the step he or she was on 10 years ago and to reflect upon the reasons for change. We use the ladder ratings as an indication of the study participant's perceived sense of agency.

### Box 1

#### Ladder of Power and Freedom

**Step 5:** Power & freedom to make most all major life decisions

**Step 4:** Power & freedom to make many major life decisions

**Step 3:** Power & freedom to make some major life decisions

**Step 2:** Only a small amount of power & freedom

**Step 1:** Almost no power or freedom to make decisions

**Semi-structured individual interview module**

Please imagine a five-step ladder [show figure of ladder], where at the bottom, on the first step, stand individual [sex of respondent] of the community with little capacity to make their own decisions about important affairs in their lives. These [sex of FGD] have little to say about if or where they will work, starting or ending a relationship with a [opposite sex], or starting a new agricultural or other business. On the highest step, the fifth, stand those who have great capacity to make important decisions for themselves, including about their working life and whether to start or end a relationship in their personal life.

**1a. On which step of this ladder would you position yourself today?**  
\_\_\_\_\_

**1b. And 10 years ago?\*** \_\_\_\_\_

**2. What do you think are the main reasons why your rating (increased/ stayed the same/decreased)?** \_\_\_\_\_

\* To aid people's recalls, be sure to substitute a fixed year for "10 years ago" and to mention an important national or local event, such as an election or major weather event from that year.

Sources: Petesch et al., (b), 2018; Petesch and Bullock, 2018

[The figure on the flipchart only needs to show the ladder and step #. The narrative in this figure is to help facilitators describe the different steps.]

Each innovation trajectory interview followed the same standardized open-ended interview protocol in all study communities and countries, which allows for coding and comparison of responses across the many different sites and countries. Qualitative analysis of the individual narrative transcripts and additional data from the other field research tools from the same case

study complement the variable-oriented comparative analysis with contextually informed analysis of individual innovators' experiences.

### **Sample Overview**

The sample includes 168 men and 168 women innovators, whose key characteristics are listed in Table 3. It is worth noting that more women than men were widows, divorced, or single, that more men than women identified farming as their primary occupation, and that men innovators had more formal education than their female counterparts.

**Table 3: Key characteristics of men and women innovators**

	<b>Men innovators (n=168)</b>	<b>Women innovators (n=168)</b>
<b>Average age</b> (years)	46	42
<b>Marital status</b> (% share)		
Married/common law	98%	76%
Widow/divorced/single	2%	24%
<b>Relation to household head</b> (% share)		
Household head	86%	21%
Not household head	14%	79%
<b>Primary occupation</b> (% share)		
Farming	97%	79%
Non-agricultural	3%	7%
Home maker	0%	14%
<b>Level of education</b> (% share)		
No/incomplete primary	23%	47%
Primary school	31%	28%
Secondary school	31%	20%
University/vocational/technical	15%	5%

In terms of innovativeness, the majority of men and women in our sample compare to Rogers' first two categories: "innovators" and "early adopters." While they were selected precisely for being innovative, no distinction between the very first and the first to follow was applied. All person and community names that follow are pseudonyms.

### **Factors enabling innovation**

We organize this section according to three dimensions related to individual capacity to innovate in agriculture, similar to Rogers' categories: personality traits, social relations and networks, and socioeconomic characteristics. We add to Rogers' framework by presenting findings on the interaction between gender norms, agency, and innovation. As we will demonstrate, gender norms influence men's and women's ability to try out, adopt, benefit from, and make decisions around agricultural innovations. Such norms affect perceptions and have practical implications for each of the three analytical categories discussed below.

Innovator interviewees were asked to think back across their innovation experience and name what they consider the most important factor enabling them to innovate. Several interviewees identified more than one and the total is therefore more than 100 percent. The responses are categorized in Table 4.

**Table 4: Frequency of factors cited as most important for ability to innovate (% share)**

	Men innovators (n=168)	Women innovators (n=168)
1. Personality traits	41%	36%
2. Family support	13%	26%
3. Local networks	15%	11%
4. Extension services and other external Partners	39%	26%
5. Agricultural/financial resources and inputs	29%	26%

Participants' perceptions about the factors contributing to their innovation capacity mirror the three categories related to innovativeness as described by Rogers. Personality traits (factor 1) or traits of individual innovators include aspects such as curiosity, determination, and open-mindedness. Social relations and networks include relationships with family members, other community members, such as neighbors or fellow farmers, and relationships with external partners, such as extension agents (factors 2, 3, and 4). Finally, socioeconomic characteristics concern formal education and financial and productive resources, such as land and inputs (factor 5).

For the sake of organization and clarity, we will treat each factor separately. However, innovation depends on multiple factors and the examples, though under a single heading, often illustrate this.

### ***Personality traits and agency***

Across the innovator sample, men and women innovators believe their success to hinge largely on particular personality traits. Grit, hard work, self-confidence, curiosity, and risk-taking attitude are among the most frequent personal strengths mentioned by innovators.

Overall, 41 percent of men innovators identify these and related personality traits as a determining factor for their innovation success, compared with 36 percent of women innovators. There is very little difference in how men and women describe these personality traits. The majority depict themselves as driven, innovative, risk-taking, and hard-working individuals with curiosity and determination to learn new agricultural skills. A 67-year-old man coffee farmer from Son, Vietnam relates how "learning, trying to find answers by yourself and the application of new agriculture and cultivation techniques have made the initiative of bringing coffee trees back successful." In Ilkhom, Uzbekistan, a 45-year-old wheat and bread innovator attributes her innovation success to her "strong motivation and character." And a 55-year-old woman farmer from Bukal, Philippines explains that "willingness to try new things" is what most helped her to innovate with improved rice varieties.

Across our sample, both women and men innovators perceive increased agency over the past 10 years. In Table 5, we compare the average ladder ratings of the individual innovators with those of middle-class men's and women's focus groups from the same communities. For both men and women, the ratings of the innovator sample are higher than those of the middle-class focus group members, both now and 10 years ago.

**Table 5: Comparison of agency on the Ladder of Power and Freedom between innovators and middle-class focus groups (average ladder step)**

	Men			Women		
	10 yrs. ago	Now	Difference	10 yrs. ago	Now	Difference
Middle-class FGDs (n=84 men groups and 84 women groups)	2.84	3.54	0.70	1.96	3.02	1.08
Innovators (n=168 men and 168 women)	3.13	4.11	0.98	2.38	3.74	1.36

We also examine the relation between marital status and innovator agency (Table 6).

