FEMALE LEADERSHIP AND FORESTATION FOR RURAL DEVELOPMENT: THREE ESSAYS IN DEVELOPMENT ECONOMICS

By

Min Young Seo

THESIS

Submitted to
KDI School of Public Policy and Management
in partial fulfillment of the requirements
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Role Model Effects of Female Leadership Training on Girls' Education

1.1. Introduction

The social status of Korean women was relatively lower than that of men before the 1970s when Korea experienced rapid economic development, and the disparity in the social perception between men and women still exists today. It was regarded as a virtue for young women to stay at home and support their family, and girls were taught to be rather passive as expressed in the frequently quoted proverb, "It goes ill with the house where the hen sings and the cock is silent". As such, women were easily excluded from the decision making process both at home and in the society.

The Korean government promoted a community-driven development project in the 1970s which was a nation-wide rural development campaign called the Saemaul Undong (SMU hereafter). The SMU was initiated to reduce the disparity in income between urban and rural areas caused by industrialization in Korea and to improve the living environment of rural areas. In early 1970, under the name of the SMU project, the government provided cement and rebar to villages as public goods. In 1971, the government analyzed the performance of the villages and found out that the presence of good village leader had profound impact on the success of the project.

To ensure the successful implementation of the project, the government appointed one male and one female SMU leader for every village. From the gendered perspective, this policy was a major cultural innovation as it gave women the opportunity to receive government-provided leadership training programs. The prevailing Confucian norms had assigned passive and

submissive roles for women within household and left virtually no room for female leadership in the public arena. However, through women's active leadership roles in the village projects, the elected and educated female leaders contributed in changing the perception of women in society. The exposure of active female leaders in the community may have been a powerful catalyst for increasing investment in girls' education in rural Korea at the time, which is also referred to as "The Role Model Effects" in this paper. One may envisage the role model effects operating on adolescent girls and their parents at two interconnected levels, where firstly, it could enable them to perceive new academic and future career options, and secondly, encourage them to thrive harder for the new available opportunities.

Between 1973 and 1980, the Korean government trained over 10,299 female SMU leaders throughout the country. The total accumulated number of trained SMU leaders were more than twenty-eight thousand, which is excluding number of trainees from other type of training programs. This paper assumed that the gradual transformation of women's social status and the supply of officially trained female leaders to communities have had a role model effect on female adolescent and young women which led to the increase in the number of educational attainments of female students during the SMU period. Based on this assumption, this paper tried to identify the impact of these training programs on educational attainment of female adolescents across the regions. According to an essay from one of the SMU female leaders, Ms. Moonja Chung[1] had income generation success though chestnut planting projects with other women in the village. The women's association rented mountains to plant 2,000 chestnut trees provided by the government, and contracted to offer 30% of the income to the mountain owners and owned 70% of the income Chestnut farming turned out to be successful leading to village

[1] Ms. Chung was elected by female villagers as the SMU female leader in 1972, and she is recognized as one of the most active female leaders. Her stories as a female leader were used for the discussion sessions during the training program, and she became a lecturer at the Training Center.

income. Incomes were used for creating scholarship program for girls' education of the village. Women's effort to develop the family's economy, including the education of their children especially for girls, were extremely fierce as seen in other essays and interviews of female leaders (Jeong 1975; Yu, 2001; Han, 2012). They testified that they have developed the village projects to improve the economic status of women and their social status. They stated that women were treated unequally to that of men because of the lack of their economic power at that time.

Despite women have made significant advances in education and labor force participation for the last 50 years, gender gap still exists as a significant issue in low-income countries. On the other hand, most of Korea's gender gap have diminished like other middle and high-income countries. Korean women's participation in social activities and employment have been greatly augmented during the last decades compared to other developing countries. Korea is well known for rapid and broad-based expansion of its educated labor force and its achievements are elimination of gender gap in access to primary, secondary and tertiary education and its learning outcomes. Even though Figure 1 shows increasing trend of girls' enrollment rate of junior high and high school, the cause of such rapid increase is yet unclear. Historically, Korean women had limited opportunities to receive official education due to the patriarchal perception in the society. Although there were no specific policy interventions for women, the compulsory education system in elementary schools in 1949 and in junior-high schools in 1984 contributed to improving gender equality through educational opportunities. Contemporaneous with the SMU, a remarkable increase in the secondary school enrollments in the 1970s resulted as shown in Figure 1, where the girls' enrollment rate in junior high school almost doubled in 15 years from 47 percentage in 1965 to 84.5 percentage in 1980. In fact, the gender equality in opportunities in higher education has been achieved since the 1990s. During the 1950s to 1970s, the investment for higher education was concentrated mainly on men, who were perceived as

the head of the households. Women were generally less educated than men since they had to support the family by participating in economic activities. Although women's educational opportunities have increased, the prevalent gender stereotypes have restricted the scope of the women's communal activities before and during the early stages of the SMU. Under these circumstances, the presence of trained female leaders in each village could have had an unprecedented role model impact in the Korean society. This mandatory appointment has served as a quota policy for women which provided the opportunity on the recognition of women in the leadership positions in the community. As seen in Figure 2, there were few female parliamentarians who were able to represent as women's role models before 2000.

The research on the effectiveness of the female quota system has been extensively conducted in India, and the quota system for female board member in the private sector has been studied mainly in the Norwegian policy (Pande et al., 2011). The direct impact of the SMU leadership training program has been empirically tested by the previous study (Kim, 2012), and it found positive correlation between the cumulated number of trainees and rice yield production, and the number of completed village projects. In addition to the previous studies, this paper strives to examine the educational effect of female leaders in short-term capacity building programs for women empowerment, which are widely implemented in developing countries, as well as to investigate the role model effect to the girls' educational attainment driven by female leadership in the community.

1.2. Literature Review

Two areas of empirical literature will be discussed, which are (1) role model effect of female leadership and (2) women empowerment and development.

1.2.1. Role Model Effect of Female Leadership

Women in leadership position have been considered as a potential provider of aspiration for girls as it generates successful women's role model, as well as women in leadership positions undertake policies that facilitate women's success. The women in leadership position influences beliefs on what is possible for girls (Duflo, 2012). The period of adolescence is when many critical decisions are made and decisions that a girl makes are likely to have significant impact throughout their lives. Adolescents tend to be influenced by the circumstances around them, and adolescent girls exposed to female leaders are likely to increase their educational achievement. Pathak et al. (2013) have also stated that the reservation policy for female leaders had the largest impact on learning outcomes on primary school children when they were exposed to such condition at a very early stage in life. The previous results all show the effectiveness of presence of female representatives on influencing adolescent girls.

There are several literatures from India that point out the significance of female role models using India's natural randomized setting of compulsory quota system for women. Since the mid-1990s, India has implemented a policy of randomly assigning more than one-third of village council head to women, and studies have been conducted to find the effectiveness of quota policy for women. Beaman (2009) argued that the exposure to a female leader alone effectively weakens stereotypes on gender roles and domestic spheres among the general public, and it also helps eliminate negative bias prevalent among male villagers towards effectiveness of female leaders' leadership. Compared to the villages which have never adopted gender quotas, the difference in parents' aspirations on their children by gender in villages assigned with female leaders decreased to 25 percent from 35 percent, and the gender gap in adolescents' educational attainment has also diminished (Beaman, 2012). The study also showed that a

quota system for female village leaders and seats in the congress not only changed the general perception on women's abilities, but also improved women's electoral chances and raised aspirations as well as the level of educational attainment for adolescent girls. Beaman et al. (2011) also stated that the exposure to female leaders through the gender quota system in local government altered the males' perceptions towards the capability of females as leaders.[2]

In addition to the in-depth studies of Indian quota system for female representation, there are previous studies which explores the role model effect of female faculties and scientists. Nixon et al. (1999) found positive impact of exposure to female high school faculty and professional staff on the educational attainment of young women, whereas the female representation had no significant impact on that of young men. Furthermore, when the middle and junior high school students were exposed to the role model of female scientist, the attitudes of students towards female changed positively (Smith at al., 1986). However, debates among policy makers and academics still continues on the effect of mandated exposure of female leaders on changing social norms and perceptions of women's ability (Beaman, 2009). This paper aims to provide supplementary evidence of previous studies on quota system by investigating the effect of trained female role models.

1.2.2. Women Empowerment and Development

Psacharopoulos (1994) argues that investment in women's education is generally more profitable than investment in men. Moreover, James Woldenshon, the former president of the Word Bank, emphasized the catalytic effect of educated girls on every dimension of economic development. As previous literature has shown, improving education of girls could change the

[2] Furthermore, Chattopadhyay et al. (2004) argue that the quota system also have influence on the provision of local public goods in rural areas, and leaders invest more in infrastructure that is relevant to the needs of their own genders. This study also provides evidence on the need for gender equality in political leadership positions.

outcomes of economic earnings. The mothers' level of education and earning have a strong correlation and effect in improving children's welfare, especially on children's health (Duflo, 2012). The influence of mothers' education on educational outcomes of children is still open to controversy due to two fundamental problems, which are the ability bias and the assortative matching. Nonetheless, many scholars state that women empowerment and economic development have strong correlation as it contributes to lowering child and maternal mortality rates and promotes educational attainment of their children (Duflo, 2012).

1.3. Institutional Background

1.3.1. Human Resource Development and Women's Empowerment in South Korea

Promoting girls' education is widely recognized as one of the most effective tools in development policy. Women often represent the underutilized, under-empowered segment of the human resources in the developing countries. Educated women don't only help themselves but also help raise the next generation of workers to better prepare themselves to face the challenges. This is the main reason the promotion of girls' education holds a preeminent position in the list of goals for international development cooperation.

In 1953, when the compulsory primary education was introduced in Korea, both women and men received the equal opportunity of education. By the end of 1950s, the enrollment rate for both men and women had reached the highest, however, gender gap in the enrollment rates in secondary and tertiary education still existed. Even though the policy for compulsory education brought women to the primary schools, opportunities for higher education remained as a privilege for sons within the family.

In developing countries, the gender gap in education remains wide as it was in Korea, where the gender gap for the average enrollment rate for primary and secondary school was about nine percentage point in the 1970s; 69 percentage points for girls and 78 percentage points for boys. South Korea before 1960s rarely had customized policies for women's capacity building, and although the government had specific division for supporting women-related policies, the main task was to support women's role in the family rather than pursuing policies to strengthen women's capacities. Numerous Korean women have contributed to the industrialization of Korea by providing long hours of labor with relatively cheap labor. Due to the development of light industry, women who have migrated from the rural areas were given limited educational opportunities through attending night schools while working in factories, but they had limited

chance of receiving secondary education after receiving primary education. Moreover, after their marriage, most of them worked at the farm as housewives. With the adoption of the compulsory primary education system in 1948, the enrollment rate in primary school for boys and girls has remained at a similar level, but the gap between boys and girls in the secondary enrollment rate remained more than 10 percent.

The level of educational attainment in Korea sharply increased during the Korean economic take-off period, and the parent's expectation on the level of education for their children had also changed. The adolescent educational attainment is usually driven by their own motivation and aspiration, and it is also affected by the change in parental expectation for their children's education. As shown in Figure 2, the expected level of education for children by heads of households has increased during the 10-year period from 1977 to 1988 in Korea. In 1977, the majority of heads of households preferred their sons to receive up to Bachelor's degrees in contrast with up to high school degrees for daughters. However, such difference changed in 1988 as the majority of heads of households preferred their children to receive at least Bachelor's degrees regardless of gender.

South Korea is well known for its investment in human resources despite when it was at a low-income state, and the universal primary education has increased the number of enrolled students at all levels. This can be seen with Figure 5, where it shows the increasing trend in the number of primary and junior high schools in 1960s and 1970s, which was when Korea experienced rapid economic development driven by export-oriented industrialization policy.

1.3.2. Leadership Training for Community-Driven Development

The SMU is a nationwide campaign for rural development aimed to reduce the disparity between rural and urban area in the 1970s. The government supplied raw materials for the

village project in its first year and selectively supplied materials only to villages that successfully completed village projects in the following year. The villagers had to decide and implement on how to use the materials provided by the government. With the Korean government's experience on its failure of some rural development projects in the past, they recognized the importance of the role of village leaders on the success of community-driven development projects. During the process of implementing the SMU, Korean society had problems such as lack of competence of village members and prevailing social norms against women's active participation. To deal with this issue, specialized leadership training program was conducted to train competent village leaders and the Saemaul Leaders Training Institute (SLTI) provided a systematic intensive training program for the village leaders. Table 1 shows the cumulative number of trainees by year from 1972. The training for female leaders started from 1973, one year after men's training, and Figure 1 and 2 shows the cumulative number of trainees by province and year.

The training program provided by the government played a key role in enhancing the capacity of leaders (Kim, 2013). The program had several distinctive features and was effectively designed to change trainer's mindset and attitudes, as well as building a sense of leadership and responsibility. Through lectures on the spirits of the SMU which are diligence, self-help, and cooperation, participants were able to discuss their experiences through case studies of successful villages and small group discussions. Even though the program was relatively short, trainees evaluated the program as one of the key inspiring factors which made them to spontaneously support the SMU (Kim, 2013). This could be seen with the diverse government's acknowledgment of the village SMU leaders. Some of them became lecturers at the SLTI, and were given the opportunity to disseminate their successful stories at the Monthly Economic Briefing organized by the President's Office. Their successful stories were televised nationwide through news stories, soap operas and even movies, and all of these show the

government's high regard on the role of the Saemaul leaders. Female leaders also testified that the education they received from the Saemaul leader training institute was so helpful in driving the SMU campaign and leading the women's association. During the training period of about a week, the dedicated attitude of the instructors contributed greatly to the development of the leaders.

The total number of trained leaders of both male and female are around 28,000 people. The previous studies do not clearly described the application and selection process of the training, but Kim's (2013) study on evaluation of village leaders training program indicates that the selection of trainees was more dependent on the administrative distribution rather than the total size of population of the district. For the case of female leaders, there were large number of trainees in the city area, such as in Seoul and Busan, and this was because there were many trainees from women's associations in the city area. Regarding the composition of female trainees, majority of trainees were less than 40 years old (72% were composed of 30- to 49-year-olds, 24% were composed of 20- to 29-year-olds) (Kim, 2013). However, the educational information of the trainees was unfortunately not confirmed by the remaining data.

1.4. Data

The data for the study is district level panel data, covering 178 districts in South Korea. The main historical data set is from the SLTI, and it contains cumulated number of trained leaders by districts (Shi, Gun)[3] of Korea from 1973 to 1980. This data was digitalized from the SLTI's archive to investigate the direct impact of the SMU leadership training on the agricultural productivity and the success of village projects (Kim, 2013). The data contains difference in the number of trainees by region, but it unfortunately has no information on other trainees' traits, such as their educational level, jobs and employment status. Since the number of the population is different for each district, the number of SMU trainees is standardized by dividing the number of Saemaul trained leaders per population.[4] The cumulative number of trainees were used as the main independent variable because the longer SMU trainees have been active in the village, the greater influence they had on the villagers.

The dependent variable, which is the girls' school enrollment rate, is derived from the Population Census which is conducted every five years. In the Census, two age cohort data was constructed with the age group of 10- to 14-year-olds and 15- to 19-year-olds. The school enrollment rate used in the analysis was calculated as the ratio of the number of students who enrolled in the school in the total population of the age group. The control variables other than the key dependent variable were from the Statistical Annual Report of each province[5]. This data has been digitalized from the paper-based documents, and this paper aimed at finding as many control variables as possible which affected girls' education. The total number of primary, junior-high, and high schools were included as control variables since the increase in the number of schools had a positive effect on the increase in the school enrollment rate. The

[3] Shi and Gun is Korean word for the administrative unit of Korea. Shi is translated as city where Gun is translated as county, a sub-provincial unit
[4] The number of population is from the Population Census each year
[5] 16 provinces and 178 districts

income level of district is another important factor affecting the educational level, so the tax burden per household by district has been collected. The regional GDP of South Korea has been compiled since 1993, so this paper has used the tax burden per household as a proxy variable for the regional average of family income. As another type of female role model, the number of female teachers of primary, junior high, and high school from the Annual Statistics Yearbook of Education was included as a control variable. Since the dependent variable, the girls' enrollment rate data, was collected every five years from 1975 to 1985, other variables were also constructed on a five-year unit basis. The key summary statistics for the sample is presented in Table 2. As shown in Figure 6, a positive correlation between the cumulative number of trained female leaders and the enrollment rate of female students in both 1975 and 1980 can be seen, and the reduced gap among districts can also be seen in 1980 compared to 1975.

1.5. Empirical Strategy

This paper tries to empirically investigate the main research question which is whether female role models through the SMU influences perceptional change of girls, and the impact of female leadership on girls' educational attainment in South Korea. The following fixed effect regression model is estimated to test the existence of the upward trend of educational attainment of female adolescents with the increase in the cumulated number of female leadership trainees at the district level.

$$\boldsymbol{Y_{i,t} = \beta_0 + \beta_1 FemaleTraniees_{i,t-1} + \theta X_{i,t}{}' + \mu_i + \delta_t + \varepsilon_{i,t}}$$

Using the linear regression, the outcome variable $Y_{i,t}$ denotes the percentage of female students' school enrollment rates in district *i* at year *t*. $FemaleTraniees_{i,t}$ denotes the number of cumulative female trainees in district *i* at year *t-1*, and is the key explanatory variable. They are all panel data collected every five years from 1975 to 1985. Since it is difficult to assume the role model effect of the trained female leaders to simultaneously influence girls' enrollment rate, the cumulative number of trained female leaders, was included as a key explanatory variable with a one-period lag. Control vector X_{it} includes observable explanatory factors, the regional tax burden by household as a proxy variable for regional average of family income, the number of primary, junior high and high schools, and the number of female teacher who could also might be other type of role models. μ_i is an unobserved time invariant district factor, δ_t is the time effect common to all districts, and $\varepsilon_{i,t}$is an error term depending on area and time. If the SMU training program generated a positive effect, $\beta_1 > 0$ is expected from the equation.

1.6. Findings

1.6.1. Estimation Results

This paper predicted female role models through the SMU having trigger effect on the perceptional change in girls, and female leadership having impact on girls' educational attainment in Korea.

