

AUTHOR'S ADDRESS :

Dr. Chae Yun Cho
Rural Development Administration (RDA)
Republic of Korea
Suweon - 441707, Korea

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The Executive Secretary
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TRANSFORMATION IN **Korean Farming**

A SUCCESS STORY OF EFFECTIVE LINKAGES

By
CHAE YUN CHO



ASIA-PACIFIC ASSOCIATION OF AGRICULTURAL RESEARCH INSTITUTIONS
FAO REGIONAL OFFICE FOR ASIA & THE PACIFIC
BANGKOK

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Foreword

The Asia-Pacific Association of Agricultural Research Institutions (APAARI) has strongly recognised the need for the regional research priority-setting among the member nations and to provide support for planning in the required directions. Publication of success stories of various NARS' was undertaken by APAARI and so far we have published six success stories, which have received wide appreciation. These success stories have played a catalytic role in promoting new technologies in other member countries.

The APAARI Executive Committee in its 3rd February, 1996 meeting, held at New Delhi, approved the publication of six more success stories out of which "Transformation in Korean Farming – A Success Story of Effective Linkages" constitutes the first of the 1996 series. This APAARI initiative is hoped to fulfil the efforts for highlighting Korean national efforts made towards projecting the effects of a social movement coupled with organisational linkages leading to the "Green-Revolution" in that country.

It is hoped that through such useful publications, in addition to its being an important forum for the region, the APAARI would continue to play a positive, analytical and catalytic role in bridging the information gap in the region. I am sure the readers would find this publication both informative and useful.



(R.S. PARODA)

Executive Secretary

Introduction

The Korean small farm economy has shown tremendous improvement, together with rapid economic growth in the non-agricultural sector, since early '60s. Farm income increased considerably due to, an overall increase in agricultural income coupled with the increase in non-agricultural earnings. The former was made possible with an overall improvement in productivity, government subsidies for agricultural operations and agricultural products as well as establishment of commercial farming. The increase in productivity may be attributed to the seed and fertilizer revolution in combination with the improvement in rural infrastructure, i.e., roads, land consolidation, irrigation systems, etc., and effective implementation of rural development programs through extension services.

This story tells the success of organized government sector in policy planning, programme execution and maintaining linkages among research, extension, education and training activities, as also with rural communities and private sector, in successful implementation of development programmes and transfer of technology.

Historical Perspective

Prior to the early '60s, Korea was one of the poorest under-developed countries; its economy being heavily dependent on traditional subsistence agriculture, primarily because of small land holdings (1.2 ha per farm family). Agricultural infrastructure was barely established, although land holdings were relatively evenly distributed among farmers due to land reforms in 1949. Korean farmers commonly cultivated rice as the staple food crop and barley, wheat, potato, corn, pulses, vegetables and fruits as secondary crops, on small scale. They also raised one to three cattle or pigs.

A dramatic change occurred during the last three decades in the structure of Korean agriculture and economy. Changes in urban consumption patterns and the affluent economy also affected composition of cultivated crops from mainly rice to a number of diverse crops; fruits and vegetables became popular, commercial farming and livestock and poultry industry have also emerged. Because of the relatively low income potential of agriculture, and the expanded opportunities for non-agricultural pursuits, labour shifted from the agriculture to the non-agricultural sector. This transition caused a labour shortage within agriculture sector which also resulted in increased labour wages.

The rapid increase in farm wages inevitably accelerated government initiatives towards mechanization of agricultural production and enlargement of farm size to attain economic efficiency. This also resulted in transforming traditional subsistence agriculture to a modern economy, due to significant changes in agricultural production from a resource-based sector to a technology-based industry. Technological inputs were enhanced with increased investment in formal and informal education systems and training programs for farmers, improving their perception and thereby ability to adopt new technologies.

Korean agriculture developed largely due to improvement in scientific and technical knowledge, its exchange and effective transfer of technology to farmers. This development was significantly influenced by agriculture-related institutions and/or agencies through effective utilization of human resources, systematic public organization, effective institutional building and productive cooperation between the agricultural research, extension and education. Adoption of agricultural technology is based on farmers' needs and emerging conditions and challenges for the Korean agriculture vis-a-vis national economy. The significance of agriculture in overall national economy is, nevertheless, relatively declining.