**Table 6: Comparison of current agency level on the Ladder of Power and Freedom between married and unmarried innovators (average ladder step)**

	Men innovators (n=168)	Women innovators (n=168)
Married/Common-law	4.12	3.60
Widow/Divorce/Single	4.00	4.00

Women in conjugal relationships perceive less agency on average than women who are single, divorced, or widowed; whereas this is slightly the opposite for men. This may indicate that traditional norms around marital roles continue to limit women's ability to participate in decision-making and exercise agency, including around agricultural innovations. As one 45-year-old married woman farmer and small-scale trader from Wariso, Ethiopia, describes:

*Now I'm on step 3 because I can make my own decision on particular issues that need my participation such as on everyday life. But the major decisions are still his, and he is responsible and controls major issues.*

In several cases, single, divorced, or widowed women innovators describe how their status as household heads means they now make decisions previously taken by their husbands. According to a 43-year-old farmer from Mogorowi, Tanzania, who separated from her husband and moved from step 2 to 5 on the ladder:

*During that time most of the decisions were being made by my husband. Every little decision I used to make was undermined by the husband. Today I can make full decisions.*

---

*I can say I will plant one acre or two acres. Planning in the absence of the husband is better.*

The following three examples of agricultural innovators demonstrate the perceived importance of personality traits and agency to innovation capacity.

### ***Individual stories, Part I***

**Danai** is a 38-year-old married mother of four from Mikita, Zimbabwe, who successfully adopted conservation agriculture (CA) related practices on her maize field. Gender norms in Mikita, a farming village of 1,762 households, have become less restrictive over the last 10 years. As a result, women farmers like Danai are now increasingly able to access farmer trainings, agricultural innovations, and job opportunities. Danai attributes her innovation success to strong support from family, extension, and local networks, and most of all to her strong will and desire to escape poverty.

*For me it was determination and seeing how wealthy other people around me were. I can tell you that I was so insignificant to the point that I was only invited to family events to fetch water and do all the heavy work.*

When Danai first applied CA-related practices on her plot, her family and neighbors mocked and discouraged her because it was not a common practice in the village. The hard labor also challenged her. “There are times when the work is so painful that I wished somebody would invent an automatic hoe which is remote controlled,” she says jokingly.

Danai enumerates a long list of positive changes resulting from CA: she bought cattle, built her own house, received a “Master Farmer Certificate,” and paid for her husband to attend “building school.” Through her initiative and achievements, Danai earned respect from her husband and family:

*Now my voice can be heard in this house, and I can make important decisions. I am the one who went for Conservation Agriculture training, and I am the one who does most of the work. My husband mainly helps me in terms of money to purchase the inputs.*

She credits her current high agency (step 4) to her economic contributions to the household and increased decision-making:

*I perform different jobs that give me money. So I could now earn money as an individual, and this also gave me more power to make decisions. I am now able to buy what I want for myself. My husband now allows me to make more decisions because we work well together, and he also appreciates the progress that I have made.*

**Tara** is a 44-year-old married woman with two sons in their mid-twenties, from Ranagar, a village of about 1,100 inhabitants located in central Nepal. Like Danai, Tara is a successful woman innovator who has benefited from the fact that gender norms in her community have become less restrictive over the last 10 years. This has increased women’s physical mobility, economic independence, and decision-making power. High male out-migration rates have

accelerated these changes, and women increasingly carry out the agricultural and economic roles previously associated with men. Her capacity to innovate was facilitated by a combination of factors, including support from extension, local, and family networks; high agency and particular personality traits; and changes in local gender norms.

Tara describes herself as curious and eager to try new things. After learning about row planting with improved maize seeds at an extension event, she adopted the practice on her farmland and saw immediate results. While describing local maize as tastier, Tara reports that the improved maize varieties resist storms and heavy rains and increase her crop yields by one-third. Most importantly, they guarantee her family's food security and raise the economic condition of the household as Tara is able to sell the surplus crop for a profit. She credits her thriving agribusiness with being able to send her sons to university. Tara has gained the respect of fellow farmers, who see her as an influential role model: "Now village people come to me and adopt my way of growing maize."

Tara considers that she has climbed from step 2 to 5 on the Ladder of Power and Freedom. She attributes this to the change in Ranagar towards less restrictive gender norms and the opportunity to participate in trainings about agriculture, gender, and leadership.

*Now we [women] can go to join meetings, trainings, excursions [organized by the local agricultural office]. But earlier, our husbands used to get angry if we went out.*

She observes that her relationship with her husband has improved:

*Now everything is going smoothly. But in the beginning my husband used to get angry whenever I wanted to participate in trainings and meetings. After getting gender training from Heifer International, he has changed a lot. Now, he reminds me to go for a course if I forget.*

In both Danai's and Tara's cases, favorable gender norms facilitate their ability to exercise agency and learn about, adopt, and benefit from agricultural innovations. In several cases, men innovators' understanding of their level of power and freedom is rooted in how well they fulfill their gender-ascribed roles as economic providers and household heads. For an example of this, we turn to the story of Chichi, whose privileged position as a male household head facilitates his access to agricultural knowledge and bolsters his decision-making and innovation capacity.

**Chichi** is a 57-year-old farmer and father of three from Karanga, a village in Tanzania, where patrilineal family systems place men as the primary household decision-makers. Chichi began innovating with improved groundnut varieties and management practices after hearing about groundnut farming on the radio. He traveled outside the village to learn from successful groundnuts farmers. "What is needed is commitment and not being afraid to try new techniques," he explains. "Advice and information from the extension officer is important." Today, Chichi is an influential farmer. "Many people come to me for advice regarding agriculture. I think this is because they have seen that I have become successful." According to Chichi, what most helped him was "not giving up, trying a new approach."

Chichi explains his upward move on the Ladder of Power and Freedom:

*I am rating myself on step 5 today because I am the head of the household, therefore I am free to make whatever decision I want. . . . You know, the decisions in the family are made by a man, otherwise everything will go wrong. Even if it is her plot, if anything goes wrong, you, the man will be blamed. So, I keep on making decisions, even though sometimes we discuss together.*

In his gender-ascribed role, Chichi is responsible for the wellbeing and food security of his family. Attaining good results with groundnuts and generating income validates his ability as economic provider and his status as a man in the community:

*Increased crop yield is the most significant. It helped me earn a lot of money and my family advanced. I paid the children's school fees and developed our restaurant; I have peace in my family because we have food. I am seen as a good father of the family.*

### ***Social relations and capacity to innovate***

Social relations and networks play an important role for men's and women's abilities to access information and support, as indicated in Table 4. However, there are differences in the way men and women innovators perceive and reflect upon various types of social relations and support networks. The main distinctions concentrate around the importance of family support, and the quality or nature of the interactions with external partners. After a brief overview of these aspects, we again turn to a set of concrete examples that illustrate men's and women's different experiences in these regards.