Table 5 shows regression results of both OLS and fixed effects for 15- to 19-year-olds female enrollment rate. The number of cumulative female trainees had significant positive coefficient and the FE estimation also showed stronger impact. When other variables including year dummy are controlled, the fixed effect results also showed robust results around 0.7 percent. This indicates that if one more trained female leader per ten thousand population is in the district, the girls' enrollment rate will increase by 0.68 percent. The number of schools also has a positive correlation, and the year dummy constantly shows statistically significant coefficient. As seen in Table 5, the impact for 10- to 14-year-olds female students is rather smaller than the late teens resulting 0.23 percent increase of enrollment rate, when other variable and fixed effects are controlled. For this age group, the correlation between the enrollment rate and the number of trained female leaders showed weaker than that of late teens. The possible reasons for the difference between late and early teens can be explained with role model having larger impact on late teens, or with the lower role model impact on enrollment rate which was already high due to the compulsory education policy for elementary from the 1950s and junior high school since 1985. However, the result is optimistic since the impact was borne from the short-term capacity building program. In addition to the previous literature which showed the effect of long-term female role model impact, such as the quota system, the paper's findings also shows the evidence that short-term capacity building trainings could also be a powerful policy tools for promoting girls' status in developing countries. From the previous analysis, since the

mean of total number of cumulative SMU female trainees was four persons per 10,000 populations, this meant that there was approximately three percent increase of girls' enrollment rates driven by the female leadership during the 1970s.

In conclusion, a significant correlation between the numbers of cumulative trained leaders and adolescents' educational attainment are found. When other influential variables, such as fixed effects and year effects are controlled, all coefficients showed statistical significance impact.

1.6.2. Robustness Check

Although this study tried to contribute in constructing analyzing the historical paper based data, there were limitations in securing necessary data. In order to confirm the robustness of the estimation results, this study tried to carry out additional analysis using other econometric methods such as IV. However, only the fixed effect and OLS analysis could be performed with the limited data. Therefore, a falsification test was conducted with the available data, and unlike the key analysis for this research, different data sets were constructed. The dependent variables included female student's enrollment rate in 1970 and 1975, and the independent variables were the cumulative number female trainees in 1975 and 1980. If the assumptions were correct, the number of female leaders in 1975 and 1980 cannot affect the enrollment rate of female students both in 1970 and 1975. The results are presented in Table 7. As a result of the OLS analysis, no statistically significant results were found, which indirectly supported the main finding of this study.

To confirm the robustness of the finding, we firstly analyzed the impact of the number of trained female leaders on boys' enrollment rate. If the impact on boys' enrollment rate is not statistically significant or the impact is much less than girl's enrollment rate, the role model

effect of female leadership is indirectly supported. We also analyzed the effect of the number of male leaders on both girls' and boys' enrollment rates. As seen in Table 8, the number of female leaders also had a statistically significant positive impact on boys' enrollment rates. However, the magnitude is about one-half of the increase in female enrollment, which indicates that female students are more affected by female leadership. As a second robustness check, we controlled provincial-specific time effects. Table 9 shows that the coefficient is still statistically significant, even though the impact is rather small when we controlled the provincial-specific time effects.

As previously mentioned, possibility on the overestimation of the effect on girls' exists because the cumulative number of trainees, and not the number of trainees each year, was used as the key explanatory variable. The additional regression analysis was conducted on the robustness check, the difference between girls' school enrollment rate in 1985 and 1980 as a dependent variable, and the difference between the trained female leaders in 1980 and 1975. As a result, the coefficient was 0.53 and it was statistically significant at the 0.1% level.[6]

[6] The number of observation is on 179 districts, and the R^2 is 0.096

1.7. Discussion

Instead of the individual-level data, the district-level data was used for analysis due to data constraints. Although the number of sample size, which had all the necessary information, was quite small, the data provided by the Korea Labor and Income Data (KLIPS) included the individual's level of education attainment along with their resident information. The district-level data was used which included the combined enrollment rate of students by district-level. Despite data limitations, the result implied the significant impact of the short-term capacity building program on the gender equality, with one more trained female leaders in ten thousand population, increased girls' enrollment rate by 0.7 percent. Since the mean of the total number of cumulative female trainees was four persons per ten thousand population, this meant there was approximately three percentage increase of girl′s enrollment rates driven by the female leadership during 1970s. The result is optimistic since the result was borne from the short-term capacity building trainings, which could be also a powerful policy tools for promoting girls′ status in developing countries. There are numerous ongoing programs in developing countries aimed at women's empowerment, including Korean funded ODA programs. If the community had the exposure of a female role model representative during a certain period of time, such impact could have positive effect on the overall outcomes of girls' education. This study also suggest policy implications for not only for regular-based school programs, but also for short-term training programs that are critical for the diverse dimensions of development. Village-level analysis could be considered for further studies.

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[Table 1] Cumulative Number of Saemaul Trainees by Year

Course	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	Total
Male Leaders Training	1,070	1,212	1,792	2,077	1,946	1,996	1,991	1,913	1,969	2,292	**18,258**
Female Leaders Training	-	1,203	1,000	978	1,079	1,202	1,062	1,505	789	1,481	**10,299**

Source: Saemaul Leader Training Institute (1982)

[Table 2] Descriptive Statistics of Data

Province	Obs	Mean	Std. Dev.	Min.	Max
Dependent Variable					
Female school enrollment rates	1,362	68.94	27.53	5.41	99.45
Explanatory Variable					
Number of cumulative SMU Trainees per 10,000 population in district	1,336	15.94	27.52	0	128.04
Number of cumulative SMU male trainees per 10,000 population in district	1,335	8.95	15.69	0	78.56
Number of cumulative SMU female trainees 10,000 population in district	1,338	3.28	5.81	0	32.90
Number of primary schools per 100,000 population	1,220	34.64	19.86	1.57	121.36
Number of junior-high schools per 100,000 population	1,218	9.52	4.68	1.28	32.25
Number of high schools per 100,000 population	1,186	5.57	4.27	0.26	56.74
Tax burden per household by district	1,268	5.40	1.62	2.01	9.65
Number of female primary school teachers per school	690	5.03	4.85	0	33.44
Number of female junior-high school teachers per school	590	5.52	3.74	0	22
Number of female high school teachers per school	570	3.89	12.97	0	213

[Table 3] Descriptive Statistics of Data (15- to 19-year-olds)

Province	Obs	Mean	Std. Dev.	Min.	Max
Dependent Variable					
Female school enrollment rates	680	47.54	23.05	5.41	92.72
Explanatory Variable					
Number of cumulative SMU Trainees per 10,000 population in district	667	15.82	27.37	0	128.04
Number of cumulative SMU male trainees per 10,000 population in district	666	8.89	15.61	0	78.56
Number of cumulative SMU female trainees 10,000 population in district	668	3.26	5.79	0	32.90
Number of junior-high schools per 100,000 population	608	9.51	4.66	1.28	32.25
Number of high schools per 100,000 population	592	5.56	4.28	0.26	56.74
Tax burden per household by district and year (Unit: 10,000 Won)	633	7.16	13.65	0.06	155.97
Number of female junior-high school teachers per school	295	5.52	3.74	0	22
Number of female high school teachers per school	285	3.89	12.98	0	213

[Table 4] Descriptive Statistics of Data (10- to 14-year-olds)

Province	Obs	Mean	Std. Dev.	Min.	Max
Dependent Variable					
Female school enrollment rates	681	90.30	8.44	18.63	99.45
Explanatory Variable					
Number of cumulative SMU Trainees per 10,000 population in district	668	15.94	27.53	0	128.04
Number of cumulative SMU male trainees per 10,000 population in district	668	8.94	15.69	0	78.56
Number of cumulative SMU female trainees 10,000 population in district	669	3.28	5.81	0	32.90
Number of primary schools per 100,000 population	610	34.64	19.87	2.85	121.36
Number of junior-high schools per 100,000 population	609	9.52	4.68	1.28	32.25
Tax burden per household by district and year (Unit: 10,000 Won)	634	7.16	13.64	0.06	155.97
Number of female primary school teachers per school	345	5.03	4.86	0	33.44
Number of female junior-high school teachers per school	295	5.52	3.74	0	22

[Table 5] Effect of the SMU Female Leadership Trainees on Adolescent Girls' Educational Attainment by District (15-to 19-year-olds)

Girl's enrollment rate	(1)OLS	(2)FE	(3)OLS	(4)FE	(5)OLS	(6)FE	(7)OLS	(8)FE	(9) OLS	(10) FE	(11)OLS	(12) FE	(13)OLS	(14) FE
Number of cumulative female trainees	0.53*** (0.07)	0.64*** (0.08)	0.44*** (0.08)	0.49*** (0.08)	0.48*** (0.08)	0.57*** (0.09)	0.60*** (0.07)	0.65*** (0.08)	0.49*** (0.11)	0.78*** (0.12)	0.48*** (0.11)	0.75*** (0.12)	0.29* (0.13)	0.68*** (0.14)
Number of middle school			0.27** (0.10)	0.60*** (0.14)									-0.21 (0.15)	0.02 (0.21)
Number of high school					0.13 (0.08)	0.13 (0.10)							0.89*** (0.19)	0.32 (0.27)
ln(Tax burden)							1.52*** (0.37)	0.64 (0.59)					1.76** (0.57)	-0.27 (0.90)
Number of female teacher (middle s.)									-0.29 (0.15)	-0.45* (0.21)			-0.21 (0.12)	-0.44* (0.21)
Number of female teacher (high s.)											-0.03 (0.03)	-0.02 (0.03)	-0.02 (0.03)	-0.03 (0.03)
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	511	551	472	472	465	465	501	501	223	223	217	217	190	190
Number of region	176	176	163	163	163	163	175	175	77	77	77	77	68	68

Notes: The numbers in parentheses are standard errors. * p<0.05, ** p<0.01, *** p<0.001

[Table 6] Effect of the SMU Female Leadership Trainees on Adolescent Girls' Educational Attainment by District (10- to 14-year-olds)

Girl's Enrollment Rate	(1)OLS	(2)FE	(3)OLS	(4)FE	(5)OLS	(6)FE	(7)OLS	(8)FE	(9)OLS	(10)FE	(11)OLS	(12)FE	(13)OLS	(14)FE
Number of cumulative female trainees	0.06*	0.17***	0.11***	0.15**	0.07*	0.12***	0.07**	0.18***	0.07	0.20***	0.07	0.21***	0.10	0.23***
	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.02)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)
Number of primary school			-0.03***	0.07***									-0.07**	0.10**
			(0.01)	(0.02)									(0.02)	(0.04)
Number of middle school					-0.01	0.24***							0.18**	-0.12
					(0.03)	(0.05)							(0.07)	(0.10)
ln(Tax burden)							0.51***	0.04					0.16	0.30
							(0.13)	(0.18)					(0.21)	(0.22)
Number of female teacher (primary s.)									0.04	-0.14*			0.03	-0.19*
									(0.03)	(0.07)			(0.05)	(0.08)
Number of female teacher (middle s.)											0.07	-0.07	0.05	0.09
											(0.04)	(0.08)	(0.08)	(0.09)
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	512	512	473	473	473	473	502	502	261	261	223	223	196	196
Number of region	176	176	163	163	163	163	175	175	90	90	77	77	68	68

Notes: The numbers in parentheses are standard errors. * p<0.05, ** p<0.01, *** p<0.001

[Table 7] Robustness Check with Falsification Test

Girl's enrollment rate	(1)	(2)	(3)
Number of cumulative female trainees	0.018 (0.057)		
Number of cumulative trainees		-0.025 (0.022)	
Number of cumulative male trainees			-0.011 (0.012)
Year dummy	Yes	Yes	Yes
Observations	325	325	325
Number of region	167	127	127

Notes: The numbers in parentheses are standard errors. * p<0.05, ** p<0.01, *** p<0.001

[Table 8] Effect of SMU Leadership Trainees on Adolescent Educational Attainment (15- to 19-year-olds)

	(1) OLS	(2) FE
	Dependent Variable: Girls' Enrollment Rate	
Number of cumulative female trainees	0.29* (0.13)	0.68*** (0.14)
Full controls	Yes	Yes
Year dummy	Yes	Yes
Observations	190	190
	Dependent Variable: Girls' Enrollment Rate	
Number of cumulative male trainees	0.14** (0.04)	0.30*** (0.05)
Full controls	Yes	Yes
Year dummy	Yes	Yes
Observations	190	190
	Dependent Variable: Boys' Enrollment Rate	
Number of cumulative female Trainees	0.15 (0.12)	0.39*** (0.11)
Full Controls	Yes	Yes
Year dummy	Yes	Yes
Observations	190	190
	Dependent Variable: Boys' Enrollment Rate	
Number of Cumulative Male Trainees	0.06 (0.04)	0.19*** (0.04)
Full Controls	Yes	Yes
Year dummy	Yes	Yes
Observations	190	190

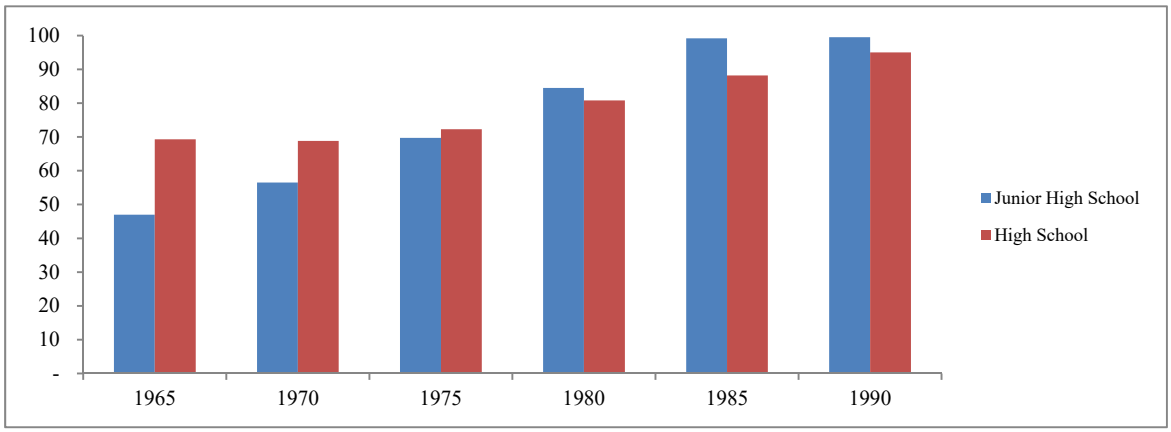
Notes: The numbers in parentheses are standard errors. * p<0.05, ** p<0.01, *** p<0.001; Full controls include (i) number of schools; (ii) log of tax burden; (iii) number of female teachers.

[Table 9] Robustness Check with Provincial-Specific Time Fixed Effects

	Girl's enrollment rate (15- to 19-year-olds)
Number of cumulative female trainees	0.54***
	(0.13)
Number of middle school	-0.03
	(0.19)
Number of high school	0.22
	(0.26)
ln(Tax burden)	-0.88
	(1.08)
Number of female teacher (middle s.)	-0.18
	(0.21)
Number of female teacher (high s.)	0.01
	(0.02)
Year dummy	Yes
District FE	Yes
Provincial-specific time FE	Yes
Observations	190
Number of region	68

Notes: The numbers in parentheses are standard errors. * p<0.05, ** p<0.01, *** p<0.001

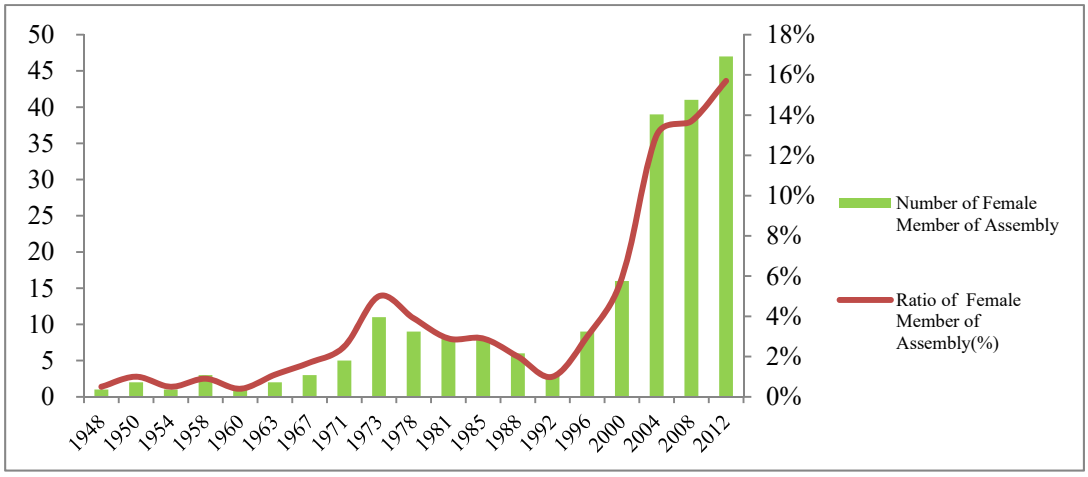
[Figure 1] Women's School Enrollment Rate in Junior High and High School



Source: The transformation of Korean women, family, and social affairs during last 70 years, The Academy of Korean Studies (2017)

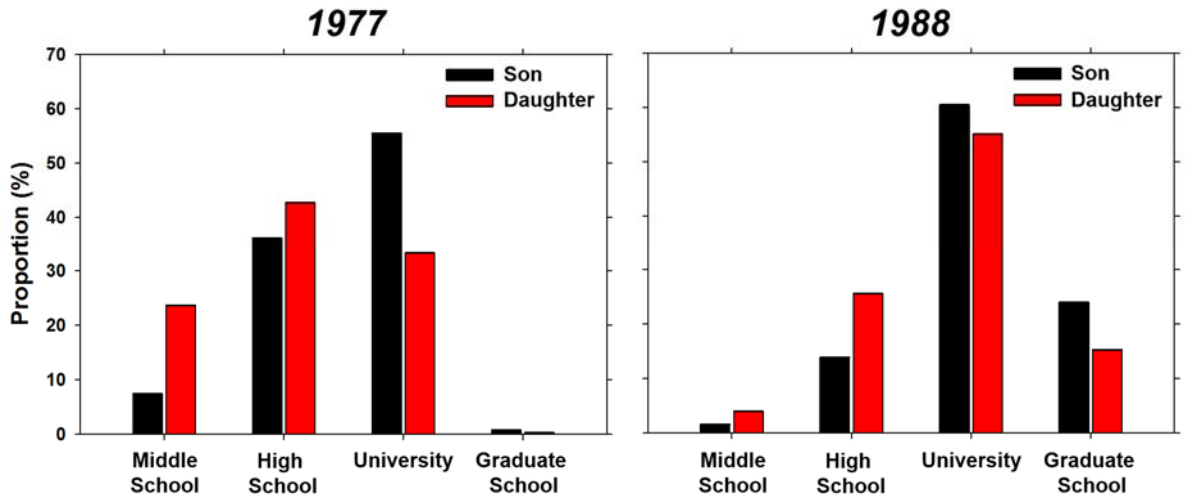
Note: The enrollment rate was calculated by the number of enrollment students among the number of graduated students from the previous school.

