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2013 Modularization of Korea's Development Experience:

Agricultural Extension System in Korea: Lessons from 1962 to 1997

2014

RDA RURAL DEVELOPMENT ADMINISTRATION

HYUPSUNG UNIVERSITY

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Preface

The study of Korea's economic and social transformation offers a unique window of opportunity to better understand the factors that drive development. Within one generation, Korea had transformed itself from a poor agrarian society to a modern industrial nation, a feat never seen before. What makes Korea's experience unique is that its rapid economic development was relatively broad-based, meaning that the fruits of Korea's rapid growth were shared by many. The challenge of course is unlocking the secrets behind Korea's rapid and broad-based development, which can offer invaluable insights, lessons and knowledge that can be shared with the rest of the international community.

Recognizing this, the Korean Ministry of Strategy and Finance (MOSF) and the Korea Development Institute (KDI) launched the Knowledge Sharing Program (KSP) in 2004 to share Korea's development experience and to assist its developing country partners. The body of work presented in this volume is part of a greater initiative launched in 2007 to systematically research and document Korea's development experience and to deliver standardized content as case studies. The goal of this undertaking is to offer a deeper and wider understanding of Korea's development experience in hopes that Korea's past can offer lessons for developing countries in search of sustainable and broad-based development. In furtherance of the plan to modularize 100 cases by 2012, this year's effort builds on the 20 case studies completed in 2010, 40 cases in 2011, and 41 cases in 2012. Building on the past three year's endeavor that saw publication of 101 reports, here we present 18 new studies that explore various development-oriented themes such as industrialization, energy, human capital development, government administration, Information and Communication Technology (ICT), agricultural development, and land development and environment.

In presenting these new studies, I would like to express my gratitude to all those involved in this great undertaking. It was their hard work and commitment that made this possible. Foremost, I would like to thank the Ministry of Strategy and Finance for their encouragement and full support of this project. I especially would like to thank KSP Executive Committee, composed of related ministries/departments, and the various Korean research institutes, for their involvement and the invaluable role they played in bringing this project together. I would also like to thank all the former public officials and senior practitioners for lending their time and keen insights and expertise in preparation of the case studies.

Indeed, the successful completion of the case studies was made possible by the dedicated efforts of the researchers from the public sector and academia involved in conducting the studies, which I believe will go a long way in advancing knowledge on not only Korea's own development but also development in general. Lastly, I would like to express my gratitude to Professors Kye Woo Lee, Jinsoo Lee, Taejong Kim and Changyong Choi for their stewardship of this enterprise, and to the Development Research Team for their hard work and dedication in successfully managing and completing this project.

As always, the views and opinions expressed by the authors in the body of work presented here do not necessary represent those of the KDI School of Public Policy and Management.

April 2014

Joon-Kyung Kim

President

KDI School of Public Policy and Management

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Abbreviation

AES	Agricultural Extension System / Services
IAI	Institute of Agricultural Improvement
IAT	Institute of Agriculture
ICA	International Cooperation Agency, USA
KREI	Korea Rural Economy Institute
MOAF	Ministry of Agriculture and Forestry
MOEP	Ministry of Economic Planning
NACF	National Agricultural Cooperatives Federation
NIAT	National Institute of Agriculture
RDA	Rural Development Administration
PRDA	Provincial Rural Development Administration
RGO	Rural Guidance Office

Summary

The purpose of this report is to share the successful lessons and experiences of agricultural technology development and the Agriculture Extension System (AES) in Korea with many developing countries. This report analyzes and explains the cases of the Rural Development Administration (RDA) that is responsible for Korean AES, especially focusing on food crops.

This report consists largely of six chapters. Chapter 1 describes the goal of RDA in terms of increased agricultural yields and farm household income. Chapter 2 discusses the background of RDA establishment and briefly reviews the AES types in other countries. Chapter 3 deals with implementation systems and strategies of RDA to promote the dissemination of agricultural technology and agricultural education and training. Chapter 4 discusses the contents and performance of AES that were implemented by RDA focused primarily on food crops. Chapter 5 reviewed eight selected success factors of Korean AES. Successful factors of Korean AES. Finally, Chapter 6 discusses implications and considerations that should be kept in mind when applying the results of Korean AES to other developing countries. The key points in each chapter are in the following.

Chapter 1. Goals and Performance of Agricultural Extension System

During as early as the 1950s, Korea was basically an agricultural country where the agricultural population was nearly 60% of the whole population and agriculture contributed to 30% of the GDP. However, Korea was still a poor country importing approximately 10% of its grains from the US. In 1962, the income of farm households was on average just 266 US dollars. Thus, the key goal of the development of agriculture and rural areas

was inevitably to increase the competitive power of agriculture necessary for an increased rate of rice self-sufficiency, as well as the farm household income. Initially, Korean AES introduced the American style cooperative system of AES, but it was not suitable with the conditions and environment of Korea, leading to some confusion and disorder. Eventually, in 1962, based on the "Rural Development Law" whose purpose was to let a single leading organization implement research and development of agricultural technology as well as AES, RDA was established and still exists.

Over the past half century, Korean agriculture was improved to a considerable extent. The productivity of rice, the primary food grain, was just 2.33 tons/ha during the 1960s, but is over 5 tons/ha these days, exceeding the self-sufficiency level. The productivity of other food crops was tremendously increased as well. Although agricultural household income on average is still 70% of that of an urban household, it is continuously increasing.

It can be concluded that the contribution of AES to the development of agriculture and rural areas was tremendous. As of today in Korea, a system has been successfully established so that any rural people can receive consultation and advice in agricultural technology. In addition, one of the great outcomes or performance was increased credibility toward agricultural extension organizations as a result of the processes of diffusing new technologies and educating and training agricultural people.

Chapter 2. Background of and Necessity for Agricultural Extension System

Chapter 2 describes the background of the establishment in 1962 of RDA. There was comprehensive discussions about unifying the diverse and scattered agricultural extension programs carried out by several organizations, which was ignited by and mainly based on the 'Macy Report', funded from ICA. In the discussions, two alternatives entered into competition: establishing an AES bureau within the MOAF and establishing an independent administrative organization in charge of AES. Eventually, the latter minority alternative was adopted and the "Rural Development Law" was enacted, establishing the present RDA.

As compared to AES in other countries, it can be said that Korean AES takes the form of government supported system. A major characteristic is that a single organization, RDA, had dual functions, that is, the function of R&D of agricultural technology, and the function of providing agricultural extension services. Also, officials in RDA are kept from doing some other work that is not contained in the "Rural Development Law", helping the extension workers achieving specialization, as well as being absorbed fully in their own job, which is extension services.

Chapter 3. Strategic Plan and System

In Chapter 3 five major strategies and the implementation system of RDA are fully discussed.

First, AES is implemented based on the "Rural Development Law". To implement AES nationally, the law prescribes a few points: i) public organizations and agencies that could implement extension projects should cooperate closely with RDA, ii) local AES organizations are under the control of governors or mayors, the law permitted the administrator of RDA to have personnel management power, and iii) to protect the specialization of officials, the extension workforce were not allowed to do the work that was not contained in the law.

Second, reflecting on the chronic needs, there were changes in the organizational structure where primary foci were slightly different. In a larger sense, there were three distinct periods separated by the corresponding focus and goal: the era of increased food crops until the 1970s, the era of increased income during the 1980s, and the era of development of plural functions of agriculture and rural areas during the 1990s. Nonetheless, i) R&D and AES functions were done by a single organization, ii) from the central to local level, agricultural extension organizations were established as being separated from general administrative bodies, and iii) cooperation with related organization such as NACF, agriculture colleges, or others have continued.

Third, in order to increase the efficiency of AES personnel management, i) national-position officials were placed in RGOs and the right of personnel management belonged to the administrator of RDA;ii) "Regulation on Specialization of Extension Personnel" was enacted to reinforce the specialization of AES workforce, forcing the workforce to have at least one or more special major areas, and iii) on-the-job training and education for the AES workforce were reinforced. Especially, on-the-job training was divided into basic training, special training, and intermittent training. The total number of trainees, from 1962 to 1991 was as many as 64,291 workers.

Fourth, in order to achieve the objectives of AES and build support for the policies, the contents related to government policy were reflected in the training curricula. Also, there were on-site extension visits and various publicity/public relations activities implemented.

Finally, the budget for AES was arranged by the MOAF in the earlier stages, independent budgeting was permitted later.

Chapter 4. Overview and Schedule of Agricultural Technology Dissemination

In this chapter, the contents and methods of technology dissemination are analyzed and discussed for every ten years they were implemented by Korean AES since 1960. Food crops technology is the main focus of this chapter because the range of agricultural technology in AES is very wide. However, it should be noted that the method of implementing AES is the same as with the other crops.

Implementation of AES was one of the means of diffusing agricultural technology. The demonstration project is a method of AES with multi-purposes such as research&experiment of newly developed agricultural technology, adoption of new technology from agricultural people, and field training in the demonstration complexes. RDA implemented AES using such methods as the result demonstration plots, demonstration complexes, method demonstration, field workshop, and appraisal fair for the diffusion of new varieties and farming technology, the diffusion of soil management&fertilizer improvement technology, monitoring disease and insect and its control technology, and agricultural mechanization.

The residential extension worker approach was used for the pilot project to increase agricultural household income in the 1970s. Extension workers lived in the village and developed the activities of community development such as resource development, operating demonstration field and promoting the farmers organization. The system contributed to the change in attitude of the rural people, increase in the agricultural productivity and farm household income, and improvement of quality of life in rural areas.

One of the emphasized projects by AES was farmers' education and training. It was divided into intensive instruction in the winter and summer, and year round training and consultation by period. There were also rural leaders' training, fostering learning groups (4-H Club, Korean Association of Rural Leaders), professional specialty education for each crop and agricultural machinery to cope with technology demand and its change over time. The farmer's training during the winter season was especially implemented to target every farmers. Therefore, they could get information on changes in agriculture policy, farming trends by crops, trends in product price and forecasting consumptions, and in establishing the farming plan for the next year.

Meanwhile, to increase the effectiveness of the farmer's education and training various media were used complexly. Most of the media were produced autonomously by establishing facilities that can produce printed materials(leaflet etc.) and audiovisual materials(movies, slides and video materials). There were also activities cooperating with external institutions such as public TV lectures on farming, agricultural broadcasting of

TV and radio, newspapers and magazines. The regular agricultural broadcasting program by National TVs and radio in particular was an excellent example of mobilizing every national resource for increased food grain production. Recently, the Internet has helped deliver consultation and technology diffusion. The technology of applying IT to farming technology is also being developed.

However, AES was not always successful. The problem of specialty on technology of the extension worker who focused on rice cultivating technology was suggested by the farmers as agriculture was becoming more diversified. RDA coped with the problem by preparing various coping mechanisms such as reinforcing on-the-job training of extension workers, legislating and operating "Regulation on Specialization of Extension Personnel", long-term dispatch of local extension workers to research institutes and organizing autonomous learning groups among extension workers.

There was case of failure because of an accident cause by the weather in implementing the pilot project. However, they used it as a source of demand on developing new technology(for example, developing an anti-coldness barley variety) and learned a lesson on implementing the pilot project based on the results of the research&experiment in advance.

The curriculum for farmer's training was organized by taking into consideration previous downward approaches that proved ineffective. For example, the method of identifying the number of people who wanted training was revamped where prior demand forecast was made and the education was applied to those agricultural people who indeed wanted it.

Chapter 5. Analysis of Success Factors

The successful factors of achieving self-sufficiency in food crops by establishing an independent AES and implementing technology diffusion to agricultural people are various in Korea, which at one time used to import the staple crop rice from other countries and adopted foreign AES. There are eight successful factors of Korean AES extracted and discussed in this report.

i) Earlier, AES was implemented in a disordered way from several administrative institutions and organizations. Then it was changed so that it was implemented by a single organization, RDA, as the "Rural Development Law" was enacted. The national goal of achieving rice self-sufficiency was possible by receiving prior approval to implement AES from other institutions.

ii) The AES was effective by performing functions of agricultural technology R&D and an agricultural extension system under one authority of RDA. The technology that can be suggested for the policies in agriculture and farming can readily be determined

by evaluating the research projects. About two thousand cases, 13% of total whole research projects .during the 1970s and the 1980s, were applied to the agricultural policies and agricultural technologies that were to be disseminated.

iii) The projects were implemented by setting a goal responding to the changing times and technology demand of the rural people. The contents and methods of R&D and agricultural extension system were implemented by being connected organically, according to the directions of implementing the national agricultural policy.

iv) Above all, the education and training of the extension workforce and rural people was emphasized. Although a government organization is in charge of AES, Korea's AES is an activity of diffusing technology based on educational processes and curricula. Although new agricultural technologies are developed, it is hard to disseminate without knowledge and a change in attitude by the agricultural people who accept them and strengthen the capabilities of extension workers who transmit them.

v) Various media were used considering the characteristics of the agricultural people in technology transfer and educational training for agricultural people. In particular, the national broadcast stations contributed to the diffusion of the agricultural technology information by airing a regular program on such matters. This would be an example case that a developing country can use if there are not enough resources.

vi) The effects of new agricultural technology were proven by the pilot projects and chose the method of diffusion. The case of failure to diffuse without a testing period of adapting to the region in the 1970s when having tried to diffuse the new variety of rice, was an opportunity to realize the importance of the pilot project. The trust of the agricultural people on extension organizations and personnel was increased by respecting the adopters than suppliers in the technology transfer.

vii) Korea's agricultural productivity improved rapidly because the business related to agricultural input factors such as fertilizer and agricultural chemicals developed together. It was possible to increase agricultural people's income by supporting price policy on the agricultural products from the government during the period of protectionism.

viii) Finally, the agricultural people trusted the extension organizations and personnel. This was possible because extension workers devoted themselves and the quality of technologies that was researched and developed was high.

Yet the problems stemming from Korea's changing AES are factors that should be prepared in advance in developing country. Professionalism in the screening procedure for extension workforce is the first problem. Extension personnel who didn't have basic

knowledge of agricultural technology were being selected but discrimination of academic ability and specialty was disappearing in Korea's recruiting system for officials. There is a limit on educating technology standards of specialized agriculture, although they can develop their basic agricultural technology and knowledge by on-the-job training. Next, after the AES was decentralized in 1997 there were many difficulties in implementing an integrated AES nationally. The developing countries should recognize Korea's experience and how it led to large regional differences in the growth of AES because of the conditions and individual traits of the directors of local governments.

Chapter 6. Implications for Developing Countries

AES is a method of policy intervention that can be developed autonomously according to the situations of each country. American-style AES was adopted in the 1950s. As was the Korean case of American-style AES, it would not be easy to tell if Korean AES would be successful in developing countries. Therefore, to apply the Korean experience of AES to developing countries, one should look at two important points.

First, in countries that want to boost AES or make a fresh start, it can be effective in reducing the national budgets for AES to apply Korea's model of an organizational system. When the function of research and extension is divided, the indirect costs for mutual coordination and cooperation of two functions might be increased and human and material resources cannot be used in an integrated way to solve the field problems and develop leading technologies.

The second applicability might be the case of developing countries where there already exists AES in any form. Countries where the functions of research and extension are divided would find it hard to effectively achieve if the two functions are performed in an integrated way over a short time period without financial support. Therefore, it is recommended that each successful factor of the Korea case be applied. This way, the developing countries could expand the means of achieving their own unique goals corresponding to their unique situations. Accordingly, it would be important to place relatively higher importance on the regional pilot projects, and educational training of extension workers and agricultural people.

2013 Modularization of Korea's Development Experience
Agricultural Extension System in Korea:
Lessons from 1962 to 1997

Chapter 1

Goals and Performance of Agricultural Extension System

1. Historical Background of Establishment of Agricultural Extension System (AES)
2. Objectives versus performance at the Time of RDA establishment
3. Contribution to Economic and Social Development in Korea

Goals and Performance of Agricultural Extension System[1]

1. Historical Background of Establishment of Agricultural Extension System (AES)

The establishment of the AES is in line with changes in Korean agricultural policies ever since 1945 when Korea was free from Japanese rule. The objectives of Korean agricultural policies have changed over the years. But R&D of agricultural technology and the extension system became active when Rural Development Administration (RDA), as an independent governmental organization, was founded in 1962. Since then, they maintained a close organic relationship with the objectives of carrying out Korean agricultural policies. In this section, we review the background of establishing AES in terms of the situations that Korean agriculture and rural areas confronted at that time.

1.1. The Agriculture and Rural Area Situation

In 1945 when Korea was set free from Japanese rule, agriculture was the most important industry as the agricultural population was higher than 70 percent. Nonetheless, primarily due to the lower productivity in agriculture, most people were poor and hungry, especially in the spring, leading to social anxiety and turmoil. Because of a chronic shortage of crops and life hardships resulting especially from tremendous inflation in 1947 (crop 9.4 times, fabrics 55 times, metal 26 times, architectural materials 68 times, fertilizers 38 times, as compared to the price levels of 1945), the US Military Administration Office then had

1. In this report, because the government policy prescribes the AES to be decentralized, we reviewed the agricultural extension system/services during 1962~1997. Although AES covers comprehensive issues on agriculture, horticulture, sericulture, livestock, improvement of living conditions, we focused primarily on the agricultural extension services on food crops.

to control the supply of crops through a 'decree-law on rice collection' in January 1946. For this reason, the utmost priority of economic policy was to overcome inflation and to stabilize the supply of crops.

Since then due to the devastation of the Korean War for almost three years, most of the agricultural infrastructure was severely damaged or completely broken down. Thus, the Korean government planned and implemented various agricultural policies, such as the 'five year plan to increase rice and barley(1953~57)', 'five year plan to revive livestock(1953~57)', 'five year plan on anti-erosion(1953~57)'. However, due to adverse weather conditions and/or shortage of technology and investment, they were not as successful as expected.

On the other hand, in order to achieve the objective of overcoming the impact of accumulated inflation and recovering economic growth, it was necessary to control the price of grains which at that time constituted the most significant proportion of price indices. To achieve such an objective, as shown in <Table 1-1>, as much as 300~400 thousand tons per year from 1956 to 1964 of grain, raw cottons and wheat were imported from the US, the monetary value of which amounted to as much as 47.554 million dollars on average annually. As compared to domestic production, imported grains were about 20% in 1957 and 1963, and approximately 10% in other years. The import of US agricultural surpluses contributed to reducing the food shortage, preventing fiscal inflation by using 80% of sales for the defense budget, and saving 30 million dollars per year that would have been spent on imports from commercial trade. But it also brought about some negative impacts such as deteriorated economic conditions of farm households, as well as drastic reduction in production of wheat and raw cottons that were not price-competitive. However, the experience of relying on the import to solve the food shortage problem was an important lesson that helped Korea realize the importance of self-sufficiency in primary grains.

Table 1-1 | Amount of Grains Imported and Produced

(Unit: 1,000 M/T, %)

	Domestic Production (A)	Imported by PL 480 (B)	Imported by MSA 402 (C)	B/A	(B+C)/A
1956	3,503	238	199	6.8	12.5
1957	3,906	299	478	7.7	20.0
1958	4,224	695	91	16.5	18.6
1959	4,288	89	107	2.1	4.6
1960	4,248	342	-	8.1	8.1
1961	4,925	407	112	8.3	10.5
1962	4,524	483	-	10.7	10.7
1963	4,440	1,014	-	22.8	22.8
1964	6,232	601	-	9.6	9.6

Source: MOAF (1964, 1965), Grain Statistics Yearbook. Recited from MOAF (1999: 33).

Since liberation from Japan, the composition ratio of the first industry and the number of farm households have continuously decreased to 32.9% and 58.3% respectively as of 1960. Korea was one of the poorest countries with agriculture as its main industry and GNP per capital was at US$81 (see, <Table 1-2> and <Table1-3>). Food security policy was the top priority that needed to be solved.

Table 1-2 | Composition of Gross National Product by Sector

(Unit: %)

	Agriculture	Manufacture	Services	GNP
1948	44.1	11.8	44.1	100.0
1950	39.0	7.9	53.1	100.0
1955	40.3	15.1	44.6	100.0
1960	32.9	18.7	48.4	100.0

*Based on current market prices.

Source: Bank of Korea (1965), National Income. Recited from KREI (1989: 8).

Table 1-3 | Number of Population and Farmers (1949~1960)

(Unit: thousand, %)

	Total Population (A)	No. of Farmers (B)	B/A
1949	20,167	14,416	71.5
1955	21,502	13,300	61.9
1958	23,611	13,750	58.2
1960	24,989	14,559	58.3

Source: Ministry of Economic Planning (1965), Economic Statistics Yearbook, recited from KREI (1989: 8).

1.2. The Situation of AES

Since 1945, AES in Korea has changed several times. The first organization was the Institute of Agricultural Improvement (IAI) based on the US Military Administrative Office's Executive Order No. 260. In 1948 as the Korean government was founded, IAI became the Institute of Agricultural Technology (IAT), which was reorganized after the Korean War(1950~1953). Since then the National Institute of Agricultural Technology (1956), under the Ministry of Agriculture and Forestry (MOAF), performed the agricultural extension services. In 1957, based on the report by H. Macy, Dean of College of Agriculture at the University of Minnesota, the Institute of Agriculture (IA) was established.

Even after the establishment of IA, however, the dissemination of agricultural technology was undertaken by, in addition to IA, each bureau of MOAF and industry bureau/division at the province/city level. The Committee for Community Development and various cooperatives implemented several extension programs for technology dissemination, rural life improvements, and model projects of good communities (MOAF,1999: Vol.1-706). There was conflict between the centralized traditional administrative style and the democratic, educational style based on the American way of thinking. Thus, the result of agricultural R&D could not be diffused directly to agricultural fields, which brought about some confusion among the farmers, leading to lower credibility in governmental organizations (RDA, 2009: Vol. 11-292).

