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Gender role in wheat production and agricultural decision-making

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Abstract Women's participation in agriculture is increasing, but their role in decision-making is still limited. Using a household survey of wheat producers in Haryana, Bihar, and Madhya Pradesh, this paper studies women's involvement in wheat production and compares it to that of men; analyses their role in decision-making; and examines the socio-economic influences on their participation. Overall, the paper concludes that although the share of time spent by women on agricultural activities is increasing, their role in decision-making is still highly dependent on the socio-economic characteristics of the farm household.

Keywords Wheat; women in agriculture; decision-making; agriculture production; India

JEL codes Q10, J16, D81, J43

Worldwide, and especially in developing countries like India, women contribute a major share of farm labour. In India, according to the Census 2011, farmers made up 34% of the rural population and women 10.3%; agricultural labourers constituted 41.4% of the rural population of India and women 17.7% (DES 2013).

Landholdings are increasingly fragmented, and households cannot afford to hire labour, leading to women to work as labour and increasing their participation in agriculture (Satyavathi et al. 2010). Second, male members of the household—most prominently in states like Bihar—migrate from rural to urban areas in search of jobs (Rao 2006). Third, many farm-related activities are now mechanized, and carried out by men; women perform the time-consuming, effort-intensive manual farm activities like cleaning seeds and weeding (Headey, Chiu, and Kadiyala 2012).

Women in poorer households work as labourers on their own farms or on other farms (Khan et al. 2012; Aregu et al. 2011); as the number of small and marginal farmers grows, women's participation in the agricultural workforce will likely increase. As the household income increases, the participation of women in agricultural activities declines. Women's participation in agricultural activities is affected also by the cultural misconceptions that men are stronger than women (Rao 2006) and women should be confined largely to on-farm activities (Tiruneh et al. 2001; Grace 2005). Some studies indicate that mechanization, too, has reduced women's participation in agricultural activities and increased the time they allocate to childcare and household activities (Aregu et al. 2011). Notwithstanding all these, women spend much more time and effort than men in agricultural and household activities together, and it is important they are involved in farm-level decisions, but overall they are not recognized or valued by society or the government (Ibrahim et. al 2012).

What affects women's decision-making? Intra-household dynamics is often assumed to exist in isolation of socioeconomic factors, although that is not the reality (Agarwal 1997); women's participation in decision-making may be influenced by quantitative factors beyond income. Women are often consulted in the decision-making process, and they can influence the decision if they have the appropriate capability

(Aregu et al. 2011), but their capability is limited by poor access to information sources, knowledge of new technology, access to credit, and training (Rao 2006; Chayal et al. 2013).

In developing countries, women perform most of the livestock-rearing activities and make decisions related to the sale of the produce (Aregu et al. 2011; Grace 2005; Khan et al. 2012; Tiruneh et al. 2001). Men make all the important decisions related to cropping, including the cropping pattern, and the use of seeds and technology (Tsegaye et al. 2012). Women do not make decisions, and their role in marketing the produce is limited (Tiruneh et al. 2001; Grace 2005). Men in rich and middle-income households mostly make decisions alone by themselves, but in the poorest households the husband and wife make decisions together (Aregu et al. 2011; Damisa and Yohanna 2007).

This study analyses women's engagement in wheat farming in India at all stages of production and compares it to that of men. The paper also analyses their involvement in decision-making. The study also estimates the role of socio-economic factors that affects her ability to participate in the decision-making process. We chose to study wheat because it is the most important food security crop in the country after rice (DES 2015), and demand is still increasing, and because the literature on women's role in the wheat production system is limited. Climate change threatens the productivity of several crops, including wheat. Several research initiatives aim to improve food security by encouraging farmers to adopt productivity-enhancing technologies and seed varieties that stabilize consumer prices. Women are both producers and consumers in the wheat production process; if the most important stakeholders cannot make decisions or are ignored, we may not be able to increase the production of wheat.

Study area, data, and methodology

The study uses the primary-level household survey data pertaining to 2014–15 rabi (winter) crop of wheat. We surveyed 1,022 households in three states of India—Haryana (335), Bihar (357), and Madhya Pradesh (330). We purposively selected two districts on the basis of high production and area under wheat from each state: Karnal and Hissar (Haryana); Samastipur and Patna (Bihar); and Jabalpur and Sehore (Madhya Pradesh). We used information from secondary sources and interviews with key stakeholders to select two blocks from each district and three villages, randomly, from each block. We conducted a household census in all the selected villages and we randomly selected 25-30 households from each village for the survey.

