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Women and Farmland Preservation in Japan: The Impact of Women's Participation in Farmland Management Governance

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Abstract

Women's empowerment is considered vital for successful natural resource management. However, owing to the problem of reverse causality, previous empirical studies have uncovered little evidence that enhancing women's presence in community institutions for natural resource management leads to resource preservation. This study explores the causal impact of women's participation in farmland management governance in Japan on farmland preservation. In 2009, municipal agricultural committees managing farmland in Japan set the goal of having at least two women executive members—the principal decision-making bodies—at the next EC elections. This study uses the timing of the election of executive committee members as an instrumental variable to identify the causal effect of women's participation on farmland preservation. Using panel data on agricultural committees from 2011 to 2015, the results show that agricultural committees with a high proportion of women executive committee members show significantly greater improvements in farmland preservation. However, this beneficial impact of women's participation is likely attributable to the increase in meetings of executive committee members for in-house training—which were held when women with less experience were elected to the committees—rather than to the increased role of women in decision-making.

Keywords: Gender, Farmland preservation, Quasi-natural experiment, Japan
JEL: J16, Q19, Q24

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1. Introduction

The role of women in agriculture has become increasingly important in most countries (De Janvry et al., 2002). Even though women agricultural laborers account for 43% of the world's agricultural labor force (FAO, 2011), women do not demonstrate their skills to the best of their abilities. In developing countries mainly, the gender gap manifests as women's lower access to inputs, resources, and services for agricultural production, and greater vulnerability of land ownership compared to men, owing to a range of institutional- and norm-based constraints (Croppenstedt et al., 2013). Agricultural productivity differences by gender have been reported in developing countries, such as Burkina Faso (Udry et al., 1995; Udry, 1996; Akresh, 2005), Ghana (Goldstein and Udry, 2008), Ethiopia (Tiruneh et al., 2001), and Zambia (Horrell and Krishnan, 2007). If access to and use of productive inputs were taken into account, and women's skills and talents were used more fully, gender differences in agricultural productivity would disappear and productivity would increase (World Bank 2012).

Likewise, there are expectations that women actively participate in management groups for natural resources, such as irrigation, forests, and fisheries (Pandolfelli et al., 2008). A large body of research reports that the gender composition of natural resource management groups determines the success of collective action for the management of natural resources (Westermann et al., 2005; Godquin and Quisumbing, 2008; Pandolfelli et al., 2008). This idea is based on the fact that women

and men differ in the nature and extent of their dependence on and use of natural resources, predicated especially on the gender division of labor and economic endowment (Agarwal, 2009). In addition, men and women tend to play different complementary roles in collective action for natural resource management. For example, women tend to be more cooperative and altruistic than men when dealing with natural resource decisions (Folbre, 1986; Revollo-Fernández et al., 2016). As a result, the presence of women leads to improved group functioning and greater cooperation, solidarity, and conflict resolution, facilitating compliance by other women and thereby reducing surveillance costs (Meinzen-Dick et al., 1997; Westermann et al., 2005; Agarwal 2009).

A large number of researchers have empirically investigated the impact of gender in groups for natural resource management, such as forest management (Agarwal, 2009), water management (Meinzen-Dick and Zwarteveen, 1998; Were et al., 2008), and fishery management (Sultana and Thompson, 2008). However, barring a few exceptions, there is little quantitative research with statistical testing on this topic. In addition, the research implicitly assumes (rather than verifies) that once women are included in decision-making, many benefits will follow in the research field itself (Agarwal, 2009). Therefore, our understanding of a manifestly simple question about the relationship between gender composition and natural resource management is limited. This is caused by the endogenous nature of women's participation in groups for natural resource management. For instance, endogeneity makes it difficult to identify if women with high ability improve natural

resource management through their actions and knowledge, or if groups with better management of natural resources adopt women with high ability. In general, this endogeneity problem makes it difficult to identify which characteristics of groups for natural resource management and of group members affect natural resource management. The endogeneity problem renders us unable to show whether there would be an impact from women's participation and if so, whether it would be positive or negative. The causal effect of gender composition on natural resource management can be resolved with clear empirical evidence that is not confounded by endogeneity.

In this study, we explore the causal impact of women's participation in the executive committees (ECs)—the principal decision-making bodies—of agricultural committees (ACs). The latter are institutions at the municipal level for promoting local agriculture and managing farmland in Japan for farmland preservation and transactions. In order to identify the effect of gender composition, we exploit a quasi-natural experiment in gender composition created by exogenous change to EC members.