[Figure 2] Number and Ratio of Female Member of Assembly



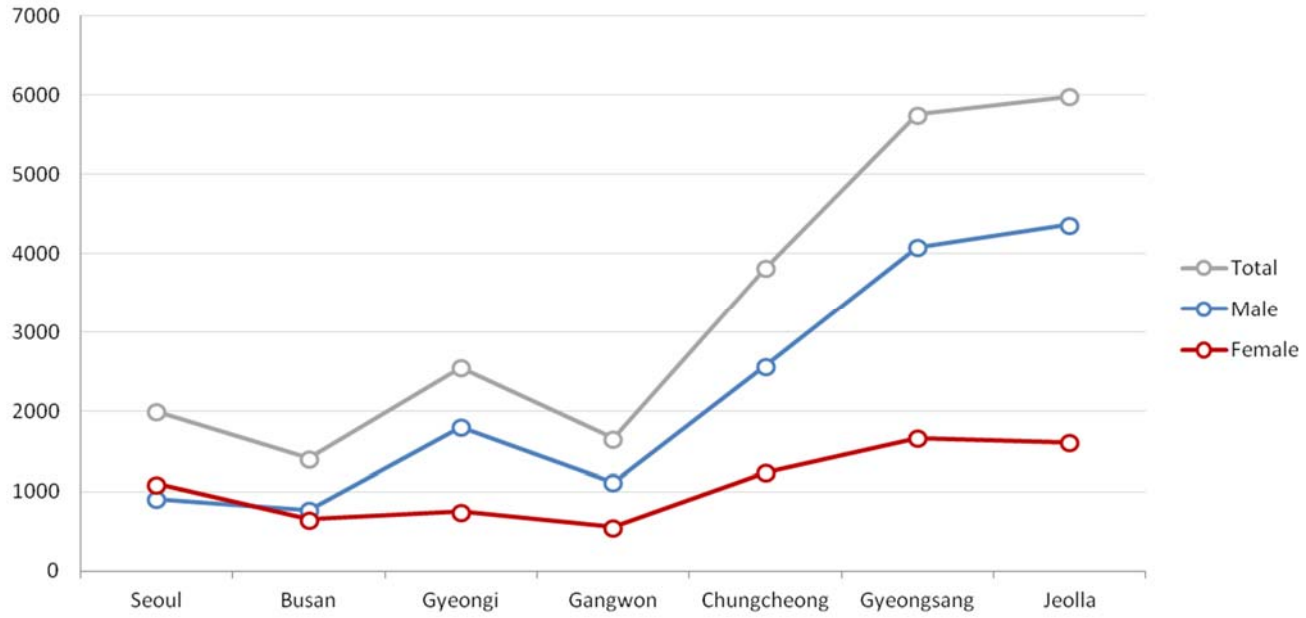
Source: Korean Women's Development Institute Gender Statistics (2010)

[Figure 3] Expected Level of Educational Attainment on Children by Heads of Households



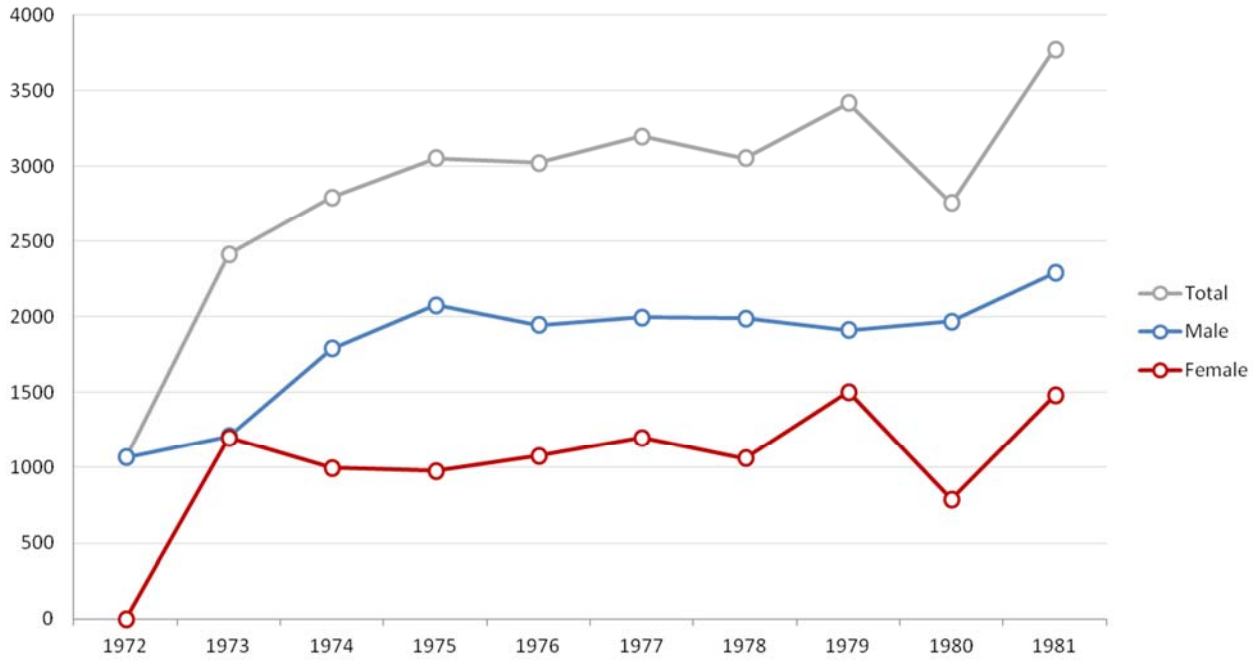
Source: Social Statistics Survey by Economic Planning Board (1988)

[Figure 4] Cumulative Number of Trainees by Province



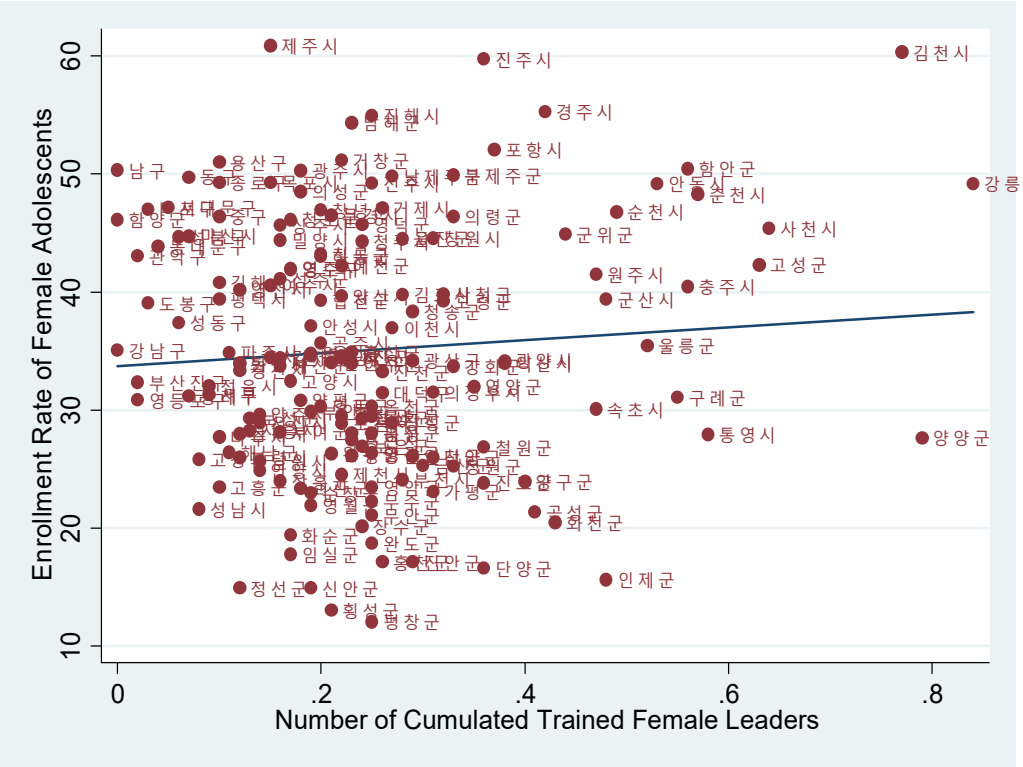
Source: Saemaul Leader Training Institute (1982)

[Figure 5] Cumulative Number of Trainees by Year

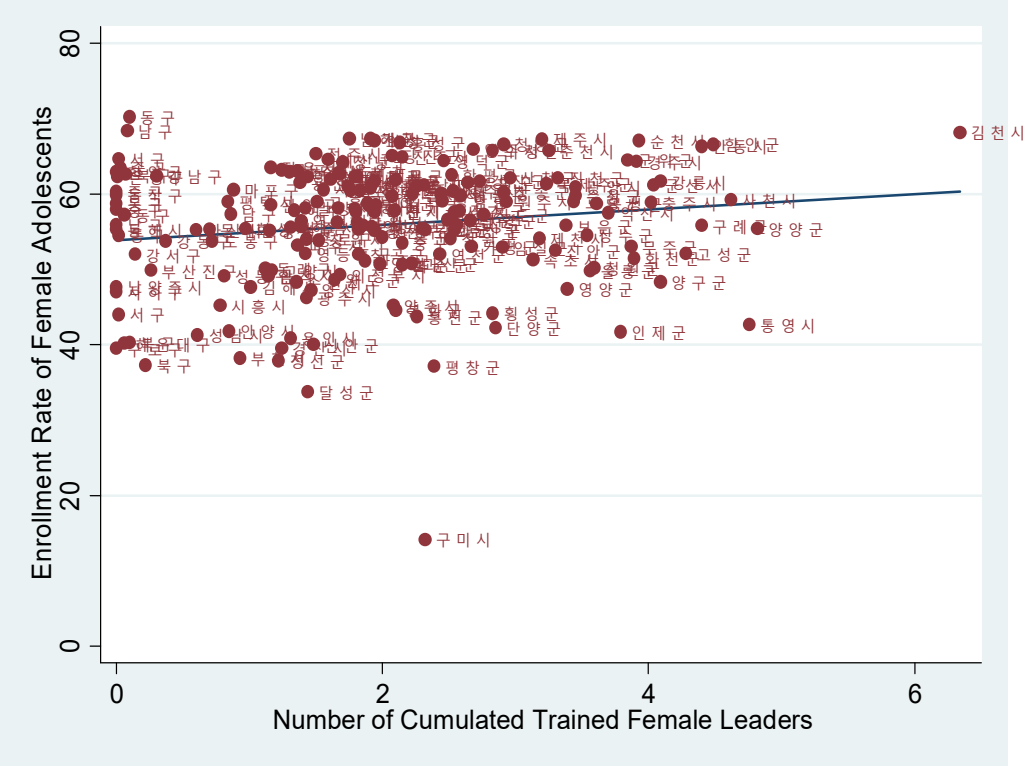


Source: Saemaul Leader Training Institute (1982)

[Figure 6] Girls' Enrollment Rate by the Number of Cumulative Trained Female Leaders

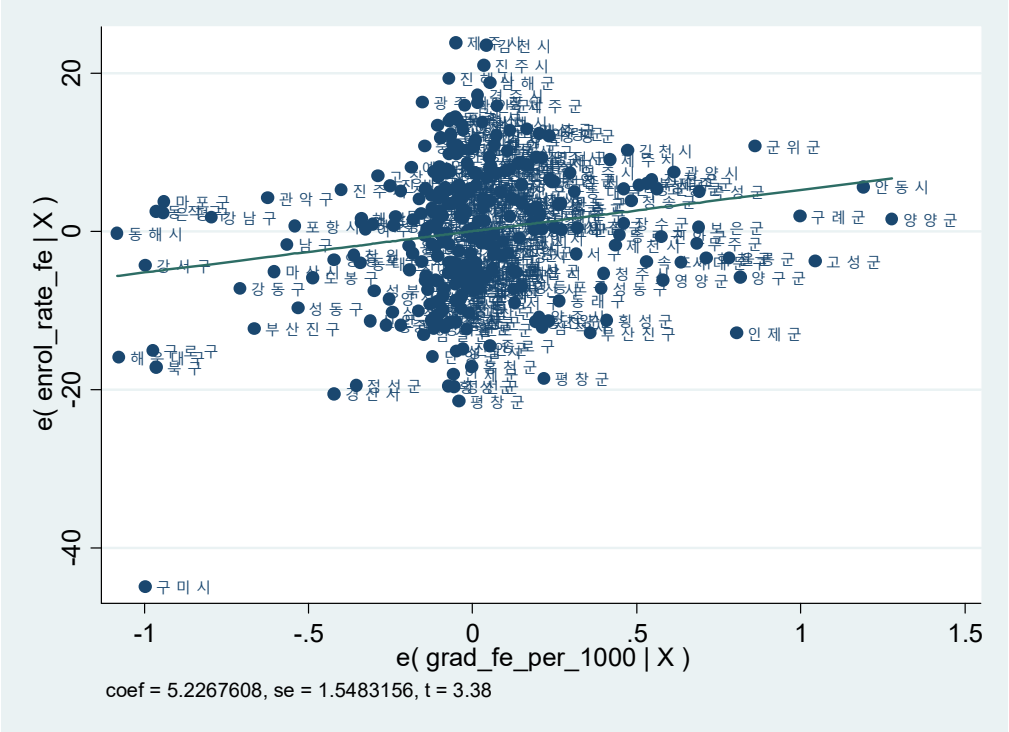


<1975>



<1980>

[Figure 7] Girls' Enrollment Rate vs. Trained Female Leaders, Total 1970-85



Chapter 2

Reforestation in South Korea and Its Consequences

2.1. Introduction

Forest is important as it provides essential goods for human activities and social operations, and a natural environment where people can live together. Occasionally, the indiscreet use and development of forests could cause social problems, leading to exhaustion of resources and environmental changes. The recent rise in the probability of extreme natural disasters caused by climate change reminds us of the importance of forestation. Such importance becomes more significant especially to developing countries where vulnerability to natural disasters or environmental degradation during economic development is more frequent with more serious damages caused by deforestation. For instance, since 1970, North Korea has converted and used its mountain areas as farmland and firewood to supplement them as energy and food resources during their bad economic conditions. It is known that one of the most serious side effects of deforestation is damages from flooding since forests contribute to preventing erosion and conserve water. As the mountains of North Korea have lost their full functions due to deforestation, the northern regions of South Korea, which are in contact with North Korea, have suffered increasingly with serious damage due to the increase in the amount of erosion and sudden floods from North Korea. The Korean peninsula is characterized by a typical monsoon climate zone, where precipitation is concentrated in the summer, and about 70% of the country is constituted of mountain areas. Because of these geographical characteristics, the most frequent type of natural disaster is flood, and the loss of forest resources equates to the loss of flood damage prevention abilities.

The issue of deforestation has raised great global concerns, but only few countries that have understood the importance and benefits of forests in human life have successfully achieved

reforestation, and Korea is one of them. Korea have successfully implemented the reforestation project in the 1970s, and as a result of the efforts of the Korean government, the volume of growing stock of forest has increased about 12 times in 2010 compared to 1970.[7]

As mentioned above, about 70 percent of Korea's territory is composed of mountains, and the impact of forests on quality of life is enormous since people highly depend on forest for living. Due to heavy deforestation during the Japanese colonial period and the Korean War, the forests have been devastated to an unrecoverable level. Serious deforestation has become one of the causes of natural disasters where it caused frequent floods and runoff during summer, making rural life more difficult and threatening the food resources (Yohan Lee et al., 2017). Agricultural production capacity has also drastically decreased and the total amount of rice production was not enough to feed even half the population of Korea. Therefore, the Korean government revised forest-related regulations and started the reforestation initiatives. The Korean government established an institutional framework for reforestation in the 1960s. The Forest Law was enacted in 1961 and the Five-Year Fuel Wood Forest Establishment Plan was initiated in 1962. After the enactment of Erosion Control Law in 1962, the government enacted the Temporary Forest Protection Act in the following year. The Forest Service was newly established in 1967, and after Saemaul Undong ("SMU" hereafter) began in 1970, a tree planting campaign entitled ″Village Hill Greening Project″ was initiated as one of the project components of the SMU. During the SMU, the establishment of Fuel Wood Forests lasted for seven years from 1971 to 1977. In 1973, the Forest Service had been transferred from the Ministry of Agriculture and Forestry to the Ministry of Home Affairs, and the Forest Service established the 10-year plan with the goal of planting 2.1 billion trees in the area of 1 million hectares within ten years. In 1979, the Second 10-Year Forest Rehabilitation Plan was initiated.

[7] The total volume of growing stock of forest increased from 69 million m^3 in 1970 to 800 million m^3 in 2010 (Source: Korea Forest Service)

Based on the past experience from the First 10-Year Forest Rehabilitation Plan, the second project was focused on the nursery strategies. In 1988, the Third 10-year Forest Resource Promotion Plan was established as a continued effort of reforestation although the area needed reforestation was smaller than that of the first or second forest rehabilitation projects.

The Korean government has implemented number of policy measures for forest reforestation, and its reforestation is globally recognized as a successful example. Korea's successful reforestation experience during the period of a rapid economic growth suggests political implications for developing partner countries to aspire in achieving two different goals simultaneously, which are economic growth and environmental improvement. During Korea's take-off period, the reforestation policy has been implemented along with the SMU creating synergy effect through government leadership and active community involvement. From the 1970s, a community-based reforestation project was efficiently placed with an active civil involvement as part of the SMU. Moreover, the government's innovative monitoring system similar to the cross-checking policy is recognized as a meaningful contribution to the successful forestation policy. With developing countries' increasing demand for knowledge sharing, Korea's development experience in achieving both reforestation and economic growth stands as an exemplary case for successful forest rehabilitation. Many also recognize deforestation to be closely linked with the welfare of citizens in developing countries. According to UNISDR (2012), the economic damages from natural disasters showed increasing trend from less than 100 billion dollars in 1980 to over 300 billion dollars in 2011 (Baak et al., 2018). Flooding, which is one of the most damaging natural disasters, is also considered as particularly harmful for developing societies that prioritize economic development instead of preserving environmental resources.