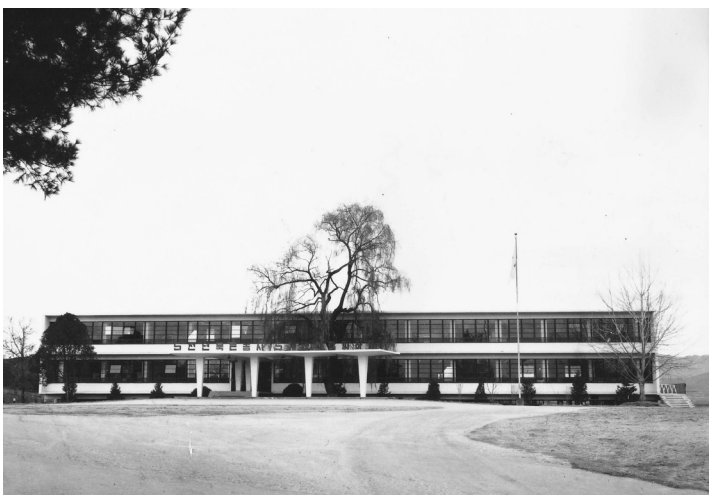
The pluralism of agricultural technology dissemination system and the conflict in the way of extension services produced confusion and inefficiency in agricultural development and the modernization of rural areas. Thus, it was imperative to develop ways to deal with such problems.

2. Objectives versus Performance at the Time of RDA Establishment

2.1. The Objectives at the Time of Establishment

In 1962 RDA, headquarters of Korean agricultural extension services was established. The primary goal was to efficiently promote national policies for agricultural development. There was a need to solve the problem of the American agricultural extension style while seeking a way to provide stable food supply for the whole population.

Reflecting on the chronic problems, the 1st clause of the Rural Development Law defines the purpose of the agency as "endeavoring to increase the wellbeing of rural people through R&D, extension services, diffusion of technology, and corresponding leadership training." That is, the purpose of AES lies in R&D and diffusion of agricultural technology, as well as in increasing yields per hectare. The objective of wellbeing of the rural people can be defined in terms of an increased level of farm income.



Front view of RDA main building in 1962. Slogan was written as "Let's solve 5,000 years of agricultural problems within five years!"

Source: RDA(2003).

<Table 1-4> shows agricultural area and production from 1951 to 1961. During this time period, except in 1957, the production of rice increased steadily even though the production was just about 2.33 tons per ha. In the case of other crops, the production increased but their absolute level was far behind today's standard. As of 1961 production was as follows; sort of barley 1.13 tons, mixed grains 0.47 tons, pulse crops 0.57 tons, and potatoes 2.31 tons, respectively. The production levels were similar to those of most of today's developing countries.

<Table 1-5> shows the income level of farm households during the 1960s. The income and debt of farm households increased over the years and the debt to income ratio was approximately 7%. Applying the 1962 exchange rate of KRW255 per US dollar, the income per household was 266 dollars and the debt per household just 18.6 dollars.

Table 1-4 | Agricultural Production and Yields in the 1950s

(Unit: ha, M/T, MT/ha)

		1951	1953	1955	1957	1959	1961
Rice	Area	922,760.9	1,077,980.4	1,098,165.3	15,737,682	1,122,462.8	1,137,484.0
	Production	1,588,895	1,979,036	2,172,128	2,203,275	2,324,345	2,646,402
	Yields	1.72	1.84	1.98	0.14	2.07	2.33
Sort of Barley	Area	683,665.0	882,651.2	916,014.3	1,003,588.9	947,852.3	969,769.2
	Production	426,072	721,287	762,924	725,010	1,012,296	1,094,756
	Yields	0.62	0.82	0.83	0.72	1.07	1.13
Mixed Grain	Area	285,080.8	180,470.9	221,079.6	214,893.4	217,108.6	205,036.4
	Production	99,483	86,202	92,416	82,721	86,935	96,965
	Yields	0.35	0.48	0.42	0.38	0.40	0.47
Pulse Crops	Area	289,309.5	290,273.6	313,963.6	320,775.5	316,404.2	341,268.8
	Production	134,156	165,128	172,876	177,241	162,067	194,944
	Yields	0.46	0.57	0.55	0.55	0.51	0.57
Potatoes	Area	80,132.5	92,200.3	91,709.9	104,772.2	100,440.7	110,197.1
	Production	132,745	225,904	219,818	197,127	199,850	254,748
	Yields	1.66	2.45	2.40	1.88	1.99	2.31

Source: Statistics Korea, National Statistics Yearbook (http://kosis.kr).

*Some data using Korean unit is converted to M/T by multiplying 0.14.

*Sort of barley includes hulled barley, naked barley, barley for brewing, wheat and rye. Pulse crops include bean, red bean and mung bean. Potatoes and sweet potatoes are included in potatoes.

Table 1-5 | Income and Debt of Farm Household in 1960s

(Unit: KRW)

	1962	1963	1964	1965	1966	1967	1968	1969	1970
Income (A)	67,885	93,179	125,692	112,201	130,176	149,470	178,959	217,874	255,804
Debt (B)	4,751	6,669	7,575	10,570	9,986	11,432	13,996	12,518	15,913
(B/A), %	7.0	7.2	6.0	9.4	7.7	7.6	7.8	5.7	6.2

Source: Statistics Korea, Agricultural Economic Survey (http://kosis.kr).

2.2. Objective versus Performance

As Korea's economic growth continued, the proportion of agriculture in the national economy kept decreasing. As <Table 1-6> indicates, the number of farm households over the total households was 53.4% in 1960, 27.1% in 1980, 15.5% in 1990, and currently just 6.7%. The percentage of farmers over the whole population drastically decreased as well: 57% in 1960, but just 6.3% in 2010.

Table 1-6 | Changes of Farm Household and Farmers Number

(Unit: person, household, %)

	Total Population (A)	No. of Household (B)	No. of Farmers (C)	No. of Farm Household(D)	C/A	D/B
1960	24,989,241	4,370,599	14,242,489	2,331,874	56.99	53.35
1970	30,882,386	5,863,440	14,421,730	2,483,318	46.70	42.35
1975	34,706,620	6,761,239	13,244,021	2,379,058	38.16	35.19
1980	37,436,315	7,969,201	10,826,508	2,157,555	28.92	27.07
1985	40,448,486	9,571,361	8,521,073	1,925,769	21.07	20.12
1990	43,410,899	11,354,540	6,661,322	1,768,501	15.34	15.58
1995	44,608,726	12,958,181	4,851,080	1,502,171	10.87	11.59
2000	46,136,101	14,311,807	4,031,065	1,383,468	8.74	9.67
2005	47,278,951	15,988,274	3,433,573	1,272,908	7.26	7.96
2010	48,580,293	17,574,067	3,062,956	1,177,318	6.30	6.70

Source: Statistics Korea, Population Census (http://kosis.kr).

Due to the change in consumption pattern resulting from economic growth, production indices varied among crops. <Table 1-7> indicates production indices of production items as of 2010. Rice, the primary food, increased steadily over the years despite a small variation, while mixed grains, pulses, and potatoes decreased continually. Livestock increased till 2000 but decreased thereafter. Special crops increased till 1985 but decreased thereafter. On the other hand, vegetables, fruits, and flowers increased drastically.

Change in production indices among crops resulting from such changes as the consumption pattern of people brought about changes in R&D and the diffusion of agricultural technology. More emphasis was placed on food safety and health after 2000. The focus shifted to increasing the income of farm households and satisfying consumer needs through high-quality agricultural products.

Table 1-7 | Agricultural Production Index

(as of 2010)

	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010
Rice	78.2	88.0	104.3	79.3	125.6	125.2	104.8	118.1	106.5	95.9
Barley	1,373.6	1,466.1	1,492	684.6	470.1	338.4	226.6	128.3	156.6	87.5
Mixed Grain	297.3	302.6	220.4	346.6	302.5	268.5	178.0	135.7	145.7	97.5
Pulse	158.9	214.6	276.7	207.2	214.4	210.4	146.8	102.6	149.8	85.0
Potatoes	344.1	271.0	259.3	154.8	141.0	83.2	96.0	112.2	120.3	99.9
Vegetables	15.6	23.7	46.3	69.8	76.1	78.6	113.3	122.5	114.7	96.8
Greens&Fruit	15.6	28.7	28.7	59.8	52.9	43.8	90.0	104.8	111.8	101.0
Fruits	8.2	11.7	18.9	30.8	55.8	63.9	81.7	92.9	100.8	96.3
Special Crops	24.5	67.5	129.3	90.8	206.4	205.0	176.6	158.6	121.1	110.5
Flowers	0.0	0.0	0.0	0.0	0.0	16.6	27.8	60.6	135.8	113.4
Livestock	23.0	39.1	99.6	64.2	128.4	72.7	180.4	392.2	157.2	107.5

Source: MOAF, Agricultural Production Index (http://Kosis.kr).

This phenomenon is closely related to the consumption of each crops and meats per capita, shown in <Table 1-8>. According to <Table 1-8>, the production of rice, the traditional primary grain for food, goes beyond the level of self-sufficiency while the per capita consumption keeps decreasing. On the other hand, while meats, vegetables, fruits continued to increase, the level of self-sufficiency remained at just 70%. One thing to note here is the achievement of self-sufficiency for rice. Until the 1960s, Korea imported rice from the US. In the 1970s, as a result of the green revolution, agricultural technology was advanced owing to R&D and AES so that rice was self-supported in Korea.

Table 1-8 | Trends of Production and Consumption of Agriculture and Livestock Stuffs

(Unit: 1,000M/T, %, Kg)

		1997	2000	2003	2006	2009	2012
Rice	Production	5,323	5,263	4,927	4,768	4,843	4,224
	Ratio of self-sufficiency	105.0	102.9	97.4	98.5	101.1	86.1
	Consumption per person	102.4	93.6	83.2	78.8	74.0	69.8
Vegetables	Production	9,806	11,282	10,068	9,994	9,889	7,166
	Consumption per person	148.2	165.9	152.6	153.8	152.5	-
Fruits	Production	2,452	2,429	2,275	2,504	2,881	2,374
	Consumption per person	58.0	58.4	55.8	62.2	67.7	61.8
Beef	Production	237.0	214.0	142.0	158.0	198.0	234.0
	Ratio of self-sufficiency	62.9	52.8	36.3	47.9	50.0	48.2
	Consumption per person	7.9	8.5	8.1	6.8	8.1	9.7
Other Meats	Ratio of self-sufficiency	83.8	78.8	70.8	72.2	73.5	69.2
	Consumption per person	29.3	31.9	33.4	33.6	36.8	40.5

Source: MOAF, Major Statistics on Agriculture and Forestry.

Despite the decline in agricultural population and land, R&D of agricultural technology and its diffusion, directed toward stabilizing the food supply, led to the tremendous development of production technology, which resulted in increased yields. As shown in <Table 1-9>, the yields of major food crops, as compared to 1960, increased as follows: rice was 1.7 times, corn 3 times, potato 2 times or higher, leading to a stable supply of foods.

Table 1-9 | Yields Change of the Major Crops

(Unit: M/T)

	Rice	Barley	Maize	Bean	Potato	Sweet Potato
1975	3.83	3.23	1.72	1.13	12.80	20.65
1980	2.88	3.59	4.36	1.15	11.93	20.05
1985	4.55	3.91	5.04	1.50	18.49	23.50
1990	4.51	3.90	4.61	1.53	17.57	22.76
1995	4.45	4.74	4.25	1.52	23.74	20.45
2000	4.93	3.38	4.06	1.31	23.95	21.36

Source: MOAF, Major Statistics on Agriculture and Forestry.

Income of farm households increased steadily. Until the 1980s, it was higher than the average urban household income. In terms of nominal income, the average annual rate of increase was 11.6% from 1990 to 1994, 5.0% from 1994 to 1997, -13% from 1997 to 1998 during the foreign currency crisis, and 6.0% from 1999 to 2004. Nonetheless, due to the opening of the domestic agricultural market precipitated by the UR, WTO, and other restructured world trade system, the gap between urban and farm household income is growing wider and wider. <Table 1-11> shows the components of household income and their changes over time. Non-farm income, while having fluctuated to some extent, at the end of the 1990s, was about 30% of total income. The proportion of production cost within gross income from agriculture increased gradually to 30% after 1985.

Table 1-10 | Changing Trends of Farm Household Income

(Unit: 1,000 KRW, %)

	1975	1980	1985	1990	1995	2000	2005	2010
Income of Farm Household (A)	873	2,693	5,736	11,026	21,803	23,072	30,503	32,121
% of (A) Compare to Urban Household	111.1	95.9	112.8	97.4	95.1	80.6	78.2	66.8

Source: Statistics Korea, National Statistics Yearbook and MOAF, Major Statistics on Agriculture and Forestry.

Table 1-11 | Income Composition of Farm Households

(Unit: 1,000 KRW, %)

	Income (A)	Farm income				Non-farm Income (D)	Transferred Income	D/A
		Net Income	Gross Income (B)	Cost (C)	C/B			
1965	112	89	116	27	23.3	23	-	20.5
1970	256	194	248	54	21.8	62	-	24.2
1975	873	715	891	176	19.8	158	-	18.1
1980	2,693	1,755	2,342	587	25.1	938	-	34.8
1985	5,736	3,677	5,477	1,788	32.6	1,060	977	18.5
1990	11,026	6,264	9,078	2,814	31.0	2,841	1,921	25.8
1995	21,803	10,469	16,012	5,553	34.7	6,931	4,403	31.8
1999	22,323	10,566	18,638	8,072	43.3	7,034	4,723	31.5

Source: Statistics Korea(2006), National Statistics Yearbook.

3. Contribution to Economic and Social Development in Korea

3.1. Quantitative Evaluation

AES contributes to the increased wellbeing of rural people by disseminating agricultural technology through educational programs. For this reason, the utility of policies as a means of achieving objectives can be evaluated in terms of the extent of contribution they have had to society, as well as the cost-benefit ratio. When agricultural technology was under-developed and the proportion of agricultural population was over 70%, a stable food supply and increased household income had to be primary national policy objectives. Until the 1980s, when industrial restructuring began, the proportion of agriculture and forestry in the national economy was large enough to be over 10% in terms of the rate of contribution to total national economic growth (see <Table 1-12>).

Table 1-12 | Contribution % of the Agriculture, Forestry and Fisheries to the GNI

	GNI (100mil $)	GNI per Person ($)	% of Contribution	
			Agriculture, Forestry&Fisheries	Mines&Manufacture
1971	94	286	11.3	23.5
1975	209	592	13.3	33.9
1980	609	1,598	147.7	12.9
1985	909	2,229	8.9	42.7
1990	2,523	5,886	-5.9	28.4
1995	4,881	10,823	4.7	36.3
2000	4,592	10,841	0.7	48.6
2005	1,756	18,372	-1.8	48.7

*based on current market prices.

Source: recited from RDA (2012).

Such a high level of contribution was possible because of the successful administration of R&D and AES. This assessment is consistent with the research results of Choi and Choe (1995), which analyzed returns on investment in agricultural research and extension in Korea by using VAR(Vector Auto Regressions) model. In the case of AES, as shown in <Table 1-13>, the coefficient of producer surplus is negative while social surplus is positive,

implying that unlike research projects most of the benefits are transferred to the consumers, that is, rural people.

Table 1-13 | Social Benefits on the Investment of Agricultural Research and Extension

(Unit: 100mil KRW)

		Total Amount of Production	Consumer Surplus	Producer Surplus	Social Surplus	B/C Ratio
1970	Extension	6,699	348	-130	218	6.82
	Research		254	230	485	15.19
1975	Extension	19,101	993	-371	622	6.78
	Research		727	657	1,383	9.84
1980	Extension	67,709	3,522	-1,315	2,207	6.36
	Research		2,577	2,327	4,904	11.65
1985	Extension	114,626	5,693	-2,226	3,736	5.59
	Research		4,362	3,939	8,302	13.71
1990	Extension	161,450	8,399	-3,136	5,262	2.95
	Research		6,144	5,549	11,693	8.88
1992	Extension	191,573	9,967	-3,721	6,244	2.38
	Research		7,290	6,585	13,874	7.57

Source: Choi and Choi(1995:13-14).

Another research (2012) using the Akino-Hayami method demonstrates that the coefficient of producer surplus is negative while social surplus is positive, consistent with previous research. These research results prove that the performance of investments into AES, which used public funds, was high and social contributions were also substantial.

3.2. Qualitative Evaluation

In addition to quantitative evaluations like increased income of agricultural households and contribution to the agricultural development in Korea, two points need to be noted in this section. First, a system was established in which rural people could get consulting and technical assistance whenever they had problems in the fields. Agricultural Technology Center (previously named Rural Guidance Office) was established at every city/county level and one Agricultural Technology Center had about 30~50 specialized extension workers, enabling the dissemination of agricultural technology while working closely with rural people, as well as providing consulting services for them.

Second, AES's approach to technology dissemination from an educational perspective raised the credibility of the agricultural extension organization to a considerable degree. In general, the adopters' trust in an extension organization plays a central role in increasing the rate of adoption of new technology. Although, coercive and authoritarian methods sometimes were used during the 1970s, there is no denying the useful lesson of AES as an educational tool. Through such processes, a system consisting of field education through pilot projects and periodic educational training were settled. While doing so, a mutual trust between the agricultural extension organization and rural people could also be built.

3.3. Overall Evaluation

Securing a stable and secure supply of food grains was an objective that was hard to achieve in a short period of time. Without government investment and the development of related agro-industries, such an objective is even more challenging to achieve. Fortunately enough in Korea, national leaders were willing to devote as much national resource as possible to increase the level of self-sufficiency for food grains. There was consensus among the whole population for this goal as well. These factors together provided a strong basis for the introduction of AES, despite a tight fiscal budget and hard economic conditions.

It is not easy to simply evaluate the contribution of AES as a policy instrument, especially in a diversified society where different needs and requirements of economic entities existed. However, given Korea's relatively small land area for agriculture and limited agricultural population, its successful experience with AES and its ability to foster competitive farmers and rural areas is worth sharing with countries around the world.

2013 Modularization of Korea's Development Experience
Agricultural Extension System in Korea:
Lessons from 1962 to 1997

Chapter 2

The Background and Necessity of AES

1. The Basis of the Present Extension System
2. Decision Making Procedures of Objectives and System
3. Cases of AES in Other Countries

The Background and Necessity of AES

1. The Basis of the Present Extension System

The agricultural extension system is important especially in agriculture and rural areas because of the sociocultural gap between them, and the unique nature of agricultural technology. In rural areas because it is hard for the people to receive benefits from educational and cultural institutions, it was only possible to improve the rural people's capacity when active and organized extension services were provided. Because the complexity of the agricultural industry requires a great deal of knowledge and techniques and also because diverse households and agricultural management are different, it is difficult to promote both agricultural production and rural life improvements.

1.1. The Introduction of the Extension System and Formulation of the Legal System

The establishment of IAI by the interim government just after the Japanese colonial era paved the way for modern agricultural extension services. During the Japanese colonial era, 15,000 people of public agricultural technicians were assigned to general government, provinces, cities, and small towns. They developed and promoted extension services. However, because of the defeat of Japan in the Second World War, many Japanese technicians were repatriated and only a few Korean technicians were dispersed all over the nation. Accordingly, it was difficult to implement organized agricultural extension services. To compensate for this, the interim government established IAI at the end of 1947. IAI, benchmarking the American extension system that successfully promoted agricultural education, research and extension in the US for half a century, was an institute which unified diverse organizations, including agricultural colleges of the national universities

(supervised by the Ministry of Education), national agricultural experiment institutes, and the extension bureau under the MOAF. It was that the modern concept of AES was attempted for the first time by adopting American system.

However, because the IAI system was basically an American-style extension system, it wasn't suitable for Korean circumstances. For this reason, it was reformed and renamed IAT. IAT operated from January, 1949 to March, 1959. The constituent agricultural colleges were separated and transferred to the Ministry of Education and it focused on two central functions: agricultural research and technology dissemination. However, over time, the extension service function was delegated to diverse organizations, such as the extension bureau of MOAF, technical dissemination bureau of IAT, and industry divisions at local governments, bringing about confusion and inefficiency in the projects. To make matters worse, the Korean War aggravated the implementation of services.

It was not until after the establishment of IA that the agricultural extension system settled down based institutionally on relevant laws. After the Korean War many international assistance organizations visited Korea and emphasized the importance of agricultural development. They also reported the urgency of implementing AES. One such report was called the "Macy Report (May, 1956)." The report was prepared, as requested by ICA, by Dr. Harold Macy, contemporary Dean of College of Agriculture of Minnesota University, together with S. Rutford and D. Simon. After staying in Korea for two months inspecting the rural areas, they advised that agricultural experiments department and extension organizations be separated from the main administrative body, but work together in a synergistic way. This report provided the basis for the establishment of the modern system of democratic, scientific administration over agricultural R&D and extension services. The government, National Assembly, and the USICA signed an "Agreement on Development of Agricultural Extension Services." The major contents were: i) an institute is to be established based on laws, ii)to promote the project, a clear chain of administrative order is to be made, iii) the National Assembly is to provide the necessary budget, and iv) politically neutral and well-trained personnel are to be placed within the institute. ICA, which was based on the agreement, purchased equipments, materials, and supplies that were necessary for the project. ICA also helped American specialists visit Korea and provide necessary technical assistance. In January, 1957 the National Assembly passed the Agricultural Extension Law, which was the basis of successful institutional implementation of AES. It paved the way for local extension organizations to be separated from administrative bodies, secure procurement of well-trained professional personnel, and bottom-up educationally oriented extension services.