Most studies of women's participation in agricultural activities and decision-making analyse male-headed or female-headed households, or select male and female farmers randomly (Ibrahim et al. 2012), or study female-headed households only (Tsegaye et al. 2012; Aregu et al. 2011, Chayal et al. 2013). Most households in our study are male-headed, and we study the intra-household participation of women in farming and decision-making using a methodology similar to Begum and Yasmeen (2011) and Mishra et al. (2008). The data used for the study pertains to responses on women's involvement in performing agricultural activities and making wheat farming decisions. We use an ordered probit model—used also by Damisa and Yohanna (2007)—to estimate the impact of socio-economic factors on women's decision-making in the household about farm activities. The dependent variable taken in the model is a dichotomous variable. Assuming a latent variable,

$Y^{\wedge} = X\beta + \varepsilon$, where $\varepsilon \sim N(0, \sigma 2)$

the decision-making by the woman in the household ($D_{i)}$ is

$$D_i = \begin{cases} 0, if\ Y^{\wedge} \le 0 \\ 1, if\ Y^{\wedge} > 0 \end{cases}$$

where ,

$D_i = 1$ if the woman makes the decisions either independently or jointly with the male household head and

$D_i = 0$, if the woman does not make decisions.

The probability of decision-making by women in the household $P(D_i = 1)$ is

$$\left[\frac{-\beta X_i}{\sigma}\right]$$

And the probability of women not taking a decision $P(D_i = 0)$ is

$$1 - \left[\frac{-\beta X_i}{\sigma}\right]$$

Where,

x is the cumulative normal distribution and

X is the explanatory variable.

As the value of the coefficient cannot be directly measured from the equation, the marginal effects of each variable are calculated. The marginal effect of X_i in the model is

$$\frac{\delta D_i}{\delta X_i} = P(D_i = 1 | X, X_i = 1) - P(D_i = 1 | X, X_i = 0).$$

The model uses seven explanatory variables: land size, wealth index, age of household head, education of spouse, household head's occupation, spouse's occupation, and caste. The state is the dummy variable.

Land size in acres (1 acre = 0.405 hectare), or the area that the household cultivates wheat on, represents the household's economic status. Larger the farm, higher the requirement of resources, and greater the participation of women in decision-making (Chayal et al. 2013). Women's participation in agricultural operations is low, and women from large farmer households hire women from marginal and small households as labour (Mishra et al. 2008).

Wealth index We used the data on household assets to compute the wealth index; we weighted each asset using principal component analysis (PCA) (Filmer and Pritchett 2001). The value of a household's wealth index can be positive or negative (Cyrdova 2008); the hypothesis is that if a household has low wealth index value, women will have a greater role in decision-making.

Age of household head in years is a continuous variable. Older males are assumed to be less likely to involve the household's women in the decision-making process. The spouse's age is correlated with the household head's age and so we excluded it from the regression.

Education of the spouse is divided into low (no literacy to fifth grade), medium (sixth grade to tenth grade), and high (eleventh grade onwards). A high level of education enables women's participation in decision-making processes. The household head's education is highly correlated with the spouse's education; we excluded it from our estimation.

Household head's occupation is the dummy variable where if the occupation is farming and related activities = 1 and others = 0, it is assumed that if the primary occupation of the household head is farming, he will be making most of the decisions in the household related to farm activities; thus, women's participation in decision-making will be low.

Spouse occupation is also a dummy variable. If a woman is involved in agriculture as her primary activity, it is expected that she will have a larger role in decision-making related to agricultural activity. With a high level of experience due to working in the fields, women engaged directly in agricultural practices also play an important role in decision-making (Damisa and Yohanna 2007; Khan et al. 2012; Chayal et al. 2013; Ibrahim et al. 2012).

Caste of the household is another dummy variable in the estimation. Women of backward-caste households participate more intensively in agricultural activities and, thus, have more decision-making power. Caste has a high correlation with income; it is likely that lower-caste households will have low income and, thus, high participation of women in agricultural activity and decision-making.

The *state* dummy variables are used to capture the state-wise effect in this paper. The data is analysed for 1,022 households across three states of India (Table 1).