Despite its devastating effect, only simple quantitative analysis of reforestation policy impacts such as evaluation on expanded size of forest area has been conducted, and there is a

lack of in-depth research on systematic and quantitative analysis of reforestation policy impacts. This paper has conducted a quantitative analysis of environmental impacts of reforestation policy to investigate the impact of growing volume of stock of forest on flood control capability. This study attempts to draw meaningful policy implications by conducting a scientific analysis of reforestation policy until 1980.

2.2. Literature Review

2.2.1. Effect of Forestation on Flood Control

The existing literature on the impacts and benefits of forestation on disaster prevention showed mixed results even though the quantitative analysis on the effects of reforestation was insufficient. Above all, there have been debates on the role of forests as a protection from flooding. Bradshaw et al. (2007) showed the empirical evidence with generalized linear and mixed-effects models on the effect of reforestation from flood-related catastrophes by using global-scale data from 56 developing countries from 1990 to 2000. Their study found the correlation of forestation and flood risk, and the research predicted increased flood frequency of 4 to 28 percent with 10 percent reduction in natural forests in studied countries.

Since developing countries' severe environment conditions reinforces large-scale forest protection for human welfare, this paper also suggests that reforestation may reduce the frequency and severity of flood-related catastrophes. Several studies have also researched the positive effects of forestation in mitigating climate disasters such as flooding. Hundecha et al. (2004) argued that intensive forestation significantly reduces the amount of water on the surface due to heavy rain storms and other weather conditions by preventing flood through reducing rapid runoff and delaying the rise of river level. Nisbet et al. (2004) stated that forestation of Cary River in Somerset of England contributed in calming the river flow and preventing floods. Genwei (1999) found that reforestation of the Yangtze River Upper Valley in China resulted effluent reduction, and Brookhuis and Hein (2016) showed a nonlinear relationship between forest cover and flood control in catchment area in Trinidad. Their study also estimated the economic benefits with increase of forest area to be $16 to $268 per hectare every year. Previous research have found the positive effect of forest in reducing natural disasters through improvement of river flow control, hence, reducing flood damage and bringing economic benefits. Baak et al. (2018) investigated the effect of reforestation in

stabilizing water levels of South Korea rivers using their daily river data. They argued that as volume of growing stock in adjacent forest increased, the damage of lagged water level and rainfall decreased. This research is regarded as the only quantitative study on the impact of reforestation policy in Korea. According to the study on the estimation of the public benefits of forestation, the total benefit from the water conservation enhancement effect is about 18.5315 trillion won. This is calculated by multiplying the cost of construction of the multipurpose dam and its submerged area. A study on the public benefit of forests by the Korea Forest Service is meaningful for showing calculations on the economic effects of forests, but it contains limitation with several questionable assumptions.

On the other hand, there is also opposite arguments that forestation is not sufficient in reducing flood damages. Vandijk et al. (2009) argued that the suggested model by Bradshaw et al. is insufficient in interpreting the statistic and correlation of population and floods. The reanalysis of Bradshaw's data showed that population density alone accounts for 83 percent of the variation in reported flood occurrences, while forest cover or deforestation accounts for only 10 percent. Even though discussions on the role of forestation in controlling floods have made for more than half century, studies that present no direct relationship between forestation and flooding also exists. We can intuitively assume that forests necessarily protect us from floods, but unfortunately only few evidence support this assumption. The evidence on forestation having buffering function for natural disasters, such as floods, is important for countries neglecting deforestation for economic development, especially for developing countries where damage from natural disasters can be severe.

2.2.2. Success Factors of Reforestation in South Korea

Some domestic rigorous quantitative studies on the success factors of forest rehabilitation in South Korea share common views on the causes of Korea's deforestation before the 1960s. The

studies agree on main cause of deforestation to be forestry exploitation by illegal tree cutting, commercial exploitation of forest products, usage of tremendous trees as fuel, and slash-and-burn farming (Bae et al., 2012, Kim, 2003, Lee et al., 2005, Shin, 2011). However, the forest has been successfully rehabilitated through combination of the SMU, economic growth, substitution of fuel materials, erosion control project, and the afforestation project. Table 15 shows a brief history of forest rehabilitation policy in South Korea and there are several success factors among these policies which offer meaningful insights to the developing partner countries. The Combination of reforestation projects and Korea's national campaign for rural development during the 1970s, also known as the SMU, have caused synergy effects on the outcome of planting a total of 12 million trees. Lee at al. (2017) have analyzed the impact of SMU on forest rehabilitation and have quantitatively investigated the contribution of the SMU to the success of reforestation. According to the study of Bhattarai et al. (2001), the governance and political system of nations have greatly contributed to preventing the forest degradation. The Korean reforestation was possible due to government-led policy efforts and villagers' participation. Lee (2013) argued that reforestation in Korea was successful in combination with the SMU, the systematic administrative measures and penalty policies on deforestation, technical guidance of forestry associations to the villagers, and active participation of villagers. In particular, the income of the farmers has increased through the production of fruit trees, and facilities for nursing the trees played a crucial role in encouraging the participation of the residents. The afforestation and cultivation of the saplings provided jobs and income for local residents in addition to agriculture. Moreover, the Saemaul Undong Forestation project was organized by the Saemaul Undong Movement Headquarters and the project was organized around the village.

2.3. Data

Data from various sources are used for the analysis on the impact of reforestation. First, the main data of accumulated volume of trees and information on water system are from the Statistical Annual Report of Local Government and the Water Resources Management Information System. The flood related data, such as the amount of damage and rainfall, the area of wetted surface, and damaged area of farmland are from the Hydrologic Annual Report in Korea and the Statistical Annual Yearbook of Disaster.

For the analysis, Seoul and Busan, which are the urban areas, and Jeju Island were excluded from the scope of the study. Instead, eight provinces including Gyeonggi-do, Gangwon-do, Chungcheongbuk-do, Chungcheongnam-do, Jeollabuk-do, Jeollanam-do, Gyeongsangbuk-do, Gyeongsangnam-do were included in the constructed data. As seen in Figure 10, since the area of forest has not changed much since 1990, using forest area as an indicator of forestation was not appropriate. Even though previous studies have generally defined forestation as an increase in forest area, this paper has used the volume of growing stock of forest data as an explanatory variable, and the average amount of growing stock of forest per hectare is considered as a proper indicator since it indicates both quantity and quality of the forest. The volume of growing stock of forest is measured every five years by the Korea Forest Service since 1985.

The most important determinant of flood damage is the precipitation factor. The natural factors which influences the flood damage, rainfall and days of heavy concentrated rainfall data were used for the analysis. The geographic factors affecting flood damage such as farmland area and population density were also included. However, data on disaster prevention factors affecting flood damage, such as changes in citizens' perception of flood risk and environmental improvement through disaster prevention measures, were not included in the analysis due to limitations of insufficient data. The amount of rainfall in the monsoon season data shows the total rainfall amount from June to October. As previously mentioned, the rainfall data are

extracted from the Korean Hydrological Yearbook, which is not organized by a city or a district, but by the gauging station. Therefore, the city and municipal districts are summarized based on the gauging station's addresses according to the list of the Hydrology Statistical Yearbook of 1971. Figure 14 shows the sample precipitation record from Hydrologic Statistical Yearbook, and Figure 15 shows the address of the gauging station. For example, the 'Jeonryu gauging station' is located in Gimpo-gun, Gyeonggi-do, and the precipitation record are included into the precipitation of Gimpo-gun. A total of 100 cities' and districts' rainfall data are collected with exclusion of overlapping cities and towns.

With integration of data from different sources, this paper has constructed a five-year panel data at the national level (Shi, Gun) from 1985 to 2005 for every five years. Table 10 shows the variables and sources of data used in analysis and since most of them didn't have electronic version, necessary part of data were collected and extracted from the printed documents.

As shown in Figure 10, the total volumes of growing stock of forest have steadily increased from 1985 to 2010 in each province. As seen in Figure 11, the flood damage and the rainfalls during the summer period showed positive correlations as expected. Figure 12 shows the negative correlation between the flooded land and the volume of growing stock of forest, and Figure 13 shows the negative correlation between the growing volume of forest and the number of flood victim.

Among the variables affecting the flood, the area of rivers and streams in the district were not included due to difficulty of data insufficiency. The area of rivers by city and municipality was computerized since 1988, but data were missing in 1990, 1991 and 1997. It was impossible to obtain data for the years of 1985 and 1990, so this variable was not able to be included to the explanatory variables. Moreover, other possible control variable, which is the type of tree, was also excluded due to incomplete data. Depending on the type of tree, water absorption capacity could also be varied, thus, having different impact on floods. The growing volume of

forest by the tree species was not computerized and verified yet, so this data can be also included for further studies after confirming availability of data.

2.4. Analysis

2.4.1. Estimation Equation

To test the downward trend of the flood damage from the volume of growing stock of forest at the district level, the following fixed effect regression model is estimated.

$$\boldsymbol{log(Y_{i,t}) = \beta_0 + \beta_1 log(Forest_{i,t}) + \beta_2 log(Forest_{i,t}) * Rainfall_{i,t} + \theta X_{i,t}{}' + \mu_i + \delta_t + \varepsilon_{i,t}}$$

The outcome variable $Y_{i,t}$ denotes the flood damage on land with individual victims and expense of farmland damage in district *i* at year *t*. The data has five-year dummies, from 1985 and 2005 with five-year gaps, indicating a five year district level panel data. $Forest_{i,t}$ denotes the volume of growing stock of forest in district *i*, in year *t*. Control vector $X_{i,t}$ includes other observable explanatory factors which could affect flood damage such as rainfalls, size of farmland, and population density. μ_i is an unobserved time invariant factor, δ_t is the time effect which is evenly applied to all areas, and $\varepsilon_{i,t}$ is an error term depending on area and time. If the growing volume of forest trees generated a negative effect on flood damage, the equation is expected to be $'\beta_1 < 0'$.

2.4.2. Estimation Results

Table 12 shows the fixed effects estimation on the impact of forestation on damage to flooded areas. The result shows a statistically significant negative correlation. When the amount of rainfall during the summer period was controlled, the flooded area decreased by 0.38 % while the volume of growing stock of forest increased by one percentage. When other control variables such as the size of farmland, population density were included, the effect became stronger. The flooded damage area decreased by 0.46% hectares, as the volume of growing stock of forest increased by one percentage. Rainfall during the summer period and the days of

concentrated heavy rain showed a strong positive correlation in all columns as expected

Table 13 shows the estimation result of impact of forestation on economic flood damage. The rainfall during the summer period steadily showed the statistically significant positive correlation. The volume of growing stock of forest was negatively correlated but not statistically significant. When we control the rainfall in summer period, year dummy and regional fixed effect, the impact is statistically significant. When the growing volume of forest is increased by one percentage, the economic damage decreased by 0.46%.

Lastly, Table 14 showed the impact of forestation on the number of flood victims and the total volume of growing stock of forest shows a statistically significant negative correlation with the number of flood victims. When all other variables were controlled, the coefficient became larger and the number of flood victims decreased by 0.54 % if the volume of growing stock of forest increased by one percentage while the volume of growing stock of forest increased by one percentage.

2.5. Discussion

Compared to 1970, the volume of growing stock of forest in the 2000s increased about 12 times, from around 69 million cubic meters in 1970 to 800 million cubic meters in 2005. According to the results of the empirical analysis, If the forest level of 2005 remained same to that of 1970's, then the total flooded area and flood victims would be increased by approximately 5 times. The number of flood victims is estimated to have increased over 6,000 people without the increase of growing forest stock. According to a study on value estimates of forest public benefits published by the Korea Forest Service 2010, the total sum of value of water conservation function of forest is estimated to be 18.5 trillion won, and water enhancement effect (construction cost for multi-purpose dam) and prevention of land productivity reduction in submerged district (land cost and forest land) are included for the calculation. This paper's findings are based on the realistic damage reduction effect on damaged area and victims by quantitative analysis and as previously mentioned, the increase of volume of growing stock of forest by one percent had reduction effect on flood damage. Through this study it is found that natural disaster can be prevented with forest quality and water control improvement through increase in the volume of growing stock of forest as well as the forest area.

According to a report released by the Green Union of South Korea in May 2018, most of the mountains north of the Demilitarized Zone have been devastated with landslides identified in many places. The problem with this was deforestation leading to disaster damage, and North Korea was already suffering from chronic landslides along with floods and droughts. This didn't affect only North Korea, but also South Korea. According to statistics released by the Center for Disaster Epidemiology at the University of Leuven in Belgium in 2016, the world's fourth largest natural disaster victim was from North Korea, and it has been estimated that at

least 1,500 people have died due to floods in North Korea in the last decade.8 This shows the seriousness of deforestation on developing countries, including North Korea, and our findings suggest policy implications that developing countries should implement with reforestation policy from a long-term perspective, rather than a short-term approach.

[8] Recitation from Hankookilbo, http://www.hankookilbo.com/News/Read/201805242264721964

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[Table 10] Data Description

Source	Variable	Period
Water Resources Management Information System, Statistics Annual Report of Local Government	Volume of growing stock of forest	1985-2010
Hydrologic Annual Report in Korea, Water Resources Management Information System, Statistical Annual Yearbook of Disaster	Total amount of flood damage, flood victim, damage of human life, area of wetted surface, damages of farmland, Annual localized heavy rain	1985-2010
Population Census	Population, Size of Lands	1970-2010
Hydrologic Annual Report in Korea, Han River Flood Control Office	Rainfall	1970-2010
Population Census	Population, Size of Lands	1970-2010

[Table 11] Descriptive Statistics of Data

Variables	Obs	Mean	Std. Dev.	Min.	Max
· Id by district (si-gun)	930	1,039.622	340.9884	301	1,521
· Volume of growing stock of forest (m^3/ha)	917	1,708,462	2,204,326	176	17,000,000
· Area of forest cover (ha)	921	33,172.54	28,914.35	0	159,284
· Total amount of flood damage (thousand won)	909	3,735,928	8,886,078	0	83,372,685
· Flood victim (household)	884	44.4468	557.26	0	16,129
· Flood victim (individual)	891	243.8979	1993.419	0	54,190
· Damage of human life (person)	880	1.0636	6.9722	0	192
· Flooded area (ha)	890	429.7338	1046.257	0	8,595
· Damage of farmland (thousand won)	883	164,113.8	794,398.8	0	9,959,322
· Population (people)	896	159,000.2	153,479.6	8,329	1,039,233
· Rainfall in summer (June-Oct.) (mm)	571	984.6234	300.3468	0	35
· Rainfall (total)	571	1,287.794	343.7894	152	2,488.1
· Annual localized heavy rain (day)	495	2.6949	3.2973	0	35
· Size of lands	929	513.4652	366.6442	5.73	1,938.24
· Size of farmlands	924	6,654.971	5,760.22	0	26,939

[Table 12] Impact of Forestation on Area Flooded

ln(Area flooded)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
ln(Growing volume of forest)	-0.37* (0.18)	-0.45* (0.20)	-0.38* (0.18)	-0.39* (0.18)	-0.46* (0.21)
Rainfall in summer	0.25*** (0.05)		0.25*** (0.05)	0.25*** (0.05)	0.20*** (0.06)
Concentrated heavy rain		0.19*** (0.05)			0.13* (0.05)
Farmland			-0.001 (0.030)		-0.01 (0.01)
Population				0.05 (0.03)	0.04 (0.03)
Year dummy	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes
Observations	369	328	369	369	302
Number of region	106	84	106	105	82

Notes: The numbers in parentheses are standard errors. * p<0.05, ** p<0.01, *** p<0.001

[Table 13] Impact of Forestation on Economic Damage of Floods

ln(Economic flood damage)	(1)	(2)	(3)	(4)	(5)
ln(Growing volume of forest)	-0.26 (0.19)	-0.46* (0.21)	-0.26 (0.19)	-0.27 (0.19)	-0.37 (0.22)
Concentrated heavy rain	0.25*** (0.06)				0.14* (0.06)
Rainfall in summer		0.33*** (0.06)	0.33*** (0.05)	0.33*** (0.05)	0.33*** (0.07)
Farmland			0.00 (0.01)		-0.00 (0.01)
Population				0.03 (0.03)	0.03 (0.03)
Year dummy	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes
Observations	342	384	342	339	316
Number of region	87	109	87	87	85

Notes: The numbers in parentheses are standard errors. * p<0.05, ** p<0.01, *** p<0.001

[Table 14] Impact of Forestation on the Number of Flood Victims

ln(Flood victims)	(1)	(2)	(3)	(4)	(5)
ln(Growing volume of forest)	-0.40* (0.16)	-0.46* (0.18)	-0.41* (0.16)	-0.42* (0.16)	-0.48* (0.19)
Concentrated heavy rain	0.13*** (0.04)				0.03 (0.05)
Rainfall in summer		0.29*** (0.04)	0.30*** (0.04)	0.30*** (0.04)	0.29*** (0.05)
Population			0.04 (0.03)		0.04 (0.03)
Farmland				-0.01 (0.01)	-0.01 (0.01)
Year dummy	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes
Observations	368	327	365	368	301
Number of region	105	83	105	105	81

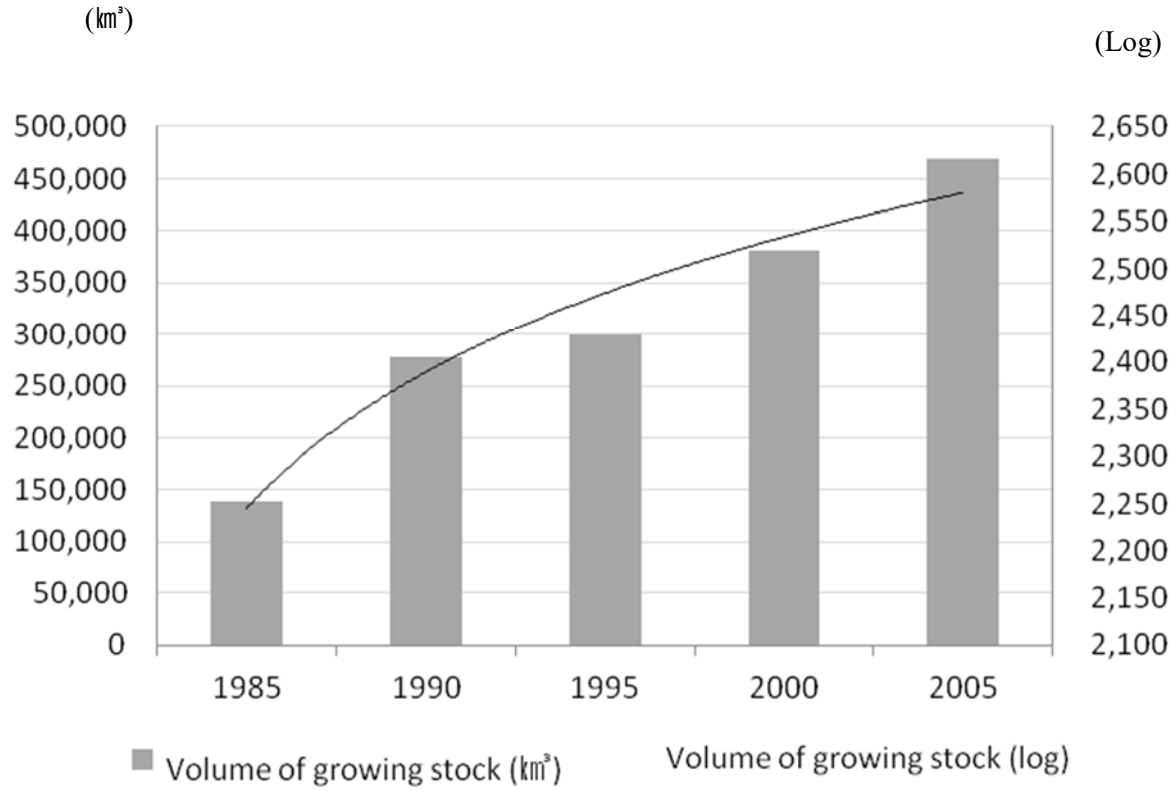
Notes: The numbers in parentheses are standard errors. * p<0.05, ** p<0.01, *** p<0.001