### **Family support**

More women than men innovators emphasize family support. Overall, just 13 percent of men identify family support as one of the most important factors in their capacity to innovate. Across the 168 innovation trajectory interviews, only seven men mention support from their wives as an important factor. In comparison, 26 percent or 44 women innovators refer to family support as important for their innovation experience (Table 4).

To the question of how innovators first learned about the new practice/technology/way of organizing, 18 percent of women respondents point to family members, compared to just six percent of the men. When asked if someone encouraged them to try out the innovation, 32 percent of women mention family members, compared to only seven percent of men (Table 7).

**Table 7: Sources of information and encouragement for men and women innovators (% share)**

	First source of information		Who (if anyone) encouraged them?		Possible source of additional information or material support?	
	Men (n=168)	Women (n=168)	Men (n=168)	Women (n=168)	Men (n=168)	Women (n=168)
Extension and other external partners	58%	42%	53%	26%	65%	49%
Local networks	22%	24%	18%	16%	10%	12%
Family members	6%	18%	7%	32%	0%	5%
No one/ self-motivation	2%	5%	8%	11%	5%	11%
Mixed	10%	10%	13%	15%	19%	21%
NA	2%	1%	0%	1%	1%	1%

Unlike the men, women innovators offer detailed explanations of how support of husbands, parents, siblings, in-laws, or children helps them take up new farming techniques or otherwise innovate in their rural livelihoods. Notably, the family support most frequently emphasized by married women innovators is that of their husbands, including, for example, emotional and financial support, sharing childcare responsibilities, or even standing up for their wife against unsupportive relatives.

### **Local networks**

The importance of social networks and collective action is highlighted in the gender literature in relation to women's empowerment (e.g. Agarwal, 2000; Bali Swain and Wallentin, 2012; Ibrahim and Alkire, 2007; Kabeer, 2001; Malhotra and Schuler 2005; Weber, 2007), and throughout the interviews both women and men study participants make reference to group membership or exchanges of information and various types of mutual help with other community members.

On several occasions, women and men innovators express high appreciation for the advice and help they receive from fellow farmers. When discussing local networks, men innovators typically reflect on learning and receiving technical advice from other men farmers who encourage them to try out an innovation. As a 30-year-old man farmer from Ethiopia shares:

*I would like to mention the support and encouragement of [my friend] Ato Bedelu who consistently makes me hope to see the future and gave me chickpea seeds to try out for free.*

And according to a 52-year-old man farmer from Lan, Vietnam, "I continuously learn from others and apply suitable technical advances for effective production." Women mention interacting with people in their community, e.g. neighbors and experienced farmers. For instance, Elsa, a 34-year-old rice farmer from Agham, Philippines, shares that when she has a question about high-yield rice varieties, she seeks the advice of farmers who have earlier tried

planting the variety. Similarly, Shan, a 45-year-old mother of three from Ganga, India, who adopted use of rotavator, a machine for land preparation, saw this machine on her neighbor's plot and was curious about it. The neighbor agreed to lend her the rotavator so she could try it out herself, and later another neighbor lent her money for farm inputs. She states that "my neighbors were my biggest help." Nonetheless, local networks are only the fourth and fifth most frequently mentioned factors by men and women, respectively (Table 4).

### **External partners**

Our data support that external partners, including extension, play an important role for both men's and women's capacity to innovate. However, there are large differences in the way women and men refer to their experiences with these entities. Men innovators are much more familiar and used to interacting with external partners than women in the sample: 39 percent of men innovators describe interactions with extension services as significant to their innovation success, compared to 26 percent of women respondents (Table 4). More men than women first learned about the new practice/technology/way of organizing from extension services, and the number of men who report receiving encouragement from extension services is more than double that of women (Table 7). Similarly, 65 percent of men identify external partners as a source of additional information or material support, compared to 49 percent of the women innovators. While considerably less than the men, the fact that half of the women in the sample consider external partners as a possible source of additional support speaks to the importance of external contacts for women's innovation.

A qualitative analysis of men's and women's responses about the importance of extension services indicates a difference in the type and quality of their interactions with external partners. In about half of the responses to the question about the most important factors to innovation success, men innovators mentioning extension reference the (good) quality of their relationships with extension agents or external partner representatives, including how this strengthens their confidence and decision-making capacity (30 out of 62); in contrast, very few women innovators describe the quality of their relationships with extension agents (eight out of 45). Instead, the majority of women innovators' responses emphasize the importance of simply having access to new knowledge or training (33 out of 45, compared to 27 out of 62 for the men).

**Table 8: Relationship between women innovators' marital status and their initial source of information about innovation (% share)**

	<b>Married/common law</b> (n=128)	<b>Single/divorced/widow</b> (n=40)
External partners	39%	50%
Local networks	27%	15%
Family members	17%	20%
No one /self-motivation	7%	0%
Mixed	9%	15%
NA	2%	0%

It is likely that gender-related constraints, for instance with regards to (married) women's physical mobility or their communication with men outside the family, affect women's ability to establish more regular interaction and relationships with extension services, or how they frame

this when speaking about it. The data indicate that women who head their households (widows, divorced, and single women) more frequently acquire information from external partners than women in conjugal relationships (Table 8).

As illustrated in the following examples, innovators often seek relationships outside their local networks and establish what might be considered “weak ties” with external actors (Granovetter, 1983).

### *Individual stories, Part II*

The following stories demonstrate the shifting, multi-faceted relationships between support networks and other structural and individual elements that make rural innovation possible in real-life contexts. The innovation experiences of Bilha from Ethiopia and Samuel from Tanzania demonstrate how gendered social networks are intertwined with access to financial resources and individuals’ ability to negotiate room for maneuver to take their projects forward.

The story of **Bilha**, a 27-year-old mother of two from Saina, a village in Ethiopia, demonstrates how husbands’ support can facilitate women’s agency and decision-making. In Saina, farmers grow wheat, teff, beans, and chickpeas. Early on in her marriage, Bilha lived according to community norms in which women are mainly expected to support their husbands and take care of household tasks. Later on, however, she decided to start a business selling local brew in her village, and her family accepted this. Bilha began earning money and things began to change. She explains:

*After I started my own business, I earned income and could participate in major decisions in our life. At the same time, I got the chance to participate in trainings and meetings that increased my knowledge and skill on farming. My husband recognized my contribution to our improvement over time.*

After attending a workshop on chickpea farming organized by the national agricultural research organization, Bilha decided to start cultivating chickpeas. The local extension department introduced Bilha and her husband to a model farmer (man) within their region, who agreed to provide them with 25 kg of chickpea seed as a loan. They rented 0.25 acre and planted the chickpeas. After their first crop failed, her husband was ready to give up, but Bilha insisted on trying again. She replanted late in the season and harvested five quintals (about 500 kilos). From this she repaid the seed loan, kept some for food and for seed, and sold the difference. The following season, the couple rented a bigger plot and harvested 16 quintals.