1.2. The Necessity of Reforming the Existing Extension System

While IA was being established in 1957, legal and institutional grounds were built that contributed to building the AES organization. The budget problem was also solved, which helped promote AES. However, during the preparation procedures several problems emerged. For example, confusion about various administrative order chains and corresponding inefficiencies in performing diverse projects occurred. In addition, in October 1961, near the end of IA era, government reorganization brought about arguments over autonomy and the educational nature of AES, leading to severe confusion among the rural people and extension personnel. For these reasons, there was a need to review the existing system and reorganize a new AES.

2. Decision Making Procedures of Objectives and System

2.1. Review of Unifying AES

In October 1961 the military government ordered that a plan for unification of AES be formulated to deal with inefficiencies, confusion and disorder. In November 1961 MOAF established "Committee for Unifying AES" and reviewed a proposal for unifying AES. The committee, whose chair was Vice-Minister of Agriculture and Forestry, after a series of meetings proposed two alternative plans: a proposal by MOAF (AES integrated into general administrative government: majority) and another proposal by IA (AES separated from general administrative government: minority). The committee failed to make a decision, and reported the result to MOAF. In January 1961MOAF submitted the first (majority) plan to the National Assembly.

2.2. Establish an Independent Outside Administration for AES

The agricultural committee in the military government compared and contrasted several alternative plans and decided to unify various AES functions scattered over several government organizations into an outside administration. The plan was approved by the chairperson of the military government and implemented. In March 1962 the Rural Development Law was passed in the National Assembly, which stipulated specific details including roles and hierarchies of the extension system. Before long, IA, community development bureau of MOAF, and some other offices were integrated into the Rural Development Administration (RDA) in April.

3. Cases of AES in Other Countries

3.1. Types of AES

The concept of AES might be different depending on the viewpoints: one is to regard AES as an educational process, the other as the process of technology transfer. AES based on educational processes is often defined as "the process of motivating the people to realize and solve their problems for themselves, providing information, knowledge, and technology so that they themselves can make rational decisions, and also offering both consulting and education"(Choi, 1995:12). On the other hand, the viewpoint of technical transfer represents the broader concept encompassing educational processes. In European countries such as England, Germany, Sweden, and Denmark, extension services is often called the advisory service, which sheds light on their view of AES is from more of a technical transfer perspective rather than an educational perspective.

The types and approaches of AES can be classified depending on who administers (government or civil), who pays expenses (government or beneficiaries), and how central and local governments are connected and operated.

First, AES by the administrative body can be classified into several types: university extension, governmental organizations, farmers' organization, and commercial organization types. The characteristics of each type are show in <Table 2-1>.

Table 2-1 | Classification of AES by the Administrative Organization

University Extension	○ Formal education developed prior to agricultural extension: USA, Switzerland, et al. ○ Emphasized role of adult education for rural development.
Governmental Organization	○ Started by government initiatives for food self-sufficiency and rural development: S. Korea, Japan, Thailand, et al. ○ Classified into independent body or belonging body under Ministry of Agriculture
Farmers' Organization	○ Started from the farmer's needs: Denmark, France, Taipei, et al. ○ Farmers Organization employs specialized extension workers
Commercial Organization	○ Based on user paying system: England, Netherland, New Zealand ○ Market-oriented consulting and demand-driven agricultural extension

Source: Rural Development Administration (2008:62-63).

Second, <Table 2-2> and <Table 2-3> show types of AES depending on the administrative body and source of funding. Government funded is classified further into two subcategories, centralized and decentralized. Also, as shown in <Table 2-3>, due to the difference in the share of budget support among countries, government funded systems varies in each country.

Table 2-2 | Comparison of Administrative Organization

Administrative Type	Countries
Operated by local government in Province with support of Ministry	Japan
Operated by Land-Grant University with support of federal and states government	USA
Moving toward commercial AES with support of government-DLV (Private institution), SEV (Agricultural Association)	Netherland
Commercialized – ASD (Wrighson Ltd). Commercial consulting	New Zealand
Operated by central government (DOAE)	Thailand
Operated by local government in Province, City/County with support of government organization, independently from Ministry	S. Korea

Source : Oh, et al. (2000:118-124).

Table 2-3 | Funding Source for AES

Classification	Countries
Grant basically from central government	Japan
40% from federal, 40% from states, and 20% from county government	USA
Curtailing 5% of government budget every year aiming its share of 50% in 2002. The rest are divided by farmer and end-users.	Netherland
Commercial Institution (Wrightson Ltd) 100%	New Zealand
100% from central government	Thailand
30% from central, 70% from local government	S. Korea

Source : Oh, et al. (2000:118-124).

Finally, when R&D and extension services are considered as two associated functions, there are three types: one where each of the two functions is separately operated within a single organization, one where two functions are completely separated, and one where two functions are completely privatized/commercialized.

Table 2-4 | Types of Linkages between Research and Extension

Types	Linkage System	Countries
Separated Unit under One Administrative Organization	Cooperative Extension System (CES) (research + extension + education)	USA
	Research and Extension Bureau at RDA and PRDA	S. Korea
Completely Separated	Research by agricultural administration, Extension by agricultural extension administration	Japan
	Research by DOA, Extension by agricultural extension administration	Thailand
	Research by DLO, extension by DLV and SEV	Netherland
Commercialized Extension	Research by MAFTech, Extension by ASD (Wrightson Ltd)	New Zealand

Source : Oh, et al. (2000:118-124).

3.2. The Status of AES of Korea

AES in Korea can be classified as government funded based on an educational process perspective. The RDA was established as an independent outside the administration of MOAF. It performs the function of R&D and AES, while some colleges of agriculture or agriculture-related institutes perform the function of agricultural education for the rural people under the relevant laws.

Choi (1995:88-89) summarized the characteristic of Korean AES organizations as follows:

i) The organization of AES in Korea, RDA, incorporates both R&D and AES. Therefore, it is easy to diffuse research results fast and effectively, to reflect the problems emerging in AES as well as farming, and to educate and train extension workers.

ii) Because extension organizations and general administrative organizations are functionally separated under the control of the governor and the mayor, it is easier to manage both agricultural administration and AES in a unified way. AES at the local level supports general administration with respect to adult education. Local governments provide some budget for AES. Although this unique characteristic may make it hard to maintain neutrality of AES from agricultural administration, it is also possible that its effectiveness could increase if AES and administration work harmoniously.

iii) Based on the structure of the office, extension workers are separated from general administration officers. The basic role of extension workers is to serve special and educational functions and to play the role of bridging rural people and administrative offices. This characteristic may increase the motivation of extension workers when their socio-economic status is high, but decrease when it is not.

iv) AES organizations work in collaboration with schools or colleges of agriculture. Based on the "Regulation on Agricultural Cooperation between Industry and Academics", they perform the projects cooperatively with colleges of agriculture and agricultural high schools.

AES in Korea deals with major policies of the central government, as well as local government projects. Therefore, both levels of government pay for necessary expenses. Extension organizations assist corresponding administration in promoting agricultural policies.

However, it is hard to implement AES fully guided by educational principles. The primary reason is that, unlike in the US, extension organization is affiliated with administration, not colleges/universities.

2013 Modularization of Korea's Development Experience
Agricultural Extension System in Korea:
Lessons from 1962 to 1997

Chapter 3

Implementation Strategies and System

1. Overview of Existing and New Laws
2. New Organizations and Restructure of Existing Organizations
3. Increasing Efficiency of Personnel Management
4. Expanding Support for Policies
5. Securing Necessary Budget

Implementation Strategies and System

1. Overview of Existing and New Laws

Rural Development Law, a law proclaimed in March 1962 for the purpose of establishing RDA, defines the main framework of RDA as agricultural R&D, AES, and training. The characteristics of the organization and mandates defined in the law are as follows:

First, the law defines the scope of AES comprehensively. That is, it integrated three existing programs that were scattered: agricultural extension services and community development projects that had been done previously by the "Agricultural Research and Extension Law", sericulture and forestry, extension programs administered by Agricultural Cooperatives (currently, NACF; National Agricultural Cooperatives Federation) and Cooperatives for Irrigation (currently, Korea Rural Community Corporation). AES include providing scientific knowledge for agriculture and rural life improvement, demonstrating and disseminating new technology, teaching the preservation and use of natural resources, fostering farmers' organizations, facilitating the construction of community development models, and training of related officers and voluntary leaders.

Second, it prohibits anyone or any organization except the central or local governments from conducting AES activities, requests public organizations to cooperate closely with RDA, and mandates other organizations that wish to do extension services to get prior approval from the administrator of RDA.

Third, though local the AES organization is under the province and city, the right of personnel management over R&D/AES officers belongs to the administrator of RDA. Thus, the system of management of specialized human resources and authority to supervise extension was integrated one another.

2. New Organizations and Restructure of Existing Organizations

2.1. Overview

Since its establishment, RDA has been trying to improve and change the organization through continuous restructuring that accommodated situations as well as trends in agriculture. Based on three distinct eras since the establishment of RDA in 1962, major contents in each era are briefly described: from 1962 to the 1970s of food grain yield, from the 1980s~1990s of raised income, after 2000s of development of the plural function of agriculture and rural areas. <Table 3-1> shows the overall characteristics in each era from IAI to the current RDA.

Table 3-1 | Major Characteristics of the AES in Transition

Name of Organization	Major Characteristics
IAI Dec.12,1947~ Jan.5, 1949	○ Adopted university extension education system based on the American system - College of Agriculture, Seoul National University + National Agricultural Experiment Stations and Extension Bureau under the MOAF - Separated local extension organizations from the local administration units ○ Lack of extension personnel and budgets
IAT Jan.6,1949~ March 5, 1956	○ Supervision authority of university returned to the MOE - Technical Dissemination Bureau with Production, Management Technology, Training department - Bureau abolished in Jan, 1954: Management Technology and Training Department transferred to Experiment Division II ○ No active implementation due to the Korean War
NIAT March 6, 1956~ May 27, 1957	○ Extension services revived - Extension Bureau with Planning, Training, Agriculture department - Integrating local extension organizations with local administration units
IA May 27, 1957~ March 31, 1962	○ Agricultural Extension Law enacted based on Macy Report - Separated local extension organizations from the local administration units, eventually forming centralized extension system - Extension Bureau with Extension policy, Technology diffusion, Rural youth, Rural home domestic department ○ Securing specialized extension personnel - Executed bottom-up extension services based on educational process

Name of Organization	Major Characteristics
ORD (changed to RDA) From April 1, 1962 to the current	○ Integrating quasi extension program (eg. community development) in order to implement rural development - Rural Guidance Bureau with Planning, Agricultural improvement, Improvement of rural living conditions, Communication and information technology department ○ Placed local extension organization as an independent organization outside administration under the local government - Cooperative extension between central and local government
	〈November 1989〉 ○ Established department unit at city/county extension body to execute specialized extension services - Two or three department based on city/county situation
	〈January, 1997〉 ○ Agricultural extension was decentralized - Supervision authority including personnel management, budget&operation of extension body transferred to the mayor of local government - Local specific extension work implementing
	〈August 1998〉 ○ Name of local extension body changed, but same function

Source: RDA (2004).

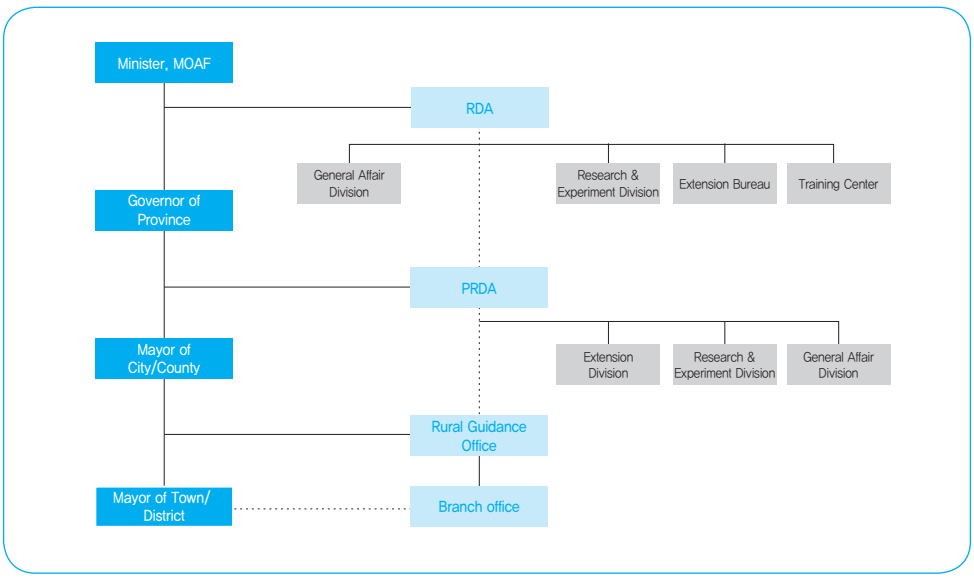
2.1.1. The Era of Increased Yield of Food Grains

From 1962 to the 1970s, the primary focus of agricultural policies was on how to increase the yield of food grains. Accordingly, RDA incorporated the functions performed previously by IA and integrated education and R&D organizations that belonged to the MOAF. The organizational structure is shown in [Figure 3-1].

RDA at the central level consisted of two bureaus (research&experiment and extension), a general affairs division, and 11 research&experiment institutes. The research&experiment bureau had two subunits (research coordination and regional adaptive test, and the extension bureau had four subunits (planning, agricultural improvement, rural life improvement, social guidance and technical information). The 11 research&experiment institutes were training center, Plant Environment Institute, Crop Experiment Station, Horticulture Experiment Station, Forestry Experiment Station, Sericulture Experiment Station, Livestock Experiment Station, Veterinary Research Institute, Agricultural Machineries Institute, Highland Experiment Station and Jeju Experiment Station.

At the province level, PRDA was established under the provincial governor, incorporating extension functions dispersed over several units within the province. PRDA had two bureaus (extension and research), a general affairs division and four sub-bodies (tree nursery, silkworms breed, stock breed, cattle health). There was the Rural Guidance Office (RGO) under the mayor of each cities/county, in each of which there were three sections (extension, agricultural technology, and rural development).

Figure 3-1 | Organizational Chart of RDA (as of March, 1962)



Source: RDA(2008: Vol. 11-501).

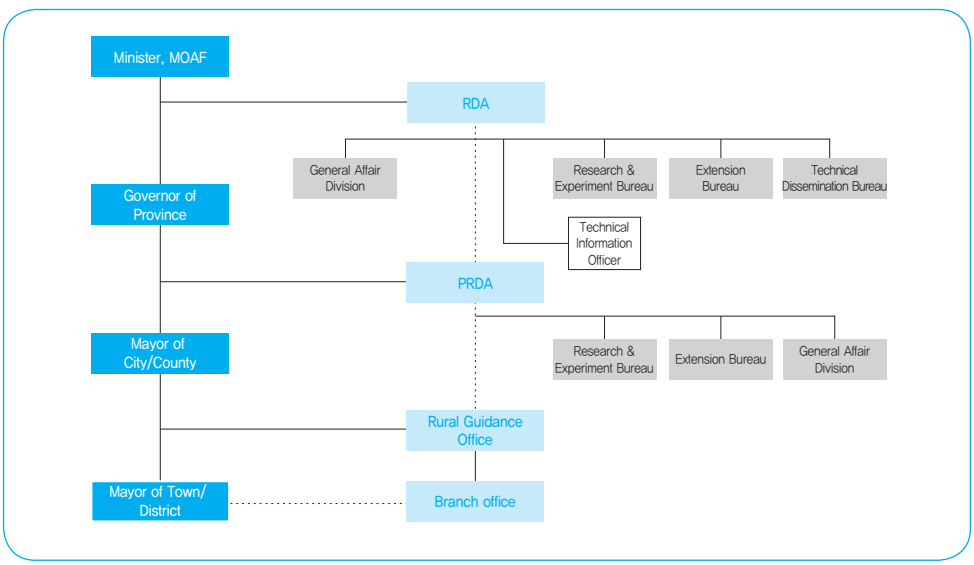
From 1962 to the 1970s, government, agricultural producers, and the general public did their best to achieve self-sufficiency of food crops by increasing the yield and savings of foods. Until 1973 when RDA was reorganized, the primary changes in organizational structure were as follows: in 1963, 410 branch offices were established; in 1968, RGO was expanded into a four section system. At the end of 1966 there was a change in the function of RDA, transferring the functions and workers of the forestry to the newly established Korea Forestry Service.

In 1970 research&experiment and bureaus were established in each of the PRDAs. The extension bureau had three divisions (extension, technology dissemination, and rural societies). In 1973 technical dissemination bureau was added to the existing extension bureau. The new bureau had four divisions (agricultural management, food crops, cash crops, sericulture&livestock). Thus, as shown in [Figure 3-2], AES was divided into two

large segments, social development and agricultural technology, leading to the increase in specialized extension of the central RDA. To satisfy the emerging needs to disseminate high-yield varieties, branch offices were added, the total being 1,473 at 1970.

At the end of 1976, in order to increase food grain yield by reinforcing disease and insect management, a crops preservation division was newly established within the technical dissemination bureau. A technical officer was placed in RGOs to carry out these tasks. According to the changes in the number of extension workers there was a continuous increase, the total being 3,173 in 1962, and 4,790 in 1964. From 1972 a total 1,642 extension personnel were recruited on a contractual base in order to promote the dissemination of high yield variety of rice, "Tongil". In 1977 their status changed to regular public official. The total number of extension personnel reached 7,628 as of 1977 and 95.9% of them were placed at RGOs.

Figure 3-2 | Organizational Chart of RDA (as of July, 1973)



Source: RDA (2008: Vol. 11-509).

2.1.2. The Era of the Objective of Increased Income

After the 1970s when Korea managed to self-support in food grain (rice), the 1980s saw the emergent need for an increase in income. Thus, identifying cash crops and development of farming technology and management skills were regarded as necessary and important. To meet with such trends and needs, the function of AES was reinforced and corresponding organizations were restructured. Specifically, the focus of AES was shifted from increasing

yield to rural development. Some of the changes include: in 1981 the community department mission was abolished, its functions were absorbed by other divisions. In 1983, in line with the globalization movement, the Tropical Agriculture Division expanded with the incorporation of the International Cooperation Office, which was newly added to reinforce global projects that provided agricultural technology.

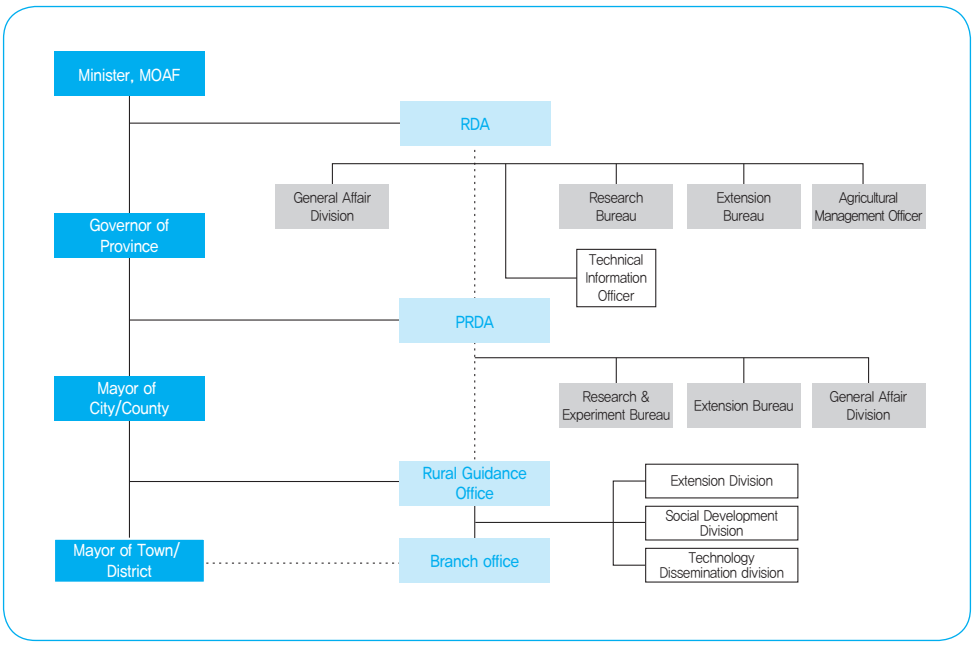
In early 1989 there was a major reform in the branch office at the town/district level. The objective of the reform was to establish a system that can cope with the changing environmental conditions. First of all, 2~3 divisions were established within RGOs, while branch offices were incorporated into the section of RGO. Within 60 RGOs there were 3 divisions (extension, social development, technology dissemination), where there were overall total of 12 sections (extension-extension planning, education and training, technology communication; social development-resource development, rural youth, rural life improvement; technology dissemination-food crops, plant environment, horticulture, livestock raising, sericulture, agricultural management). Of the 76 of them there were 2 divisions (social guidance, technology dissemination). The structure of divisions was similar with only a small difference (social guidance-guidance planning, education and training, technology dissemination, resource development, rural youth, rural live improvement; technology dissemination-the same divisions).

In 1994 to reinforce the local research function, 13 local specific crop experiment stations were established in the PRDA. Such establishment along with reinforced specialized extension system and extra recruitment of extension workers contributed to the increased motivation of extension workers. Extension worker belonged still to the central government. Since 1980 the capacity was maintained at 7,979 workers (central 105, provincial 226, city/county 7,648). In 1992 and 1994, extension workers' jobs were substituted by researchers' jobs, resulting in the reduced total capacity of 6,964 workers.

In 1994 there was a signal of great reform as there was an increasing concern about the reduced size and weakened function of the organization. Enforced by the Local Autonomy Law amended that year, except 179 (research 127, extension 52), the status of all 6,696 officials that worked in the provincial RDAs were changed from central-government officials to local-government officials with a two-year grace period. In 1994, following the government guidelines for reducing organizational size, a major change in job positions was made within RDA as well as within RGOs, which altogether brought about confusion within the entity.