Training of extension officials on agricultural machines

THE Development SCENARIO

An effective research and technology transfer during the green revolution and the vinyl revolution enabled achieving self-sufficiency for rice and year-round production of fresh vegetables. The steady increase in productivity (Table 1) was made possible through the extensive use of modern farming techniques, particularly highly productive and superior quality cultivars, better water activities



Joint evaluation of a new rice cultivar by researchers and extension workers in a demonstration plot

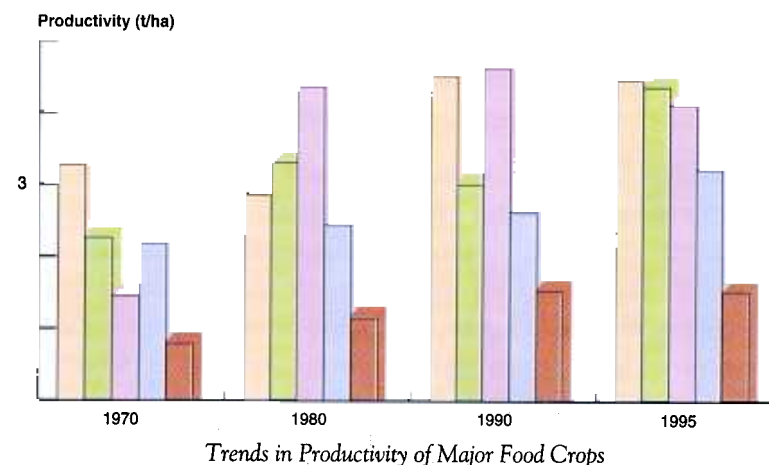


Table 1 PRODUCTIVITY OF MAJOR CEREALS OVER YEARS				
Commodity	Productivity (t/ha)			
	1970	1980	1990	1995
Rice (polished)	3.27	2.88	4.51	4.45
Wheat (unhulled)	2.26	3.30	3.00	4.35
Corn	1.45	4.36	4.62	4.11
Barley (polished)	2.18	2.44	2.62	3.21
Soybean	0.79	1.15	1.53	1.52

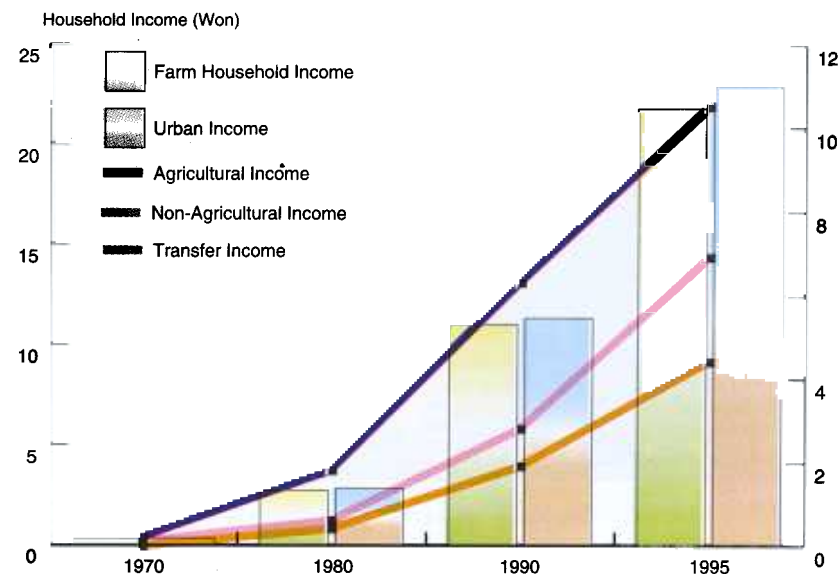
management, intensive use of chemicals and advanced cropping methods. Growth in agricultural output has been increasingly based on development of scientific and technical capacity to invent and diffuse new mechanical, chemical, and biological technologies. Rural extension offices covered all rural areas to guide farmers for the adoption of new technologies although there were few obvious gaps in available farm technologies in relation to the size of holdings. The increase in agricultural production in Korea is largely attributed to the increased productivity, attained through the innovation, development and dissemination to farmers of new, scale-neutral,

mechanical, chemical and biological technologies which were not land-augmenting. Mechanical innovations also had a dramatic effect on the volume of output per worker and on intensity of cultivation.

During the '70s, the Korean government launched a large scale integrated rural development program, namely "Saemaul Undong", a movement with the slogan of "diligence, self-reliance, and cooperation". It started with simple project to improve residential environments in rural villages, but subsequently got extended to inspire farmers' spiritual enlightenment for their better future and also to increased rural income at large. The Saemaul Undong was remarkably successful in terms of rural development, looking into a lot of desirable changes, both external and internal, those were brought about within a short period of time for farmers as well as rural villages. The participation of rural community leaders, trained through the Rural Development Agency's (RDA's) various fostering programs, could be attributed among the key factors in its success although the coordinating agency for the movement was the Ministry of Home Affairs (MHA) and not the RDA. The latter, however, also provided support through agricultural research and extension services.

The improved rice varieties of "Tongil" series were developed, and identified for dissemination during the Saemaul Undong Movement. RDA's extension officers worked hard to deliver new cultivars and accompanying technologies to farmers. The government provided support price for rice grains, the cultivation of the high yielding rice variety enhanced the overall rice production and the rural income increased thereby (Table 2). The increased resource allocation to the rural sector through Saemaul Undong also speeded up the process of green revolution.

The national annual rice production in the '60s was around 3 million tons, which was insufficient to meet the domestic needs alone. However, with the introduction of new rice variety "Tongil", developed by RDA, the rice production increased dramatically.