Bilha explains how, at first, the community did not approve of her attending meetings outside of the homestead without her husband. His support and encouragement gave her the strength and confidence to persist and move ahead, despite the criticism and pressure to conform. Over time, Bilha has become the woman representative in the *woreda*<sup>iii</sup>. She is proud that her initiative improved her family’s welfare: they built a bigger house and their children can now dress well and go to school comfortably.

There are several narratives similar to Bilha’s in which husbands’ openness and support facilitate women’s ability to innovate. Yet, some people hold on to more traditional gender views. This

was certainly the case for Chichi, the groundnut farmer from Tanzania, and likewise for Samuel, also from Tanzania, whose story we turn to next.

**Samuel** is a 45-year-old married farmer and father of three who adopted improved maize. He lives in Mogorowi, a community of about 2,300 people characterized by fluid, slowly changing gender norms. Though men in Mogorowi are better positioned to take advantage of agricultural innovations, women increasingly find outlets for strengthening their livelihoods. Both men and women farmers cultivate improved maize and rice and raise livestock, and some grow vegetables for sale. Very skeptical of women's economic independence, Samuel faces the burden of providing for the household largely on his own.

Samuel shares how his determination to improve his family's economic condition led him to start a brickmaking business. Brickmaking gave him sufficient income to build a new house and to rent land and try out new cultivation practices with improved maize. According to Samuel:

*What has helped me most is being closer to the agricultural extension agents who continue helping me. In case of any problem, I turn to them for help.*

With good maize harvests, Samuel has been able to ensure his family's food security and economic wellbeing. He continues to interact closely with local extension agents and recently expanded into livestock activities. However, rental costs for land are rising, so he and his wife farm far away from their home where renting is more affordable. This means Samuel relies on his children to manage the livestock.

The pressure that Samuel shoulders to provide for his family is exacerbated by his traditional view of gender roles. For example, Samuel farms alongside his wife—not permitting her to plant and sell crops individually—because if “women sell and get money on their own, they normally become a problem to their husbands.” Yet, while Samuel attempts to limit his wife's economic agency, he claims a shift towards more cooperative decision-making in economic and household matters:

*I can say that the way decisions are made has greatly changed. Before I attended the seminar, I did not know that we needed to have cooperation as a family in decision-making. This has brought great change, and now we decide together.*

These seemingly conflicting statements may indicate a growing recognition of the value of cooperation and jointness. Though there are no assurances, with time Samuel's attitude towards women's economic roles could evolve as well.

Many quotes by women innovators allude to expectations of deference of married women to their husbands. As our final story illustrates, single, widowed, and separated women sometimes find it easier to engage with extension workers and make decisions around agricultural innovations.

**Celestine** is a 49-year-old widow with eight children from Nirama, Rwanda. Development and extension programs began arriving in Nirama in the 2000s. Today, villagers have access to

microcredits, technical schools, social assistance, and trainings on improved seeds and fertilizer application.

Celestine's decision to adopt improved maize varieties increased her economic stability, food security, and self-confidence. It also gave her a newfound respect within the community:

*I used to be a nobody. Now I am knowledgeable and everyone recognizes my opinion in the community and beyond. I can go to the mayor's office or even the Minister if I have something I want to tell them. All this is because of my activity growing improved maize!*

Celestine learned about improved maize varieties from an agronomist who later helped her and other farmers acquire seeds, maize-shelling machines, and other farming inputs. Celestine's status as a widow and household head meant that she was less constrained by certain gender norms that tend to limit married, or young, women's access to meetings, trainings, and other public interactions. The presence of good agricultural advisory services, combined with Celestine's dedication and eagerness to try out new things, made her innovation experience very positive.

Despite disapproval and skepticism from family members, Celestine remained optimistic and persisted to try out new maize varieties:

*They would ask me why I am so enthusiastic about maize and what makes me feel so confident about the maize. I told them that I am hopeful that one day I will renovate my house and make it modern. I will even buy a television because of maize!*

Many family members and neighbors have since adopted the practice following her example.

### ***Socioeconomic characteristics: financial and productive resources***

In his categorization of innovation adopters, Rogers (2003) places great importance on socioeconomic characteristics and closely relates education level and possession of financial and productive resources to capacity to innovate, going so far as to consider these as prerequisites for innovation. Nevertheless, he acknowledges that these are not the only elements that shape innovation processes: "Although wealth and innovativeness are highly related, economic factors do not offer a complete explanation of innovative behavior (or even approach doing so)". He emphasizes "Although agricultural innovators tend to be wealthy, there are many rich farmers who are not innovators" (p. 289). From this study we can add that there are numerous examples of successful innovators who started with very few financial and productive resources.

### **Financial and productive resources and inputs**

Men and women innovators in our study place considerable weight on being able to access the necessary resources for their projects. Overall, 29 percent of men and 26 percent of women in the sample mention access to productive or financial resources and farm inputs as one of the most important factors for their capacity to innovate (see Table 4).

The testimonies presented above reflect the importance of resources as well as how people negotiated the challenge of not having certain resources. Bilha and her husband did not have land of their own, and Samuel had just 0.2 ha. In both cases, they first had to find a way of generating

resources with which to access land; in Bilha's case it was brewing and selling drinks, and in Samuel's it was making and selling bricks. Tara, on the other hand, had access to land but still needed to invest in improved maize seed. She explained the big difference it made that she was able to acquire the seed she needed at a 33 percent discount through her membership in a women's farmer group. Tran, a 26-year-old married mother of two from Lan, a village in Vietnam, talks about how money borrowed from her in-laws helped her start rearing pigs:

*Yes, when [we] first moved out I borrowed seven million (about \$300 USD) with 1.5 percent interest from my parents-in-law to grow maize; after selling maize I used that money to raise pigs.*

The majority of the interviewees have access to land: 97 percent of the men and 81 percent of the women. However, although they share similar views with regards to the importance of being able to access productive resources, access to and control over land differs considerably between women and men, as shown in Table 9.

**Table 9: Land ownership (% share)**

	Men innovators (n=168)	Women innovators (n=168)
Together with spouse or other family member(s)	50%	39%
Self	42%	18%
Spouse or other family member(s)	5%	23%
Other	3%	19%

The information on land size is incomplete and only available for 109 (or 65 percent) of the women, and 125 (or 74 percent) of the men in the sample (Table 10). However, based on these numbers more than a quarter of the men and half the women innovators report total household land holdings of less than 1 ha.