The extension workforce was continuously decreasing as a result of new establishemrnt of local specific crop experiment stations in the PRDAs, workers leaving the workforce, and the integration of cities/counties. In 1999, the overall capacity of the workforce was 5,153 (central 71, province 234, city/county 4,848) as shown in <Table 3-2>.

Figure 3-3 | Organizational Chart of RDA (as of December, 1994)



Source: RDA (2008: Vol.11-526).

Table 3-2 | Number of Agricultural Extension Personnel

(Unit: person)

	Total	Central	Province	City / County			Remarks
				Sum	Main Office	Branch	
1961	1,444	63	151	1,230	1,230	-	
1964	4,790	71	210	4,509	2,017	2,492	Branch established
1975	7,626	82	226	7,318	2,667	4,651	
1980	7,980	106	226	7,648	2,997	4,651	
1989	7,979	105	226	7,648	7,250	398	
1994	6,964	95	289	6,580	6,286	294	No. of extension personnel decreased, due to status change into research personnel
2004	4,901	71	240	4,590	4,528	62	

* The numbers for 1975 included 1,642 personnel who were employed from 1972 on a contractual basis. Their status changed to regular public officials.

Source: reconstructed from RDA (2004) and RDA (2012a).

2.1.3. The Era of Development of Plural Functions of Agriculture and Rural Area

As of the 2000s, the new Millennium, extension organizations were required to prepare for the new technology assistance system. In 2004 there was a big change in RDA and the corresponding organizational structure in which the Bureau of Research Management was renamed the Bureau of R&D, and the Bureau of Technology Assistance was renamed the Bureau of Rural Assistance, reflecting the shift in focus from agricultural technology to rural development. The names of each division were changed to reflect the needs of those times.

Some of the extension workers were assigned to the division of Technology Assistance that was established within the three research institutes (Institute of Crop Science, Institute of Horticulture, Institute of Livestock) of RDA. They provided technology consulting, solutions to complaints, fast communications of research results, and feedback on field problems.

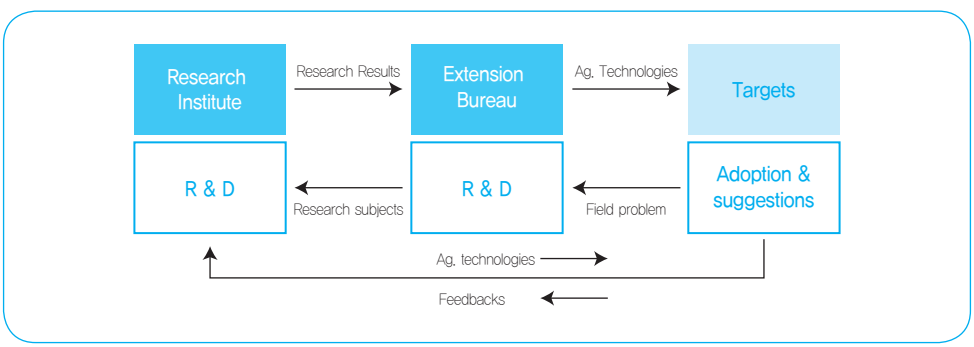
2.2. Linkage System of Associated Organizations

2.2.1. Linkage between Research and Extension Functions

RDA, a central body, and provincial RDAs perform both research and extension functions. [Figure 3-4] shows the linkage system between research and extension functions. The main characteristics of this network are summarized as follows:

i) The research results and experiments can be easily and effectively diffused to the agricultural population via the nationwide agricultural extension system. In this process, research results can be modified or adapted to the rural situations. Field problems can also be reflected in the research projects and subsequently solved.

Figure 3-4 | Linkage between Research and Extension



ii) The research results are evaluated, in every year, through committes in close collaboration with research and extension organizations. Based on the review, the results are utilized for suggestions on formulating agricultural policies or technologies that will be disseminated to farmers.

iii) The extension workforce acquires new knowledge and technology through lectures and practices in research institutes, by participating in meetings of research design and evaluation, and making necessary comments.

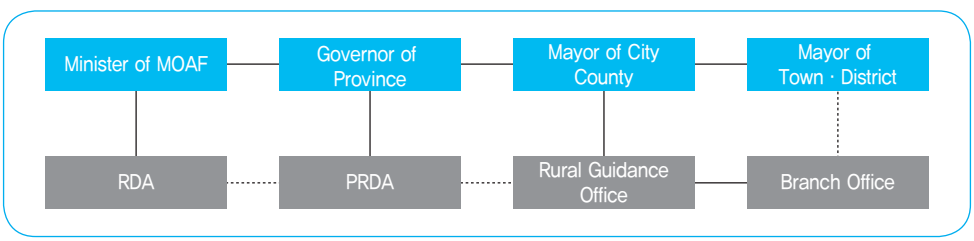
iv) Participation of researchers in extension services contributes to the technology diffusion as well as information acquisition. Through participation in farmers' education and evaluation meetings, they have opportunities to investigate the adoption process of research results. Also, it is possible to directly transfer individual consultations and technology, which meets the demands for advanced technology.

v) The research workforce, with the assistance of local extension organizations, can practice newly developed pilot projects on the advanced farms, which enables them to experience empirical research and evaluation.

2.2.2. Network between Administrative Units and Extension Organization

The whole agricultural extension organization in Korea is composed, as shown in [Figure 3-5], of RDA in the central government and those associated organizations at the decentralized local government level based on “Local Autonomy Law”. PRDAs in the provinces, RGOs in the cities/counties, branch offices in the town/district, were established respectively. Agricultural extension organizations take the form of an agency.

Figure 3-5 | Linkage between Administrative Units and Extension Organizations



Extension workers with national position are placed in each of the extension organizations. Higher-level extension workers are appointed by the central government, while general low level workers are appointed by the provincial governor with the recommendation of the director-general of PRDA. The main characteristics of such organizational system are as follows.

i) The agency structure facilitates each organization to easily carry out corresponding extension activities that reflect the unique educational nature of AES. Under such a system, it is easier to get fiscal assistance from each local government.

ii) Although agricultural extension organizations are established on plural levels, that is, central and local, the central government has the right to organize and manage personnel. Therefore, national agricultural projects can be implemented effectively while the unique nature of the extension organization is well reflected in implementation.

iii) Coping with disease and insect control or weather problems nationally, extension organizations worked in a synergistic way with assistance of administration units.

iv) Because branch offices for each RGO were established, it was easy to solve field problems, leading to increased effectiveness of AES.

v) Such a cooperative network among administration extension organizations was effective in terms of administration, finance, project, and personnel. On the other hand, provincial and city/county organizations had difficulty, to a certain extent, due to the dual line of supervision from the upper-level organization.

2.2.3. Cooperation among Related Organizations

While agricultural extension service in Korea is performed primarily by RDA, agriculture-related institutes or associations also perform similar functions for their members. NACF does some extension services including farming or rural life improvement. Specific examples of the extension services include: providing production funding, assisting agricultural inputs, educating farmers' group members, doing business in traditional market distribution, and offering classes for women. During the earlier stage of RDA, Cooperatives for Irrigation performed some extension projects related to the land improvement plans.

Such a situation was inevitable, to a certain degree, because the agricultural extension organization had the driving objective of agricultural and rural development. For this reason, central and local governments were kept from performing extension functions unless they were based on the law, avoiding potential confusions. If and when necessary, all extension services were to be done in close cooperation with RDA. In addition, other organizations had to get approval from the RDA administrator before starting. Nonetheless, there were occurrences of confusion, duplication of similar projects, or implementation of mutually conflicting projects. In an effort to coordinate such conflicts, administrative orders were issued by the President, and/or agreements were made between RDA and individual extension organizations like NACF. In short, efforts were made to establish the identity and the main principal of the extension projects.

Cooperation or collaboration between AES and relevant institutions was encouraged to implement agricultural policies and agricultural extension services more effectively. Main contents are summarized in the following.

i) During the initial stage of RDA, "Committee for Rural Development" and "Committee for Agricultural Research Guidance" were established at the central and provincial level, where the body in charge and associated organizations and committees participated in the projects and gave recommendations and consultations.

ii) An extension organization was allowed, by the "Regulation on Agricultural Cooperation between Industry and Academics", to implement cooperative projects with colleges of agriculture and agricultural high schools. Thus, extension workers did the job of teachers, while teachers did the job of extension workers by providing students with field training.

iii) At the city/county and town/district level, related organizations or associations like administrative, extension, NACF, and Cooperatives for Irrigation, were in operation. They sought ways to cooperate with one another, leading eventually to the contribution to regional development.

3. Increasing Efficiency of Personnel Management

3.1. Securing the Personnel Management Authority

Although local agricultural extension organizations belong to the local government, the status of the national workforce of research and extension was protected by the administrator of RDA. It helps motivate them to do their job diligently and provided a psychologically safety net. There was an incident when the President did not change the administrator of RDA for nearly 12 years (1968~1980) in order to continuously and consistently implement agricultural extension service.

To keep extension workers from overworking due to administrative chores, they were not allowed to do any work that was not prescribed by the law. After 1997, due to the introduction of the decentralized system, with the exception of just a few high-level extension workers and ruling directors, provincial governors and/or city/county mayors had the authority of personnel management.

3.2. Implementing Specialized Human Resource System

For the purpose of increasing the professional capabilities of the extension workers, "Regulation on Specialization of Extension Personnel" was enacted. It prescribed details of the examination. RDA administered the exam through which extension work candidates acquired the extension license. Professional extension workers were assigned to RDA and provincial RDAs while specialty extension workers were assigned to cities/counties.

Professional extension workers had 13 different areas of professionalism: food crops, crops protection, soil&fertilizer, sericulture, livestock, fruits, vegetables, cash crops, farm machinery, agricultural management, community development, technology communication, and rural life improvement. Specialty extension workers had 11 different areas of specialties, except for technology communication, and vegetables and fruits, which were fused into horticulture. This system was substituted, in January 1989, by "Guidelines for Specialization" that intended for individual workers to develop their own majors. There were 12 specialty areas and majors: i) food crops: paddy rice and field rice farming, ii) crops environment: soil& fertilizer, crops protection, iii) vegetable: leaf&root vegetables, greens& fruits, protected farming, iv) fruit trees: pome fruits, stone fruits, berry fruits, tropical fruits, v) floriculture/flowers: bulbs and tubers, foliage plants(flowering trees), flowering plant(perennial root), potted plant, landscaping, vi) cash crops: oilseed crops, medicinal herb, mushrooms, fiber crops, vii) sericulture: sericulture raising, mulberry farming, viii) livestock: big livestock, mid-livestock(including special livestock), poultry, bee raising, livestock sanitation, forage, cattle facilities, ix) farm machinery: farm machines, x) agricultural management: management improvement, distribution, computerization, xi) rural life improvement: clothing life, food life, housing environment, home management, life equipment, xii) social development: rural organization fostering, resource development, environment preservation, and community development.

In 1974, as a means to reinforce farmer's education as well as to increase the capabilities of the extension workforce, "Regulation on Agricultural Technology Training" was enacted, which provided the basis of classification of education and training, training organizations, training facilities, standards of equipment, and farming technology test.

At the end of 1985, the job position system made up of eight hierarchies was refined to two large categories: extension officials and extension workers. Owing to the refinement, obstacles to specialization, such as inconsistency between job and their specialty area or anxiety about promotions, were removed.

In 1997 extension workers' status was changed from a national position to a local position. Thus, RDA helped them to raise their specialized capabilities through, for example, exchange of technology information, participation in project activities, reinforcing mutual relationships among them.

3.3. Reinforcing Specialized On-The-Job Training

Trainings for extension workers were classified into two categories: training for new workers and periodic job training if needed.

After graduation and passing the exam for extension workers, new workers received 2~4 weeks of basic training provided by RDA. The curriculum consisted of classes related to common capabilities required for extension workers. The main classes included: the ideals and principles of AES, project planning and evaluation, present condition of extension organizations, fostering learning groups, extension methods, extension cases, work division discussion and presentations. Because new workers lacked field experiences, after basic education they were assigned to RGOs where they accumulated field experiences together with senior workers. Depending on individual offices, as residential extension workers, they learned how to perform actual extension services.

On-the-job training consisted of basic training for one time over a 5-year period and extra specialized training programs that was operated when necessary. Basic training was required periodically for all workers. It usually lasted for 2~3 weeks and was done in training institutes for agricultural officials. The curriculum consisted of common classes and technology classes oriented toward new technologies and field problems: examples of common classes were agricultural policies and extension programs, principle of extension, rural organizations, and leadership. Specialized training varied depending on chronological needs, and was usually done after the demand for research and training plan was prepared. Long-term training programs typically lasted for 10 months to 2 years, in which experience-oriented learning was the main goal. Various short-term programs for about 2 weeks were implemented under the cooperation of RDA's training division and research institutes. Since 1999, the training division of RDA was designated the official training institute for research and extension and was in charge of on-the-job training for extension workers.

Table 3-3 | Accomplishment of Training for Extension Personnel

(Unit: person)

	1957~1961	1962~1974	1975~1991	1992~2001	2002~2011	Total
Basic Course	793	7,623	26,439	3,550	873	36,612
Advanced Specialized Course	-	12,910	14,938	16,231	19,892	44,872
On Occasional Course	-	3,233	1,148	297	-	4,778
Total	793	23,766	42,525	20,178	20,765	87,262

Source: RDA (2012c : 912).

On the other hand, during every winter season there was a program for extension workers who would be in charge of farmers' training during the winter season as instructors. It usually lasted for 3~5 days. Common classes included: agricultural and extension policies, distribution management, weather planning, and extension methods. Specialized classes reflected new or core technologies. After the central-level training, there was extra training on the provincial level for city/county extension workers who would train rural people.

In addition, when occasional needs occurred, like immediate projects and disease and insect control, related administrative units of RDA provided necessary training programs. These programs were about one week long workshops or project training that facilitated successful implementation of such tasks.

3.4. Increasing Supervisory Field Activities

There was concern over the possibility of extension workers neglecting their own jobs because they are closely related to administration. For this reason, "Rural Development Law" prohibited extension workers from doing work that was not stipulated in their job descriptions. Thus, extension workers could concentrate on their own tasks.

Because extension workers needed to come in contact with rural people to quickly solve field problems and to encourage them to adopt new technology early, extension organizations needed to be located close to rural people. For this reason, in 1963, one year after RDA establishment, one branch office per 3~4 towns/districts was established and belonged to RGOs. In 1975 all towns/districts had an office respectively and recruited more extension workers, including those officials for increasing rice production. About 96.0% (7,318) of all extension workers (7,626) worked in RGOs field organizations. At that time, one extension

worker dealt with an average of approximately 325 farm households and farming land of 306ha. The number of workforce had been increasing until the self-sufficiency of rice was achieved. After that time, a considerable portion of the workforce was reduced due to the small government orientation and the change in the environment of AES.

Meanwhile, in 1963 for the purpose of helping extension workers at RGOs focus on their own job by reducing the amount of paper work, "Guidelines on Reduction of Administrative Paperwork" was made and implemented. Its implementation was supervised and checked by the PRDAs and RRD.

4. Expanding Support for Policies

4.1. Holding National Meeting and Support from Government Officers

To build support for policies and reinforce readiness to provide extension services, meetings of organizational leaders at each level of RDA, PRDAs, and RGOs were held periodically and when necessary. Those meetings were a good opportunity to communicate information of present conditions and/or implementation plans, leading to reinforced support for policies and readiness for implementation.

With the emerging need for self-sufficiency of rice, the diffusion of new rice varieties, pest management and insect control, there was a push for a successful green revolution. Usually through the year-end appraisal fairs or workshop there were competition events in which selected organizations presented their success cases and were awarded, leading to increased self-confidence and support for policies. The next year's plan was also announced and discussed. In short, all these efforts contributed to the increased level of support and confidence.

On important national policies, the minister, prime minister, president, and high ranking officials were at the front end. Sometimes, by using such methods as autographed letters, various meetings and/or directions were emphasized and simultaneously requested. The proceedings were checked according to a corresponding checklist and time schedule. The president paid special attention to these interests to encourage officials and the general public. When rice self-sufficiency was achieved, the President awarded the persons of merit with medals and monetary rewards. On the main pending issues, mass media was used for high-position officers to inform officials and the general public of the government's willingness to implement policies. All these procedures were prepared in advance and implemented based on detailed planning.

4.2. Training Curriculum for Government Policies

As an important part of programs, main curricula were prepared in advance in diverse education and training programs that targeted rural people and/or extension workers. Training organizations prepared for the curricula with necessary classes, largely based on the request by the central body or sometimes on their own judgment. Based on the curricula, usually high-position officials delivered lectures to individual classes.

In addition to detailed explanations on short-and long-term policies, many classes dealt with such pending issues as free import of agricultural products, problems and coping strategy of FTAs. Since reinforced local self-governing of 1997, regional policies and pending issues were the main focus of training.

4.3. Public Relations and Supervision by Higher-level Organization

To help officials and the general public including farmers, understand and remember what to do, various publicity campaigns were applied. For example, RDA made frames containing the key points of implementation that were printed or written. These frames were hung on the wall in offices or outside the buildings. Also, placards and posters were used. All these tools of publicity expanded support for policies and encouraged participation in the implementation process.

During the period of importance, higher-level organizations made on-site tours, checking the implementation points and guiding the procedures. The task force for on-site tours consisted of sometimes high-position officials only, and sometimes of high-position officials accompanied by R&D, extension, and administration persons. They checked present conditions and also assisted in necessary technology information. When extension workers were negligent or erred, a penalty in personnel affairs was given to them while excellent workers were rewarded with incentives. Through these steps, the importance of field implementation was emphasized.

5. Securing Necessary Budget

5.1. Choosing and Supporting National Policy Projects

The AES expenses were arranged by the government and local government and the labor expenses were covered entirely by the government. Basically, the total amount of expenses are decided by MOEP and approved by the National Assembly. However, the RDA requests an extension budget to MOEP based on an organization's discretion and request of PRDA and RGOs.

On nationally emerging projects, a national subsidy was made for their implementation so that new technologies could diffuse nationwide. In that case, funding from local governments was assumed. RDA suggested and recommended local governments the project list, necessary budget, ratios of budget burden among national, local, and farmers. Based on the suggestion, RDA requested anticipated projects that, after reviewing, was approved, finalized, and subsequently implemented. Similar procedures were applied in the budget case of building the bases of AES (like extension facilities or equipment), agricultural education, and building and fostering learning organizations.

5.2. Procuring Financial Resource for Extension Organizations

At the time of RDA establishment, financial resources came from the MOAF. However, since 1964 RDA has made the financial plan for the extension services. As shown in <Table 3-4>, the expenses were increasing every year, recorded at 508,143 million KRWs as of 2000. The financial source of extension services consisted of resources from the central government and local governments. Funding from the local government is higher than that of the central government.

Table 3-4 | Changes in the Budgets for Agricultural Extension

(Unit: mil. KRW)

	Budget	Funding Source			
		National Government		Local Government	
		Amount	%	Amount	%
1965	589	284	35.1	305	64.9
1970	1,671	593	35.5	1,078	64.5
1975	6,313	2,526	40.0	3,787	60.0
1980	13,661	2,913	21.3	10,748	78.7
1985	26,747	4,895	18.3	21,852	81.7
1990	89,183	9,797	9.9	80,386	90.1
1995	285,600	92,600	32.4	193,000	67.6
2000	508,134	81,333	16.0	426,801	84.0

Source: RDA (2000).

2013 Modularization of Korea's Development Experience
Agricultural Extension System in Korea:
Lessons from 1962 to 1997

Chapter 4

Overview and Schedule of Agricultural Technology Dissemination

1. Overview of Agricultural Technology Dissemination
2. Success and Failure Cases

Overview and Schedule of Agricultural Technology Dissemination

1. Overview of Agricultural Technology Dissemination

1.1. Historical Changes of Agricultural Technology Dissemination

1.1.1. The Era of Building the Ground of Agricultural Technology Diffusion (1962~1970)

It was between 1962 and 1970 when basic agricultural technology for increasing the yield of rice was diffused. In farming rice, instead of a single factor, high yield demonstration plot and collective rice farming, monitoring disease and insect&chemical spraying were started. New varieties and demonstrations of farming methods for barley, corn, potato, flowers, special crops, and sericulture were implemented, leading to building basic technology diffusion.

1.1.2. The Era of Achieving Green Revolution (1971~1980)

Between 1971 and 1980 the green revolution was achieved as a result of a tremendous increase in rice thanks to the diffusion of the high yield rice variety. In 1971 a new high yield rice, "Tongil", was cultivated for the first time. As new and improved varieties kept following suit, Korea's wish for self sufficiency of rice could be achieved. Despite severe oppositions against diffusing "Tongil" and hardships, the farming of "Tongil" was eventually successful owing to the persistent effort of extension organizations.

In the case of field crops, pilot project was primarily implemented for the diffusion of new varieties. For higher yield, vinyl mulching farming technology for pepper, sesame and peanut was disseminated. Also, pilot project for collective farming complexes was implemented.

Technology diffusion was focused on the diffusion of "Tongil" in order to achieve self-sufficiency of rice during this time. Therefore, the extension services in crops, flowers, livestock, and other products were not very active.

1.1.3. The Era of White Revolution and Mechanized Equipment (1981~1990)

From 1981 to 1990 the white revolution occurred where the production of vegetables, throughout the year was possible by using vinyl houses and to save on labor mechanized equipment was promoted heavily. Along with increased GDP and an upgraded food consumption pattern, agricultural production also changed into the form of multi-item small-production. For the purpose of diversification of income sources, complex farming in which agronomy and livestock were combined, and the introduction of vegetables&fruits, were heavily emphasized. Also, owing to the wide diffusion of vinyl-mulching technology, diverse vegetables and fruits were produced throughout the seasons. Over the next ten years, facility areas were increased three-fold, which made almost the entire field white, thus the period was named the white revolution.