Trends in Farm and Urban Household Income

Table 2
CHANGES IN FARM AND URBAN HOUSEHOLD
INCOME OVER YEARS

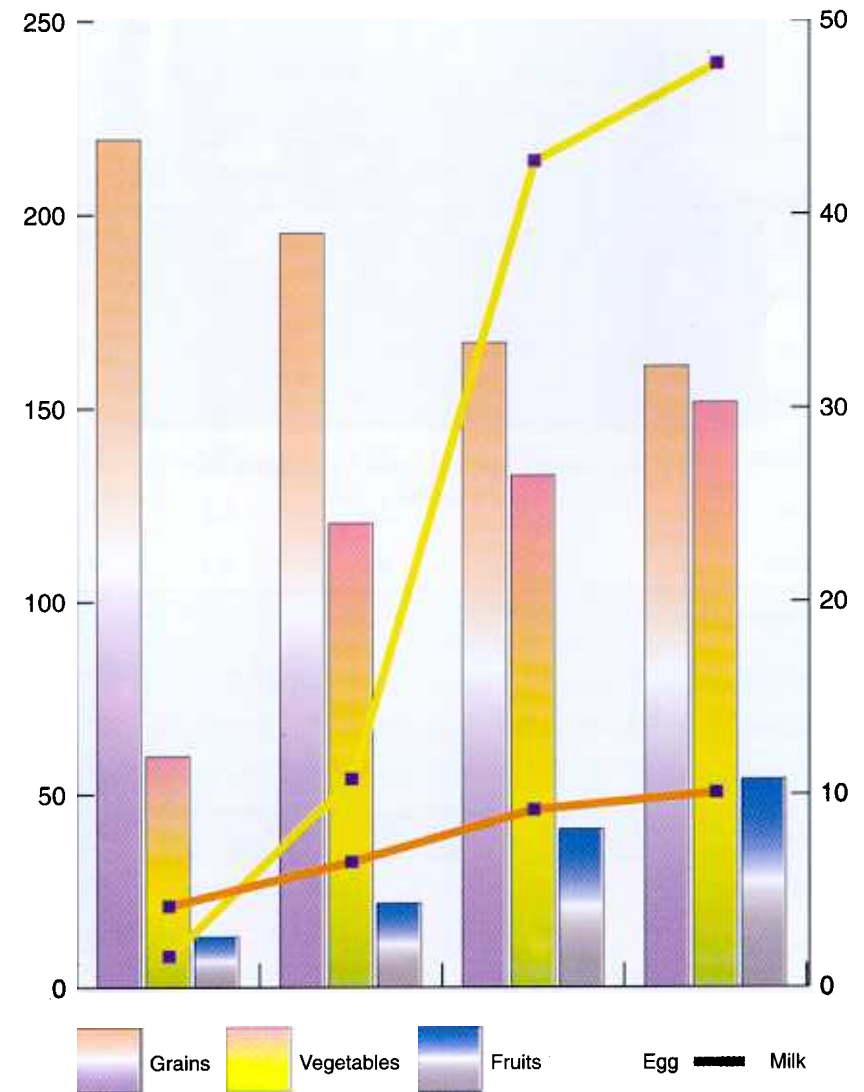
Income Head	Income (m Won)			
	1970	1980	1990	1995
Farm household income (A)	0.3	2.7	11.0	21.8
– Agricultural income	0.2	1.8	6.3	10.5
– Non-agricultural income	0.1	0.6	2.8	6.9
– Transfer income	–	0.4	1.9	4.4
Urban income (B)	0.3	2.8	11.3	22.9
– A/B (%)	100	96	97	95



Recording observations at rice measurement plots

Average yield of new rice varieties was 30% more than that of traditional varieties which also required less pest protection, although the fertilizer need was higher than that of traditional varieties. A self-sufficiency in rice was accomplished in 1975 with 54% of total rice area occupied by the new varieties. Korea set the world record of national-average rice yield in 1977, producing 4.94 t/ha, 11 per cent higher than the Japanese record of 4.47 t/ha set in 1975.

The gap between rural and urban income gradually reduced during the Saemaul Undong due to rapid increase in farmers' income, though the income gap between rural and urban families still exists. The rapid growth of farmers' income has often been attributed to the increased rice production promoted by strong rice prices. Saemaul Undong also encouraged farmers to raise marketable commodities such as vegetables, fruits, flowers, beef cattle, and dairy cows (Table 3). The production of cash crops became popular in the later stages of Saemaul Undong, and is still expanding. RDA's research and extension services had been focused to support activities on these changes.