**Table 10: Household land size for men and women innovators**

Land size (ha)	Men innovators (n=125)	Women innovators (n=109)
<1	34 (27%)	55 (50%)
1 - 2.99	42 (34%)	29 (27%)
3 - 4.99	17 (14%)	15 (14%)
5 - 9.99	16 (13%)	7 (6%)
> 9.99	16 (13%)	3 (3%)

Bilha and her husband managed to rent a plot with money from her brewing. They could not pay for the chickpeas seed, but negotiated the seed acquisition as a loan to be paid back after harvest. Access to information and creative negotiation with other people compensated for their financial and land-resource limitations. Similarly, Celestine relates that access to information is more important for innovation adoption than financial resources:

*I don't really need money. I think training and capacity building in other areas of development would be more helpful.*

### Educational status

Examining the relationship between innovators' perceived agency and their level of education (see Table 11), we find that across different levels of education, men innovators report higher levels of agency than their women counterparts. The level of agency among the innovators interviewed is higher for those who completed primary school or more, compared to those with no or incomplete primary education. Yet, for both men and women innovators, even in the lowest educational category of no or incomplete primary school, the average levels of perceived agency are relatively high, greater than 3.62. Overall, the data do not indicate that higher education is accompanied by a higher sense of perceived agency.

**Table 11: Education level/average step on Ladder of Power and Freedom**

	Men innovators (n=168)	Women innovators (n=168)
No/incomplete primary	3.92	3.62
Primary school	4.19	3.85
Secondary school	4.15	3.91
University/vocational/technical	4.16	3.57

### **Capacity to innovate from a gender perspective**

The innovators in the study identified important enabling factors which can be grouped in alignment with Rogers' three categories of variables related to individual innovativeness: personality traits, social relations, and socioeconomic characteristics. A gender perspective allows us to consider the extent to which individual capacity to innovate is influenced by gender norms, and in the following we discuss this in relation to each of the three categories.

While we structure the discussion around these three categories and treat them separately, it is important to stress that successful innovation is mostly a result of multiple factors. In some cases, there are synergies among factors, while in others, individuals skillfully weave together various elements from the three categories and the specific context to overcome challenges related to physical or financial resources, information, or, indeed, the normative context. The one factor that seems to be universally present across the women and men innovators in our dataset is strong personal drive, and we start the discussion with that.

#### *Personality traits*

Despite their many different contexts, the innovators in our dataset have a number of similar personality traits in common: they are open-minded, determined, aspirational, and willing to take on uncertainty; and their ratings on the Ladder of Power and Freedom are higher than those of other groups in the case studies (Table 5). Based on their own testimonies, it is their curiosity, grit, and intentionality that drive them forward in search of new knowledge and different types of support to facilitate their projects, and which spur them to seek alternative ways of negotiating

challenges. These are elements that facilitate capacity to exercise agency, and our data show little difference in the way men and women innovators speak about these factors.

We have analyzed data on agricultural innovators' experiences, and found that the aforementioned personality traits appear to favor individual capacity to innovate. However, due to our focus on successful innovators, our data do not allow for conclusions regarding other groups, e.g. those that do not innovate or tend to adopt late; nor how the development of such traits can be stimulated, or how individuals who have them can be identified. These are topics that require further investigation.

### *Social relations and networks*

Except when it happens accidentally, innovation is about purposely doing something differently, which requires agency. In addition, innovation potentially challenges local views of how things *should* be done or by *whom*. Depending on the context, the potential consequences of challenging local norms can be more than an individual is able or willing to face. By extension, normative dimensions, including those related to gender, can affect people's capacity to innovate.

However, as our findings show, it is a characteristic of innovators that they do not shy away from challenge. Many of them are adept at moving skillfully on the border between resistance and conformity. Women's efforts to innovate in their agricultural activities often challenge local norms for appropriate behavior for (married) women, and many of the women participants speak about facing harsh criticisms from other family or community members. In this situation, several of the married women created room for maneuver for their innovation endeavors by explicitly subscribing to certain gender norms, for example those accentuating deference to the power of the male household head. Thus by deliberately playing into what is expected of a good wife in other respects, an impression of conformity is maintained. These findings are congruent with the literature, (e.g. Cornwall and Edwards, 2010; Beck 2009), on the need for women, in some situations, to subscribe to certain societal expectations in order to acquire certain freedoms.

Economic gain from an innovation is often a key turning point for both women and men innovators in terms of gaining buy-in from the spouse and other family members, and for women furthermore in terms of gaining respect from the husband and increasing participation in decision making, as in the cases of Danai, Tara, and Bilha (see also Locke et al., 2017).

Spousal support appears to be particularly important for women. When women innovators can count on support from their husbands, it helps them withstand the criticism and the social pressure to conform, and reduces the risk of tension in the household. And this in turn facilitates individual capacity to innovate, as also described by Locke et al. (2017). For these same reasons, relaxation of norms around women's physical mobility, economic agency, and decision making can be game-changing. This underscores the importance of working with men and boys, as well as women and girls, and of fostering the support of husbands and local opinion leaders to strengthen women's capacity to innovate. In relation to this, it is worth noting the effects of gender awareness trainings referred to by several men and women in our dataset as something that contributes to nurturing cooperation and support among spouses, including in Tara's and Samuel's stories above.

Our findings related to external and local networks are in line with Rogers' framework, according to which those with the highest levels of innovativeness are oriented towards the external environment and often form social relationships outside their local circle of peers. For Rogers, this "frees the innovator from the constraints of the local system and allows him or her the personal freedom to try out previously untried new ideas" (2003, p. 291). This aligns with Granovetter's (1983) arguments regarding the strength of weak ties, which play a key role in establishing access to exotic ideas, information, and technologies, e.g. new crop varieties or agronomic practices, and bringing these into the local system. In the context of this study, examples of such weak ties would include Bilha's connection with the model farmer elsewhere in the region, who provided her with improved chickpea seed; or the extension agents in Samuel's and Celestine's stories, as well as other external rural development partners, business people, or personal acquaintances in other innovators' cases.

The qualitative and numerical findings presented in Tables 4 and 7 draw attention to gender disparities in access to extension, a problem which is well documented in the literature (e.g. FAO and IFAD, 2009; Meinzen-Dick et al., 2012; Peterman, Behrman, and Quisumbing, 2014;) but which requires greater attention in policy and agricultural research for development. Our findings furthermore indicate differences in the type and quality of the interactions with external partners. Men appear to be better positioned to access and cultivate relations with extension personnel and other external entities, which resonates with previous studies (e.g. Moore et al., 2001). While our data do not include details on the approaches and procedures of extension and other external partners in the case study communities, the differences highlighted in Table 7 could indicate that extension and other external partners tend to service and support men innovators more and better than women innovators. This is likely the result of the reproduction of dominant gender norms and related assumptions and stereotypes in the broader institutional context, including extension and other external entities.

