

From Working in the Wheat Field to Managing Wheat: Women Innovators in Nepal

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Abstract There is very little research on women in wheat in Nepal, and wheat is still considered a ‘man’s crop’. Consequently, extension services rarely target women, and women are not considered as innovators. However, research conducted in the Terai plains in 2014/15 shows that women are innovating in wheat to the extent that wheat farming is experiencing a shift from feminisation of agricultural labour towards women taking control over decision-making. Processes accounting for this include male outmigration, non-governmental organisation (NGO) work on promoting women’s equality which has developed women’s confidence, individual

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support from extension agents and strong cooperation between women to foster each other's 'innovation journeys'. Women who lived in seclusion 10 years ago are receiving recognition within their families and communities. This article provides recommendations for researchers, rural advisory services and other partners to bring their work in alignment with the realities of women wheat innovators.

Résumé *Il y a très peu de recherches sur les femmes travaillant dans le secteur du blé au Népal, et le blé est toujours considéré comme une «culture d'homme». En conséquence, les services de proximité ciblent rarement les femmes et elles ne sont pas considérées comme des innovatrices. Cependant, des recherches menées dans les plaines du Terai en 2014/15 montrent que les femmes innovent dans le secteur du blé au point où la culture du blé est en train de vivre un changement profond, passant de la féminisation du travail agricole à la prise de contrôle par les femmes de la prise de décision. La migration des hommes, le travail des ONG sur la promotion de l'égalité des femmes qui a développé la confiance en soi des femmes, le soutien individuel des agents de proximité et une forte collaboration entre les femmes pour favoriser le «parcours d'innovation» des unes et des autres en sont la cause. Les femmes qui vivaient recluses il y a dix ans reçoivent à présent une reconnaissance au sein de leur famille et de leur communauté. L'article fournit des recommandations aux chercheurs, aux services consultatifs ruraux et à d'autres partenaires pour qu'ils alignent leur travail sur les réalités des femmes innovatrices dans le secteur du blé.*

Keywords Wheat · Gender · Innovation processes · Nepal · Women's empowerment

Introduction

The wheat–rice cropping system is one of the most important cropping systems in Nepal. Wheat occupies 23 % of the total area devoted to cereals, and accounts for 22.5 % of total cereal production (MOAD 2012, cited in Dahal et al. 2015). In 2017, wheat was grown on around 760,000 ha with expected production of 1,834,212 mt (MOAD et al. 2017). In the 1960s, wheat productivity was 1.5 Mt ha⁻¹ compared with 2.5 Mt ha⁻¹ today (MOAD 2014, cited in Dahal et al. 2015). The increase is due to release of improved varieties, irrigation and incentives provided by expanding markets. Today, farmers sell around 60 % of their wheat crop (Dahal et al. 2015). Wheat is imported in varying quantities, but by 2030 surplus in domestic production over total domestic demand may occur (Prasad et al. 2011). Household food expenditure in 2015/2016 for grain and cereals averaged 32.1 %, followed by meat and fish (14.5 %) and vegetables (13.3 %). Average per capita consumption of wheat was 24.5 kg per person (fine rice 38.5 kg, coarse rice 92.8 kg). Mean wheat consumption scores vary strongly by quintile (Government of Nepal 2016). Despite its increasing importance in the Nepalese diet, wheat production is challenged by climate change, particularly reduced rainfall and increase in mean maximum temperature.



New genotypes and a variety of capacity development measures are required across the wheat system (Dahal et al. 2015). Such improvements are reliant on the capacity of farmers to innovate and on successful partnerships between farmers, extension workers, researchers, policy-makers and other development partners.

Women are actively involved in wheat farming across Nepal. However, their roles and responsibilities, the challenges they face and the opportunities they seize are under-researched. A search for peer-reviewed literature using the search terms “gender”/“social equity”/“wheat”/“Nepal”, spanning a 20-year period, found only ten papers, and these relate only indirectly to women in wheat (Jafry 2016). In a second study, interviews with wheat breeders, rural advisory services and policy-makers showed that institutional recognition of women as wheat farmers is weak. This appears to be because wheat is considered a ‘man’s crop’ (Jafry 2013).

The hypothesis guiding empirical research and analysis for this paper is that wheat farming in Nepal is experiencing a shift from feminisation of agricultural labour across most productive and postharvest management tasks towards women taking control over decision-making. The research set out to determine (i) the extent to which women are strongly represented in labour on wheat, (ii) the extent to which women are taking managerial decisions around wheat, (iii) factors that facilitate or hamper women’s participation in wheat and (iv) women’s innovatory capacity. If women are not formally targeted by extension services for training in wheat technologies, do women nevertheless seek to innovate? If so, what are their strategies for doing so? Collectively, the research questions set out to establish whether wheat is becoming a ‘woman’s crop’.

Fieldwork assessed women’s roles in wheat and how these are changing over time. Particular attention was paid to developing an understanding of the strategies women develop to innovate and succeed as wheat farmers. The implications of weak institutional recognition of women as wheat farmers with regard to their ability to access wheat-related technologies and associated capacity development were assessed. Data were sourced from a case study conducted in 2014/2015 in Rupan-dehi District, a significant wheat-growing area in the Terai plains. The study community was selected specifically due to the prominence of wheat in the agricultural strategies of most households.