Changes in Per Capita Consumption of Food Crops, Vegetables, Fruit, Meat, Egg and Milk

Table 3
CHANGES IN PER CAPITA CONSUMPTION OF
MAJOR COMMODITIES

Commodity	Per capita consumption (kg)			
	1970	1980	1990	1995
<Grains>	219.4	195.2	167.0	160.8
Rice	136.4	132.4	119.6	106.5
Barley	37.3	13.9	1.6	1.7
Wheat	26.1	29.4	29.8	33.9
Corn	1.1	3.1	2.7	3.4
Beans	5.3	8.0	8.3	9.9
<Vegetables>	59.9	120.3	132.6	151.4
Chinese cabbage	19.8	47.6	46.9	36.5
Radish	19.0	31.0	26.7	20.1
Red pepper	1.2	2.2	1.8	2.8
<Fruits>	13.1	21.8	41.0	53.9
<Meat>	5.2	11.3	19.9	27.4
Beef	1.2	2.6	4.1	6.7
Pork	2.6	6.3	11.8	14.8
Chicken	1.4	2.4	4.0	5.9
<Egg>	4.2	6.5	9.2	10.1
<Milk>	1.6	10.8	42.8	47.8



*Field discussion of researchers and extension workers
with a foreign scientist*

The concept of farming system was relatively simple a few decades ago, having major thrust on increased productivity. The farming technologies handled by agricultural research and extension services were accordingly concentrated on the enhancement of productivity of small farmers, solving the problems of small farms, and addressing the needs of all segments of the rural communities. However, new dimensions of being competitive locally and internationally in a commercial sense, have been added to the modern agricultural scenario, while still being sustainable. Research on advanced agricultural technologies and their large-scale dissemination is strengthened to maintain its effectiveness and usefulness for an overall rural development.

THE Linkages UNDERLYING THE DEVELOPMENT

Organization of the Institutional Linkages

Korea has systematically organized institutional linkages; the Development, Administration, Research and Extension services, and the Financial support proceed through the Ministry of Agriculture, Fisheries and Forestry (MAFF) and the Rural Development Administration (RDA) of the central government. Provincial governments are also involved in rural development of their respective areas through funding and administrative support for rural development projects. The Ministry of Home Affairs (MHA) of the central government also takes part in rural development through funding and administrative support as it directs the operations of provincial governments. The farmers receive administrative information mainly through the provincial governments and RDA's extension offices, and the financial support from MAFF, MHA and provincial governments through comprehensive banking services of the agricultural cooperatives maintained in every district.

The RDA, along with its constituent institutions, is the main governmental organization responsible for agricultural research and extension under general directions from the MAFF. The MHA and provincial governments are also concerned with research and extension services for rural development projects. The agricultural educational institutions are under the Ministry of Education. The

Agricultural colleges and the agricultural cooperatives are partly involved in research and extension. There are some Semi-Public specialized research institutions constituted by special laws under the direction and partial funding of MAFF; the Korean Food Research Institute conducts research on food processing and commercialization of food products to increase the consumption of local agricultural produce, and the Korea Rural Economy Institute handles research programs in rural economy and policy assessment for agricultural development. The RDA encourages coordinated research among public research institutions and universities; some private firms or organizations, such as, seed companies or agro-machinery manufacturers are directly involved in the development of new marketable commodities and commercialization of their inventions. The Rural Development Administration enables close linkage between agricultural research and extension aiming at the improvement of crops and cropping technologies directly applicable to local farm fields.

The RDA, in its set up, has 5 Bureaus, 12 key research experiment stations or institutes and 9 provincial RDAs (PRDAs). In addition, the RDA has the technical information service center, the national seed production and distribution office, and the national agricultural college (Figure 1). The PRDAs also conduct research and extension activities through research and extension bureaus, farmers training centers, 32 location-specific crop experiment stations, 161 city/county extension offices and 1,380 agricultural consulting offices, covering all rural districts of southern Korean peninsula. A cadre of about 2,100 research, 6,800 extension, and 1,300 technical and administrative staff is assigned to the Rural Development Administration.

The RDA's activities are oriented towards development and transfer of agro-technology to meet the following objectives: 1) stable and labour-efficient production of major grain crops, 2) quality improvement and cost-efficient production of cash crops and livestock, 3) safe and pollution-free crop production and adequate pest management, 4) creation of extra revenue by exploiting high-tech agriculture, 5) technical support on the production for special local or export markets, and 6) development of sustainable agriculture.



Rural housewife preparing food in well-equipped kitchen for improvement of living environment



