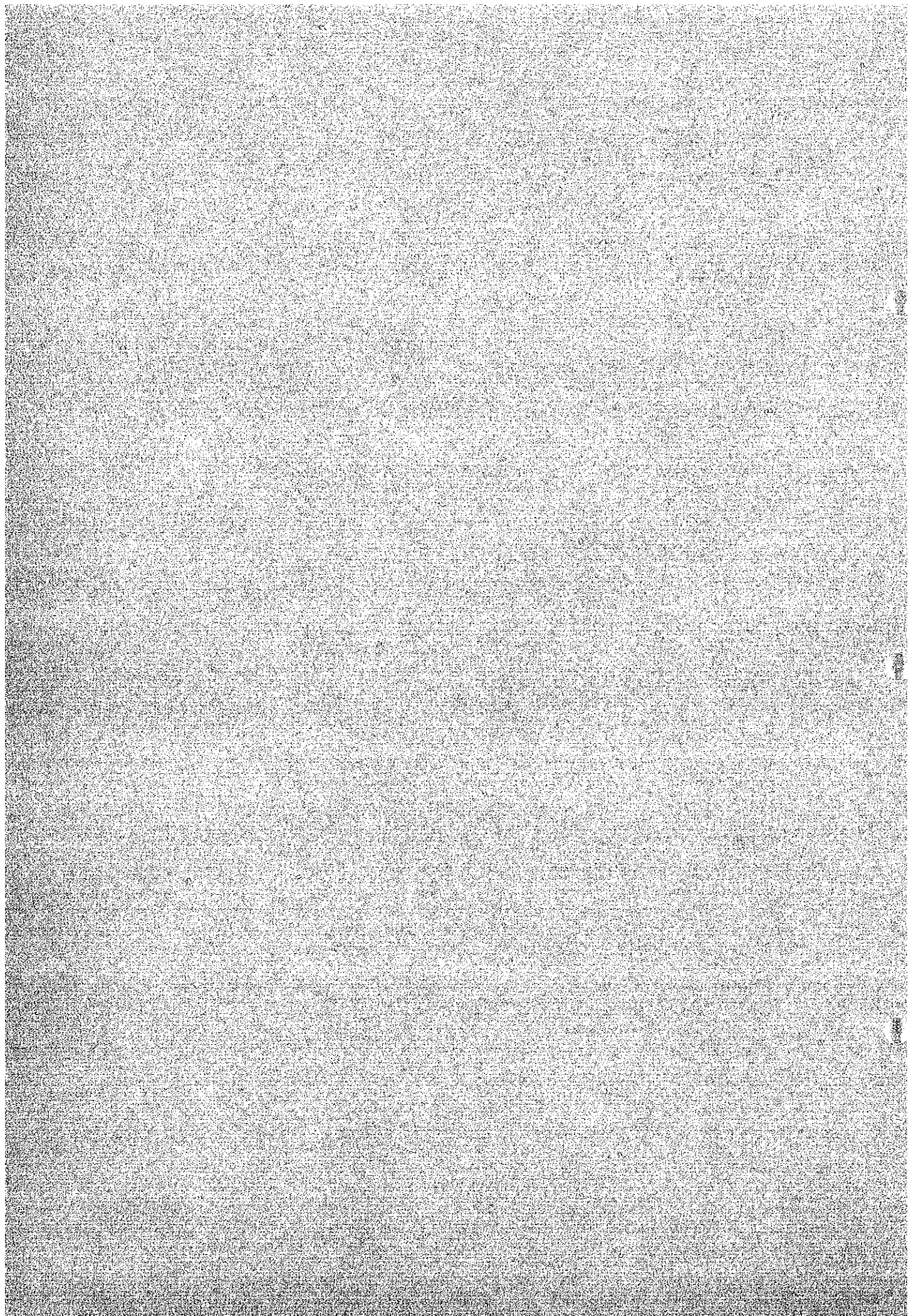


A N N E X F

AGRICULTURE



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## F 1 INTRODUCTION

This ANNEX presents the agronomic and agro-economic studies undertaken mainly on the following items necessary for the estimation of the agricultural benefit attributable to the proposed multipurpose dam schemes in the three river basins:

- (1) To review the present situation of agricultural in Korea, especially the recent achievement of rice production revolution,
- (2) To study the historical cropping pattern and crop production in order to confirm the effect of drought on agriculture,
- (3) To analyze the present pattern of land use and to examine the potentiality of land resource development for the establishment of future land use programme,
- (4) To set up the future cropping pattern and to anticipate crop yield and production under the condition with the more improved irrigation facilities and consolidated paddy field, and
- (5) To estimate the agricultural benefit from the economic viewpoint for evaluating of the priority in the agricultural sector among the 10 proposed dam schemes.

## F 2 AGRICULTURE IN KOREA

### F 2.1 Achievement in Agricultural Sector during Second Five-Year Economic Development Plan Period

Basic concepts in agricultural sector during the period of Second Five-Year Economic Development Plan (1967 to 1971) was to produce a plentiful and cheap supply of food to consumers and to improve farmer's position from social and economical viewpoint. For the purpose of realization of the concepts, W 199 x 10<sup>9</sup> of investment and loan, as shown in Table F 1, was put in the following five main measures:

- (1) To increase crop production and to attain to self-sufficiency level until 1971,
- (2) To build up a main producing region of each crop on the principle of "the right crop in the right land",
- (3) To control market prices of farm products under the Government and to make it possible to stimulate farmer's desire of increase in crop production,
- (4) To promote the development of livestock by timely supply of feed, and
- (5) To increase production of exportable crops and to get larger share in the international market.

During this period, crop production in 1967 and 1968 was seriously suffered from the drought resulting in that the Government dug many tube wells as an immediate measure throughout the country from 1969 to 1970. Nearly 20 % of the total budget allocation for the agricultural sector was concentrated on improvement of irrigation facilities. Thus, the proportional extent of fully irrigated paddy field went up from 57 % at the beginning of 1967 to 81 % at the end of 1971 and its area extent increased from 744 x 10<sup>3</sup> ha to 1,022 x 10<sup>3</sup> ha during this period.

Main agricultural indicators during the period of Second Five-Year Economic Development Plan are summarized in Table F 2. There still

remained a shortage in supply of food grain crops. This problem as awaiting satisfactory solution was carried over to the next Five-Year Plan.

#### F 2.2 Achievement in Agricultural Sector during Third Five-Year Economic Development Plan Period

In the 1960's, 500 to 600 x 10<sup>3</sup> tons of major food grain crops were annually imported from U.S.A. to even up the supply to meet the demand. All of them could be procured by using the aid of U.S.A. either free of charge or by getting a long-term and soft loan from U.S.A. However, after the change of foreign aid policy by U.S.A. at the beginning of the 1970's, a business transaction became necessary to import food grain crops from abroad. This fact was closed up as the main cause leading the serious unbalance of international payment in Korea. Furthermore, the enormous progress in the industrial sector enlarged the earning differences between farmers and factory workers.

The basic concepts in the agricultural sector during the period of Third Five-Year Economic Development Plan were inevitably composed of the self-sufficiency of the main food grain crops and narrowing of the above-mentioned earning differences. The Government set the following strategy:

- (1) To distribute evenly incomes among farm households and salary and wage earners' ones in cities, and to improve infrastructure in farm villages through rural electrification, farm road construction, modernized roofing of houses, etc.,
- (2) To increase crop production, especially to attain the self-sufficiency of rice,
- (3) To build up all weather type of foundation for the intensive farming,
- (4) To promote the modernization of agriculture through farm mechanization, and
- (5) To expand and strengthen marketing, storing and processing facilities for greater encouragement of commercial crop production.

Out of the total national budget of ₩ 2,319 x 10<sup>9</sup> during the period of Third Five-Year Economic Development Plan, 21.5 % or ₩ 499 x 10<sup>9</sup> was allocated to the agricultural sector as shown in Table F 3. It was reported that the budget distribution within the agricultural sector was 27.5 % for farmland development, 21.9 % for improvement of farm villages, 7.8 % for crop production increase, 4.4 % for farm mechanization, 2.0 % for research and extension, 1.7 % for livestock, 1.5 % for cash crops, 1.0 % for sericulture, and 19.8 % for others as well as 6.9 % for forestry and 5.4 % for fishery. About ₩ 110 x 10<sup>9</sup> corresponding to 80 % of the budget allocated for the farmland development were invested for the implementation of large-scale agricultural developments. Most of the budget for the rural development concentrated in the investment for the new community movement (Saemaul Undong).

Throughout the period of Third Five-Year Development Plan, farmers have been compared favorably with salary and wage earners in gross income since 1974 because of increase in production and sale price of rice. At the end of 1976, 1,083 x 10<sup>3</sup> ha or 84 % of the whole paddy field were fully irrigated and 294 x 10<sup>3</sup> ha or 23 % were consolidated.

The main agricultural indicators during this period are presented in Table F 4. The cultivated area of high-yielding new rice varieties was expanded year by year and it became that the demand for rice could almost be met by the domestic production.

### F 2.3 Present Production Basis

The farm population in 1977 totaled 12.3 x 10<sup>6</sup> persons corresponding to 33.8 % of the whole population in Korea. The number of farm household in 1977 was 2.34 x 10<sup>6</sup>, corresponding to 5.3 persons per household. The employment in the agriculture, forestry and fishery sector was 5.4 x 10<sup>6</sup> persons and shared 41.8 % of the total employment of Korea, 12.9 x 10<sup>6</sup> persons, in 1977. The farm population reduced at an annual average rate of 3 % between 1971 and 1977 and the proportion of employment in the agriculture, fishery and forestry went down from 48.4 % in 1971 to 41.8 % in 1977 (see Table A 3).

The total cultivated land as of 1977 was  $2.23 \times 10^6$  ha including  $1.29 \times 10^6$  ha of paddy field and  $0.94 \times 10^6$  ha of upland. The average land holding size was estimated at 0.95 ha/household. Among the total farm households, 53 % belonged to the size of 0.5 to 1.5 ha and 34 % was the holders of less than 0.5 ha.

Total  $283 \times 10^3$  ha of farmland were sprawled for 10 years between 1968 and 1977 due to urbanization, industrial use and construction of road and railroad network with the rapid economic development. The Government enacted the "Farmland Integrity and Utilization Law" at the end of 1972 in order to control the conversion of farmland to other purposes, and from 1973 commenced to classify all the existing farmlands into designated and undersigned areas depending on their productivity and development potentiality. By the end of 1977, about  $1.15 \times 10^6$  ha have been announced publicly as the designated farmlands and, furthermore,  $41.6 \times 10^3$  ha have been noticed as promotive development area for upland, orchard and intensive grass land.

At the end of 1977, 85 % of the total paddy field was fully irrigated. Table F 5 shows the command area by the following six types or irrigation facility in 1976; reservoir, weir, pump, feed canal, infiltration gallery and tube well. In 1977, total W  $35.2 \times 10^9$  was invested for 1,440 irrigation development projects covering 63,904 ha of benefited areas. As a result, 87 % of the whole paddy field became irrigated. The growth of rice was, however, hazarded by the serious drought during the nursery period, April to the beginning of June, 1978. This fact suggests that some of irrigation facilities are still not adequate and some need replacement.

In 1970, implementation of the first large-scale agricultural development project was commenced with the financial assistance from IBRD. Until 1978, three projects, Geumgang, Pyeongtaeg and Gyeongju, were completed. The following 10 projects are under construction: Gaewhado, Yeongsangang (I) and (II), Sapkyocheon (I), Changryeong, Imjin, Mihocheon, Namgang, Nagdonggang and Nonsan. The development area of these 13 projects internationally financed totals 165,891 ha and the whole investment

expensed and planned is W 526 x 10<sup>9</sup> as shown in Table F 6. The total work progress reached nearly 40 % at the end of 1977.

In an area of 95.6 x 10<sup>3</sup> ha among the existing sea reclamation areas, total 1,832 km of dike and 3,709 tide gates were rehabilitated for drainage improvement in coastal areas as tabulated in Table F 7. In order to expand farm land, upland reclamation has been carried out in hilly and mountainous land. Out of the total area of 616,300 ha planned by MOAF, 166.3 x 10<sup>3</sup> ha or 27 % were reclaimed at the end of 1977 as given in Table F 8.

Land consolidation and drainage improvement of paddy field in flood plains along the main rivers have also been executed continuously and the summary of results in 1977 are presented in Table F 8. For the farm mechanization in the near future, the accelerated implementation of these works is urgent requirement in Korea. MOAF projected that the total area was 588 x 10<sup>3</sup> ha for the land consolidation and 127 x 10<sup>3</sup> ha for the drainage improvement. The work progress including the result in 1978 was 56 % for the land consolidation and 12 % for drainage improvement.

Farm mechanization is increasingly needed under the condition that the shortage and soaring cost of farm labor, especially skilled labor, have been induced by the expanding job opportunity in non-agricultural sectors. Furthermore, the cultivation of high-yielding new rice varieties under standardized method needs mechanization of farming practices. Under these circumstances, such power-driven farm machineries as plow, sprayer, duster and thresher have been continuously introduced Table F 9 is an inventory of farm machineries. The Government is promoting the use of small-sized farm machinery but restricts the introduction of large-sized machinery in view of ordered mechanization. In 1977, 26 demonstration farms of mechanized transplanting system with total area of 243 ha were established throughout the country to examine field level mechanized transplanting techniques which was developed in research institutes and to set up practical farming system in the future.

During the period of Fourth Five-Year Economic Development Plan, an integrated demonstration farm with an area of 300 ha will be con-



structed in each province in order to establish a system of mechanized rice cultivation by using large-sized tractor and combine. This project was started from 1977 in Gongweon-do and 92 various farm machineries including several tractors and combines were provided.

The supply and consumption of chemical fertilizers and pesticides in 1977 are summarized in Table F 10. The total quantity of fertilizer elements consumed was  $754 \times 10^3$  tons comprising  $397 \times 10^3$  tons of nitrogen,  $216 \times 10^3$  tons of phosphate, and  $141 \times 10^3$  tons of potassium. From 1976 to 1977, the pesticide consumption increased by approximately 30 %. For the improvement of soil fertility,  $326 \times 10^3$  tons of calcareous fertilizer,  $300 \times 10^3$  tons of silicate fertilizer and  $33.7 \times 10^6$  tons of compost were applied in 1977, and furthermore soil dressing and deep tillage works were carried out as shown in Table F 11. The result of plant protection in some spot areas required for pest extermination works in addition to preventative pest control were reported as summarized in Table F 11.

#### F 2.4 Agricultural Production

The results of crop production in 1977 are tabulated in Table F 12. The total production of grain crops was over the level of  $8 \times 10^6$  tons, among which  $6 \times 10^6$  tons were rice. However, barley and naked barley production in 1977 decreased by 53 % in comparison with that in 1976 due to freezing damage in the early spring of 1977.

In the horticulture, fruit production increased from  $615 \times 10^3$  tons in 1976 to  $744 \times 10^3$  tons in 1977, while vegetable production went down from  $3.2 \times 10^6$  tons in 1976 to  $3.0 \times 10^6$  tons in 1977.

As shown in Table F 13, total  $1.5 \times 10^6$  Korean cattles were fed in 1977 and about  $82 \times 10^3$  tons of beef meat were produced. Under the strong support by the Government, the livestock production is on the upward trend.

The sericulture production in 1977 decreased by  $10 \times 10^3$  tons from 1976 and recorded  $32 \times 10^3$  tons in silkworm as a result of the govern-

mental production control which was conducted taking into account the import restriction by Japan.

The summary of forest management in 1977 is given in Table F 14. During 1977, about  $226 \times 10^3$  ha were afforested with special use tree, improved popular, timber and fuel wood. The existing afforested area totaling  $843 \times 10^3$  ha were maintained. To establish the future development plan of forest area, the over-all forest survey was completed by 1977 and the total surveyed areas were  $3.7 \times 10^6$  ha.

## F 2.5 Agricultural Supporting Services

The organization chart of the Ministry of Agriculture and Fishery (MOAF) is as shown in Fig. F 1. There are nine bureaus and two offices inside MOAF, 13 extraministerial offices, two related government agencies and six related organizations. The nine bureaus comprise Agricultural Economics, Agricultural Development, Agricultural Production, Farmland Management, Farmland Development, Special Crops and Sericulture, Livestock, Food Grain Policy, and Food Grain Management. Among them, the Agricultural Development Bureau is responsible for administrative works regarding rural development planning, agricultural cooperatives and farm mechanization: the Farmland Management Bureau controls administration for farmland management, irrigation facilities maintenance and farmland improvement: the Farmland Development Bureau shares administrative works for farmland expansion, land consolidation and special area development.

The Office of Rural Development (ORD) was organized in 1958 as the government agency for agricultural research and extension service. At present, ORD is composed of the Planning and Management Office, the Research Bureau, the Rural Guidance Bureau, and the Technique Dissemination Bureau. As illustrated in Fig. F 2, ORD has also 12 research organizations including the Agricultural Science Institute, the Crop Experiment Station, and other major research facilities.

At the local level, there are nine Provincial Offices of Rural Development (PORD), 173 City and Country Rural Guidance Offices, and 1,471 Branch Guidance Offices at the township level.

Members of ORD as of 1977 totaled 9,373 among which 1,577 were assigned to the main ORD Office, research institutes and stations, while the remaining 7,796 were assigned to the Provincial ORD and City or Country Rural Guidance Offices.

The outline of present implementation programs in research and extension works is as follows:

(1) For the development of high-yielding rice varieties resistant to pests and constraints:

- Generation advancement and testing of promising lines at IRRI in winter,
- Certified seed increase and experimental trials in farmers' field, and
- Development of tolerant rice varieties of cold and salinity.

(2) For the development of early and high-yielding wheat and barley varieties:

- Expansion of seed multiplication of new varieties, and
- Accelerated development of high-yielding wheat and barley varieties.

(3) For the development of high-yielding soybean and corn varieties:

- Expansion of seed multiplication for the single-cross hybrids,
- Generation advancement of 508 soybean breeding lines in winter, and
- Accelerated development of high-yielding corn and soybean varieties.

(4) For the development of new horticultural crop varieties:

- Accelerated development of horticultural crop varieties in greenhouse,
- Improvement of production techniques for new, disease-free garlic varieties, and

- Regional yield trials of summer Chinese cabbage varieties.
- (5) For the development of hybrid cattle and pasture resources:
- Farm trials of hybrid cattle developed for both meat and milk,
  - Development of herbage-fed hybrid between beefalo and Korean cattle, and
  - Continuous use of local forage resources such as rice straw, animal waste, etc.
- (6) For the guidance program for increasing rice production:
- Refresher training for all extension workers and training for all farmers in winter,
  - Utilization of Saemaul farming association,
  - Introduction of mechanized farming for cooperative farming, and
  - Recommendation of the suitable variety, improvement method of low-yielding areas, and fertilizer application and pest control to maintain high-yield per unit area through advanced and standardized techniques.

ORD also implements other programs for the production increase in sericulture and mushroom, and for the development of new plant-protein and oil resources as well as for the rearing of future Saemaul leaders, improvement of rural life, farmers' technical training and agricultural technical information services.

The Agricultural Development Corporation (ADC) is a state-run enterprise to undertake exclusive implementation of the nationwide large-scale agricultural development projects. ADC was founded in 1940 as the Union of Land Improvement Association and reorganized into the present Corporation in 1970 on the basis of the Rural Modernization Promotion Law. The organization chart as of 1977 is as shown in Fig. F 2.

ADC is engaged in the implementation of survey, design and construction supervision of integrated agricultural development projects,

and also in the fostering of 127 Farmland Improvement Associations. For these works, ADC has a total of 2,500 staff members, including engineers and specialists in various fields of engineering, agronomy, agro-economics, mechanics and management sciences.

The Farmland Improvement Association is a farmer's organization which is established by the approval by the Minister of Agriculture and Fishery of the application through the provincial government by more than 20 farmers in a proposed project area according to the Rural Modernization Law, 1970. In 1977, 127 FLIAs of which membership was 701,292 covered 464,442 ha of irrigated paddy field throughout the country. The project facilities are transferred from ADC to FLIA for operation and maintenance after completion of construction works. FLIA is responsible for operation, maintenance and recovery of investment funds on the project facilities. FLIA receives technical assistance from ADC for investigation, survey, detailed design and construction supervision of irrigation, drainage and related facilities of FLIA's project, but FLIA itself carries out the engineering works with regard to land consolidation of its paddy fields. The Union of Farmland Improvement Associations was established in 1978 as a central organ of FLIAs. At present, 122 FLIAs with  $733 \times 10^3$  farm households in total are organized under the Union.

The National Agricultural Cooperative Federation (NACF) was established in 1961. The present NACF is vertically organized at three levels; primary cooperative at the township level, country cooperative at the country level, and the central organization at the national level. Horizontally, they are classified into two groups; multipurpose cooperatives and special-purpose cooperatives. Farmers, engaged primarily in production of main food grain crops like rice and barley, are members of the multipurpose primary cooperatives which are affiliated with country cooperatives. County cooperatives are in turn member cooperatives of NACF together with special-purpose cooperatives. Farmers, specialized in livestock, horticulture, or any other special cash crop production, are members of special-purpose cooperatives.

In 1977, there were 1,523 primary multipurpose cooperatives, 140 county cooperatives and 141 special-purpose cooperatives under the control of NACF. More than 90 % of the farm households are currently members of the primary multipurpose cooperatives each of which membership averages approximately 1,200 farm households.

The activities of NACF include supply of farm inputs, marketing farm products, agricultural credit service and mutual insurance. All these activities have been firmly connected with government policies and programs for agricultural development. NACF has made every effort to establish new marketing facilities for expansion of NACF's market share and modernization of marketing system throughout the country. Until 1977, NACF opened 10 main cooperative sales shops and eight branch shops under which 1,587 direct sales stores of food grains were controlled. Total 11 collecting center of farm products were also constructed along express highways in the major agricultural production areas. As a result, marketing share of farm products increased by 14 % between 1971 and 1977 as shown in Table F 15. In 1977, the total amount of agricultural production in Korea was estimated at W 3,106 x 10<sup>9</sup> among which W 1,904 x 10<sup>9</sup> or 61.3 % was sold to market.

The record on supply of farm input in 1977 is summarized in Table F 16. Loans granted by NACF account for more than 90 % of the total loans made for agriculture by all banking institutions of the country. NACF provides two kind of farm credit, i.e. short-and middle-term credit to purchase farm input and machinery, and sales proceeds of farm products by subscription. The whole amount of farm credits and loans provided accounted for W 166 x 10<sup>9</sup> in 1976 and 288 x 10<sup>9</sup> in 1977. The rate of demand sufficiency was 69 % in 1976 and 88 % in 1977 as tabulated in Table F 17. The short-term credit is mainly provided for 25 % of purchase cost of fertilizers at an interest rate of 8.5 %. The principal may be paid by grains. The middle-term credit is for 70 % of procurement cost of farm machinery repayable in five years at an interest rate of 9 %.

## F 2.6 New Community Movement (Saemaeul Undong)

For the betterment of rural community, the new community movement called as the Saemaeul Undong was started in 1971. The Saemaeul Undong has a set of procedures such as discussions on problems, election of leaders, framing and planning of projects with grass root cooperation and participation, without any discrimination of sex and age. At present, the Saemaeul Undong is carried out not only in farm and fishing villages but also urban and industrial areas all over the country. In 1977, total investment for various projects accounted for W  $104 \times 10^9$  out of which 53 % was subsidy and loan from the central and provincial governments, banks and cooperatives, and the remaining 47 % was inhabitants' share. From 1971 to 1977, W  $306 \times 10^9$  were invested for the Saemaeul Undong.

In order to achieve the final target comprising the levelling up of farm income to W  $3 \times 10^6$ , the continuation of Saemaeul Undong and the establishment of welfare farm village, integrated rural community development projects were undertaken for 30 primary cooperatives selected throughout the country.

Various types of infrastructure necessary for the betterment of production basis have been improved. During the seven years until 1977, 43,060 km of farm road were newly constructed resulting in the smooth transportation of farm inputs and outputs between farm villages and market centers. Other results consist of 63,927 small bridges, 9,518 small farm ponds, 20,085 small weirs, 4,002 km of feed canals, 406 x 103 ha of afforestation, rebuilding of  $2.7 \times 10^6$  houses including non-farm houses, construction of 18,921 small scale domestic water supply systems and construction of 34,665 storage houses. Total  $2.7 \times 10^6$  households corresponding to 98 % of the target in the rural area were also electrified by the end of 1977. Table F 18 shows the progress and the final goal of major works under the Saemaeul Undong as of 1977.

## F 2.7 Rice Production Revolution

In spite of continuous efforts to attain rice self-sufficiency during the period of Second Five-Year Economic Development Plan, frequent drought and flooding due to the lack of adequate irrigation and drainage systems hindered these efforts. During this period, polished rice yield of traditional Japanese varieties fluctuated between 2.8 and 3.4 tons/ha as summarized in Table F 19.

As food grain production was abundant in 1966, the stock carried over could meet the demand in 1967 to larger extent. Rice production in 1968 was damaged by the serious drought all over the country. The demand for staple foods in 1968 was met by barleys imported and domestically harvested. From 1969, import of rice kept a high level and its peak exceeded over  $900 \times 10^3$  tons in 1971 as shown in Table F 20.

In order to attain rice self-sufficiency, ORD started to develop high-yielding new rice varieties in 1965 and in 1967 could obtain the  $F_1$  generation from a cross between "Yukara", a Japanese variety with early maturity and cold tolerance and "Taichung Native 1", a Taiwanese variety with wide adaptability and short stature. After ORD started technical collaboration with the International Rice Research Institute (IRRI) in 1968 to expand and strengthen mutual cooperation in such fields as varietal improvement, winter season seed multiplication in Philippines, training of research workers, etc., the above-mentioned  $F_1$  was crossed with IR 8, a high-yielding Philippine variety resistant to rice blast, resulting in the highly productive triple cross that was named as IR 667, or "Tongil". The development of Tongil variety could solve two of most serious rice diseases, rice blast and stripe virus diseases, which always caused problems associated with the traditional Japonica rice varieties.

In 1971, seed multiplication and demonstration trials were carried out in farmers' fields of 2,750 ha involving 550 cooperative farms throughout the country. Rice yield of the Tongil variety exceeded by 50 % over the national average of traditional varieties grown in 1971. The extensive dissemination of the Tongil variety was started from 1972



and the total planted area of the first year was  $187 \times 10^3$  ha. However, continuous low temperatures prevailing during August and September, which was one of typical phenomenon among world-wide abnormal weather conditions in 1972, delayed the growth of rice and caused red discoloration of the leaves of the Tongil variety. As a result, the actual yield of Tongil in 1972 crop season was 3.86 tons/ha, which was far below the expected level, though the Tongil variety yielded 20 % more than the traditional varieties as shown in Table F 19 and Fig. F 3. Under normal weather conditions in 1973, the planted area decreased to  $121 \times 10^3$  ha, but the Tongil variety showed 4.81 tons/ha of rice yield on an average. This yield was 37 % higher than that of the traditional varieties in 1973.

In 1974, taking into account weaknesses of the Tongil variety in grain quality, cold tolerance and adaptability for late spring planting, breeding programs were expanded with strengthening of research facilities for the special purpose of improvement of the above weak characteristics. For the development of new varieties, Indica x Japonica crosses have practically been utilized resulting in 15 new improved varieties available in 1978 crop season with insect and disease resistance in addition to one or two of such characteristics as high grain quality, cold tolerance and adaptability for late spring planting.

The planted area had been expanded year by year from 1974 and 54.6 % of total paddy field was grown with these high-yielding new varieties in 1977. Total production of these varieties was  $4.5 \times 10^6$  tons and occupied 77 % of the whole rice production in the country in 1977. Average yield marked 5.53 tons/ha in 1977 under the favorable weather condition.

The rice production in 1978 dropped by  $200 \times 10^3$  tons from 1977, though the cropped area of high-yielding new rice varieties expanded by  $269 \times 10^3$  ha. The following unfavorable weather conditions for each growing stage of rice formed the determining causes: serious drought throughout the nursery period, flood at the heading time, low temperature and insufficient sunshine hours during the milk-ripe stage after the heading time, and high temperature for the dough-ripe stage followed by the milk-ripe stage. As a result of such unfavorable weather conditions,

the rice seedlings of high-yielding new varieties grew weak and, furthermore, rice plants after transplanting became more delicate through the milk-ripe stage. Due to the above-mentioned high temperature, blast diseases extensively broke out all over the country and caused damage especially to some specified varieties of high-yielding new rices at the final stage of growing period.

According to the official announcement of MOAF, the total cropped area of high-yielding new rice varieties was  $929 \times 10^3$  ha and accounted for 75.5 % of the total cropped area of wet paddy. The average yield was estimated at 4.86 tons/ha and the total production reported was  $4.5 \times 10^6$  tons in 1978. On the other hand, the whole cropped area of traditional rice varieties reduced to  $290 \times 10^3$  ha and the total harvest was  $1.3 \times 10^6$  tons. The average yield calculated became 4.35 tons/ha.

This satisfactory rice production revolution also owed to intensified training works provided to farmers, strengthening and expansion of cooperative farming system, and modification of national agricultural policies. The first is to train intensively team leaders of cooperative farming systems and also to provide all rice farmers during the winter off-season with guidance for new farming techniques necessary for the proper management of high-yielding new rice varieties. The second is to organize five to ten rice farmers into one cooperative farming system aiming at the promotion of standardized rice cultivation method throughout the country. The third is mainly composed of (1) increased government purchase price and an inspection grade in favor of the Tongil rice, (2) improvement of the milling facilities for the Tongil grain type, (3) expansion of an incentive award system for outstanding farmers and (4) an adequate supply of agricultural materials to improve farmer capabilities.

#### F 2.8 Food Supply and Demand

Rice production in 1977 crop season marked a new national record of  $6.0 \times 10^6$  tons. Although, the self-sufficiency in rice production was achieved in 1977, total  $3.6 \times 10^6$  tons of food grain crops consisting of wheat, corn and soybean were imported as shown in Table F 20.

The reason is that domestic production of these crops is still insufficient to meet the demand increasing year by year as summarized in Table F 21. These crops are grown on less improved upland field so that these are frequently suffered from abnormal weather condition.

Reflecting the decrease in rice production in 1978 and the eager demand for rice consumption based on the growing income elasticity in urban and industrial areas, the total amount of stocked rice to be carried over from 1978 to 1979 reduced from  $1.8 \times 10^6$  tons to  $1.2 \times 10^6$  tons. Therefore, unless the total rice production in 1979 attains to  $6.0 \times 10^6$  tons, the demand for rice could not be met.

Consumption of livestock products is not high yet, but it is increasing sharply. Especially, beef meat consumption has exceeded domestic supply by a great deal and its import increased from 1,000 tons in 1976 to 5,938 tons in 1977. The Government is strongly supporting livestock farmers in multiplication of beef cattles.

#### F 2.9 Farm Economy

An average annual gross income per farm household rose from W 190,150 in 1967 to W 1,771,920 in 1977. The gross income of 1977 comprised W 1,329,140 for gross farm income and W 442,780 for gross side-business income. An annual cost required to earn the gross income was W 293,000 for farming and W 46,110 for side-business on an average. An annual net income in 1977 totaled W 1,432,810 consisting of W 1,036,140 for net farm income and W 396,670 for side-business income. During the period from 1967 to 1977, the annual net income increased by W 1,283,340 as shown in Table F 22. A real annual net income, which was deflated on the basis of the consumer's price of Seoul in 1971, became W 206,200 for 1967 and W 618,700 for 1977, respectively.

In 1967, the net income per farm household was 39.9 % below in comparison with that per salary and wage household. As a result of the Government efforts to smooth out this earning difference between farmers and salary and wage workers, the former has exceeded the latter in the net income since 1974 as shown in Table F 23.