This study selects Japan as the focus for natural resource management groups, because even though it is a developed country, its society has apparent gender differences between men and women. Since the Basic Act for Gender Equal Society was implemented in 1999, various efforts have been undertaken toward realizing genuine equality between men and women. The Japanese

government set a goal that, by 2020, the proportion of women in leadership positions in all sectors of society should be at least 30%. However, Japan has made slow progress toward meeting this goal, and is ranked 111 out of 144 countries according to a gender gap index (World Economic Forum, 2016). Agriculture is no exception with regard to gender difference between men and women. Women constitute approximately 40% of Japan's agricultural labor force. However, the participation of women in farm management and management groups for natural resources has not progressed. The participation of women in agriculture has continued to be a major agricultural policy issue. Japan's experience of gender differences provides meaningful insights for resolving such differences in developing countries.

The rest of this paper proceeds as follows. Section 2 describes the gender composition of ACs. Section 3 presents the identification strategy. Section 4 describes the data. Section 5 investigates the impact of women's participation as EC members on farmland preservation and transactions. Section 6 concludes.

2. ACs and gender composition

ACs, which provide the context for this study, were established in 1951 as administrative committees to protect the achievement of land reform implemented from 1947 to 1949, after

enforcing the Act on Agricultural Committee in 1951. In principle, one AC is present in each municipality. However, municipalities with significant amounts of farmland can establish more than one AC. Conversely, municipalities with no farmland cannot establish ACs, while it is optional for a municipality with farmland of less than 200 ha to establish an AC. There were 1,708 ACs with 35,618 EC members in 1,698 of Japan's 1,741 municipalities in 2015. An AC has two goals: (1) to grant permission for farmland transactions among farmers and (2) to promote the efficient use of farmland. First, ACs have the authority to grant licenses or approve the purchase, sale, and rental of farmland. If farmers buy or rent farmland in Japan, it is necessary to obtain permission from the relevant AC. The AC decides whether to grant permission by investigating whether the farmland is efficiently utilized by farmers, with higher agricultural productivity or with a desirable efficiency purpose. Second, in terms of promoting the efficient use of farmland, ACs have undertaken additional work to concentrating farmland among *core farmers*, each of whom is defined as "already or aiming to be an efficient and stable farm and are expected to lead the agricultural sector" (Arimoto, 2011), in line with a revision to Act on Agricultural Committee in 2004. ACs act as intermediaries between core farmers and farmland lenders. Moreover, in order to eliminate the growth of unused farmland, ACs' main work since 2009 has been investigating the utilization conditions for farmland and administrative guidance, as well as recommendations regarding

landowners of unused farmland. Currently, ACs place importance on promoting the efficient use of farmland (i.e., concentrating farmland and eliminating unused farmland).

An AC consists of an EC as the core decision-making body. EC members comprise elected as well as recommended committee members, both of whose terms are three years. The elected committee is voted for by farmers, and the recommended committee is appointed by the mayor of the municipality from among candidates recommended by agricultural organizations (agricultural cooperatives, agricultural mutual benefit associations, and land improvement districts) and the municipal council. In the process of electing committees, candidates are selected in advance in most districts. Therefore, in most cases, the number of candidates is the same as the number of elected committees in the district. As a result, elections for elected committees are not conducted in most districts.

On average, in October 2014, ACs had 21 EC members (five members of recommended committees and 16 members of elected committees). At least one woman EC was present on 69% of ACs, while 7.3% of EC members were women, 2% of elected committees comprised women, and 23% of recommended committees comprised women. Women members of ECs are elected mainly in recommended committees. Even though women constitute approximately 40% of the agricultural labor force, their participation in ECs has not progressed. The causes of the imbalance of gender

composition lie in prejudice against women, cultural norms, and women's passive attitudes caused by lack of knowledge about agriculture (Fujimoto, 2009).

3. Method

3.1 Identification strategy

In this study, we present new evidence on the relationship between gender composition and farmland preservation and transactions by exploiting a quasi-natural experiment in the EC structure created by exogenous change of EC members. There are two econometric concerns about the endogeneity of gender composition, which is our explanatory variable of interest. The first concern is omitted variable bias, in which unobservable factors, such as culture or norms, affect gender composition and farmland preservation and transactions. For example, if an AC with a positive gender attitude has a more conservative mindset about farmland, it results in a positive relationship between the participation of women in ECs and farmland preservation. Culture or norms thus explain both the high proportion of women EC members and farmland preservation. The second concern is reverse causality, by which—instead of women EC members improving farmland preservation or transactions of farmland—ACs with better management of farmland positively adopt women EC members with a more conservative mindset about farmland. Thus, endogenous AC

decisions confound the observed relationship between participation of women in ECs and farmland preservation or transactions.