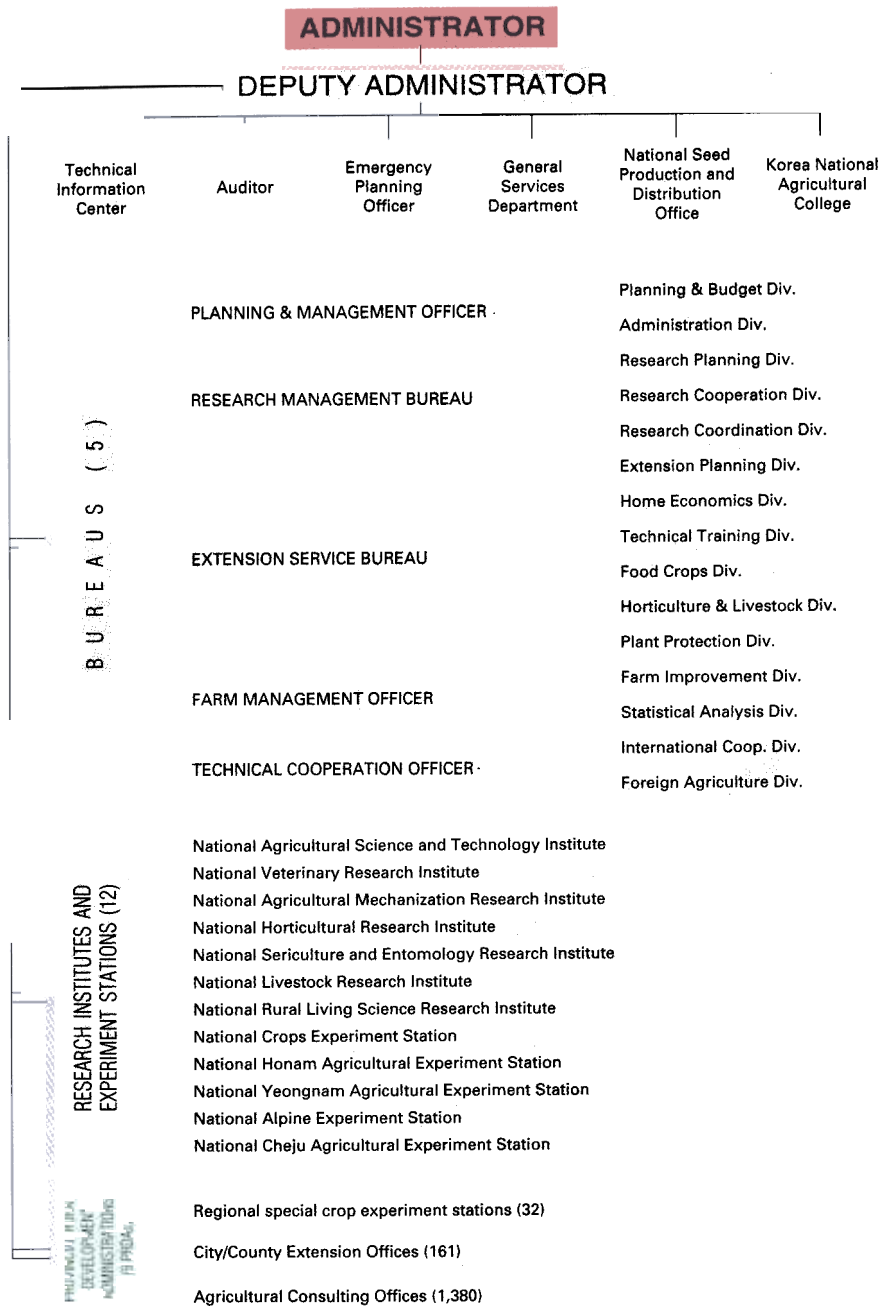
Packing of spicy pickled vegetables (Kimchi) for income generating activities



Introduction of traditional cooking to urban women



Practice room for dress-making by the rural women



Research Management Bureau of the RDA coordinates various research programs carried out by research institutes, experiment stations and PRDAs ensuring that the development plans and research programs complement each other and would contribute to the welfare of rural communities, increase farmers' income, solve their farming problems, reduce production cost and enhance crop quality. The MAFF and RDA's extension services give due weightage to the transfer of improved technology involving new crop cultivars and techniques generated.

Various research institutions, located at different levels in the system, are engaged in defined primary activities; the basic and fundamental studies are conducted in the central institutions, while region-specific and commodity-oriented studies in the provincial experiment stations. PRDAs and special crops experiment stations are particularly supported to advance as the regional center of agricultural research, and some county extension offices are equipped



Automated pest control and irrigation of orchards

Figure 10 Organizational Chart of the Rural Development Administration (A)



*Special training for farmers in the
National Horticultural Research Institute*



Training of 4-H members in the National Livestock Research Institute



Extension workers' specialization training with the fruit trees



Twin calves produced by embryo transfer



Teaching of animal management technologies to future farmers



Direct teaching of farmers by the researchers using remote controlling vision transmitting system

with a partial research capability and perform as the regional centers of agricultural technology.

The institutional arrangements integrated under the control of RDA, ensure systematic participation of extension specialists in research, and vice versa, enabling fast dissemination of research results and also in carrying out the practical problem oriented research. The research sector, besides providing technological information, also imparts frequent training to extension workers to maximize efficiency of technology transfer. Two regular courses are offered to extension workers, viz., a one week basic and professional training, and another five month special intensive course for newly employed workers. Extension workers also participate, to some extent, in activities such as conduct of regional adaptability tests for new cultivars, germplasm collection, and forecasting of plant pests and diseases.