Despite these challenges, 49 percent of the women innovators in our study consider external partners as an important enabling factor and a possible source of further information and support (Table 7). This is an encouraging finding which suggests that despite the less intense and sustained interaction with extension agents, women innovators appreciate access to new knowledge and learning, and due to the scarcity, possibly even more so than men. Gender norms in many places can make it seem more challenging for planned interventions to reach women, but our findings support that it is well worth the effort, and a more fine-grained understanding of gender norms and agency will allow us to further engage in this.

### *Resources*

Rogers' framework associates the most innovative people with educational and social status and control of financial and productive resources. Conversely, lack of the same is associated with the least innovative individuals. While we acknowledge that poverty can hold people back from innovating, e.g. because they cannot afford the basic inputs to implement innovation, we find that this is not always the case, and that particular resource endowments—financial or otherwise—are a not a prerequisite for capacity to innovate. Our dataset is very diverse with regards to study participants' land ownership, education, and access to financial or agricultural inputs. We find that some people innovate possibly *because* they are poor and have little to lose, as in the case of Danai, for example, who describes her poverty as her main motivation.

Notwithstanding, having financial and productive resources can be helpful or even required, as may be the case for education. Access to resources should therefore be considered an important enabling aspect in relation to capacity to innovate. Facilitating access to resources for those who have little would therefore be an important investment area for those concerned with scaling out agricultural innovations. This should include alternative financing mechanisms and rethinking the role of subsidies for the resource constrained, as in the case of Tara, who was able to try out improved maize when she qualified for a discount.

Single women/widows sometimes face less of the social norm constraints that apply to married women, and may in some ways perceive more sense of freedom and power to make decisions on certain things than many married women (Table 6). However, widows and single women can sometimes be more resource constrained than married people. Yet, in some cases, their motivation and increased ability to exercise agency may more than compensate for their financial or physical resource constraints. This represents an opportunity for initiatives interested in stimulating women's innovation.

Overall, men and women rural innovators point to factors related to personality and agency as being the most important in relation to capacity to innovate. The view that financial or productive resources are a prerequisite for capacity to innovate has led to a strong focus on socioeconomic variables in agricultural research for development, and relative underinvestment in other dimensions influencing capacity to innovate, most particularly the role and nature of agency and the interlinkages to social norms and social relations. While these dimensions may seem more challenging to tackle or measure, our findings show that they cannot be overlooked in efforts to scale out agricultural innovations. Rogers refers to the tendency of focusing on farmers with resources, education, and extensive social networks as "the innovativeness/needs paradox and the strategy of least resistance" (2003, p. 295), and he points out how this sometimes leads to widening socioeconomic gaps rather than helping the ones who most need innovation.

## Conclusions

According to our findings key characteristics of rural innovators include personality traits related to open-mindedness, intentionality and resourcefulness, willingness to take on uncertainty and relatively high levels of agency. Often this is combined with the formation of social relationships with people outside their immediate circle of local peers. Men are often better positioned to take advantage of innovation opportunities than women, and women innovators more often than men face criticisms for challenging local gender norms, especially if married. Spousal support is therefore particularly important for (married) women innovators. While often more resource constrained than married people, single women or widows sometimes experience more freedom and power in certain regards than married women.

Innovation requires multiple factors to come together, including aspects related to personality traits, social networks, and other resources. Initiatives should consider all these dimensions when selecting approaches for enabling and stimulating innovation. Focusing primarily on better educated, relatively well-off, male farmers is a limiting perspective that not only reinforces existing inequality, but also leaves most of the innovation potential untapped. The exact

approach should be adapted to the specific context; however, here we identify some opportunities to consider:

- Targeting regions/areas where the normative or institutional context is (becoming) encouraging for both women and men to innovate, and where agricultural advisory services and other elements in the local opportunity space, e.g. micro-finance and subsidy programs, are equally supportive of poor women and men. As we have demonstrated, the more tolerant and non-restrictive the normative context, the greater possibility that women can build and activate their capacity to innovate. Further research is needed to develop methods for assessing institutional environments, as well as for leveraging personality traits that favor innovation.
- Caution should be exercised in focusing on resource-strong farmers. We find encouraging examples of agricultural innovators who lacked basic financial or physical resources, but who found ways of overcoming these challenges. More attention should be directed to supporting resource-constrained potential innovators to negotiate such challenges, e.g. through building and leveraging social relations, subsidy arrangements, and rental or collaborative arrangements.
- Rethinking gender awareness training with communities and R&D partners, including community leaders, as a central axle in strategies for agricultural development and poverty reduction. As our findings indicate, achieving husbands' acceptance and support is key for married women's ability to innovate. Gender-transformative approaches can support women and men to develop shared visions for their lives, and to work together to overcome gender barriers to innovation (see Farnworth et al., forthcoming).
- Depending on the circumstances, women heading their households are sometimes better positioned than other women for engaging with agricultural innovation. Single women and widows represent an area of opportunity for agricultural R&D, as potential role models and vehicles for opening space for more women.

## **Acknowledgments**

This paper draws on data collected as part of GENNOVATE case studies funded by the CGIAR Research Programs on Wheat, Maize, Grain Legumes, Humidtropics and Rice, as well as RTB (Roots, Tubers and Bananas), A4NH (Agriculture for Nutrition and Health) and FTA (Forests, Trees and Agroforestry). Development of research design and field methodology was supported by the CGIAR Gender & Agricultural Research Network, the World Bank, the governments of Mexico and Germany, and the CGIAR Research Programs on Wheat and Maize. Data analysis was supported by the Bill & Melinda Gates Foundation. The authors wish to thank the women and men farmers who participated in this research, as well as the local data collection teams in each of the study countries. Two competent teams led by Diana E Lopez in Mexico and Lucila Rozas Urrunaga in Peru coded the case studies. A special thank you also goes to our two anonymous reviewers who provided valuable feedback. The views expressed in the article are those of the authors and not of any organization.