To address this endogeneity, we use an instrumental variable approach similar to that of Levitt (1997), who explores the effect of police on crime. However, high crime rates might be attributed to the presence of police. Levitt (1997) uses the timing of mayoral and gubernatorial elections as an instrumental variable to identify the causal effect of police on crime. We follow his approach and use the variation of timing of election of EC members across ACs as an instrument to capture the exogenous variation in changes in the proportion of women EC members over time. Specifically, we make good use of the AC policy change in relation to the participation of women EC members. In May 2010, at a nationwide conference of all ACs, a common goal was set for an AC with less than one women EC member to increase women representation to at least two women EC members after the EC election in 2011. Figure 1 shows the time series of this dramatic transformation in the gender composition of EC members. After this goal was set in 2010, more women were elected as EC members and there was a rising trend after 2011. The timing of election of EC members in ACs is fixed every three years. Although 70% of elections were concentrated in July 2011, the timing of elections varied among ACs (Figure 2). The AC law was implemented in March 1951, and the first AC elections were conducted in July 1951. Currently, 30% of ACs hold elections in months other than July, because of extended terms of EC members resulting from

municipal mergers. Thus, the rate of women EC members in ACs increased only in election years. The fixed timing of elections is unrelated to farmland preservation or transactions. Moreover, if elections are to serve as valid instruments, then they must be uncorrelated with farmland preservation or transactions of farmland, except through variables that are included in the equation explaining farmland preservation. At the aforementioned AC conference in 2010, a common goal was set for ACs to have at least 30% *core farmers* who are EC members after the 2011 EC elections. Therefore, elections might affect farmland preservation or transactions through electoral cycles by increasing core farmers other than via the change in women EC members. Consequently, by controlling for the rate of core farmers in the equation, it seems plausible that election timing will be unrelated to farmland preservation or transactions.

To identify the effect of the gender composition on farmland preservation and transactions of farmland, we estimate the following equation:

$$Y_{i,t} = \alpha + \beta W_{i,t} + \gamma \mathrm{X}_{it} + \theta_i + \tau_t + \varepsilon_{i,t} \qquad (1)$$

where i indexes AC and t indexes time; $Y_{i,t}$ is an outcome representing farmland preservation or transactions of farmland; $W_{i,t}$is the percentage of women EC members of AC i in year t; X_{it} is observed AC characteristics, including the percentage of core farmers who are EC members of the AC and other controls that are not constant over time that might affect farmland preservation; θ_i

are AC fixed effects; and τ_t are time fixed effects for 2011 to 2015. The AC fixed effects control for any observed or unobserved AC characteristics that are constant over time and that might affect farmland preservation and transactions. The year effects control for any common aggregate factors, such as agricultural policy, which might affect the outcome. To instrument for the percentage of women EC members, we use an indicator variable with a value of one in *after election* years and zero otherwise.

3.2 Timing of elections and participation of women as EC members

We demonstrate a positive relationship between change in the number of women EC members and the timing of elections since 2010. As a result of the Basic Act for Gender Equal Society in 1999, ACs have tended to appoint women EC members, whose numbers have been increasing slowly, as Figure 1 shows. It is possible that an AC did not increase women EC members in this timeframe. However, Figure 1 shows a different percentage change of women EC members from 2010 to 2011, during which time about 70% of ACs had elections, compared to that from 2004 to 2005 and from 2007 to 2008, during which time about 70% of ACs had elections.

4. Data and variables

4.1 Data

Data are from the *Agricultural Committee Card*. The data contain information of the AC level from 2011 to 2015 on indicators of the structure of EC members, farmland preservation, and concentration of farmland among core farmers. In regards to the study's analytical methods, these data are the most detailed and comprehensive.

We choose the sample for the analysis as follows. First, following Takahashi (2012), we exclude ACs in five out of 47 prefectures. We exclude ACs in Hokkaido and Okinawa due to differences in climatic conditions, and in Tokyo, Kanagawa, and Osaka due to the strong effect of urbanization in these areas. Second, we select ACs that are the sole AC in their municipalities. In principle, one AC is present in municipalities. However, as exceptions, municipalities with remarkable larger farmland can establish a few ACs. Conversely, municipalities with no farmland cannot establish an AC, and a municipality with farmland of less than 200 ha can choose whether to establish an AC. Therefore, the process of establishing these special ACs is different from the case of only one AC in a municipality, in that the municipality judges whether to establish special ACs. As these judgements by municipality were not captured owing to data limitations and the study's analytical methods, we exclude them from the sample. Third, because a common goal was set that

ACs with less than one woman EC member aim to have at least two women EC members after the EC elections in 2011, we select ACs with less than one woman EC member to assess whether the common goal affected the EC membership structure. These procedures yielded a comprehensive panel data set for academic research on ACs. The sample consists of 3.119 AC-year observations over 2011 to 2015 for 659 ACs. In fact, the number of ACs varies from 659 in 2011 to 553 in 2015, as ACs might merge and the Agricultural Committee Card has insufficient data to analyze errors, such as mistakes in information filled out.