Living conditions in farm villages has much improved through the increase in the net income of farm household. As tabulated in Table F 24, the Engel's low reduced from 49.0 % in 1967 to 42.8 % in 1976. The average farm household consumed W 135,320 in 1967 and W 976,410 in 1977 for living expenditure and other expenses. Thus, the farm household gained W 14,150 in 1967 and W 456,400 in 1977 as a disposable income. The salary and wage workers in urban areas obtained the annual disposable income of W 286,320 in 1977.

### F 3 PRESENT SITUATION OF AGRICULTURE IN THREE RIVER BASINS

#### F 3.1 Agro-climatic Condition in Three River Basins

From the agro-climatic viewpoint, it has been considered that the following factors have impact on the growth of paddy rice in Korea: low temperature in April and October; high temperature in July and August; dates of the first and the last frosts; rather light rainfall in May and June; heavy rainfall in July and August; and less sunshine hours in July to August.

To grasp agro-climatic differences between the three river basins, the above-mentioned factors were examined. For this examination, the climate of the Han river basin was represented by the observation data of Seoul meteorological station; the Nagdong river basin by the Chupungryeong, Daegu and Busan station; and the Seomjin river basin by the Gurye station (Ref. F 12). The observation data examined are summarized in Table F 25 (1) to (3).

The average mean temperature in April is 11.3°C at Seoul and Chupungryeong, 12.5 to 12.6°C at Daegu and Busan, and 17.2°C at Gurye. The last frost data recorded ranges between April 11th and 14th at Seoul, Chupungryeong and Daegu, while in Busan the date is advanced to March 8th and it is shifted to April 24th in Gwangju which is taken up instead of Gurye due to lack of observation work. These climatic factors have had such impact on rice cultivation practices as extension of protected semi-irrigated rice nurseries throughout the country except southern coastal area.

The total of average rainfall from May 1st to June 20th shows that the Busan station is the largest, 258.7 mm, Gurye is the second, 183.5 mm, and Seoul and Chupungryeong from the next group, 148.3 to 151.3 mm, followed by Daegu, 140.7 mm. On the other hand, the total rainfall from June 21st to August 31st broadly ranges from 742.3 mm at Seoul to 481.1 mm at Daegu. Between the two meteorological station, there exist Chupungryeong with 538.9 mm, Busan with 559.3 mm and Gurye with 640.4 mm.

The average monthly sunshine hours during July and August total 274.8 hours at Seoul, 351.9 hours at Chupungryeong, 355.5 hours at Daegu, 356.6 hours at Busan and 463.1 hours at Gurye. The average mean temperature of July exceeds 25°C at Daegu and Gurye, while it is below 24°C at Busan. In August it becomes above 26°C at Daegu and above 25°C at Seoul and Busan, while it ranges between 24°C and 25°C at Chupungryeong and Gurye. The period during late June to August corresponds to the vegetative stage and the first half of reproductive stage of rice plant in Korea. As climatic conditions throughout this period show manifold changes, rice plant has been hampered by various kinds of disease and insect resulting in accelerated development of new rice varieties with disease and insect tolerance, and improvement of technology to foresee the occurrence of disease and insect damage and to control it.

The average mean and minimum temperature in October records 12.9°C and 7.6°C at Chupungryeong, 13.7°C and 8.8°C at Seoul, 14.5°C and 9.1°C at Daegu, 14.6°C and 9.3°C at Gurye, and 16.8°C and 13.5°C at Busan. The first frost comes on October 14 at Chupungryeong, on October 18th at Seoul, on October 20th at Daegu, on October 28th at Gurye and on November 21st at Busan. The average mean temperature in September ranges between 19°C and 22°C at all the stations. It is well known that the percentage of ripened grains is unfavorably affected if the mean temperature goes down below 20°C during the second half of ripening period. To secure enough ripened grains, early-planting and early-harvesting culture was developed and has prevailed throughout the country. In connection with this culture, the protected semi-irrigated rice nurseries covered with vinyl film have also prevailed.

The result of review on meteorological observation data at the representative stations of each river basin shows the existence of agro-climatic differences between the three river basins as well as within the Nagdong river basin. In due consideration of the aforementioned difference in the agro-climatic condition, the study area was divided into five agricultural zones, i.e. the Han river basin, the northern, central and southern zones of the Nagdong river basin, and the Seomjin river basin.

### F 3.2 Farm Population and Household

By referring to statistics, historical records for the past 10 years on farm population and household in each river basin and zone were reviewed (Refs. F 3 & F 13). Tables F 26 to F 28 present the distribution of farm population by age group. Table F 29 shows the number of farm household classified into the following three kinds from the viewpoint of farmers' dependence on agriculture:

- (1) Full-time farm household obtaining its whole income by agriculture;
- (2) Class 1 part-time farm household of which main income source is farming supplemented by side-business; and
- (3) Class 2 part-time farm household depending on side-business income which exceeds over farm income.

Table F 30 through F 32 give the information on the number of farm household classified by main crop.

The total farm population in the three river basin largely decrease as a result of remarkable growth of industrial sectors which has constantly created employment opportunity for young people living in farm villages. From 1967 to 1976, the total farm population went down by 22 % in the Han river basin and approximately 30 % in all zones of the Nagdong river basin as well as the Seomjin river basin. The farm population aged from 20 to 49 years old in the Han river basin decreased by 13 % during the past decade, while that in the Nagdong and Seomjin river basins dropped by 40 % each. The proportional extent of farm population aged over 50 years old is about 18 % in the three basins in 1976 and it rose by 3 to 7 % compared with the extent in 1967.

The total number of farm household diminished by  $47 \times 10^3$  in the Han river basin,  $57 \times 10^3$  in the Nagdong river basin and  $15 \times 10^3$  in the Seomjin river basin, respectively, during the period from 1967 to 1976. The ratio of full-time farming household to part-time farming household during the same period increased from 0.10 to 0.20 in the

Han river basin, 0.08 to 0.24 in the Nagdong river basin and 0.08 to 0.15 in the Seomjin river, respectively. This trend clearly indicates the effect of nation-wide industrialization.

The proportion of farm household of which main crop was rice in its farming type went up from 57.2 % in 1967 to 64.6 % in 1976 for the Han river basin, 77.7 % to 80.8 % for the Nagdong river basin and 84.1 % to 87.0 % for the Seomjin river basin. Reflecting diversification of consumer's demand in recent years, vegetable, fruit and special crop farming types have expanded each share in the Han and Nagdong river basins, while the proportion of annual upland crop farming type has reduced.

The average family size of farm households is 5.6 persons in the three river basins including 3.1 potential labor force if farm population aged from 14 to 60 years old may be regarded as the labor force.

### F 3.3 Farm Land Holding Size

The historical record on number and distribution of farm household by holding size of cultivated land is summarized in Tables F 33 to 35 based on annual statistics (Ref. F 3). The area extent by hold size of cultivated land is presented together with its proportion in Tables F 36 through F 38.

In the Han river basin and the northern zone of the Nagdong river basin, the land holding size less than 1.0 ha accounts for 60 % and it rises to 75 % in the remaining zone of the Nagdong river basin as well as in the Seomjin river basin.

As of 1976, the farm land holding size averaged 1.17 for the Han river basin, 0.91 ha for the Nagdong river basin and 0.85 ha in the Seomjin river basin, respectively. The average size of the Nagdong river basin in 1976 distributed from 0.99 ha in the northern zone to 0.85 ha in the southern zone. In the Han river basin and the northern zone of the Nagdong river basin, the land holding size was larger than the national average which was computed to be 0.97 ha.



From Tables F 36 to F 38, it can be seen that, in 1976, the cultivated land belonging to farmers with the holding size less than 1.0 ha accounts for 31.3 % of the total in the Han river basin, 45.5 % in the Nagdong river basin and 50.8 % in the Seomjin river basin. During the past decade from 1967 to 1976, this proportion increased by 3.2 % in the Han river basin, 1.8 % in the Nagdong river basin and 1.0 % in the Seomjin river basin, respectively. On the other hand, the proportional extent belonged to the holding size more than 2.0 ha becomes 23.0 % in the Han river basin, 12.8 % in the Nagdong river basin and 10.3 % in the Seomjin river basin.

#### F 3.4 Present Land Use

On the basis of available data, the present land-use pattern in the three river basins were categorized into 10 items such as paddy field, upland, paddy/upland, orchard, forest/upland, forest, wild grass land, waste land, rocky land and others comprising water reservoir, villages and towns (Refs. F 3, F 14 & F 15). This classification was done for each 60 sub-basins, as illustrated in Fig. F 3 and F 4, corresponding to those established for the agricultural water use study in ANNEX G. The outcome of categorization is tabulated in Tables F 39 to F 41.

The total area of paddy field, upland, paddy/upland and orchard equals the total cultivated area of each sub-basin. In the total cultivated area, the proportion of paddy field is less than 50 % in the Han and the northern zone of the Nagdong river basin. On the other hand, it ranges between 60 % and 70 % in the remaining zones of the Nagdong river basin and the Seomjin river basin.

The land categorized as forest/upland almost extends over the area with the slope ranging from 7 % to 15 %. This land is mainly covered with copse and partially with extensive upland. This area has enormous potentiality for land development, especially for new reclamation of upland, orchard and intensive grass land. There exist  $299 \times 10^3$  ha of such potential land in the Han river basin,  $172 \times 10^3$  ha in the Nagdong river basin and  $44 \times 10^3$  ha in the Seomjin river basin, respectively.

Its proportional extent to the total area is 5 % in the Han river basin, 7 % in the Nagdong river basin and 9 % in the Seomjin river basin, respectively.

### F 3.5 Cropped Area and Cropping Pattern

Historical record on cropped area in the three river basins is summarized in Tables F 42 to F 44 by referring to the statistical data (Ref. F 3).

Two cropping area on the paddy field in the Han river basin has increased year by year as vegetable cultivation in vinyl-covered green house has become popular in the suburbs. The proportion in the northern and central zones of the Nagdong river basin has decreased every year due to a sharp decline in barley and wheat cultivation. In the southern zone of the Nagdong river basin and the Seomjin river basin, there was a tendency to decrease until 1973, but the tendency since 1974 has been turning toward increase reflecting the expansion of area cropped by high-yielding new rice varieties in summer season and barley, wheat or vegetables in winter to spring seasons.

On the upland, vegetables and special crops comprising sesame and rape have recently taken the place of potatoes. The area of orchard and mulberry field has been enlarged by utilization of copse in the footslope of rolling hills and mountains.

Historical change in cropping pattern was estimated by using the statistical record on cultivated land and cropped area. The result of estimation for each river basin are also presented in Tables F 42 to F 44.

The multiple crop intensity in the three river basins has gradually declined mainly caused by the lowering of upland utilization efficiency in recent years. In 1976, the intensity estimated was 1.11 in Han river basin, 1.24 in the northern zone of Nagdong river basin, 1.54 in the central zone, 1.64 in the southern zone and 1.53 in the Seomjin river basin, respectively.

### F 3.6 Cultivation of High-yielding New Rice Varieties

In F 2.7, the history of rice cultivation revolution was described.

The standard cropping calendar of high-yield new rice varieties in the cases of one and two cropping is presented in Table F 45. This standard calendar was prepared by ORD and modified to a little extent by every nine PORD taking into account the difference in local climatic condition. PORD is responsible for promotion of standard cropping calendar modified by each through its Country Rural Guidance Offices and Branch Guidance Offices.

The planting area of high-yielding new rice varieties has been expanded in the three river basins on the schedule which is annually prepared by ORD in conformity with national goal as shown in Tables F 42 to F 44.

### F 3.7 Historical Crop Production

The annual paddy production has gone up every year after 1972 when serious cold-weather damage happened as shown in Table F 46. The average yield of 1976 crop season attained to the level of 4.1 tons/ha in the Han river basin, 4.0 tons/ha in the Nagdong river basin and 4.3 tons/ha in the Seomjin river basin resulting from the enlargement of high-yielding new rice cultivation area.

The annual upland, special and perennial crop production changed as given in Table F 46.

## F 4 FUTURE DEVELOPMENT OF AGRICULTURE IN THREE RIVER BASINS

### F 4.1 Agricultural Development Strategy

In order to dissolve the difference of income and living condition between urban and rural areas, the Government has been making various efforts since 1971. The period during the Third and Fourth-Year Economic Development Plan from 1972 to 1981 is regarded as the basic stage through which the living standard of rural areas becomes similar to that of urban areas. In this case, the living standard means gross income per household and payment capacity for subsistence commodities. For this purpose, program for increasing gross income and improving farm and fishery village circumstances has been nation-widely promoted by the Government mainly through the execution of farm land development projects and Saemaetul Undong.

According to the governmental study, the target in the next stage from 1982 to 1986 is that the balance of culture and welfare level between rural and urban areas becomes realistic (Ref. F 25). In this stage, farm income will grow larger by supply of enough livestock and orchard products to meet eager demand for high-grade meat and fruits over the country. Social and welfare infrastructures in rural areas will be improved up to the same level of urban areas. The goal in the third stage from 1987 to 1991 is to earn large incomes and to secure high social welfare.

The target of each stage would become unrealistic unless the following measures to solve the present constraints will be executed and the agricultural productivity will be increased: (1) increase in production of superior new crop varieties through breeding works; (2) continuation of self-sufficiency in food grain crops and strengthening of wheat production; (3) promotion of animal husbandary and dairy farming; (4) expansion of special and commercial crop cultivation area; (5) development of modernized farming practices and improvement of farm machineries; (6) training and security of successors to agriculture; (7) building up of social concensus to follow that graduates of agricultural high schools

and universities find employment in farm villages; and (8) permanent continuation of Saemaeul Undon, and development and promotion of new programs.

The future investment for agricultural sector might be concentrated into the following parts in carrying out the above-mentioned eight measures; (1) development of forest/upland area and sea reclamation for expansion of cultivated land; (2) implementation of large-scale agricultural development and special crop development projects; (3) promotion of farm mechanization and construction of agro-industrial bases to make innovations in farming and marketing system; (4) enrichment of agricultural education system; and (5) establishment of cultural and social welfare in frastructures.

#### F 4.2 Projection of Food Demand

The national population projected in ANNEX A is  $37.95 \times 10^6$  in 1981,  $41.08 \times 10^6$  in 1986,  $44.04 \times 10^6$  in 1991,  $47.21 \times 10^6$  in 1996 and  $50.11 \times 10^6$  in 2001, respectively.

The future demand for food crop consumption per capita was forecasted by ORD in 1976 and by KDI in 1977, respectively, (Refs. F 10 & F 11). In the forecast made by ORD, the following three cases for the per capita annual consumption of whole grain crops were set up for 50 years from 1976 to 2025: 313 kg/person; 350 kg/person; 400 kg/person. On the contrary, KDI studied the future trend of demand for 10 crops and forecasted the growth rate with three steps, i.e. 1977 to 1981, 1982 to 1986 and 1987 to 1991, for each crop as shown in Table F 47. The per capita consumption of whole grain crops forecasted by KDI increased from 286 kg in 1976 to 343 kg in 1991.

Taking into account 299 kg of per capita food grain consumption in 1977 as calculated from Table F 21, the KDI's forecast for the annual growth rate of per capita food consumption was mainly referred for the projection in this pre-feasibility study which was supplemented by the ORD's forecast. Table F 48 presents the annual growth rate and amount of per capita consumption projected in this study. The total demand

for food crops was estimated as shown in Table F 49 on the basis of the projected national population and the projection of per capita food consumption given in Table F 48.

According to the estimation in Table F 48, the annual demand, for whole grain crops is  $12.03 \times 10^6$  tons in 1981,  $14.28 \times 10^6$  tons in 1986,  $16.28 \times 10^6$  tons in 1991,  $18.39 \times 10^6$  tons in 1996 and  $20.04 \times 10^6$  tons in 2001, among which the annual rice demand shares  $5.47 \times 10^6$  in 1981,  $5.74 \times 10^6$  tons in 1986,  $5.93 \times 10^6$  in 1991,  $6.23 \times 10^6$  in 1996 and  $6.58 \times 10^6$  in 2001, respectively.

#### F 4.3 Future Land Use Program

Taking into account the aforementioned agricultural development strategy and future demand for food consumption, the land use program at the target year, 2001, in this study was established on the basis of the ORD's recommendation for the future land use as presented in ANNEX E. The program was established for total 60 sub-basins of the three river basins corresponding to those set up for the study on agricultural water use in ANNEX G.

The gross area was categorized into seven land use patterns, i.e. paddy field, upland, orchard, grass land, forest, erosion control forest and others comprising cities, villages, water reservoir, etc. Among these patterns, grass land was divided into two types, i.e. intensive grass land with the slope less than 30 % and extensive one with the slope more than 30 %. Further, the area of designated forest, which has been defined to be permanently kept and highly used for obtaining of forest products, was independently counted.

The area extent of each land use pattern in each sub-basin is presented in Tables F 50 to F 52. Compared with the present land use as of 1976 as given in Tables F 39 to F 41, the area of paddy field will increase by 2,330 ha in the Han river basin, 1,490 ha in the Nagdong river basin and 540 ha in the Seomjin river basin, respectively. In the Nagdong river basin, the area of paddy field will increase by 820 ha in the northern zone and by 690 ha in the central zone, while it will

decrease by 20 ha in the southern zone. These area increases of paddy field will be shifted from paddy/upland or upland having the slope less than 7 %.

The total upland area grown with annual upland crops, fruits and mulberry will show the following change during 25 years from 1976 to 2001; (1) 5,540-ha decrease in the Han river basin; (2) 3,550-ha decrease in the Nagdong river basin comprising 1,880 ha for the northern zone, 3,340 ha for the central zone and 1,610 ha for the southern zone; and (3) 900-ha increase in the Seomjin river basin. The decrease in the total area of upland will be mainly due to conversion for non-agricultural use in the suburbs.

#### F 4.4 Future Cropping Pattern

The national goal of high-yielding new rice cultivation was set to enlarge the planting area up to  $1 \times 10^6$  ha throughout the country (Refs. F 9 & F 18). According to the government announcement as shown in Table F 19, the total planted area has reached  $929 \times 10^3$  ha until 1978. In the three river basin, the planted was estimated at  $372 \times 10^3$  ha in 1978.

By referring to the study on the suitability/productivity of paddy soils for cultivation of high-yielding new rice varieties made in ANNEX E and the future land use program, the paddy field classified into Grade 1 to 4 totals  $446 \times 10^4$  ha comprising  $377 \times 10^3$  ha of Grade 1 to 3 area and  $69 \times 10^3$  ha of Grade 4 area. The balance between the planted area in 1978 and the total paddy field of Grade 1 to 4 is  $74 \times 10^3$  ha and it would become potential area for high-yielding new rice variety cultivation in the future.

In establishing the future cropping pattern on paddy field, the planting area of high-yielding new rice varieties was allotted as follows to each river basin taking into account the situation as described hereinbefore;  $133.0 \times 10^3$  ha or 84 % for the Han river basin,  $245.8 \times 10^3$  ha or 86 % for the Nagdong river basin comprising  $53.6 \times 10^3$  ha or 81 % in the northern zone,  $103.4 \times 10^3$  ha or 88 % in the central zone and  $88.8 \times 10^3$  or 86 % for the southern zone, and  $46.6 \times 10^3$  ha or 72 % for the

Seomjin river basin. The total planting area was  $425.4 \times 10^3$  ha in the three river basins corresponding to 83.4 % of the whole paddy field in the target year of 2001. In the above, the paddy field with Grade 1 to 4 would be fully grown with high-yielding new rice the Han and Nagdong river basins, while a part of paddy field belonging to Grade 4 in the Seomjin river basin would be planted by traditional rice due to habitual area suffering from insect damage.

The proportion of two cropping area to the total paddy field decreases nation-widely toward the north and regionally toward the higher elevation reflecting the difference in agro-climatic condition. The proportion in each river basin has almost been unchanged during the previous years since 1974 except for the Han river basin where the proportion has been increased because of increasing vegetable cultivation in vinyl-covered green house during the off-season of paddy cropping. It is considered that this tendency now is reaching a peak. It was assumed herein that the present proportion of two cropping will be maintained in the future cropping pattern.

Every year, ORD prepares a national standard cropping calendar for cultivation of high-yielding new rice varieties and traditional varieties. Each PORD modifies the ORD's standard cropping calendar to some extent based on the locality in climatic and physiographic conditions together with varietal characteristics of high-yielding new rice varieties in practical use and ORD's guideline in selecting variety as summarized in Tables F 53 and F 54 (Ref. F 17 & F 18). However, there is no big difference of transplanting and harvesting dates between the ORD's original and the modified one of each PORD. By referring to these cropping calendars and guideline, growing period of high-yielding new and traditional rices and barley on main paddy fields is summarized in Table F 55.

As cleared in Table F 55, two cropping on paddy fields becomes possible only in combination of early-maturing high-yielding new rice varieties and early-maturing barley in the Han river basin and the northern zone of the Nagdong river basin. In other combinations, each harvesting period overlaps sowing or transplanting period of each



other. Instead of barley, when vegetables are planted in vinyl-covered greenhouse which is temporarily built on paddy field during only off-season of rice cultivation, traditional rice varieties must be combined in order to obtain enough period for land preparatory works in June after harvesting vegetables. In the Han river basin, 35 % of total paddy field will become two cropping area in which a pattern of early-maturing high-yielding new rice varieties followed by early-maturing barley will share 19 % of the total and another pattern of traditional rice varieties combined with vegetables grown in vinyl house will share the remaining 16 %. In the northern zone of the Nagdong river basin, on the other hand, the proportion of the latter pattern will reduce to 9 % of the total paddy field because of its location far from large markets. Thus, the remaining two cropping area corresponding to 35 % of the total will be covered with the former cropping pattern. As the cultivation area of high-yielding new rice varieties accounts for 81 %, the proportion of single cropping of high-yielding new rice varieties becomes 46 %. Also, single cropping of traditional varieties will share 10 % of the total paddy field.

In the central and southern zones of the Nagdong river basin, two cropping in combination with early-maturing high-yielding new rice varieties and early-maturing barley will be carried out. In addition, another pattern of early-maturing high-yielding new rice variety followed by medium-maturing barley will also be done. The proportion of two cropping area will be 82 % for the central zone and 81 % for the southern zone. The balance of high-yielding new rice cultivation area, which corresponds to 6 % of the total paddy field in the central zone and 5 % in the southern zone, will be covered with single cropped high-yielding new rice varieties. In the remaining paddy field which is 12 % for the central zone and 14 % for the southern zone, traditional rice varieties will be grown.

The following two types of combination will prevail in the Seomjin river basin; (1) early-maturing high-yielding new rice varieties combined with early-maturing barley and (2) traditional rice varieties followed by medium-maturing barley. The proportion of the former type

will account for 59 % and the latter will be 21 %. In the single cropping area corresponding to 20 % of the total paddy field, high-yielding new rice varieties will share 13 % and traditional rice varieties will share the remaining 7 %.

Table F 56 presents the future cropping pattern projected for paddy field of each river basin and agricultural zone hereinabove.

All the paddy field cropped with the high-yielding new rice varieties was assumed to be equipped with irrigation facilities completely and provided with irrigation water adequately as shown in Table F 57. Traditional rice varieties was assumed to be grown on unconsolidated paddy field a part of which was adequately provided with irrigation water from river tributaries through pumps, while the remaining part was supplementarily irrigated.

The future cropping pattern on upland field including orchard was prepared for potential irrigable upland in this pre-feasibility study. In Korea, upland irrigation system has recently been put to practical use in order to supply water required for spraying of chemicals and supplementing effective soil moisture in apple orchards of the central zone of the Nagdong river basin. Taking into account that this zone is main apple producing center in Korea, requirement for irrigation system in apple orchards will increase year by year. Furthermore, it is very important for retail price control in Korea to supply constantly such vegetables as Chinese cabbage, cucumber, raddish, red pepper and garlic which play principal role in settled habit of eating in Korean people. To meet the needs of timely supply in the future, these vegetables might be grown on upland field equipped with irrigation system which could secure invariable yield under drought condition. Out of upland areas in the three river basins, 5 % to 10 % will be provided with irrigation water during the coming 25 years.

Accordingly, the future cropping pattern for potential irrigable upland field with irrigation system was established as shown in Table F 58. The future cropping pattern under the condition without irrigation system was presented in Table F 59.

#### F 4.5 Anticipated Crop Yield

The average yield of high-yielding new rice varieties marked 5.5 tons/ha in 1977 and 5.0 tons/ha during six years from 1973 to 1978. According to the regional cooperative yield trials at standard fertilizer level, which were carried out by ORD from 1974 to 1976, the average yield of medium-maturing varieties ranged between 5.6 and 6.0 tons/ha, and that of early-maturing varieties was between 5.1 and 5.9 tons/ha. The yield in high productive paddy fields recorded from 6.2 to 8.4 tons/ha (Refs. F 8 & F 21). Under the standard cultivation method of ORD, the yield in experimental farms of PORD ranged between 5.8 and 7.2 tons/ha. Taking into account these trials and experiments, the target yield at national level was set for 6.0 tons/ha under irrigated and consolidated condition.

In order to anticipate future crop yield in each river basin, the following factors were kept in mind; (1) the difference of yield between traditional and high-yielding new rice varieties; (2) productivity of paddy soils; (3) yield difference under various irrigated conditions, and; (4) yield increase by undertaking of land consolidation works for paddy field (Refs. F 8, F 14, F 15 & F 22).

From the first factor, it can be interpreted that the yield of high-yielding new varieties exceeds over nearly 40 % over that of traditional varieties, as shown in 1 of Table F 60.

The second factor indicates that there is a slight difference of yield in the three river basins as well as between paddy field along main stem of each river and that along its tributaries as shown in 2 of Table F 60.

The third factor in 3 of Table F 60 (2) gives the following informations;

- (1) Under drought condition, maximum 35 % increase in rice yield can be expected when irrigation water is adequately provided.

(2) Paddy field with irrigation facilities well maintained by FLIA can obtain higher rice yield than paddy field under the control of Non-FLIA.

The last factor shows that rice yield in consolidated paddy field increase by 25 % compared with that in unconsolidated paddy field as shown in 4 of Table F 60 (2).

In due consideration of the aforementioned factors, the following assumptions were made for the anticipation of rice yield;

(1) Yield increase expected would be 25 % when paddy field would be improved from supplementarily to adequately irrigated condition.

(2) Yield of high-yielding new rice varieties would be 35 % higher than that of traditional varieties.

(3) Yield increase by the land consolidation would be 12 %.

(4) Yield difference of paddy field would be 12 % between flat plains along the main stems and narrow valleys along their tributaries.

In accordance with the regional cooperative yield trials by using Suweon 258, Milyang 30, Raekung and Tongil varieties at standard fertilizer level, Yungnam region covering the central and southern zones of the Nagdong river basin recorded 5.64 tons/ha averaging 84 results from 1975 to 1976. On the basis of the above-mentioned assumptions in addition to the yield obtained through the trials, rice yield in each river basin and agricultural zone was anticipated as below and as shown in Table F 61; 5.6 tons/ha for the central and southern zones of the Nagdong river basin, 5.5 tons/ha for the Han and Seomjin river basins, and 5.4 tons/ha for the northern zone of the Nagdong river basin.

The data on yield of upland crops grown under irrigated condition are not available. Therefore, the yield was assumed by referring to the maximum historical crop yield. The anticipated yield of representative upland crops are summarized in Table F 62.

#### F 4.6 Farming Practices and Farm Input Requirement

The farming practices for rice cultivation under adequately irrigated condition are summarized in Table F 45. By fully referring to the ORD's recommendations based on the farming practices, the quantity of seeds, fertilizers and pesticides was determined, as shown in Table F 63 and F 64, to meet the farm input requirement for securing the crop yield anticipated in F 4.5.

Although the quantity of fertilizers and pesticides actually applied by farmers changes from place to place depending on soil characteristics as well as frequency in occurrence of disease and insects, the requirement determined is uniformly adopted for all the river basins as the standard in this study.

#### F 4.7 Farm Labor Requirement

By referring to the available data, farm labor requirement for paddy and upland crop cultivation was estimated as shown in Tables F 65 and F 66 (Refs. F 1 & F 22).

In "Evaluation Report on Middle Scale Irrigation Project Financed by IBRD (First Year)" (Ref. F 1), KDI carried out field surveys on impacts born from implementation of middle-scale irrigation projects financed by IBRD in the six study areas dotted throughout the country.

In this report, farm labor requirement for paddy planting under the condition of "with-irrigation" and "without-irrigation" was analyzed for each project. And also the labor requirement each for the cultivation of high-yielding new and traditional varieties was studied.

As mentioned in F 4.5, the variation in labor requirement before and after undertaking of land consolidation works for paddy field was investigated by MOAF in October, 1973 (Ref. F 22). In accordance with this investigation, it is expected that about 42 man-days of labor force can be saved by land consolidation works throughout the rice cropping season in both cases of high-yielding new and traditional varieties.

This reduced amount is equivalent to approximately 30 % of the total farm labor requirement for paddy consolidation on unconsolidated field.

From the review on the results of the two investigations, the farm labor requirement in planting high-yielding new and traditional varieties was estimated for three cases, i.e. unconsolidated condition with supplemental and full irrigation system, and consolidated condition with full irrigation system. The estimates are summarized in Table F 67.

The farm labor requirement for upland crop cultivation was respectively estimated for irrigated and rain-fed condition on the basis of "Analysis of Production Costs and Profitability of Crop and Livestock Farming" made by the College of Agriculture, Seoul National University, Korea, 1978 (Ref. F 25). The results of estimation are presented in Table F 62.

## F 5 AGRICULTURAL BENEFIT ATTRIBUTABLE TO WATER RESOURCE DEVELOPMENT

### F 5.1 Economic Price of Farm Input and Output

The economic prices of farm inputs and outputs were estimated as tabulated in Tables F 67 through F 71. In this estimation, the economic farmgate prices of rice and other internationally marketable crops as well as chemical fertilizers were based on a projection to 1990 at 1978 constant price level by IBRD (Ref. F 23). As for agrochemicals, the economic farmgate prices were estimated on the basis of C.I.F. Korea prices at the end of 1976 and the retail price index as of June, 1978 (Refs. F 2 & F 3). The farm labor cost including family labor was counted according to the MOAF's statistics in which results of farm survey annually carried out by NACF were compiled (Ref. F 3). Regarding the other farm inputs and products, average annual prices received or paid by farmers during 1978 were taken up (Refs. F 1, F 3, F 8 & F 25).

### F 5.2 Economic Production Cost

The estimate of economic crop production cost was made for paddy and upland crops for various irrigation condition including rain-fed condition as shown in Tables F 72 to F 74. For the estimation, the farm input and labor requirement given in Tables F 63 through F 66 and the aforementioned economic unit prices were used. These costs estimated include seeds, fertilizer, pesticides, materials and tools, fuel and oil, draft animal and machinery and employed and family labor, but they exclude taxes, water charges, land lent, repayment for initial investment.

### F 5.3 Net Production Value

By referring to the anticipated crop yields in Tables F 61 and F 62 together with the economic farmgate prices in Tables F 67 and F 68, the gross production value expected by paddy cultivation and

upland cropping under irrigated and rain-fed conditions was calculated as shown in Table F 75 for paddy rice and in Table F 76 for upland crops.

The net production value was obtained by subtracting the economic production cost from the gross production value as presented in Table F 75 for paddy rice and in Table F 76 for upland crops.

#### F 5.4 Agricultural Benefit

In the present study, it was defined that the agricultural benefit corresponded to the surplus after deducting the capital investment and O & M costs for irrigation, land consolidation and reclamation as well as upland irrigation from the net incremental value which was equivalent to the balance between the both net production values with and without land development projects.