The next section examines literature relevant to the hypothesis. The subsequent section discusses research design and methodology. This is followed by the study findings. The paper concludes with a discussion and suggestions for researchers, agricultural advisory services and policy-makers on how they can support women as innovators in wheat in Nepal.

From Labouring in the Field to Managing the Farm

Evidence for increasing feminisation of agricultural labour in Nepal is empirically well attested (Suvedi et al. 2017; Aly and Shields 2011; Gartaula et al. 2010; Gurung and Gurung 2002; Subedi and Garforth 1996). Women generally perform the same agricultural activities conducted by men—apart from ploughing—and women often provide more agricultural labour (Aly and Shields 2011). A key driver of



feminisation processes is men taking advantage of off-farm work opportunities, and male outmigration (Maharajan et al. 2012; Sharma and Sharma 2011; Gartaula et al. 2010). Official figures for 2013/14 show that 521,878 men left the country compared with 29,152 women (Ministry of Labour and Employment 2014). Remittances from absent men are an important revenue stream for de facto women-headed households (Adhikari and Hobley 2015), but some data indicate that remittances are mostly spent by recipients on capital-intensive projects such as housing and land purchase, rather than primarily as investment or working capital for agriculture (Gartaula et al. 2010). Indeed, there is some evidence that participation in migrant off-farm work can reduce the propensity of a household to adopt improved crop varieties (Suvedi et al. 2017). This may be because migrant off-farm work appears more lucrative than farming, thus reducing incentives to invest in agriculture (*ibid.*).

According to the Ministry of Agricultural Development (2014, cited in Suvedi et al. 2017), adoption of smallholder and women-friendly technologies is essential to improve low agricultural technology adoption rates. This goal is supported by the Nepal Agricultural Development Strategy (MOAD 2014) and the Nepal Agricultural Research Council's Strategic Vision for Agricultural Research (2011–2030) (NARC 2010). However, realising these intentions is compromised by the reality of weak rural advisory services in Nepal. Poor linkages between research, education, extension staff and farmers hamper development of a pluralistic system capable of fostering innovation processes (Suvedi et al. 2017).

Though research on women in agricultural innovation processes in wheat in Nepal scarcely exists, a study on maize found that, when conservation agriculture (CA), based on maize intercropped with millet and cowpea, is introduced into maize-based systems, women predominantly take on increases in labour demands. However, the majority of women reported they were not involved in discussions over whether to adopt CA, nor is it clear whether they derive direct benefits (Halbrendt et al. 2014).

Studies on women's decision-making power more broadly suggest that women in many rural households experience low agency. Malapit et al. (2015), using the Women's Empowerment in Agriculture Index (WEAI), found lower levels of empowerment for Nepali women compared with women in Bangladesh, Guatemala or Uganda. The Nepal WEAI findings indicate, however, a significant and positive association between women's autonomy in agricultural production and almost all maternal and child outcomes (though not women's own nutrition). This, the authors argue, is consistent with bargaining models that suggest that individuals who have greater decision-making power in the household receive a larger share of the benefits from household resources (*ibid.*).

An analysis of Nepal Demographic Health Survey (2006) data regarding women's participation in intra-household decision-making in relation to own health care, making major household purchases, making purchases for daily household needs, and visits to her family or relatives showed that 37 % of currently married women participated in all four decisions whilst 31 % did not participate in any (Acharya et al. 2010). Women from rural areas, including the Terai, and wealthier women experience less autonomy in decision-making across all four measures. Older women, and women in nuclear households, are more likely to participate (*ibid.*). Adhikari and Hobley (2015) find that women experience less autonomy in extended



families in Khotang and Udaypur Districts. In such families, a husband typically sends remittances directly to his father rather than his wife. This is then shared by the extended family (*ibid.*). A study in Jhapa District in the Terai, which experiences high male outmigration, suggests that de facto women heads of household experience more decision-making power, though they consult with their husbands by cell-phone, than women who live with their in-laws (Gartaula et al. 2010).

Regmi (2011) found that income derived from women's involvement in micro-businesses contributes directly to improved family nutrition, though not women's nutrition. Women eat last and often consume the poorest quality food. In extended families, men—husbands and fathers-in-law—continue to control household food allocations and frequently take control of women's earnings. Children benefit from improved nutrition and educational opportunities. Men, relieved of their role as sole breadwinner, report feeling relaxed. In comparison, in nuclear families, intra-household food distribution is more equal, and women can spend their income as they choose. Nevertheless, women in both extended and nuclear families experience severe labour demands because they are managing household and care work, farm work, and the micro-business. Regmi concludes that socio-cultural norms can constrain and direct women's choices, thus preventing them from meeting their immediate practical needs (*ibid.*).

These studies suggest that women have limited decision-making capacity, despite their work in the field, in their micro-businesses, and in household and care work. This capacity appears particularly limited in extended families. However, a focus on defining and measuring women's decision-making *autonomy* in nuclear and extended households may obscure relational and interactive forms of agency whereby women engage with others to secure support for their enterprises. Subedi and Garforth (1996) examined communication patterns of women and men farmers in Nepal in relation to diffusion of innovations in maize-based systems. They found that the prevailing assumption in extension services that information provided to men will flow unimpeded to all members of a social system is mistaken. Rather, four types of gender-based networks exist: male–male, male–female (male-led networks), female–male (female-led networks) and female–female. Men communicate strongly with men and rarely consult women, and their networks are highly connected between themselves and external entities. Since men receive more extension information than women yet are poor at communicating it to women, women are doubly disadvantaged. However, though women's networks are much less connected to external entities, they initiate discussions with men on farming, and share experiences with other women (*ibid.*). More recent research shows that membership of farmer groups increases propensity to adopt improved varieties, as does training in improved technologies. Younger farmers, better educated farmers, larger households and nearness to extension services all positively influence adoption, whereas migrant off-farm work and the converse of these factors reduce it (Suvedi et al. 2017).