Women's participation in wheat production operations

The various operations under the wheat production system can be classified as plot preparation, seeding, weeding, irrigation, fertilizer application, pesticide application, harvesting, threshing, and transportation. Usually, it is believed that all the operations are carried out by men; and women play a secondary role. The increased level of mechanization reinforced this belief in the society in general (Behera and Behera 2013) and the work done by women is considered to be inferior to that done by men. But the role of women is crucial in wheat production, as they have a specific role in particular activities. Tsegaye et al. (2012), Aregu et al. (2011), and Tiruneh et al. (2001) observe that on-farm activities—like land preparation, tillage operation, seeding, and crop protection measures—are usually done by men, whereas weeding, storage of produce, and value addition of produce is done by women. It is also shown in the study by Mishra et al. (2008), but they also found that in some locations sowing, weeding,

Table 1 Socio-economic characteristics of the households under study

Parameter	Haryana	Bihar	Madhya Pradesh
Total number of households	335	357	330
Percentage of male head of household	89.6	99.4	99.7
Average age of household head (years)	54.6	51.9	47.1
Average age of spouse (years)	49.6	46.1	42.3
Education of household head (in %)			
Low	46.7	36.3	17.0
Medium	23.9	45.1	31.0
High	35.3	33.7	30.1
Education of spouse of household head (in %)			
Low	72.7	24.4	2.6
Medium	62.9	27.6	8.9
High	63.8	25.3	6.7
Percentage of household heads with farming as primary occupation	88.4	82.9	97.0
Percentage of females in the household with farming as an occupation	9.0	19.5	7.4
Average land size in hectares (ha)	3.9	1.0	4.4
Land size- percentage of households			
Marginal (< 1ha)	10.7	69.2	9.7
Small (1-2 ha)	20.3	19.3	24.5
Semi-medium (2-4 ha)	32.2	9.8	26.4
Medium (4-10 ha)	31.0	1.1	29.4
Large (>10 ha)	5.7	0.6	10.0
Percentage of households with tractors	37.0	7.8	45.5

Source Calculated by authors from household survey data

harvesting, and post-harvest handling of the produce are done by women. Chayal et al. (2013) observed increased participation of women in field preparation and harvesting in Rajasthan, India.

Thus, to understand if a similar trend exists for wheat cultivation, the average number of days women spent on each operations of wheat production is calculated and compared with the contribution by men for the same in the study area.

The number of women participants for each activity is different from men; these frequencies are presented in Table 2. The average number of days and percentage share of time spent for each agricultural operation by men and women are analysed and presented in Table 3. The average time spent by the men in Haryana is highest for irrigation followed by fertilizer application and threshing. The men spent 27.0 days on irrigation and 25.3 days on fertilizer application. The women in Haryana spent more time for irrigation and fertilizer application. The share of time spend on irrigation, among other operations, is much higher (42.6%) than fertiliser application (19.2%) by the women in Haryana. The number of days required for irrigation is 14.8 days and for fertilizer application is 6.7 days. For all the other operations the number of days is either more than 1 day or less than 2.6 days.

In Bihar, the number of days required for an operation by men is highest for irrigation, which requires 12.2 days on average and constitutes 20.6% of the total labour contribution—followed by fertiliser application, harvesting, and plot preparation. The women in Bihar mainly contributed to weeding operation, even higher than their counterparts. The share of their labour is 30.8% and consisted of 12.4 days. Apart from this they also participated in harvesting, fertilizer application, and irrigation. The share to total labour by the men in Madhya Pradesh is for irrigation. The total number of days required for irrigation by men is 38.7 days. The share of labour for plot preparation and threshing by men is also higher when compared to others in Madhya

Table 2 Number of households based on the participation of men and women in different agricultural operations

Number of households

States	Haryana (335)		Bihar (357)		Madhya Pradesh (330)	
Agricultural operations	Men	Women	Men	Women	Men	Women
Plot preparation	335	15	356	20	328	8
Seeding	332	70	350	52	316	146
Weeding	9	1	81	11	6	0
Irrigation	330	55	355	18	325	56
Fertilizer	334	53	351	49	253	21
Pesticides	310	40	61	0	2	0
Harvesting	325	52	354	224	223	201
Threshing	41	19	342	124	117	37
Transportation	331	51	306	124	271	33

Note Figures in the parentheses are the total number of households surveyed. Only valid observations in the households are given in the table

Source Calculated by authors from household survey data

Table 3 Average number of days and percent share for each operation by the men and women