In estimating the agricultural benefit, the annual investment and O & M costs described in ANNEX G and summarized in Table F 77 was utilized. The change of the cultivated area from an irrigation condition to another was analyzed based on the results of the agricultural land development projection, which was described in ANNEX G. It is noted that the future land use programme given in Tables F 50 to F 52, the future cropping patterns with and without land development projects, presented in Tables F 56 to F 59, the future cultivated area of high-yielding new rice varieties as described in Tables E 14 to E 16 of ANNEX E were also taken into account for this analysis. The results of the analysis is presented as the increase in the benefited area in the intervals of five years as shown in Tables F 78 through F 80. As the benefited area corresponds to that considered in the water budget as explained in ANNEX K, it excludes all the upstream areas of the Soyang and Chungju dams in the Han river basin, the Andong, Hapcheon and Yeongcheon dams in the Nagdong river basin, and the Seomjin and Boseonggang dams in the Seomjin river basin.

The Unit net increment benefit expected by development of irrigation, land consolidation, reclamation and upland irrigation were



estimated for each case as shown in Tables F 81 to F 83. The increase in the irrigation benefit in each basin in the intervals of five years is therefore obtained by multiplying the unit benefit in Tables F 81 to F 83 to the increment area in Tables F 78 to F 80. It is summarized in Table F 84.

#### F 5.5 Land Enhancement Benefit

With the flood control provided by the proposed reservoir, frequency and duration of flooding will be considerably reduced in the present flood vulnerable areas in the downstream reaches. The farms can be expected to be used for more intensive cropping. This benefit was estimated in this study as the land enhancement benefit. This benefit mainly will accrue from an increase of farm land higher agricultural productivity which will be made possible by lesser flood risk.

To estimate this benefit, net value of crop production per hectare in a river stretch was estimated depending on five ranges of return period of flooding, i.e. less than two years, two to three years, three to five years, five to 10 years and more than 10 years up to 100 years. The increase in the net agricultural production value less, if necessary, irrigation cost and the decreased area was regarded as the loss in the net agricultural production value. The balance between the increased value and decreased value was, consequently, estimated as the land enhancement benefit. In estimating the unit value, the following land use was assumed taking into account the production loss due to the inundation and soils which are generally sandy in the flood vulnerable area:

- (1) For the frequency of flooding less than 1/10, high-yielding rice varieties will be grown on paddy, on which irrigation and land consolidation will be provided. Rice yield will be 96 % of that in Table F 61. Upland will be rainfed with yield as shown in Table F 62.

- (2) For the frequency of flooding 1/10 to 1/5, traditional rice varieties will be grown on paddy which will have been supplemen-

tarily irrigated. Rice yield will be 80 % of that in Table F 61. Upland will be rainfed with yield 85 % of that in Table F 62.

(3) For the frequency of flooding  $1/5$  to  $1/3$ , traditional rice growing on supplementarily irrigated paddy will yield 75 % of the yield in Table F 61. Upland will be rainfed with yield 75 % of that in Table F 62.

(4) For the frequency of flooding  $1/3$  to  $1/2$ , traditional rice growing on supplementarily irrigated paddy will yield 50 % of the yield in Table F 61. Rainfed upland crop yield will be 50 % of that in Table F 62.

(5) For the frequency of flooding more than  $1/2$ , land will not be cultivated.

The unit values applied for the estimate of land enhancement benefit are as shown in Table F 85.

#### F 5.6 Production Foregone in Reservoir Areas

The present crop cultivation in each reservoir area of 10 proposed dams could not be continued after the completion of dams. Although crop production is small, it is necessary that the net value of crop production is counted as a negative benefit in evaluating economic feasibility of each dam.

For the estimation of negative benefit, therefore, historical record on crop yield in each reservoir area was analyzed on the basis of statistics (Ref. F 3). As a result, there is no difference in the crop yield between the planned reservoir areas and agricultural zones in which the reservoir areas are included. The gross production value per hectare in each reservoir area was therefore computed based on Tables F 75 and F 76. From the gross production value, crop production cost, being saved by dam construction, was deducted and the remainder was counted as the net production value to be lost in the future. The estimates of net production value per hectare in each reservoir area are summarized in Table F 86.

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Table F 1 BUDGET ALLOCATION TO AGRICULTURAL  
SECTOR DURING SECOND FIVE-YEAR  
ECONOMIC DEVELOPMENT PLAN PERIOD

Unit: W 10<sup>9</sup>

Item	Investment		Loan		Total	
	Amount	%	Amount	%	Amount	%
1. Whole sectors	627.1	-	142.7	-	769.8	-
2. Agriculture, forestry and fishery sector	138.8	100.0	60.1	100.0	198.9	100.0
2.1 Agriculture	106.9	77.0	45.9	76.2	152.8	76.8
2.1.1 Land improvement	34.8	25.0	11.4	18.8	46.2	23.2
(1) Irrigation facilities	28.8	20.7	8.2	13.6	37.0	18.6
(2) Land consolidation	2.4	1.7	-	-	2.4	1.2
(3) Land reclamation	0.1	0.1	3.1	5.1	3.2	1.6
(4) Tidal reclamation	3.5	2.5	0.1	0.1	3.6	1.8
2.1.2 Production improvement	13.3	9.6	14.8	24.8	28.1	14.2
2.1.3 Cash crops	0.9	0.7	2.5	4.1	3.4	1.7
2.1.4 Sericulture	3.3	2.3	2.9	4.8	6.2	3.1
2.1.5 Livestock	3.4	2.5	5.1	8.4	8.5	4.3
2.1.6 Research and extension	6.9	5.0	0.5	0.8	7.4	3.7
2.1.7 Farm machinery	4.7	3.4	4.1	6.9	8.8	4.4
2.1.8 Others	39.6	28.5	4.6	7.6	44.2	22.2
2.2 Forestry	15.5	11.1	0.9	1.5	16.4	8.2
2.3 Fishery	16.4	11.9	13.3	22.3	29.7	15.0

Source; Refs. F 1 & F 2

Table F 2 AGRICULTURAL INDICATORS DURING SECOND  
FIVE-YEAR ECONOMIC DEVELOPMENT PLAN PERIOD

Item	1967	1968	1969	1970	1971
1. Utilization of national land ( $10^3$ km <sup>2</sup> )					
1.1 Cultivated land	23.1	23.2	23.1	23.0	22.7
1.2 Forest	66.4	66.3	66.3	66.1	66.1
1.3 Others	9.0	9.0	9.1	9.4	9.7
1.4 Total	98.5	98.5	98.5	98.5	98.5
2. Farm household and population					
2.1 Number of household ( $10^6$ )	2.59	2.58	2.55	2.48	2.48
2.2 Population ( $10^6$ )	16.1	15.9	15.6	14.4	14.7
2.3 Proportion to national population (%)	53.4	51.6	49.4	45.9	44.7
2.4 Family size (person/household)	6.2	6.2	6.1	5.8	5.9
3. Number of farm household by dependence on farming (%)					
3.1 Full-time	87.0	85.4	85.7	67.7	85.2
3.2 Class 1 part-time	8.0	7.1	6.5	19.7	6.2
3.3 Class 2 part-time	5.0	7.5	7.8	12.6	8.6
4. Number of farm household by holding size of cultivated land (%)					
4.1 Less than 0.5 ha	35.6	35.5	35.4	34.5	36.1
4.2 0.5 to 1.0 ha	32.0	31.8	31.7	33.2	31.7
4.3 1.0 to 1.5 ha	17.3	17.6	17.8	18.0	18.0
4.4 1.5 to 2.0 ha	8.4	8.4	8.4	7.8	8.0
4.5 More than 2.0 ha	6.7	6.7	6.7	6.5	6.2
5. Farm population by age group (%)					
5.1 Under 13 years old	-	-	-	43.5	38.6
5.2 14 to 19	-	-	-	10.4	14.3
5.3 20 to 49	-	-	-	30.5	30.8
5.4 50 to 59	-	-	-	7.7	8.5
5.5 Over 60 years old	-	-	-	7.9	7.8
6. Composition of cultivated land ( $10^3$ ha)					
6.1 Paddy field	1,291	1,289	1,283	1,273	1,265
6.1.1 Two-crop area	612	636	641	639	629
6.1.2 One-crop area	679	653	642	634	636
6.2 Upland	1,021	1,029	1,028	1,024	1,006
6.2.1 Annual crop	904	884	873	879	870
6.2.2 Orchard	48	51	56	60	55
6.2.3 Mulberry	69	94	99	85	81
6.3 Total	2,312	2,318	2,311	2,297	2,271

Source; Ref. F 3

Table F.2 Continued (2)

Item	1967	1968	1969	1970	1971
7. Area of paddy field by irrigation and land consolidation conditions (10 <sup>3</sup> ha)					
7.1 Fully irrigated	744	746	983	1,021	1,022
7.2 Partially irrigated and rain-fed	547	544	300	263	243
7.3 Land consolidated	-	88	100	112	127
8. Fertilizer consumption and production (10 <sup>3</sup> tons)					
8.1 Consumption by fertilizer elements					
8.1.1 Nitrogen	278	286	320	356	347
8.1.2 Phosphorus	133	121	131	124	165
8.1.3 Potash	76	71	84	83	93
8.1.4 Total	487	478	535	563	605
8.2 Production by fertilizer elements					
8.2.1 Nitrogen	156	322	367	401	408
8.2.2 Phosphorus	21	121	146	140	145
8.2.3 Potash	10	42	49	50	47
8.2.4 Total	187	485	562	591	600
9. Pesticide consumption and production (10 <sup>3</sup> tons)					
9.1 Consumption by kind of pesticide					
9.1.1 Fungicides	7.8	1.9	2.1	8.5	10.9
9.1.2 Insecticides	4.5	7.7	7.3	7.5	8.9
9.1.3 Herbicides	0.1	0.3	0.5	1.2	5.0
9.1.4 Others	0.1	0.1	0.3	0.3	0.8
9.1.5 Total	12.5	10.0	10.2	17.5	25.6
9.2 Production by kind of pesticide					
9.2.1 Fungicides	0.9	1.7	9.2	10.7	3.4
9.2.2 Insecticides	7.6	7.3	7.0	9.5	12.9
9.2.3 Herbicides	0.2	0.3	0.5	5.9	8.8
9.2.4 Total	8.7	9.3	16.7	26.1	25.1
10. Utilization of cultivated area (10 <sup>3</sup> ha)					
10.1 Rice	1,235	1,151	1,220	1,203	1,190
10.2 Barley & wheat	886	894	862	833	768
10.3 Miscellaneous grains	616	198	143	123	100
10.4 Pulses	377	381	376	365	338
10.5 Potatoes	195	196	191	180	163
10.6 Special crops	74	72	88	89	91
10.7 Vegetables	177	193	226	254	257
10.8 Tobacco	38	39	39	43	41
10.9 Fruits	48	51	56	60	55
10.10 Mulberry	69	94	99	85	81
10.11 Others	23	32	37	29	16
10.12 Total crop area	3,283	3,301	3,337	3,264	3,100
10.13 Crop intensity (%)	142.0	142.4	144.4	142.1	136.5

Table F 3 BUDGET ALLOCATION TO AGRICULTURAL  
SECTOR DURING THIRD FIVE--YEAR  
ECONOMIC DEVELOPMENT PLAN PERIOD

Unit: W 10<sup>9</sup>

Item	Investment		Loan		Total	
	Amount	%	Amount	%	Amount	%
1. Whole sector	2,115.7	-	203.1	-	2,318.8	-
2. Agriculture, forestry and fishery sector	411.4	100.0	87.6	100.0	499.0	100.0
2.1 Agriculture	358.3	87.1	79.4	90.6	437.7	87.7
2.1.1 Land improvement	122.2	29.7	15.2	17.4	137.4	27.6
2.1.2 Production improvement	38.7	9.4	-	-	38.7	7.8
2.1.3 Cash crops	4.1	1.0	3.5	4.0	7.6	1.5
2.1.4 Sericulture	4.1	1.0	1.0	1.1	5.1	1.0
2.1.5 Livestock	7.0	1.7	1.3	1.5	8.3	1.7
2.1.6 Research and extension	10.3	2.5	-	-	10.3	2.0
2.1.7 Farm machinery	0	0	22.0	25.1	22.0	4.4
2.1.8 Rural development	74.9	18.2	34.6	39.5	109.5	21.9
2.1.9 Others	97.0	23.6	1.8	2.0	98.8	19.8
2.2 Forestry	33.8	8.2	0.7	0.8	34.5	6.9
2.3 Fishery	19.3	4.7	7.5	8.6	26.8	5.4

Source; Refs. F 1 & F 2



Table F 4 AGRICULTURAL INDICATORS DURING THIRD  
FIVE-YEAR ECONOMIC DEVELOPMENT PLAN PERIOD

Item	1972	1973	1974	1975	1976
1. Utilization of national land ( $10^3$ km <sup>2</sup> )					
1.1 Cultivated land	22.4	22.4	22.4	22.4	22.4
1.2 Forest	66.0	65.9	66.4	66.4	66.1
1.3 Others	10.1	10.5	10.0	10.0	10.3
1.4 Total	98.5	98.8	98.8	98.8	98.8
2. Farm household and population					
2.1 Number of household ( $10^6$ )	2.45	2.45	2.38	2.38	2.34
2.2 Population ( $10^6$ )	14.7	14.6	13.5	13.2	12.8
2.3 Proportion to national population (%)	43.8	42.9	38.8	38.2	35.7
2.4 Family size (person/household)	6.0	6.0	5.7	5.6	5.5
3. Number of farm household by dependence on farming (%)					
3.1 Full-time	84.5	85.1	80.3	80.6	79.8
3.2 Class 1 part-time	6.2	6.4	11.4	12.5	12.8
3.3 Class 2 part-time	9.3	8.5	8.3	6.9	7.4
4. Number of farmhousehold by holding size of cultivated land (%)					
4.1 Less than 0.5 ha	36.2	35.9	33.0	33.0	33.9
4.2 0.5 to 1.0 ha	31.7	31.5	34.0	34.8	34.9
4.3 1.0 to 1.5 ha	18.0	18.1	18.2	18.1	17.8
4.4 1.5 to 2.0 ha	7.9	8.2	8.2	7.9	7.5
4.5 More than 2.0 ha	6.2	6.3	6.6	6.2	5.9
5. Farm population by age group (%)					
5.1 Under 13 years old	37.5	36.5	38.4	36.1	35.1
5.2 14 to 19	15.2	16.0	13.3	15.0	14.9
5.3 20 to 49	30.9	31.0	31.5	31.7	32.2
5.4 50 to 59	8.5	8.6	8.3	8.4	8.6
5.5 Over 60 years old	7.9	7.9	8.5	8.8	9.2
6. Composition of cultivated land ( $10^3$ ha)					
6.1 Paddy field	1,259	1,263	1,269	1,277	1,290
6.1.1 Two-crop area	617	603	727	766	800
6.1.2 One-crop area	642	660	542	511	490
6.2 Upland	983	978	969	963	948
6.2.1 Annual crop	846	832	806	784	770
6.2.2 Orchard	59	66	75	88	95
6.2.3 Mulberry	78	80	88	91	83
6.3 Total	2,242	2,241	2,238	2,240	2,238

Source; Ref. F 3

Table F 4 Continued (2)

Item	1972	1973	1974	1975	1976
7. Area of paddy field by irrigation and land consolidation conditions (10 <sup>3</sup> ha)					
7.1 Fully irrigated	1,029	1,042	1,050	1,065	1,082
7.2 Partially irrigated and rain-fed	231	221	219	211	208
7.3 Land consolidated	150	173	235	263	293
8. Fertilizer consumption and production (10 <sup>3</sup> tons)					
8.1 Consumption by fertilizer elements					
8.1.1 Nitrogen	373	411	449	482	361
8.1.2 Phosphorus	171	432	232	238	142
8.1.3 Potash	104	150	155	167	140
8.1.4 Total	648	793	836	887	643
8.2 Production by fertilizer elements					
8.2.1 Nitrogen	418	447	514	583	535
8.2.2 Phosphorus	163	159	166	196	215
8.2.3 Potash	55	65	70	82	84
8.2.4 Total	638	671	750	860	834
9. Pesticide consumption and production (10 <sup>3</sup> tons)					
9.1 Consumption by kind of pesticide					
9.1.1 Fungicides	6.9	4.7	6.3	6.9	8.3
9.1.2 Insecticides	13.9	17.9	19.7	35.9	46.2
9.1.3 Herbicides	8.3	10.2	9.7	19.4	25.9
9.1.4 Others	0.4	0.7	0.4	0.6	-
9.1.5 Total	29.5	33.5	36.1	62.8	80.4
9.2 Production by kind of pesticide					
9.2.1 Fungicides	4.5	6.2	5.0	12.8	31.1
9.2.2 Insecticides	18.1	31.4	30.8	49.8	116.3
9.2.3 Herbicides	10.4	14.4	18.1	25.5	28.2
9.2.4 Total	33.0	52.0	53.9	88.1	175.6
10. Utilization of cultivated area (10 <sup>3</sup> ha)					
10.1 Rice	1,191	1,182	1,204	1,218	1,215
10.2 Barley & wheat	777	713	745	761	752
10.3 Miscellaneous grains	86	92	81	73	72
10.4 Pulses	340	370	349	341	316
10.5 Potatoes	147	138	123	147	137
10.6 Special crops	82	83	107	100	93
10.7 Vegetables	248	254	274	276	269
10.8 Tobacco	58	56	54	54	55
10.9 Fruits	59	66	75	88	95
10.10 Mulberry	78	80	88	91	83
10.11 Others	9	16	21	15	6
10.12 Total crop area	3,075	3,050	3,021	3,164	3,093
10.13 Crop intensity (%)	137.2	136.0	139.5	141.4	138.2

Table F 5 DETAILS OF IRRIGATION CONDITION  
AS OF END OF 1976

Item	No. of Facilities	Benefited Area (ha)	Proportional Extent (%)
1. Reservoir	15,708	412,572.3	32.0
2. Pump	1,288	96,419.6	7.5
3. Pump & drainage	34	13,635.1	1.0
4. Weir	14,014	119,815.1	9.3
5. Feed canal	1,138	7,409.0	0.6
6. Infiltration gallery	4,638	18,100.1	1.4
7. Tube well	22,274	12,698.4	1.0
8. Other facilities	-	192,578.5	14.9
9. Sub-total 1 to 8		873,228.1	67.7
10. Mobile pump	82,332 <sup>/1</sup>	78,445.9	6.1
11. Replacement of facilities required	-	130,025.9	10.1
12. Sub-total 10 & 11		208,471.8	16.2
13. Irrigated paddy field Total 9 & 12		1,081,699.9	83.9
14. Partially irrigated paddy field		208,300.6	16.1
15. Total paddy field		1,290,000.5	100.0

Source; Refs. F 4 & F 5

Remarks; /1 : Total number of mobile pump required for  
irrigation of benefited area of 78,445.9 ha  
was estimated at 124,017.

Table F 6 RESULT OF INVESTMENTS IN LARGE-SCALE  
AGRICULTURAL DEVELOPMENT PROJECT IN 1977

Project	Benefited Area (ha)	Construction Period	Total Investment <sup>9</sup> (₩ 10 <sup>9</sup> )	Investment in 1977 (₩ 10 <sup>6</sup> )	Work Progress (%)	Finance Source
Guemgang	13,114	1970-75	17	-	100	IBRD
Pyeongtaeg	18,419	1970-76	38	-	100	IBRD
Gaewhado	2,500	1974-77	86	4,792	98	OECD
Gyeongju	1,140	1974-77	49	696	100	IBRD
Yeongsangang (I)	34,500	1972-78	794	19,590	86	IBRD/IDA
Sapkyocheon (I)	24,700	1975-79	844	9,087	13	OECD
Changryeong	2,539	1975-79	125	2,289	23	OECD
Imjin	8,166	1975-79	355	2,700	10	ADB
Mihocheon	12,665	1977-81	394	819	3	IBRD
Namgang	12,160	1977-81	300	561	2	ADB
Yeongsangang (II)	20,700	1976-83	899	1,350	2	IBRD

Source; Ref. F 4

Table F 7 RESULT OF REHABILITATION WORKS OF  
SEA DIKES AND TIDE GATES IN 1977

Item	No. of Sites	Benefited Area(ha)	Benefited Farms(10 <sup>3</sup> )	Dike		Tide Gate	
				No. of Site	Total Length(km)	No. of Site	No. of Gate
Government controlled facilities							
	52	24,500	41	85	164	116	480
Non-government controlled facilities							
	1,872	71,051	116	2,046	1,668	2,195	3,229
Total	1,924	95,551	157	2,131	1,832	2,311	3,709

Source; Ref. F 4

Table F 8 RESULTS OF LAND RECLAMATION, LAND  
CONSOLIDATION AND DRAINAGE WORKS IN 1977

		Unit: ha		
Item	Land Reclamation	Land Consolidation	Drainage Improvement	
1.	Target area	741,284	588,000	127,000
1.1	Paddy field	125,000	588,000	127,000
1.2	Upland	616,284	-	-
2.	Completed area up to 1976	174,597	271,515	10,527
2.1	Paddy field	8,313	271,515	10,527
2.2	Upland	166,284	271,515	10,527
3.	Results in 1977	5,648	42,807	2,500
3.1	Paddy field	3,148	42,807	2,500
3.2	Upland	2,500	-	-
4.	Work progress up to 1977 (%)	24.3	53.5	10.3

Source; Ref. F 4

Table F 9 FARM MACHINERIES SUPPLIED  
AND OPERATED IN 1977

		Unit: Number			
Kind of Machinery	Total No. as of 1976	Supply No. in 1977	Total No. as of 1977	No. of Farm Household per Unit	
1.	Plow	122,070	43,670	165,740	14
2.	Tractor	790	270	1,060	2,174
3.	Transplanter	24	65	89	25,888
4.	Power sprayer	40,500	11,530	52,030	44
5.	Power duster	123,500	27,490	150,990	15
6.	Pump	85,700	14,500	100,200	23
7.	Harvester	173	50	223	10,332
8.	Combine	69	15	84	27,429
9.	Thresher	145,000	6,800	151,800	15
10.	Dryer	630	110	740	3,156
Total 1 to 10		518,456	104,500	622,956	-

Source; Ref. F 4

Table F 10 CONSUMPTION OF FERTILIZER  
AND PESTICIDES IN 1977

Item	Carry-in	Supply	Consumption	Carry-out
Fertilizer nutrient (element ton)				
Nitrogen	226	420	397	249
Phosphorus	172	197	216	153
Potassium	113	117	141	89
Total	511	734	754	491
Pesticides (ton)				
For paddy rice				
Fungicides	1,400	3,080	-	-
Insecticides	1,930	5,166	-	-
Sub-total	3,330	8,246	8,875	2,701
For horticulture				
Fungicides	429	1,907	-	-
Insecticides	1,134	3,788	-	-
Sub-total	1,563	3,695	6,383	875
Herbicides	1,491	3,721	3,992	1,220
Others	953	6,341	6,878	416
Total	7,337	24,003	26,128	5,212

Source; Ref. F 4

Table F 11 RESULT OF MAJOR MANAGEMENT WORKS  
FOR PADDY CULTIVATION IN 1977

1. Improvement of Soil Fertility

Calcareous fertilizer ( $10^3$ tons)	326
Silicate fertilizer ( $10^3$ tons)	300
Compost ( $10^3$ tons)	33,680
Soil dressing ( $10^3$ ha)	146
Deep tillage ( $10^3$ ha)	233

2. Plant Protection (ha)

Aerial pest control	105
Cooperative pest control	308
Ordinary pest control	8,784
Total	9,197

Source; Ref. F 4

Table F 12 RECORD ON CROP PRODUCTION  
IN 1977

Crop	Planted Area (10 <sup>3</sup> ha)	Yield (ton/ha)	Production (10 <sup>3</sup> tons)
1. Grain crops	2,299	3.48	8,005
1.1 Paddy rice	1,208	4.94	5,965
1.1.1 High-yielding new variety	660	5.53	3,650
1.1.2 Traditional variety	548	4.23	2,315
1.2 Barley & wheat	545	1.58	862
1.2.1 Barley & naked barley	515	1.58	813
1.2.2 Others	30	1.63	49
1.3 Pulses	319	1.20	383
1.3.1 Soybean	250	1.27	318
1.3.2 Others	69	0.94	65
1.4 Potatoes	129	4.66	602
1.5 Miscellaneous grains	97	1.97	191
1.5.1 Corn	38	2.96	113
1.5.2 Others	59	1.32	78
2. Vegetables	285	10.73	3,058
3. Fruits	96	7.75	744
4. Special crops	101	0.80	81
5. Mushroom	0.3	168.2	47

Source; Refs. F 4 & F 6

Table F 13 RECORD ON LIVESTOCK IN 1977

1. <u>Number of Livestock (10<sup>3</sup>)</u>			
Korean cattles	1,492	Pigs	1,484
Milk cows	109	Chicken	30,189
Beef cattles	16		
2. <u>Livestock Products (ton)</u>			
Beef meat	81,623	Eggs (10 <sup>6</sup> No.)	3,552
Pork meat	146,276	Milk	253,500
Chicken meat	73,052		

Source; Ref. F 4

Table F 14 RECORD ON FORESTRY IN 1977

Item	Unit	Result	Item	Unit	Result
1. Afforestation	ha	225,837	5. Prevention		
1.1 Special use tree	ha	31,399	5.1 Prevention of artificial damage	No. of case	8,716
1.2 Improved poplar	ha	47,610	5.2 Insecticide protection	ha	731,685
1.3 Timber	ha	69,823	5.3 Settlement of shifting cultivation farmer	household	2,285
1.4 Fuel wood	ha	77,005			
2. Maintenance of afforested area	ha	841,756	6. Forest development		
3. Seedling production	10 <sup>6</sup> trees	465	6.1 Forest survey	ha	3,695,000
4. Erosion control			6.2 Overseas forest development	10 <sup>3</sup> m <sup>3</sup>	$\frac{1}{472}$
4.1 Hillside	ha	5,228			
4.2 Sea coast	ha	-			
4.3 Stream channel improvement	ha	-			

Source; Ref. F 4

Remarks; /1 : Timber imported from forest areas developed abroad by Korean fund.

Table F 15 RECORD ON SALES ON FARM PRODUCTS UNDER AGRICULTURAL COOPERATIVES FROM 1971 TO 1977

Item	Unit: W 10 <sup>9</sup>			
	1971	1975	1976	1977
1. Total production	985	24,502	28,352	31,063
2. Marketable production	483	1,453	1,735	1,904
3. Production sold through cooperative channels				
3.1 NACF's collecting center	26	141	155	194
3.2 Primary and country units	22	158	217	256
3.3 Total	48	299	372	450
4. Market share (%)	10	20	21	24

Source; Ref. F 4



Table F 16 RECORD ON SUPPLY OF FARM INPUT IN 1976 AND 1977

Item	Unit	1976	1977
1. Chemical fertilizer	10 <sup>3</sup> tons	643	745
2. Pesticides	ton	9,848	8,920
2.1 For paddy rice	ton	5,690	5,256
3. Farm machinery	No.	87,554	90,767
3.1 Plow & tractor	No.	39,334	40,600
3.2 Power sprayer & duster	No.	30,193	35,500
3.3 Thresher	No.	6,199	6,000
3.4 Pump	No.	11,456	6,380
3.5 Tractor	No.	175	50
3.6 Others	No.	197	2,237

Source; Ref. F 4

Table F 17 DEMAND AND SUPPLY OF FARM CREDITS AND LOANS IN 1976 AND 1977

Item	1976	1977	Net Increase
1. Demand (A)	23.9	30.6	6.7
2. Supply (B)	16.6	28.8	12.2
2.1 Farm credit	5.6	9.8	4.2
2.1.1 Short-term credit	3.6	3.8	0.2
2.1.2 Sales proceeds by subscription	2.0	6.0	4.0
2.2 Mutual finance	4.7	10.0	5.3
2.3 Fertilizers	4.0	5.5	1.5
2.4 Other materials	2.3	3.5	1.2
3. Demand sufficiency (B/A)	0.69	0.88	

Source; Ref. F 4

Table F 18 PROGRESS AND TARGET OF MAJOR WORKS UNDER SARMAEUL UNDONG

Project	Unit	Target	Results up to 1977	Progress (%)
Farm road construction	km	49,167	43,060	88
Farm road improvement	km	26,266	42,220	161
Bridge construction	site	76,749	63,927	83
Weir construction	site	22,787	20,085	88
Common use hall	No.	35,608	32,531	91
Common use storage	No.	34,665	17,325	50
Rural electrification	10 <sup>3</sup> house	2,755	2,696	98
Common use communication	No. of Ri & Don	18,633	15,929	85
Modernized roofing	10 <sup>3</sup> house	2,428	2,372	98
Housing improvement	No.	990,000	19,934	2
Domestic water supply system	No.	27,581	18,921	69
Nature conservation				
along national road	km	8,288	4,361	53
along express way	km	1,217	1,217	100
around town	site	1,458	212	15
along small stream	km	17,239	6,476	38

Source; Ref. F 4

Table F 19 HISTORICAL RECORD ON RICE PRODUCTION IN KOREA FROM 1967 TO 1978

Year	Total			High-yielding New Rice Variety				
	Cropped Area (10 <sup>3</sup> ha)	Yield (ton/ha)	Products (10 <sup>3</sup> tons)	Cropped Area		Yield	Products	
				(10 <sup>3</sup> ha)	(%)	(ton/ha)	(10 <sup>3</sup> tons)	(%)
1966	1,199	3.23	3,871	-	-	-	-	-
1967	1,204	2.97	3,572	-	-	-	-	-
1968	1,127	2.81	3,166	-	-	-	-	-
1969	1,198	3.39	4,057	-	-	-	-	-
1970	1,184	3.30	3,907	-	-	-	-	-
1971	1,178	3.37	3,975	-	-	-	-	-
1972	1,178	3.34	3,933	187	15.9	3.86	722	18.4
1973	1,170	3.58	4,190	121	10.3	4.81	582	13.9
1974	1,189	3.71	4,417	181	15.2	4.73	856	19.4
1975	1,198	3.86	4,626	274	22.9	5.03	1,378	29.8
1976	1,196	4.33	5,180	533	44.6	4.79	2,553	49.3
1977	1,208	4.94	5,965	660	54.6	5.53	3,650	61.2
1978	1,230	4.74	5,797	929	75.5	4.81	4,468	77.1

Source; Refs. F 4, F 8 & F 9

Table F 20 HISTORICAL RECORD ON IMPORT OF MAIN CROPS

Crops	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
<b>Rice</b>											
Quantity (10 <sup>3</sup> tons)	113	216	755	541	907	584	437	206	481	168	-
Amount (\$ 10 <sup>6</sup> )	19	40	140	88	140	105	113	100	202	44	-
Self-sufficiency (%)	97	94	84	88	82	87	91	96	89	96	100
<b>Barley &amp; naked barley</b>											
Quantity (10 <sup>3</sup> tons)	-	106	67	-	-	254	350	299	354	-	330
Amount (\$ 10 <sup>6</sup> )	-	11	7	-	-	25	52	75	103	-	56
Self-sufficiency (%)	100	95	97	100	100	89	84	85	79	100	49
<b>Wheat</b>											
Quantity (10 <sup>3</sup> tons)	909	1,026	1,369	1,254	1,532	1,881	1,835	1,592	1,703	1,814	1,900
Amount (\$ 10 <sup>6</sup> )	62	73	103	89	100	126	221	356	333	277	242
Self-sufficiency (%)	25	25	22	22	17	11	8	8	6	5	2
<b>Corn</b>											
Quantity (10 <sup>3</sup> tons)	49	131	174	284	383	460	576	569	548	859	1,271
Amount (\$ 10 <sup>6</sup> )	4	10	11	20	26	28	60	89	84	112	149
Self-sufficiency (%)	67	38	27	19	14	11	10	9	9	6	4
<b>Soybean</b>											
Quantity (10 <sup>3</sup> tons)	29	17	24	36	81	31	73	66	61	119	151
Amount (\$ 10 <sup>6</sup> )	4	2	3	4	8	4	17	20	15	32	44
Self-sufficiency (%)	88	94	91	87	79	88	77	83	84	74	68