The Subedi and Garforth (1996) study discussed above tantalisingly hints that correlating the feminisation of farming in Nepal with mere feminisation of labour in the absence of men may be mistaken. Rather, women are actively seeking agricultural information, presumably with the intent of acting upon it. Gartaula et al. (2010) make a valuable distinction between labour feminisation of agriculture and managerial



feminisation, with the latter term indicating that women have a strong decision-making role in agriculture. However, we suggest that, rather than seeing these two states as a dichotomy, the process can be conceptualised as a kind of messy continuum, with women exerting various forms of decision-making power at various points along the continuum.

The concept of managerial feminisation can be usefully associated with that of capacity to innovate. This refers to the conditions that enable people to create and harness social and technical innovations. Cohen et al. (2016, p. 310) differentiate between adaptive capacity—the ability to respond to external change—and the capacity to drive change—the ability to deliberately transition or transform a system from its current state to a new state. This returns the focus to the hypothesis guiding this paper: wheat farming in Nepal is experiencing a shift from feminisation of agricultural labour towards women taking control over decision-making and thus exercising their capacity to innovate.

Methods and Materials

Methods

Enabling Gender Equality in Agricultural and Environmental Innovation (GENNOVATE) in Nepal represents the first ever large attempt to research gender in wheat innovation processes in the country. GENNOVATE uses a comparative case study approach deploying standardised instruments to identify factors which hinder and facilitate men and women's individual and collective capacities for engaging in innovation (Badstue et al. 2015). A purposive sampling frame was used to select research sites. This was a simple matrix with four variables: high gender gaps or low gender gaps in assets and capacities on one axis, and high economic dynamism or low economic dynamism on the other. Gender gaps were estimated with reference to indicators such as women's leadership, physical mobility status, education levels, access to and control over productive assets, and the ability to market and to benefit from sales of agricultural produce. Economic dynamism was estimated using indicators such as infrastructure development, the integration of local livelihood strategies with markets, labour market opportunities, and resources available to local communities for innovations in agriculture. To facilitate global comparisons between study sites, further complexities, such as intersectionalities between gender and caste or ethnicity, were not introduced as sampling criteria. There is insufficient space to discuss the methodology per se here; interested readers are referred to Petesch et al. (2018) for reflections on the global process.

Six sites, three for wheat and three for maize, were selected in Myagdi, Chitwan, Rupandehi and Jajarkot Districts. Kuda (a pseudonym) in Rupandehi District, the wheat research site discussed in this paper, was assessed as experiencing high economic dynamism and high gender gaps.



Data Collection and Analysis

The GENNOVATE methodology comprises several tools, including community profiles, a 'ladder of life' activity which seeks to understand the causal factors of women and men moving in and out of poverty, a 'ladder of power and freedom' which seeks to establish trends in levels of empowerment today and 10 years ago, and tools focussing on establishing the capacities that innovators require to succeed. Two sets of sex-disaggregated focus group discussions (FGDs) are held with adults aged 25–55 years, and a second FGD with youths aged 18–24 years. Respondents are selected to represent 'average farmers' in the community. The adult FGDs are further sub-divided by economic class. Respondents are drawn from low-income and from middle-income members of the community using locally developed classifications. FGD discussion guides for each of these groups cover similar and different themes. To deepen understanding of successful innovators, one-to-one interviews are held with locally recognised innovators (four men and four women per study site) and with local key experts (two per gender per study site). In Kuda, FGDs were held with 70 wheat farmers, 35 women and 35 men.

Field research was carried out in 2014/15. The data were analyzed and written up by the Nepali team in an unpublished synthesis paper. This provides the raw material for this article.

Research Site

Rupandehi District comprises the Chure Hills and the Terai plain in southwest Nepal on the border with India. Key cereals include rice, wheat, maize and finger millet. Around half of cereals are exported. Diverse fruits, vegetables, oilseeds, pulses and spices are grown. Women are prominent in wheat and maize production as well as in vegetables and livestock. The average landholding is 1 bigha (0.676 ha), with 10 % of members in the study community owning land of 8 bigha. The smallest holdings are 5 kattha (0.169 ha).

Kuda, the research site, is situated on the Terai plain. The community includes several ethnic groups, including Tharu, Yadav, Kurmi and Ahirs. People in each group span all wealth classes. The Tharu community is numerically dominant but politically marginalised. Brahmins and Newars (caste groups), though few, take key decisions. Between 40 and 50 % of women work as agricultural waged labourers (compared with around 15 % 10 years ago), but they receive half the male wage for the same work (Rs 250: 500 in 2014). Banks usually decline to provide loans to women even in cases where they hold land certificates in their own name. Young men generally expect to outmigrate; indeed there is social pressure to do so (Adhikari and Hobley 2015); outmigration is identified with modernity (Gartaula et al. 2012). Whilst waiting, they assist their families on the farm, particularly in harvesting and threshing wheat. Young women work across the production cycle on all crops, and many expect to remain in farming. There are many community and producer/marketing groups with increasing numbers of women members, though men hold key posts.