4.2 Definition and summary statistics of the variables

Table 1 shows the definitions and cross-sectional mean values of AC and EC member characteristics from 2011 to 2015. Panel A shows EC member characteristics, including an indicator for gender composition, while Panel B shows AC characteristics, including an indicator for the impact on gender composition.

Panel A of Table 1 shows that the average EC size is about 21 members (about 15 members of elected committees, and about six members of recommended committees). The relatively constant size of EC members suggests that ACs replaced, rather than added, EC members to comply with the common goal of all ACs. As shown in Figure 1, the percentage of women EC

members increases from 1.61% to 5.68% for our sample firms. In particular, the increase of the percentage of women elected as committee members (from 4.12% to 16.47%) is higher than that for women recommended as committee members (from 0.71% to 1.69%). As the indicator of gender composition for an AC, we use the percentage of women EC members of the AC.

In Panel B of Table 1, we report the indicator of the impact of gender composition (percentage of women EC members). ACs have two main goals in promoting the efficient use of farmland: concentrating farmland among *core farmers* and eliminating unused farmland. In terms of promoting efficient use of farmland, we focus on the percentage of unused farmland as an indicator of eliminating unused farmland, and on the percentage of accumulated farmland of core farmers as an indicator of concentrating farmland among core farmers. Panel B shows that the percentage of unused farmland declines over time, and the percentage of accumulated farmland follows a hump-shaped pattern, peaking in 2014.

Furthermore, we focus on three indicators to examine how the change of gender composition impacts AC characteristics, especially to identify the changes to AC characteristics that might lead to changes to the AC goal of promoting the efficient use of farmland. As the outcome, we add three variables (AC cooperative members, farmland consultation members, and meetings for EC members). The first variable, cooperative members appointed by ACs, offer information about

farmland in the district in which AC cooperative members reside. The second variable, farmland consultation members, provides advice about farmland transactions, farm management, and unused farmland for EC members. The role of these consultation members is to support the activity of EC members. The third variable, meetings for EC members, refers to in-house training, by which the members improve their knowledge, for example, on the role of ACs and institutions for farmland. In our analysis, we use these three variables to investigate how gender composition affects other aspects of AC activities. Other controls include the number of clerical staffs and branch offices.

5. Results

5.1 Impact of gender composition on farmland preservation and transactions

Panel B of Table 2 presents the first-stage regression results, which show the time-series average changes in women EC members. As expected in Figure 1, ACs are more likely to increase the number of women EC members after elections, and a large F-statistic indicates strong explanatory power (Stock et al., 2002). The point estimates imply that the percentage of women EC members increases by about 1.5% after elections. In addition, as a result of a test of over-identifying restrictions, we cannot reject the null hypothesis that our instruments are valid.

Panel A of Table 2 presents the results of instrumental variable estimates of the effect of gender composition. The coefficient on the percentage of women EC members in columns (1) to (3) is negative and significant at the 10% test level, showing weak evidence of the effect on eliminating unused farmland. The point estimate implies that a 1% increase in the percentage of women EC members leads to a decline in unused farmland of 0.34%, compared to unused farmland of 4.28% on average across all ACs and years. This is not a small effect on farmland preservation. The coefficient of the percentage of women EC members in columns (4) to (6) is negative but insignificant, showing no relationship between gender composition and farmland accumulation. The participation of women in ACs has been considered to negatively affect the work of ACs, stemming from the prejudice that women's knowledge and skills related to farmland transactions, including regulations, institutions, and negotiations, is inferior to that of men. Therefore, this result of no causal relationship between gender composition and transaction of farmland supports the call for ACs to have more women EC members in the future.