Source; Refs. F 3, F 10 &amp; F 11

Table F 21 HISTORICAL RECORD ON DEMAND AND SUPPLY OF OVER-ALL FOOD GRAINS

Unit: 10<sup>3</sup> tons

Item	1976	1977	Supply	
			1976	1977
<u>Demand</u>			<u>Supply</u>	
1. Food use	7,494	7,742	9. Carry-in	2,987 3,369
1.1 Farmers' use	3,136	3,223	10. Production	7,692 7,244
1.2 Non-farmers' use	4,358	4,519	10.1 Rice	4,669 5,215
2. Processing and industrial use	1,202	1,397	10.2 Barley	1,759 814
3. Seeds	139	177	10.3 Wheat	82 45
4. Feed	1,050	1,280	10.4 Corn	60 84
5. Waste and loss	386	492	10.5 Potatoes	718 693
6. Sub-total	10,271	11,088	10.6 Others	404 393
7. Carry-over	3,255	3,177	11. Sub-total	10,679 10,613
			12. Import	2,847 3,652
8. Total	13,526	14,265	13. Total	13,526 14,265

Source; Refs. F 3 & F 6

Table F 22 HISTORICAL INCOME AND EXPENDITURES OF FARM HOUSEHOLD

Unit: W/average household

Item	1967	1972	1976	1977
Gross income	190,150	514,300	1,441,470	1,771,920
Gross farm income	151,000	428,000	1,165,960	1,329,140
Farming cost	34,640	74,610	244,760	293,000
Net farm income	116,360	353,390	921,200	1,036,140
Gross side-business income	39,150	86,300	275,510	442,780
Cost required	6,040	10,290	40,450	46,110
Net side-business income	33,110	76,010	235,060	396,670
Net income	149,470	429,400	1,156,260	1,432,810
Living expenditure and others	135,320	326,200	788,390	976,410
Disposable income	14,150	103,200	367,870	456,400

Source; Refs. F 2 & F 4

Table F 23 COMPARISON OF INCOME PER HOUSEHOLD  
BETWEEN CITIES AND FARM VILLAGES

Unit: Won

Year	Farm Household in Rural Area		Salary and Wage Workers in Urban Area		A/B (%)
	Nominal Income	Real Income (A)	Nominal Income	Real Income (B)	
1967	149,500	206,200	248,600	343,000	60.1
1972	429,400	341,900	517,400	412,000	83.0
1973	480,700	371,200	550,200	424,900	87.4
1974	674,500	421,300	644,500	402,600	104.7
1975	872,900	431,700	859,300	425,000	101.6
1976	1,156,300	499,300	1,151,800	497,000	100.4
1977	1,432,800	618,700	1,405,100	606,300	102.0

Source; Refs. F 3 & F 6

Table F 24 AVERAGE LIVING EXPENDITURES PER  
HOUSEHOLD IN CITIES AND FARM VILLAGES

Unit: Won & (%)

Item	1975	1976	1977
Living expenditures of farm household			
Food and beverages	291,508 (47.3)	342,651 (45.7)	418,046 (42.8)
Housing	42,846 (6.9)	57,184 (7.6)	76,977 (7.9)
Fuel and light	38,685 (6.3)	46,153 (6.2)	56,498 (5.9)
Clothing	42,498 (6.9)	53,590 (7.2)	65,975 (6.7)
Miscellaneous	200,742 (32.6)	249,605 (33.3)	358,911 (36.7)
<b>Total</b>	<b>616,280</b>	<b>749,183</b>	<b>976,407</b>
Living expenditures of salary and wage earner's household			
Food and beverages	333,960 (44.2)	406,800 (43.0)	466,560 (41.7)
Housing	126,240 (16.7)	166,680 (17.6)	227,160 (20.3)
Fuel and light	40,080 (5.3)	45,120 (4.8)	55,200 (4.9)
Clothing	68,280 (9.0)	87,960 (9.3)	108,360 (9.7)
Miscellaneous	186,960 (24.8)	239,760 (25.3)	261,480 (23.4)
<b>Total</b>	<b>755,520</b>	<b>946,320</b>	<b>1,118,760</b>

Source; Refs. F 3 & F 6

Table F 25 AGRO-CLIMATIC CONDITIONS  
IN THREE RIVER BASINS

Item		Han	Nagdong			Seomjin
			Northern	Central	South	
1. Temperature (°C)						
Apr.	Ave.	11.3	11.3	12.5	12.6	17.2
	Max.	16.9	17.4	18.7	16.8	19.3
	Min.	6.6	5.6	6.9	9.3	7.4
May	Ave.	17.0	16.8	17.9	17.0	17.3
	Max.	22.9	23.0	24.3	21.1	23.4
	Min.	12.2	11.2	12.3	13.9	11.6
June	Ave.	20.9	20.5	21.7	19.8	21.7
	Max.	26.3	26.1	27.5	23.4	27.3
	Min.	16.9	15.7	16.9	17.3	16.4
July	Ave.	24.4	24.2	25.5	23.8	25.4
	Max.	28.4	28.5	30.1	26.8	29.9
	Min.	21.5	20.7	22.0	21.6	21.6
Aug.	Ave.	25.3	24.6	26.1	25.5	24.1
	Max.	29.6	29.5	31.3	29.0	30.9
	Min.	22.1	20.9	22.3	23.1	21.5
Sep.	Ave.	20.4	19.3	20.8	21.8	20.8
	Max.	25.5	24.7	26.1	25.6	27.0
	Min.	16.3	15.0	16.6	19.0	16.2
Oct.	Ave.	13.7	12.9	14.5	16.8	14.6
	Max.	19.4	19.2	20.9	21.3	21.7
	Min.	8.8	7.6	9.1	13.5	9.3

2. Non-frost period

Last frost date

Apr. 14    Apr. 12    Apr. 11    Mar. 8    Apr. 24

Non-frost period

From        Apr. 15    Apr. 13    Apr. 12    Mar. 9    Apr. 25  
To            Oct. 17    Oct. 13    Oct. 19    Nov. 20    Oct. 27

First frost date

Oct. 18    Oct. 14    Oct. 20    Nov. 21    Oct. 28

Table F 25 Continued (2)

Item		Han	Nagdong			Seomjin
			Northern	Central	South	
3. 10 days rainfall (mm)						
Apr.	F	33.4	29.7	26.5	48.4	22.7
	M	31.5	35.2	24.9	54.4	39.0
	L	36.1	35.3	33.9	61.9	52.0
	Total	101.0	100.2	85.3	164.7	113.7
May	F	35.4	35.1	30.6	63.3	50.4
	M	21.9	24.0	22.4	56.5	22.8
	L	35.0	31.1	27.9	38.8	29.2
	Total	92.3	90.2	80.9	158.6	102.4
June	F	29.2	25.9	25.2	43.4	43.4
	M	26.8	35.2	34.6	56.7	37.7
	L	69.6	59.4	51.9	94.8	61.9
	Total	125.6	120.5	111.7	194.9	143.0
July	F	125.6	114.1	107.5	107.5	115.0
	M	154.1	85.6	75.1	76.8	85.9
	L	114.7	84.5	61.5	75.3	95.5
	Total	394.4	284.2	244.1	259.6	296.4
Aug.	F	92.2	59.1	56.5	53.1	90.6
	M	102.1	53.4	50.3	61.6	74.3
	L	84.0	82.8	78.3	90.2	117.2
	Total	278.3	195.3	185.1	204.9	282.1
Sep.	F	116.4	64.2	50.7	73.5	45.3
	M	49.3	45.3	47.4	82.3	52.2
	L	21.0	28.6	27.0	34.3	30.4
	Total	186.7	138.1	125.1	190.1	127.9
Oct.	F	15.0	18.2	17.6	19.1	24.5
	M	20.2	16.6	18.4	26.1	17.1
	L	18.5	14.2	11.4	14.5	19.5
	Total	53.7	49.0	47.4	59.7	61.1
Total from April to October						
		1,232.0	977.5	879.6	1,232.5	1,126.6

Table F 25 Continued (3)

Item	Han	Nagdong			Seomjin
		Northern	Central	South	
4. Total monthly sunshine hours					
Apr.	199.7	215.4	204.6	184.3	222.3
May	227.6	247.8	223.5	213.3	246.3
June	184.4	204.0	190.8	175.1	247.4
July	120.5	162.4	164.1	148.3	219.0
Aug.	154.3	189.5	191.4	208.3	244.1
Sep.	175.3	176.1	166.6	161.7	218.1
Oct.	206.6	209.5	201.1	196.0	197.9

Source; Ref. F 12

Remarks; Observation station represented

Han	Seoul
Nagdong, Northern	Chupungryeong
Central	Daegu
Southern	Busan
Seomjin	Gurye

Observation period usable

Seoul	1954-1976 (1956-1976)*
Chupungryeong	1953-1976 (1956-1976)
Daegu	1952-1976 (1956-1976)
Busan	1952-1976 (1956-1976)
Gurye	1972-1976 (1966-1976)

\* Figures in the parentheses show the period used for 10-day rainfall estimation.



Table F 26 HISTORICAL RECORD ON FARM POPULATION  
BY AGE GROUP IN HAN RIVER BASIN

Unit: 10<sup>3</sup> person

Age Group	1967	1968	1969	1970	1971
<u>Total Population</u>					
1. Under 13 years old	988.4	814.6	799.2	802.3	719.6
2. 13 to 19 years old	196.9	244.8	234.1	204.6	270.7
3. 20 to 49 years old	607.1	641.3	613.3	547.8	546.5
4. 50 to 59 years old	202.8	189.1	181.6	151.6	164.6
5. More than 60 years old	67.9	129.9	129.9	138.7	135.6
6. Total 1 to 5	2,063.1	2,019.7	1,958.1	1,845.0	1,837.0

Male Population

7. Under 13 years old	480.6	423.3	415.7	414.1	374.0
8. 13 to 19 years old	104.4	129.5	124.3	112.7	145.1
9. 20 to 49 years old	335.0	323.1	312.3	287.3	280.7
10. 50 to 59 years old	97.3	90.9	86.9	77.5	79.4
11. More than 60 years old	28.9	59.5	59.0	66.8	62.8
12. Total 7 to 11	1,046.7	1,026.3	998.2	958.4	942.0

Age Group	1972	1973	1974	1975	1976
<u>Total Population</u>					
1. Under 13 years old	694.8	664.4	666.8	602.1	553.2
2. 13 to 19 years old	285.5	295.7	256.2	262.8	249.8
3. 20 to 49 years old	562.9	557.7	552.8	532.7	525.5
4. 50 to 59 years old	160.9	159.2	149.9	142.3	138.2
5. More than 60 years old	137.1	135.8	146.9	141.8	141.3
6. Total 1 to 6	1,841.2	1,812.8	1,772.6	1,681.7	1,608.0

Male Population

7. Under 13 years old	362.7	344.7	345.0	307.9	287.0
8. 13 to 19 years old	153.5	158.4	142.0	145.3	138.1
9. 20 to 49 years old	286.0	284.3	275.4	264.1	264.1
10. 50 to 59 years old	78.1	76.7	75.0	69.4	66.6
11. More than 60 years old	63.8	63.1	70.7	68.5	68.6
12. Total 7 to 11	944.1	927.2	908.1	855.2	824.4

Source; Refs. F 3 & F 13

Table F 27 HISTORICAL RECORD ON FARM POPULATION  
BY AGE GROUP IN NAGDONG RIVER BASIN

<u>Whole Basin</u>		Unit: 10 <sup>3</sup> person				
Age Group	1967	1968	1969	1970	1971	
<u>Total Population</u>						
1. Under 13 years old	1,586.9	1,425.0	1,387.6	1,386.2	1,257.2	
2. 13 to 19 years old	482.8	458.5	452.9	340.2	472.4	
3. 20 to 49 years old	1,532.7	1,118.0	1,083.0	990.2	1,005.3	
4. 50 to 59 years old	342.2	300.6	299.0	256.8	285.8	
5. More than 60 years old	139.2	250.7	249.2	257.7	258.5	
6. Total 1 to 5	4,083.8	3,552.8	3,471.7	3,231.1	3,279.2	
<u>Male Population</u>						
7. Under 13 years old	763.4	740.3	722.1	716.3	652.0	
8. 13 to 19 years old	214.7	240.3	237.0	177.8	246.7	
9. 20 to 49 years old	793.6	555.7	539.8	464.2	497.5	
10. 50 to 59 years old	156.9	139.3	137.4	126.5	133.1	
11. More than 60 years old	56.0	105.5	104.4	113.7	109.3	
12. Total 7 to 11	1,984.6	1,781.1	1,740.7	1,598.5	1,638.6	
Age Group	1972	1973	1974	1975	1976	
<u>Total Population</u>						
1. Under 13 years old	1,207.2	1,169.5	1,098.3	1,086.7	961.1	
2. 13 to 19 years old	502.3	518.0	399.1	447.3	427.8	
3. 20 to 49 years old	1,014.8	1,017.7	940.2	955.4	927.4	
4. 50 to 59 years old	282.1	297.0	253.7	261.1	252.2	
5. More than 60 years old	261.4	264.0	258.7	264.7	265.1	
6. Total 1 to 5	3,267.8	3,266.2	2,950.0	3,015.2	2,833.6	
<u>Male Population</u>						
7. Under 13 years old	464.6	606.0	569.8	537.9	498.9	
8. 13 to 19 years old	264.2	273.7	215.7	238.5	229.9	
9. 20 to 49 years old	526.9	512.1	460.2	461.2	449.2	
10. 50 to 59 years old	132.6	134.9	124.3	128.8	123.1	
11. More than 60 years old	111.2	111.9	116.2	117.0	119.1	
12. Total 7 to 12	1,499.5	1,638.6	1,486.2	1,483.4	1,420.2	

Source; Refs. F 3 & F 13

Table F 27 Continued (2)

Northern Zone		Unit: 10 <sup>3</sup> person				
Age Group	1967	1968	1969	1970	1971	
<u>Total Population</u>						
1. Under 13 years old	425.0	386.8	375.2	378.9	341.9	
2. 13 to 19 years old	129.1	111.3	111.1	84.9	119.1	
3. 20 to 49 years old	379.5	285.1	273.5	250.5	253.7	
4. 50 to 59 years old	91.1	79.0	80.2	71.0	77.6	
5. More than 60 years old	35.3	64.3	64.4	67.3	67.5	
6. Total 1 to 5	1,060.0	926.5	904.4	852.6	859.8	
<u>Male Population</u>						
7. Under 13 years old	222.3	202.6	197.2	196.9	179.0	
8. 13 to 19 years old	58.7	59.0	59.2	45.4	63.4	
9. 20 to 49 years old	189.0	140.6	135.5	118.1	126.0	
10. 50 to 59 years old	41.2	36.5	36.7	34.6	35.8	
11. More than 60 years old	15.1	28.6	28.3	31.2	29.8	
12. Total 7 to 11	526.3	467.3	456.9	426.2	434.0	
Age Group	1972	1973	1974	1975	1976	
<u>Total Population</u>						
1. Under 13 years old	329.2	321.5	306.7	294.5	270.7	
2. 13 to 19 years old	127.6	132.5	103.1	119.6	116.2	
3. 20 to 49 years old	256.2	258.6	242.4	248.6	245.5	
4. 50 to 59 years old	76.6	76.6	67.3	68.8	66.6	
5. More than 60 years old	68.7	70.0	68.0	71.7	73.2	
6. Total 1 to 6	858.3	859.2	787.5	803.2	772.2	
<u>Male Population</u>						
7. Under 13 years old	171.7	167.8	161.1	153.5	141.1	
8. 13 to 19 years old	68.1	70.7	56.3	64.2	63.3	
9. 20 to 49 years old	128.2	130.8	120.5	121.9	121.8	
10. 50 to 59 years old	35.7	35.8	32.7	33.5	32.2	
11. More than 60 years old	30.8	31.1	31.8	33.1	34.2	
12. Total 7 to 11	434.5	436.2	402.4	406.2	392.6	

Table F 27 Continued (3)

<u>Central Zone</u>		Unit: 10 <sup>3</sup> person				
Age Group	1967	1968	1969	1970	1971	
<u>Total Population</u>						
1. Under 13 years old	639.6	572.8	553.4	548.0	499.2	
2. 13 to 19 years old	198.5	186.7	184.1	138.5	191.3	
3. 20 to 49 years old	631.3	457.6	440.7	402.2	411.7	
4. 50 to 59 years old	141.2	123.3	122.9	105.6	117.7	
5. More than 60 years old	57.3	103.5	102.2	105.7	106.7	
6. Total 1 to 5	1,667.9	1,443.9	1,403.3	1,300.0	1,326.6	
<u>Male Population</u>						
7. Under 13 years old	272.2	297.7	287.9	282.7	258.6	
8. 13 to 19 years old	88.0	97.5	96.0	71.6	99.2	
9. 20 to 49 years old	342.9	227.9	220.0	189.9	203.9	
10. 50 to 59 years old	65.2	57.7	57.0	52.8	55.6	
11. More than 60 years old	22.8	43.2	42.4	46.5	45.0	
12. Total 7 to 11	791.1	724.0	703.3	643.5	662.3	
Age Group	1972	1973	1974	1975	1976	
<u>Total Population</u>						
1. Under 13 years old	477.2	459.1	428.9	396.9	364.5	
2. 13 to 19 years old	203.0	211.5	158.2	178.9	171.7	
3. 20 to 49 years old	413.8	415.3	379.8	389.9	375.6	
4. 50 to 59 years old	115.7	118.3	104.1	103.9	102.3	
5. More than 60 years old	108.0	108.2	105.4	108.3	107.6	
6. Total 1 to 6	1,317.7	1,312.4	1,176.4	1,177.9	1,121.7	
<u>Male Population</u>						
7. Under 13 years old	286.6	238.1	221.8	205.0	188.8	
8. 13 to 19 years old	106.3	110.7	84.5	94.4	91.6	
9. 20 to 49 years old	226.2	208.6	186.6	188.7	182.3	
10. 50 to 59 years old	54.9	56.1	51.7	51.8	50.3	
11. More than 60 years old	45.6	45.8	46.8	48.1	48.6	
12. Total 7 to 11	719.6	659.3	591.4	588.0	561.6	

Table F 27 Continued (4)

<u>Southern Zone</u>		Unit: 10 <sup>3</sup> person				
Age Group	1967	1968	1969	1970	1971	
<u>Total Population</u>						
1. Under 13 years old	522.3	465.4	459.0	459.3	416.1	
2. 13 to 19 years old	155.2	160.5	157.7	116.8	162.0	
3. 20 to 49 years old	521.9	375.3	368.8	337.5	339.9	
4. 50 to 59 years old	109.9	98.3	95.9	80.2	90.5	
5. More than 60 years old	46.6	82.9	82.6	84.7	84.3	
6. Total 1 to 5	1,355.9	1,182.4	1,164.0	1,078.5	1,092.8	
<u>Male Population</u>						
7. Under 13 years old	268.9	240.0	237.0	236.7	214.4	
8. 13 to 19 years old	68.0	83.8	81.8	60.8	84.1	
9. 20 to 49 years old	261.7	187.2	184.3	156.2	167.6	
10. 50 to 59 years old	50.5	45.1	43.7	39.1	41.7	
11. More than 60 years old	18.1	33.7	33.7	36.0	34.5	
12. Total 7 to 11	667.2	589.8	580.5	528.8	542.3	
Age Group	1972	1973	1974	1975	1976	
<u>Total Population</u>						
1. Under 13 years old	400.8	388.9	362.7	395.3	325.9	
2. 13 to 19 years old	171.7	174.0	137.8	148.8	139.9	
3. 20 to 49 years old	344.8	343.8	318.0	316.9	306.3	
4. 50 to 59 years old	89.8	102.1	82.3	88.4	83.3	
5. More than 60 years old	84.7	85.8	85.3	84.7	84.3	
6. Total 1 to 6	1,091.8	1,094.6	986.1	1,034.1	939.7	
<u>Male Population</u>						
7. Under 13 years old	206.3	200.1	186.9	179.4	169.0	
8. 13 to 19 years old	89.8	92.3	74.9	79.9	75.0	
9. 20 to 49 years old	172.5	172.7	153.1	150.6	145.1	
10. 50 to 59 years old	42.0	43.0	39.9	43.5	40.6	
11. More than 60 years old	34.8	35.0	37.6	35.8	36.3	
12. Total 7 to 11	545.4	543.1	492.4	489.2	466.0	

Table F 28 HISTORICAL RECORD ON FARM POPULATION  
BY AGE GROUP IN SEOMJIN RIVER BASIN

Unit: 10<sup>3</sup> person

Age Group	1967	1968	1969	1970	1971
<u>Total Population</u>					
1. Under 13 years old	368.7	339.8	331.1	339.2	315.8
2. 13 to 19 years old	105.2	94.1	93.0	65.4	98.9
3. 20 to 49 years old	334.5	247.7	244.8	218.9	221.2
4. 50 to 59 years old	70.9	62.9	61.9	51.2	59.1
5. More than 60 years old	34.5	59.6	59.2	60.3	60.4
6. Total 1 to 5	913.8	804.1	790.0	735.0	755.4

Male Population

7. Under 13 years old	190.6	175.9	172.3	174.8	163.7
8. 13 to 19 years old	45.4	50.1	49.5	34.6	50.6
9. 20 to 49 years old	168.7	124.2	123.5	106.3	109.8
10. 50 to 59 years old	32.1	28.6	27.9	24.7	26.8
11. More than 60 years old	13.4	24.5	24.1	26.0	24.5
12. Total 7 to 11	450.2	403.3	397.3	366.4	375.4

Age Group	1972	1973	1974	1975	1976
<u>Total Population</u>					
1. Under 13 years old	302.1	292.9	290.6	263.3	248.2
2. 13 to 19 years old	104.1	109.7	80.0	91.5	87.4
3. 20 to 49 years old	221.6	219.3	208.3	203.7	195.0
4. 50 to 59 years old	63.5	60.6	54.4	53.5	53.3
5. More than 60 years old	60.7	60.0	59.6	59.1	59.4
6. Total 1 to 6	752.0	742.5	692.9	671.1	643.3

Male Population

7. Under 13 years old	156.7	151.5	150.2	139.4	128.8
8. 13 to 19 years old	55.6	59.0	44.6	46.7	48.1
9. 20 to 49 years old	111.7	111.5	101.6	99.6	95.4
10. 50 to 59 years old	27.3	27.6	26.0	25.6	25.7
11. More than 60 years old	25.0	24.5	26.2	25.1	25.3
12. Total 7 to 11	376.3	374.1	348.6	336.4	323.3

Source; Refs. F 3 & F 13

Table F 29 HISTORICAL RECORD ON NUMBER OF FARM  
HOUSEHOLD CLASSIFIED INTO FULL AND  
PART-TIME FARMING IN THREE RIVER BASINS

Unit: household

River Basin	Year	Total	Full-time	Class 1 Part-time	Class 2 Part-time
<u>Han river basin</u>	1967	336,420	305,590	21,730	9,100
	1968	330,960	291,850	19,900	19,210
	1969	323,210	290,190	16,390	16,630
	1970	-	-	-	-
	1971	310,940	278,510	14,100	18,330
	1972	305,720	275,790	13,380	16,550
	1973	300,710	273,590	12,400	14,720
	1974	312,810	261,920	30,730	20,160
	1975	297,950	254,160	29,120	14,670
	1976	289,330	241,740	30,280	17,310
<u>Seomjin river basin</u>	1967	130,300	120,870	6,940	2,490
	1968	130,210	116,220	6,890	7,100
	1969	128,540	114,460	6,340	7,740
	1970	-	-	-	-
	1971	124,800	110,820	5,540	8,440
	1972	122,790	109,050	5,270	8,470
	1973	122,100	109,350	5,170	7,580
	1974	120,460	104,630	8,340	7,490
	1975	117,430	102,440	8,110	6,880
	1976	115,110	100,260	8,490	6,360
<u>Nagdong river basin</u> (Whole area)	1967	583,500	537,850	31,510	14,140
	1968	580,670	526,680	27,750	26,240
	1969	572,160	523,270	24,550	24,340
	1970	-	-	-	-
	1971	557,370	513,410	19,780	24,180
	1972	550,280	504,880	20,480	24,920
	1973	551,010	501,790	24,430	24,790
	1974	530,780	448,150	53,590	29,040
	1975	540,260	446,270	68,170	25,820
	1976	526,990	425,180	74,100	27,710

Source: Ref. F 3

Table F 29 Continued (2)

Unit: household

River Basin	Year	Total	Full-time	Class 1 Part-time	Class 2 Part-time
<u>Nagdong river basin</u> (Northern zone)	1967	149,620	137,580	8,710	3,330
	1968	148,890	136,620	6,990	5,280
	1969	146,920	135,540	6,160	5,220
	1970	-	-	-	-
	1971	142,860	132,680	5,060	5,120
	1972	140,280	130,050	5,140	5,090
	1973	140,920	130,620	5,360	4,940
	1974	136,460	121,120	8,120	7,220
	1975	141,210	125,340	10,040	5,830
	1976	138,550	120,130	12,380	6,040
<u>Nagdong river basin</u> (Central zone)	1967	237,440	219,230	12,150	6,060
	1968	236,430	214,310	10,930	11,190
	1969	231,990	212,540	9,500	9,950
	1970	-	-	-	-
	1971	225,900	208,380	7,640	9,880
	1972	223,280	206,020	7,460	9,800
	1973	223,410	203,020	10,040	10,250
	1974	212,980	173,350	29,270	10,360
	1975	217,630	170,150	38,370	9,110
	1976	211,260	158,090	42,140	11,030
<u>Nagdong river basin</u> (Southern zone)	1967	196,440	181,040	10,650	4,750
	1968	195,350	175,750	9,830	9,770
	1969	193,250	175,190	8,890	9,170
	1970	-	-	-	-
	1971	188,610	172,350	7,080	9,180
	1972	186,720	168,810	7,880	10,030
	1973	186,680	168,150	8,930	9,600
	1974	181,340	153,680	16,200	11,460
	1975	181,420	150,780	19,760	10,880
	1976	177,180	146,960	19,580	10,640



Table F 30 HISTORICAL RECORD ON NUMBER OF FARM HOUSEHOLD  
CLASSIFIED BY MAIN CROP IN HAN RIVER BASIN

Unit: household

Type	1967	1968	1969	1970	1971
1. Paddy rice	192,290	191,370	189,070	-	189,150
2. Upland crops	117,230	100,890	99,180	-	92,050
3. Fruits	2,050	2,540	2,510	-	3,050
4. Vegetables	2,620	5,210	4,350	-	6,330
5. Special crops	1,210	2,480	1,900	-	3,030
6. Livestocks	1,340	2,140	1,870	-	3,250
7. Sericultures	470	1,340	1,540	-	1,560
8. Fire-field	12,180	10,600	9,090	-	5,150
9. Green-house	-	360	770	-	770
10. Landless farmer	-	8,650	8,940	-	2,320
11. Others	7,030	5,380	3,990	-	4,280
12. Total 1 to 11	336,420	330,960	323,210	-	310,940

Type	1972	1973	1974	1975	1976
1. Paddy rice	180,240	177,600	185,170	186,740	186,890
2. Upland crops	92,010	92,110	81,880	49,820	52,310
3. Fruits	2,980	3,190	3,770	5,650	4,830
4. Vegetables	5,930	4,920	7,970	10,440	9,190
5. Special crops	4,640	5,050	8,640	11,620	11,420
6. Livestocks	3,340	3,790	6,020	3,550	4,350
7. Sericultures	1,320	1,840	3,760	3,970	3,510
8. Fire-field	2,330	-	-	-	-
9. Green-house	570	390	-	-	-
10. Landless farmer	10,030	8,650	15,020	14,520	15,290
11. Others	2,330	3,180	580	1,640	1,540
12. Total 1 to 11	305,720	300,710	312,810	297,950	289,330

Source; Ref. F 3

Table F 31 HISTORICAL RECORD ON NUMBER OF FARM HOUSEHOLD  
CLASSIFIED BY MAIN CROP IN NAGDONG RIVER BASIN

Whole Basin

Type	1967	1968	1969	1970	1971
1. Paddy rice	453,550	458,390	459,190	-	450,910
2. Upland crops	100,230	77,460	75,580	-	62,330
3. Fruits	5,410	9,430	6,910	-	7,740
4. Vegetables	3,030	5,670	5,010	-	5,280
5. Special crops	2,840	4,960	4,150	-	5,380
6. Livestocks	1,540	3,310	2,490	-	3,980
7. Sericultures	580	2,380	2,020	-	2,040
8. Fire-field	1,700	1,580	1,380	-	920
9. Green-house	-	880	820	-	1,570
10. Landless farmer	-	9,510	9,800	-	13,120
11. Others	14,620	7,100	4,810	-	4,100
12. Total 1 to 11	583,500	580,670	572,160	-	557,370

Type	1972	1973	1974	1975	1976
1. Paddy rice	444,480	446,170	409,120	431,410	426,040
2. Upland crops	57,830	56,620	63,900	44,320	38,790
3. Fruits	8,900	9,860	15,540	18,310	17,760
4. Vegetables	5,150	5,420	9,130	11,200	10,840
5. Special crops	7,660	7,830	14,560	15,870	14,420
6. Livestocks	3,630	3,580	4,470	2,450	2,970
7. Sericultures	2,220	2,830	3,520	4,210	3,460
8. Fire-field	680	-	-	-	-
9. Green-house	1,290	940	-	-	-
10. Landless farmer	14,750	14,960	9,980	12,160	11,990
11. Others	3,690	2,800	860	530	720
12. Total 1 to 11	550,280	551,010	530,780	540,260	526,990

Source; Ref. F 3

Table F 31 Continued (2)

Northern Zone		Unit: household				
Type	1967	1968	1969	1970	1971	
1. Paddy rice	86,110	92,500	90,850	-	90,710	
2. Upland crops	54,360	46,170	46,700	-	40,490	
3. Fruits	650	860	960	-	1,210	
4. Vegetables	300	640	490	-	660	
5. Special crops	2,300	3,440	3,060	-	4,400	
6. Livestocks	230	410	260	-	770	
7. Sericultures	210	750	680	-	600	
8. Fire-field	1,390	1,320	1,190	-	800	
9. Green-house	-	60	70	-	250	
10. Landless farmer	-	980	1,010	-	1,560	
11. Others	4,070	1,760	1,650	-	1,410	
12. Total 1 to 11	149,620	148,890	146,920	-	142,860	

Type	1972	1973	1974	1975	1976
1. Paddy rice	87,980	88,420	77,190	92,890	94,640
2. Upland crops	38,950	38,710	36,270	20,680	17,600
3. Fruits	1,430	1,660	2,870	3,560	3,590
4. Vegetables	780	870	4,200	5,980	6,510
5. Special crops	6,250	6,780	11,710	14,450	12,900
6. Livestocks	680	810	1,430	430	510
7. Sericultures	740	970	1,160	1,390	1,110
8. Fire-field	630	-	-	-	-
9. Green-house	120	50	-	-	-
10. Landless farmer	1,790	1,870	1,500	1,740	1,580
11. Others	930	780	230	90	110
12. Total 1 to 11	140,280	140,920	136,460	141,210	138,550

Table F 31 - Continued (3)

Central Zone		Unit: household				
Type	1967	1968	1969	1970	1971	
1. Paddy rice	198,970	202,400	201,400	-	197,300	
2. Upland crops	25,200	16,410	15,380	-	11,220	
3. Fruits	3,770	4,830	4,700	-	4,940	
4. Vegetables	1,040	2,290	1,950	-	2,160	
5. Special crops	270	1,050	730	-	730	
6. Livestocks	920	1,640	1,280	-	1,980	
7. Sericultures	220	940	760	-	840	
8. Fire-field	170	220	150	-	80	
9. Green-house	-	160	130	-	440	
10. Landless farmer	-	3,560	3,790	-	5,140	
11. Others	6,880	2,930	1,720	-	1,070	
12. Total 1 to 11	237,440	236,430	231,990	-	225,900	