Linkage with Rural Communities

The RDA's extension services provide a vital link between research and farmers, and between scientific acquisition and practical application. It delivers the findings of research to farmers and brings farmer's problems to the research arena to formulate further need based research experiments. This feedback mechanism is typical of the organizational structure in Korea, helping to address situation-specific requirements for development of agriculture. The research institutes and experimental stations offer intensive training courses to farmers in which more than 80,000 farmers, including young farmers and village leaders, have been trained, since 1981. Recently, the RDA has established a National Agricultural College which offers a two-year specialization courses to young farmers. The college has 6 faculties for specialized fields, and receives 240 new students annually.

The researchers also disseminate technology to farmers through mass media, publications, seminars, and farmers' counseling by attending individual meetings for technical advice and inter-



Consultation for disease and insect through remote controlling vision transmitting system connected between research and extension institutions



Farmer's winter field training in January-February for New Year's farm planning

disciplinary farm demonstrations, along with extension workers. In 1995 alone, a total of 5,568 man-hours of technical assistance was provided by researchers on disease and insect pest control, livestock and medical treatment, etc. Services on mushrooms and upland industrial crops have been increasing, which reflects recent tendency towards rapid development of these high income technologies. Every county level extension office operates at least one cultivar adaptability test or a forecasting field for plant insect pests and diseases (Figure 2).

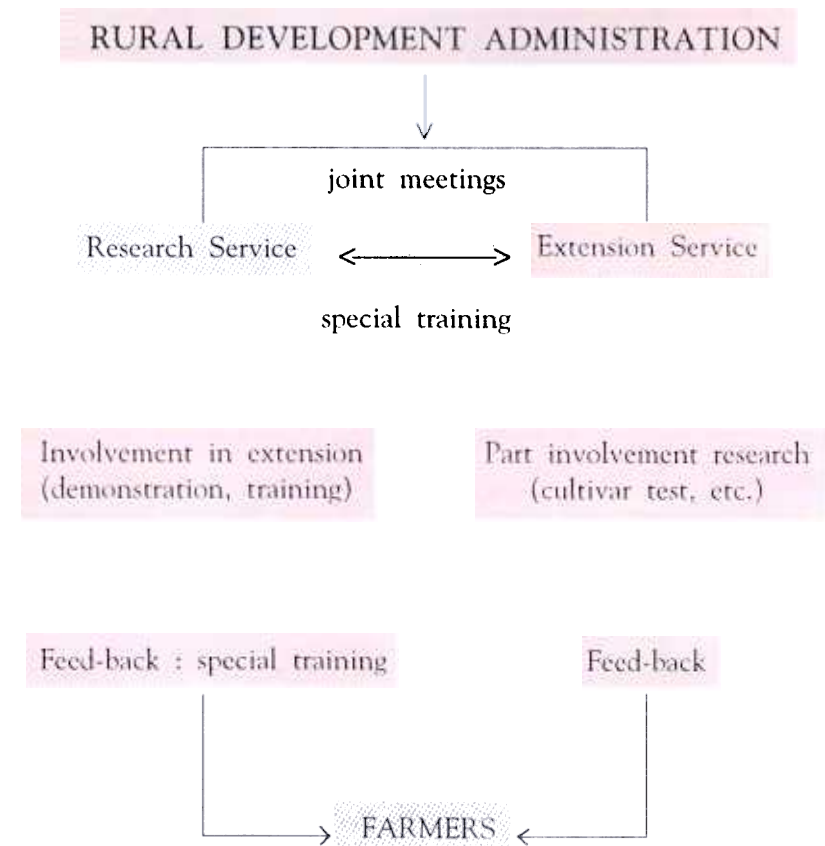


Figure 2. Institutional linkages of research and extension in RDA

Linkage with Educational Institutions and Private Sectors

There are 43 agricultural universities and colleges, 11 agricultural vocational colleges, and 85 agricultural high schools in Korea; all agricultural schools, except for one which is under the RDA, are under the jurisdiction of the Ministry of Education. The agricultural research and extension are not directly linked to these educational institutions but a close cooperation is maintained. Institutional linkages between research and education have been enforced by law since 1971. Under the law, the Institutional Cooperation Committees (ICCs) were embodied to control the cooperative matters at national and provincial levels. These include, 1) selection of cooperative projects on research and extension, 2) joint appointment for research and extension, 3) decision on research fund awards for colleges, and 4) enhancement of mutual use of research facilities between PRDAs and agricultural colleges.

The Central ICC, under the dual jurisdiction of the MAFF and the Ministry of Education (MOE), is the main body governing the cooperation between the RDA and agricultural colleges. The Administrator (Head) of RDA acts as the Chairman and the Dean of the College of Agriculture, Seoul National University, is the vice-chairman of the Committee. The Central ICC consists of 20 members comprising national-level research and extension staff, professors, and administration staff from MAFF, MOE, the Ministry of Science and Technology (MOST), and the Forest Development Administration (FDA). The Provincial ICCs are headed by the Deans of agricultural colleges of the national university located in respective provinces, and the Director Generals of PRDAs as Vice-Chairmen. Each committee has 14 members which include research and extension staff and the agricultural staff from local government. the central committee has 21 special sub-committees and the provincial-level committees have 10 each, for specific matters. The sub-committees are headed by Professors and consist of 5 members, usually researchers and extension workers. The sub-committees select and evaluate the research and extension projects and discuss the detailed cooperative

on their specialized areas. The sub-committees sometimes hold conferences for the project planning and evaluating. Through these institutional arrangements (Figure 3), 335 projects funded by RDA were actually in cooperation with Professors, in 1995. The joint utilization of research facilities between RDA and the agricultural colleges has resulted in increased research efficiency and budget savings. The RDA's experimental fields are often used for practical training of college students.