[Table 15] History of Forest Rehabilitation Policy in South Korea[9]

Year	History
1951	"The Temporary Forest Protection Act" was enacted to prevent the forests from being further devastated due to the war.
1961	The military government of Park Chung-Hee enacted the first "Forest Law" on Dec 27th 1961.
1962	The Korea Forestry Cooperative Union was established.
	The military government enacted and promulgated the "Erosion Control Law".
	In 1962, the Five-Year Fuel Wood Forest Establishment Plan was initiated.
1965	The large-scale planting stock raising plan was implemented.
1967	The government publicly announced its "Agriculture and Industry bilateral policy".
	The Forest Service was newly established in 1967.
1968	The Government initiated the Farmer's Income-Boosting Project. Chestnut tree was selected as a special farming item.
1971	SMU began in April 1970, and the following year in 1971, a tree planting campaign entitled "Village Hill Greening Project" was initiated as SMU.
	The establishment of fuel wood forests as part of SMU lasted for seven years from 1971 until 1977, when the program was discontinued.
1973	The government transferred the Forest Service which had been under the Ministry of Agriculture and Forestry to the Ministry of Home Affairs.
	The government introduced the "Planted Tree Inspection System" and follow-up management system.
1973-82	The Forest Service made the 10-year plan, which was to plant 2.1 billion trees in 1 million ha for 10 years.
1974	The National Reforestation Campaign was governed by the division in charge of SMU at the Ministry of Home Affairs. For the whole year of 1974, the national forest conservation education was conducted.
1974–79	Since the fireplace and chimney improvement project was in progress in the 1960s, the First 10-Year Forest Rehabilitation Plan was made systematic which improved and could save a lot of fuel.
1979	The Second 10-Year Forest Rehabilitation Plan was initiated. Based on the experience from the First 10-Year Forest Rehabilitation Plan, the second project was more specified and specialized in the nursery strategies.
1980	"Instructions for SMU in Cities" issued by the Ministry of Home Affairs in 1980, a variety of projects as below contributed to urban greening.
1988	The Third 10- year Forest Resource Promotion Plan was established for continuous reforestation although the area of reforestation was smaller than that of the 1st or 2nd forest rehabilitation projects.

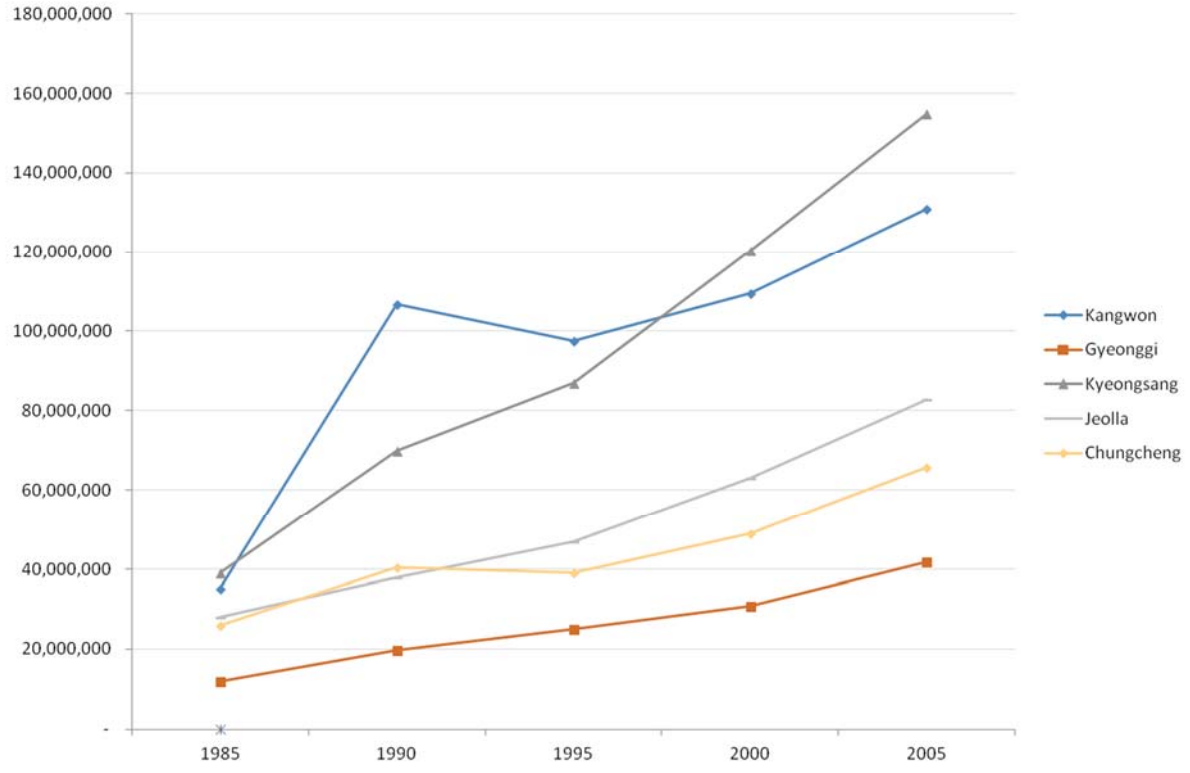
[9] Source: The contents in the table are summarized from the research paper of 2012 Modularization of Korea's Development Experience: New Research on Saemaul Undong: Lessons and Insights from Korea's Development Experience (2013)

[Figure 8] Volume of Growing Stock of Forest

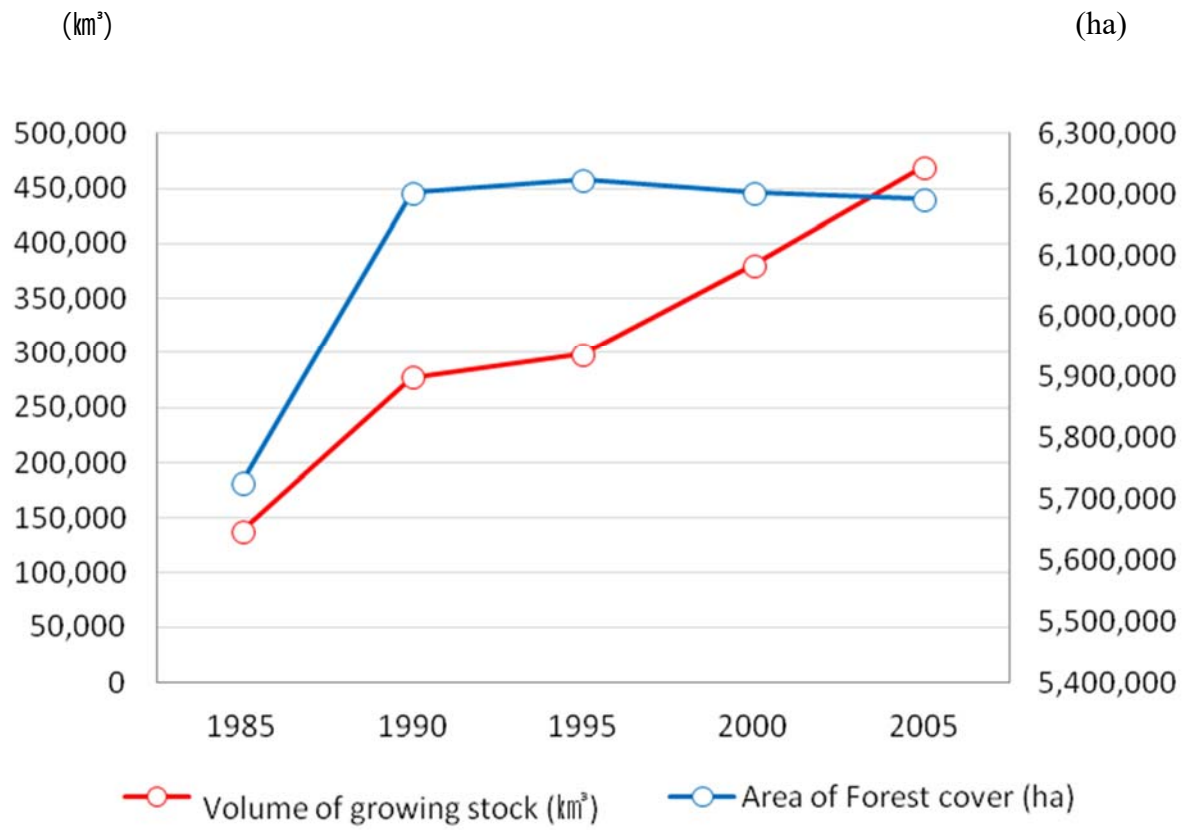


Notes: Left axis shows the volume of growing stock of forest and right axis shows the log of the forest volume.

[Figure 9] Volume of Growing Stock of Forest by Region

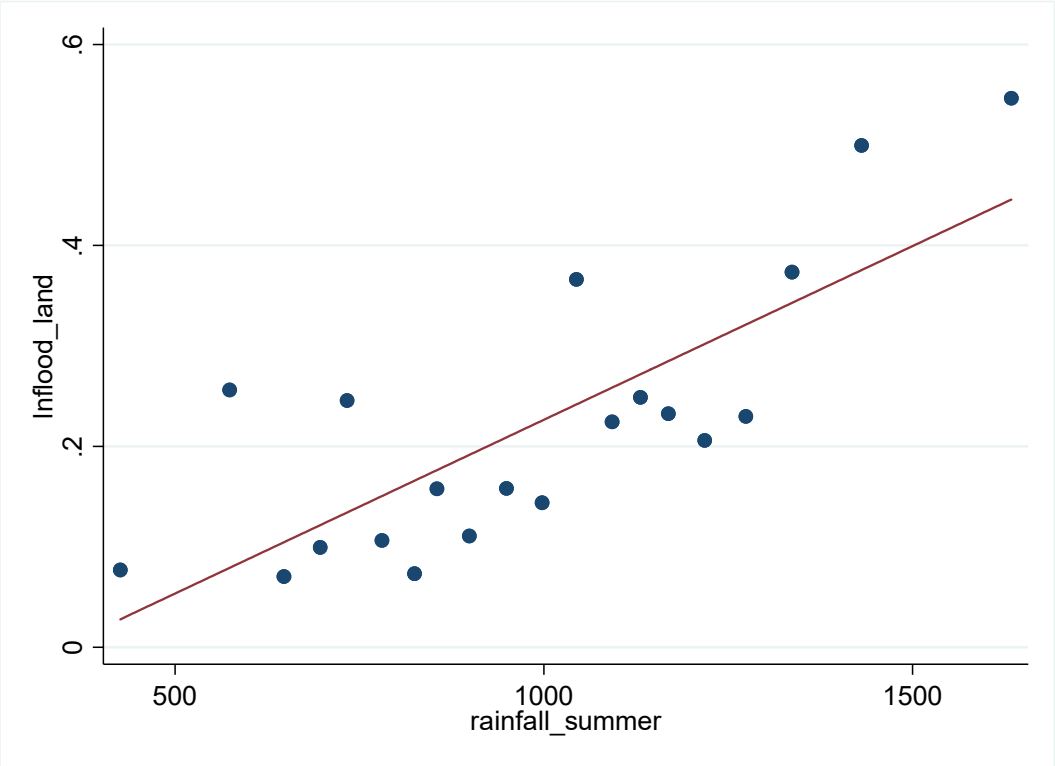


[Figure 10] Volume of Growing Stock of Forest by Region



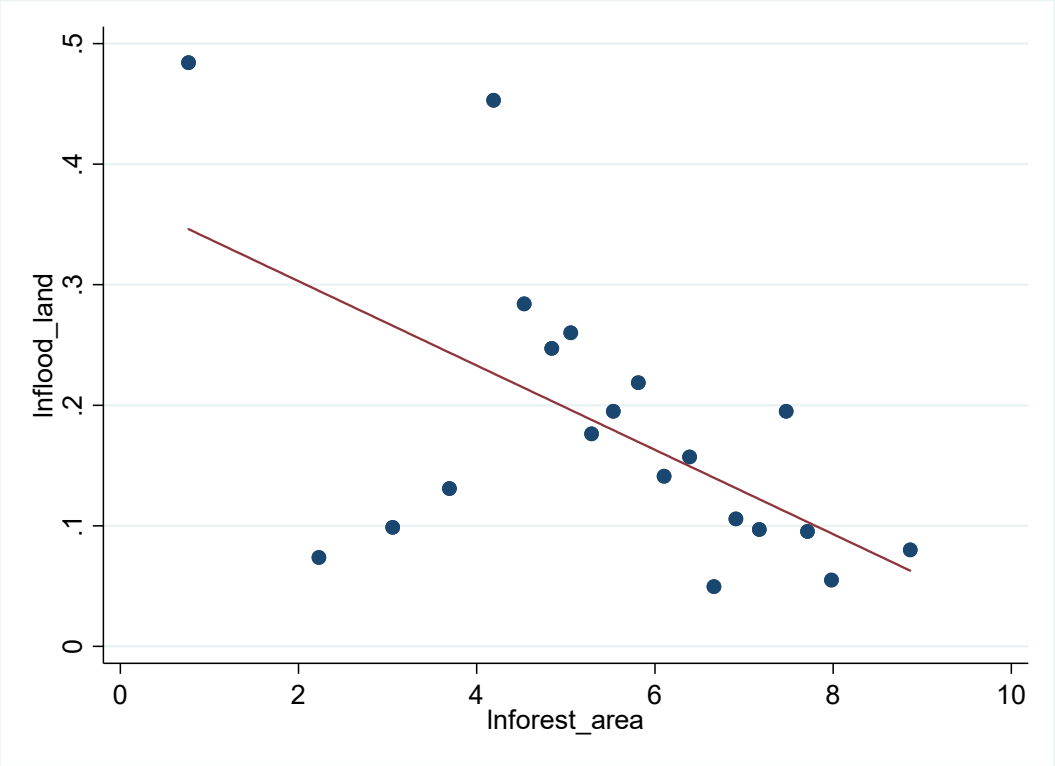
Notes: Left axis shows the volume of growing stock of forest and right axis shows the area of forest cover by hectare

[Figure 11] Rainfalls in Summer and Area Flooded



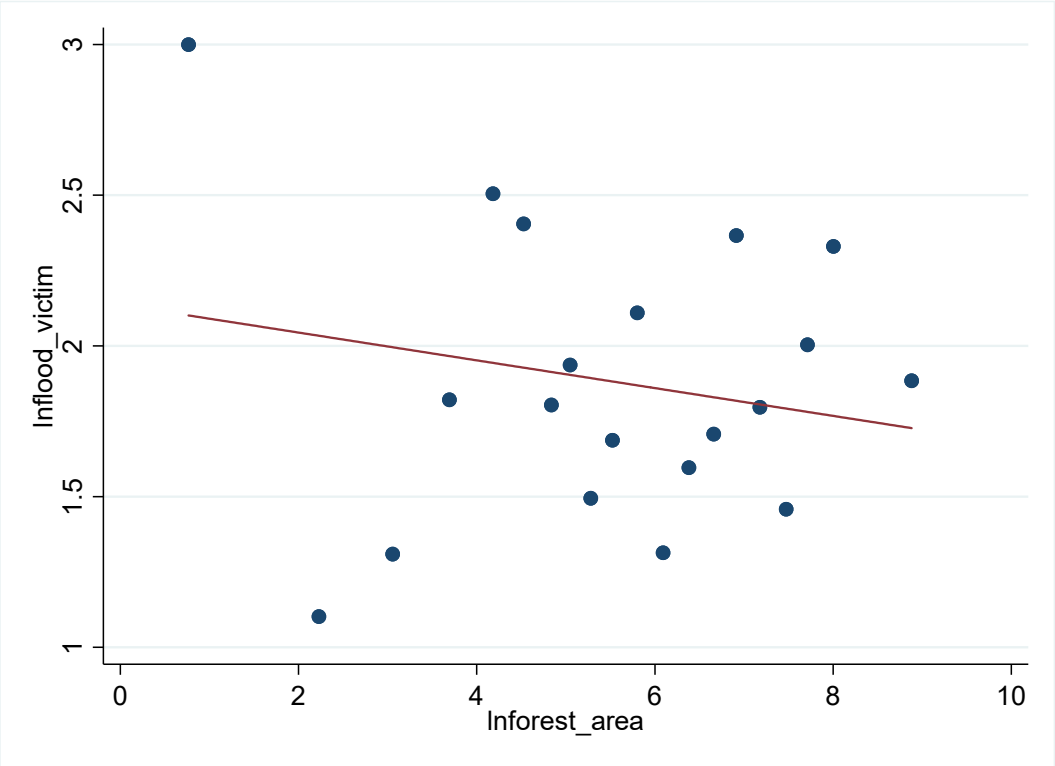
Notes: The graph shows the positive correlation between the rainfalls in summer and the area flooded. Left axis shows area flooded area and right axis shows the rainfall during the summer