We next attempt to identify the changes to AC characteristics that might lead to improvement of farmland preservation, to better understand the causes of eliminating unused farmland area by the participation of women EC members. We use the same instrumental variable approach to provide causal evidence of how gender composition impacts the characteristics of an AC (the AC's structure and in-house training). Although we consider the differences in characteristics of

new versus existing EC member among women and men, without a sample of all EC members with individual characteristics, such as age, education, and agricultural experience, we cannot examine the effect of personal characteristics of EC members on farmland preservation. Therefore, we argue that AC characteristics are likely to affect farmland preservation and transactions directly. We then consider the effect of gender composition policy changes on changes in an AC's structure and in-house training. In addition to EC members, ACs have cooperative members and farmland consultation members that support the activities of EC members. In addition, as meetings for EC members indicate that in-house training has been held, EC members improve their knowledge of, for example, the role of ACs and institutions in farmland transactions.

In panel A of Table 3, we run instrumental variable regressions of the effect of participation by women EC members on the number of AC cooperative members, the number of farmland consultation members, and the number of meetings. In columns (4), (8), and (12) of Table 3, we use an exponential mean model, since the dependent variable is a count variable. The coefficient on the percentage of women EC members in columns (1) to (8) is insignificant. The number of AC cooperative members and the number of farmland consultation members are unaffected. The coefficient of the percentage of women EC members in columns (9) to (12) is positive and significant at the 5% test level, showing that participation by women EC members lead to an increase in meetings of EC members. The estimates imply that a 10% increase in women members

on an EC leads to nearly double the meetings. This shows that ACs do not have more AC cooperative members and farmland consultation members to cope with an increasing number of less experienced women EC members. Alternatively, ACs would foster women EC members by in-house training. Women EC members are eager to hold meetings to compensate for their lesser farmland governance ability, due to women's great honesty (Dollar et al., 2001) and pressure from prejudice that women's farmland governance ability is inferior to that of men. The main role of the meetings is to improve members' knowledge of, for example, the role of ACs and institutions for farmland; an increase in meetings might alter the result of farmland preservation from AC activities. In particular, eliminating unused farmland has been the main goal since the AC law amendment in 2009. ACs are responsible for investigating the condition of all unused farmland and for providing administrative guidance, advice, and recommendations. Therefore, in-house training meetings mainly focus on eliminating unused farmland. In addition, meetings would be held for not only these newly elected women, but also for existing EC members. As a result, an increase in meetings might alter the positive result of farmland preservation by enhancing women and men's farmland governance ability.

In summary, the results of our analyses provide evidence that participation of women EC members leads to an increase in the number of meetings and the elimination of unused farmland. This beneficial impact of women's participation is likely attributable not to the raising the role of

women in decision-making, but to an increase in training sessions for all EC members, which were held after the election of women as new EC members. However, it is noteworthy that we cannot directly test for a causal relationship between an increase in the number of meetings and eliminating unused farmland area. The exogenous shock used in this study is based on the timing of elections and policy changes, with AC choices being endogenous. Although we would like to examine the effect of meetings on eliminating unused farmland directly, this test cannot provide a causal relationship, and the interpretation of the relationship between gender composition and unused farmland would be unclear. Therefore, we rely on the direct test of the effect of gender composition on farmland preservation and transaction of farmland to illustrate how a gender composition change, caused by policy change, leads to AC characteristics that might result in a change of farmland preservation and transactions.

5.2 Robustness checks

To better understand the elimination of unused farmland area caused by increasing numbers of meetings, we test whether there is a different effect on eliminating unused farmland and the number of meetings from an increase in elected or recommended committee members. EC members are elected to either recommended or elected committees. In the general process of

elections, after the members serve in the recommended committees for a few terms, they are voted onto the elected committees of districts. Compared to recommended committee members, elected committee members have longer experience on the EC. Therefore, to test for the possibility of different effects by years of experience of committees, using the exogenous nature of our setting, we examine the impact of an increase in women in elected or recommended committees on the elimination of unused farmland and the number of meetings.

Panel A of Table 4 shows the results of instrumental variable estimates of the effect of gender composition. Columns (1) to (3) show the effect of women in elected committees on unused farmland area. The coefficient of the percentage of women in elected committees is negative but insignificant. The coefficient of the percentage of women in recommended committees in columns (4) to (6) is negative and significant at the 10% test level, showing weak evidence of the effect on eliminating unused farmland. In panel A of Table 5, we run instrumental variable regressions of the effect of elected or recommended committee members on the number of meetings. In columns (4) and (8) of Table 5, we use an exponential mean model, since the dependent variable is a count variable. The coefficient of the percentage of women on elected committees in columns (1) to (4) is insignificant. The number of meetings is unaffected. The coefficient of the percentage of women in recommended committees in columns (5) to (8) is positive and significant at the 5% test level,

showing that participation by women in recommended committees leads to an increase in meetings for EC members.