Type	1972	1973	1974	1975	1976
1. Paddy rice	193,760	194,540	177,450	183,890	179,490
2. Upland crops	9,990	9,710	15,100	11,610	9,960
3. Fruits	5,810	6,100	9,150	11,140	10,730
4. Vegetables	1,960	2,310	1,530	2,000	1,320
5. Special crops	1,060	830	2,180	1,100	1,320
6. Livestocks	1,840	1,650	1,910	1,370	1,600
7. Sericultures	990	1,240	1,390	2,130	1,810
8. Fire-field	30	-	-	-	-
9. Green-house	420	250	-	-	-
10. Landless farmer	6,010	6,000	4,080	4,320	4,740
11. Others	1,410	780	190	270	290
12. Total 1 to 11	223,280	223,410	212,980	217,630	211,260

Table F 31. Continued (4)

<u>Southern Zone</u>		Unit: household				
Type	1967	1968	1969	1970	1971	
1. Paddy rice	168,470	163,490	166,940	-	162,900	
2. Upland crops	20,670	14,880	13,500	-	10,620	
3. Fruits	990	3,740	1,250	-	1,590	
4. Vegetables	1,690	2,740	2,570	-	2,460	
5. Special crops	270	470	360	-	250	
6. Livestocks	390	1,260	950	-	1,230	
7. Sericultures	150	690	580	-	600	
8. Fire-field	140	40	40	-	40	
9. Green-house	-	660	620	-	880	
10. Landless farmer	-	4,970	5,000	-	6,420	
11. Others	3,670	2,410	1,440	-	1,620	
12. Total 1 to 11	196,440	195,350	193,250	-	188,610	

Type	1972	1973	1974	1975	1976
1. Paddy rice	162,740	163,210	154,480	154,630	151,910
2. Upland crops	8,890	8,200	12,530	12,030	11,230
3. Fruits	1,660	2,100	3,520	3,610	3,440
4. Vegetables	2,410	2,240	3,400	3,220	3,010
5. Special crops	350	220	670	320	200
6. Livestocks	1,110	1,120	1,130	650	860
7. Sericultures	490	620	970	690	540
8. Fire-field	20	-	-	-	-
9. Green-house	750	640	-	-	-
10. Landless farmer	6,950	7,090	4,400	6,100	5,670
11. Others	1,350	1,240	440	170	320
12. Total 1 to 11	186,720	186,680	181,340	181,420	177,180

Table F 32 HISTORICAL RECORD ON NUMBER OF FARM HOUSEHOLD  
CLASSIFIED BY MAIN CROP IN SEOMJIN RIVER BASIN

Unit: household

Type	1967	1968	1969	1970	1971
1. Paddy rice	109,630	110,400	110,450	-	109,080
2. Upland crops	14,710	10,480	10,250	-	8,520
3. Fruits	100	140	140	-	170
4. Vegetables	80	180	140	-	180
5. Special crops	50	280	140	-	550
6. Livestocks	250	520	420	-	350
7. Sericultures	120	390	350	-	450
8. Fire-field	250	200	220	-	40
9. Green-house	-	50	180	-	150
10. Landless farmer	-	6,870	5,450	-	4,910
11. Others	4,610	900	900	-	400
12. Total 1 to 11	130,300	130,210	128,540	-	124,800

Type	1972	1973	1974	1975	1976
1. Paddy rice	107,470	108,030	102,610	101,040	100,150
2. Upland crops	8,280	6,920	10,480	9,820	8,520
3. Fruits	170	190	400	330	290
4. Vegetables	180	600	260	540	520
5. Special crops	380	300	880	1,230	700
6. Livestocks	350	240	530	200	190
7. Sericultures	480	580	1,060	930	830
8. Fire-field	30	-	-	-	-
9. Green-house	80	70	-	-	-
10. Landless farmer	5,250	4,990	4,090	3,290	3,830
11. Others	120	180	150	50	80
12. Total 1 to 11	122,790	122,100	120,460	177,430	115,110

Source; Ref. F 3

Table F 33 HISTORICAL RECORD ON NUMBER AND PROPORTIONAL  
EXTENT OF FARM HOUSEHOLD BY HOLDING SIZE OF  
CULTIVATED LAND IN HAN RIVER BASIN

Unit :  $10^3$  households and (%)

Holding Size	1967	1968	1969	1970	1971
1. Non-crop-farming	-	7.04	6.98	-	9.99
	( - )	( 2.1 )	( 2.1 )	-	( 3.2 )
2. Less than 0.1 ha	9.98	5.36	4.98	-	4.85
	( 3.0 )	( 1.6 )	( 1.5 )	-	( 1.5 )
3. 0.1 to 0.3 ha	30.80	28.05	27.36	-	26.79
	( 9.1 )	( 8.5 )	( 8.5 )	-	( 8.6 )
4. 0.3 to 0.5 ha	46.12	41.75	40.74	-	38.32
	(13.7)	(12.6)	(12.6)	-	(12.3)
5. 0.5 to 1.0 ha	100.46	97.85	93.74	-	88.24
	(29.9)	(29.6)	(29.0)	-	(28.4)
6. 1.0 to 1.5 ha	72.94	74.84	74.30	-	72.70
	(21.7)	(22.6)	(23.0)	-	(23.4)
7. 1.5 to 2.0 ha	42.37	41.72	41.51	-	39.08
	(12.6)	(12.6)	(12.8)	-	(12.6)
8. 2.0 to 3.0 ha	26.79	26.91	26.58	-	24.48
	( 8.8 )	( 8.1 )	( 8.2 )	-	( 7.9 )
9. More than 3.0 ha	6.96	7.44	7.02	-	6.49
	( 2.1 )	( 2.3 )	( 2.3 )	-	( 2.1 )
10. Total 1 to 9	336.42	330.96	323.21	-	310.94

Holding Size	1972	1973	1974	1975	1976
1. Non-crop farming	9.51	9.80	20.40	17.12	17.53
	( 3.1 )	( 3.2 )	( 6.5 )	( 5.8 )	( 6.1 )
2. Less than 0.1 ha	4.17	4.97	1.38	0.55	1.48
	( 1.4 )	( 1.6 )	( 0.4 )	( 0.2 )	( 0.5 )
3. 0.1 to 0.3 ha	26.37	25.63	25.38	26.94	25.92
	( 8.6 )	( 8.5 )	( 8.1 )	(9.0)	( 9.0 )
4. 0.3 to 0.5 ha	36.94	38.16	35.70	33.68	34.14
	(12.1)	(12.7)	(11.4)	(11.3)	(11.8)
5. 0.5 to 1.0 ha	88.06	84.71	93.59	94.36	93.88
	(28.8)	(28.2)	(29.9)	(31.7)	(32.4)
6. 1.0 to 1.5 ha	72.09	69.36	67.35	65.34	62.33
	(23.6)	(23.1)	(21.5)	(21.9)	(21.5)
7. 1.5 to 2.0 ha	38.18	38.15	37.82	32.39	29.88
	(12.5)	(12.7)	(12.1)	(10.9)	(10.3)
8. 2.0 to 3.0 ha	24.02	23.38	24.11	21.27	19.02
	( 7.8 )	( 7.8 )	( 7.7 )	( 7.1 )	( 6.6 )
9. More than 3.0 ha	6.38	6.55	7.08	6.30	5.15
	( 2.1 )	( 2.2 )	( 2.4 )	( 2.1 )	( 1.8 )
10. Total 1 to 9	305.72	300.71	312.81	297.95	289.33

Source : Ref. F 3

Table F 34 HISTORICAL RECORD ON NUMBER AND PROPORTIONAL  
EXTENT OF FARMHOUSEHOLD BY HOLDING SIZE OF  
CULTIVATED LAND IN NAGDONG RIVER BASIN

Whole Basin		Unit : 10 <sup>3</sup> households and (%)				
Holding Size	1967	1968	1969	1970	1971	
1. Non-crop farming	- ( - )	9.86 ( 1.7)	8.66 ( 1.5)	-	13.83 ( 2.5)	
2. Less than 0.1 ha	15.16 ( 2.6)	10.73 ( 1.9)	9.70 ( 1.7)	-	8.14 ( 1.5)	
3. 0.1 to 0.3 ha	83.79 (14.4)	80.18 (13.8)	77.60 (13.6)	-	75.71 (13.6)	
4. 0.3 to 0.5 ha	111.88 (19.2)	109.32 (18.8)	107.72 (18.8)	-	102.44 (18.4)	
5. 0.5 to 1.0 ha	200.36 (34.3)	197.80 (34.1)	196.27 (34.4)	-	191.88 (34.4)	
6. 1.0 to 1.5 ha	100.20 (17.2)	101.82 (17.5)	102.25 (17.8)	-	101.08 (18.1)	
7. 1.5 to 2.0 ha	43.17 ( 7.4)	42.74 ( 7.4)	42.57 ( 7.4)	-	39.55 ( 7.1)	
8. 2.0 to 3.0 ha	23.58 ( 4.0)	22.76 ( 3.9)	22.02 ( 3.9)	-	20.12 ( 3.6)	
9. More than 3.0 ha	5.36 ( 0.9)	5.46 ( 0.9)	5.37 ( 0.9)	-	4.62 ( 0.8)	
10. Total 1 to 9	583.50	580.67	572.16	-	557.37	

Holding Size	1972	1973	1974	1975	1976
1. Non-crop farming	14.82 ( 2.7)	14.91 ( 2.7)	14.02 ( 2.6)	13.47 ( 2.5)	14.01 ( 2.7)
2. Less than 0.1 ha	7.95 ( 1.4)	9.52 ( 1.7)	1.76 ( 0.3)	0.22 ( 0.1)	0.75 ( 0.1)
3. 0.1 to 0.3 ha	75.13 (13.7)	71.80 (13.0)	62.00 (11.7)	70.32 (13.0)	69.77 (13.2)
4. 0.3 to 0.5 ha	98.87 (18.0)	98.03 (17.8)	82.90 (15.6)	90.10 (16.7)	90.12 (17.1)
5. 0.5 to 1.0 ha	190.23 (34.6)	189.21 (34.4)	199.78 (37.7)	204.31 (37.7)	198.35 (37.6)
6. 1.0 to 1.5 ha	100.74 (18.3)	102.31 (18.6)	103.13 (19.4)	99.40 (18.4)	96.81 (18.5)
7. 1.5 to 2.0 ha	38.49 ( 7.0)	40.45 ( 7.3)	41.65 ( 7.9)	38.24 ( 7.1)	34.83 ( 6.6)
8. 2.0 to 3.0 ha	19.41 ( 3.5)	19.84 ( 3.6)	20.70 ( 3.9)	19.29 ( 3.6)	18.15 ( 3.4)
9. More than 3.0 ha	4.64 ( 0.8)	4.94 ( 0.9)	4.84 ( 0.9)	4.91 ( 0.9)	4.20 ( 0.8)
10. Total 1 to 9	550.28	551.01	530.78	540.26	526.99

Source; Ref. F 3



Table F 34 Continued (2)

Northern Zone		Unit : 10 <sup>3</sup> households and (%)				
Holding Size	1967	1968	1969	1970	1971	
1. Non-crop farming	-	1.38	1.16	-	2.36	
	( - )	( 0.9)	( 0.8)		( 1.6)	
2. Less than 0.1 ha	2.01	1.36	1.32	-	1.20	
	( 1.3)	( 0.9)	( 0.9)		( 0.8)	
3. 0.1 to 0.3 ha	15.04	14.26	13.84	-	13.60	
	(10.0)	( 9.6)	( 9.4)		( 9.5)	
4. 0.3 to 0.5 ha	22.76	21.90	21.46	-	20.51	
	(15.2)	(14.7)	(14.6)		(14.4)	
5. 0.5 to 1.0 ha	52.84	52.00	51.01	-	49.13	
	(35.4)	(34.9)	(34.6)		(34.4)	
6. 1.0 to 1.5 ha	32.31	32.93	32.87	-	32.71	
	(21.6)	(22.1)	(22.4)		(22.9)	
7. 1.5 to 2.0 ha	14.63	14.99	15.23	-	14.38	
	( 9.8)	(10.1)	(10.4)		(10.1)	
8. 2.0 to 3.0 ha	8.36	8.34	8.31	-	7.52	
	( 5.6)	( 5.6)	( 5.7)		( 5.3)	
9. More than 3.0 ha	1.67	1.73	1.72	-	1.45	
	( 1.1)	( 1.2)	( 1.2)		( 1.0)	
10. Total 1 to 9	149.62	148.89	146.92	-	142.86	
Holding Size	1972	1973	1974	1975	1976	
1. Non-crop farming	2.43	2.35	3.25	2.06	1.93	
	( 1.7)	( 1.7)	( 2.4)	( 1.5)	( 1.4)	
2. Less than 0.1 ha	1.20	1.42	0.33	0.05	0.13	
	( 0.9)	( 1.0)	( 0.2)	( 0.1)	( 0.1)	
3. 0.1 to 0.3 ha	13.63	13.19	11.24	13.50	12.83	
	( 9.7)	( 9.4)	( 8.2)	( 9.6)	( 9.3)	
4. 0.3 to 0.5 ha	19.39	20.25	16.32	18.43	18.48	
	(13.8)	(14.4)	(12.0)	(13.0)	(13.3)	
5. 0.5 to 1.0 ha	48.36	47.68	48.06	52.51	52.35	
	(34.5)	(33.7)	(35.2)	(37.2)	(37.8)	
6. 1.0 to 1.5 ha	32.42	32.68	33.74	33.33	33.16	
	(23.1)	(23.2)	(24.7)	(23.6)	(23.9)	
7. 1.5 to 2.0 ha	14.14	14.51	15.24	13.36	12.48	
	(10.1)	(10.3)	(11.2)	( 9.4)	( 9.0)	
8. 2.0 to 3.0 ha	7.24	7.34	6.82	6.75	6.15	
	( 5.2)	( 5.2)	( 5.0)	( 4.7)	( 4.4)	
9. More than 3.0 ha	1.47	1.50	1.46	1.22	1.04	
	( 1.0)	( 1.1)	( 1.1)	( 0.9)	( 0.8)	
10. Total 1 to 9	140.28	140.92	136.46	141.21	138.55	

Table F 34 Continued (3)

Central Zone		Unit : 10 <sup>3</sup> households and (%)				
Holding Size	1967	1968	1969	1970	1971	
1. Non-crop farming	-	4.54	3.89	-	6.16	
	( - )	( 1.9)	( 1.7)		( 2.7)	
2. Less than 0.1 ha	5.82	4.49	3.74	-	3.25	
	( 2.5)	( 1.9)	( 1.6)		( 1.4)	
3. 0.1 to 0.3 ha	35.44	33.71	32.66	-	31.71	
	(14.9)	(14.3)	(14.1)		(14.0)	
4. 0.3 to 0.5 ha	46.59	45.65	44.86	-	42.58	
	(19.6)	(19.3)	(19.3)		(18.9)	
5. 0.5 to 1.0 ha	83.40	82.18	81.12	-	79.25	
	(35.1)	(34.8)	(34.9)		(35.1)	
6. 1.0 to 1.5 ha	39.92	40.15	40.48	-	39.70	
	(16.8)	(16.9)	(17.5)		(17.6)	
7. 1.5 to 2.0 ha	16.00	15.81	15.71	-	14.51	
	( 6.7)	( 6.7)	( 6.8)		( 6.4)	
8. 2.0 to 3.0 ha	8.26	7.98	7.65	-	7.17	
	( 3.5)	( 3.4)	( 3.3)		( 3.2)	
9. More than 3.0 ha	2.01	1.92	1.88	-	1.57	
	( 0.9)	( 0.8)	( 0.8)		( 0.7)	
10. Total 1 to 9	237.44	236.43	231.99	-	225.90	

Holding Size	1972	1973	1974	1975	1976
1. Non-crop farming	6.44	6.28	5.49	4.95	6.05
	( 2.9)	( 2.8)	( 2.6)	( 2.3)	( 2.9)
2. Less than 0.1 ha	3.09	3.98	0.75	0.04	0.25
	( 1.4)	( 1.8)	( 0.4)	( 0.1)	( 0.1)
3. 0.1 to 0.3 ha	31.63	30.30	25.23	29.79	29.39
	(14.2)	(13.6)	(11.9)	(13.7)	(13.9)
4. 0.3 to 0.5 ha	41.12	40.93	34.13	37.63	37.45
	(18.4)	(18.3)	(16.0)	(17.3)	(17.7)
5. 0.5 to 1.0 ha	78.64	78.18	82.90	83.51	80.16
	(35.1)	(35.0)	(38.9)	(38.4)	(37.9)
6. 1.0 to 1.5 ha	39.88	40.18	39.38	37.79	36.23
	(17.9)	(18.0)	(18.5)	(17.3)	(17.2)
7. 1.5 to 2.0 ha	14.01	14.81	15.38	14.69	13.00
	( 6.3)	( 6.6)	( 7.2)	( 6.7)	( 6.2)
8. 2.0 to 3.0 ha	6.89	7.02	7.91	7.25	6.95
	( 3.1)	( 3.1)	( 3.7)	( 3.3)	( 3.3)
9. More than 3.0 ha	1.58	1.73	1.81	1.98	1.78
	( 0.7)	( 0.8)	( 0.8)	( 0.9)	( 0.8)
10. Total 1 to 9	223.28	223.41	212.98	217.63	211.26

Table F 34 Continued (4)

Southern Zone		Unit : 10 <sup>3</sup> households and (%)				
Holding Size	1967	1968	1969	1970	1971	
1. Non-crop farming	- ( - )	3.94 ( 2.0)	3.61 ( 1.9)	-	5.31 ( 2.8)	
2. Less than 0.1 ha	7.33 ( 3.7)	4.88 ( 2.5)	4.64 ( 2.4)	-	3.69 ( 1.9)	
3. 0.1 to 0.3 ha	33.31 (16.9)	32.21 (16.5)	31.10 (16.1)	-	30.40 (16.2)	
4. 0.3 to 0.5 ha	42.53 (21.8)	41.77 (21.4)	41.40 (21.4)	-	39.35 (20.9)	
5. 0.5 to 1.0 ha	64.12 (32.7)	63.62 (32.6)	64.14 (33.2)	-	63.50 (33.7)	
6. 1.0 to 1.5 ha	27.97 (14.2)	28.74 (14.7)	28.90 (15.0)	-	28.67 (15.2)	
7. 1.5 to 2.0 ha	12.54 ( 6.4)	11.94 ( 6.1)	11.63 ( 6.0)	-	10.66 ( 5.6)	
8. 2.0 to 3.0 ha	6.96 ( 3.5)	6.44 ( 3.3)	6.06 ( 3.1)	-	5.43 ( 2.9)	
9. More than 3.0 ha	1.68 ( 0.8)	1.81 ( 0.9)	1.77 ( 0.9)	-	1.60 ( 0.8)	
10. Total 1 to 9	196.44	195.35	193.25	-	188.61	
Holding Size	1972	1973	1974	1975	1976	
1. Non-crop farming	5.95 ( 3.2)	6.28 ( 3.4)	5.28 ( 2.9)	6.46 ( 3.6)	6.03 ( 3.4)	
2. Less than 0.1 ha	3.66 ( 2.0)	4.12 ( 2.2)	0.68 ( 0.4)	0.13 ( 0.1)	0.37 ( 0.2)	
3. 0.1 to 0.3 ha	29.87 (16.0)	28.31 (15.2)	25.53 (14.1)	27.03 (14.9)	27.55 (15.5)	
4. 0.3 to 0.5 ha	38.36 (20.5)	36.85 (19.7)	32.45 (17.9)	34.04 (18.8)	34.19 (19.3)	
5. 0.5 to 1.0 ha	63.23 (34.0)	63.35 (33.9)	68.82 (37.9)	68.29 (37.6)	65.84 (37.2)	
6. 1.0 to 1.5 ha	28.44 (15.2)	29.45 (15.8)	30.01 (16.5)	28.28 (15.6)	27.42 (15.5)	
7. 1.5 to 2.0 ha	10.34 ( 5.5)	11.13 ( 6.0)	11.03 ( 6.1)	10.19 ( 5.6)	9.35 ( 5.3)	
8. 2.0 to 3.0 ha	5.28 ( 2.8)	5.48 ( 2.9)	5.97 ( 3.3)	5.29 ( 2.9)	5.05 ( 2.8)	
9. More than 3.0 ha	1.59 ( 0.8)	1.71 ( 0.9)	1.57 ( 0.9)	1.71 ( 0.9)	1.38 ( 0.8)	
10. Total 1 to 9	186.72	186.68	181.34	181.42	177.18	

Table F 35 HISTORICAL RECORD ON NUMBER AND PROPORTIONAL  
EXTENT OF FARM HOUSEHOLD BY HOLDING SIZE OF  
CULTIVATED LAND IN SEOMJIN RIVER BASIN

Unit :  $10^3$  households and (%)

Holding Size	1967	1968	1969	1970	1971
1. Non-crop farming	- ( - )	2.05 ( 1.6)	2.30 ( 1.8)	-	2.82 ( 2.2)
2. Less than 0.1 ha	4.92 ( 3.8)	3.43 ( 2.6)	3.05 ( 2.4)	-	2.89 ( 2.3)
3. 0.1 to 0.3 ha	21.52 (16.5)	21.29 (16.3)	20.67 (16.1)	-	19.09 (15.3)
4. 0.3 to 0.5 ha	27.12 (20.8)	26.17 (20.1)	25.45 (19.8)	-	24.06 (19.3)
5. 0.5 to 1.0 ha	45.23 (34.8)	45.28 (34.8)	45.03 (35.0)	-	43.97 (35.3)
6. 1.0 to 1.5 ha	19.40 (14.9)	19.75 (15.2)	19.90 (15.5)	-	19.90 (15.9)
7. 1.5 to 2.0 ha	7.56 ( 5.8)	7.61 ( 5.8)	7.60 ( 5.9)	-	7.66 ( 6.1)
8. 2.0 to 3.0 ha	3.72 ( 2.8)	3.73 ( 2.9)	3.72 ( 2.9)	-	3.55 ( 2.9)
9. More than 3.0 ha	0.83 ( 0.6)	0.90 ( 0.7)	0.82 ( 0.6)	-	0.86 ( 0.7)
10. Total 1 to 9	130.30	130.21	128.54	-	124.80

Holding Size	1972	1973	1974	1975	1976
1. Non-crop farming	3.05 ( 2.5)	2.86 ( 2.3)	4.56 ( 3.8)	3.36 ( 2.9)	3.90 ( 3.4)
2. Less than 0.1 ha	2.74 ( 2.2)	2.99 ( 2.4)	0.29 ( 0.2)	0.05 ( 0.1)	0.12 ( 0.1)
3. 0.1 to 0.3 ha	18.82 (15.3)	18.00 (14.7)	15.54 (12.9)	17.49 (14.9)	16.83 (14.6)
4. 0.3 to 0.5 ha	23.61 (19.3)	23.80 (19.5)	20.94 (17.4)	22.09 (18.8)	21.34 (18.6)
5. 0.5 to 1.0 ha	43.24 (35.3)	43.14 (35.4)	46.29 (38.4)	44.74 (38.1)	44.44 (38.6)
6. 1.0 to 1.5 ha	19.92 (16.2)	20.11 (16.5)	21.35 (17.8)	19.32 (16.4)	18.63 (16.2)
7. 1.5 to 2.0 ha	7.28 ( 5.9)	7.20 ( 5.9)	7.05 ( 5.8)	6.96 ( 5.9)	6.45 ( 5.6)
8. 2.0 to 3.0 ha	3.37 ( 2.7)	3.25 ( 2.7)	3.76 ( 3.1)	2.80 ( 2.4)	2.80 ( 2.4)
9. More than 3.0 ha	0.76 ( 0.6)	0.75 ( 0.6)	0.68 ( 0.6)	0.62 ( 0.5)	0.60 ( 0.5)
10. Total 1 to 9	122.79	122.10	120.46	117.43	115.11

Source : Ref. F 3

Table F 36 HISTORICAL RECORD ON AREA AND PROPORTIONAL  
EXTENT BY HOLDING SIZE OF CULTIVATED LAND  
IN HAN RIVER BASIN

Unit: 10<sup>3</sup> ha and (%)

Holding Size	1967	1968	1969	1970	1971
1. Non-crop farming	—	—	—	—	—
2. Less than 0.1 ha	0.50 (0.1)	0.28 (0.1)	0.24 (0.1)	—	0.25 (0.1)
3. 0.1 to 0.3 ha	6.24 (1.7)	5.76 (1.6)	5.34 (1.5)	—	5.41 (1.5)
4. 0.3 to 0.5 ha	18.69 (5.2)	17.15 (4.7)	15.91 (4.4)	—	15.47 (4.4)
5. 0.5 to 1.0 ha	76.31 (21.1)	75.36 (20.6)	68.64 (18.8)	—	66.80 (18.9)
6. 1.0 to 1.5 ha	92.35 (25.5)	96.06 (26.3)	114.39 (31.3)	—	111.33 (31.5)
7. 1.5 to 2.0 ha	75.10 (20.8)	74.97 (20.5)	70.92 (19.5)	—	69.03 (19.6)
8. 2.0 to 3.0 ha	67.84 (18.8)	69.08 (18.9)	64.87 (17.8)	—	61.78 (17.5)
9. More than 3.0 ha	24.67 (6.8)	26.74 (7.3)	23.99 (6.6)	—	22.93 (6.5)
10. Total 1 to 9	361.70	365.40	364.30	—	353.00

Holding Size	1972	1973	1974	1975	1976
1. Non-crop farming	—	—	—	—	—
2. Less than 0.1 ha	0.22 (0.1)	0.26 (0.1)	0.08 ( 0 )	0.03 ( 0 )	0.09 ( 0 )
3. 0.1 to 0.3 ha	5.63 (1.6)	5.32 (1.6)	5.43 (1.6)	5.96 (1.8)	6.14 (1.8)
4. 0.3 to 0.5 ha	15.77 (4.5)	15.84 (4.8)	15.29 (4.4)	14.91 (4.4)	16.19 (4.8)
5. 0.5 to 1.0 ha	70.49 (20.3)	65.92 (19.9)	75.15 (21.6)	78.30 (23.3)	83.45 (24.7)
6. 1.0 to 1.5 ha	96.17 (27.7)	89.96 (27.2)	90.13 (25.9)	90.36 (27.0)	92.34 (27.4)
7. 1.5 to 2.0 ha	71.31 (20.5)	69.27 (20.9)	70.86 (20.4)	62.71 (18.7)	61.97 (18.3)
8. 2.0 to 3.0 ha	64.09 (18.4)	60.64 (18.3)	64.53 (18.5)	58.83 (17.5)	56.36 (16.7)
9. More than 3.9 ha	23.82 (6.9)	23.79 (7.2)	26.53 (7.6)	24.40 (7.3)	21.36 (6.3)
10. Total 1 to 9	347.50	331.00	348.00	335.50	337.90

Source; Ref. F 3

Table F 37 HISTORICAL RECORD ON AREA AND PROPORTIONAL  
EXTENT BY HOLDING SIZE OF CULTIVATED LAND  
IN NAGDONG RIVER BASIN

Whole Basin		Unit: 10 <sup>3</sup> ha and (%)				
Holding Size	1967	1968	1969	1970	1971	
1. Non-crop farming	—	—	—	—	—	
2. Less than 0.1 ha	0.78 (0.2)	0.55 (0.1)	0.49 (0.1)	—	0.43 (0.1)	
3. 0.1 to 0.3 ha	17.25 (3.5)	16.44 (3.3)	15.70 (3.3)	—	16.07 (3.3)	
4. 0.3 to 0.5 ha	46.06 (9.2)	44.82 (9.1)	43.59 (9.0)	—	43.50 (9.0)	
5. 0.5 to 1.0 ha	154.67 (30.8)	152.06 (30.9)	148.90 (30.0)	—	152.76 (31.4)	
6. 1.0 to 1.5 ha	128.92 (25.8)	130.46 (26.5)	129.29 (26.8)	—	134.12 (27.6)	
7. 1.5 to 2.0 ha	77.76 (15.6)	76.66 (15.5)	75.36 (15.6)	—	73.47 (15.1)	
8. 2.0 to 3.0 ha	60.67 (12.1)	58.32 (11.8)	55.69 (11.5)	—	53.39 (11.0)	
9. More than 3.0 ha	13.79 (2.8)	13.99 (2.8)	13.58 (2.8)	—	12.26 (2.5)	
10. Total 1 to 9	499.90	493.30	482.60	—	486.00	
Holding Size	1972	1973	1974	1975	1976	
1. Non-crop farming	—	—	—	—	—	
2. Less than 0.1 ha	0.42 (0.1)	0.50 (0.1)	0.09 ( 0 )	0.01 ( 0 )	0.04 ( 0 )	
3. 0.1 to 0.3 ha	16.00 (3.3)	15.06 (3.1)	12.97 (2.7)	14.74 (3.1)	15.30 (3.2)	
4. 0.3 to 0.5 ha	42.10 (8.8)	41.14 (8.6)	34.69 (7.2)	37.78 (7.9)	39.52 (8.3)	
5. 0.5 to 1.0 ha	151.89 (31.6)	148.87 (31.1)	156.74 (32.5)	160.60 (33.7)	163.09 (34.0)	
6. 1.0 to 1.5 ha	134.06 (27.9)	134.17 (28.0)	134.86 (28.0)	130.22 (27.3)	132.67 (27.7)	
7. 1.5 to 2.0 ha	71.71 (14.9)	74.26 (15.5)	76.25 (15.8)	70.14 (14.7)	66.82 (14.0)	
8. 2.0 to 3.0 ha	51.66 (10.8)	52.04 (10.9)	54.14 (11.2)	50.54 (10.6)	49.75 (10.4)	
9. More than 3.0 ha	12.35 (2.6)	12.96 (2.7)	12.66 (2.6)	12.87 (2.7)	11.51 (2.4)	
10. Total 1 to 9	480.20	479.00	482.40	476.90	478.70	

Source; Ref. F 3

Table F 37 Continued (2)

Northern Zone		Unit: 10 <sup>3</sup> ha and (%)				
Holding Size	1967	1968	1969	1970	1971	
1. Non-crop farming	—	—	—	—	—	
2. Less than 0.1 ha	0.10 (0.1)	0.06 ( 0 )	0.06 ( 0 )	—	0.06 ( 0 )	
3. 0.1 to 0.3 ha	2.99 (2.1)	2.72 (2.0)	2.66 (1.9)	—	2.84 (2.0)	
4. 0.3 to 0.5 ha	9.05 (6.3)	8.34 (6.0)	8.26 (6.0)	—	8.56 (6.0)	
5. 0.5 to 1.0 ha	39.42 (27.4)	37.15 (26.9)	36.80 (26.5)	—	38.44 (26.8)	
6. 1.0 to 1.5 ha	40.17 (27.9)	39.21 (28.4)	39.52 (28.5)	—	42.65 (29.6)	
7. 2.0 to 3.0 ha	25.47 (17.7)	24.99 (18.1)	25.63 (18.5)	—	26.25 (18.3)	
8. 2.0 to 3.0 ha	20.79 (14.5)	19.86 (14.4)	19.98 (14.4)	—	19.61 (13.6)	
9. More than 3.0 ha	5.81 (4.0)	5.77 (4.2)	5.79 (4.2)	—	5.29 (3.7)	
10. Total 1 to 9	143.80	138.10	138.70	—	143.70	
Holding Size	1972	1973	1974	1975	1976	
1. Non-crop farming	—	—	—	—	—	
2. Less than 0.1 ha	0.06 ( 0 )	0.07 ( 0 )	0.02 ( 0 )	0.00 ( 0 )	0.01 ( 0 )	
3. 0.1 to 0.3 ha	2.87 (2.0)	2.76 (1.9)	2.36 (1.7)	2.84 (2.0)	2.70 (2.0)	
4. 0.3 to 0.5 ha	8.16 (5.7)	8.46 (5.9)	6.87 (4.8)	7.77 (5.4)	7.77 (5.6)	
5. 0.5 to 1.0 ha	38.14 (26.8)	37.36 (26.3)	37.92 (26.5)	41.49 (29.1)	41.25 (29.8)	
6. 1.0 to 1.5 ha	42.61 (30.0)	42.67 (30.0)	44.36 (31.0)	43.89 (30.8)	43.55 (31.5)	
7. 1.5 to 2.0 ha	26.02 (18.3)	26.53 (18.6)	28.06 (19.6)	24.63 (17.2)	22.95 (16.6)	
8. 2.0 to 3.0 ha	19.03 (13.4)	19.17 (13.5)	17.94 (12.6)	17.78 (12.4)	16.15 (11.7)	
9. More than 3.0 ha	5.41 (3.8)	5.48 (3.8)	5.37 (3.8)	4.50 (3.1)	3.82 (2.8)	
10. Total 1 to 9	142.30	142.50	142.90	14.290	138.20	