Rupandehi District is among the top ten districts in Nepal for male outmigration, and rates are increasing exponentially (Table 1). In Kuda, on average, one man per household has migrated. Social norms have changed to the extent that a woman working for pay outside the home yet within the community—provided she has her family’s permission—is viewed favourably. However, a woman who travels outside the community for paid work is rarely respected.

Over the past 10 years, key roads between Kuda and the nearest big town have been paved. Whereas 10 years ago there was only one primary school, today there are two secondary schools and five primary schools, with most boys and girls attending. Some of these changes are due to the Bhairahawa-Lumbini Deep Tube Well Irrigation Project. Following completion of the project, improved varieties of wheat were introduced. This was supported by the development of wheat seed production and marketing cooperatives. Popular varieties include WK1204, Gautam, Bijaya and NL 297. Today, international and local markets for wheat grain experience high demand. Locally, wheat is used to prepare roti (bread), with chaff fed to cattle. The typical gender division of labour on wheat is that men (husbands or hired labour) plough—using tractors or rotovators—and they also market wheat. Women sow, irrigate, weed, apply fertiliser, harvest and store wheat grain. Whilst women are traditionally responsible for selecting and storing crop seed, men are increasingly involved in grading, packaging and marketing improved wheat grain.

Results

The findings are set out as follows: change in gender norms due to male outmigration, further factors influencing capacity to innovate, capacities of innovators, innovation journeys and constraints to innovation.

Change in Gender Norms Due to Male Outmigration

Figure 1 visualises the research results. It shows that, as a direct consequence of male outmigration, **women’s mobility** has increased dramatically over the past 10 years, with young single girls claiming that 7 out of 10 women of their age can move freely. Young married women experience the most restrictions. Older women remarked, “*We ride a bicycle to market*”, and “*When I came here after marriage about 10 years ago, women were not allowed to go out. There were lots of restrictions on women at that time.*” A young man confirmed, “*Earlier, due to a lack of knowledge and awareness, there were lots of restrictions upon women. Women were*

Table 1 Outmigration from Rupandehi District (Ministry of Labour and Employment 2014)

	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	Total
Men	3403	4122	5375	5867	10,557	11,603	40,927 (98 %)
Women	16	41	53	119	293	162	684



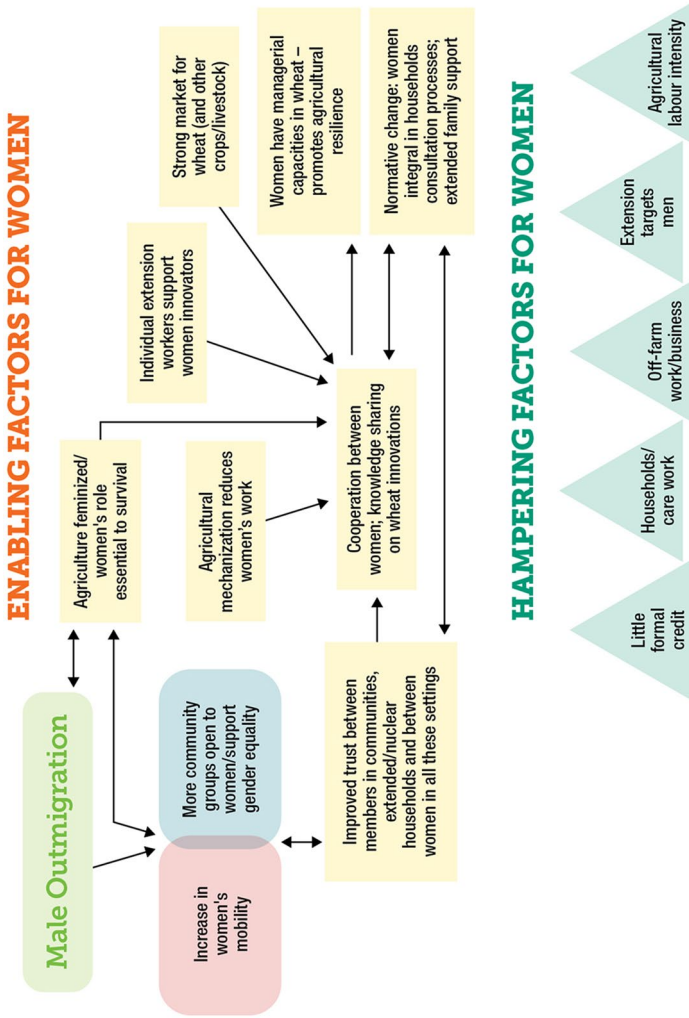


Fig. 1 Changing gender norms



not allowed to go out and they used to hide their face in their sari. Now women are compelled to come out of the house because husbands go abroad for work. All of the responsibility lies on women's shoulders. Most agricultural activities are done by women."