In summary, we find that women in recommended rather than in elected committees affect farmland preservation. We observe an increase in meetings and elimination of unused farmland in the case of an increase in less experienced women EC members (recommended committees) rather than in relative experienced women EC members (elected committees). When less experienced women EC members were elected as EC members, meetings would be held for less experienced women as well as for existing EC members, but not vice versa. As a result, the increase in the number of meetings might have altered the result of farmland preservation by AC activity. We do not find evidence of gender differences in farmland management governance. Women EC members do not perform better or worse than men EC members, once the initial disadvantage of less experienced women EC members recedes.

6. Conclusion

In this study, we explore the causal impact of women's participation in ECs, the principal decision-making bodies of ACs, which are institutions for promoting local agriculture and managing farmland in Japan for farmland preservation and transactions. Using a quasi-natural experiment in

EC group composition created by exogenous change to ECs, we find that a 1% increase in the proportion of women EC members leads to a decline in unused farmland of 0.34%, compared to the mean of 4.28% across all ACs and years. Next, we show that women's participation causes the characteristics of the AC to change as a result of the exogenous change to EC members. Using the exogenous nature of our setting, the participation of women EC members led to an increase in the number of meetings for eliminating unused farmland.

Our findings show that the presence of women EC members affect elimination of unused farmland, but do not show that women EC members are more effective than men are, while there is a positive effect of inducing training of women EC members into governance. This beneficial impact of women's participation is likely attributable not to raising the role of women in decision-making, but to an increase in training sessions for all EC members, which were held when women with less EC experience were voted in. However, we are careful to note that our setting does not allow us to identify the causal effect of meetings on farmland preservation separately.

This study extends prior research on the gender composition of natural resource management and provides the first evidence on the causal impact of gender composition on natural resource management, focusing on Japan's ACs. We study how women EC members affect farmland preservation and transactions. Prior research investigating gender within natural resource

management could provide clues as to how women will affect natural resource conditions in future. Research on the mechanism of the relationship between gender and natural resource management is an important avenue for future research.

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Table 1 Summary statistics of variables by year

Variable	Definition	2010	2011	2012	2013	2014	2015
Panel A. EC member characteristics							
Number of EC members	Total number of EC members	21.53	21.42	21.27	21.20	21.20	21.29
Number of elected committee members	Total number of elected committee members	16.20	16.04	15.91	15.85	15.84	15.85
Number of recommended committee members	Total number of recommended committee members	5.34	5.38	5.36	5.34	5.36	5.44
Percentage of women EC members	Women EC member/EC members	1.61	3.27	3.57	3.99	4.51	5.68
Percentage of women elected committee members	Women elected committees/elected committee members	0.71	1.22	1.25	1.32	1.41	1.69
Percentage of women recommended committee members	Women recommended committees/recommended committee members	4.12	9.00	10.17	11.50	13.04	16.47
Percentage of core farmers' EC members	Core farmers' EC members/EC members	n.a.	25.69	25.94	25.86	26.20	26.93
Panel B. AC characteristics (outcome)							
Percentage of unused farmland	Unused farmland/farmland	n.a.	4.58	4.53	4.20	4.17	3.84
Percentage of accumulated farmland	Accumulated farmland/farmland	n.a.	15.01	16.33	16.95	18.22	17.35
AC cooperative member	Number of AC cooperative members	n.a.	7.53	5.49	6.26	6.39	6.42
Famland consultation member	Number of farmland consultation members	n.a.	0.21	0.23	0.24	0.25	0.33
Meeting	Number of meetings for EC members	n.a.	1.95	1.23	1.43	1.53	1.64
Panel C. Election of EC members (instumental variables)							
First election	Dummy, 1 if AC had its first election since 2011, 0 otherwise	n.a.	0.63	0.71	0.94	1.00	1.00
Second election	Dummy, 1 if AC had its second election since 2011, 0 otherwise	n.a.	0.00	0.00	0.00	0.02	0.71

Table 2
The impact of gender composition on farmland conservation and farmland transactions

	Percentage of unused farmland			Percentage of accumulated farmland		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Instrumental variable regressions						
Percentage of women EC members	-0.340 *	-0.344 *	-0.331 *	-0.002	-0.009	-0.016
	(0.200)	(0.203)	(0.197)	(0.340)	(0.343)	(0.337)
Percentage of core farmers who are EC members	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	No	No	Yes	No	No	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
AC fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Panel B. First-stage regressions: dependent variable = percentage of women EC members						
First election	1.518 ***	1.493 ***	1.507 ***	1.518 ***	1.493 ***	1.507 ***
	(0.243)	(0.238)	(0.235)	(0.243)	(0.238)	(0.235)
Second election	1.535 ***	1.525 ***	1.532 ***	1.535 ***	1.525 ***	1.532 ***
	(0.304)	(0.317)	(0.317)	(0.304)	(0.317)	(0.317)
Percentage of core farmers who are EC members	No	Yes	Yes	No	Yes	Yes
Other controls	No	No	Yes	No	No	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
AC fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
F-statistic	43.50 ***	40.42 ***	41.82 ***	43.50 ***	40.42 ***	41.82 ***
Hansen J statistic	1.116	1.192	1.078	0.050	0.052	1.078
Observations	3,114	3,114	3,114	3,114	3,114	3,114