Time	Plot preparation	Seeding	Weeding	Irrigation	Fertilizer spay	Pesticides spay	Harvesting	Threshing	Transport-ation	Total
					Haryana					
Men days	7.2	5.3	3.4	27.0	25.0	9.0	6.4	12.6	2.8	98.8
% men days share	7.3	5.4	3.5	27.3	25.3	9.1	6.5	12.8	2.9	100.0
Women days	2.6	2.0	1.0	14.8	6.7	2.3	2.5	1.5	1.3	34.7
% women days share	7.5	5.9	2.9	42.6	19.2	6.6	7.3	4.4	3.8	100.0
					Bihar					
Men days	8.3	3.4	3.9	12.2	9.9	2.1	8.9	5.5	5.1	59.2
% men days share	14.0	5.7	6.7	20.6	16.7	3.5	15.1	9.2	8.6	100.0
Women days	3.5	1.7	12.4	4.6	5.1	-	7.2	2.3	3.5	40.1
% women days share	8.6	4.2	30.8	11.4	12.8	0.0	17.9	5.7	8.7	100.0
					Madhya Pradesh					
Men days	12.1	6.0	1.3	38.7	4.1	2.0	7.1	11.8	5.8	88.8
% men days share	13.6	6.7	1.5	43.6	4.6	2.3	7.9	13.3	6.5	100.0
Women days	1.6	1.9	-	8.5	1.8	-	17.1	1.8	1.1	33.7
% women days share	4.8	5.5	0.0	25.1	5.4	0.0	50.7	5.2	3.2	100.0

Note Per cent (%) share is share of men or women time in total labour days per operation.

'-'data missing.

Source Calculated by authors from household survey data

Pradesh. The main activity for women in Madhya Pradesh is harvesting wheat. It takes 17.1 days on average and its share in the total labour by the women is 50.7%. The participation of women in harvesting is much higher than men's in Madhya Pradesh. They contributed to irrigation also by 25.1% of their total labour days. The number of days required for irrigation by women is 8.5. The number of days the women participated in different operations in Haryana is lesser when compared to Bihar and Madhya Pradesh. However, in all the three states, the participation of women is pronounced in weeding, irrigation, fertilizer application, and harvesting. Also, there are differences in total time spent on the same activity across states, based on the level of mechanization; for example, wheat harvesting in Haryana is more mechanized than

in Bihar and Madhya Pradesh. This is also because the average number of farmers in Haryana have large holdings compared to average land size in Bihar.

Large farms in Haryana have become largely mechanized (Singh 2004); thus, the share of women in threshing and their involvement in harvesting is very low compared to other states. The share of labour by the women in households in Bihar is higher than at other locations. In Bihar, the feminization of agriculture is very high, due to the migration of the male members of the family for non-farm employment and due to the inability of a large number of poor households to afford hired labour (Datta and Mishra 2011; Rao 2006; Headey, Chiu, and Kadiyala 2011). Thus, the involvement of women in plot preparation and seeding is also relatively high in terms of number of days spent per acre. Pesticide application is the only activity where women's involvement is negligible.

Women's role in the decision-making process related to wheat production

In the context of the above analysis, the study tests the hypothesis that since women have a substantial role in agricultural activity, they should also be equally involved in the decision-making process related to agricultural activities. From the literature it is usually said that although women might be active participants in agricultural activity, they might not be playing an important role in decision-making, because of the gender gap—lack of education and low decision-making power (Mehar, Mittal, and Prasad 2016). The migration of men to cities in search of jobs and better livelihoods has left women to work in their fields more prominently than in the past; however, Aregu et al. (2011) show that men are the main decision-makers in crop production as they play a key role in crop production and marketing of produce.

Thus, as the second objective, the role of women in decision-making at the different stages of wheat production is analysed to understand the role of socio-economic factors that impacts women's participation in decision-making. During the survey, the respondents were asked who makes the decision related to several activities as listed in Table 4. They were given three options: male head of the household, the woman (spouse of the male household head), or jointly. There might be bias in the responses, as most of the respondents in the study were men, and the questions on decision-making were asked of them (Garbarino and Strode 2012; Kishor and Gupta 2005). Still, it is believed that these results are indicative of the real situation and not too far away from reality.

Table 4 presents the percentage share of households where women are involved in decision making. It is seen that primarily the decisions related to the technology adoption, marketing of produce, storage of produce, and consumption in all the states under study are mostly taken by men, but many households reported that joint decisions were also taken. Ibrahim et al. (2012) report similar results in their study, and Damisa and Yohanna (2007) also find that the participation of women in decision-making is limited, but their opinion is considered during harvesting, storage, and marketing of the produce.