The increasing prevalence of **community groups promoting women's equality with men** is a strong factor in promoting women's collective and individual agency. Most community groups insist on women's participation. These include farmers' groups which are organised into cooperatives and networks, groups set up by international partners such as World Vision, and others. Some cooperatives are open to men and women, some just to women, and one group is open to men farmers only. Women reported that community groups support their innovatory practice. They have received leadership and financial training. A poor woman wheat farmer explained, "*I received leadership training from the Saving and Credit Cooperative. It transformed my life. I learned how to manage money and conduct financial transactions. It taught me to take decisions and carry them out.*" Women frequently reiterated that the active promotion of equal treatment for women, and gender equality, in these groups is fundamental to building their confidence and willingness to innovate.

Male outmigration, increased women's mobility, women's membership of groups and women's increased visibility in agriculture have increased **inter-personal trust**. All respondents described a tense society a decade ago, with people sticking to themselves. Women recalled that neighbours were suspicious, reserved and rarely helpful. Respondents attributed this to women's low mobility, and in particular to husbands and in-laws refusing permission for women to work outside the home or to participate in training courses. Everyday life was characterised by numerous dos and don'ts, as one woman explained: "*There were lots of restrictions for women. Women never got an opportunity to talk and know each other. Hence, we could not think of trusting each other. We used to hide ourselves within a sari. We used to obey whatever men or husband used to say.*"

According to respondents, improvements in women's confidence has had the iterative effect of increasing men's respect towards women.

Despite women's presence as farmers of improved wheat, the absence of many men, and inclusive strategies by NGOs, women are not targeted as a gender in extension programmes focussed on wheat. Training courses are only offered to men. However, a number of women have taken the initiative and approached **committed individual agricultural officers**—junior technicians and junior technical assistants, the Shree Annapura Seed Production Agriculture Cooperative Organization, and Krishi Samagra Sanshta (an agricultural cooperative) for advice. The women named specific extension agents and a middleman who have helped them. One woman explained how the guidance of two agricultural technicians on how to innovate in wheat led to the "*best part of my life*". Women pro-actively seek information on market trends for wheat varieties from the agriculture office and from individual men farmers.



Further Factors Nurturing Capacity to Innovate

Although the women respondents engage in innovative behaviours, this should not be taken to indicate full managerial *autonomy*. **Consultation** with husbands and extended family members prior to taking a decision remains a normative must, although the degree of consultation varies by marital status, household typology and simply due to changing expectations. Broadly speaking, single women, widows, divorcees, women in nuclear families, and women de facto heads of household—whose husbands are abroad—experience substantial decision-making capacity. “*We have to make all decisions at home and outside.*” This is because “*women are becoming household heads due to the absence of husbands. And now women have become more mobile.*” Another woman said, “*We can go to meetings and training; we don’t have to wait for our husband’s permission.*” In such cases, consultation is more ritual than real. The norm of consultation may be observed but appears hollowed out and formulaic.

Some men in nuclear households who have not migrated also expect more engagement by their wives. Kanchan (aged 43 years, middle class) explained: “*In the beginning, when I came here after marriage, I was young and not used to agricultural work or milking. My husband said, ‘You should learn milking. I am not going to help you every day.’ I realised I must be independent economically and should not depend on anyone, not even my husband. Since then I have learned to do all agricultural work and all the household work. I bought a tractor with a loan for Rs. 350,000 and I have my own property worth Rs. 450,000. Now I make all decisions independently. My husband says, ‘I believe in you and I know that you will not take any wrong decisions’.*” In this case, the woman demonstrates full managerial autonomy despite the everyday presence of her husband.

However, the majority of women agreed that they cannot independently take large decisions, for instance to buy or sell big assets. This is in line with the broader literature on intra-household decision-making processes in Nepal (Malapit et al. 2015; Regmi 2011; Acharya et al. 2010). Women are expected to talk to husbands or extended family members. However, respondents did not portray this as women having to request permission, but rather that husbands and extended family members now expect women to participate in discussions—rather than taking decisions without them as in the past. Respondents repeatedly stated that “*both husband and wife work equally and take decisions based on mutual understanding.*” Young women stated that consultation is now a norm. “*It is not that women can’t do things.*” Respondents further argued that consultation is simply commonsense; For instance, if a woman wants to plant something new, “*she consults. She needs to know who has grown the wheat variety before, and where, and she makes enquiries. She asks her husband about pesticides and when to spray. If a husband wants to try something new, he consults his wife.*”

Of particular interest to our study is the fact that some women innovators in extended families are encouraged to take decisions by their in-laws and in return receive their active support. Our literature review did not reveal any other cases of this. We present the experiences of two middle-income women here (names changed).



Parvati, aged 33 years, said “*When I came here upon marriage most decisions were made by my father and mother-in-law. But when my husband was out of work for 5 years, my in-laws started asking me to do all the essential work and even to take decisions on the farm. Slowly my interest started to increase and with training I was able to do better farming and that is how things improved.*” Kanchan, also 33 years, recalled “*My husband, my brother-in-law, the extension worker, and the village cooperative all encouraged me to do better. My parents-in-law were always positive about what I did. I earned their trust. I shared my ideas with my neighbours and friends and always sought their advice. My extended family used to ask me why I planted rice so thinly. I explained with the new rice technology I had to plant clumps at a distance to get bigger clumps. Later when the rice produced well they believed me and they saw it was easier to weed. In the cooperative all of us wheat farmers did well. Now, I contribute my time and suggestions to all important decisions in the family. Their respect for me has increased because I always try to be successful. People in the neighbourhood respect me and seek my advice.*”

The testimonies of both women indicate how their individual managerial autonomy developed over time as trust accrued. As they experienced increasing autonomy and respect, they felt motivated to improve their practice and to innovate. Kanchan in particular shows how support from various sources had a synergetic effect.