---

## References

- Adesope, O.M., Matthews-Njoku, E.C., Oguzor, N.S. and Ugwuja, V.C. (2012) 'Effect of socio-economic characteristics of farmers on their adoption of organic farming practices', in Sharma, Peeyush (ed.) *Crop Production Technologies*. InTech, pp. 211-220.
- Agarwal, B. (2000) 'Conceptualising environmental collective action: why gender matters'. *Cambridge Journal of Economics*, 24(3), pp. 283-310.
- Ahl, H. and Marlow, S. (2012) 'Exploring the dynamics of gender, feminism and entrepreneurship: advancing debate to escape a dead end?'. *Organization*, 19(5), pp. 543-562.
- Ahl, H. (2006) 'Why research on women entrepreneurs needs new directions'. *Entrepreneurship theory and practice*, 30(5), pp. 595-621.
- Ali, A. and Erenstein, O. (2017) 'Assessing farmer use of climate change adaptation practices and impacts on food security and poverty in Pakistan'. *Climate Risk Management*, 16, pp. 183-194.
- Alsos, G., E. Ljunggren and Hytti, U. (2013) 'Gender and innovation: State of the art and a research agenda'. *International Journal of Gender and Entrepreneurship*, 5(3), pp. 1-23.
- Badstue, L., Petesch, P., Feldman, S., Prain, G., Elias, M., and Kantor, P. (Submitted) Qualitative, comparative, and collaborative research at large scale: an introduction to GENNOVATE. GENNOVATE Special Issue submitted to Journal of Gender, Agriculture and Food Security.
- Bali Swain, R. and Wallentin, F.Y. (2012) 'Factors empowering women in Indian self-help group programs'. *International review of applied economics*, 26(4), pp. 425-444.
- Beck, R. M. (2009) 'Gender, innovation and ambiguity: speech prohibitions as a resource for 'space to move''. *Discourse & Society*, 20(5), pp. 531-553.
- Behrenbruch, K., Söllner, M., Leimeister, J.M. and Schmidt, L. (2013) 'Understanding diversity—the impact of personality on technology acceptance'. In *IFIP Conference on Human-Computer Interaction*. Springer, Berlin, Heidelberg, pp. 306-313.
- Berdegúe, J. A. (2005) 'Pro-poor innovation systems'. *Background Paper, IFAD, Rome*. pp. 1-42.
- Bossenbroek, L. and Zwartveen, M. (2014) 'Irrigation Management in the Pamirs in Tajikistan: A Man's Domain?'. *Mountain Research and Development*, 34(3), pp. 266-275.
- Chambers, R. (2007) 'Participation and poverty'. *Development*, 50(2), pp. 20-25.
- Cornwall, A. and Edwards, J. (2010) 'Introduction: negotiating empowerment'. *IDS Bulletin*, 41(2), pp. 1-9.
- Drew, G. (2014) 'Mountain women, dams, and the gendered dimensions of environmental protest in the Garhwal Himalaya'. *Mountain Research and Development*, 34(3), pp. 235-242.
- FAO and IFAD. (2009) 'Gender in agriculture sourcebook'. Washington, DC: World Bank Group.
- Farnworth, C.R., Lopez, D.E., Badstue, L.B.; Haile-Mariam, M. and Abeyo, B. (under review) 'Gender and agricultural innovation in Oromia Region, Ethiopia'. Submitted to *The European Journal of Development*.
- Fressoli, M., Arond, E., Abrol, D., Smith, A., Ely, A. and Dias, R. (2014) 'When grassroots innovation movements encounter mainstream institutions: implications for models of inclusive innovation'. *Innovation and Development*, 4(2), pp. 277-292.
- Geels, F. W. (2011) 'The multi-level perspective on sustainability transitions: Responses to seven criticisms', *Environmental innovation and societal transitions*, 1(1), pp. 24-40.
- Hall, A. (2007) *Challenges to Strengthening Agricultural Innovation Systems: Where Do We Go From Here?* Working Paper Series 2007-038. Maastricht: United Nations University.

- Hölzle, K., Mansfeld, M.N. and Gemünden, H.G. (2011) 'Motivation and commitment in innovation management – personal characteristics of innovators'. *International Journal of Innovation Management*, 14(06), pp. 1129-1147.
- Granovetter, M. (1983) 'The strength of weak ties: A network theory revisited'. *Sociological theory*, pp. 201-233.
- Ibrahim, S. and Alkire, S. (2007) 'Agency and empowerment: A proposal for internationally comparable indicators'. *Oxford development studies*, 35(4), pp. 379-403.
- Jumali, D. (2008) 'Constraints and opportunities facing women entrepreneurs in developing countries: A relational perspective'. *Gender in Management: An international Journal*, 24(4), pp. 232-251.
- Kabeer, N. (1999) 'Resources, agency, achievements: Reflections on the measurement of women's empowerment'. *Development and change*, 30(3), pp. 435-464.
- Kabeer, N. (2001) 'Reflections on the Measurement of Women's Empowerment', in Kabeer, N., McFadden, P., Arnfred, S., Dominguez, and Sadallaah, S. (eds.) *Discussing Women's Empowerment: Theory and Practice*. SIDA Studies No. 3, pp. 17-57.
- Kabeer, N. (2010) 'Women's empowerment, development interventions and the management of information flows'. *IDS Bulletin*, 41(6), pp. 105-113.
- Katengeza, S., Mangisoni, J. H., Kassie, G. T., Sutcliffe, C., Langyintuo, A. S., La Rovere, R. and Mwangi, W. M. (2012) 'Drivers of improved maize variety adoption in drought prone areas of Malawi'. *Journal of Development and Agricultural Economics*, 4(14), pp. 393-403
- Kingiri, A.N. (2013) 'A review of innovation systems framework as a tool for gendering agricultural innovations: exploring gender learning and system empowerment'. *The Journal of Agricultural Education and Extension*, 19(5), pp. 521-541.
- Klerkx, L., van Mierlo, B. and Leeuwis, C. (2012) 'Evolution of systems approaches to agricultural innovations: concepts, analysis and interventions', in Darnhover, I., Gibbon, D. and Dedieu, B. (eds.) *Farming Systems Research into the 21st Century*. The New Dynamic. Dordrecht, NL: Springer Science and Business Media, pp. 457-483.
- Knight, J. and Ensminger, J. (1998) 'Conflict over changing social norms: Bargaining, ideology, and enforcement'. *The new institutionalism in sociology*, 105, p. 121.
- Kumar, M. and Bharadwaj, A. (2016) 'Psychology of innovation: innovating human psychology?' *Technological and Institutional Innovations for Marginalized Smallholders in Agricultural Development*. Springer, pp. 65-80. Leach, M. (Eds.). (2015) *Gender equality and sustainable development*. London and New York: Routledge.
- Leeuwis, C. (2013) *Coupled Performance and Change in the Making*. Professorial inaugural lecture. Wageningen University.
- Legese, G., Jaleta, M., Langyintuo, A. S., Mwangi, W. M. and La Rovere, R. (2010) 'Characterization of Maize Producing Households in Adami Tulu-Jido Kombolcha and Adama Districts in Ethiopia'. Ethiopian Institute for Agriculture Research (EIAR)-CIMMYT.
- Locke, C., Muljono, P., McDougall, C. and Morgan, M. (2017) 'Innovation and gendered negotiations: Insights from six smallscale fishing communities'. *Fish and Fisheries*.
- Malhotra, A. and Schuler, S. R. (2005) 'Women's empowerment as a variable in international development'. *Measuring empowerment: Cross-disciplinary perspectives*, pp. 71-88.
- Marcus, R. and Harper, C. (2014) 'Gender justice and social norms—processes of change for adolescent girls'. *Towards a conceptual framework*, 2.