On the other hand, as a result of rapid industrialization, agricultural workforces were moved to other industries, which in turn made agricultural labor insufficient during the farming period. Wages also increased sharply. To cope with this trend, machinery demonstration projects, where the diffusion of rice-planting machines and combines were the primary focus, and other demonstrations like technology of using rice primordium and removing weeds were implemented. New varieties, the safe usage of agricultural chemicals, and mechanized farming were diffused for barleys, wheat, beans, corns, and sweet potatoes. For fruits, high-quality new varieties and corresponding technology were diffused. As SS pest control machines were produced domestically, technology of reducing the number of agricultural chemicals spraying was diffused widely.

1.1.4. The Era of High-quality Orientation and Diversification of Agricultural Products (1991~2000)

From 1991 to 2000 the consumption pattern of agricultural products was diversified and price differences in products with varying quality levels increased. For this reason, during this time, technology for producing high-quality diversified products was heavily dispersed. Technology of rice planting was also oriented toward high quality rice, thus rice varieties "Tongil" gradually disappeared and were substituted with general high-quality varieties. For the purpose of cultivating more environment-friendly agriculture, new farming technologies such as duck-farming and snail-farming methods began to be introduced and spread. To meet diverse consumer needs, various new varieties were developed and diffused

for barleys, beans, corns, and sweet potatoes. As consumption increased continuously and demand are diversified, farming technology significantly developed.

In 1997, extension organizations were localized. Since then, in order to increase the income of regional agricultural population, region-specialized pilot projects were heavily implemented. Raising special kinds of crop was accelerated.

Table 4-1 | Emphasized Strategies of AES

	Emphasized Strategies
Period of Strengthening Extension System (1962~1970)	· Dissemination of basic agricultural technologies in order to increase production of food grains
Period of Green Revolution (1971~1980)	· Dissemination of new varieties and agricultural technologies in order to improve self-sufficiency of food grains
Period of White Revolution and Farm Mechanization (1981~1990)	· Dissemination of agricultural technologies in order to overcome constrains of seasonal produce · Dissemination of agricultural technologies focusing on farm machineries and automotive equipments
Period of High Quality and Diversified Products (1991~2000)	· Dissemination of agricultural technologies to meet the diversified consumer needs such as high quality, safe and health-oriented products · Dissemination of agricultural technologies to reduce farming costs

1.2. Pilot Project of Agricultural Technology Dissemination

1.2.1. Implementation System

Demonstration project was applied as one of the most important tools to diffuse new agricultural technology. The implementation system for the demonstration project consisted of coordinated roles of RDA, provincial RDAs, city/county rural guidance office, and town/district office. To accelerate implementation, diverse groups were established to show and teach rural farmers such as the Agricultural Improvement Club, Rural Life Improvement Club, and the 4-H Club. The members of these groups played the key role of diffusing new technologies.

1.2.2. Implementation Procedures/Steps

The national implementation procedures by RDA are summarized below.

① Developing technologies and new varieties by research institutes, RDA → ② Transferred to Extension Bureau→ ③ Deciding on whether or not to conduct a pilot project → ④ Making a pilot project plan → ⑤ Collecting local extension organization's demands → ⑥ Securing budget (central and local government) → ⑦ Notifying local extension organization → ⑧ Implementing pilot project → ⑨ Monitoring&evaluating → ⑩ Reflecting its results in the next year plan and gathering feedback from research institutes

In each of the steps, depending on the contents of the demonstration project, some steps were abbreviated or others were added. The factors of demonstration projects were developed by research units within RDA, research results of agricultural colleges, or the needs of rural people.

Basically, research institutes of RDA developed technologies and new varieties that the rural people need. The demonstration projects that were selected reflected the field requests, the direction of national policies, and cases of advanced agricultural technologies. Developed technologies and demonstration factors are transferred to the Extension Bureau which, based on experiences, knowledge, and field requests, decides whether to select it or not. Then a plan is prepared and a budget secured for the chosen demonstration project. The projects are implemented using such channels as demonstration farm, method demonstration, training, broadcasting, and appraisal. After completing the projects, their performances are measured and evaluated, and excellent ones are awarded. The results are also incorporated into the next year's projects.

1.2.3. Implementation Methods

a. Establishing Demonstration Farm and Complex

To implement demonstration projects, various result demonstrations were used as a primary method. Farmers could see and compare the results of new high-quality varieties or new technologies from the demonstration plot or demonstration complex. There were diverse result demonstrations and demonstration complexes: high-quality varieties for each plant, varieties comparison, collective farming, among others.

In 1968, for the first time, with prior education and thoughtful preparation, 500 demonstration complexes for collective farming were established. It contributed to the increase of yield, increased cooperation among agricultural households, diffusion of new

varieties, savings of production expenses, and implementation of machinery. By establishing a demonstration complex of collective farming, combined technology demonstrations were held for barley since 1969, and beans and corns since 1970.

(Clockwise from top left) Result demonstration plot for rice variety IR667 (1971), Collective farming (1972), Adaptive test to local condition (1983) and Anti-rice blast disease(1983)

Source: RDA (2003).

During the 1970s, while the implementation kept going, the demonstration complex for rice was renamed “Tongil” result demonstration plot. And, new seeds demonstration plot and demonstration farms for cash crops were expanded. In the late 1970s, demonstration complexes of dwarf apple trees were established nationwide, and used as a training center for increased productivity of sloped fruit gardens. Demonstration complexes for agricultural machinery, introduced in the early 1970s, were gradually diffused. Utilized since 1968, extension workers were assigned to, and responsible for, each of the major production areas for fruits, vegetables, special crops, sericulture, and livestock. The number of which was 73 in 1971 and 137 in 1972. In 1973, 1,557 extension workers were assigned to 137 complexes. This system was maintained until 1976.

During the 1980s, projects for demonstration farms for varieties comparison and safe high-yield were implemented. Demonstration farms were used as a place for field training

where farmers could see the results for themselves. From 1980 to 1991, 1,834 demonstration farms for fruits were established, contributing to the diffusion of high-quality seeds, as well as mechanized technology and an increased quality of fruits.

b. Method Demonstration

The method demonstration that showed the implementation processes of new technologies directly to the farmers was an important way of implementing projects. Looking directly at the implementation process enhanced the possibility to carry out the technology well. Examples included the rice seeds method, sample soil picking for measuring acidity of barleys, lime demonstration farm, bee tick control method, and heat-retaining vinyl rice nursery method.

c. Training and Field School

Background context, necessity, goals, implementation method, and expected effects of AES were understood through lectures, practices, on-site visiting, discussions at RGOs, result demonstration places, and demonstration complexes. In the training, various print materials like leaflets and pamphlets, slides, movies, samples, drawing boards, etc. were used to increase the effect of training.

d. Appraisal Fair

National and local appraisal fairs for the performance of demonstration projects were important opportunities for AES to evaluate the project, solve problems, and discover excellent success cases. To extension workers and farmers, they provided an opportunity to learn in a useful and practical way, and indeed contributed to the diffusion of demonstration projects nationwide. Specific examples include the nation appraisal on nursery box technology for rice farming, and on-site appraisal on dwarf apple tree, new corn varieties, mulberry management and mechanization plan.

e. Others

Various methods according to the situations of the period and crops were used to implement the demonstration successfully. For example, they gave a focused education by making intensive efforts in a short time of preparing a rice seed plot, and disease and insect pest control from the 1960s. They established and managed a conference room for technology extension at the headquarters every farming period from 1974. Therefore they promoted training in the field for increased provisions and prepared a counter measure figuring out the situations of weather, crop, disease and insect pest. Meanwhile, in the process of the green revolution, the opportunity to focus on increasing the yield of rice was provided by workshops for PRDA&RGO. For example, there were campaigns for producing 4.2 million tons of rice in 1973 and 4.48 million tons of rice in 1975.

1.2.4. Contents of Implementation

a. Diffusion of New Varieties

The seed is important in agricultural production. Therefore, the diffusion of the new superior seed was always an important assignment because the attention and effort on securing a superior seed was high.

There was an effort to diffuse a new variety of crops such as rice, corn, radish, cabbage, onion, cucumber, pepper, tomato, pumpkin, spinach, sesame and peanut. However, the results were not so satisfactory because of the under-developed research technology. For example, there was a rice blast disease and the rice was not sufficient although there was a diffusion of the various kinds of rice.

There was an improvement of breed according to the crop in the 1970s that was focused on a high yield. The improvements included rice that was strong against rice blast disease, barley that was resistant to cold, and corn that was possible of a high yield. Especially with vegetables, the variety that could be cultivated year round was required because of the year round demand and division of the various crops grown in facilities. There was a diffusion of the varieties according to the promotion of growth, semi-forcing, facility suppression, early raising, outdoor raising and rain-proof farming from research institutes of RDA and private seed companies. With vegetables, there were 556 varieties of 14 crops registered until the end of 1975. At this time, extension workers figured out the varieties suitable for the characteristics and the method of farming within their area. They also contributed to the diffusion of new varieties through vegetable demonstration projects and education because they could recommend superior varieties by crop types to the farmers.

The variety of rice was focused on taste not high yield in the 1980s. Focusing on quantity before the green revolution alternated into quality because of the achievement of the self-sufficiency in staple grains. The variety of vegetables was developed by private seed companies, 14 crops of radish and cabbage, and there were 888 varieties in 1988. Therefore, it was difficult for extension workers to be well informed with the characteristics of the varieties to recommend the appropriate variety to cultivate to farmers. There were bad seeds because some of them ignored the precautions and didn't consider the characteristics of the region and farming facilities. The rate of the diffusion was increased when there was a good result in the diffusion process of recommending a new variety. However, the AES was in trouble when there was a bad result. It was difficult to recommend the new variety from a private seed company. Therefore, they didn't disseminate the new variety as in the past. They referred to the precautions of farming and characteristics of variety by education and demonstration projects and then guided the farmers to choose and cultivate on their own.

During the 1990s, the focus of varieties development was shifted from quantity to the quality and processability. In rice, the technology of rice farming was completely alternated into quality-centered so 17 varieties of "Tongil" rice and 11 varieties that have bad quality were excluded from the encouraged breed and were changed into general quality variety. The consumption of fruit increased in accordance with an improvement in standard of living and the alternation of food pattern alternated into high quality, year round consumption. Therefore, the area of facility farming was increased, and cropping form and season was diversified. Then there were 2,031 varieties registered of radish, cabbage, tomato and watermelon in 1997. Also the sale of imported seeds increased so that it was difficult for the extension workers to diffuse the new varieties to the farmers.

Information on characteristics of variety and precautions of farming was provided through the farmers' education. However, choosing the variety was a passive way of diffusing new variety for agricultural.

Table 4-2 | Status of Major Crop Seeds Developed by RDA

(Unit: no. %)

	1906~1960	1961~1970	1971~1980	1981~1990	1991~2000	2001~2010	Total
Food Grains	136 (84)	40 (65)	91 (53)	115 (48)	222 (37)	420 (22)	1,024 (32)
Horticulture	12 (8)	6 (10)	40 (23)	75 (32)	255 (42)	1,297 (67)	1,685 (53)
Cash Crops	12 (8)	16 (25)	42 (24)	47 (20)	124 (21)	201 (10)	442 (14)
Forage	-	-	-	1	2	19	442 (14)
Total	160 (5)	62 (2)	173 (6)	238 (7)	603 (19)	1,937 (61)	3,137 (100)

Source: RDA (2012c: 104).

b. Diffusion of the Farming Technology

The demonstration projects included diffusion of new farming technologies, improvement of cropping system as well as improvement of quantity and quality by new varieties.

The seedling culture technology using vinyl, scattered seedling in a non-irrigated field, and early farming in the highland were diffused in rice farms in the 1960s. It started from the vineyard and was expanded through the diffusion of the plastic facility farming technology in 1969. There was a diffusion of the demonstration factor such as applying a proper amount of lime and N.P.K. fertilizer and balanced chemical fertilization in vegetables. The effectiveness of introducing technology was high that the head of a village came to RGOs and asked that the technology be established in their village. There was also a rapid diffusion of the high yield farming technology with the attendance of voluntary farmers from opinion leaders, and advanced farmers in method demonstration and from the appraisal fair.

The vinyl rice nursery was settled in rice farming in the 1970s, which was first disseminated in 1958. The vinyl rice nursery was 65% established in 1976. After this the early farming of rice was possible and contributed to rice farming in the alpine region. For vegetables, there was a tunnel and arch-shaped house made of iron pipes in the early 1970s. However, it was not widely diffused because of the initial cost of the equipment. Also there was a regulation of planting perennials like fruit in fertile fields because the policy was focused on the increase of food grains at the time. They recommended the construction of orchards on slopes to utilize abandoned land. Therefore, it was used as a field school for improving production on orchards on slopes supporting irrigation with the construction of the dwarf apple tree demonstration plot of 20ha in 1975.

Method demonstration for raising seeding of rice (1974, Left)
and Seedling culture technology using plastic (1978, Right)

Source: RDA (2003).

The farming of vegetables in facilities using plastic coating, plastic tunnel, and plastic houses grew rapidly in the 1980s. From 1981, the standardized house was widely diffused by standardized house design. It was a chance to advance collective vegetable farming given the favorable evaluation of the standardized house design. There was a large diffusion of clean seeds through tissue culture with the establishment of tissue culture labs in RGOs in 1984. With fruits, there was a diffusion of high quality technology on reflective film and a dropping water applying facility.

In the case of vegetables in the 1990s, there was a diffusion of standard automatic house design. There was also a diffusion of technology to reduce production cost of the dropping water applying technology, hot water-bag in vinyl houses to reduce oil, simplified rain shade and gentrification of quality. The fruit farming technology was developed by the increase in fruit consumption. Also a small storehouse was provided to farmers to prevent fruit from flooding the markets simultaneously and prices were reasonable.

c. Diffusion of Technology on Soil Management and Fertile Improvement

It is important to know the soil conditions and manage it accordingly to maintain the physical and chemical characteristics that can help the crop grow well. The soil acidification was fostered by chemical fertilizer because soil in Korea was more likely to be acidification. The improvement of acid soil is an urgent problem for agricultural policy and technology guidance, as barley and bean are being cultivated more since they are weak of acidity.

The focus was on the improvement of acid soil from the late 1950s so the effect demonstration of lime fertilizer on the main crop such as barley and bean was implemented with the full support of the government funding. There were 10,486 demonstration plots for testing lime in 1958 and 102,606 demonstration plots for testing lime in 1959 and these were used as field schools. The focus was clearly on this business given the rapid increase in the number of demonstration plots. As a result of managing demonstration farms, there was a high yield effect in barley and bean. Therefore, farmers paid more attention to the improvement of soil and there was a rapid diffusion of technology on lime testing.

Portable soil tester training for extension worker (1972, Left)
and Bringing soil to make soil fertile (1962, Right)

Source: RDA (2003).

The demonstration plot for testing lime and the demonstration of fertilizer were the main assignment of AES in the 1960s. The acidity-testing project was started above all because the usage of proper amounts was the most important factor for the trial effect of lime fertilizer. The necessity to improve soil fertility was emphasized through the balanced application

of N.P.K., to make soil fertile, achieve high yield of fertilizers, and improve drainage by effective demonstration of fertilizer. However, there were difficulties. First, the extension program on soil improvement was pushed back on the political priority list because the results were not visualized. Next, the farmers were dependent on the government instead of doing it themselves.

There were some trial and errors in technology education of soil improvement in the 1970s. However, the effectiveness of soil improvement on lime and silicate fertilizer was widely recognized and there was further development in improving the low productive soil. The detailed soil map by city/county was completed by soil investigation on fields and paddies from the 1970s and was nationally completed by 1979. Soil management by soil types and soil improvement was carried out in earnest. The handbooks of soil management on fields, paddies and new farming were published to help the farmers. There were not only data services and a technology extension system for soil management, but also diffusion of soil conditioners such as lime and silicate by cooperating institutions and by spending a huge budget. They even made a greater effort to supply and improve the trial effect.

The basis for technology diffusion of soil management of paddies and improvement of fertilizer was completed in the 1980s. There was a ten-year plan for soil improvement that was issued in an overall soil management manual that entailed a complete examination of soil of every paddy. The RGOs collect samples of paddy soil and send it to the PRDAs under the research institute of RDA. Then the testing bureau made a complete examination of the soil and issued a manual for soil management. With this manual for soil management, the extension workers educated the farmers. They wrote and managed a soil research report of specimens and recorded the soil testing results and the results from the farmers. The establishment of a lab for soil testing in 27 RGOs in 1988 was the basis of support for analyzing soil.

The 5-year plan for field soil investigation was implemented for the scientific management of field soil source in the 1990s. They made a soil map by observing the morphometric characteristics of soil. As this succeeded, the basic information for appropriate crops for proper land, proper amount of fertilizers, and water management were achieved after understanding the characteristics of soil.

Meanwhile, there was a concern about sustainability of agricultural production in 1990. This was because the consumers demanded safe farm production, but the pollution of agricultural land and agricultural water due to an increase use in agricultural chemicals led to a decline in organic content in some agricultural land and weakened the fertility of soil. The environment-friendly agriculture division was established in the MOAF in 1994 and "Environment-friendly Agriculture Promotion Law" was enacted in 1997. They made the agriculture production sustainable by harmonizing agriculture and the environment. They

also implemented environment-friendly agriculture by seeking economics of agriculture production, environment protection and stability of agricultural products at the same time. The technology diffusion of soil management was shifted to soil management of environment protection and soil improvement instead of a high yield depending on chemical fertilizer. Therefore, the Integrated Nutrient Management (INM) was applied to manage soil by submitting a prescription after a detailed soil testing on the crop.

The RGOs that has a lab for soil testing managed a demonstration plot for soil improvement targeting soil of decreasing crop growth. There were various factors of soil condition improvement and demonstration factors according to the available regions. First, there were total soil management by results of soil testing by field parcel and practice of environment-friendly agriculture. Next, there was soil improvement by transported soil, soil conditioner(lime, silicate) and natural ore. Third, there was soil improvement by organic fertilizer, by-product fertilizer. Fourth, there was a test on environment-friendly fertilizer like slow-release fertilizer by fertilizer paper. Fifth, there were drainage improvements (wet land, rice paddy affected by salt) and soil improvement of the heavy-metal contaminated area. It was compared with an experimental group by choosing a control group. The appraisal data was used by recording the main work and situations of growth and development by stages. It was even used as a field school by having mid appraisal fair and final appraisal fair in the field.

d. Monitoring Disease and Insects and Diffusion of Control Technology

If there are disease and insects, 10~20% of the harvest decreases depending on the type, the time of occurrence and the frequency of occurrence of the disease and insects. It is inferred that the damage by the disease and insect is huge from considering that from 1953 to 1956, for 4 years, the annual average area of occurrence was 23.6% of farm areas. Therefore, informing the occurrences of the disease and insect through complete examination and diffusing safety control technology is important.

To implement the monitoring of the disease and insect, the establishment of a monitoring post was started nationally since 1958. Initially, there were 10 monitoring posts in 1958. The number of posts increased to 23 in1964, 34 in 1965, and 48 in 1973. They investigated the occurrence of disease and insect by establishing equipments for monitoring disease and insects. In case of rice, RGOs installed them in the leased paddy&field of 20 ha of farm plot, and PRDAs on the demonstration plots. In the case of barley, each PRDA installed them in 10 ha of leased farmland for the investigation. Meanwhile, to solve the problems occurring in the monitoring plots, the leased paddy/field were purchased by city/county for RGOs to operate directly the monitoring plot. They started to establish one monitoring post in every city and county, there were a total of 151 in 1979, which created a national monitoring network.

The varieties of the disease and insects that were the object of investigation were added continually in the monitoring plots. Problematic disease and insects were investigated in the monitoring plots periodically and the data were reported by postcards. After the development of a computerized analysis program in 1987, the data were analyzed at RDA. They also investigated the situations of occurrence of disease and insects in farming land by regular monitoring visits. By the increased provisions policy, a substation was established in 2~3 towns in 1962 and the number of extension workers were increased. After this, the extension system was established.

The monitoring of disease and insects was possible by dividing up the monitoring locally and the extension of control technology like directions of agricultural chemicals was developed. Therefore, the extension workers from headquarters and branch offices visited the agriculture fields once every five days. They investigated the occurrence of disease and insects in paddy/field and recorded it as a news flash and reported it at RDA and PRDA. This postcard system was used until 1979. The telephone was used since 1980 and reported every five days. The results of investigations were used as inputs to analyze disease&insect occurrence trends, for presentation of occurrence information of disease and insects, and material for the extension of control technology. It was applied in planning the supply and demand of agricultural chemicals and prevention methods by reporting to the related organizations, such as administrative bodies and NACF. However, this regular visit monitoring was alternated to investigating only when necessary, focusing on major and unexpected disease and insects as the town/district offices were abolished in 1989.

Equipment for monitoring disease and insects (1962, Left)
and Collective chemical spraying (1984, Right)

Source: RDA (2003).

The information on the occurrence of disease and insects was classified into forecast, watch, and warning, and was announced after analyzing the data from monitoring posts, observation posts, regular visits, and weather and occurrence situations of disease and

insects from China and Japan. It was printed in three different colors to be easily recognized. The printed materials were distributed to the administrative bodies, related organizations, newspapers, and broadcasting stations, and was publicized by broadcasting stations, newspapers, speakers in the villages and the Internet.