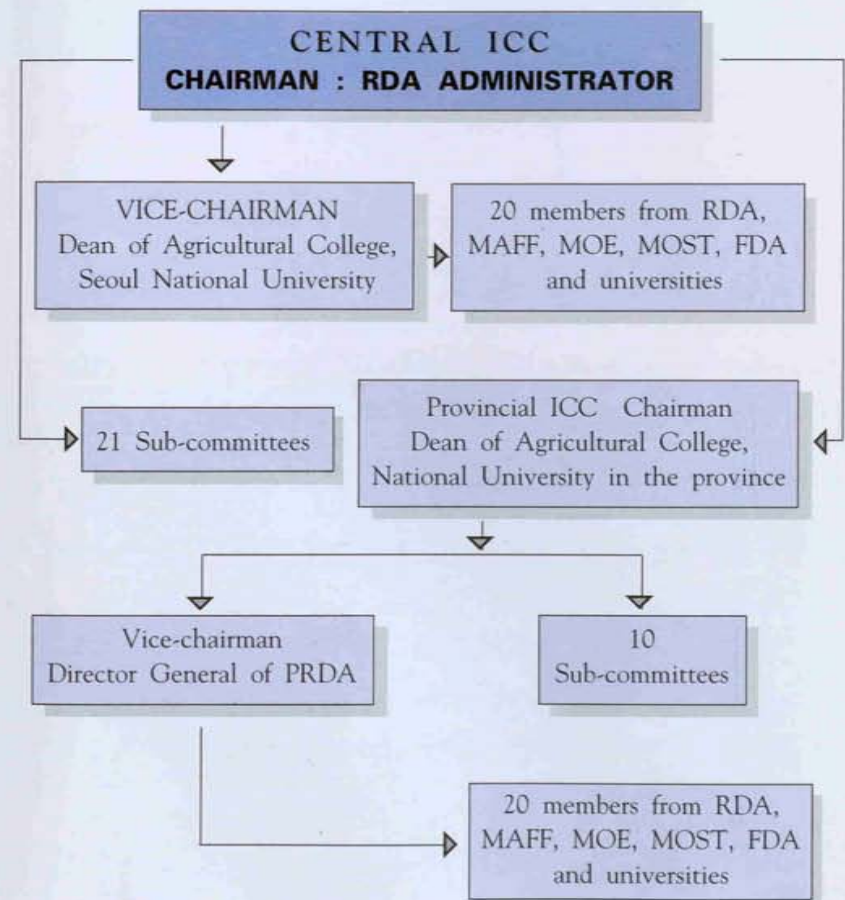


Figure 3 : Institutionalized linkages among research, extension and education

The RDA, and the agricultural colleges, have a joint appointment system; 227 professors are concurrently appointed as staff in research and extension institutions under RDA, and 9 RDA research scientists are appointed as faculty members in the universities. The colleges offer graduate and under-graduate degree programmes for researchers and extension workers; 449 researchers and extension workers obtained Ph.D. degree, and 813 the Master's degree. Correspondingly, 148 RDA staff delivered lectures in various universities in 1995.

Korea has also developed institutional cooperation between county-level extension offices and agricultural high schools. The Councils for the Establishment of Pilot Agricultural High School have been organized in central and provincial levels since 1972 under the dual jurisdiction of Ministry of Education and MAFF. The Chairman of the Provincial Board of Education is the Chairman of the Council, and the Director General of PRDA is the Vice-Chairman. The Council consists of 8 members which include extension staff and administration personnel from agriculture and education. Cooperative activities such as designating cooperative



An RDA Symposium organized both for researchers and extension workers



Teaching to farmers on Sesamium plot

agencies, joint appointments, mutual use of facilities, etc., fall under the purview of the council. Agricultural high school teachers participate in workshop activities of the county extension offices.

The agricultural research and extension services of the RDA also maintain some links with private sector, such as, seed companies, particularly for vegetables, pesticide companies, fertilizer suppliers and farm machinery manufacturers. The National Agricultural Science and Technology Institute is the official inspector of pesticides and fertilizers for registration, and the National Agricultural Mechanization Research Institute for agricultural machinery and equipments. Other RDA institutions are also involved in the official inspection and evaluation for agricultural materials and manufactured goods. Some joint research projects figure among the cooperative activities carried out in collaboration with private companies, e.g., the National Crops Experiment Station has associated its malting barley improvement program with brewing and malting companies.