Table 4 Percentage of household's response on participation of women in decision-making relating to wheat activities

State	Haryana (335)			Bihar (357)			Madhya Pradesh (330)		
Decisions –Who decides?	Men	Women	Joint	Men	Women	Joint	Men	Women	Joint
Which wheat variety to be grown?	37.3	0	62.7	59.4	0.3	40.3	54.1	0.6	45.3
How much area to plant under wheat?	37.3	0	62.7	54.1	0	45.9	54.1	0.6	45.3
What technology is to be used in wheat?	40.6	0	59.4	80.4	0.3	19.3	76.9	0.6	22.5
When to sell the produce?	37.3	0	62.7	50.4	0	49.6	69.6	0.9	29.5
Where to sell the produce?	37.3	0	62.7	50.4	0	49.6	67.2	0.9	31.9
Whom to sell the produce?	36.4	0	63.6	50.1	0.3	49.6	65.7	0.9	33.4
How much to store?	33.7	0	66.3	43.7	3.1	53.2	35.9	4	60.2
How to store?	33.1	0	66.9	44.3	2.8	52.9	36.8	4.3	59.0
How much to put aside for home consumption?	18.2	0.6	81.2	44.5	2.5	52.9	49.4	11	39.6

Source Calculated by authors from household survey data

This trend shows some inter-state disparities. In Haryana, although a large proportion of households have responded that most of the decisions are taken by men alone or jointly by men and women, Bihar and Madhya Pradesh have trends that vary across different activities. For technology adoption- and marketing-related decisions, major decisions are taken by men or jointly. An almost negligible percentage of households reported that women take the decision alone. These households are usually women-headed households where all the men have migrated or they are too young to take decisions. The final decision in the adoption of new technologies is made by men (Mishra et al. 2008).

In both Bihar and Madhya Pradesh, on the issues of storage and consumption, a few households responded that women are the prime decision-makers followed by joint decision making. Women decide, mainly, how much produce to store, how to store the produce, and how much to set aside for consumption. These results are partially contradictory to our hypothesis that if women are involved in the agricultural activity, then their role in decision-making is also large. Although they are involved in joint decision-making, largely the household head makes most decisions linked to agricultural activities.

The participation of women in farming activities depends mainly on the crop grown, type of farming, financial background of the farming household, and level of technology used for production; accordingly, their role in decision-making is determined (Aregu et al. 2011). This is what is investigated further in the next section.

Factors influencing decision-making

To understand what the factors are that influence women's participation in the decision-making process, even if they are not exclusive decision-makers but joint decision-makers, an ordered probit model is estimated. This model estimates the socio-economic factors that might impact the role of women's decision-making in the household. The results are presented in Table 5.

The variable for decision-making by the women in the household is a dichotomous variable which is derived from the questions given in Table 4. If a woman in a household makes decisions either alone or jointly with the head of the household in any one of the activities asked about in Table 4, the value 1 is assigned; if no decision is made, the value assigned is 0. Thus, the model estimates the likelihood of a woman's engagement in the decision-making process in agricultural activities given the household's socio-economic characteristics. This is estimated by the marginal effects calculated for the significant variables of the probit estimations. The predicted percentage correction of the estimated model is 0.70, which means that the model could correctly predict 69% of observations. The model is statistically significant at 1% level (Table 5).

The ordered probit model estimates show that the primary occupation of the head of the household, education level of the spouse, and wealth index are the statistically significant factors that affect the involvement of women in decision-making in the household.

The estimated coefficient of the primary occupation of the head of the household variable is negative and significant. Thus, with increased participation of the head of the household in the primary activity, the probability of women being involved in the decision-making of agricultural activity declines by 0.127. This also implies that in households where men are not directly involved in agricultural activities, women are more likely to be involved in decision-making.

The other significant and positive variable is the education of the spouse of the head of the household (the woman). Low and medium educated women with respect to high educated women are more likely to participate in the decisions related to agriculture. This is an interesting observation. It can also be interpreted that as high educated women participate less in agricultural activities related to production and marketing, their role in decision-making related to agriculture also declines. Khan et al. (2012) found that the years of education of the women in the household had a negative effect on the participation of women in farming activities. Mishra et al. (2008) observed that women educated up to middle school and above spent more time on household activities and collection of fuel and fodder rather than on crop production and livestock care. The coefficient of the wealth index is negative and significant, as expected. Thus, the women in the families that are wealthier play a limited role in decision-making, although the value of the marginal effect is small.