Control technology of disease and insects from crops was diffused since 1962. The prevention of disease and insects was centered in the extension organizations as the measures of increased production were implemented. The administrative agency supervised, agricultural chemical was provided by NACF, and extension organizations did the monitoring and gave technology extension on prevention methods. In other words, the work was divided by the institutions and they cooperated. Since 1965 when the extension organization was monitoring the farm plots within the region, they put the big and small red notices into the paddy where disease and insects were identified. They also noted the type of disease and insect, name of agricultural chemical, and directions on how to use it on the inside of the notice pocket. The farmers read this and prevented further outbreaks. They also promoted the prevention by broadcasting with the loud speakers. They exhibited samples of the real disease and insects, and agricultural chemicals. They sent professional instructors to have consultations and distributed leaflets.

They dispatched the most agricultural extension public officials into the prevention extension of disease and insects to minimize potential damages in the 1970s. There was a shortage of workforce because of an aging population in the rural areas and more women in the 1980s. Therefore, the farm mechanization was important because it can reduce the use of agricultural chemicals and enhance effectiveness. There was an extension on the control model to reduce the number of controls from 6~7 to 3~4.

The Integrated Pest Management (IPM) project was initiated by the agreement between UNDP and RDA from 1993. In the IPM of rice, it was instructed to introduce a prevention model, seed treatment, seedling treatment, penetrating and selective agricultural chemicals to reduce the number of prevention. In the IPM of apple and mandarin, the prevention model that reduces the number of prevention was introduced. The appropriate agricultural chemical was chosen and sexual pheromone was used in monitoring moths and preventing mating disruptions. There even was a control by using a natural enemy.

e. Diffusion of Farm Mechanization Technology

The agricultural mechanization demonstration complex was established on 30ha for the first time under the agricultural mechanization policy in1970. It was used as a place of education for the public officials by tractor, motorized machines, binder and combine for each one. The demonstration complex was expanded to 3 in 1971 and 19 in 1972. They provided education on operating the machine to the actual user and organized a group of

mobile repair teams to give training on repairs. There were farm machinery training centers, training equipment, education for the farmers and repair service from 1972 to 1974 because the response was positive. The transplanting machine was diffused from 1975 and the 26 demonstration plot for transplanting machine was established in 1977 and 88 in 1987. There was a rapid increase of transplanting machines because of the demand. The demonstration project on small machines was implemented at 130 institutions in 1979.

The diffusion of the labor saving technology was an important assignment because of the shortage in workforce and increased wages in rural area in the 1980s. In rice farming, the mechanized transplant technology was rapidly diffused by establishing and managing 5,000 demonstration plots for mechanized farming. As the rice transplant machine was popularly diffused, research on transplant machines for the small size of rice sprouts proved more effective in saving than the mid-size. The diffusion of transplant machines for the small sizes of rice sprouts was started in 1990s, it was expanded to 395 thousand ha in 3 years of the establishment of the demonstration project in 1992. This cost-cutting effect was 560 million won and solved the problem of shortages in the rural workforce. It was the highest evaluation since the development of the rice "Tongil". The weed control technology demonstration project was conducted to replace weeding that requires a great deal of effort in the rice farms from the middle of the 1980s. In fruit, after the localization of SS weeds machine for the first time in 1981, the education of reducing agricultural chemicals and diffusion of saving cultivation technology were active.

There was a diffusion of various kinds of seedling technology, such as scattered seedling in dried field, direct seedling in the wet, by using new developed direct seedling methods when the complete mechanization of rice was achieved in the 1990s. This was expanded but stopped until 1995. The demonstration project for rice mechanized transplant was implemented from 1995. It was able to reduce the problem of shortage in rural workforce and choose the right method to cultivate according to the region as the method of direct planting and transplantation was diversified. In farm products, the 3-spoke barley seeding machine was used in the bean cultivation and established demonstration complex of mechanized cultivation on farm products. Since then, the mechanized seeding of farm products was expanded as the demonstration project was broaden using every farm products such as bean, sweet potato and corn.

1.3. Pilot Project by Using Residential Extension Workers

1.3.1. Background and Overview

Extension projects where extension workers resided in viallages the origin of the community development worker system that begun with economic aid from the US. The community

development worker was assigned to the demonstration village since the establishment of the community development committee in 1958. Its work included: researching the present condition of villages, organizing and fostering 4-H Club and women's associations, various self-support projects done with their own resources, and projects with financial subsidies from the central government but with regional human and material resources.

In 1962, community development projects were transferred to RDA. Since then the residential extension worker did not reside in an individual village but, instead, made rounds to a group of villages, 6~10 villages where the economic and social situation were similar were selected as a demonstration group of community development. Community development projects were reformed in 1968, and the above system was recombined since 1969 with the method of putting community development policies into the group.

From 1969 to 1972, one residential extension worker was assigned per 317 villages. Since the Saemaeul Movement began, the development of residential extension worker projects were changed to Saemaeul demonstration projects to increase income. There were 138 demonstration villages per city/county. Every six years, one extension worker resided in each demonstration village. In 1974, 16 villages were added, the total being 154. The second Saemaeul demonstration project was to increase income, which was implemented for three years from 1979 to 1981 in 154 villages. The third Saemaeul demonstration project was implemented for three years from 1982 to 1984 in 139 villages. Since then, as the name was changed, 139 fourth AES demonstration areas were selected and fostered. And, 139 fifth AES demonstration areas were selected and fostered.

1.3.2. Screening and Training of Residential Extension Workers

During the earlier period, only the candidates who had service mind and extension experiences were recruited for extension workers. They were placed in the job after being trained for 7 weeks at RDA. Since 1969, brochures of residential extension workers were published four times a year. The brochures were stopped for a short period but revived in 1978.

When fostering Saemaeul demonstration areas to increase income, there was social consensus about the importance of high-quality residential extension worker. The screening standards were reinforced in 1973. Such higher standards included: strong Saemaeul spirit and calling, strong creativity and implementing energy, specialized technology of strategic income plants, and more than two years of experience of extension services with a bachelor's degree. Those candidates who satisfied the criteria were selected and, after a certain amount of training, placed in demonstration villages. Also, to raise the ability to provide excellent extension services, a workshop of nationwide residential extension workers was held every year where new knowledge was disseminated, excellent cases shared, and extension information exchanged.

1.3.3. Extension Activities of Residential Extension Workers

Residential extension workers performed diverse activities of development while continuously contacting farmers. They investigated resources in their area and with the cooperation of residents, made plans with autonomy and implemented them. Their job included: investigating cropping · planting system, investigating effective resources, making long-and short-term planning, and increasing continuously the agricultural household income. They also implemented self-support projects by getting outside funds and fostered leading farmer's association. Main contents of extension services were: innovation of farming technology, improvement of agricultural structure, development of income plants, life improvement, and development of non-farm income.

Field school on rice paddy (1974, Left)
and Workshop for residential extension worker (1974, Right)

Source: RDA (2003).

1.3.4. Major Performance of Residential Extension Workers and Impact of Extension Activities

Major performance through the residential extension project included: residents' attitudinal change, change in technology level, change in income, and diffusion of income plants into adjacent areas. The evaluation of the first Saemaeul demonstration project to increase income at the end of 1978 indicated that: 62% were willing to implement earlier than others in demonstration villages while just 36.3% were willing in adjacent villages. The ratio of A-class farmers who were utilizing advanced technology for major income plants were 50.5% in demonstration villages, while just 14.9% were in adjacent villages. The comparison of yearly rate of increase in agricultural household income indicates that initially the difference was small but, over the years, the difference increased. Also, from 1973 to 1978, there was a case where in 94 villages that received continuous extension services, the income plants were grown and subsequently diffused into adjacent villages,

being a huge major producers' area. Such good performance was possible due to long-term intensive residential extension activities and education, progressive change in farmer' attitude and increased level of technology, which in turn lead to the increased income. It appears that residents of residential extension area cultivated the capability to continuously develop themselves with such experiences.

According to the evaluation of the second Saemaeul demonstration project, the level of success in income plants that were invested in the demonstration area was high, owing to technology extension of the residential extension workers, leading to a higher rate of diffusion into adjacent farmers. Thus, the small area became the larger one, being the main producers' area of regional special crops. In case of the second Saemaeul demonstration project, the average household income after a three year period of the project was increased by 206%, as compared to three years ago. As satisfaction with agriculture increased, life improved, and cooperation and active participation were higher than before. According to the performance of the fourth AES demonstration project, the average household income was increased by 71%, compared to three years ago. In the case of the fifth regional agricultural development demonstration project, average household income was increased by 94%, compared to three years ago.

The names of this project changed over time. The residential extension system was meaningful in that it contributed to the change in residents' attitude, the diffusion of new technologies to the farmers, the increased agricultural household income and productivity, and higher quality of life in rural areas.

1.4. Building Learning Group among Farmers

1.4.1. 4-H Club

The 4-H movement started in the early 1900s, and first emerged in the United States. The main goal was to train young people. The ideals of the movement consisted of 4 factors beginning with the letter 'H': Head represents being smart, ability to make sound judgment and planning; Heart represents virtues, truth, modesty, and living with others; Hands represent labor, service, and functions, enabling pleasant societies; and Health represents enhanced health, no disease, and increased efficiency, enabling pleasant lives.

Though the 4-H movement in Korea started in 1947 first in Gyeonggi-do(Province), the primary turning point occurred in 1952 when the 4-H movement was adopted as AES. Since 1954, a competition event was help to implement 4-H activities. The American-Korea Foundation(AKF) supported 4-H activities from 1953 to 1973.

In 1962, after city/county rural guidance offices and town/district offices were established

following the establishment of RDA, the 4-H movement became more active as the number of extension workers that played the role of fostering farmers' learning groups increased. In 1965, 27,911 4-H groups were composed nationwide. At that time, there were, on average, 20 4-H groups per town/district, and each worker guided 10 groups and 200-300 members.

In early 1970s, as the Saemaeul movement diffused, the name of 4-H groups was changed to 4-H Club and all 35,000 villages had a 4-H Club. The focus of 4-H projects was on increasing income that led scientific agricultural technology, where high-yield competition for rice, barley, and bean, high utilization of farming land, utilization of abandoned land, were held. Group activities included: improvement of roof, kitchen, rest room; renovation of waterworks and sewerage; construction of flower-roads&flower gardening, which altogether contributed to improving environments. As for training, the primary purpose was to inspire love for agriculture and hometown, and to make 4-H ideals and Saemaeul spirits a way of life.

Since mid-1970s, as rural young people left rural areas for cities, how to secure and train a succeeding rural workforce became the key point of agricultural policies. Thus, a plan for fostering Saemaeul 4-H groups was prepared in 1978 and implemented from 1979. Thus, small-size short-term funds for agricultural farming projects were changed to mid-term and other financing conditions were improved, as well as expanded. In late 1980s, to cope with the rapid reduction of agricultural population and other social changes, the structure of 4-H was changed in 1991 from region-oriented to function-oriented, consisting of students 4-H, farmers 4-H, and specialists 4-H. The focus of students 4-H was on development of the farming mind, and farmers 4-H on fostering capable farmers who can confront globalization.

The 4-H Movement that was developed according to the changing times and demand was the media that served as the leading implementation entity and extensive diffusion in the development of agricultural technology until the middle of the 1980s. By implementing the newly developed diffusion of agricultural technology in the field through 4-H project activities, they accepted new varieties and technology from conservative agricultural communities and connected it to farm household income. It also was an accelerator of diffusing to neighboring farmers. The 4-H members accepted "Tongil" rice and implemented the plastic house agriculture faster than anyone. They also volunteered to take farm machine training and were the leaders of agricultural mechanization. A notable member was elected as king of rice production increase in 1984 produced 1,006 kg per 10a and established the highest yield in the history of the world. Considering that they were the members of 4-H who were successful farmers today, it is safe to say that the 4-H movement contributed to the innovation of agriculture and increase of farm income.

1.4.2. Korean Association of Rural Leaders

Voluntary workers appeared naturally and were pioneers of community development as the leaders of rural modernization by diffusing 4-H Club activities nationally in the late 1950s.

The group learning activity was used as a important strategy to improve knowledge of the farmers and change their attitude from the early days of implementing AES. Agricultural Improvement Club was organized and promoted in natural village units for diffusion of technology on farming improvements and education according to the opening of IA in 1957. The number of Agricultural Improvement Club was 1,684, the number of members was 27,614, and the number of rural leaders was 1,258 nationally in 1960. The number of club and members increased consistently so that there were 396,309 members and 35,016 rural leaders at 31,073 villages in 1976.

The agricultural extension workers played a diverse leading role of horizontal communicator among the farmers, the supporter of extension workers, implementer of learning organizations' activities, as well as pioneer of green revolution from AES. They contributed to reducing the psychological distance between the government's administration system and the farmers by being a horizontal communicator for, and among, the farmers. The suggestions and ideas from opinion leaders contributed to coordinating extension plans, encouraging the farmers to participate in the education, and led the diffusion of new agricultural technology by the leader operating demonstration plots.

Rural leaders were important in diffusing the contents of extension workers' guide to the general rural people. The time and effort were necessary to get used to the new principles and method. It was more effective when internal leaders who were close to them and worked in the same environment than when new technology was diffused directly by outside extension workers because they were influenced more by internal leaders and it was easier for the trainees to follow them. Therefore, when extension workers diffused new technology to rural leaders, they could master it faster than the general rural people, owing to their relatively high level of understanding. They also improved the new technology by adapting it to their conditions and transmitted it to their neighbors. Therefore, it could be diffused continuously.

1.5. Farmers' Training

1.5.1. Winter Agricultural Education

This education was initiated with the sponsorship of administrative organizations whose primary goal was to correct inappropriate habits of farmers who gamble and drink during the winter. It consisted largely of extra activities that farmers could do during idle times such as: producing straw bags, making twisted straws, and other educational programs like helping illiterates learn to read. Due to the specialization problem of the implementing organization, the educator's role was transferred to AES organizations. From 1969, city/county rural guidance offices nationwide implemented the projects at the same time.

In the beginning, because rice self-support was important, education for farmers of rice and barley was implemented heavily, providing the basis of the green revolution where the technology of rice farming was elevated to a world-class level. Since 1976, it provided the basis of the white revolution in which protected agriculture was improved through scientific farming education based largely on income plants.

Initially, over four months (December 1 to March 31) every year, the educational programs lasted for 1~5 days for each village. Since 1978, as the busy farming season shifted back, it was done 5 hours each day, being adapted to the situation of each towns/districts. Lecturers were primarily extension workers and administration officials, and sometimes included related organizations, leading agricultural households, kings of high-yield, which overall raised the effectiveness of education. The target audience of the education was the whole population of a village and the content was about the overall agricultural society. Since 1969, food crop-oriented agricultural technology education was done for the targets, including farming managers, members of learning organizations, members of collective cultivating groups for rice, barley, and bean, members of special project complexes, and village leaders.

Since 1976, the education program was divided into two classes: food crops and income crops. In 1993, it was changed into specialized technology education corresponding to each crop.

Table 4-3 | Accomplishment of Farmers' Training during Winter Season

(Unit: person)

	Total No. of Trainee	No. of Trainees by Courses				
		Comprehensive (food grain)	Specialized (cash crops)	Women's Group	Farming Successor	4-H
1969~1970	5,889,436	5,889,436	-	-	-	-
1971~1975	12,934,704	12,934,704	-	-	-	-
1976~1980	13,367,827	10,313,341	3,054,486	-	-	-
1981~1985	12,032,015	8,300,221	3,448,887	282,907	-	-
1986~1990	10,405,554	5,458,720	4,027,204	919,630	-	-
1991~1995	4,271,313	2,888,710	611,393	702,204	34,657	34,349
1996~2000	3,181,217	2,667,396	-	513,821	-	-
2001~2005	2,795,007		2,411,688	383,319	-	-
2006~2010	2,039,217		1,814,557	223,265	-	-

Source: RDA (2012c: 994).

This winter agricultural education, with just a short educational period, contributed to the diffusion of a new direction of agricultural policies, agricultural technologies, and major AES projects nationwide. Also, because of the joint implementation with administrative organizations, NACF and Farmers' Associations, they began to cooperate more closely with one another.

1.5.2. Summer Agricultural Education

There were various ways of extension such as result demonstration, method demonstration, visiting the farmers, and regular visits for the diffusion of agricultural technology. In 1989, the AES was modified. Accordingly, there was an implementation of summer agricultural education by training in the field, visiting the agricultural field school to complement the weakened regular on-site visit.

There was training on the method of managing main crops by growth stages, farming technology and safe usage of agricultural chemicals, and the introduction of agricultural administration by using convenient places such as the shade of a tree, and demonstration plots by visiting the farm from June to August, for three months, which corresponds to the farming period of main crops. The farm machines maintenance and education through regular visits were implemented at the same time and they repaired the malfunctioning agricultural machine in the field. This received a fervent response by the farmers.

This education was first implemented voluntarily by the local extension organization and was implemented nationally from 1991 to 1994. Since then it was implemented by local self-governing bodies.

1.5.3. A Year-round Education

The year-round in-depth education among primary crops of the region was implemented according to the regional situation from 1978, as the demand on education of income plants was increased. It didn't develop at first because there was no budget. However, it was implemented in earnest by the government expenditure from 1991. The education of RGO by crops, leading farm and production area was implemented 3~4 times a year, taking into consideration the conditions of the city and county, and the time that farmers wanted, usually between March and December.

The professional knowledge and technology improved crops through this education, which contributed to the implementation of special crops and increased farm household income that became competitive in the region.

1.5.4. Training for the Rural Leaders

To support the promotion of collective self-learning clubs, there was a one-week education implemented by RDA and PRDA targeting volunteers of learning clubs from 1962. The target was expanded to Saemaeul Movement leaders and leading farmers in RGOs from 1969, implementing education on agricultural policy and new agricultural technology for 2~3 days.

This contributed to the promotion of capable leaders who could promote modernization of agriculture and rural area. They were the leaders of the national Saemaeul Movement from 1971 and contributed to the development of agriculture, farming, and village. This education was implemented until 1973 and was alternated to professional technology education on crops.

1.5.5. Professional Technology Education by Crops

There were a lot of external changes in the farming village by the implementation of National Economic Development Plans and Saemaeul Movement. However, the government implemented various plans for increasing farm household income because it was difficult to avoid the bad condition of agricultural economy with the self-sufficient production of mainly rice only. Therefore, the extension organizations enacted the "Rules for Farm Technology Training" in 1974, which focused on education of new technology on income plants, reflecting the regional characteristics to achieve an innovative increase in farm household income.

There was by-crops professional technology education for 2~10 weeks using the facilities of RDA research experiment institutes, and research team, targeting the farmers who could play a central role in production areas from 1974. In the early days, the curriculum consisted of various contents such as rice crops, field crops, special crops and flowers. However, segmented by crops professional technology, a new curriculum was set up and implemented from 1983. The farmers who were educated with this curriculum built a basis for commercial farmers and full-time farmers out of self-sufficient farmers. Therefore, they took charge of establishing production areas by crops throughout the country and acting as an important leader of the farming village.

1.5.6. Public Lecture on the Agriculture

For four years, from 1985 to 1988, the Korean Broadcasting Station (KBS), in cooperation with each local KBS branches, offered public lectures on agriculture for the public interest of supporting regional development of agriculture. Due to the difficulty in crops selection, lecturer recommendation, and textbook production, KBS asked RDA for assistance in cooperating on public lectures on agriculture.

Since 1989, RDA was responsible for lecturer recommendations and textbook production, while KBS was responsible for public relations matters. From 1992 to 2000, however, the system was changed: RDA was responsible for the budget and KBS for public relations.

The public lecture was offered in the spring and in the fall, the total number of which was 18. It took the form of regular visits to major production areas. The lecture planned to accommodate 250 farmers in each lecture and proceeded with lecture, questions and answers, and discussions.

The public lecture was a meaningful campaign in that RDA provided professional specialized expertise and know-how while a broadcasting station, with high interest, participated in the national educational programs. Such a campaign facilitated development of regional special crops, as well as farming technology by crops, which together contributed significantly to increase in farm household income and to reinforced competitiveness of regional agriculture.

1.5.7. Education and Training of Agricultural Machine

The agricultural and manufacturing training for 4-H was from RGOs from 1962 as the government realized the importance of agricultural mechanization, as well as of increasing food production. The training on farm machines operation sprang up from 1963.

There was training from 1960 to 1968 in RDA on carpentry, earthwork and ironwork targeting 181 of 4-H Club members at 4-H farming machine training centers. This training

field was reformed to a Farm Machine Training Center and implemented farm machines training, targeting mature 4-H members, in 1969. Basically, it was farm machine special training for 6~8 weeks, targeting 4-H Club members, and helped them acquire a motor license from 1969 to 1982. RDA also implemented farm machines special training for extension workers who would provide agricultural field training and technology training for the farmers.

Meanwhile, it was difficult to satisfy the demand for training done by farm machines manufacturer only, because agricultural machines were diffused by the 5-year implementation plan for farm mechanization(in 1972~1976). Therefore, the farm machines trainers were dispatched to the producer training field by cooperating with farm machines manufacturer from 1973 to 1987. It contributed to the safe use of agricultural machine and technology improvement by focusing on practice training that targeted the consumers of agricultural machines before actual diffusion of the machines.

The farmer education center, being established in each Province, provided training on agricultural machin for 4-H members for two years grom 1969. The training on basic operations, inspection, maintenance, repair technology and safe usage was done mainly with practices for 2~8 weeks, targeting excellent 4-H members. Training on operation technique was provided for a week, targeting the farmers who had agricultural machines, by building 141 farming manufacturing training centers until 1974. There also was training on operation technology such as cultivator, motorized weed remover, motors and water pump, for a week, by setting up farm machines for women training system in the PRDAs from 1975, as more women became farmers.

It was transferred to RGOs training system and implemented regular visit training on transplanting machines, combines, and small tractors and machines for two days. Unfortunately, as the diffusion of agricultural machines increased rapidly, there were more and more accidents happened during work every year. For this reason, RGO supplemented farm machines training with safety maintenance from 1983. They tried to prevent accidents and protect their priceless lives and property by teaching for one day traffic laws and safety usage/operation of farm machines, targeting the farmers who had road-types of machinery, such as motorized transporters and tractors.