[Figure 12] Volume of Growing Stock of Forest and Area Flooded



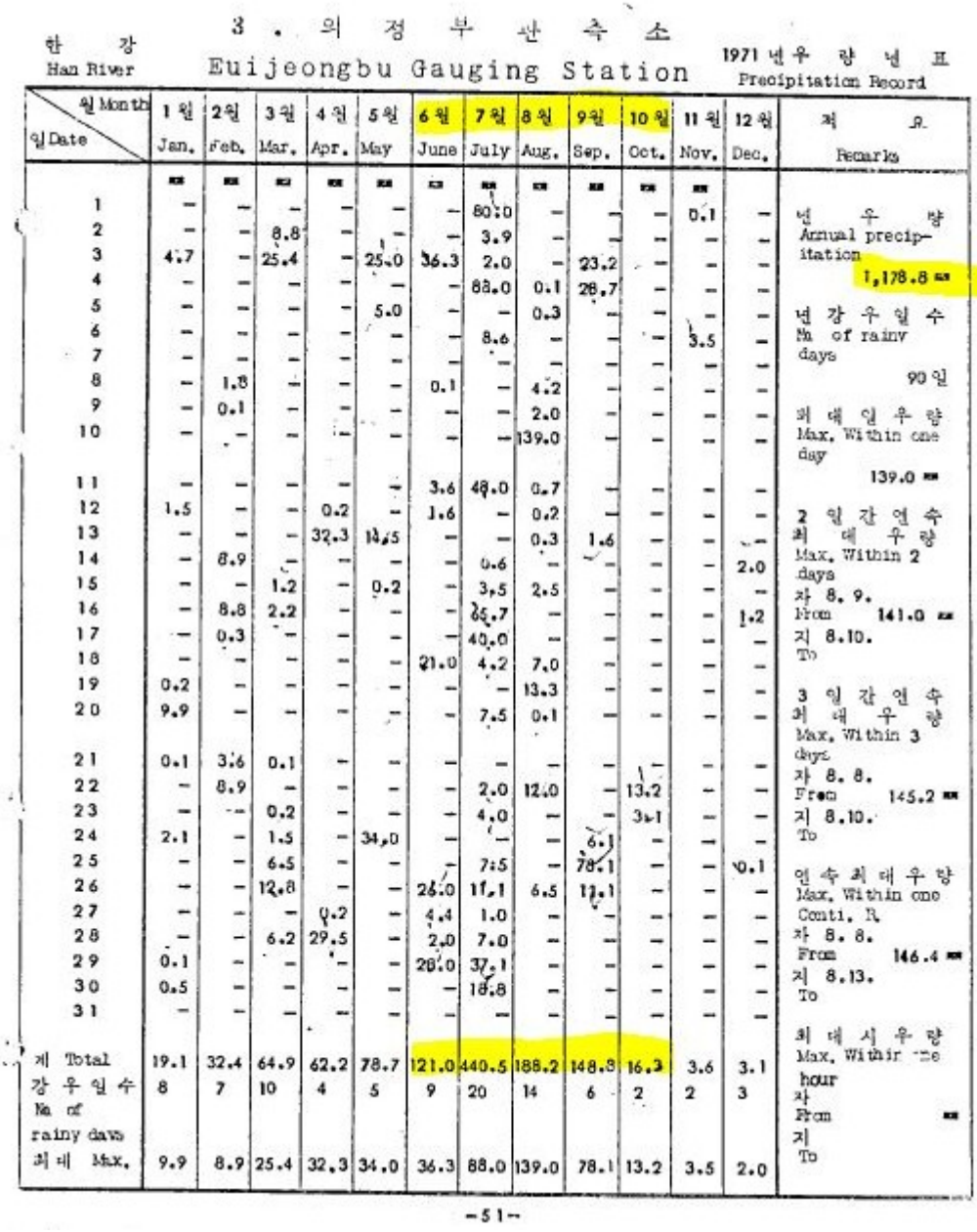
Notes: The graph shows the negative correlation between the growing volume of forest and the area flooded. Left axis shows area flooded area and right axis shows the growing volume of forest.

[Figure 13] Volume of Growing Stock of Forest and Number of Flood Victim



Notes: The graph shows the negative correlation between the growing volume of forest and the number of flood victim. Left axis shows the number of flood victim and right axis shows the growing volume of forest.

[Figure 14] Sample Precipitation Record from Hydrologic Statistical Yearbook



3. 의 정 부 관 측 소

한 강 Han River — Euijeongbu Gauging Station — 1971 년 우 량 년 표 Precipitation Record

월 Month / 일 Date	1월 Jan.	2월 Feb.	3월 Mar.	4월 Apr.	5월 May	6월 June	7월 July	8월 Aug.	9월 Sep.	10월 Oct.	11월 Nov.	12월 Dec.
1	–	–	–	–	–	–	80.0	–	–	–	0.1	–
2	–	–	8.8	–	–	–	3.9	–	–	–	–	–
3	4.7	–	25.4	–	25.0	36.3	2.0	–	23.2	–	–	–
4	–	–	–	–	–	–	88.0	0.1	28.7	–	–	–
5	–	–	–	–	5.0	–	–	0.3	–	–	–	–
6	–	–	–	–	–	–	8.6	–	–	–	3.5	–
7	–	–	–	–	–	–	–	–	–	–	–	–
8	–	1.8	–	–	–	0.1	–	4.2	–	–	–	–
9	–	0.1	–	–	–	–	–	2.0	–	–	–	–
10	–	–	–	–	–	–	–	139.0	–	–	–	–
11	–	–	–	–	–	3.6	48.0	0.7	–	–	–	–
12	1.5	–	–	0.2	–	1.6	–	0.2	–	–	–	–
13	–	–	–	32.3	14.5	–	–	0.3	1.6	–	–	–
14	–	8.9	–	–	–	–	0.6	–	–	–	–	2.0
15	–	–	1.2	–	0.2	–	3.5	2.5	–	–	–	–
16	–	8.8	2.2	–	–	–	35.7	–	–	–	–	1.2
17	–	0.3	–	–	–	–	40.0	–	–	–	–	–
18	–	–	–	–	–	21.0	4.2	7.0	–	–	–	–
19	0.2	–	–	–	–	–	–	13.3	–	–	–	–
20	9.9	–	–	–	–	–	7.5	0.1	–	–	–	–
21	0.1	3.6	0.1	–	–	–	–	–	–	–	–	–
22	–	8.9	–	–	–	–	2.0	12.0	–	13.2	–	–
23	–	–	0.2	–	–	–	4.0	–	–	3.1	–	–
24	2.1	–	1.5	–	34.0	–	–	–	6.1	–	–	–
25	–	–	6.5	–	–	–	7.5	–	78.1	–	–	0.1
26	–	–	12.8	–	–	26.0	11.1	6.5	11.1	–	–	–
27	–	–	–	0.2	–	4.4	1.0	–	–	–	–	–
28	–	–	6.2	29.5	–	2.0	7.0	–	–	–	–	–
29	0.1	–	–	–	–	28.0	37.1	–	–	–	–	–
30	0.5	–	–	–	–	–	18.8	–	–	–	–	–
31	–	–	–	–	–	–	–	–	–	–	–	–
계 Total	19.1	32.4	64.9	62.2	78.7	121.0	440.5	188.2	148.8	16.3	3.6	3.1
강 우 일 수 No. of rainy days	8	7	10	4	5	9	20	14	6	2	2	3
최 대 Max.	9.9	8.9	25.4	32.3	34.0	36.3	88.0	139.0	78.1	13.2	3.5	2.0

Remarks

년 우 량 Annual precipitation 1,178.8 ㎜

년 강 우 일 수 No. of rainy days 90 일

최 대 일 우 량 Max. Within one day 139.0 ㎜

2 일 간 연 속 최 대 우 량 Max. Within 2 days 141.0 ㎜ 자 8. 9. From 지 8.10. To

3 일 간 연 속 최 대 우 량 Max. Within 3 days 145.2 ㎜ 자 8. 8. From 지 8.10. To

연 속 최 대 우 량 Max. Within one Conti. R. 146.4 ㎜ 자 8. 8. From 지 8.13. To

최 대 시 우 량 Max. Within one hour ㎜ 자 From 지 To

-51-

[Figure 15] Sample of List and Address of Gauging Stations

2 · 수 위 관 측

Names and Locations of

번호 No	관측소명 Gauging Station	수계명 River System	하천명 Name of River	관측종별 Type of Recording	위치 Location			관측개시년월일 Beginning of observation
					지명 Location	동경 Longitude (LE)	북위 Latitude (QN)	
1	전 류	한 강 Han River	본 류	자 기	경기도김포군하성면	126°- 6′	37°- 42′	1956. 1
2	행 주	〃	〃	〃	경기도고양군지도면창천내리	126°-50′	37°- 35′	1916. 8
3	구용산	〃	〃	〃	서울용산구	127°-57′	37°- 31′	1958. 3
4	인도교	〃	〃	〃	서울영등포구	126°-58′	37°- 31′	1918. 8
5	뚝 도	〃	〃	보 통	서울성동구성수동	127°-03′	37°- 32′	1916. 9
6	광 장	〃	〃	자 기	서울성동구광장동	127°-07′	37°- 33′	1962. 2
7	관 당	〃	〃	보 통	경기도양주군와부면괄용동	127°-15′	37°- 30′	1962. 7
8	고 안	〃	〃	자 기	〃 〃 〃 능내리	127°-17′	37°- 32′	1914.11
9	용 인	〃	경안천	〃	〃 용인군용인면호리	-	-	1963. 1
10	양 평	〃	본 류	보 통	〃 양주군양평면양근리	127°-30′	37°- 29′	1953.11
11	여 주	〃	남한강	자 기	〃 여주군여주읍상리	127°-39′	37°- 18′	1913. 3
12	간 현	〃	섬진강	보 통	강원도원성군지정면간현리	127°-50′	37°- 32′	1962. 7
13	횡 성	〃	〃	〃	〃 횡성군횡성읍하리	128°-00′	37°- 30′	1962. 7
14	원 주	〃	원주천	〃	〃 원주시봉산동	127°-57′	37°- 22′	1962. 7
15	목 계	〃	본 류	〃	충북중원군엄정면목계리	127°-53′	37°- 05′	1917. 1
16	충(업)주	〃	〃	〃	〃 〃 금가면문산리	127°-55′	37°- 01′	1917. 6
17	충(율)주	〃	〃	보 통	〃 〃 동양면조동	128°-58′	37°- 00′	1966.11
18	단(업)양	〃	〃	〃	〃 단양군단양면외중만리	128°-17′	37°- 55′	1917. 6
19	단(율)양	〃	〃	〃	〃 〃 가곡면사평리	128°-23′	37°- 01′	1966.11
20	영(업)월	〃	〃	〃	강원도영월군영월읍	128°-19′	37°- 11′	1917. 6
21	영(율)월	〃	〃	자 기	〃 〃 하동면정양리	128°-31′	37°- 08′	1967.12
22	후 포	〃	주천강	보 통	〃 〃 서면	128°-19′	37°- 13′	1962. 7
23	주 천	〃	〃	〃	〃 〃 주천면신리	128°-13′	37°- 17′	1962. 7
24	평 창	〃	평창강	〃	〃 평창군평창면중리	128°-25′	37°- 21′	1958. 1
25	대 화	〃	〃	〃	〃 평창군대화면상안리	128°-25′	37°- 28′	1962. 7
26	거 운	〃	남한강	〃	〃 영월군영월읍거운리	128°-28′	37°- 10′	1962. 7

Chapter 3

The Impact of Female Leadership in Rural Development Project in Myanmar

3.1. Background

3.1.1. Motivation

The New Village Movement (Saemual Undong; SMU hereafter) was a comprehensive rural development movement initiated by the Korean government in 1970. The process of industrialization in the 1960s began to take a heavy toll on the nation, widening disparity between the rural-urban areas. Against a backdrop of growing rural-urban imbalance, the SMU aimed to reform rural and agricultural infrastructure. Many Koreans believed that the SMU played an important role in reducing poverty in Korea. According to a poll by Korea Gallup in 2010, the Korean public chose the SMU as the most important development policy in the nation's history. In fact, Korea's absolute poverty rate drastically decreased from 27.9% in 1970 to 10.8% in 1978.

Since the establishment of the 'Strategic Plan for the Saemaul Undong ODA Project', which was led by the Prime Minister's Office in 2011, the SMU ODA Projects have developed both qualitatively and quantitatively. In particular, the Korea International Cooperation Agency (KOICA) has promoted the project to build SMU pilot sites in more than 100 villages in developing countries. To provide capacity-building programs for the village leaders and villagers, comprehensive package-type programs for SMU ODA projects, such as construction of SMU training centers in villages, were also implemented. Currently, five Southeast Asian countries, Myanmar, Cambodia, Laos, Vietnam, and Nepal, are participating the SMU ODA projects. Among the five piloting countries, Myanmar Saemaul Undong Project is the largest with the total budget of around 20 billion Korean won for four years from 2015 to 2019. The

SMU ODA project is one of the representative aid models selected by the Korean government's 'Advancement Plan for International Development Cooperation'. Under the SMU ODA framework, and various programs, including infrastructure construction to strengthen the capacity of residents, have been implemented for past years. However, it should be noted that the scientific analysis of the impact and the specific implementation mechanism of the SMU has not been performed yet.

The characteristics of the SMU implementation mechanism can be explained in two ways. First, it applied a performance-based allocation of resources based on the results of each village and on increasing the rewards for villagers who have achieved excellent results through intra-group competition, maximizing efficiency by promoting inter-group cooperation. It has been proven by numerous studies that the inter-group competition reduces free-riding dilemma of public goods games and facilitates intra-group cooperation and coordination in various experimental environments and field trials (Bornstein and Ben-Yossef, 1994; Erev, Bornstein and Galili, 1993; Bornstein, Gneezy and Nagel, 2002). Following these field experiments, it is expected that villagers will attempt to maximize intra-village cooperation under the SMU's inter-village competition scheme. The second feature is the appointment of a female leaders in the process of promoting the SMU as well as the active participation of the village women, both of which significantly enhanced women's capacity and status in society. The Myanmar Saemaul Project is designed to utilize both of these two unique characteristics of the SMU of Korea.

3.1.2. Rural Community-Driven Development (CDD) Project in Myanmar

Myanmar, one of the poorest countries in East Asia and Oceania, has about 70% of its population concentrated in rural areas, where it evidently has most severe levels of poverty. The country is one of the least developed nations in Southeast Asia with the GDP per capita of

US$1,298 in 2017[10], and with 26.1% of the population living below the national poverty line[11].

After new president's inauguration, the Myanmar government implemented a variety of rural development and poverty alleviation policies, and the World Bank has launched a National Community-Driven Development (NCDD) project[12] to support these efforts. The main goal of the NCDD project is to build sustainable capacity building through local skill and experience transfer, so that village-level initiatives continue to deliver benefits to the local community even after the project fund has been terminated. The NCDD project, launched in October 2012, has been implemented throughout 3,000 villages of 15 townships[13] in Myanmar, and will be completed in 2019. The impact of the project is still under evaluation. Likewise, during the last decade, the CDD (Community-Driven Development) has been a key strategic project. That is true not only for many central governments, but also for international aid organizations, and among the developing partner countries, the case of Myanmar may well provide the ideal basis for gauging the effectiveness of the SMU. Myanmar has many commonalities with South Korea in the 1970s. Both countries faced colonial civil war experience and recognized the importance of the agriculture sector in the economic development. In such context, Myanmar has the potential to successfully replicate SMU through drawing key lessons and principles of Korean SMU mechanisms.

Inspired by the success stories of the Korean SMU, the Myanmar government requested the Korean government to share experiences and technical know-how. In 2012, the Korean and Myanmar government agreed to collaborate in the areas of rural development, under the title of the 'Myanmar SMU Project'[14]. The full-scale project got off the ground in December 2014 and has been implemented across 100 villages in nine states and regions, with the support of

[10] World Bank 2017, https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=MM
[11] Source: An Analysis of Poverty in Myanmar, 2016, World Bank
[12] The total budget of the NCDD is about 80 million US dollars
[13] Townships were selected for each of 14 regions and federal states, and federal territory
[14] The official title of the project has been changed from Myanmar SMU Project to Rural Community-Driven Development (CDD) Project in Myanmar in 2018.

the Korea International Cooperation Agency (KOICA) fund. The SMU focuses on building capacity, enhancing living conditions and income generation in the project villages to alleviate rural poverty and to provide a platform for rural development. For the implementation of the SMU project, the villagers themselves formulated a Village Development Plan (VDP) for the 2016 to 2017 fiscal years, in line with priority needs during the village general meetings. VDP encompassed three types of projects: Capacity Building project; Living Environment Improvement project; and Income Generation project.[15]

3.1.3. Village Committee for Rural CDD Project in Myanmar

The Rural CDD Project in Myanmar has four levels of committees for rural development project. As a representative body of the residents of village, the committee should manage all the components of the villages' projects responsibly. When the Committee convinces the purposes of sub-projects, members of the Committee elect a chairperson, a vice-chairperson, a secretary, and a head of sub-committee through the voting system. The Committee members shall be formed as shown in Figure 17. The functions of the committee vary, including approving and monitoring village projects, transparently managing funds for projects, writing minutes for all meetings related to the village projects, and reporting to the Ministry of Agriculture and Irrigation (MOAI) every month. The committee summarizes the main contents of the reports and releases it on the village notice board. In particular, for the case of a sub-committee for capacity building, the forms of training building report and visits to the advanced villages for learning exchange are prepared by female members. As shown in Table 17, among the sub-committees, the participation of female members in the capacity building field was the

[15] Through the capacity building component, village leaders and SMU committee members will receive training on leadership, financial literacy and agricultural techniques. In the improving living environment component, specific activities include road pavement, installation of a public water tank, and improving sewerage system. The objective of the income generation component is to achieve by increasing new businesses, agricultural production or fishery and livestock. The SMU village fund will support farmers with microcredit for income generation activities.

highest. In accordance with the government's guidelines for women to participate in the committee by 30% or more, women committee members participate in the committee's activities the same way as male committee members.

3.1.4. Competition-based rewarding principle of the SMU

One of the reasons for the difficulty in finding successful cases of community development in international society may be due to top-down implementation system that relies on aid agencies and governments, rather than development driven by local village members. In fact, it is difficult to induce villagers to have any kind of ownership of the village project by cultivating a spirit of self-help sprit to those who are suffering from poverty, sickness, and hunger in developing countries. According to Mansuri and Rao (2012), while the World Bank has invested 8.5 billion US dollars in Community-Driven Development or participatory projects over the past decade, the effects were inconsistent or did not persist after the conclusion of such projects. However, through the villager's cooperation, the SMU and village unit project tended to be maintained, and continued to be developed even after external factors has waned.