Table F 37 Continued (3)

Central Zone		Unit: 10 <sup>3</sup> ha and (%)				
Holding Size	1967	1968	1969	1970	1971	
1. Non-crop farming	—	—	—	—	—	
2. Less than 0.1 ha	0.30 (0.1)	0.24 (0.1)	0.19 (0.1)	—	0.17 (0.1)	
3. 0.1 to 0.3 ha	7.39 (3.7)	7.08 (3.5)	6.59 (3.5)	—	6.69 (3.5)	
4. 0.3 to 0.3 ha	19.42 (9.6)	19.19 (9.5)	18.11 (9.5)	—	17.96 (9.4)	
5. 0.5 to 1.0 ha	65.17 (32.3)	64.77 (32.3)	61.38 (32.1)	—	62.68 (32.7)	
6. 1.0 to 1.5 ha	51.99 (25.7)	52.73 (26.2)	51.05 (26.7)	—	52.33 (27.4)	
7. 1.5 to 2.0 ha	29.18 (14.4)	29.07 (14.5)	27.74 (14.5)	—	26.78 (14.0)	
8. 2.0 to 3.0 ha	21.52 (10.6)	20.96 (10.4)	19.30 (10.1)	—	18.90 (9.9)	
9. More than 3.0 ha	7.33 (3.6)	7.06 (3.5)	6.64 (3.5)	—	5.79 (3.0)	
10. Total 1 to 9	202.30	201.10	191.00	—	191.30	
Holding Size	1972	1973	1974	1975	1976	
1. Non-crop farming	—	—	—	—	—	
2. Less than 0.1 ha	0.16 (0.1)	0.20 (0.1)	0.04 (0)	0.00 (0)	0.01 (0)	
3. 0.1 to 0.3 ha	6.63 (3.5)	6.19 (3.4)	5.19 (2.8)	6.10 (3.3)	6.47 (3.4)	
4. 0.3 to 0.5 ha	17.24 (9.2)	16.71 (9.0)	14.04 (7.5)	15.41 (8.3)	16.50 (8.7)	
5. 0.5 to 1.0 ha	61.80 (33.0)	59.86 (32.4)	63.91 (33.9)	64.14 (34.4)	66.21 (34.8)	
6. 1.0 to 1.5 ha	52.24 (27.8)	51.28 (27.8)	50.61 (26.8)	48.37 (26.0)	49.87 (26.2)	
7. 1.5 to 2.0 ha	25.69 (13.7)	26.46 (14.3)	27.67 (14.7)	26.32 (14.2)	25.05 (13.2)	
8. 2.0 to 3.0 ha	18.05 (9.6)	17.92 (9.7)	20.33 (10.8)	18.56 (10.0)	19.13 (10.1)	
9. More than 3.0 ha	5.79 (3.1)	6.18 (3.3)	6.51 (3.5)	7.10 (3.8)	6.86 (3.6)	
10. Total 1 to 9	187.60	184.80	188.30	186.00	190.10	



Table F 37 Continued (4)

Southern Zone		Unit: 10 <sup>3</sup> ha and (%)				
Holding Size	1967	1968	1969	1970	1971	
1. Non-crop farming	—	—	—	—	—	
2. Less than 0.1 ha	0.37 (0.2)	0.25 (0.2)	0.24 (0.2)	—	0.19 (0.1)	
3. 0.1 to 0.3 ha	6.73 (4.4)	6.60 (4.3)	6.39 (4.2)	—	6.41 (4.2)	
4. 0.3 to 0.5 ha	17.18 (11.2)	17.12 (11.1)	17.00 (11.1)	—	16.59 (11.0)	
5. 0.5 to 1.0 ha	48.55 (31.6)	48.91 (31.7)	49.38 (32.3)	—	50.19 (33.3)	
6. 1.0 to 1.5 ha	35.30 (22.9)	36.82 (23.9)	37.09 (24.2)	—	37.76 (25.0)	
7. 1.5 to 2.0 ha	22.16 (14.4)	21.41 (13.9)	20.89 (13.6)	—	19.66 (13.0)	
8. 2.0 to 3.0 ha	17.57 (11.4)	16.50 (10.7)	15.55 (10.2)	—	14.30 (9.5)	
9. More than 3.0 ha	5.94 (3.9)	6.49 (4.2)	6.36 (4.2)	—	5.90 (3.9)	
10. Total 1 to 9	153.80	154.10	152.90	—	151.00	
Holding Size	1972	1973	1974	1975	1976	
1. Non-crop farming	—	—	—	—	—	
2. Less than 0.1 ha	0.19 (0.1)	0.22 (0.1)	0.03 (0)	0.01 (0)	0.02 (0)	
3. 0.1 to 0.3 ha	6.35 (4.2)	5.96 (3.9)	5.25 (3.5)	5.61 (3.8)	6.06 (4.0)	
4. 0.3 to 0.5 ha	16.32 (10.9)	15.52 (10.2)	13.35 (8.8)	14.13 (9.5)	15.05 (10.0)	
5. 0.5 to 1.0 ha	50.43 (33.5)	50.01 (33.0)	53.11 (35.1)	53.14 (35.9)	54.34 (36.2)	
6. 1.0 to 1.5 ha	37.81 (25.2)	38.76 (25.6)	38.60 (25.5)	36.68 (24.8)	37.72 (25.1)	
7. 1.5 to 2.0 ha	19.24 (12.8)	20.51 (13.5)	19.86 (13.1)	18.50 (12.5)	18.01 (12.0)	
8. 2.0 to 3.0 ha	14.04 (9.3)	14.42 (9.5)	15.35 (10.2)	13.72 (9.3)	13.89 (9.2)	
9. More than 3.0 ha	5.92 (3.9)	6.30 (4.2)	5.65 (3.7)	6.21 (4.2)	5.31 (3.5)	
10. Total 1 to 9	150.30	151.70	151.20	148.00	150.40	

Table F 38 HISTORICAL RECORD ON AREA AND PROPORTIONAL  
EXTENT BY HOLDING SIZE OF CULTIVATED LAND  
IN SEOMJIN RIVER BASIN

Unit: 10<sup>3</sup> ha and (%)

Holding Size	1967	1968	1969	1970	1971
1. Non-crop farming	—	—	—	—	—
2. Less than 0.1 ha	0.25 (0.3)	0.17 (0.2)	0.15 (0.2)	—	0.15 (0.2)
3. 0.1 to 0.3 ha	4.30 (4.3)	4.26 (4.3)	4.17 (4.2)	—	3.89 (3.9)
4. 0.3 to 0.5 ha	10.85 (11.0)	10.48 (10.5)	10.27 (10.3)	—	9.80 (9.9)
5. 0.5 to 1.0 ha	33.91 (34.2)	34.01 (34.1)	34.09 (34.3)	—	33.57 (34.1)
6. 1.0 to 1.5 ha	24.25 (24.5)	24.74 (24.9)	25.11 (25.2)	—	25.33 (25.7)
7. 1.5 to 2.0 ha	13.23 (13.4)	13.34 (13.4)	13.42 (13.5)	—	13.65 (13.9)
8. 2.0 to 3.0 ha	9.30 (9.4)	9.34 (9.4)	9.39 (9.4)	—	9.04 (9.2)
9. More than 3.0 ha	2.91 (2.9)	3.15 (3.2)	2.90 (2.9)	—	3.07 (3.1)
10. Total 1 to 9	99.00	99.50	99.50	—	98.50
Holding Size	1972	1973	1974	1975	1976
1. Non-crop farming	—	—	—	—	—
2. Less than 0.1 ha	0.14 (0.1)	0.16 (0.2)	0.01 (0)	0.00 (0)	0.01 (0)
3. 0.1 to 0.3 ha	3.87 (4.0)	3.77 (10.1)	3.10 (8.6)	3.70 (9.7)	3.71 (9.6)
4. 0.3 to 0.5 ha	9.71 (10.0)	9.96 (10.1)	8.35 (8.6)	9.34 (9.7)	9.42 (9.6)
5. 0.5 to 1.0 ha	33.36 (34.3)	33.86 (34.4)	34.60 (35.8)	35.47 (36.7)	36.78 (37.4)
6. 1.0 to 1.5 ha	25.61 (26.4)	26.31 (26.7)	26.60 (27.5)	25.53 (26.4)	25.70 (26.2)
7. 1.5 to 2.0 ha	13.10 (13.5)	13.19 (13.4)	12.30 (12.7)	12.87 (13.3)	12.45 (12.7)
8. 2.0 to 3.0 ha	8.67 (8.9)	8.50 (8.6)	9.37 (9.7)	7.40 (7.7)	7.72 (7.9)
9. More than 3.0 ha	2.74 (2.8)	2.75 (2.8)	2.37 (2.5)	2.29 (2.4)	2.32 (2.4)
10. Total 1 to 9	97.20	98.50	96.70	96.60	98.10

Source; Ref. F 3

Table F 39 AREA EXTENT OF PRESENT LAND USE PATTERN  
IN HAN RIVER BASIN (AS OF 1976)

Unit: ha

Land Use Pattern	Sub-Basin Code No.					
	01(1)	01(2)	02	03(1)	03(2)	04 <sup>/1</sup>
1. Paddy field	20,950	19,970	14,810	13,260	14,490	10,760
2. Upland	7,440	12,720	10,090	7,240	7,110	9,180
3. Paddy/Upland	-	-	-	-	490	80
4. Orchard	870	2,340	1,440	1,340	1,340	2,030
5. Forest/Upland	19,350	31,070	29,230	18,460	18,180	19,340
6. Forest	12,200	50,920	64,290	6,250	16,330	87,810
7. Wild grass land	-	-	-	-	-	-
8. Waste land	-	2,010	140	280	1,240	20
9. Rocky land	1,780	11,340	5,500	430	650	12,140
10. Others <sup>/2</sup>	9,210	31,430	10,200	3,840	5,170	4,240
Total 1 to 10	71,800	161,800	135,700	51,100	65,000	145,600

Land Use Pattern	Sub-Basin Code No.					
	05	06 <sup>/1</sup>	07 <sup>/1</sup>	08	09	10 <sup>/1</sup>
1. Paddy field	11,900	11,060	9,370	5,850	440	1,610
2. Upland	8,470	13,790	20,330	16,260	5,070	10,150
3. Paddy/Upland	1,040	1,040	1,010	160	20	60
4. Orchard	2,150	1,570	2,210	1,180	290	360
5. Forest/Upland	12,540	21,310	24,780	10,520	4,910	14,700
6. Forest	46,940	69,060	153,440	111,250	57,140	122,620
7. Wild grass land	-	-	-	-	-	-
8. Waste land	190	20	-	-	-	-
9. Rocky land	5,490	12,250	30,310	29,000	3,870	20,920
10. Others <sup>/2</sup>	5,280	4,700	3,750	2,680	160	380
Total 1 to 10	94,000	134,800	245,200	176,900	71,900	170,800

Source: Refs. F 14 to F 16

Remarks; <sup>/1</sup>: These sub-basins are further divided into two or three portions for the agricultural water use study in ANNEX G.

<sup>/2</sup>: Consisting of cities, villages, water reservoir, etc.

<sup>/3</sup>: Sub-basin HN-17 locating beyond D.M.Z line is excluded.

Table F 39 Continued (2)

Unit: ha

Land Use Pattern	Sub-Basin Code No.					
	11	12	13	14	15(1)	15(2)
1. Paddy field	3,420	2,960	5,950	3,750	2,320	900
2. Upland	2,620	3,210	7,690	4,910	4,680	2,560
3. Paddy/Upland	100	90	700	20	230	310
4. Orchard	480	740	870	780	360	100
5. Forest/Upland	10,100	6,020	7,870	9,180	20,580	12,950
6. Forest	38,010	53,920	103,340	70,370	104,410	66,140
7. Wild grass land	-	-	-	-	-	-
8. Waste land	-	-	-	-	-	-
9. Rocky land	7,270	10,020	18,630	9,640	32,620	20,360
10. Others <sup>/2</sup>	1,800	1,040	2,250	4,750	800	980
Total 1 to 10	63,800	78,000	147,300	103,400	166,000	104,300

Land Use Pattern	Sub-Basin Code No.	
	16 <sup>/1</sup>	Whole Basin <sup>/3</sup>
1. Paddy field	2,250	156,020
2. Upland	2,350	155,870
3. Paddy/Upland	-	5,350
4. Orchard	220	20,670
5. Forest/Upland	8,300	299,390
6. Forest	82,070	1,316,510
7. Wild grass land	-	-
8. Waste land	-	3,900
9. Rocky land	6,000	238,220
10. Others <sup>/2</sup>	1,810	94,470
Total 1 to 10	103,000	2,290,400

Table F 40 AREA EXTENT OF PRESENT LAND USE PATTERN  
IN NAGDONG RIVER BASIN (AS OF 1976)

Unit: ha

Land Use Pattern	Sub-Basin Code No.					
	01	02	03	04	05	06(1)
1. Paddy field	1,500	2,000	4,140	2,660	12,680	10,190
2. Upland	5,990	3,730	10,550	4,190	8,310	3,710
3. Paddy/Upland	10	-	530	100	-	-
4. Orchard	440	420	640	360	2,180	1,260
5. Forest/Upland	2,810	4,180	2,450	2,860	9,750	1,990
6. Forest	82,780	33,930	94,760	41,290	92,730	28,370
7. Wild grass land	-	680	60	780	2,770	570
8. Waste land	5,840	580	1,970	4,000	1,510	890
9. Rocky land	10,620	760	7,580	3,740	3,960	4,570
10. Others <sup>/2</sup>	510	1,620	320	420	1,510	1,450
Total to 1 to 10	110,500	47,900	123,000	60,400	135,400	53,000

Land Use Pattern	Sub-Basin Code No.			
	06(2)	06(3)	06(4)	Northern-total
1. Paddy field	8,830	10,040	13,340	65,380
2. Upland	6,480	7,080	8,520	58,560
3. Paddy/Upland	330	160	240	1,370
4. Orchard	990	1,760	4,800	12,850
5. Forest/Upland	7,250	2,850	4,440	38,580
6. Forest	45,240	38,580	61,890	519,570
7. Wild grass land	20	40	110	5,030
8. Waste land	800	5,990	7,280	28,860
9. Rocky land	11,320	5,580	9,070	57,200
10. Others <sup>/2</sup>	1,340	1,220	1,310	9,700
Total 1 to 10	82,600	73,300	111,000	797,100

Source: Refs. F 14 to F 16

Remarks; /1: This sub-basin is further divided into two portions for the agricultural water use study in ANNEX G.

/2: Consisting of cities, villages, water reservoir, etc.

Table F 40 Continued (2)

Unit: ha

Land Use Pattern	Sub-Basin Code No.					
	05	06(1)	06(2)	07	08	09
1. Paddy field	12,370	17,080	12,130	790	17,310	7,330
2. Upland	4,290	10,130	5,880	1,500	5,720	1,660
3. Paddy/Upland	-	-	220	-	-	-
4. Orchard	1,780	2,670	1,920	200	7,180	1,560
5. Forest/Upland	8,210	13,690	3,050	2,030	13,650	3,190
6. Forest	41,320	91,950	60,190	14,330	71,930	23,290
7. Wild grass land	130	340	-	-	-	2,140
8. Waste land	-	-	-	-	-	5,890
9. Rocky land	3,830	9,560	3,790	1,940	10,520	3,080
10. Others <sup>/2</sup>	1,770	1,280	2,720	2,710	4,590	6,260
Total 1 to 10	73,700	146,700	89,900	23,500	130,900	54,400

Land Use Pattern	Sub-Basin Code No.				
	10	11	12	13	14
1. Paddy field	14,330	8,540	10,200	4,480	12,250
2. Upland	7,320	3,200	3,710	2,200	7,220
3. Paddy/Upland	-	-	560	-	-
4. Orchard	1,620	820	1,270	200	460
5. Forest/Upland	3,560	4,880	4,690	3,340	6,400
6. Forest	45,140	53,150	60,260	27,870	45,770
7. Wild grass land	340	220	10	10	-
8. Waste land	1,520	-	-	-	780
9. Rocky land	2,350	1,680	9,920	1,410	6,160
10. Others <sup>/2</sup>	620	5,610	1,880	590	1,760
Total 1 to 10	76,800	78,100	92,500	40,100	80,800

Table F 40 Continued (3)

Unit: ha

Land Use Pattern	Sub-Basin Code No.				
	Control-total	15(1)	15(2) <sup>/1</sup>	16	17
1. Paddy field	116,810	14,170	11,340	20,110	23,430
2. Upland	52,830	4,390	4,510	10,960	8,640
3. Paddy/Upland	780	50	80	-	-
4. Orchard	19,680	1,610	1,120	1,940	1,760
5. Forest/Upland	66,690	8,260	10,120	10,330	7,030
6. Forest	535,200	86,960	60,970	61,560	35,920
7. Wild grass land	3,190	40	-	-	10
8. Waste land	8,190	-	-	-	-
9. Rocky land	54,240	6,640	11,120	10,570	17,790
10. Others <sup>/2</sup>	29,790	4,480	2,640	2,630	3,120
Total 1 to 10	887,400	126,600	101,900	118,100	97,700

Land Use Pattern	Sub-Basin Code No.			
	18	19	Southern-total	Whole Basin
1. Paddy field	18,750	15,420	103,220	285,410
2. Upland	3,180	4,330	36,010	147,400
3. Paddy/Upland	400	590	1,120	3,270
4. Orchard	910	2,740	10,080	39,330
5. Forest/Upland	8,540	19,490	63,770	172,320
6. Forest	39,520	69,200	354,130	1,408,900
7. Wild grass land	100	100	250	8,470
8. Waste land	-	-	-	37,050
9. Rocky land	17,360	31,250	94,730	206,170
10. Others <sup>/2</sup>	3,340	1,580	17,790	57,280
Total 1 to 10	92,100	144,700	681,100	2,365,600

Table F 41 AREA EXTENT OF PRESENT LAND USE PATTERN  
IN SEOMJIN RIVER BASIN (AS OF 1976)

Unit: ha

Land Use Pattern	Sub-Basin Code No.					Whole Basin
	01	02 <sup>/1</sup>	03	04	05	
1. Paddy field	12,150	16,610	10,000	18,410	6,990	64,160
2. Upland	5,200	6,740	3,000	7,030	6,230	28,200
3. Paddy/Upland	20	400	-	-	-	420
4. Orchard	930	1,260	680	1,650	760	5,280
5. Forest/Upland	8,030	13,730	8,030	3,980	10,530	44,300
6. Forest	73,070	85,950	41,250	67,390	45,390	313,050
7. Wild grass land	-	-	-	-	-	-
8. Waste land	-	-	-	-	-	-
9. Rocky land	12,010	6,510	2,930	6,320	5,950	33,720
10. Others <sup>/2</sup>	1,530	730	510	1,050	450	4,270
Total 1 to 10	112,940	131,930	66,400	105,830	76,300	493,400

Source; Refs. F 14 to F 16

Remarks; /1: This sub-basin is further divided into two portions  
for the agricultural water use study in ANNEX G.

/2: Consisting of cities, villages, water reservoir, etc.



Table F 42 HISTORICAL RECORD ON CROPPED AREA AND CROPPING PATTERN IN HAN RIVER BASIN

Item	1967	1968	1969	1970	1971
<u>Cultivated Area (10<sup>3</sup> ha)</u>					
Paddy field	157.6	159.6	158.7	158.2	154.0
Upland	185.4	182.6	181.5	180.0	177.9
Orchard	18.7	23.2	24.1	21.0	21.1
Total	361.7	265.4	264.3	359.2	353.0
<u>Cropped Area (10<sup>3</sup> ha)</u>					
Paddy rice	147.5	147.4	147.6	145.2	147.9
(Two cropping)	(16.9)	(21.0)	(22.4)	(23.4)	(25.4)
(New variety)	( - )	( - )	( - )	( - )	( - )
Barley & wheat	85.5	79.7	77.5	69.2	50.8
Pulses	78.1	77.3	74.5	69.4	63.7
Potatoes	22.3	22.7	21.3	20.4	19.1
Other grains	56.7	50.9	37.4	48.0	37.2
Vegetables	31.5	33.5	37.8	50.8	53.4
Special crops	26.2	15.6	15.4	17.8	15.8
Fruits	6.0	6.1	6.0	6.3	5.8
Mulberry	12.7	17.0	18.1	14.7	14.3
Total	466.5	450.3	435.6	441.8	408.0
<u>Cropping Pattern (%)</u>					
Paddy rice	40.8	40.3	40.5	40.4	41.9
(New variety)	( - )	( - )	( - )	( - )	( - )
(Traditional v.)	(40.8)	(40.3)	(40.5)	(40.4)	(41.9)
Barley & wheat	23.6	21.8	21.3	19.3	14.4
Pulses	21.6	21.2	20.5	19.3	18.0
Potatoes	6.2	6.2	5.8	5.7	5.4
Other grains	15.7	13.9	10.3	13.4	10.5
Vegetables	8.7	9.2	10.4	14.1	15.1
Special crops	7.2	4.3	4.2	5.0	4.5
Fruits	1.7	1.7	1.6	1.8	1.6
Mulberry	3.5	4.7	5.0	4.1	4.1
<u>Multiple Crop Index</u>					
Paddy field	1.04	1.06	1.07	1.07	1.12
Upland	1.48	1.37	1.29	1.36	1.18
Whole farm land	1.29	1.23	1.20	1.23	1.16

Table F 42 Continued (2)

Item	1972	1973	1974	1975	1976
<u>Cultivated Area (10<sup>3</sup> ha)</u>					
Paddy field	153.0	147.7	157.2	151.4	156.0
Upland	175.1	162.7	167.3	161.1	161.2
Orchard	19.4	20.6	23.5	23.0	20.7
Total	347.5	331.0	348.0	335.5	337.9
<u>Cropped Area (10<sup>3</sup> ha)</u>					
Paddy rice	143.2	140.9	138.4	141.5	141.2
(Two cropping)	(24.7)	(20.1)	(27.7)	(33.7)	(41.7)
(New variety)	(10.5)	(10.0)	(11.0)	(16.0)	(32.5)
Barley & wheat	46.5	42.2	44.0	33.8	30.4
Pulses	70.7	67.6	74.3	71.1	64.0
Potatoes	16.1	15.7	14.5	16.0	14.8
Other grains	43.0	38.7	36.4	42.7	35.2
Vegetables	44.0	47.5	51.5	49.6	48.8
Special crops	28.1	18.0	20.8	20.5	20.1
Fruits	6.4	7.1	8.7	10.4	10.6
Mulberry	13.0	13.5	14.8	12.6	10.1
Total	411.0	391.2	403.4	398.2	375.2
<u>Cropping Pattern (%)</u>					
Paddy rice	41.2	42.6	39.8	42.2	41.8
(New variety)	3.0	3.0	3.2	4.8	9.6
(Traditional v.)	38.2	39.6	36.6	37.4	32.2
Barley & wheat	13.4	12.7	12.6	10.1	9.0
Pulses	20.3	20.4	21.4	21.2	18.9
Potatoes	4.6	4.7	4.2	4.8	4.4
Other grains	12.4	11.7	10.5	12.7	10.4
Vegetables	12.7	14.4	14.8	14.8	14.4
Special crops	8.1	5.4	6.0	6.1	5.9
Fruits	1.8	2.1	2.5	3.1	3.1
Mulberry	3.7	4.1	4.3	3.8	3.0
<u>Multiple Crop Index</u>					
Paddy field	1.10	1.09	1.06	1.16	1.17
Upland	1.25	1.26	1.24	1.21	1.06
Whole farm land	1.18	1.18	1.16	1.19	1.11

Table F 43 HISTORICAL RECORD ON CROPPED AREA AND  
CROPPING PATTERN IN NAGDONG RIVER BASIN

Northern Zone

Item	1967	1968	1969	1970	1971
<u>Cultivated Area (10<sup>3</sup> ha)</u>					
Paddy field	65.1	64.1	65.3	63.1	65.0
Upland	66.0	63.8	60.3	63.1	67.2
Orchard	12.7	10.2	13.1	11.7	11.5
Total	143.8	138.1	138.7	137.9	143.7

Cropped Area (10<sup>3</sup> ha)

Paddy rice	59.7	60.2	60.2	59.5	59.0
(Two cropping)	(31.7)	(30.9)	(29.3)	(21.3)	(28.7)
(New variety)	( - )	( - )	( - )	( - )	( - )
Barley & wheat	71.2	74.0	66.7	63.9	59.0
Pulses	28.2	22.7	27.4	24.8	25.2
Potatoes	8.8	9.3	8.4	7.8	8.1
Other grains	16.8	17.9	15.7	13.3	7.3
Vegetables	9.3	4.4	9.3	10.3	10.8
Special crops	6.6	6.3	7.2	7.7	7.3
Fruits	3.5	3.4	3.5	3.6	3.5
Mulberry	9.2	6.8	9.6	8.1	8.0
Total	213.3	205.0	208.0	199.0	188.2

Cropping Pattern (%)

Paddy rice	41.5	43.6	43.4	43.1	41.1
(New variety)	0	0	0	0	0
(Traditional v.)	41.5	43.6	43.4	43.1	41.1
Barley & wheat	49.5	53.6	48.1	46.3	41.1
Pulses	19.6	16.4	19.8	18.0	17.5
Potatoes	6.1	6.7	6.1	5.7	5.6
Other grains	11.7	13.0	11.3	9.6	5.1
Vegetables	6.5	3.2	6.7	7.5	7.5
Special crops	4.6	4.6	5.2	5.6	5.1
Fruits	2.4	2.5	2.5	2.6	2.4
Mulberry	6.4	4.9	6.9	5.9	5.6

Multiple Crop Index

Paddy field	1.40	1.42	1.37	1.28	1.35
Upland	1.55	1.54	1.61	1.58	1.28
Whole farm land	1.48	1.48	1.50	1.44	1.31

Table F 43 Continued (2)

Northern Zone

Item	1972	1973	1974	1975	1976
<u>Cultivated Area (10<sup>3</sup> ha)</u>					
Paddy field	64.8	64.8	64.6	64.8	65.4
Upland	65.9	65.3	64.5	64.6	59.9
Orchard	11.6	12.4	13.8	13.5	12.9
Total	142.3	142.5	142.9	142.9	138.2
<u>Cropped Area (10<sup>3</sup> ha)</u>					
Paddy rice	59.8	58.9	59.9	61.0	60.9
(Two cropping)	(28.8)	(27.3)	(24.8)	(25.4)	(25.2)
(New variety)	(13.2)	( 8.5)	(12.8)	(19.7)	(35.7)
Barley & wheat	50.6	46.7	48.9	37.3	34.3
Pulses	24.5	26.6	25.4	26.5	26.8
Potatoes	6.7	6.3	7.2	6.9	8.1
Other grains	10.1	8.6	8.2	7.6	6.7
Vegetables	12.2	12.1	12.4	13.1	13.5
Special crops	9.2	9.1	9.6	8.9	8.2
Fruits	3.5	3.8	5.7	5.6	6.2
Mulberry	8.1	8.6	8.1	7.9	6.7
Total	184.7	180.7	185.4	174.8	171.4
<u>Cropping Pattern (%)</u>					
Paddy rice	42.0	41.3	41.9	42.7	44.1
(New variety)	9.3	6.0	9.0	13.8	25.9
(Traditional v.)	32.7	35.3	32.9	28.9	18.2
Barley & wheat	35.6	32.8	34.2	26.1	24.8
Pulses	17.2	18.7	17.8	18.5	19.4
Potatoes	4.7	4.4	5.0	4.8	5.9
Other grains	7.1	6.0	5.7	5.3	4.8
Vegetables	8.6	8.5	8.7	9.2	9.8
Special crops	6.5	6.4	6.7	6.2	5.9
Fruits	2.5	2.7	4.0	3.9	4.5
Mulberry	5.7	6.0	5.7	5.5	4.8
<u>Multiple Crop Index</u>					
Paddy field	1.37	1.33	1.31	1.33	1.32
Upland	1.24	1.22	1.29	1.13	1.17
Whole farm land	1.30	1.27	1.30	1.22	1.24

Table F 43 Continued (3)

Central Zone

Item	1967	1968	1969	1970	1971
<u>Cultivated Area (10<sup>3</sup> ha)</u>					
Paddy field	119.6	117.6	114.2	113.2	115.5
Upland	64.0	64.0	59.3	57.9	62.5
Orchard	18.7	19.5	17.5	14.5	13.3
Total	202.3	201.1	191.0	185.6	191.3

Cropped Area (10<sup>3</sup> ha)

Paddy rice	110.2	110.3	108.4	108.9	106.6
(Two cropping)	(96.8)	(98.6)	(85.9)	(93.0)	(91.0)
(New variety)	( - )	( - )	( - )	( - )	( - )
Barley & wheat	146.7	140.4	134.0	132.0	127.2
Pulses	32.5	32.6	33.5	36.7	30.6
Potatoes	10.1	8.6	7.8	7.1	7.7
Other grains	6.5	5.2	3.2	2.5	1.4
Vegetables	12.8	13.3	17.9	17.7	17.7
Special crops	8.6	8.6	10.3	10.7	10.1
Fruits	10.2	9.8	9.1	8.5	7.7
Mulberry	8.5	9.7	8.4	6.0	5.6
Total	346.1	338.5	332.6	330.1	314.6

Cropping Pattern (%)

Paddy rice	54.5	54.8	56.8	58.7	55.7
(New variety)	0	0	0	0	0
(Traditional v.)	54.5	54.8	56.8	58.7	55.7
Barley & wheat	72.5	69.8	70.2	71.1	66.5
Pulses	16.1	16.2	17.5	19.8	16.0
Potatoes	5.0	4.3	4.1	3.8	4.0
Other grains	3.2	2.6	1.7	1.3	0.7
Vegetables	6.3	6.6	9.4	9.5	9.3
Special crops	4.3	4.3	5.4	5.8	5.3
Fruits	5.0	4.9	4.8	4.6	4.0
Mulberry	4.2	4.8	4.4	3.2	2.9

Multiple Crop Index

Paddy field	1.73	1.78	1.70	1.78	1.71
Upland	1.68	1.55	1.80	1.78	1.54
Whole farm land	1.71	1.68	1.74	1.78	1.64

Table F 43 Continued (4)