MAINTENANCE OF Effective Linkages

Much emphasis has been given to the unobtrusive linkage and communication between research institutions and extension services, although the research institutions operate more or less autonomously in planning and evaluating their research. Preliminary evaluation is made either directly by the Extension Service Bureau of the RDA or, sometimes, by the Research Management Bureau before the results are delivered to the Extension Service Bureau. The results accepted for technical dissemination are published as a guiding material for the extension workers. Regular field surveys on the research needs in farms and cropping areas have been carried out by the researchers in cooperation with extension workers so as to orient research projects towards farm needs. Researchers as well as extension workers are encouraged to pay attention to feedback activities. Some research experiments are conducted in cooperation with extension offices, e.g., field evaluation of new cultivars or machines before their final release.

Systematic participation of extension specialists in research is secured by institutionalized meetings. The RDA holds monthly staff meetings for the Directors of all research and extension Bureaus, Heads of research institutions and the PRDAs. Meetings of Bureau Directors at the RDA headquarters are held thrice a week, chaired by the Administrator or Deputy Administrator, to discuss both research and extension activities. The proceedings of these meetings are officially directed towards the related institutes or personnel for necessary follow-up action. Research planning and evaluation conferences are organized by respective research institutions invariably in late January for summer crops, sericulture and livestock, and in mid August for winter crops. The procedure and results of research are evaluated at least twice a year. Interim evaluations are made



Production and dissemination of virus free seed potato through tissue culture

mid-year to identify mid-term difficulties. Research results have clearly indicated success of agricultural policy decisions, extension service activities, and scientific information. Necessary recommendations for policy making are officially submitted to MAFF through the Research Management Bureau in the RDA headquarters. The new technology for on-farm level is disseminated to farmers by the Extension Service Bureau of RDA or provincial RDAs through the nationwide extension service channels.

A considerable annual increase observed in the number of subjects recommended for policy making of MAFF and for technology transfer of extension services (Table 4) clearly indicated that agricultural research in Korea has been directed towards farm level applied research.

Table 4 NUMBER OF ITEMS SUGGESTED BY RDA RESEARCH INSTITUTIONS FOR POLICY RECOMMENDATIONS AND EXTENSION MATERIALS, OVER YEARS				
	1970	1980	1990	1995
Policy recommendation	19	158	154	123
Extension material	104	123	125	592

Secrets of Success

Rural development vis-a-vis agricultural development in Korea was made possible because of several key factors, such as

- i. Expansion of rural infrastructure, intensive land consolidation and development.
- ii. Strong government initiatives towards improving the farmers' education level and channels to develop and transfer new technologies.
- iii. Functional and organizational linkages between research, extension and education.
- iv. Successful transformation of development programme "Saemaul Undong" to a Movement of diligence, self-reliance and co-operation.
- v. Extensive use of modern technologies developed under close technical and institutional cooperation among agricultural research and extension staff.
- vi. Fusion of technologies and sciences and their practices at the farm level.

Epilogue

The general structure of the Korean economy has already shifted from agriculture to industry. Socio-economic situation of rural society changed rapidly with fast urban industrialization. The proportion of farm population to whole populace decreased from 38% in 1976 to 11% in 1995, with the share of agriculture in GNP decreased sharply from 24% to 7%. It is further projected that agricultural share will decrease to 3% in the year 2001 when GNP per capita is estimated to increase to around US\$ 20,000. Within 10 years, only 5% of population shall be farm-based. The situation, therefore, requires seeking other alternatives in rural development strategies. The RDA must change its basic approach from the concept of increased food production alone to achieving agricultural competitiveness locally and internationally. There is also a need to strengthen research that would bring out recommendable and more easily acceptable results for the rural population.

Under the catch phrase "food-self-sufficiency", every effort made by the public sector, both in research and extension, in Korea, has emphasized on higher rice production. The prevailing system, under which resources are preferentially allocated to rice research and its dissemination, has become ineffective for resolving conflicts of interest between consumers and producers for other farm commodities, such as crops other than rice and livestock. There is a need to expand a further intensified commodity-oriented research, suitable at the respective levels of competitiveness of the respective commodities. This intensification should aim at minimizing production cost by facilitating farm mechanization and automation of production and marketing systems.

Further orientation of agricultural research, extension and education has to be quickly done to adapt to changes in demand, institutions, physical conditions, and technologies. To achieve this, current coordinating effects should be maintained among the institutions related to agricultural development. These institutions must function well and should be closely tied together for farmers' fast adjustment to socio-economical and/or technical changes. Applications for patent or arrangement for commercialization of agricultural technologies, which is usually in the hands of researchers, should be coordinated by a specifically constituted body for commercialization of technologies within the agricultural sector. It may be desirable for the extension services to take part in the commercialization process, while the Research Management Bureau of the RDA may act as a coordinating body for agro-technology commercialization. An "adaptation research" division within each and every rural extension office is being created to strengthen on-farm research capability of the total extension systems. These divisions will also facilitate a direct linkage between research and extension, and a shift in the extension services from 'production-oriented' to 'market-oriented' operational mode.

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