The RGOs provided training service for the operating members of farm mechanization team as the farmer organized the teams that were small size co-usage group of farm machines in rice farming from 1981. The demand for training on those increased every year as the 612 farm mechanizing teams were organized for the first time in 1981. The primary goal was to organize one per every village. Two thousand people were trained at the province every year from 1981. They improved safe operation techniques of farm machines and capability to

do self-repairs and maintenance by providing education for 4,500 people, for a week, from 1989. Therefore, it was possible to train key operating workers who were expected to lead the farm mechanizing team successfully.

Mobile repair team at RGOs visited regularly remote villages where there was no repair shop for agricultural machine and repaired various powered farm machines that didn't work because of malfunctions. This contributed to the improvement of farmers' capability to repair and maintain the machines and the usage rate of farm machines.

1.6. Technical Information

Because the AES project is taking educational approach to make farmers adopt new technology by changing their attitude and orientation, it is very important to utilize educational medium that can communicate the contents effectively. The department of technology communication of RDA played the role of providing diverse media that fit with the chronological needs. Also, extension workers selected the ideal, effective medium that well suited the educational goals and contents.

Mobile farm machineries repair program (1972, Left)
and Farm machinery training (1985, Right)

Source: RDA (2003).

1.6.1. Printed Materials

Printed materials can explain agricultural technology systematically and are conveniently portable. They are recordable to see again easily and can be published in large quantities, and the cost of production is cheaper than other materials. Therefore, the printed materials were produced and used in various forms from the very beginning of AES.

a. Leaflets

The leaflet was a way of providing useful information for the farmers when there was not enough information about the agricultural technology from the late 1950s to 1960s. It was used to diffuse present agricultural technology information to cope with the situations of agriculture effectively ever since the first leaflet titled 'Let's Fertilize Rice This Way' was published in 1958.

b. Monthly Agricultural Magazine

To transmit new agricultural technology rapidly to the farmers and opinion leaders, a monthly magazine titled 'Agricultural Technology Magazine', serving as the representative printed material was published. On average, 500~800,000 copies per month were published in the early days and approximately 50,000 copies were distributed to opinion leaders and leading farmers in every village. Considering that there were 35,000 villages nationwide, it was distributed to more than one leading farmer of each village. The magazine was an important medium for diffusing current farming projects and new agricultural technology to every farmer.

c. Standard Agricultural Farming Textbook

The standard farming textbook on crops was published and distributed as a series of 3~4 volumes each year since 1974. This served as a means of establishing the standard technology of agriculture. Since the first dairy farm was published, 187 books on chickens, protected flowers, apple farming, Korean beef, mushroom, grape farming, bee raising, village farming, onions, fruits, soil management, paddy farming machines, and technology for rice quality upgrading were published. Sixty-two books were out of print because there was no demand for them as the agricultural conditions were changed. The others were published by complementing new technology contents that changed consistently.

Researchers and experts on crops wrote the contents directly based on the proven agricultural technology from RDA research institutes. They also proofread and supervised the research. It was a standard guideline for learning agricultural technology.

1.6.2. Audiovisual Materials

From the introduction of AES there was a realization of the importance of using audiovisual materials when diffusing new technology to the farmers. Therefore, audiovisual education for farmers was more advanced than the education in regular schools. The board, charts, manual projectors and film stripes were made and supported from RDA in the early stages. The importance of audiovisual education was realized by extension workers with workshops and there was training on making audiovisual materials. However, the infrastructure was poor so in the early stages they could not use audiovisual materials because the lights were not working in the rural areas. They needed to use small generators.

a. Technology Education Movie

The audiovisual education, like showing a movie, was implemented by the diffusion of educational tools for audio/visual and got great responses from the farmers in 1958. Two to three technology training movies were produced and used in a year by cooperation with the National Film Production Center. There were 27 movie vehicles managed until 1965.

There were basic picture-production facilities and producing officials at RDA in 1967 so that they diffused 10 educational movies to the RGOs for self-production and supported them with projectors and portable generators. It was welcomed by the farmers who had no electricity, and the extension workers were able to educate with the 8mm movie.

However, the farmers were less interested in the educational films as TVs became more popular in remote villages in the 1970s. The projector became obsolete and malfunctioned. Therefore, an audiovisual media that could replace these problems was necessary.

b. Slide Film

The diffusion of projectors was expanded from the late 1970s when the winter agricultural education was most active. The utilization of natural colored slides was increased rapidly. Thirty-two slide materials were produced and diffused in 1980. The utilization was increased for 10 years and had the best results as audiovisual material. However, because the video materials was getting popular in the 1990s, production was stopped in 2002.

c. Video Material

By the introduction of video equipment as a new audiovisual material at RDA in 1979, 4~7 video materials were produced and diffused. However, because it was expensive, it was not easy to get one from the RGOs.

About 10 materials per year containing the results of research and testing, new development technology, and leading farm cases, were produced by RDA. The video material was the representative audiovisual material in the 1990s. The production of video

material according to the regional's situation was promoted in 1992. A contest of producing high-quality video materials was held for the diffusion of excellent materials and nine pieces were selected. The production technology of video material from local extension workers was increased rapidly. The video material was used mainly on collective education like winter agricultural education.

1.6.3. Mass Media

a. Radio Agricultural Broadcasting

The mass media was used as an important extension tool to motivate the farmers by diffusing new technology information rapidly, and promoting excellent agricultural examples. Especially, radio broadcasting was the important means of communication in disseminating agricultural technology information.

There was a radio program titled 'Agricultural Diary' on the KBS channel, which at that time was the only radio broadcasting station in 1958, broadcasted twice a week and was enjoyed by the farmers. Its coverage became wider. The recording studio broadcasting was established in the Agricultural Communication Room of RDA in 1963 and provided the broadcasting station with various agricultural broadcasting programs directly recorded and produced there. There was a program named 'Radio Agricultural School' on KBS, broadcasting everyday at the same time. This helped the farmers to approach agriculture scientifically by broadcasting the basic theory of agriculture and the method of applying it in the field. Forty thousand 'radio textbooks for agricultural schools' were distributed to extension workers and 15,000 'radio textbooks for agricultural schools' were published the next year. This was the first attempt of distance education by broadcasting in Korea. The agricultural broadcasting programs were produced in all six broadcasting stations in 1969. The RDA produced one thousand broadcasting recording tapes a year and provided them to the broadcasting stations.

As the rice "Tongil" was diffused, RDA divided the whole land of Korea into northern, central, and southern areas. The farmers separated highlands, flat lands, and the highlands proposed a standard farming method by heights and applied the agricultural technology according to the characteristics of the areas. However, there was confusion because they didn't know where their paddy belonged to. There was a limitation because they couldn't solve this problem through the central broadcasting media. The self-broadcasting from one PRDA was started in 1970 and was greatly appealing to the regional farmers so the other districts started self-broadcasting. Trust was increased by broadcasting the problems of real farm fields from local agricultural broadcasting.

Two agricultural broadcasting programs were stopped because of the restructuring of the broadcasting stations in 1980 and three were stopped in 1987. Therefore, the KBS Radio 1's "Time of Farmers and Fishermen" was the only agricultural broadcasting program that survived.

b. TV Agricultural Broadcasting

By the diffusion of TV broadcasting in the rural area in 1966 for the first time, the KBS-TV station started to broadcast irregular agricultural broadcasting in 1968. 'New Dawning Rural' from KBS-TV station and irregular agricultural broadcasting from the MBC-TV station were started as the Saemaeul Movement was developed in 1972 and the AES was absorbed by the Saemaeul complex technology extension system. There were 190 TV agricultural broadcasting programs in 1972. Due to several years of continuously good harvests in the mid-1970s, the mass media paid more attention to agricultural development. The special programs were produced and broadcasted, focusing on some cases of successful farming and rural life.

The contents of TV programs were diversified over time. For example, in 1981, introducing advanced agricultural technology and discovering some excellent examples of successful farms, the program, 'Leading Rural Areas', was broadcasted everyday by the KBS-TV station. In the same year, a program named 'Let's Live Better' was broadcasted on the KBS-2TV station, focusing on successful farming cases. There was also a regular program named 'Our Dawning Hometown' on the MBC-TV station.

However, since 1985, as the number of farmers and the importance of agriculture decreased, agricultural broadcasting was not as active and the number of broadcasts decreased as well. After 1993, the communication of agriculture, rural area, and the farmers was included as part of the general programs instead of being the sole agricultural broadcasting programs.

c. Village Amplifier Broadcasting

The relay broadcast of the radio by connecting the cabled speaker in the 1960s was the beginning of the amplifier broadcasting system, when the diffusion of radio was insignificant and there was no electricity in most rural areas. The facilities of cable amplifier broadcasting started to increase after the middle of the 1960s and there were 1,300 locations in 1968.

Recording tape of contents of AES for 40 production areas was distributed to use for amplifier broadcasting effectively. Seven thousand LPs about technology extension on collective rice farming and the increase of income was produced and distributed in 1971. This complemented the weakness of radio broadcasting that is not recordable and in time restricted. The amplifier was created in every village as the Saemaeul project was developed since 1972. It was used to inform the areas of the notices rather than radio relay

broadcasting because the radios were already diffused to the agricultural community. The amplifier broadcasting was used as a media of contacting groups when extension workers visited the village. If it was difficult to inform the results of monitoring the disease and insects, the amplifier broadcasting was an important media for them.

The amplifier broadcasting was used to rapidly propagate the agricultural project in the 1970s. It was important during the green revolution of the Saemaeul project and for the self-sufficiency of a staple grain.

d. Newspaper and Magazine

Newspapers and magazines were used as means of communication of agricultural technology. There was a column named 'Agricultural Diary' in Chosun Daily newspaper for eight months and were three articles of the agricultural information weekly in the Seoul Daily newspaper. Therefore, there was regular agricultural information in each national newspaper and each PRDAs used the newspaper as a method of educating by having a regular column.

They also stared to write about agricultural technology in the periodic publications focusing on agriculture. They used the outside printed media. For example, they provided information on 'New Nation', 'New Power', 'New Farmers' in the 1960s and in the monthly 'Saemaeul' after the 1970s, and also in the periodic publication from other agricultural institutions and organizations.

1.6.4. Internet

The possession of computers by farmers and the use of internet only recently increased. Internet, in turn, contributed to the diffusion of agricultural technology. Various kinds of information are provided by the RDA website (http://rda.go.kr), such as information that had been accumulated thus far, standard farming textbook, video of agricultural technology information, weekly agricultural information, seed information, agricultural weather information, soil information, disease and insect information, internet newspaper, and Agricultural Development Newspaper. The Agricultural Development Newspaper provides news about, for example, new agricultural information from RDA, local extension organizations, education, business, events. They even write a newsletter to the clients once a week by E-mail.

There is a blog named 'Jonny' of RDA. The university students and housewife bloggers introduce the stories of the agricultural field in the form of direct coverage. Therefore, an agriculture online community is created. It is used as a media for extension and promotion like SNS, such as Facebook and Twitter, with daily updates. The daily contents such as agricultural policy news and agricultural information are provided at the representative account on Facebook and Twitter by RDA. The interactive communication of overcoming

limitations of time, space and cost of broadcasting and printed media, providing diverse information rapidly and continuously and understanding demand of the clients by internet is innovative. It is, therefore, important to figure out how to use internet more effectively.

1.6.5. Exhibitions of Agricultural Technology

As the number of visitors to RDA were increasing, exhibition facility introducing agricultural technology and AES was necessary.

The booklet written in Korean/English and slides introducing AES was used until the late 1970s. There was a farmer consulting guideline in 1980 demonstrating the actual sample and empirical educational materials in the RGO branches. It was expanded to RGOs so that each extension organizations started to establish various forms of demonstration facilities according to the actual circumstances of the region and used them as promotion to create a synergy effect.

The Agricultural Science Building was established at RDA in 1982 and was used as extension field, and exhibition rooms for farm machines were attached in 1986. They also demonstrated new technology by establishing result demonstration in each labs and research institution of RDA, and was also used as a training center and visiting course. The Agricultural Science Building's size of two stories&one basement whose overall areas were 11,883m^2 was newly built in RDA in 2002 and informed visitors of the agriculture and new agricultural technology.

2. Success and Failure Cases

2.1. Specialization of Extension Workers

The farmers demanded more professional farming technologies to extension workers as the conditions of agriculture was rapidly changed in the 1980s. It was difficult to satisfy them because the extension workers didn't have much information, technology and experience. This caused role-conflict and demoralization of extension workers. Extension workers played a role as adult instructor to the agricultural community. They were respected by the agricultural community when they were able to provide enough information, technology and knowledge, whereas they felt a sense of alienation and role-conflict when they weren't able to respond to their demands. Job satisfaction and morale of extension workers decreased.

Various ways to increase professionalism and morale of extension workers were implemented. The 'Code of Extension Workers Professional Specialties' was established to promote professionalism of extension workers in 1977. According to this regulation the extension workers was divided into professional worker, special extension workers, and

general extension workers. The professional extension works were sent to RDA and PRDA and extension workers who had the license over special extension workers were sent to RGOs. The license of professional extension workers and special extension workers was assigned by passing examinations. They were able to increase their professionalism and cultivated their researching and instructing skills by gearing up for the examinations.

The RDA implemented a long-term dispatch program for two years for 437 people, one worker per city/county every year from 1989 to 1992, as a method of increasing their professionalism. The candidates for training can be more professional by learning agricultural information and technology and results of recent research for two years at RDA research institutes. They also supported the specialized research group that is an autonomous studying group of extension workers to help them increase their professionalism. They had a study meeting 3~4 times a year, planned by themselves based on the demand of the members. They had chances of studying urgent technology and information and sharing excellent examples and experiences. It was organized by crops such as strawberry, watermelon, Korean beef, hog, apple and peach. The extension workers who are in charge of the same crop were gathered and they studied and shared information and technology. Therefore, there was a chance of acquiring necessary technology and information in the field. It was also a chance to form a human network so that they can get professional help when they need.

Experiencing advanced agricultural technology and extension system by overseas training in developed country can motivation people to improve their professionalism and raise morale.

2.2. Implementation of Pilot Projects

There were failure cases of pilot projects because of unexpected weather accidents and disasters. For example, barley seed in the autumn of 1976 was decreased by 30% because of a severe cold and drought. However, this provided a chance to reestablish agricultural technology of barley and the cold-resistant variety was developed and diffused.

In extensive diffusion of feed crops in the late 1970s, to feed Seombodi (Dystaeniatakesimana), a perennial grass from Ulleungdo, they tried to establish over 3,000 demonstration plots and to invest a lot of leadership. However, it would not settle down as a feed crop and disappeared in 2~3 years. It was because they implemented the demonstration project accepting opinions of the possibility without prior research to disseminate. They realized the importance of pilot projects in diffusing new varieties.

The farmers used poisonous agricultural chemicals in the fruit garden as in rice, misunderstanding the use of agricultural chemicals for disease&insect control during the

1960s. There were people who were poisoned or were dead. Therefore, there was a regulation on poisonous agricultural chemicals sellers, who were required to get permissions from RGOs. There was confusion to the farmers because the variety of agricultural chemicals was increased rapidly by the development of domestic agricultural chemical industry. To reduce this confusion the germicide was colored in pink, pesticide in green, herbicide in yellow, poisonous chemicals in red and growth regulators in white. This made it simple to warn farmers of the agricultural chemicals. The RDA also implemented educational programs on the agricultural, extension in the field and promotion activities use of use of agricultural chemicals into practice in every education.

In the use of nitrogen fertilizer for soil improvement, the farmers applied the same amount of sulphate fertilizer and urea fertilizer although they are different in nutrient amount and effectiveness. Therefore, there were some damaged cases of various disease and insects. The RDA started to educate the farmers on how to use different amounts of fertilizer according to their types by establishing demonstration plots for sulphate and urea fertilizer.

Box 4-1 | A Successful Case of High Yield Rice Variety Dissemination

When high yield rice variety, "Tongil", was first disseminated, it was very popular among agricultural people due to its high yield. But, in the following year, during the diffusion process, there was frost earlier than normal in certain areas where the phenomenon occurred in which rice failed to ripen but stood straight. A close investigation revealed that the phenomenon occurred in about 10% of the farming lands. Because mass media announced widely with heavy emphasis on the damages, leading to the general people's belief and public opinion that high yield rice variety, "Tongil", failed. For this reason, it was very hard to disseminate the "Tongil" next year.

But, analyses of the characteristics of damaged areas indicated that the damages occurred primarily in the concave areas that were surrounded by the mountains. Therefore, those areas of much earlier frosts were excluded from the dissemination. Instead, flat areas were the target for the dissemination and education. Extension workers often visited individual households to persuade them, contributing to the higher diffusion of high yield rice variety, "Tongil". On the other hand, the same kind of rice varieties as "Tongil" but strongly resistant to coldness. Through such processes, high yield rice variety, "Tongil" was diffused widely and the whole population could eat, at their disposal, the rice, leading to the eventual self-support of rice.

Interview with Lee, Soo-cheol, Former Director of Extension Bureau, RDA.

2.3. Implementation of the Farmer's Training

In the early stages of training on income plants, sometimes the results of education were low because those farmers who had no interests were mandatorily mobilized.

However, the education was changed since 1989. Those who wanted to acquire the new professional technology, succession farmers over 20 years old who wanted to settle down in the rural areas, and opinion leaders who can lead the new rural areas, were the primary concerns among the farmers who had careers of cultivating crops for more than three years. The effectiveness of education was high by implementing bottom-up way.

Box 4-2 | A Successful Case of Increasing Income through Farmers' Organization

Because agricultural people did not have an interest in new technology and subsequently the ability to learn, there was big difference in the level of technology among agricultural people. Thus, there inevitably was a difference in the quality of agricultural products, as well as in the household income among the people. To solve such problems, AES implemented efficiently the diffusion of new technologies and the plan for increasing income.

As an example, an association was formed among about 500 households cultivating apples, one of the five main producers' plants, the name of which was "Bonghwa County Association for Apple Development". This association was pioneering in adopting actively the results of research and extension services for apple. Also, the association received consultations from extension worker three to four times a year, invited specialists' lectures, or overseas training. All these activities contributed to the increased average level of technology of the apple farmers. In addition to production, members of the association participated in various activities, including apple appraisal fairs, apple tasting fair, seminars, apple tower and billboards, which publicized the excellent quality of Bonghwa County Apples.

As another example, Ganghwa County has been famous for figured mats, "Hwamunseok". Merchants from all over the place used to deal with agricultural women with arrogance and try to buy the mats for a ridiculously cheap price. Fortunately, owing to the efforts of extension workers, producers of figured mats in Ganghwa County formed an association, "Hwamunseok Producers' Union", opened a demonstration building where the mats were displayed and sold for normal prices. Also, the Union trained and educated the member producers regarding the improved rush varieties, "Wanggol", cultivating technology, drying methods, dying methods, etc., making the product, "Hwamunseok", a leading income source in the county.

Interview with Lee, Soo-cheol, Former Director of Extension Bureau, RDA.

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Chapter 5

Analysis of Success Factors

1. Success Factors
2. Unsatisfactory and Necessity of Supplementation
3. Difference Analysis of Related International Cases

Analysis of Success Factors

1. Success Factors

Starting with the liberation from Japanese imperialism and the chaos of the Korean War, achieving stable self-sufficiency was one of the most urgent problems in Korea. Since then, AES of Korea has been coped with change of the social, economic situation. As a result, the production of rice that was the main food crop went beyond the self-sufficiency. Also, yields for such crops as vegetables, potatoes, mixed grains and livestock reached the level of advanced countries through efficient agricultural R&D and dissemination system. The following factors had a significant influence on the success.

1.1. Establishment of Organization under the Law and Budget Support

Before the establishment of the RDA in 1962, we learned a lesson, from the experience of having applied the American style AES model, in that the American extension system did not fit the unique situation of Korea. Accordingly, Korea had such problems as waste of limited government budget and/or inefficiency in applying extension personnel primarily because they implemented various agricultural extension systems that were not coordinated and/or integrates one another.

As a means to overcome such obstacles, Korea established RDA for the purpose of solving the problem of chronic food shortage in Korea. The establishment of RDA, supported by the Rural Development Law enacted in March 1962, was an innovative work because it could conduct research on agricultural technology and the extension system in a more coordinated way. According to the law, even the institutions that could implement extension service by another law were forced to get approval from the Administrator of RDA in advance. This

gave RDA an authority to implement the agricultural extension system in an integrated way at the national level, which was one of its most distinguished features.

In addition, the establishment of RDA, the responsible organization, by law permitted RDA the authority of preparing the budget independently and getting the approval from the government to implement the budget. Although the agricultural extension budget was organized by MOAF in 1962 and in 1963, it started to be organized independently from 1964 and was able to continuously implement the agricultural extension works corresponding to the planned goal. In terms of finances, the local expenditure increased more than the government expenditure. This resulted from the change, after the decentralization of AES in 1997, in the way to promote pilot projects which is combined with the central budget when the project budget was secured by the local expenditure.

1.2. Linkages between Research and Extension Function in a Single Organization

Agricultural extension system in Korea has dual functions of agricultural technology R&D and extension service in a single organization. The AES is administratively hierarchical in line with RDA (central), PRDA (province), and RGO (city/county). So, the front-line rural extension workers can identify the difficulties of the field and new subjects of research to the higher-level research institutes and the research results can be applied back to the field. This was an efficient system. <Table 5-1> shows the suggestions for agricultural policy and the number of suggestions that were actually applied by AES organizations. The researcher suggests an idea for agricultural policy and farming application, based on the results of the research, and RDA collects and evaluates them and selects the data to be used.