Central Zone

Item	1972	1973	1974	1975	1976
<u>Cultivated Area (10<sup>3</sup> ha)</u>					
Paddy field	113.4	111.6	115.0	113.0	116.8
Upland	62.6	60.2	57.7	54.4	53.6
Orchard	11.6	13.0	15.6	18.6	19.7
Total	187.6	184.8	188.3	186.0	190.1
<u>Cropped Area (10<sup>3</sup> ha)</u>					
Paddy rice	107.5	102.3	108.7	108.7	109.5
(Two cropping)	(84.7)	(79.1)	(88.7)	(82.4)	(84.8)
(New variety)	(15.8)	(10.5)	(15.5)	(22.5)	(45.4)
Barley & wheat	119.2	110.0	113.4	99.3	93.9
Pulses	27.6	32.1	29.3	26.7	25.2
Potatoes	6.1	5.7	5.5	6.3	6.5
Vegetables	19.2	19.1	19.8	21.4	23.2
Special crops	12.4	12.2	13.0	12.0	11.0
Fruits	6.8	7.7	8.3	11.0	12.5
Mulberry	4.8	5.3	7.3	7.6	7.2
Total	305.2	298.5	307.5	295.0	291.9
<u>Cropping Pattern (%)</u>					
Paddy rice	57.3	55.4	57.7	58.4	57.6
(New variety)	8.4	5.7	8.2	12.1	23.9
(Traditional v.)	48.9	49.7	49.5	46.3	33.7
Barley & wheat	63.5	59.5	60.2	53.4	49.4
Pulses	14.7	17.4	15.6	14.4	13.3
Potatoes	3.3	3.1	2.9	3.4	3.4
Other grains	0.9	2.2	1.2	1.1	1.5
Vegetables	10.2	10.3	10.5	11.5	12.2
Special crops	6.6	6.6	6.9	6.5	5.8
Fruits	3.6	4.2	4.4	5.9	6.6
Mulberry	2.6	2.9	3.9	4.1	3.8
<u>Multiple Crop Index</u>					
Paddy field	1.69	1.63	1.72	1.69	1.66
Upland	1.52	1.60	1.50	1.42	1.33
Whole farm land	1.63	1.62	1.63	1.59	1.54

Table F 43 Continued (5)

Southern Zone

Item	1967	1968	1969	1970	1971
<u>Cultivated Area (10<sup>3</sup> ha)</u>					
Paddy field	103.4	103.6	102.0	101.1	100.6
Upland	40.4	41.3	41.2	41.6	41.3
Orchard	10.0	9.2	9.7	9.4	9.1
Total	153.8	154.1	152.9	152.1	151.0
<u>Cropped Area (10<sup>3</sup> ha)</u>					
Paddy rice	96.9	96.5	94.7	92.9	91.8
(Two cropping)	(79.4)	(79.4)	(74.4)	(73.0)	(72.2)
(New variety)	( - )	( - )	( - )	( - )	( - )
Barley & wheat	112.5	113.0	105.7	105.3	101.6
Pulses	17.8	17.3	17.4	17.6	18.4
Potatoes	15.9	15.2	15.2	12.6	10.6
Other grains	5.0	4.8	3.7	2.9	1.6
Vegetables	14.6	13.7	26.7	21.8	20.1
Special crops	5.8	6.0	8.5	7.7	7.3
Fruits	3.4	3.4	3.3	3.3	3.2
Mulberry	6.6	5.8	6.4	6.1	5.9
Total	278.5	275.7	281.6	270.2	260.5
<u>Cropping pattern (%)</u>					
Paddy rice	63.0	62.6	61.9	61.1	60.8
(New variety)	0	0	0	0	0
(Traditional v.)	63.0	62.6	61.9	61.1	60.8
Barley & wheat	73.1	73.3	69.1	69.2	67.3
Pulses	11.6	11.2	11.4	11.6	12.2
Potatoes	10.3	9.9	9.9	8.3	7.0
Other grains	3.3	3.1	2.4	1.9	1.1
Vegetables	9.5	8.9	17.5	14.3	13.3
Special crops	3.8	3.9	5.6	5.1	4.8
Fruits	2.2	2.2	2.2	2.2	2.1
Mulberry	4.3	3.8	4.2	4.0	3.9
<u>Multiple Crop Index</u>					
Paddy field	1.71	1.70	1.66	1.64	1.63
Upland	2.03	1.98	2.21	2.05	1.91
Whole farm land	1.81	1.79	1.84	1.78	1.73

Table F 43 Continued (6)

Southern Zone

Item	1972	1973	1974	1975	1976
<u>Cultivated Area (10<sup>3</sup> ha)</u>					
Paddy field	100.8	101.4	102.2	100.0	103.2
Upland	41.0	40.8	39.3	38.0	37.1
Orchard	8.5	9.5	9.7	10.0	10.1
Total	150.3	151.7	151.2	148.0	150.4
<u>Cropped Area (10<sup>3</sup> ha)</u>					
Paddy rice	92.4	92.3	96.8	96.1	94.5
(Two cropping)	(72.5)	(71.0)	(78.3)	(78.6)	(76.9)
(New variety)	( 8.0)	( 3.5)	( 7.7)	(11.5)	(23.7)
Barley & wheat	101.9	97.4	99.6	89.5	85.1
Pulses	17.6	21.9	21.1	16.9	15.7
Potatoes	13.2	8.5	7.9	10.7	10.7
Other grains	1.9	2.6	2.3	2.1	1.7
Vegetables	20.1	20.1	21.1	23.9	21.4
Special crops	7.6	7.4	8.0	7.5	6.9
Fruits	3.2	3.9	3.8	4.0	4.1
Mulberry	5.3	5.6	5.9	6.0	6.0
Total	263.2	259.7	266.4	256.7	246.1
<u>Cropping Pattern (%)</u>					
Paddy rice	61.5	60.8	64.0	64.9	62.8
(New variety)	5.3	2.3	5.1	7.8	15.8
(Traditional v.)	56.2	58.5	58.9	57.1	47.1
Barley & wheat	67.8	64.2	65.9	60.5	56.6
Pulses	11.7	14.4	14.0	11.4	10.4
Potatoes	8.8	5.6	6.2	7.2	7.1
Other grains	1.3	1.7	1.5	1.4	1.1
Vegetables	13.4	13.2	14.0	16.1	14.2
Special crops	5.1	4.9	5.3	5.1	4.6
Fruits	2.1	2.6	2.5	2.7	2.7
Mulberry	3.5	3.7	3.9	4.1	4.0
<u>Multiple Crop Index</u>					
Paddy field	1.64	1.61	1.71	1.75	1.66
Upland	1.99	1.92	1.87	1.71	1.58
Whole farm land	1.75	1.71	1.76	1.73	1.64



Table F 44 HISTORICAL RECORD ON CROPPED AREA AND  
CROPPING PATTERN IN SEOMJIN RIVER BASIN

Item	1967	1968	1969	1970	1971
<u>Cultivated Area (10<sup>3</sup> ha)</u>					
Paddy field	63.6	63.7	63.5	63.4	63.2
Upland	30.4	29.2	29.0	28.8	28.9
Orchard	5.0	6.6	7.0	6.8	6.4
Total	99.0	99.5	99.5	99.0	98.5
<u>Cropped Area (10<sup>3</sup> ha)</u>					
Paddy rice	58.7	58.3	58.7	58.4	58.2
(Two cropping)	(42.3)	(42.0)	(42.5)	(42.0)	(41.3)
(New variety)	( - )	( - )	( - )	( - )	( - )
Barley & wheat	62.8	66.7	65.7	66.1	65.2
Pulses	12.7	14.5	14.6	14.6	14.4
Potatoes	10.8	11.3	7.3	11.0	10.0
Other grains	5.0	3.9	4.3	4.2	3.2
Vegetables	6.7	7.7	8.6	9.1	8.9
Special crops	5.8	6.0	7.4	6.5	7.5
Fruits	0.8	0.8	0.9	0.9	0.7
Mulberry	4.2	5.8	6.1	5.9	5.7
Total	167.5	175.0	173.6	176.7	173.8
<u>Cropping Pattern (%)</u>					
Paddy rice	59.3	58.6	59.0	59.0	59.1
(New variety)	0	0	0	0	0
(Traditional v.)	59.3	58.6	59.0	59.0	59.1
Barley & wheat	63.4	67.0	66.0	66.8	66.2
Pulses	12.8	14.6	14.7	14.7	14.6
Potatoes	10.9	11.4	7.3	11.1	10.2
Other grains	5.1	3.9	4.3	4.2	3.2
Vegetables	6.8	7.7	8.6	9.2	9.0
Special crops	5.9	6.0	7.4	6.6	7.6
Fruits	0.8	0.8	0.9	0.9	0.7
Mulberry	4.2	5.8	6.1	6.0	5.8
<u>Multiple Crop Index</u>					
Paddy field	1.59	1.57	1.59	1.58	1.57
Upland	1.88	2.09	2.01	2.14	2.10
Whole farm land	1.69	1.76	1.74	1.78	1.76

Table F 44 Continued (2)

Item	1972	1973	1974	1975	1976
<u>Cultivated Area (10<sup>3</sup> ha)</u>					
Paddy field	62.8	64.2	63.5	63.6	64.2
Upland	28.2	28.0	27.1	27.2	28.6
Orchard	6.2	6.3	6.1	5.8	5.3
Total	97.2	98.5	96.7	96.6	98.1
<u>Cropped Area (10<sup>3</sup> ha)</u>					
Paddy rice	57.9	57.6	58.8	59.7	59.5
(Two cropping)	(39.8)	(39.7)	(44.1)	(45.4)	(46.4)
(New variety)	( 5.8)	( 4.0)	( 6.0)	( 9.2)	(19.0)
Barley & wheat	66.8	58.1	59.4	48.4	47.5
Pulses	13.9	16.2	13.7	13.1	12.4
Potatoes	9.7	8.8	6.0	6.7	6.0
Other grains	2.8	2.4	2.0	1.8	1.9
Vegetables	9.7	9.6	10.3	10.6	10.6
Special crops	6.4	6.4	7.9	7.5	6.9
Fruits	0.7	0.8	1.0	1.1	1.3
Mulberry	5.5	5.5	5.1	4.7	4.0
Total	173.4	165.4	164.2	153.6	150.1
<u>Cropping Pattern (%)</u>					
Paddy rice	59.6	58.5	60.8	61.8	60.7
(New variety)	6.0	4.1	6.2	9.5	19.4
(Traditional v.)	53.6	54.4	54.6	52.3	41.3
Barley & wheat	68.7	59.0	61.4	50.1	48.4
Pulses	14.3	16.4	14.2	13.6	12.6
Potatoes	10.0	8.9	6.2	6.9	6.1
Other grains	2.9	2.4	2.1	1.9	1.9
Vegetables	10.0	9.7	10.7	11.0	10.8
Special crops	6.6	6.5	8.2	7.8	7.0
Fruits	0.7	0.8	1.0	1.1	1.3
Mulberry	5.7	5.6	5.3	4.9	4.1
<u>Multiple Crop Index</u>					
Paddy field	1.56	1.52	1.62	1.65	1.65
Upland	2.20	1.99	1.85	1.47	1.30
Whole farm land	1.78	1.68	1.70	1.59	1.53

Table F 45 STANDARDIZED CROPPING CALENDER AND FARMING PRACTICES IN PLANTING HIGH-YIELDING NEW RICE VARIETIES

One Cropping (1)

Farming Practices	High-yielding New Variety	Traditional Variety	
	Whole Country	Area I & II <sup>/1</sup>	Area III <sup>/1</sup>
1. Seeding	Apr.10 to 15	Apr.10 to 15	Apr.25 to May 5
2. Transplanting			
Suitable period	May 20 to 30	May 20 to 30	June 10 to 20
Latest date	June 5	June 5	June 25
3. Fertilizer application			
Basal dressing	- 5 days before transplanting -		
Top dressing at tillering stage			
for both varieties except for Yushin variety	- 12 to 14 days after transplanting -		
for Yushin variety (K-fertilizer only)	- 35 days after transplanting -		
Top dressing at young ear formation stage			
for Milyang & Yushin groups and traditional varieties	- 24 days before heading -		
for early-maturing varieties and Tongil & Suweon group	- 15 days before heading -		
Top dressing at ripening stage	- heading time -		
4. Weeding by application of herbicides			
First weeding	- 1 to 2 days before transplanting to 7 days after transplanting -		
Second weeding	- 10 to 15 days after transplanting -		

Source; Refs. F 17 to F 19

Remarks; /1: Area I includes Han river basin.  
Area II covers northern zone of Nagdong river basin.  
Area III consists of central and southern zones of Nagdong river basin and Seomjin river basin.

Table F 45 Continued (2)

One Cropping (2)

Farming Practices	High-yielding New Variety	Traditional Variety	
	Whole Country	Area I & II <sup>/1</sup>	Area III <sup>/1</sup>
5. Water management			
Deep irrigation	- After transplanting to root taking stage -		
Shallow irrigation	- Root taking stage to productive tillering stage		
Mid-summer drainage	- Non-productive tillering stage (7 days starting at 35 to 45 days before heading) -		
Intermittent irrigation	- From young-ear formation stage till ripening stage -		
Complete surface drainage	- Ripening stage (starting at 30 to 35 days after heading) -		
6. Disease and insect control	- Timely undertaking of pest control under cooperative system based on forecasting of disease and insect occurrence (usually 6 to 7 times) -		
7. Harvesting			
Heading at beginning of August	- 40 days after heading -		
Heading at middle of August	- 45 days after heading (Yushin group 40 days) -		
Heading at end of August	- 50 days after heading		

Table F 45 Continued (3)

Two Cropping (1): Paddy

Farming Practices	High-yielding New Variety	Traditional Variety	
	Whole Country	Area I & II <sup>/1</sup>	Area III <sup>/1</sup>
1. Seeding			
Early-maturing varieties (including Yushin groups)			
Apr.25 to 30			
Medium-maturing varieties			
Apr. 20 to 30	Apr.20 to 30	Apr.25 to May 5	
2. Transplanting			
Suitable period	June 10 to 20	June 15 to 25	June 15 to 25
Latest date	June 25	June 30	June 30
3. Fertilizer application	- Same as those for one cropping -		
4. Weeding by application of herbicides	- Same as those for one cropping -		
5. Water management	- Same as those for one cropping -		
6. Disease and insect control	- Same as those for one cropping -		
7. Harvesting	Sept.25 to Oct.5	Oct.1 to 10	Oct.1 to 10

Table F 45 Continued (4)

Two Cropping (2): Barley, Naked Barley and Wheat

Farming Practices	Area I <sup>/1</sup>	Area II <sup>/1</sup>	Area III <sup>/1</sup>
1. Soil fertility maintaining			
Application of compost	- at seeding time -		
2. Seeding	Oct. 1 to 10	Oct. 5 to 15	Oct. 20 to 30
3. Fertilizer application			
Basal dressing	- at seeding time -		
Top dressing			
first time	Mid Mar.	Beginning Feb.	End Feb.
second time	Beginning Apr.	Mid Mar.	End Mar.
4. Earthing and trampling			
Earthing			
first time	- End Nov. -		End Dec.
second time	- Beginning to Mar. -		End Feb.
third time	- Beginning Apr. -		Mid to end Mar.
Trampling			
first time	- End Nov. -		End Nov.
second time	- Beginning to Mid Mar. -		End Feb.
third time	- End Mar. -		Mid Mar.
5. Disease and pest control	- Usually 2 to 3 times -		
6. Harvesting			
Barley & naked barley			
Barley & naked barley	June 5 to 15	June 1 to 10	May 25 to June 10
Wheat	-	-	June 10 to 20

Table F 46 HISTORICAL RECORD ON CROP  
PRODUCTION IN THREE RIVER BASIN

Unit: 10<sup>3</sup> tons

Crop	1967	1968	1969	1970	1971
1. Han river basin					
Rice	433.5	398.9	463.1	447.6	493.3
Barley & wheat	145.8	120.2	150.7	118.9	94.3
Pulses	63.5	64.9	59.1	56.2	52.3
Potatoes	287.5	301.0	263.9	265.3	250.7
Other grains	64.7	68.0	68.5	70.4	54.9
Vegetables	340.4	374.8	432.8	550.3	427.1
Special crops	4.3	4.5	4.3	4.9	4.8
Fruits	40.7	39.2	42.0	35.1	51.5
2. Nagdong river basin (Northern zone)					
Rice	137.0	153.0	189.4	196.0	188.3
Barley & wheat	124.1	118.5	127.9	124.1	98.7
Pulses	19.3	28.2	24.1	19.7	23.1
Potatoes	87.2	88.8	87.5	80.8	90.8
Other grains	11.5	16.0	14.1	11.8	6.1
Vegetables	76.9	93.7	103.9	126.2	130.1
Special crops	2.2	2.2	2.5	2.5	2.4
Fruits	53.4	55.4	59.2	66.4	75.1
3. Nagdong river basin (Central zone)					
Rice	371.8	276.9	383.7	365.8	358.7
Barley & wheat	276.9	259.5	295.7	222.7	249.1
Pulses	23.2	18.2	23.9	28.9	24.1
Potatoes	100.9	102.8	100.1	91.2	99.1
Other grains	3.1	2.4	1.7	1.5	1.0
Vegetables	173.6	139.3	203.5	205.5	225.8
Special crops	3.5	3.6	4.4	4.3	4.0
Fruits	70.6	67.1	78.5	75.2	83.9

Source; Ref. F 3

Table F 46 Continued (2)

Unit: 10<sup>3</sup> tons

Crop	1967	1968	1969	1970	1971
1. Han river basin					
Rice	441.5	520.9	521.2	588.5	585.0
Barley & wheat	99.3	90.3	75.8	64.1	58.8
Pulses	50.1	54.3	81.5	73.7	71.0
Potatoes	202.0	204.4	170.2	216.0	193.0
Other grains	67.0	63.7	59.8	64.4	83.4
Vegetables	427.1	418.9	508.8	439.1	514.1
Special crops	4.6	5.0	6.7	5.5	5.3
Fruits	51.5	55.6	64.1	76.7	77.8
2. Nagdong river basin (Northern zone)					
Rice	176.7	215.2	242.3	279.8	252.0
Barley & wheat	94.1	88.0	90.2	78.6	68.7
Pulses	20.3	20.1	25.2	28.6	28.5
Potatoes	72.8	70.9	80.9	81.5	93.9
Other grains	7.6	6.8	7.2	8.5	7.5
Vegetables	130.1	131.4	145.7	143.0	143.5
Special crops	2.7	2.8	2.8	2.5	1.9
Fruits	75.1	84.1	84.3	81.3	80.8
3. Nagdong river basin (Central zone)					
Rice	362.7	387.0	415.7	419.8	428.1
Barley & wheat	247.7	197.0	205.8	215.8	201.6
Pulses	22.5	23.1	30.7	29.6	28.0
Potatoes	77.0	72.1	72.0	103.6	91.1
Other grains	1.2	2.4	1.8	2.0	2.5
Vegetables	233.4	221.3	244.9	257.2	263.1
Special crops	4.2	4.2	4.3	4.0	3.1
Fruits	96.4	106.9	107.1	103.0	102.4



Table F 46 Continued (3)

Crop	Unit: 10 <sup>3</sup> tons				
	1967	1968	1969	1970	1971
4. Nagdong river basin (Southern zone)					
Rice	315.4	242.7	306.7	279.1	306.2
Barley & wheat	251.8	233.8	253.6	236.8	226.1
Pulses	12.5	8.9	11.6	11.9	13.0
Potatoes	227.7	184.2	216.2	205.2	147.0
Other grains	3.6	3.4	2.2	2.2	1.4
Vegetables	245.6	190.5	329.8	317.7	302.5
Special crops	3.9	4.0	5.7	5.4	4.7
Fruits	30.5	25.9	39.2	31.6	34.0
5. Seomjin river basin					
Rice	135.2	169.6	195.3	179.2	195.1
Barley & wheat	122.9	159.1	151.2	156.5	178.2
Pulses	6.8	9.3	10.6	10.4	10.7
Potatoes	129.2	143.8	147.0	166.8	172.3
Other grains	2.9	6.6	4.3	4.3	3.2
Vegetables	65.4	83.5	92.7	90.1	102.1
Special crops	4.2	5.0	6.9	4.8	6.3
Fruits	7.8	8.8	8.9	9.0	7.3
Crop	1972	1973	1974	1975	1976
4. Nagdong river basin (Southern zone)					
Rice	310.7	301.3	353.7	298.1	384.9
Barley & wheat	216.0	175.9	180.7	182.6	185.6
Pulses	13.0	14.2	15.8	14.3	16.5
Potatoes	137.0	119.2	111.6	166.3	170.1
Other grains	1.4	1.7	1.6	2.3	2.0
Vegetables	294.3	265.6	292.2	346.0	365.9
Special crops	4.1	3.9	4.5	4.3	3.7
Fruits	43.5	44.9	45.0	42.4	42.1
5. Seomjin river basin					
Rice	202.3	201.2	216.2	227.3	257.5
Barley & wheat	159.7	137.2	121.6	105.8	122.3
Pulses	10.3	12.3	15.8	15.9	13.8
Potatoes	154.2	133.9	89.9	98.2	99.6
Other grains	3.0	1.9	1.8	2.0	2.3
Vegetables	106.9	101.1	108.9	108.8	123.6
Special crops	3.7	3.8	5.5	4.9	4.7
Fruits	8.4	8.9	10.2	9.8	9.7

Table F 47 KDI'S FORMULATION OF PER  
CAPITA FOOD CONSUMPTION

Crops	1976	1981	1986	1991	Annual growth rate (%)		
					1977/81	1982/86	1987/91
Food crops	286.4	301.6	326.0	342.6	1.07	1.57	1.00
Rice	126.6	127.6	123.7	119.2	0.17	-0.61	-0.74
Barley	47.8	43.4	41.5	38.6	-1.90	-0.89	-1.45
Wheat	50.7	54.7	58.7	62.9	1.51	1.43	1.38
Pulses	11.6	15.1	19.6	21.3	5.30	5.33	1.70
Potatoes	20.0	14.8	12.2	9.8	-5.86	-3.81	-4.19
Corn	27.1	43.3	67.4	87.4	9.86	9.24	5.34
Others	2.6	2.7	2.9	3.4	0.84	1.79	2.88
Vegetables	89.1	119.1	152.5	180.0	5.96	5.08	3.38
Fruits	17.2	23.9	31.6	41.7	6.75	5.74	5.71
Meat	6.8	8.8	11.3	14.9	5.22	4.99	5.74
Beef	2.1	3.0	3.8	5.0	6.68	4.94	5.75
Pork	3.0	3.5	4.3	5.4	2.99	4.06	4.92
Chicken	1.7	2.3	3.2	4.5	7.07	6.37	6.77
Eggs (No.)	85	113	145	176	5.86	5.11	3.95
Cow milk	5.6	12.7	26.9	49.8	18.06	16.16	13.09
Marine products	47.8	68.1	93.7	114.4	7.33	6.60	4.08

Source; Ref. F 11

Table F 48 PROJECTED PER CAPITA CONSUMPTION OF FOOD CROPS

(1) Average Annual Growth Rate of Consumption (%)

Crops	1977/81	1981/86	1986/91	1991/96	1996/01
<b>Grains</b>					
Total	1.46	1.87	1.23	1.06	0.50
Rice	0.17	-0.61	-0.74	-0.40	-0.10
Barley & naked barley	-1.90	-0.89	-1.45	-1.20	-1.00
Wheat	1.51	1.43	1.38	1.10	0.50
Pulses	5.30	5.33	1.70	2.00	1.70
Potatoes	-5.86	-3.81	-4.19	-4.00	-3.80
Corn	9.86	9.24	5.34	3.40	1.40
Miscellaneous grains	0.84	1.79	2.88	1.80	0.80
Vegetables	5.96	5.08	3.38	2.20	1.00
Fruits	6.75	5.74	5.71	3.50	2.00

(2) Annual Consumption per Capita (kg/year/person)

Crops	1977	1981	1986	1991	1996	2001
<b>1. Food grains</b>						
Rice	143.1	144.1	139.8	134.7	132.0	131.3
Barleys	31.4	29.1	27.8	25.8	24.3	23.1
Wheat	53.4	56.7	60.9	65.2	68.9	70.6
Pulses	12.2	15.0	19.4	21.1	23.3	25.3
Potatoes	19.0	14.9	12.3	9.9	8.1	6.7
Miscellaneous grains	2.7	2.8	3.1	3.6	3.9	4.1
Sub-total	261.8	262.6	263.3	260.3	260.5	261.1
<b>2. Feed grains</b>						
Corn	37.2	54.2	84.3	109.3	129.2	138.5
<b>3. Total grains</b>						
1 + 2	299.0	316.8	347.6	369.6	389.7	399.6
<b>4. Vegetables</b>						
	83.9	112.1	143.6	169.6	189.1	198.7
<b>5. Fruits</b>						
	20.4	28.3	37.4	49.4	58.7	64.8

Source; Refs. F 4, F 10 & F 11

Table F 49 ESTIMATED FOOD DEMAND IN FUTURE

Item	1977	1981	1986	1991	1996	2001
<b>1. Projected Population (10<sup>6</sup> persons)</b>						
	35.61	37.95	41.08	44.04	47.21	50.11
<b>2. Estimated Food Crop Demand (10<sup>6</sup> tons)</b>						
Rice	5.10	5.47	5.74	5.93	6.23	6.58
Barleys	1.12	1.10	1.14	1.14	1.15	1.16
Wheat	1.90	2.15	2.50	2.87	3.25	3.54
Pulses	0.43	0.57	0.80	0.93	1.10	1.27
Potatoes	0.68	0.57	0.51	0.44	0.38	0.34
Miscellaneous grains	0.10	0.11	0.13	0.16	0.18	0.21
Sub-total	9.33 ( 9.46)	9.97 (10.02)	10.82 (10.88)	11.47 (11.54)	12.29 ( - )	13.10 ( - )
Corn	1.32 ( 1.08)	2.06 ( 1.68)	3.46 ( 2.84)	4.81 ( 3.96)	6.10 ( - )	6.94 ( - )
Total grains	10.64 (10.54)	12.03 (11.70)	14.28 (13.72)	16.28 (15.50)	18.39 ( - )	20.04 ( - )
Vegetables	2.99 ( 3.46)	4.25 ( 4.62)	5.90 ( 6.42)	7.47 ( 8.20)	8.93 ( - )	9.96 ( - )
Fruits	0.73 ( 0.68)	1.07 ( 0.84)	1.54 ( 1.23)	2.18 ( 1.72)	2.77 ( - )	3.25 ( - )

Source ; Refs. F 4, F 10 & F 11

Remarks; Figures in parentheses show the estimate done by KDI

Table F 50 AREA EXTENT OF FUTURE LAND USE PROGRAMME  
IN HAN RIVER BASIN (AS OF 2001)

Unit: ha

Land Use Pattern	Sub-Basin Code No.					
	01(1)	01(2)	02	03(1)	03(2)	04 <sup>/1</sup>
1. Paddy field	21,000	19,500	15,000	14,000	14,800	11,000
2. Upland	5,750	9,900	8,100	6,800	7,600	8,200
3. Orchard	1,750	4,600	2,900	2,700	2,600	2,600
4. Grass land	1,800	7,500	6,400	7,200	4,700	500
4.1 Intensive	150	150	150	800	100	100
4.2 Extensive	1,650	7,350	6,250	6,400	4,600	400
5. Forest (Designated)	29,500 (20,600)	60,400 (34,900)	84,700 (74,500)	15,100 (5,400)	27,800 (22,800)	112,700 (107,200)
6. Erosion control	800	6,900	2,600	400	1,400	5,400
7. Others <sup>/2</sup>	11,200	53,000	16,000	4,900	6,100	5,200
Total 1 to 7	71,800	161,800	135,700	51,100	65,000	145,600

Land Use Pattern	Sub-Basin Code No.					
	05	06 <sup>/1</sup>	07 <sup>/1</sup>	08	09	10 <sup>/1</sup>
1. Paddy field	12,000	11,300	9,500	6,000	450	1,650
2. Upland	6,900	12,500	19,100	14,600	4,650	9,800
3. Orchard	3,300	3,200	3,400	2,700	400	550
4. Grass land	3,200	1,400	1,200	500	200	400
4.1 Intensive	150	200	200	100	-	50
4.2 Extensive	3,050	1,200	1,000	400	200	350
5. Forest (Designated)	59,800 (59,000)	95,200 (89,300)	194,400 (190,500)	137,200 (135,200)	64,200 (62,200)	148,600 (141,200)
6. Erosion control	2,600	5,500	13,600	13,000	1,700	9,400
7. Others <sup>/2</sup>	6,200	5,700	4,000	2,900	300	400
Total 1 to 7	94,000	134,800	245,200	176,900	71,900	170,800

Remarks; <sup>/1</sup>: These sub-basins are further divided into two or three portions for the agricultural water use study in ANNEX G.

<sup>/2</sup>: Consisting of cities, villages, water reservoir, etc.

<sup>/3</sup>: Sub-basin HN-17 locating beyond D.M.Z line is excluded.

Table F 50 Continued (2)

Unit: ha

Land Use Pattern	Sub-Basin Code No.					
	11	12	13	14	15(1)	15(2)
1. Paddy field	3,600	3,000	6,000	3,900	2,350	950
2. Upland	2,150	2,500	7,200	3,900	2,100	2,600
3. Orchard	950	1,500	1,800	1,600	2,900	200
4. Grass land	1,100	1,400	500	800	650	750
4.1 Intensive	-	-	50	-	50	-
4.2 Extensive	1,100	1,400	450	800	600	750
5. Forest (Designated)	50,900 (46,800)	64,000 (60,800)	121,200 (119,400)	84,000 (78,100)	142,500 (138,600)	90,400 (86,700)
6. Erosion control	3,200	4,500	8,300	4,300	14,600	9,100
7. Others <sup>/2</sup>	1,900	1,100	2,300	4,900	900	300
Total 1 to 7	63,800	78,000	147,300	103,400	166,000	104,300

Land Use Pattern	Sub-Basin Code No.	
	16 <sup>/1</sup>	Whole Basin <sup>/3</sup>
1. Paddy field	2,350	158,350
2. Upland	2,000	136,350
3. Orchard	450	40,100
4. Grass land	600	40,800
4.1 Intensive	-	2,250
4.2 Extensive	600	38,550
5. Forest (Designated)	93,000 (90,300)	1,675,600
6. Erosion control	2,700	110,000
7. Others <sup>/2</sup>	1,900	129,200
Total 1 to 7	103,000	2,290,400

Table F 51 AREA EXTENT OF FUTURE LAND USE PROGRAMME  
IN NAGDONG RIVER BASIN (AS OF 2001)

Unit: ha

Land Use Pattern	Sub-Basin Code No.					
	01	02	03	04	05	06(1)
1. Paddy field	1,450	1,950	4,300	2,700	13,000	10,300
2. Upland	5,700	3,550	9,200	3,850	6,800	3,050
3. Orchard	500	450	1,900	650	3,400	1,750
4. Grass land	1,650	8,250	2,700	8,000	9,000	2,200
4.1 Intensive	100	450	100	250	700	50
4.2 Extensive	1,550	7,800	2,600	7,750	8,300	2,150
5. Forest (Designated)	90,600 (89,000)	31,300 (18,400)	99,400 (98,600)	39,600 (32,600)	98,300 (75,000)	31,100 (14,800)
6. Erosion control	10,000	800	5,150	5,200	3,100	2,800
7. Others <sup>/2</sup>	600	1,600	350	400	1,800	1,800
Total 1 to 7	110,500	47,900	123,000	60,400	135,400	53,000

Land Use Pattern	Sub-Basin Code No.			
	06(2)	06(3)	06(4)	Northern-total
1. Paddy field	9,000	10,100	13,400	66,200
2. Upland	6,400	6,900	10,700	56,150
3. Orchard	1,200	2,000	2,900	14,750
4. Grass land	3,300	4,900	3,300	43,300
4.1 Intensive	100	700	100	2,550
4.2 Extensive	3,200	4,200	3,200	40,750
5. Forest (Designated)	55,300 (49,800)	40,000 (25,000)	68,500 (63,000)	554,100 (466,200)
6. Erosion control	5,800	7,900	10,600	51,350
7. Others <sup>/2</sup>	1,600	1,500	1,600	11,250
Total 1 to 7	82,600	73,300	111,000	797,100

Remarks; <sup>/1</sup>: This sub-basin is further divided into two portions for the agricultural water use study in ANNEX G.

<sup>/2</sup>: Consisting of cities, villages, water reservoir, etc.

Table F 51 Continued (2)

Unit: ha.