- Meinzen-Dick, R., Quisumbing, A., Behrman, J., Biermayr-Jenzano, P., Wilde, V., Noordeloos, M., Ragasa, C. and Beintema, N. (2011) *Engendering agricultural research, development and extension* (Vol. 176). Washington DC: Intl Food Policy Res Inst.
- Minniti, M. and Naudé, W. (2010) 'What do we know about the patterns and determinants of female entrepreneurship across countries?' *The European Journal of Development Research*, 22 (3), pp. 277-293.
- Moore, K. M., Hamilton, S., Sarr, P. and Thiongane, S. (2001) 'Access to technical information and gendered NRM practices: Men and women in rural Senegal'. *Agriculture and Human Values* 18(1), pp. 95-105.
- Narayanan, G., Singh, P. and Chahal, V. P. (2016) 'Factors influencing agri-preneurial success among rural women entrepreneurs: An empirical analysis'. *The Indian Journal of Agricultural Sciences*, 86(9), pp. 1214-1219.
- Okwoche, V. A. and Obinne, C. P. O. (2010) 'Comparative analysis of socio-economic characteristic of rural women cooperators in Nigeria: evidence from Benue state'. *Journal of Human Ecology*, 32(2), pp. 119-125.
- Oluwasusi, J.O. and Akanni, Y.O. (2014) 'Effectiveness of extension services among food crop farmers in Ekiti State, Nigeria'. *Journal of Agricultural & Food Information*, 15(4), pp. 324-341.
- Padmanabhan, M.A. (2002) *Trying to grow: Gender relations and agricultural innovations in Northern Ghana* (Vol. 3). Münster: LIT Verlag.
- Patterson, F., Kerrin, M. and Gatto-Roissard, G. (2009) 'Characteristics and behaviours of innovative people in organisations'. *Literature Review prepared for the NESTA Policy & Research Unit*, pp. 1-63.
- Pecis, L. (2016) 'Doing and undoing gender in innovation: Femininities and masculinities in innovation processes'. *Human relations*, 69(11), pp. 2117-2140.
- Peterman, A., Behrman, J.A. and Quisumbing, A.R. (2014) 'A review of empirical evidence on gender differences in nonland agricultural inputs, technology, and services in developing countries'. In *Gender in Agriculture* (pp. 145-186). Springer Netherlands.
- Petes, P., Badstue, L., Camfield, L., Feldman, S., Prain, G. and Kantor, P. (2018b) 'Qualitative, comparative and collaborative research at large scale: The GENNOVATE field methodology'. *Journal of Gender, Agriculture and Food Security*, 3(1), pp. 28-53."
- Petes, P., Badstue, L., Prain, G. (2018). *Gender norms, agency, and innovation in agriculture and natural resource management: The GENNOVATE methodology*. Mexico, D. F.: CIMMYT.
- Petes, P. & Bullock, R. (2018). Ladder of Power and Freedom: A qualitative data collection tool to understand local perceptions of agency and decision-making. *GENNOVATE resources for scientists and research teams*. CDMX, Mexico: CIMMYT.
- Pyburn, R. (2014) 'Gender dimensions of agricultural innovation', in Pyburn, R. and Woodhill, J. (eds.) *Dynamics of Rural Innovation – A primer for emerging professionals*. Arnhem, NL: LM Publishers, pp.74-86.
- Reynolds, P.D., Bygrave, W.D., Autio, E., Cox, L.W. and Hay, M. (2002) 'Global Entrepreneurship Monitor, 2002 Executive Report'. Babson College, London Business School and Kauffman Foundation.
- Rogers, E.M. (2003). *Diffusion of innovations*. New York: Free Press.
- Schut, M., Klerkx, L., Sartas, M., Lamers, D., Mc Campbell, M., Ogbonna, I., Kaushik, P., Attakrah, K., and Leeuwis, C. (2016) 'Innovation platforms: experiences with their institutional

- embedding in agricultural research for development', *Experimental Agriculture*, 52(4), pp. 537-561.
- Schut, M., van Paassen, A., Leeuwis, C. and Klerkx, L. (2014) 'Towards dynamic research configurations: A framework for reflection on the contribution of research to policy and innovation processes', *Science and Public Policy*, 41(2), pp. 207-218.
- Sriyabhand, T. and John, S.P. (2014) 'An empirical study about the role of personality traits in information technology adoption'. *Silpakorn University Journal of Social Sciences, Humanities, and Arts*, 14(2), pp. 67-90.
- Thompson, J., Millstone, E., Scoones, I., Ely, A., Marshall, F., Shah, E., Stagl, S. and Wilkinson, J. (2007) 'Agri-food system dynamics: pathways to sustainability in an era of uncertainty'. STEPS Working Paper 4, Brighton: STEPS Centre, pp. 1-71.
- Weber, S. S. (2007) 'Saving St. James: A case study of farmwomen entrepreneurs'. *Agriculture and Human Values*, 24(4), 425-434.
- Zulkosky, K. (2009) 'Self-efficacy: a concept analysis'. *Nursing Forum* 44(2), pp. 93-102.

## Endnotes

- 
- <sup>i</sup> GENNOVATE, or "Enabling Gender Equality in Agricultural and Environmental Innovation" is a qualitative, comparative, and collaborative research initiative on gender norms, agency, and agricultural innovation involving 137 case studies across 26 countries and drawing on the voices and lived experiences of over 7000 rural women, men, and youth of different socioeconomic levels (see: <https://gender.cgiar.org/themes/gennovate/>).
- <sup>ii</sup> Rogers does not use the term agency as such. Instead he refers to self-efficacy, which he defines as an individual's belief that he or she can control their future (2003, p. 200), and states that "an individual is more likely to adopt an innovation if he or she has more self-efficacy and believes that he or she is in control, rather than thinking that the future is determined by fate" (p. 290). In his framework, Rogers associates earlier adopters in a system with greater levels of self-efficacy compared to later adopters (p. 298).
- <sup>iii</sup> Third-level administrative divisions of Ethiopia, further subdivided into wards (*kebele*).