Table 5-1 | No. of Suggestions for Agricultural Policy and Farm Applicable Technology Derived from the Research Result

	1979	1980	1985	1990	1995	2000	2005	2010
Suggestion	44	54	149	143	123	77	316	413
Farming Technology	114	104	107	2,320	593	508	903	1,243

Source: reconstructed from RDA (1994:280~281), RDA (2012:105~106) and MOAF (2005:731).

If research and development of agricultural technology and the extension system belong to different departments, there might be a conflict in selecting the technologies to be diffused, otherwise some coordination might be necessary. However, in the case of Korea, owing to regular meetings meeting in a single organization, job rotation between research

and extension positions, and review of the applicability of research results into the field, RDA are able to develop new cutting-edge technology leading to an effective system of diffusing agricultural technology that can solve the field problems.

1.3. Goal-setting and Project Promotion in Response to Time Change and Need for Technology

The agricultural technology extension system in Korea planned and implemented a project to keep pace with the national agricultural policy. <Table 5-2> shows the chronological alteration of Korea's goal of agricultural policy, research and development, and extension system as mentioned above.

In the 1960s, newly established RDA built a basis for implementing agricultural policies to increase food production with focusing on the R&D of agricultural technologies. In the 1970s, the research institutions achieved the green revolution by developing new varieties and innovative farming technologies. Extension system implemented various pilot projects so as to provide the innovations efficiently to the target groups while the government kept price-support policy for the rice farming.

Table 5-2 | Relationships of Emphasized Strategies among Agricultural Policy, Research, and Extension

	Agricultural Policy	Agricultural Research	Agricultural Extension
1960s	• Period of economic development and food grains increase - encouraging production increase and mobilization of idle resources	• Strengthening research capability	• Transit to active guidance - comprehensive technologies - group contact through farmers' group
1970s	• Period of price support and income increase - stimulating increase - executing income increase policy with dual price system	• Green Revolution - diffusion of high yield varieties	• Vitalization of Saemaeul (New Village) Movement - specialization and capacity building of the extension worker - cash crop complexity enlarged

	Agricultural Policy	Agricultural Research	Agricultural Extension
1980s	• Period of non-farm income development and regional development - reduction of protective policies by Government - securing stable price of products - developing non-farm income opportunities	• White Revolution - overcoming constraints of seasonal produce - farm mechanization - supply fresh vegetables yearly possible	• Strengthening cooperative extension - enlarging dissemination of comprehensive farming technologies - strengthening relationships with rural leaders
1990s	• Period of structural improvement and improvement of competition - massive investment for agriculture - subsidies through farmer's group	• Quality Revolution - high qualified products and low cost production technologies - coping of UR and WTO	• Strengthening research functions at local extension body - adaptive research and dissemination of technologies - fostering local extension bodies to be local specific agricultural development center
2000s	• Period of enlargement of programs related with food industries - income increase through 6th industries* - dissemination of processing technologies and equipment	• Knowledge Revolution - application of BT, IT, NT - application of high tech	• Reformation of organization - decentralization and reduction of extension personnel - support local extension bodies with scientific equipment and facilities
2010s	• Fostering high value added food industries - creation of food cluster - change of policy direction to selection and concentration system	• Value Revolution - eco-friendly, health oriented high value added tech. - applied research with medicine materials	• Support for leading industries for the future - fostering small, but strong farm business - eco-friendly, health oriented high value added tech

* The 6th industries means packaged programs, which emphasize producers' capacity from agricultural production, processing and marketing.

Source: reconstructed from RDA (2012) and Kim&Joo (2013).

In the 1980s, in research, it achieved a base that can provide fresh vegetables through the year by the white revolution and extension system made an attempt to disseminate a compound farming technology and reform organizations of local agricultural extension in response to the agricultural policy of nonfarm income increase and rural village development. In the 1990s, Korea's goal of agricultural policy was to improve the agricultural structure and competitive responsiveness to the opening market, as represented by the UR and WTO. Agricultural research focused on the revolution of high quality and low cost production. And, in the extension system, the RGOs was emphasized to carry out the field research and education function.

In the 2000s, agricultural production and processing in close connection with the food industry were the main goal of the agricultural policy. Research focused the technology of fusion and convergence that was applied to such functions as BT, IT, NT. In the extension system, facilities and equipment for the scientific farming at local level were provided more for the RGOs. The goal of agricultural policy and research in 2010s is to create future growth power for the higher value added through applied research in food industry and medical science. Especially, the goal of extension system is to build higher capacity of the farmers and to promote agro-business.

Once the goal was set up to respond to the alterations in the domestic market situation, agricultural R&D and extension system worked together so as to achieve the goal. It shows that AES in Korea worked well in maintaining consistency with the national policy. Especially, with the extension system, various projects that were needed to achieve specific goal was implemented, in addition to basic function of farmers education and technology transfer. Finding a new demonstration project, cooperation with a rural leader, promotion of study groups, equipment and facilities for RGOs are examples of those projects.

1.4. Reinforcing the Training of Extension Workers and the Farmers

As a change agent, secure professionalism of agricultural extension personnel is the focal point of the agricultural technology extension system. They disseminate technology by interacting closely with the farmers in the field and reflect their demands. Especially, when someone is not a professional in the agricultural technologies, or if the agricultural extension personnel are below the level of technology that the farmers already have, or if it is difficult to have consultation or instruction with the farmers, they lose credibility.

Regarding this, it was necessary for RDA to reinforce the professional capability of agricultural extension personnel in Korea. Therefore, RDA made "Regulation on Specialization of Extension Personnel" toward extension workers since 1974 and implemented the reinforced

on-the-job training to help every extension personnel acquire at least one specialized skill in agriculture or rural development. Also, RDA supported a system that reinforced professional competency in information sharing, self-assignments training and presentation of the results by helping them organize "Special Extension Study Group", an autonomous learning group targeting agricultural extension personnel everywhere since the middle of 1990s.

Meanwhile, because of the limitation of the number of extension personnel, the farmers' education focused on the efficiency of technology dissemination at various levels. The focus shifted from contacting individual farmers to contacting with groups since 1994 by promoting study groups among the farmers as well as by continuously fostering 4-H and rural leaders. As a result, farmers' agricultural research associations by crops, basically learning groups, were organized; whose total number was over 2,500. Furthermore, education of the farmers in the winter and summer, agricultural off-seasons, was implemented on a national scale for every farmer and it was implemented in various issues, including education in computer, operation and maintenance of agricultural machines, product processing and marketing.

Reinforcing professionalism of extension personnel through on-the job training and promoting self-study group can boost the confidence of farmers and make them confident as experts. In addition, organizing the farmers can reduce the number of extension personnel and budget necessary for contacting with the farmers, promote the technology adoption via group decision making, and enhance the farmer's competitiveness.

In Korea the AES tried to approach the dissemination of technology through the educational process. The emphasis of agricultural extension personnel as a teacher and the farmers as students helped build capabilities to secure sustainability of agricultural development.

1.5. Multiple Applications of Various Extension Methods

Socio-economic levels of the farmers adopting agricultural technology and responding to popular technology are diverse. Therefore, it is important to use the proper extension method that fits well with the characteristics of the farmers in developing and disseminating new agricultural technology.

Demonstration plots, method demonstration, and field schools provided farmers with an opportunity to observe the effectiveness of the new varieties and technologies to be diffused. AES used printed media, as a means, such as leaflets, monthly magazines, standard textbooks on agriculture, audio-visual materials. They also used media including farm broadcasting through radio and television stations and amplification system in the village. These diverse tools and applications could help to accommodate the various socio-economic characteristics of the farmers.

Recently, more information is being provided through internet and educational materials using IT. This has provided diverse opportunities for farmers to acquire information. Nonetheless, there is an emerging issue of how to react to the aging rural population, with respect to developing new and better ways of agricultural extension.

1.6. Effectiveness Verification and Dissemination through Pilot Project

Agriculture deals with a complex technical system because the growing condition are different from each location and there is a gap between the result of an experiment from the research institution and the actual circumstances in the field. The farmers are not willing to adopt new technology if they are not familiar with it.

The pilot project is one of the ways to solve this problem that agricultural technology might have. In other words, it is a system that investigates the effects of the technology by adapting to local circumstances during the process of transferring the technology developed by the research institution to the farmers through the extension system. By using facilities of RGOs and/or applying new technology to demonstration plots can contribute significantly to the advancement of technology level of both extension workers and the farmers.

Korean AES used the strategy of step by step approach to in diffusion of newly developed technology. It first evaluated the results of major technology developed through the pilot project and then diffused it gradually. Thus, AES increased credibility of recommended agricultural technology by diffusing only the successful technology that was well-suited to the local characteristics and helped implement the field-oriented agricultural extension system.

1.7. Supported by the Agro-industries and Policies

It is difficult to increase agricultural productivity by only improving the breed and simple technology factors. For the last half-century agricultural productivity was raised to global standard. It was possible because of the industries related to agricultural input elements such as seeds, agricultural chemicals, agricultural materials and agricultural machines have all been improved. Farmers were able to purchase agricultural inputs at low prices by the agricultural policy that helped farmers to borrow money easily through policy funds from the government. The supply channel of agricultural inputs was established in the NACF nationwide so that the inputs could be supplied in time.

However, agricultural technology, which requires excessive chemical fertilizer and agricultural chemicals, has been changing to be more environment-friendly, utilizing organic agricultural technology to meet the needs of high quality consumers' preferences for healthy agricultural products.

1.8. Trust in the Agricultural Extension Organization and Extension Personnel

In the process of diffusing agricultural technology, the trust of the farmers in extension organization and its personnel is important. If the real consumers don't trust them, even superior technology can't be adopted easily and quickly. Korea increased the farmers' trust in various ways. Above all, the agricultural extension personnel showed their faith in the farmers instead of using instructive and coercive ways. They figured out the characteristics of each household, recommended proper agricultural technology, and advised how to solve the problems. They encouraged competition among their farmers only when it was necessary. They gave them knowledge and information continuously through further extension even after the demonstration project ended.

Agricultural extension personnel were devoted with faith and integrity to achieve national food self-sufficiency. It was possible because, even though most of the personnel were from rural areas, different institutions played unique roles in a coordinated way. For example, the MOAF and NACF were in charge of the price policy of agricultural production while extension organizations devoted themselves to dissemination of agricultural technologies. Thus, the mutual cooperation through the division of role was fully achieved for the successful development of agriculture. This helped make the agricultural extension organizations concentrate on the diffusion of agricultural technology.

2. Unsatisfactory and Necessity of Supplementation

2.1. Weakened Specialty of the Extension Workers

Professionalism of agricultural technology was not so important until 1970s when rice was the central crop of self-sufficiency. However, the professional capability of the agricultural extension personnel was emphasized gradually because of diversification of crops, consumers' demand for high quality products, and emerging importance of post-harvest technologies.

On the other hand, being an agricultural extension service official was desired until the 1970s because the employment market for the agricultural high school and university graduates was not fully developed. However, after the 1980s of rapid growth period, there was trouble in supply and demand of agricultural extension personnel who were intelligent and had technological backgrounds for various reasons.

For this reason, for a short time period during the 1980s, to secure excellent graduate candidates from agricultural colleges for extension personnel, a special employment policy

was implemented so that they could be free from mandatory military services. However, these days, non-agricultural personnel are being recruited as extension personnel with the introduction of a competition system that prohibits discrimination based on gender, religion, and the number of academic years when recruiting the public officials. Recruiting the personnel with no basic knowledge and technology in agriculture brings some direct problems in, for example, contacting and consulting the farmers and doing the current job. There are also indirect problems in fostering the extension personnel. For example, there was lack of linakges beteen pre-service and on the job training and wasted budgets and administrative capacities that were revealed in implementing on-the-job training. This means there should be some support programs to improve professionalism through on-the-job training and reinforcing self-directed learning.

2.2. Weakened Effects of Decentralization

Until the local autonomous system was established, the central units had the authority to control personnel and budget of the agricultural extension system. Therefore, personnel placement and project implementation worked well as far as the local characteristics were concerned. Technology could also be implemented efficiently within the agricultural extension system. However, since decentralization in 1997, AES is different from what it was in the past.

Most of all, because budget and investment in agricultural extension system vary, depending on local government directors' perception of AES, it is hard to maintain balanced development between national agriculture and local agriculture. Next, because the budget for agricultural extension system is arranged by combination of national treasury and local expenditure, in cities and districts where the fiscal self-reliance ratio is low, the agricultural extension system does not work very well. Third, there is a problem that agricultural extension system is becoming administrative and regulative in nature, instead of being educational, as the local agricultural administrative organization and extension organizations are combined.

Box 5-1 | The Problems of Decentralization of AES

AES in Korea was decentralized as "Local Autonomy Law" was amended in March 1994. Even before the amendment, decentralization of AES, especially changing the status of national position extension workers to local position under the limited control of local government heads, was anticipated to a certain extent. Though even RDA opposed the amendment, there eventually were no means of opposing the amendment.

But, the law was proclaimed. The law prescribed the status of extension workers, after a two years' grace period, to become a local position. So there were appeals submitted by associated organizations, such as the Korean Association of Rural Leaders and Korean Society of Agricultural Extension, to the President's Office or National Assembly. The primary reason for their opposition was that the specialized function of agricultural extension might become weaker and extension workers' motivation and morale lower, which might lead to the weaker competitive power of Korean agriculture.

Indeed, from my experience with working as the Director of Provincial RDA, it was clear that, as many people were concerned, there was a big difference in the budgets among the local organizations, depending on the understanding in AES of the governor/mayors of local government. Especially, depending on the financial condition of local government, whenever labor reduction was implemented, the Agricultural Technology Centers (former RGO) were the primary target. The priority in the budget planning of AES was also being lowered. More than anything else, the most feared point was that, because the pending issues within the local government were regarded as more important than agricultural development on the national level, balanced development of agriculture among the areas or regions was adversely affected. When crop diseases or insect and pest occurred in a certain area, it were reported directly to the RDA before, but some local governments did not report the project because of the concern about the potentially aggravated image of the region or area. That was one of the big problems.

But, when the director of a local government had much interest in AES, though exceptional, very successful cases occurred as was the case of Mungyeong City's Korean Schisandra, "Omija", regional specialty plant.

Therefore, two implications for developing countries deserve mention here. First, even if being decentralized, the central government needs to subsidize the AES projects every year. Second, various statistics and situations of pest and/or insects, should be reported to higher-level organizations or research institutes.

Interview with Cho, Young-cheol, Former Director of RDA at Chunbuk Province.

Although support for budget and education on extension personnel for local organization is provided continuously by the central government, contrary to the past, whether participation in regional projects and education or not depends more on the local organizations. Decentralization is a global trend and necessary to a certain extent. However, if the agricultural extension is weakened by decentralization, the local agricultural development might also be slower.

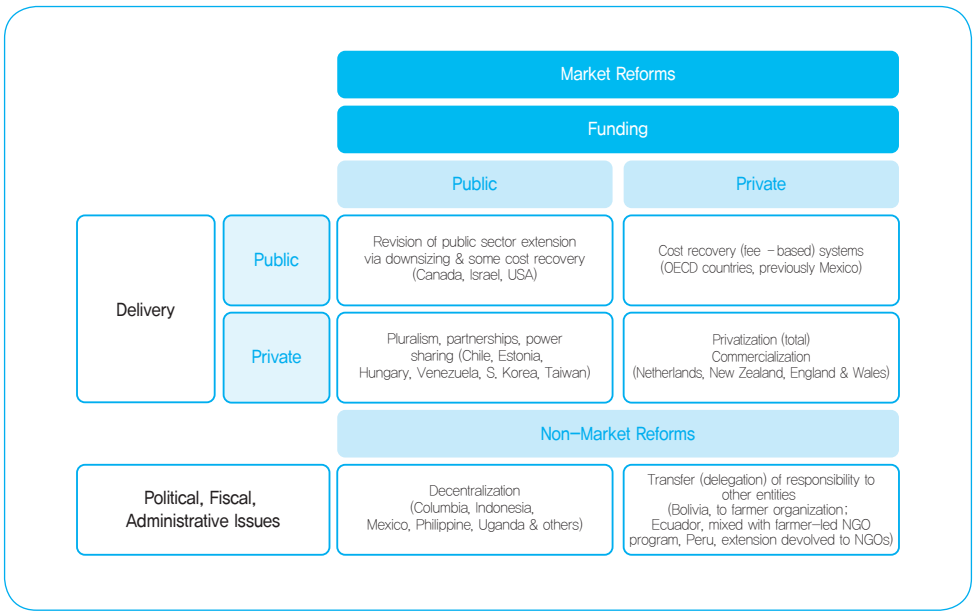
3. Difference Analysis of Related International Cases

The efficiency of public AES has been criticized by the World Bank and FAO in the late 1980s. Especially, the problems related to cost and finance of the agricultural extension system were the main issue regarding the public extension system, often debated among politicians and economists. The criticism centered on the fact that the extension system doesn't have enough impact in effectiveness and efficiency, which is different from saying that the public extension system is not implementing the task properly or is unnecessary.

Therefore, there were three reactions taken by the whole world: first, improvement and re-activation of the public extension system; second, privatization of agricultural extension system; and third, promotion of alternative diffusion of technology. Especially, the improvement of public extension system brought about some meaningful changes as shown in [Figure 5-1]. There has been much efforts to improve the AES, specifically, emphasizing subject oriented activities, management by objective, combining extension function into research institutions, developing extension system by beneficiary and commercial level, and decentralizing extension system, and budgeting and program management through cooperation with the agricultural groups and NGOs.

In Korea, AES was decentralized in 1997 since the introduction of local self-governing system and some of the functions were transferred to the private Agricultural Technology Commercialization Foundation. Nevertheless, in terms of organizational system, Korean AES has a special structure in which both AES and research are implemented together by a single organization and, thus, is hard to find the similar case in the world. However, the extension method and approaches used in AES can be applied globally. Nonetheless, in case of Korea, as mentioned above in the successful examples, they were managed synthetically within the national agricultural system.

Figure 5-1 | Extension Reform Strategies



Source: Rivera, et al. (2001:24).

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Chapter 6

Implications for Developing Countries

1. Lessons for International Comparison Perspectives
2. The Possibilities of Applying Policy on Developing Countries
3. Considerations in the Policy Advisory

Implications for Developing Countries

1. Lessons for International Comparison Perspectives

For any country to develop a public agricultural extension system there should be an appropriate legal system. It is especially desirable to give authority of extension system the managerial power of planning and executing the national budget, which would help to efficiently promote the projects.

In case of Korea, the law gave RDA the authority to manage and sign up for the other organization's business to the agricultural extension. This made it possible for RDA to coordinate the related AES projects.

Next, to manage the agricultural extension system, one has to establish midterm goals, under the assistance of those departments that research and develop agricultural technology. And, it is important to make a road map on how to manage and evaluate the annual performance. However, one has to keep in mind that qualitative results are more important than quantitative results in the public field of the agricultural extension system. In national budget investment, excessive performance-based application can be an obstacle to achieving the agricultural policy's goal. Even in the case of Korea, there have been difficulties in verifying the quantitative effects of budget investment on agricultural extension system and the securing of government budget.

Third, investment in agricultural extension personnel and education on the agricultural community can be more efficient in the long term. If the capabilities of the persons who are involved are reinforced, there would be more confidence and capabilities in coping with new conditions. Lessons of Korea's agricultural policy that was able to compete in the world market and overcome the difficulties of the transition period of opening markets in the time of protectionism is proving it.

2. The Possibilities of Applying Policy on Developing Countries

Agricultural extension system is one way in which policy can make individual nations develop autonomously based on their unique situations. It is difficult to come to the conclusion that the Korean system could bring the same result in developing countries because we failed to introduce successfully the American agricultural extension system in the 1950s. Especially, poor finance of the government, lack of political leader's willingness to devote to the development of agriculture and rural areas, and failure to recognize the difference in the political systems can make it difficult to establish new organizations necessary for the development of agriculture.

Therefore, in terms of the possibilities of applying policy in the developing countries, we need to consider, as in reviewing information sharing system, two things.

First, in the case of a country that wants to reconstruct the agricultural extension system or wants a fresh start of applying our organizational system, it could do effectively while being able to reduce the national budget. If the research and the extension are separated, non-operating expenses for mutual regulations and cooperation between the two functions could end up costing more, also it cannot utilize human and material resources in an integrated way to solve the field problems and develop the leading technology.

The second possibility is the case of developing countries where they already are managing an agricultural extension system in any form. It is difficult to be effective without financial support to integrate and manage two functions in a short time in case of countries where the research and extension functions are separated. Therefore, in these countries it is desirable to start with applying the factors from our successful examples. Through this, it can be possible to increase the means of achieving the goal in accordance with their own country's conditions. Above all, it is important to focus on regional pilot projects, agricultural extension personnel, and the education of the farmers.

3. Considerations in the Policy Advisory

To develop an information sharing project on Korea's agricultural technology extension system, one has to keep in mind the following facts.

First, one should analyze the characteristics of developing countries as to agricultural policy organizations, R&D organizations, and the extension system, and recognize the difference between the two countries. Especially, because the weather and agricultural conditions of most developing countries are different from those of Korea, it is important

to emphasize the meaning of the agricultural extension system in terms of supplying technology to the farmers more than R&D itself of the agricultural technology.

Second, one should develop those elements that could contribute to the development in the short, mid, and long term, by making a plan for comprehensive agricultural development in each country. One should develop a demonstration project by area bases, as well as regional groups, and then learn a lesson from the developing country itself and, finally, emphasize the step by-step approach to expanding the application based on the performance.

Third, no matter how excellent the system is, if the personnel that implements it cannot strengthen their abilities, it would not work effectively. Therefore, in sharing agricultural extension system with developing countries, one should understand the importance of educational training for both the extension personnel and the farmers.

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