Table 5 Marginal effects in an ordered probit model of the factors affecting the decision making of women in wheat production

Dependent variable: Decision making by women

Independent variables	Coefficients	Standard error	Marginal effects
Land size	0.107	0.068	
Caste	-0.009	0.009	
Age male household head	-0.285	0.200	
Wealth of household	-0.029**	0.013	-0.009
Primary occupation male_ HH head	-0.384**	0.195	-0.127
Women occupation	0.046	0.131	
Women education level			
Low	0.711***	0.196	0.234
Medium	0.409**	0.197	0.135
State Dummies			
Bihar	-0.881***	0.147	-0.291
Madhya Pradesh	-0.632***	0.124	-0.209
Log-likelihood	-492.21		
Restricted log-L (Chi^2)	80.43		
Significance level	0.0000		
Mac Fadden Pseudo R^2	0.0755		
Predicted percentage correction	0.70		
N	847		

Note *** and ** are levels of significance at 1% and 5%. Marginal effects are only presented for significant variables
The number of observations considered in the regression is less when compared to the total sample size due to the unavailability of data for some of the variables considered in the model.
Spouse education high and Haryana are omitted dummy variables due to collinearity

The regional effects are captured through state dummies in the estimations. Both Bihar and Madhya Pradesh show a negative and highly statistically significant marginal effect on the decision-making of women with respect to the third state dummy, Haryana. Thus, the role of women in decision-making in these states is also low as compared to the third dummy state, Haryana.

The other variables like caste, land size, age of head of household, and own primary occupation of women are not found statistically significant in the estimated model. Even though these variables are non-significant, their likely effect on the decision-making variable seems to be of the right sign, as discussed in the hypothesis.

Conclusions

The paper shows that the women labour force contributes substantially to wheat production in all the three states of India presented in this study. Even though women's share in terms of labour has increased, their role in decision making related to major agricultural activities is still constrained by cultural and social barriers and by the gender gap in education, experience, and awareness. The paper found that in the wheat production system, women play specific roles in particular activities—which differ slightly across different states. Women's labour share contribution in terms of the number of days is lowest in Haryana and highest in Bihar. The major activities where women are occupied are seeding and fertilizer application in Bihar and Madhya Pradesh; weeding and irrigation in Haryana and Bihar; and harvesting in all the three states. Women in these states spend even more time than men in activities like irrigation and harvesting.

But the role of women in decision-making is not completely aligned with her role in agricultural activities as labour. While analysing the role of women

in decision-making at the different stages of wheat production, it is found that almost all the decisions related to the technology to be used, marketing of produce, storage of produce, and consumption in all the states under study are mostly made by men alone and sometimes jointly by men and women of the household. An almost negligible percentage of households report that women make the decision alone. The decisions made by the women in these households are mainly on: how much produce to be stored? How to store the produce? And how much to put aside for home consumption?

The socio-economic factors that primarily drive women's engagement in decision-making were estimated using the ordinal probit regression and by calculating its marginal effects. The results show that women have better participation in decision in households where there is low participation of the male head of the household, their own education level is not extremely high, and the households are relatively not wealthy. This also implies that in households that have high women's participation, women also play an important role in decision-making related to agricultural activities.

Overall, the paper concludes that although the share of time spent by women in agricultural activities is increasing, their role in decision-making is still dependent on the socio-economic characteristics of the farm household. This can act as an additional constraint on the wheat crop sector, which is struggling with the threat of climate change. If the labour force involved in the production activity is not involved in the decision-making linked to technology use and seed use, then it is more likely that they will not be adopting the technologies which are better for them to improve productivity.

Women's involvement in decision-making is more an issue of social and cultural barriers, but on the policy front also it is important to develop a framework of gender inclusiveness. Karl (2009) criticized the lack of ability of policy makers to recognize the role of women in agricultural production and food security. Women's role as food producer and in fighting food insecurity needs to be incorporated and recognised as part of the policy planning process. The efforts and strategies to recognize this role can be made by creating institutions of knowledge transfers through the extension system, training, and education and awareness campaigns, and by enabling the implementation of gender-sensitive and -inclusive policies.

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