The SMU contributed greatly to the establishment of social infrastructure in the rural areas of Korea during the 1970s, and led to an increase in agricultural productivity as well as the income of farming households. The voluntary participation of residents participating in the SMU played a critical role in the rural development of the region, along with monitoring and support from the government. For the successful implementation of village projects, the government introduced a rewards scheme that showed the outstanding progress toward the village projects. Pursuant to the SMU reward scheme, all of the participating villages were grouped into three stages based on the degree of progress in each of the projects: 'Self-reliant village', 'Self-help village', and 'Basic village'. Once the village was designated as 'Self-reliant village', the financial resource support was differentiated according to the stage of

development of the village. The SMU emphasized the importance of competition as a principle for incentive reward principle at the community level, and it encourages a spirit of self-help among the residents. In the case of villages that were excluded from the allocation of financial resources as a result of an evaluation of their performance, they carried out village projects using their own resources. Korea's SMU has been evaluated as a model that contributes to the balanced and inclusive development of the Korean economy through the improvement of farmer's income, as well as the boost of agricultural productivity and the accumulation of social capital in rural areas during the period of rapid economic development.

3.1.5. Female leaders′ role in the SMU of Korea

To ensure the successful implementation of the project, the government has insisted on appointing both male and female leader of the SMU for each village. From a gender perspective, this policy was a major cultural innovation. It provided women the opportunity to be trained directly through government-provided leadership training programs. The prevailing Confucian norms had, up till now, assigned passive and submissive roles for women within the household, and left them with virtually no room to explore leadership roles in the public arena. However, unlike in the past, the elected and educated female leaders played a leading role in changing the perception of women in society by actively participating in village projects. By fostering trained female leaders, the social status of women has been enhanced by allowing them to carry out the public role at the village level. Since the 1960s, women’s level of education and participation in the labor force has steadily increased. However, women's increasing social, economic, and political participation did not necessarily translate to elevate their status. In particular, compared with other policies related to women, implementing new laws and policies involving women’s education has been stagnant for many years because educational ideology was heavily dominated by the patriarchal gender roles and stereotypes.

With this context, the educational opportunities and training programs offered to female leaders have proven to be very effective, as women were very eager to learn. After receiving leadership training, female leaders actively held regular meetings and delivered news related to the progress of the SMU (Yeo, 2015). The capacity building program for female leaders was one of the most significant factors for the success of the SMU. With respect to the role of women in the SMU, it is evident that female leaders were eager to be educated, seizing this opportunity to gain new knowledge. It is not easy to analyze how the training program and its impacts are linked to the achievements of the SMU, but it has been repeatedly confirmed in the essays written by the SMU leaders that the training of female leaders has certainly played a critical role (Kim, 2015, Yeo, 2015, Kim et al., 2013). In addition to the diverse types of infrastructural projects within the SMU, a number of supplementary campaign projects for the reform of daily life have taken place. Thus, the active participation of women was indispensable to widely spread the campaign projects. Women in rural areas have shouldered the responsibility of being the breadwinners of their homes even before the commencement of the SMU, and the socio-economic activities of female roles were expanded through the SMU. Although the attitudes of the villagers and men have not been changed fundamentally, the SMU shifted the traditional gender norms through the women's successful economic empowerment.

3.2. Literature Review

In a number of analyzed studies (Kim et al., 2013, Kim, 2013, Yeo, 2015, Jung et al., 2016), the factors of success and impacts of the SMU indicated that there were active female leaders in successful villages. There are previous studies that show the enhancement of women's rights through the SMU and the presence and active participation of female leaders contributing to overcome bias against women's social roles. Furthermore, there are studies on the relationship between women and development, and the effects of gender equality in leadership on other policy decisions are reported to be significant. The following literature review focus on strengthening women's capacity through regional development projects and the role model effects of female leaders.

3.2.1. Women's Empowerment in the Community Development

Evidence has shown mixed results on policy measures which promote women's involvement in regional development projects to encourage their active participation and increase the effectiveness of development projects. This paper reviewed the results of rural and regional development projects with focus on strengthening women's capacity. The National Solidarity Program, which took place in Afghanistan from 2006 to 2011, is an exemplary instance of the World Bank's CDD project, in which the proportion of women in the community development councils (CDCs) was mandated to a minimum of 35%, so that women's opinions and perspectives could be reflected in the CDCs' decision making process. This has resulted in a dramatic increase in women's participation at the local level. However, the question of whether the enhancement of women's participation has affected villagers' perceptions about the role of women in society and whether the increased participation of women in CDCs has encouraged women's participation at the local level remains uncertain, as evaluation studies have not been conducted (World Bank, 2014). The GoBifo Project, implemented in Sierra Leone from 2005

to 2010, required women to participate as village co-signers of community bank accounts managed by the village development committees to encourage women's participation in village meetings. After the conclusion of the program, the results showed no significant increase in the number of women speaking in village meetings, and found no evidence to prove the intended results (Casey et al., 2011). In the West Bengal Forestry Project in India from 1992 to 1998, women's participation in the Forest Protection Committee (FPC) was mandated by the 1991 government order in an attempt so secure gender equality in the management of industrial resources, but realized the need of greater efforts to raise the awareness of women's participation (World Bank, 1999). While some studies have shown that the measures to ensure women's participation are not as effective as its expectations, there are studies that show the effectiveness of the regional development program which has strengthened women through their participation. Women in the rural credit program in Bangladesh have significantly improved their decision-making capacity at home, and this program has contributed significantly to the economic stability and purchasing power of women (Syed et al., 1996). The study was conducted by setting eight indicators which measure women's empowerment.

Other than the measures of promoting women's participation in the community development projects, there are not many cases of specific targeted programs for women. Among those few projects, there were programs to strengthen the capacity of women in rural areas in Nepal (Acharya et al., 2005) and Nigeria (Yemisi et al., 2009). The regional literacy education program for rural women in Nepal contributed greatly to the reduction of the gender gap. The agricultural extension service which supports female farmers in Nigeria promoted the participation of women in rural development and also promoted the ownership of female farmer. Our study contributes to filling the knowledge gap as there were not many previous studies on the impact of expansion of women's participation in rural development projects in promoting the effectiveness of the project and to overcome gender roles and stereotypes.

3.2.2. The Role Model Impact of Female Leaders

There are numbers of Indian literature which point out the significance of female role models with India's natural randomized setting of compulsory quota system for women. Since the mid-1990s, India has implemented a policy of randomly assigning more than one-third of village council heads to women, and studies have been conducted on the effectiveness of quota policy for women. Beaman (2009) argues that an exposure to a female leaders effectively weakens stereotypes about gender roles and domestic spheres among the general public and eliminates negative bias prevalent among male villagers towards effectiveness of female leaders' leadership. As a legal and political means to resolve discrimination against women, the quota system is a provisional measure in which women are given priority under certain conditions to each some level of women's participation. This measure of increasing women's participation in local development is meaningful and effective in expanding representation, even though its effectiveness has not been fully proven.

3.3. Data and Research Questions

3.3.1. Survey Data

From January to February 2016, the baseline survey was conducted on the treatment group.[16] The impact evaluation lab of the KDI School and KOICA signed the MOU in March 2016, and agreed to carry out a rigorous impact evaluation study on Myanmar SMU project. The evaluation team confirmed the list of the controlled villages, and carried out a baseline survey by the local firm[17] in November 2016. The baseline survey took place in one hundred villages in Myanmar, and 5,496 households were randomly sampled from the total 18,456 households in the 100 treatment villages. The baseline survey consisted of several questions that could measure social capital including the demographics of each household. The midline survey was conducted from February 5th to April 11th in 2018. For midline survey, several questionnaires were added to examine the correlation between the presence of female leaders and the participation of villagers, the improvement of village residents' awareness towards female leaders, and the correlation between female leaders and village project outcomes. In addition to the midline survey, a separate survey for village chief, local government official, and SMU chairperson in controlled groups and treated groups, were conducted, respectively. Questions included effectiveness and participation of female leaders in village projects, involvement of village leaders in its projects, and the perceptions towards male and female leaders in general. For impact evaluation, 50 control villages were selected from the baseline survey and the same survey was conducted with the treated villages. The descriptive statistics of data for the analysis at the village-level is shown in Table 18 and in Table 18.

[16] The survey was conducted by Good Neighbors Myanmar
[17] Myanmar Survey Research (MSR)

3.3.2. Administrative Data

The first-year village evaluation was conducted in February 2017, one year after the project. Myanmar SMU encouraged villagers to efficiently manage the project by the competition-based reward policy. In the first year, 20,000 USD was equally provided to all the 100 treated SMU villages. However, in the subsequent years, different amounts were allocated based on each village's performance evaluation. The evaluation criteria were evaluated according to Myanmar SMU Project's three main objectives, which are capacity building, living environment, and income generation. The top 30% 'A' grade villages received additional 20,000 USD from the base 20,000 USD project grant, so the total amount of the grant was 40,000 USD. For the middle 50% 'B' grade villages, additional 10,000 USD bonus was provided from the base 20,000 USD, and for the lower 30% 'C' grade villages, no additional bonus was given and the villages, and they only received the base 20,000 USD project grant. Table 1 shows the incentives for each grade.

The evaluation for incentive is based on the result of both quantitative and qualitative evaluation. The qualitative evaluation is from officials of local government and central government and KOICA volunteers, and audit results are reflected in the evaluation. In the case of Capacity Building sub-committee, scores are given according to the number of meetings, committee members, training, trainees, visits, and of public relations. An evaluation criteria of the Capacity Building is shown in Table 28.

As described above, since the role of women leaders in SMU was a significant factor in the success of the village project, it was mandated that the number of female leaders should be at least 30% of the total number in the SMU Committee of Myanmar, which is a village-level organization responsible for implementing and coordinating village projects. Table 17 shows the number of female leaders and the composition in SMU committee in ten regions. The regions in which women took the position of chair or vice chair was very rare, and there were

only two regions that had female chairperson. The participation of female participation in sub-committee of capacity building, living environment and income generation, was quite significant, with approximately 30%. In Tanintharyi region, female participation rate was as high as 40%. Mandalay region had a relatively conservative committee which had no female members in the position of chair, vice chair and secretary.

3.3.3. Research Questions

From the midline survey and the administrative data on the village evaluation, as well as women's committee participation, this paper analyzed the following research questions:

(1) Does the presence of more women in leadership lead to better perception towards female leaders?

(2) Does the presence of more women in leadership lead to better development outcomes?

3.4. Empirical Model for Analysis

The analysis will be conducted using the above-mentioned baseline, midline survey data, women's committee composition information, and village evaluation data in 2017 and 2018. First, this paper investigated the correlation between the composition of village committee and performance of village projects by the following regression model. Compared to the villages that have received A, B, and C grades, the number of women in the committee on the grades has been investigated. Data from the midline survey for correlation analysis was also used for analysis. Using the survey results of the treated group and the controlled group collected through the midline survey, the Myanmar SMU project's effect on the participation of women and men in the village project and the role of women on carrying out the village project was investigated. In addition, it was possible to analyze how the active participation of women in treatment village sub-committees influenced village residents' perception towards leadership of women.

The correlation between perception towards female leadership as well as development outcome and proportion of women's committee members was examined by the following statistical regression model.

$$\boldsymbol{Y_i = \beta_0 + \beta_1 FemaleLeader_i + \theta X_i' + \varepsilon_i}$$

Using a linear regression, the outcome variable Y_i denotes a development outcome and perception on female leader in village i. $\mathrm{FemaleLeader}_{i,t}$ denotes the proportion of female leaders in the village committee, village i, which is the key explanatory variable. Control vector X_{it} includes observable explanatory factors including gender, religion, age, educational level, employment, length of residence and working as a farmer. $\varepsilon_i$is an error term. If the numbers of female leaders in the committee generated a positive effect on the village evaluation, the equation is expected to result in $'\beta_1 > 0'$.

3.5. Findings

The follow-up survey included questionnaires regarding residents of both treated and controlled villages that evaluated the performance of female and male leaders and perceptions toward male and female leaders.

The perception toward female and male leaders was measured by each question on a scale of numbers starting from 1 (negative) to 10 (positive). Overall, the residents from both treated and controlled villages had more positive perception for male leaders, rather than female leaders. This result was expected considering the social environment of Myanmar, where women's social participation is not active. However, the gap in positive perception was larger in the controlled villages, which was 1.13 points (8.20 vs. 7.07). The mean difference in the perception for male and female leaders was 0.85 points (9.04 vs. 8.19) in the treated villages. In the case of treated villages compared to controlled villages, the mean difference in the gap between male leaders and female leaders was reduced by about 0.3 points.

Through the analysis of the gathered household level data, we examined whether the participation of women leaders in the SMU committee brought changes in the overall performance and recognition of female leaders. As shown from Table 19 to Table 23, the correlation between the percentage of female members in the committee and the perception of female leaders have been analyzed. The result was statistically significant when controlled for a residents' religion, age, educational level, occupation and subjective trust. If the percentage of female leaders in the committee increased by one percentage point, the score increased by 0.163 points. Table 20 shows the correlation between the number of female leaders and the evaluation of the effectiveness of a female leader. The higher the female leaders ratio, the higher the evaluation rate of the effectiveness of female leaders. Thus, when the subjective trust among residents were higher, they positively evaluated the effectiveness of a female leader's performance.

Table 21 shows the results of analysis on the degree of participation of women leaders in the SMU committee on village evaluation. Since the total number of village committees in each village was different, analysis on the correlation between the percentage of female committee members in the SMU committee and the ranking of the villages have been made. Statistically significant positive correlation have been found as the result of the analysis.

The highly rated villages in 2017 were also mostly highly rated in 2018, so the analysis controlled the ranking in 2017. When controlling the results of village evaluation in 2017, the results of the 2018 evaluation had positive correlation with the percentage of women's committee participation, and a rise in the proportion of women by 1 percentage point led to a rise to 0.44 in the village evaluation ranking.

Table 26 shows a statistically significant correlation between the number on the female members in the SMU committee and the village evaluation. When the number of female members of committee increased, the increase in ranking was estimated to increase by about 3, when the ranking from 2017 was controlled. This indicated the participation of women in village projects having a positive role in the success of the village project.

3.5.1 Robustness Check

It is found that the number of female leaders was positively correlated with the improvement of perception toward female leader and the evaluation of female leader’s performance. To confirm the robustness of this result, the falsification test was conducted to investigate the correlation between the number of female leader and evaluation for the male leaders’ performance, and there was no statistically significant correlation. This result can be interpreted as an evidence for supporting the main result.

3.6. Conclusion

The Rural CDD Project in Myanmar is a large-scale ODA project which reflects Korea's experience in rural development, and it is conducted through three-step surveys, starting with the baseline survey for rigorous impact evaluation. Considering that women's participation in the Korean SMU played a significant role in the success of the project, the Rural CDD Project in Myanmar encouraged the participation of women in the formation of village committees. As a result, up to 60% of the female villagers participated in the committee. Some questionnaires were added to the midline survey to investigate the impact of women's active involvement in the village project and the correlation with village evaluation was also examined.

The results of the analysis showed that there is a positive correlation between the participation of women in the committee and perception towards female leadership, and there also is a positive correlation between participation of women in the committee and village performance. Further analysis was conducted with reference to the results of previous studies which suggest that women empowerment had a positive impact on health and education indicators, although it was somewhat difficult to look at the development outcome at the end of the project.

The rate of female leaders in the committee positively influenced the subjective well-being of the villagers, but there was no statistically significant correlation with the days of illness and the school enrollment rate of middle school students, which were selected as the proxy variables in health and education. Even though it showed no correlation with the days of illness and the enrollment rate of students, it is likely to show positive correlations to these health indicators in the future long term research depending on our findings on the perception of the female leaders and village evaluation. Other research reports analyzing the impact on women empowerment were the results of an analysis of the impacts of the project since the project lasted more than seven to ten years. In the case of the Myanmar project, the results of the

analysis of this study are encouraging, considering that the project has not been completed yet, and the duration of the project implementation is less than five years.

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[Table 16] Incentive System of Rural Community-Driven Development Project in Myanmar

Year	Grade	Amount	Number of villages	Total amount
2016		USD 20,000	100	USD 2,000,000
2017	A	USD 40,000	30	USD 1,200,000
	B	USD 30,000	40	USD 1,200,000
	C	USD 20,000	30	USD 600,000
2018	A	USD 40,000	30	USD 1,200,000
	B	USD 30,000	40	USD 1,200,000
	C	USD 20,000	30	USD 600,000
2019	A	USD 20,000	30	USD 600,000
	B	USD 10,000	40	USD 400,000
	C	0	30	0
Total				USD 9,000,000

[Table 17] Number of Female Leaders in the Committee

Region	Total Number of Members in SMU Committee	Number of Female Leaders in the Committee								Proportion of Female Leaders in SMU Committee (%)
		Chair	Vice Chair	Secretary	CB	LE	IG	Audit	Total	
NayPyiTaw	524	1	2	5	48	32	56	26	170	32.44
Shan	130	0	5	1	11	4	10	8	39	30.00
Mandalay	117	0	0	0	10	5	7	5	27	23.08
Sagaing	145	0	0	1	18	5	14	10	48	33.10
Ayeyarwady	119	0	0	2	11	5	9	7	34	28.57
Bago	65	0	0	0	5	1	4	7	17	26.15
Yangon	112	0	0	0	11	1	13	7	32	28.57
Mon	62	0	0	1	9	6	2	1	19	30.65
Tanintharyi	65	0	1	2	6	3	5	9	26	40.00
Rakhine	55	0	0	2	6	3	7	3	21	38.18
Total	1394	1	8	14	135	65	127	83	433	31.06

Note: CB means capacity building, LE means living environment and IG means income generation.