Innovation Journeys

Women and men innovators in wheat were asked to describe their innovation journeys and the characteristics they needed to succeed in this journey. Women argued that both genders require the same characteristics to innovate: a willingness to work hard, experience, profit-orientation, and knowledge about seed and fertiliser. The primary precondition for women being able to innovate, they said, is a feeling of equality between women and men. These sentiments were not fully shared by men respondents. One man observed that women study others and then feel motivated to try out the same innovation, and another added that women have to work hard. However, other men argued that women are responsible for the household, and that “*Women are inactive. All new things have been done by men.*”

When men spoke of the characteristics men need to innovate, they highlighted similar innovator skill sets as those mentioned by women, and added good knowledge of soil structure, irrigation techniques, pesticides, harvesting times, up-to-date information and access to markets. Proper training in technical skills by agricultural technicians is deemed essential. Men require courage to take risks, and to have sufficient financial means. They also said that men had to have sufficient family labour (a production factor never mentioned by women).

Women and men experience very different innovation journeys. Because women are not included in wheat training events run by extension services, they closely observe men’s practice in the field and imitate it. Over time, this led women to start row planting and to apply inorganic fertilisers including potassium, urea, and diammonium phosphate (DAP). Use of rotovators for land preparation (by men or hired labour) has been key, because this makes work easier for women and saves time.



The lack of external support means progress is slow. At the beginning, women experimented with improved wheat varieties, but negative experiences made them anxious about risk. They found that NL, Guara, Royani, Bhrikuti, Bijay and Gautam are prone to disease, whereas Vijay and Gaura are prone to lodging. Many women reverted to traditional varieties, at least for a while. Today, however, nearly all women wheat farmers grow improved varieties because the seeds are treated and have high germination rates. Productivity is high, the varieties are tasty, and women no longer need to spend time selecting seed.

Over time, the primary learning trajectory has become observing and learning from other women innovators. Women share their successes and failures with each other. Based on this, women then experiment with new varieties and techniques on small plots of their own. This involves, they explain, taking risks and a lot of learning. Women listed the type of knowledge they require: where to obtain good seed, the type of soil required, how to prepare the field, the right timing for sowing, weed management, use of compost, zero tillage and improved harvesting technologies. As a direct consequence of institutional exclusion from agricultural training events, however, women's learning and implementation cycle is slow for each innovation. From observing others to implementing on one's own plot takes around 1–2 years.

Men describe their innovation journeys very differently. They have not changed over time. Men have always been able to obtain information on new technologies directly from extension agents and to try them out right away on their fields. Similar to women, men ascribed part of their success in innovation to individual extension workers who actively encourage and support them. They also learn from other men farmers, seed production cooperatives and NGOs, and men claimed ready access to government subsidies through their membership in a men's producer group.

Men explained that they learn much more quickly than women. They try a new technology on a small plot for around 4–5 months before taking preferred technologies to scale. They ascribe their relative speed to learning direct from service providers, learning from other men farmers and their mobility. Male respondents also noted gains in their personal agency over their life-cycle, and this has allowed them to take decisions more quickly and with greater autonomy. Adult middle-class men all agreed that, when they lived with parents, *"I couldn't make decisions on my own. I had no income. Now I have my own income. So I make my decisions by myself."*

However, this picture of autonomous decision-making by adult men is not uniform. Some men actively consult with women. A poor married man, who has lost both parents, explained *"I have two sisters. One is unmarried and the other is divorced. They live together near my house. Most of my decisions are guided by them. I do not do anything without consulting them."* His comment may reflect a more widespread recognition of women as innovators as well as the absence of his parents with whom he formerly consulted.

Constraints to Innovation

Women and men outlined different constraints. Men reasoned that *"traditional attitudes to farming"* are a prime barrier preventing people from opening their minds



to innovation. No women mentioned this as a constraint. Men find row planting for wheat onerous due to labour and time demands. Some men resist taking out loans due to fear of indebtedness. Men added that, because average land size is decreasing, it is becoming increasingly problematic to try out new innovations. Young men reported very low agency. They do not feel empowered because parents take important decisions on their behalf, and they feel they lack sufficient knowledge and ideas to take good decisions. Thus, they did not report innovating at all.

Women listed a range of institutional gender barriers. These include the refusal of formal lenders such as banks to offer women loans, even in cases where land is in women's name. Women thus take small loans from savings and credit groups, and from their cooperatives, such as the Women's Vegetable Cooperative, and they pawn gold jewelry. Since women are not directly targeted by extension services, they lack knowledge on effective weed and pest management, and they find the design of agricultural machinery inappropriate to their needs. The cultural constraint on women preparing land means that, if they do not have access to male labour, or there is a lack of hired labour, they find it difficult to prepare land in time. Managing irrigation is very time-consuming "*because we have to wait for our turn.*" Young women are generally involved in farming alongside their mothers and did not report specific constraints. Women repeatedly noted that they have to do all the household and care work alongside their expanded agricultural roles and that this is very tiring.