Notes: * Significant at 10%; *** 1%. Standard errors are clustered by AC and prefectures are reported in parentheses.

Table 3
The impact of gender composition on AC characteristics

	AC cooperative member				Farmland consultation member				Meeting			
	2SLS	2SLS	2SLS	Exponential mean model (control function)	2SLS	2SLS	2SLS	Exponential mean model (control function)	2SLS	2SLS	2SLS	Exponential mean model (control function)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panel A. Instrumental variable regressions												
Percentage of women EC members	0.198	0.189	0.183	0.014	-0.076	-0.082	-0.081	0.685	0.095 **	0.096 **	0.092 **	0.124 *
	(0.257)	(0.259)	(0.258)	(0.278)	(0.053)	(0.059)	(0.058)	(0.532)	(0.042)	(0.042)	(0.039)	(0.069)
Percentage of core farmers who are EC members	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Other controls	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AC fixed effects	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Panel B. First-stage regressions: dependent variable = percentage of women EC members												
First election	1.518 ***	1.493 ***	1.507 ***	1.499 ***	1.518 ***	1.493 ***	1.507 ***	1.499 ***	1.518 ***	1.493 ***	1.507 ***	1.499 ***
	(0.243)	(0.238)	(0.235)	(0.361)	(0.243)	(0.238)	(0.235)	(0.361)	(0.243)	(0.238)	(0.235)	(0.361)
Second election	1.535 ***	1.525 ***	1.532 ***	1.080 **	1.535 ***	1.525 ***	1.532 ***	1.080 **	1.535 ***	1.525 ***	1.532 ***	1.080 **
	(0.304)	(0.317)	(0.317)	(0.503)	(0.304)	(0.317)	(0.317)	(0.503)	(0.304)	(0.317)	(0.317)	(0.503)
Percentage of core farmers who are EC members	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Other controls	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AC fixed effects	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No
F-statistic	43.50 ***	40.42 ***	41.82 ***		43.50 ***	40.42 ***	41.82 ***		43.50 ***	40.42 ***	41.82 ***	
Hansen J statistic	0.079	0.086	0.096		0.371	0.381	0.398		2.068	2.107	2.183	
Observations	3,114	3,114	3,114	3,114	3,114	3,114	3,114	3,114	3,114	3,114	3,114	3,114

Notes: ∗ Significant at 10%; ∗∗ 5%; ∗∗∗ 1%. Standard errors are clustered by AC and prefectures are reported in parentheses.

Table 4
The impact of women in elected (or recommended) committees on unused farmland

Dependent Variable: Percentage of unused farmland	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Instrumental variable regressions						
Percentage of women in elected committees	-0.531	-0.518	-0.511			
	(0.483)	(0.482)	(0.476)			
Percentage of women in recommended committees				-0.120 *	-0.121 *	-0.116 *
				(0.069)	(0.070)	(0.069)
Percentage of core farmers who are EC members	No	Yes	Yes	No	Yes	Yes
Other controls	No	No	Yes	No	No	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
AC fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Panel B. First-stage regressions: dependent variable = women in elected (or recommended) committees						
First election	0.312	0.304	0.312	5.218 ***	5.182 ***	5.215 ***
	(0.226)	(0.206)	(0.204)	(0.690)	(0.722)	(0.721)
Second election	0.674 ***	0.672 ***	0.674 ***	3.789 ***	3.784 ***	3.807 ***
	(0.155)	(0.156)	(0.155)	(1.154)	(1.178)	(1.192)
Percentage of core farmers who are EC members	No	Yes	Yes	No	Yes	Yes
Other controls	No	No	Yes	No	No	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
AC fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
F -statistic	13.39 ***	13.47 ***	13.37 ***	28.73 ***	26.00 ***	26.29 ***
Hansen J statistic	1.630	1.718	1.611	0.565	0.587	0.525
Observations	3,114	3,114	3,114	3,114	3,114	3,114

Notes: * Significant at 10%; *** 1%. Standard errors are clustered by AC and prefectures are reported in parentheses.