[Table 18] Descriptive Statistics of Data (Village-level)

Variables	Obs	Mean	Std. Dev.	Min.	Max
· Villages	100	61.23	5.48	46.06	69.79
· Ranking of village evaluation in 2017	100	50.48	29.02	1	100
· Ranking of village evaluation in 2018	100	50.49	29.01	1	100
· Proportion of female leaders in SMU committee	100	24.96	11.19	0	60
· Numbers of female leaders in SMU committee	100	3.22	1.50	0	7
· Female household head	100	46.92	3.73	34.78	56.85
· Married household head	100	0.59	0.17	0.08	0.93
· Length of residency (year)	100	40.40	5.21	26.31	53.41
· Household head with at least secondary education	100	40.40	5.21	26.31	53.41
· Household head employed	100	0.33	0.19	0.02	0.87
· Subjective trust	100	4.65	0.51	0	5

[Table 19] Correlation between Number of Female Leaders in SMU Committee and Perception towards Female Leaders (1)

Positive Feelings towards FL	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Proportion of female leader	0.157*** (0.01)	0.157*** (0.01)	0.159*** (0.01)	0.157*** (0.01)	0.157*** (0.00)	0.160*** (0.01)	0.157*** (0.01)	0.159*** (0.01)	0.155*** (0.00)	0.163*** (0.00)
Female		-0.001 (0.03)								0.029 (0.03)
Buddhist			-0.230*** (0.07)							-0.241** (0.07)
Age				0.000 (0.00)						0.002 (0.00)
Secondary education					-0.052 (0.03)					-0.060* (0.03)
Employed						0.116*** (0.06)				0.125*** (0.03)
Length of residence							-0.000 (0.00)			-0.002 (0.00)
Farmer								0.066* (0.07)		0.045 (0.07)
Subjective trust									0.082*** (0.04)	0.079*** (0.04)
Observations	5,585	5,585	5,585	5,585	5,585	5,585	5,585	5,585	5,585	5,585
R-squared	0.025	0.025	0.026	0.025	0.025	0.028	0.025	0.025	0.028	0.035

Notes: The numbers in parentheses are standard errors. * p<0.05, ** p<0.01, *** p<0.001

[Table 20] Correlation between Number of Female Leaders in the Committee and Perception towards Female Leaders (2)

Effectiveness of female leader	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Proportion of female leader	0.111*** (0.01)	0.111*** (0.01)	0.112*** (0.01)	0.111*** (0.01)	0.112*** (0.00)	0.114*** (0.01)	0.112*** (0.01)	0.114*** (0.01)	0.110*** (0.00)	0.117*** (0.00)
Female		-0.001 (0.03)								0.028 (0.03)
Buddhist			-0.073 (0.06)							-0.085 (0.08)
Age				0.000 (0.00)						0.002 (0.00)
Secondary education					-0.052 (0.03)					-0.059 (0.03)
Employed						0.077** (0.02)				0.070* (0.02)
Length of residence							-0.000 (0.00)			-0.002 (0.00)
Farmer								0.067** (0.07)		0.084* (0.02)
Subjective trust									0.063*** (0.01)	0.084*** (0.01)
Observations	4,771	4,771	4,771	4,771	4,771	4,771	4,771	4,771	4,771	4,771
R-squared	0.012	0.012	0.013	0.012	0.013	0.014	0.012	0.014	0.016	0.020

Notes: The numbers in parentheses are standard errors. * p<0.05, ** p<0.01, *** p<0.001

[Table 21] Correlation between Number of Female Leaders in the Committee and Perception towards Female Leaders (3)

Participation of female leader	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Proportion of female leader	0.136*** (0.01)	0.136*** (0.01)	0.137*** (0.01)	0.136*** (0.01)	0.136*** (0.01)	0.139*** (0.00)	0.137*** (0.01)	0.138*** (0.01)	0.134*** (0.01)	0.141*** (0.01)
Female		0.002 (0.03)								0.034 (0.02)
Buddhist			-0.142 (0.06)							-0.148 (0.08)
Age				0.001 (0.00)						0.004* (0.00)
Secondary education					-0.024 (0.03)					-0.027 (0.03)
Employed						0.097*** (0.03)				0.109*** (0.03)
Length of residence							-0.001 (0.00)			-0.003* (0.00)
Farmer								0.050 (0.03)		0.032 (0.03)
Subjective trust									0.063*** (0.02)	0.076*** (0.02)
Observations	4,870	4,870	4,870	4,870	4,870	4,870	4,870	4,870	4,870	4,870
R-squared	0.018	0.018	0.019	0.019	0.019	0.021	0.019	0.019	0.022	0.026

Notes: The numbers in parentheses are standard errors. * p<0.05, ** p<0.01, *** p<0.001

[Table 22] Correlation between Number of Female Leaders in the Committee and Subjective Wellbeing

Subjective wellbeing	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Proportion of female leader	0.065*** (0.01)	0.068*** (0.00)	0.065*** (0.00)	0.065*** (0.00)	0.065*** (0.00)	0.067*** (0.01)	0.067*** (0.00)	0.067*** (0.00)	0.064*** (0.01)	0.072*** (0.01)
Female		-0.094*** (0.03)								-0.071** (0.03)
Buddhist			-0.069 (0.08)							-0.073 (0.07)
Age				-0.001 (0.00)						0.001 (0.00)
Secondary education					0.033 (0.03)					0.003 (0.03)
Employed						0.061* (0.03)				0.024 (0.03)
Length of residence							-0.002* (0.00)			-0.002* (0.00)
Farmer								0.073* (0.03)		0.051 (0.03)
Subjective Trust									0.029 (0.02)	0.027 (0.02)
Observations	5,585	5,585	5,585	5,585	5,585	5,585	5,585	5,585	5,585	5,585
R-squared	0.004	0.006	0.004	0.004	0.005	0.005	0.005	0.005	0.004	0.008

Notes: The numbers in parentheses are standard errors. * p<0.05, ** p<0.01, *** p<0.001.

[Table 23] Impact of Female Leadership on Villagers' Perception

	(1)	(2)
	Dependent variable: Positive Feelings on Female Leader	
Proportion of female leader	0.029*** (0.01)	0.043*** (0.01)
Basic Controls	No	Yes
Observations	100	100
	Dependent variable: Effectiveness of Female Leader	
Proportion of female leader	0.067** (0.02)	0.094*** (0.02)
Basic Controls	No	Yes
Observations	100	100
	Dependent variable: Participation of Female Leader	
Proportion of female leader	0.047** (0.02)	0.061*** (0.02)
Basic Controls	No	Yes
Observations	100	100

Notes: The numbers in parentheses are standard errors. * p<0.05, ** p<0.01, *** p<0.001. Basic controls include (i) gender; (ii) religion; (iii) age; (iv) educational level; (v) employment; (vi) length of residence; (vii) working as a farmer and (viii) subjective trust.

[Table 24] Robustness Check with Villagers' Perception on Male Leadership

	(1)	(2)
	Dependent variable: Positive Feelings on Male Leader	
Proportion of female leader	0.005	0.029
	(0.02)	(0.02)
Basic Controls	No	Yes
Observations	100	100
	Dependent variable: Effectiveness of Male Leader	
Proportion of female leader	-0.000	0.063
	(0.04)	(0.04)
Basic Controls	No	Yes
Observations	100	100
	Dependent variable: Participation of Male Leader	
Proportion of female leader	-0.003	0.065
	(0.06)	(0.06)
Basic Controls	No	Yes
Observations	100	100

Notes: The numbers in parentheses are standard errors. * p<0.05, ** p<0.01, *** p<0.001. Basic controls include (i) gender; (ii) religion; (iii) age; (iv) educational level; (v) employment; (vi) length of residence; (vii) working as a farmer and (viii) subjective trust.

[Table 25] Correlation between the Number of Female Leaders in SMU Committee and Village Evaluation (1)

Second year's ranking in evaluation	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
When the proportion of female leaders increased by 10%	4.82* (0.20)	5.06* (0.20)	4.13* (0.20)	5.06* (0.20)	4.82* (0.20)	4.44* (0.20)
First year's ranking in evaluation	0.64*** (0.08)	0.64*** (0.08)	0.63*** (0.08)	0.64*** (0.08)	0.64*** (0.08)	0.64*** (0.08)
Education level of household head		-0.26 (0.43)				-0.35 (0.43)
Employed household head			-18.71 (11.83)			-18.63 (11.93)
Length of residence				-0.26 (0.43)		0.00 (.)
Subjective trust					-6.08 (4.25)	-5.59 (4.25)
Observations	100	100	100	100	100	100
R-squared	0.435	0.438	0.450	0.438	0.447	0.463

Notes: The numbers in parentheses are standard errors. * p<0.05, ** p<0.01, *** p<0.001.

[Table 26] Correlation Between the Number of Female Leaders in SMU Committee and Village Evaluation (2)

Second year's ranking in evaluation	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Number of female leader	2.99*	3.11*	2.53	3.11*	3.07*	2.78
	(1.49)	(0.52)	(1.50)	(1.52)	(1.49)	(1.51)
First year's ranking in evaluation	0.64***	0.64***	0.63***	0.64***	0.63***	0.63*
	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
Education level of household head		-0.21				-0.32
		(0.44)				(0.43)
Employed household head			-20.47			-20.21
			(11.81)			(11.94)
Length of residence				-0.20		0.00
				(0.44)		(.)
Subjective trust					-6.41	-5.84
					(4.29)	(4.28)
Observations	100	100	100	100	100	100
R-squared	0.425	0.426	0.442	0.426	0.438	0.456

Notes: The numbers within the parentheses are standard errors. * p<0.05, ** p<0.01, *** p<0.001.

[Table 27] Impact of Female Leadership on Development Outcomes

	(1)	(2)
	Dependent variable: Positive Feelings on Male Leader	
Proportion of female leader	0.005 (0.02)	0.029 (0.02)
Basic Controls	No	Yes
Observations	100	100
	Dependent variable: Effectiveness of Male Leader	
Proportion of female leader	-0.000 (0.04)	0.063 (0.04)
Basic Controls	No	Yes
Observations	100	100
	Dependent variable: Participation of Male Leader	
Proportion of female leader	-0.003 (0.06)	0.065 (0.06)
Basic Controls	No	Yes
Observations	100	100

Note: Basic controls include (i) gender; (ii) religion; (iii) age; (iv) educational level; (v) employment; (vi) length of residence; (vii) working as a farmer. The middle school enrollment rate is measure from scale from 0 to 5, from none, very few, less than half, about half of children, most children, and all children. The numbers within the parentheses are standard errors. * $p<0.05$, ** $p<0.01$, *** $p<0.001$

[Table 28] Evaluation Criteria and Scoring for Village Project

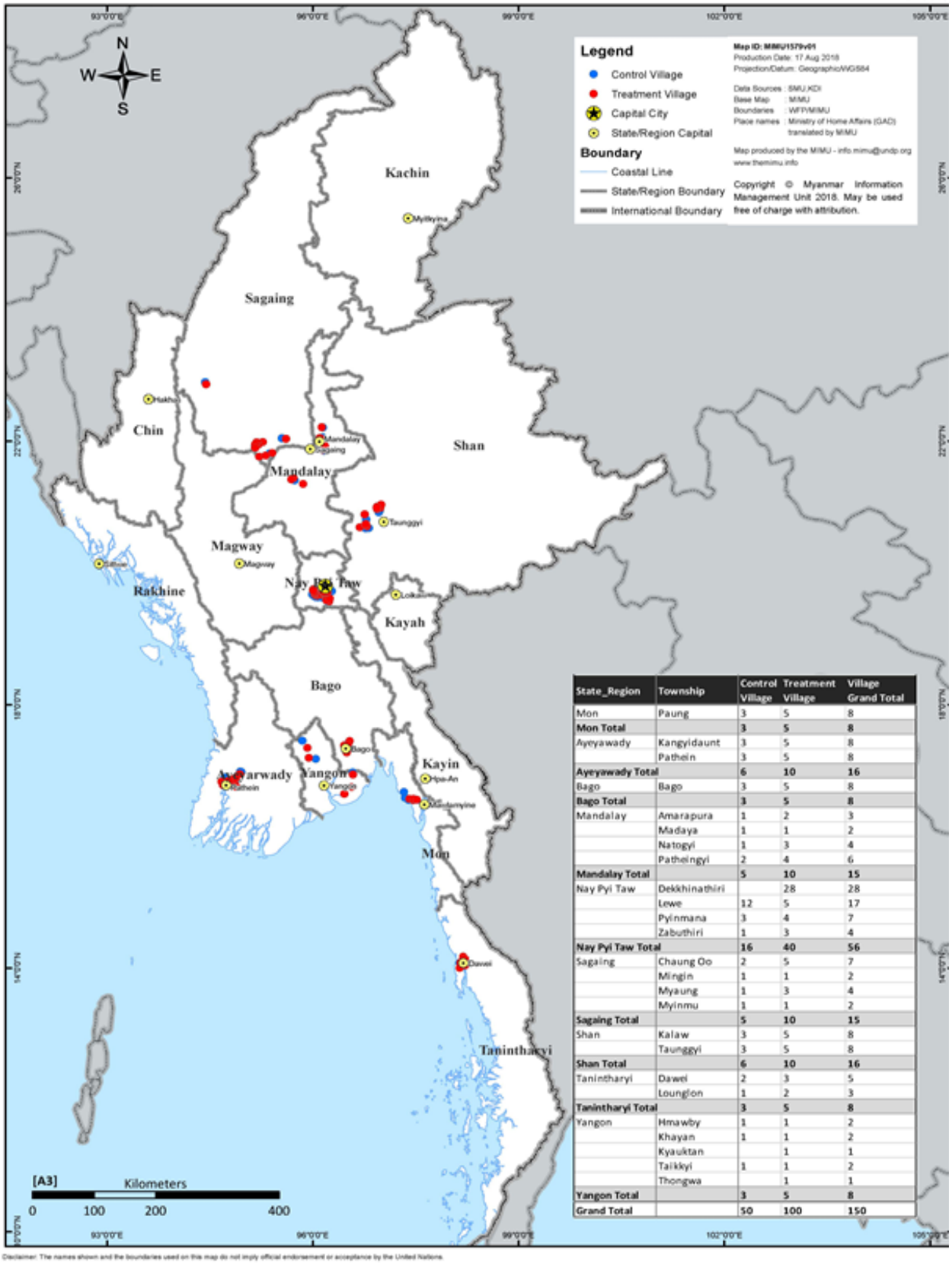
1) Capacity building (by Region/State)

_____ State/Region, _____ Township, _____Village

No.	Evaluation criteria	Detailed explanation of scoring	Score given
(1)	No. of meeting	Meeting may be held 10-20 times per year Scoring up to 10 meetings = 10 11-15 meetings = 15 16-20 meetings = 20 Total score 10-20	
(2)	No. of technical/ educational training	Training may be conducted 1-10 times per year Scoring 1-2 training = 10 3-5 training = 15 6-10 training = 20 Total score 10- 20	
(3)	No. of trainee	Villagers attended in various trainings in a year (5-50) Scoring 5- 15 = 10 16- 30 = 15 31- 50 = 20 Total score 10-20	
(4)	No. of villagers visit to other advance villages	Villagers may visit to other advance villages to learn technology know–how (5-50) Scoring 5- 15 = 10 16- 30 = 15 31- 50 = 20 Total score 10-20	
(5)	No. of public information on project movement	No. of publicity by means of leaf let, pamphlet, radio, TV and speech etc. (5-10) Scoring 1- 5 = 10 6- 10 = 15 > 10 = 20 Total score 10-20	
		Grand Total score 50 - 100	

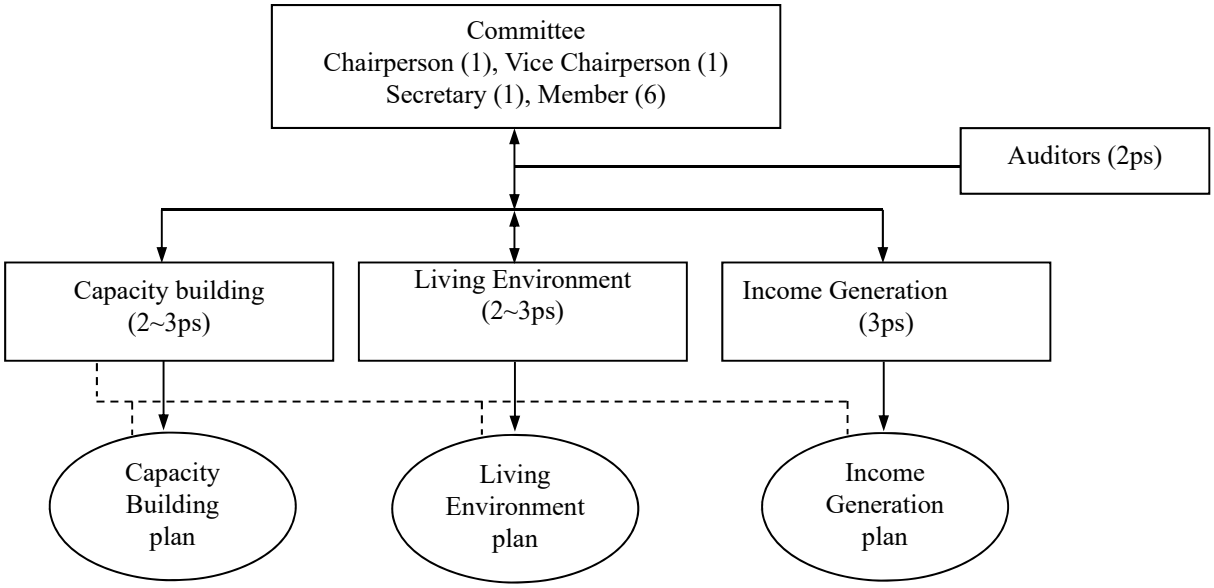
Source: Master Plan Report for Rural CDD Project in Myanmar, KOICA, 2016

[Figure 16] Survey Areas of Rural Community-Driven Development Project in Myanmar



State_Region	Township	Control Village	Treatment Village	Village Grand Total
Mon	Paung	3	5	8
Mon Total		**3**	**5**	**8**
Ayeyawady	Kangyidaunt	3	5	8
	Pathein	3	5	8
Ayeyawady Total		**6**	**10**	**16**
Bago	Bago	3	5	8
Bago Total		**3**	**5**	**8**
Mandalay	Amarapura	1	2	3
	Madaya	1	1	2
	Natogyi	1	3	4
	Patheingyi	2	4	6
Mandalay Total		**5**	**10**	**15**
Nay Pyi Taw	Dekkhinathiri		28	28
	Lewe	12	5	17
	Pyinmana	3	4	7
	Zabuthiri	1	3	4
Nay Pyi Taw Total		**16**	**40**	**56**
Sagaing	Chaung Oo	2	5	7
	Mingin	1	1	2
	Myaung	1	3	4
	Myinmu	1	1	2
Sagaing Total		**5**	**10**	**15**
Shan	Kalaw	3	5	8
	Taunggyi	3	5	8
Shan Total		**6**	**10**	**16**
Tanintharyi	Dawei	2	3	5
	Lounglon	1	2	3
Tanintharyi Total		**3**	**5**	**8**
Yangon	Hmawby	1	1	2
	Khayan	1	1	2
	Kyauktan		1	1
	Taikkyi	1	1	2
	Thongwa		1	1
Yangon Total		**3**	**5**	**8**
Grand Total		**50**	**100**	**150**

[Figure 17] Composition of the Committee



Source: Master Plan Report for Rural CDD Project in Myanmar, KOICA, 2016