Despite the constraints outlined above, women are increasingly recognised as being successful in pulling their households, whether nuclear or extended, out of poverty. A well-being exercise was used as the basis for first categorising households in the community by placing them on different steps now and 10 years ago, and then for explaining the causal factors for movement in and out of poverty. This showed that 4 % (5–7 households) were considered very poor, 74 % (100 households) low income, and 22 % middle income, with no households considered wealthy. Poor households are landless, have little to no formal education, live hand to mouth with no food security and cannot afford health care. Low-income households have at least 0.05 ha land, mud or brick-built homes, earn at least 200 USD per month, live from farming and their skilled labour, have at least 6 months food security, access to health care, and remittances are important to half of these households. Middle-income houses are made of concrete, they have at least 1.6 ha land, are well educated, experience food security all year around, and earn at least 500 USD per month. They obtain health care in towns, and almost all obtain remittances.

The results show that women-managed households are moving much more rapidly out of low income compared with men-managed households. Women explained that, when their husbands or sons who have gone abroad send remittances, they spend this money carefully. They grow off-season vegetables on leased land, are involved in small enterprises, and lease land for wheat. However, many men remaining in the community are not involved in agriculture and rely on off-farm work. This is scarce. Men do not innovate into new areas of work.



Discussion

The hypothesis guiding field research and analysis for this paper is that wheat farming in Nepal is experiencing a shift from feminisation of agricultural labour across most tasks towards women taking control over decision-making. A set of research questions was formulated to establish whether wheat is becoming a women's crop vis á vis the feminisation of labour in wheat. The following provides a reflective discussion of the research findings, addressing the research questions set out in the introduction.

The findings (summarised in Fig. 1) show that women are developing a range of strategies to succeed as wheat farmers and as innovators and that wheat is indeed coming under women's control. This is happening despite lack of formalised and intentional targeting and training by agricultural advisory services. Douthwaite and Gummert (2010) consider that a key issue facing agricultural development is not technological scarcity but rather innovation capacity scarcity. The findings presented here suggest, however, that 'innovation capacity scarcity' may be a fallacious reading of the situation in some locations. Such a perception could arise from an institutional inability to perceive farmer capacity to innovate because innovation processes are being driven by women as much as by men. Lack of perception may in turn arise from the historical focus of research and agricultural advisory service focus on men as farmers and as recipients of technologies. 'Conceptual lock in', a term devised by Farnworth (Farnworth and Colverson 2015; Aryal et al. 2014 for application to India), describes the phenomenon of policy-makers and rural advisory services constructing farmers as male—regardless of the reality of highly visible female farmers on the ground.

The findings are all the more surprising because the study site was selected by GENNOVATE specifically to exemplify and research the effect of high gender gaps upon innovation processes. However, the data show that, within the past decade—due to high levels of male outmigration—women are shifting from being farmers and household members to becoming farm managers and innovators in wheat. Young women see a future in farming, unlike young men. Whilst this is largely due to social norms which discourage young women from leaving the community, this does not necessarily mean that young women see farming as an unpleasant future. Rather, they seem encouraged by the experiences of older women in wheat and are anxious to convey that women 'can do things'.

The findings further suggest that analytic frameworks which focus on establishing the extent of women's personal autonomy in decision-making may fail to recognise the synergetic effects of women's agency in combination with the agency of extended family members in ways which allow women to develop their capacity to innovate. Though the data are limited, extended families clearly confer varied degrees of autonomy in decision-making power to women who have married into the family. This is allowing some women to develop managerial capacity and possibly to become stronger innovators than de facto women heads of household due to the support they receive from their in-laws as well as, presumably, the ability



to deploy larger resources (land, capital, machinery), at least in some cases, than women working on their own. This is a hypothesis worth further investigation.

Furthermore, gender research focussed on establishing degrees of women's autonomy risks an overly strong analytic focus on male–female dichotomies, appears to assume that women and men do not (necessarily) have interests—or values—in common, and they inevitably lead researchers to presume that higher levels of female autonomy in the domains of interest are intrinsically preferable and lead to better outcomes for women and children. However, this framework may be unintentionally disparaging of cultural frameworks which privilege family togetherness and the importance of intra-familial decision-making (Mokomane 2012; Belcher et al. 2011; Acharya et al. 2010). Such cultural frameworks are common across the Indo-Gangetic Plains (IGP), and therefore a singular focus on autonomy as an indicator of empowerment may lead researchers to overlook how women exercise agency in complex multi-dimensional relationships. It may also lead to agricultural interventions which not only fail to facilitate the ability of extended families to adapt to the changed realities created by male outmigration but also—by promoting women's capacity to innovate within a collaborative framework—help promote effective agricultural development. Cornwall and Edwards (2010) argue that seeing empowerment as a process of negotiation—including subtle acts which increase women's room for manoeuvre rather than only the overt exercise of agency—allows an understanding of empowerment to emerge that is less about clear-cut choices that are transformed into actions and outcomes, but as something that is more provisional yet dynamic.

The evidence presented here suggests that strengthened women's agency in nuclear and extended families is important in unlocking productive resources. This inverts Kabeer's hypothesis that resources are a *precondition* for the meaningful exercise of agency (1999). Rather, overtly *stating* that women and men are equal (in families and in community organisations) can motivate women to be innovative and to negotiate better access to resources from this conviction. This chimes with a less prescriptive and more interactive definition of empowerment processes put forward by Bandyopadhyay and Mukherjee (2003, p. 208) that empowerment involves “a personal change in consciousness involving a movement towards control, self-confidence, and the right to make decisions and determine choices.”