Table 5
The impact of women in elected (or recommended) committees on number of meetings

Dependent Variable: number of meetings	2SLS	2SLS	2SLS	Exponential mean model (control function)	2SLS	2SLS	2SLS	Exponential mean model (control function)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(4)
Panel A. Instrumental variable regressions								
Percentage of women in elected committees	0.114	0.110	0.106	0.325				
	(0.110)	(0.109)	(0.108)	(0.262)				
Percentage of women in recommended committees					0.034 ***	0.035 ***	0.033 ***	0.039 *
					(0.013)	(0.013)	(0.012)	(0.021)
Percentage of core farmers who are EC members	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Other controls	No	No	Yes	Yes	No	No	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AC fixed effects	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Panel B. First-stage regressions: dependent variable = women in elected (or recommended) committees								
First election	0.312	0.304	0.312	0.434	5.218 ***	5.182 ***	5.215 ***	4.713 ***
	(0.226)	(0.206)	(0.204)	(0.299)	(0.690)	(0.722)	(0.721)	(1.087)
Second election	0.674 ***	0.672 ***	0.674 ***	0.502	3.789 ***	3.784 ***	3.807 ***	2.601
	(0.155)	(0.156)	(0.155)	(0.360)	(1.154)	(1.178)	(1.192)	(1.588)
Percentage of core farmers who are EC members	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Other controls	No	No	Yes	Yes	No	No	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AC fixed effects	Yes	Yes	Yes	No	Yes	Yes	Yes	No
F -statistic	13.39 ***	13.47 ***	13.37 ***		28.73 ***	26.00 ***	26.29 ***	
Hansen J statistic	2.265	2.376	2.463		1.290	1.287	1.299	
Observations	3,114	3,114	3,114	3,114	3,114	3,114	3,114	3,114

Notes: * Significant at 10%; *** 1%. Standard errors are clustered by AC and prefectures are reported in parentheses.

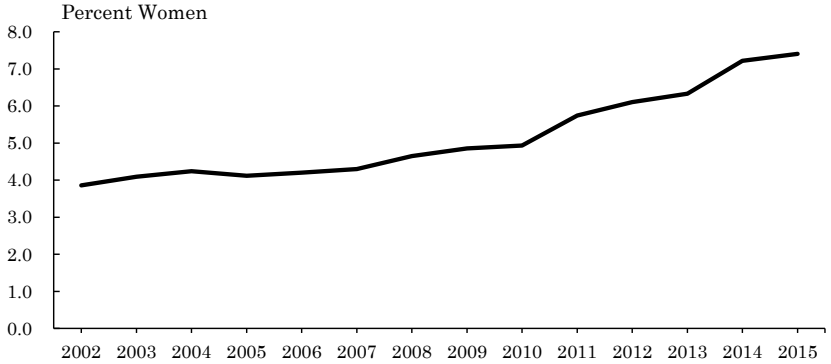

Fig. 1. Percentage of women EC members in ACs

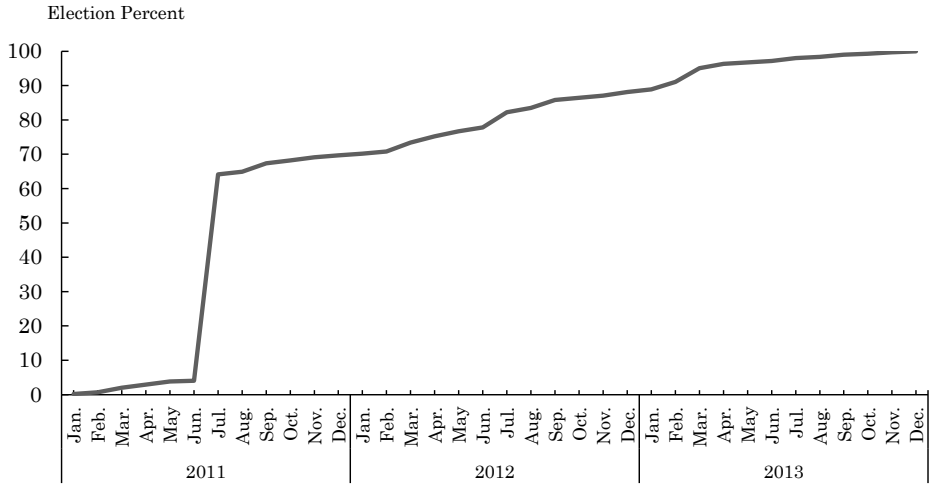

Fig. 2. Percentage of elections held by ACs by month