The study findings are broadly in line with other studies (Adhikari and Hobbey 2015 and others cited above), though the findings on support for managerial feminism in extended families appears to be new, as is the empirical evidence for women's active innovation in wheat. The analysis further shows that, in the study community, agricultural institutions are failing to recognise the changes in gender relations and the implications for their practice. Men are still targeted, exclusively, for formal training events. Individual extension agents work in a committed fashion with women, but this can only ever be ad hoc and reliant on personal good will and conviction.



Conclusions

The study originally set out to explore an important wheat-growing district known for its high gender gaps and low participation of women in wheat farming. The findings show that the original assessment was incorrect. Not only is wheat farming increasingly feminised with respect to labour, but women are also exerting managerial competencies with the support of their husbands and their extended families. At the same time, women face many constraints stemming from weak institutional recognition of women as wheat farmers. Key actors in rural advisory services remain prey to believing in myths that cast women only as helpers in farming, or as managing the home. This in turn creates difficulties for women attempting to obtain training, finance, and other mechanisms for making their participation in innovation processes easier.

Distinguishing between widely held norms and the reality of what is actually happening is essential. Gender norms remain important because they help to structure expectations of what men and women *should* do, but in myriad ways these norms are being 'hollowed out' and renegotiated in ways which support important local values yet allow the freedoms necessary to move forward and develop capacity to innovate. Understanding, recognising, and building on change processes is essential if innovation processes in wheat are to be supported by researchers, policy-makers, development partners and rural advisory services. Suggestions to break conceptual lock-in for researchers, rural advisory services and development partners are provided below.

Researchers

Given the prevalence of cultural environments characterised by patrilineality, virilocality and patriarchy across the Indo-Gangetic Plains, it would be valuable to further investigate the degree to which extended families are not only cognisant of the implications of absent men for effective agricultural decision-making but are actively dismantling barriers to decision-making which have hitherto marginalised daughters-in-law. Improved data would assist policy-makers and rural advisory services to support processes which enable women to shift from being labourers in feminised farm systems which currently lack an effective replacement for male decision-makers to farming systems attuned to the reality of systems reliant primarily on women's labour and managerial capacity.

Further potential areas of enquiry include: How do women develop formal and informal support innovation networks with other women and other networks? In what ways do women exercise their decision-making power in intra-household discussions with their spouses, and extended family, in order to innovate? How can men, including men decision-makers at community level, be encouraged to support women as innovators? How are gender norms shifting to accommodate women as innovators, and are changes to norms likely to be institutionalised?



Research into intersectionalities between gender, socio-cultural markers of identity (caste, religion, ethnicity), age, economic status, household typology and participation in innovation processes would provide further valuable information.

Agronomic research, preferably cross-cutting with some of the above areas of enquiry, into women's preferred technical innovations is necessary, including with respect to facilitating women's access to and use of labour-saving machinery. Research into gendered tradeoffs between different kinds of innovation is required.

Some work has been conducted into preferred maize traits, but this work is over a decade old (Gurung and Gurung 2002). More research by plant breeders into women-preferred traits in wheat and maize is needed, along with an understanding of how and why trait preferences change, and whether women or men suppress trait preferences under specific conditions.

Rural Advisory Services

It is essential for extension services to recognise women as innovators in wheat and maize and to develop strategies to reach them. This would bring them into alignment with government policy. Women-friendly training events are essential, as is ongoing support. This may require deployment of more women extension staff (with support as necessary) in some locations, and re-orientating men staff to recognise women as wheat farmers.

Few young men see a future in agriculture. Retention of some of the brightest and best is necessary if rural societies are to remain viable institutions. What are the best ways to support young men in agricultural innovation processes? What needs to happen to allow parents and other family members to see an agricultural occupation as viable for some of their sons and to support them in this choice?

Young women are Nepal's future farmers. How can extension services encourage them to innovate, and how can this learning be carried through periods when young women, for example upon marriage, may experience mobility and other constraints? How can parents be encouraged to support their daughters to become active innovators? How can fathers/mothers-in-law in extended families be encouraged to support their daughters-in-law?

Development Partners

Gender equality messages make a difference. Community organisations which walk the talk on gender, for instance by training women in budgeting, planning, public speaking and leadership, help women to feel powerful and able to innovate. Developing gender equality messages to identify and support women as innovators is important, as is work to develop women's self-esteem (Bhattarai and Pant 2013). Men need to be integrally involved in these processes—and as understandings of masculinities change, men may require support as well.

Development partners can help to introduce labour-saving machinery to save women's time in wheat and maize, and in other agricultural tasks. It is equally



important to develop and introduce labour-saving devices to help women manage house and care work.

Household methodologies (HHM) and other gender-transformative approaches support women and men to develop shared visions for their lives, and to work together to overcome gender barriers to innovation (Farnworth et al. 2017). Other gender-transformative approaches include some which recruit women and men as farmer scientists. This helps them to develop their research skills on their own land with their own crops and animals. They are trained to develop hypotheses, set up study conditions, and record and discuss results (Farnworth and Colverson 2015).

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