Land Use Pattern	Sub-Basin Code No.					
	05	06(1)	06(2)	07	08	09
1. Paddy field	12,400	17,300	12,100	800	17,000	7,100
2. Upland	3,300	7,200	5,500	1,300	5,000	1,400
3. Orchard	2,400	5,000	2,500	350	7,800	1,600
4. Grass land	4,000	2,900	200	850	3,100	3,000
4.1 Intensive	950	300	50	150	200	600
4.2 Extensive	3,050	2,600	150	700	2,900	2,400
5. Forest (Designated)	47,800 (39,400)	108,500 (101,300)	64,700 (63,600)	16,200 (15,500)	87,800 (76,800)	27,200 (12,200)
6. Erosion control	1,700	4,300	1,700	800	4,700	6,600
7. Others <sup>/2</sup>	2,100	1,500	3,200	3,200	5,500	7,500
Total 1 to 7	73,700	146,700	89,900	23,500	130,900	54,400

Land Use Pattern	Sub-Basin Code No.				
	10	11	12	13	14
1. Paddy field	15,000	8,600	10,200	4,500	12,500
2. Upland	6,500	2,500	3,200	1,800	5,700
3. Orchard	1,800	1,300	2,100	400	1,300
4. Grass land	3,800	700	500	400	1,900
4.1 Intensive	400	100	100	50	150
4.2 Extensive	3,400	600	400	350	1,750
5. Forest (Designated)	46,600 (39,100)	57,600 (55,000)	69,900 (65,300)	31,700 (29,000)	54,600 (46,500)
6. Erosion control	2,400	700	4,400	600	2,700
7. Others <sup>/2</sup>	700	6,700	2,200	700	2,100
Total 1 to 7	76,800	78,100	92,500	40,100	80,800



Table F 51 Continued (3)

Unit: ha

Land Use Pattern	Sub-Basin Code No.				
	Central-total	15(1)	15(2) <sup>/1</sup>	16	17
1. Paddy field	117,500	14,200	11,300	20,100	23,400
2. Upland	43,400	3,900	4,400	9,300	7,100
3. Orchard	26,550	1,800	1,100	3,600	2,900
4. Grass land	21,350	2,100	1,900	3,200	9,400
4.1 Intensive	3,050	100	200	200	1,200
4.2 Extensive	18,300	2,000	1,700	3,000	8,200
5. Forest (Designated)	612,600 (552,700)	96,400 (94,600)	75,100 (73,200)	74,100 (68,400)	43,200 (38,700)
6. Erosion control	30,600	2,900	5,000	4,700	8,000
7. Others <sup>/2</sup>	35,400	5,300	3,100	3,100	3,700
Total 1 to 8	887,400	126,600	101,900	118,100	97,700

Land Use Pattern	Sub-Basin Code No.			
	18	19	Southern-total	Whole Basin
1. Paddy field	18,800	15,400	103,200	286,900
2. Upland	3,100	4,800	32,600	132,150
3. Orchard	900	2,700	13,000	54,300
4. Grass land	11,500	5,700	33,800	98,450
4.1 Intensive	1,400	1,000	4,100	9,700
4.2 Extensive	10,100	4,700	29,700	88,750
5. Forest (Designated)	46,000 (42,300)	100,300 (96,400)	435,100 (413,600)	1,601,800 (1,432,500)
6. Erosion control	7,800	14,000	42,400	124,350
7. Others <sup>/2</sup>	4,000	1,800	21,000	67,650
Total 1 to 8	92,100	144,700	681,100	2,365,600

Table F 52 AREA EXTENT OF FUTURE LAND USE PROGRAMME  
IN SEOMJIN RIVER BASIN (AS OF 2001)

Unit: ha

Land Use Pattern	Sub-Basin Code No.					Whole Basin
	01	02 <sup>/1</sup>	03	04	05	
1. Paddy field	12,000	17,000	10,000	18,600	7,100	64,700
2. Upland	4,800	6,900	2,400	4,700	6,200	25,000
3. Orchard	1,200	1,600	1,600	4,300	1,100	9,800
4. Grass land	1,400	5,300	1,300	1,900	1,300	11,200
4.1 Intensive	250	600	50	300	300	1,500
4.2 Extensive	1,150	4,700	1,250	1,600	1,000	9,700
5. Forest (Designated)	85,100 (84,500)	92,200 (95,200)	47,900 (45,600)	70,500 (66,600)	56,300 (56,600)	352,000 (348,500)
6. Erosion control	5,400	2,900	1,300	2,800	2,600	15,000
7. Others <sup>/2</sup>	1,640	730	600	1,130	400	4,500
Total 1 to 7	112,940	131,930	66,400	105,830	76,300	493,400

Remarks; /1: This sub-basin is further divided into two portions  
for the agricultural water use study in ANNEX G.

/2: Consisting of cities, villages, water reservoir, etc.

Table F 53 CHARACTERISTICS OF HIGH-YIELDING  
NEW RICE VARIETIES IN PRACTICAL USE

Name of Variety	Length of Culm (cm)	No. of Panicles per Hill	No. of Grains per Panicle	Plant Vigor	Roof Activity
<u>Early-maturing Varieties</u>					
Early Tongil	58	14.6	108	Full	Medium
Yeongnam early	58	12.4	108	Full	Medium
Milyang 21	60	12.6	115	Full	Medium
Honam early	60	20.0	87	Full	Medium
<u>Medium-maturing Varieties</u>					
Tongil	60	15.4	108	Full	Medium
Suweon 251	62	13.0	126	Full	Medium
Suweon 258	56	15.0	121	Most full	Medium
Suweon 264	53	15.0	109	Full	Medium
Yushin	70	17.0	113	Medium	Medium low
Iri 326	57	18.0	115	Full	Medium
Nopoong	64	15.0	112	Full	Medium
Milyang 22	72	11.2	128	Full	Medium
Milyang 23	69	14.0	114	Most full	Medium
Raekung	69	13.6	135	Most full	Medium
Milyang 30	67	14.0	111	Full	Medium

Source; Refs. F 18 & F 21

Table F 53 Continued (2)

Name of Variety	Cold Tolerance in Ripening Stage	Late Planting Resistance	Akagare Phenomenon	Lodging Resistance	Wilting
<u>Early-maturing Varieties</u>					
Early Tongil	Medium	Strong	Common	Strong	Insusceptible
Yeongnam early	Weak	Strong	Many	Strong	Insusceptible
Milyang 21	Weak	Strong	Common	Strong	Insusceptible
Honam early	Strong	Strong	Few	Strong	Insusceptible
<u>Medium-maturing Varieties</u>					
Tongil	Weak	Weak	Many	Strong	Insusceptible
Suweon 251	Weak	Weak	Common	Strong	Insusceptible
Suweon 258	Weak	Weak	Few	Strong	Insusceptible
Suweon 264	Medium weak	Weak	Few	Strong	Insusceptible
Yushin	Weak	Strong	Common	Weak	Susceptible
Iri 326	Weak	Medium	Common	Strong	Insusceptible
Nopoong	Weak	Strong	Few	Strong	Insusceptible
Milyang 22	Weak	Weak	Few	Strong	Insusceptible
Milyang 23	Weak	Weak	Few	Strong	Medium
Raekung	Weak	Weak	Few	Strong	Insusceptible
Milyang 30	Weak	Medium	Common	Strong	Insusceptible

Table F 53 Continued (3)

Name of Variety	Resistance for Major Diseases and Insects				
	Sheath Blight	Bacterial Leaf Blight	Leaf Blast	Stripe Virus	Rice Leafhopper
<u>Early-maturing Varieties</u>					
Early Tongil	Moderate	Strong	Strong	Strong	Weak
Yeongnam early	Moderate	Strong	Strong	Strong	Weak
Milyang 21	Moderate	Weak	Strong	Strong	Weak
Honam early	Moderate	Strong	Strong	Strong	Weak
<u>Medium-maturing Varieties</u>					
Tongil	Moderate	Strong	Strong	Strong	Weak
Suweon 251	Moderate	Medium strong	Medium	Strong	Weak
Suweon 258	Moderate	Strong	Strong	Strong	Weak
Suweon 264	Moderate	Weak	Strong	Strong	Weak
Yushin	Weak	Medium strong	Medium weak	Strong	Weak
Iri 326	Moderate weak	Weak	Strong	Strong	Medium weak
Nopoong	Moderate	Weak	Medium strong	Strong	Weak
Milyang 22	Moderate	Weak	Strong	Strong	Medium weak
Milyang 23	Moderate	Weak	Medium weak	Strong	Medium weak
Reakung	Moderate	Strong	Strong	Strong	Medium weak
Milyang 30	Moderate	Strong	Strong	Strong	Strong

Table F 53 Continued (4)

Name of Variety	Shattering	1,000 Grain Weight (g) (Brown Rice)	Amylose Content (%)	Eating Quantity	Yield <sup>/1</sup> Level (ton/ha)
<u>Early-maturing Varieties</u>					
Early Tongil	Easy	23.5	21.4	Medium	4.7
Yeongnam early	Easy	23.5	22.0	Medium	4.8
Milyang 21	Hard	20.1	18.5	Good	5.0
Honam early	Easy	21.0	20.0	Good	4.9
<u>Medium-maturing Varieties</u>					
Tongil	Easy	24.2	22.2	Medium	5.1
Suweon 251	Easy	21.1	20.2	Good	5.3
Suweon 258	Medium	22.0	18.4	Good	5.6
Suweon 264	Hard	19.5	18.1	Very good	5.4
Yushin	Easy	23.0	20.6	Good	5.3
Iri 326	Medium	18.3	18.3	Good	5.4
Nopoong	Medium	18.9	18.2	Very good	5.4
Milyang 22	Early	21.3	19.7	Good	5.3
Milyang 23	Early	22.7	20.1	Good	5.6
Raekung	Easy	24.4	20.6	Good	5.8
Milyang 30	Medium	19.1	18.1	Good	5.3

Remarks; /1: Yield expected under the ordinary season with the ordinary fertilizer level when grown by ordinary farmers on their ordinary paddy fields.

Table F 54 ORD'S GUIDELINE IN SELECTING RICE VARIETY

Name of Varieties	Main Areas for Promotion in Three River Basins
<u>Early-maturing Varieties</u>	
Early Tongil	<ol style="list-style-type: none"> <li>1. One cropping area in whole Han river basin with elevation less than 400 m, and in both Nagdong and Seomjin river basins with elevation less than 500 m.</li> <li>2. Two cropping area in whole Han river basin and northern and central zones of Nagdong river basin.</li> <li>3. All areas suffered from drought and cold irrigation water as well as located in valleys and shade.</li> <li>4. Late seeding and transplanting area due to vegetable cultivation in spring season.</li> </ol>
Milyang 21	<ol style="list-style-type: none"> <li>1. One cropping area in whole Han river basin with elevation less than 300 m, and in southern zone of Nagdong river basin and whole Seomjin river basin with elevation less than 400 m.</li> <li>2. Two cropping area in whole Han river basin and northern and central zones of Nagdong river basin.</li> <li>3. Except for areas always suffered from inundation and disease of bacterial leaf blight.</li> </ol>
Yeongnam early	<ol style="list-style-type: none"> <li>1. One and two cropping areas in Nagdong and Seomjin river basins with elevation less than 300 m.</li> </ol>
<u>Medium-maturing Varieties</u>	
Tongil, Suweon 258	<ol style="list-style-type: none"> <li>1. One cropping area in whole Han river basin and northern and central zones of Nagdong river basin with elevation less than 100 m, and southern zone of Nagdong river basin and whole Seomjin river basin with elevation less than 200 m.</li> <li>2. Except of all areas suffered from cold irrigation water.</li> </ol>

Source; Ref. F 18 & F 21

Table F 54 Continued (2)

Name of Varieties	Main Areas for Promotion in Three River Basins
Yushin (Iri 1)	<ol style="list-style-type: none"> <li>1. One cropping area in lower part of Han river basin and northern and central zones of Nagdong river basin with elevation less than 200 m, and southern zone of Nagdong river basin and whole Seomjin river basin with elevation less than 300 m.</li> <li>2. Two cropping area in central and southern zones of Nagdong river basin and Seomjin river basin.</li> <li>3. Except for areas suffered from water pollution, nitrogen excess irrigation water, poor drainage, shade and blast disease.</li> </ol>
Milyang 22	<ol style="list-style-type: none"> <li>1. One cropping area in both Nagdong and Seomjin river basins with elevation less than 300 m.</li> <li>2. Two cropping area in southernmost zone of Nagdong river basin.</li> <li>3. Except for areas always suffered from inundation and disease of bacterial leaf blight.</li> </ol>
Milyang 23	<ol style="list-style-type: none"> <li>1. One cropping area in lower part of Han river basin and northern and central zones of Nagdong river basin with elevation less than 200 m, and southern zone of Nagdong river basin and whole Seomjin river basin with elevation less than 300 m.</li> <li>2. Two cropping area in southernmost zone of Nagdong river basin.</li> <li>3. Except for areas always suffered from inundation and disease of bacterial leaf blight.</li> </ol>



Table F 55 GROWING PERIOD OF PADDY RICE  
IN THREE RIVER BASINS

Crop & variety	Han	Nagdong			Seomjin
		Northern	Central	Southern	
(1) <u>Single cropping area</u>					
- High-yielding new rice varieties					
- Early-maturing varieties					
- Transplanting					
	May 20 to June 5	May 20 to June 5	May 20 to June 5	May 20 to June 5	May 20 to June 5
- Harvesting					
	Sept. 5 to 20	Sept. 5 to 20	Sept. 5 to 20	Sept. 5 to 20	Sept. 5 to 20
- Medium-maturing varieties					
- Transplanting <sup>/1</sup>					
	May 20 to 30	May 20 to 30	May 20 to 30	May 20 to 30	May 20 to 30
- Harvesting					
	Sept. 20 to 30	Sept. 20 to 30	Sept. 20 to 30	Sept. 20 to 30	Sept. 20 to 30
- Traditional varieties					
- Transplanting					
	May 20 to 30	June 10 to 20	June 10 to 20	June 10 to 20	June 10 to 20
- Harvesting					
	Oct. 5 to 20	Oct. 5 to 20	Oct. 5 to 20	Oct. 5 to 20	Oct. 5 to 20

Source; Refs. F 17 & F 18

Remarks; <sup>/1</sup> : Transplanting period is 10 days for Yushin, Iri and Milyang varieties, and 5 days for Tongil varieties.

Table F 55 Continued (2)

Crop & variety	Han	Nagdong			Seomjin
		Northern	Central	Southern	
(2) <u>Two cropping area</u>					
- High-yielding new rice varieties					
- Early-maturing varieties					
- Transplanting					
	June 10 to 20	June 10 to 20	June 10 to 20	June 10 to 20	June 10 to 20
- Harvesting					
	Oct. 1 to 10	Oct. 1 to 10	Oct. 1 to 10	Oct. 1 to 10	Oct. 1 to 10
- Medium-maturing varieties					
- Transplanting					
	June 10 to 20	June 10 to 20	June 10 to 20	June 10 to 20	June 10 to 20
- Harvesting					
	Oct. 10 to 20	Oct. 10 to 20	Oct. 10 to 20	Oct. 10 to 20	Oct. 10 to 20
- Traditional rice varieties					
- Transplanting					
	June 15 to 25	June 15 to 25	June 15 to 25	June 15 to 25	June 15 to 25
- Harvesting					
	Oct. 15 to 25	Oct. 15 to 25	Oct. 15 to 25	Oct. 15 to 25	Oct. 15 to 25
- Barley					
- Sowing					
	Oct. 1 to 15	Oct. 1 to 15	Oct. 10 to 25	Oct. 20 to 30	Oct. 20 to 30
- Harvesting of early-maturing varieties					
	June 5 to 15	June 5 to 15	June 1 to 10	May 20 to 30	May 20 to 30
- Harvesting of medium-maturing varieties					
	June 15 to 25	June 15 to 25	June 10 to 20	May 25 to June 10	May 25 to June 10

Table F 56 FUTURE CROPPING PATTERN  
ON IRRIGATED FIELD

Unit: %

Crop	River Basin				Seomjin
	Han	Nagdong			
		Northern	Central	Southern	
<u>Paddy field</u>					
One cropping	65	56	18	19	20
New variety	(65)	(46)	(6)	(5)	(13)
Traditional variety	(0)	(10)	(12)	(14)	(7)
Two cropping	35	44	82	81	80
New variety	(19)	(35)	(82)	(81)	(59)
Traditional variety	(16)	(9)	(0)	(0)	(21)
Total	100	100	100	100	100

Table F 57 FUTURE CROPPING PATTERN ON PADDY FIELD  
BY TYPE OF IRRIGATION FACILITY

Irrigation System	Land Consolidation		Newly Converted from Upland
	Consolidated	Unconsolidated	
Reservoir	All new variety	All new variety	All new variety
Pump (Main Stream)	All new variety	All new variety	All new variety
Pump (Tributary)	All new variety	All new variety or all traditional variety	All new variety
Supplemental irrigation		All traditional variety	

Table F 58 FUTURE CROPPING PATTERN ON POTENTIAL IRRIGABLE  
UPLAND UNDER RAIN-FED CONDITION

Unit : %

Crop	River Basin				Seomjin
	Han	Nagdong			
		Northern	Central	Southern	
<u>Upland field irrigable</u>					
Soybean	50	50	40	50	50
Sweet potato	26	6	6	10	15
Chinese cabbage	12	10	10	10	10
Red pepper	4	4	4	10	10
Apple	10	30	40	20	15
Total	100	100	100	100	100

Table F 59 FUTURE CROPPING PATTERN ON POTENTIAL IRRIGABLE  
UPLAND UNDER IRRIGATED CONDITION

Unit : %

Crop	River Basin				Seomjin
	Han	Nagdong			
		Northern	Central	Southern	
<u>Upland field irrigated</u>					
Cucumber	50	40	40	38	50
Chinese cabbage	45	40	40	40	43
Garlic	10	10	10	20	20
Red pepper	20	16	4	10	12
Apple	20	30	50	20	20
Total	145	136	144	128	145

Table F 60 FACTORS AFFECTING RICE YIELD

1. Comparison of Rice Yields between High-yielding New Rice Variety and Traditional Variety (ton/ha)

Item	1972	1973	1974	1975	1976	1977	1978
1. New variety	3.86	4.81	4.73	5.03	4.79	5.53	4.81
2. Traditional variety	3.34	3.58	3.53	3.51	3.96	4.23	4.35
3. 1 / 2	1.16	1.34	1.34	1.43	1.21	1.31	1.10

Source ; Ref. F 8

2. Crop Productivity Index of Paddy Soils in Three River Basins (%)

Item	River Basin				Seomjin
	Han	Nagdong			
		Northern	Central	Southern	
1. Difference between three basins	99	98	100	100	99
2. Difference within each basin					
- Main stream	100	100	100	100	100
- Tributary	96.5	98	98	98.5	98.5

Source ; Refs. F 14 & F 15

3. Comparison of Rice Yield by Irrigation Condition (ton/ha)

Item	1966	1967	1968	1969	1970	1971	1972	1973	1974
1. Fully irrigated paddy field									
1.1 FLIA	3.49	3.44	3.48	3.80	3.75	3.72	3.69	3.82	4.24
1.2 Non-FLIA	3.44	3.42	3.36	3.74	3.52	3.66	3.70	4.04	4.10
2. Partially irrigated paddy field	3.10	2.92	2.81	3.49	3.49	3.54	3.48	3.73	3.94
3. Rain-fed paddy field	3.15	2.55	2.57	3.60	3.77	3.42	3.24	3.44	3.77

Source ; Ref. F 22

Table F 60 Continued (2)

## 4. Effect of Land Consolidation Works

	Before Land Consolidation		After Land Consolidation	
	Paddy Rice	Barley	Paddy Rice	Barley
1. Yield (ton/ha)	3.12	1.99	3.89	2.04
2. Yield index (%)	100	100	124.7	102.5
3. Two cropping area of paddy field (%)	36.4		61.5	
4. Production cost saving (%)	100		84.0	

Source ; Ref. F 22

Table F 61 ANTICIPATED YIELD OF PADDY RICE

Unit: ton/ha

Crop	Irrigation System & Land Consolidation	River Basin				Seomjin
		Han	Nagdong			
			Northern	Central	Southern	
<u>1. Paddy Rice (High-yielding New Variety)</u>						
Reservoir						
	Consolidated	5.5	5.4	5.6	5.6	5.5
	Unconsolidated	5.0	4.9	5.1	5.1	5.0
Pump (Main stem)						
	Consolidated	5.2	5.1	5.3	5.3	5.2
	Unconsolidated	4.7	4.6	4.8	4.8	4.7
Pump (Tributary)						
	Consolidated	4.7	4.6	4.8	4.8	4.7
	Unconsolidated	4.2	4.1	4.3	4.3	4.2
<u>2. Paddy Rice (Traditional Variety)</u>						
Pump (Tributary)						
	Unconsolidated	3.1	3.0	3.2	3.2	3.1
Supplemental irrigation						
	Unconsolidated	2.5	2.4	2.6	2.6	2.5
<u>3. By-products (Percentage of Gross Production Value) /1</u>						
	New variety	4.0 %	4.5 %	4.5 %	4.0 %	5.0 %
	Traditional variety	7.5 %	9.0 %	9.0 %	8.0 %	9.5 %

Remarks ; /1 : This rate of by-products is estimated by referring to Ref. F 1.

Table F 62 ANTICIPATED YIELD OF REPRESENTATIVE UPLAND CROPS

Unit: ton/ha

	Han	River Basin			Seomjin
		Northern	Nagdong Central	Southern	
<b>Rainfed Upland</b>					
Soybean	1.1	1.1	1.1	1.2	1.2
Sweet potato	11.0	10.6	12.0	11.0	10.9
Chinese cabbage	11.6	11.3	11.9	12.2	11.5
Red pepper	0.9	0.8	0.7	0.7	0.8
Apple	8.0	7.9	8.2	8.0	8.0
<b>Irrigated Upland, Main Stream</b>					
Cucumber	20.0	19.0	20.0	19.0	19.0
Chinese cabbage	16.0	16.0	16.0	18.0	17.0
Garlic	5.0	5.5	5.0	6.0	5.6
Red pepper	1.6	1.5	1.6	1.4	1.6
Apple	13.0	14.0	14.0	13.0	13.0
<b>Irrigated Upland, Tributary</b>					
Cucumber	20.0	19.0	20.0	19.0	19.0
Chinese cabbage	15.8	15.9	15.8	18.0	17.0
Garlic	4.7	5.2	4.6	5.6	5.4
Red pepper	1.4	1.3	1.3	1.3	1.4
Apple	13.0	13.8	13.4	12.4	12.5

Table F 63 FARM INPUT REQUIREMENTS FOR  
PADDY CULTIVATION

Unit : kg/ha

Variety Irrigation system Land Consolidation	New		Traditional	
	Consol- idated	Unconsol- idated	Unconsol- idated	Supplementarily Unconsol- idated
1. Seed	40	40	40	40
2. Fertilizer				
N	150	130	110	100
P	90	90	50	40
K	100	100	60	50
Silicic lime	200	0	0	0
Farm manure	10,000	10,000	8,000	6,000
3. Agro-chemicals				
Fungicides	0.7	0.7	0.7	0.7
Insecticides	3.1	3.1	3.1	3.1
Herbicides	0.9	0.9	0.9	0.9
Others	0.1	0.1	0.1	0.1

Source ; Refs. F 17 to F 20



Table F 64 FARM INPUT REQUIREMENTS FOR  
UPLAND CROP CULTIVATION

Unit: kg/ha

Item	Non-irrigated Crops				
	Soybean	Sweet Potato	Chinese Cabbage	Red Pepper	Apple
1. Seed	50	500	4	5	50
2. Fertilizer					
N	40	75	275	200	160
P	50	75	175	100	80
K	45	150	200	100	100
Silicic lime	0	0	0	0	0
Farm manure	2,500	3,500	8,000	7,000	7,500
3. Agro-chemicals	1.0	1.6	2.1	4.0	56

Item	Irrigated Crops				
	Cucumber	Chinese Cabbage	Garlic	Red Pepper	Apple
1. Seed	7	4	10	5	50
2. Fertilizer					
N	300	300	30	250	160
P	200	190	70	180	80
K	150	220	100	230	100
Silicic lime	200	100	100	100	200
Farm manure	10,000	10,000	10,000	10,000	10,000
3. Agro-chemicals	4.0	2.1	1.2	4.0	65

Source; Refs. F 19 & F 20

Table F 65 FARM LABOR REQUIREMENTS FOR PADDY CULTIVATION  
BY LAND DEVELOPMENT CONDITION

Unit : Man-day/ha

Farming Practices	High-yielding New Rice Variety			Traditional Rice Variety		
	S/U <sup>/1</sup>	I/U <sup>/1</sup>	I/C <sup>/1</sup>	S/U	I/U	I/C
1. Land preparation	6.7	6.6	6.0	6.6	6.3	5.7
2. Seed bed	12.4	12.1	12.1	7.3	7.3	7.3
3. Sowing and transplanting	22.3	21.6	19.6	19.1	19.1	17.1
4. Water management	33.5	14.2	13.0	29.1	13.5	12.3
5. Inter-cultivating & weeding	9.5	9.0	8.4	9.5	9.2	8.6
6. Plant protection	8.0	9.0	8.4	9.0	9.9	9.3
7. Harvesting, transplanting & threshing	38.3	49.3	26.7	39.2	46.0	25.0
8. Miscellaneous	10.6	7.9	4.6	14.5	11.8	8.5
9. Total 1 to 8	141.3	129.7	98.8	134.3	123.1	93.8
10. Family labor	105.3	96.6	73.6	100.1	91.7	69.9
11. Hired labor	36.0	33.1	25.2	34.2	31.4	23.9

Source ; Refs. F 1 & F 22

Remarks ; /1 : S/U means supplementarily irrigated and unconsolidated paddy field, I/U shows irrigated and unconsolidated one, and I/C expresses irrigated and consolidated one.

Table F 66: FARM LABOR REQUIREMENT FOR  
UPLAND CROP CULTIVATION

Unit : Man-day/ha

Crops	Total Labor	Family Labor	Hired Labor	Crops	Total Labor	Family Labor	Hired Labor
Non-irrigated crops			Irrigated crops				
Chinese cabbage	180	160	20	Cucumber	1,140	950	190
Red pepper	260	220	40	Chinese cabbage	225	200	25
Soybean	50	40	10	Red pepper	342	232	120
Sweet potato	170	150	20	Garlic	320	280	40
Apple	500	420	80	Apple	670	590	80

Source ; Refs. F 1 & F 22

Table F 67 ECONOMIC PRICE OF INTERNATIONAL  
MARKETABLE FOOD GRAINS

Item		Unit: Amount per ton		
		Rice	Corn	Soybean
1. FOB <sup>/1</sup>	(\$)	426	150	347
2. International freight <sup>/2</sup>	(\$)	90	90	90
3. CIF (\$) : Total 1 & 2		516	240	437
4. Wholesale price	(W 10 <sup>3</sup> )	250	116	212
5. Marketing cost <sup>/3</sup>	(W 10 <sup>3</sup> )	20	6	12
6. Farmgate price (4) - (5)	(W 10 <sup>3</sup> )	230	110	200
7. Farmgate price	(\$)	474	227	412

Source; Refs. F 1 & F 23

Remarks; <sup>/1</sup> : IBRD commodity price projection for 1990  
in 1978 constant dollars.

<sup>/2</sup> : including marine insurance and loading/  
unloading costs.

<sup>/3</sup> : Comprising storage, milling and  
transportation costs.

Table F 68 ESTIMATED FARMGATE PRICE OF  
DOMESTIC MARKETABLE CROPS

Crops	Prices as of 1976	Price Index 1976 to 1978	Unit: W 10 <sup>3</sup> /ton
			Prices as of June, 1978
Barely	139	120.4	170
Naked barley	131	120.4	169
Sweet potato	62	196.4	120
Chinese cabbage	38	198.6	80
Cucumber	101	198.6	200
Red pepper (dried)	1,117	181.3	2,000
Garlic (fresh)	440	181.3	800
Apple	165	153.4	250

Source; Refs. F 1, F 8 & F 24

Table F 69 ECONOMIC PRICE OF FERTILIZER

Item		Unit: Amount per ton			
		Urea	Triple super phosphate	Potassium chloride	
1.	FOB <sup>/1</sup>	(\$)	203	171	86
2.	International freight <sup>/2</sup>	(\$)	15	15	15
3.	CIF (\$) : Total 1 & 2		218	186	101
4.	Wholesale price	(W 10 <sup>3</sup> )	106	90	49
5.	Handling & storage cost	(W 10 <sup>3</sup> )	1	1	1
6.	Farmgate price	(W 10 <sup>3</sup> )	107	91	50
7.	Farmgate price	(\$)	221	188	103
8.	Fertilizer nutrient content	(kg)	460	460	600
9.	Unit price of fertilizer nutrient	(W/kg)	233	198	83

Source ; Refs. F 8, F 23 & F 24

Remarks; <sup>/1</sup> : IBRD commodity price projection for 1990 in 1978 constant dollars.

<sup>/2</sup> : Including marine insurance cost.

Table F 70 IMPORTED PRICE OF AGRO-CHEMICALS

Item		Fungicides	Insecticides	Herbicides	Others
1.	Imported quantity and value in 1976				
1.1	Quantity (kg)	1,557,742	4,934,609	363,450	2,437
1.2	Value (\$)	7,939,789	25,324,957	1,624,928	105,487
1.3	Unit price (\$/kg)	5.1	5.0	4.5	43.3
2.	Price index of agricultural chemicals				
2.1	1976	100	100	100	100
2.2	1978.6	117.8	117.8	117.8	117.8
3.	Imported price at 1978 price level				
3.1	1.3 x 2.2 (\$/kg)	6.0	5.9	5.3	51.0
3.2	Won equivalent (W/kg)	2,910	2,860	2,570	24,740

Source; Refs. F 3, F 8 & F 24

Table F 71 UNIT PRICE OF FARM INPUTS AND FARM LABOR

1. Seed (W/kg)			
Paddy rice	280	Cucumber	28,000
Sweet potato	1,050	Red pepper	9,000
Soybean	80	Garlic	165,500
Chinese cabbage	35,000	Apple	420
2. Labor (W/Man-day)			
Family labor	2,500	Hired labor	3,600
3. Local fertilizer (W/kg)			
Silicic lime	12	Farm manure	6
4. Agro-chemicals for upland crops per 1 kg			3,300

Source ; Refs. F 1, F 3, F 8 & F 24

Table F 72 ECONOMIC PRODUCTION COST OF PADDY RICE

	Unit : W 10 <sup>3</sup> /ha			
	<u>Case I</u>	<u>Case II</u>	<u>Case III</u>	<u>Case IV</u>
1. <u>Rice Variety</u>	Traditional	Traditional	High-yield- ing New	High-yield- ing New
2. <u>Irrigation</u>	Supple- mentarily	Irrigated	Irrigated	Irrigated
3. <u>Land Consolidation</u>	Uncon- solidated	Uncon- solidated	Uncon- solidated	Con- solidated
4. <u>Economic Production Cost</u>				
4.1 Seed	11	11	11	11
4.2 Fertilizer				
2.1 N	23	26	30	35
2.2 P	8	10	18	18
2.3 K	4	5	8	8
2.4 Manure	30	40	50	60
2.5 Sub-total	65	81	106	121
4.3 Agro-chemicals	16	16	16	16
4.4 Farm-labors				
4.1 Family	250	230	242	184
4.2 Hired	123	112	119	91
4.3 Sub-total	373	342	361	275
4.5 Others <u>/1</u>	65	60	96	87
4.6 Total 4.1 to 4.5	530	510	590	510

Remarks ; /1 : Including costs for materials, farm tools, draft animals, agricultural building, etc.

Table F 73 ECONOMIC PRODUCTION COST OF REPRESENTATIVE IRRIGATED UPLAND CROPS

Unit: W 10<sup>3</sup>/ha

Item	Cucumber	Chiness Cabbage	Garlic	Red Pepper	Apple
1. Seed	196	140	1,655	45	21
2. Fertilizer					
2.1 N	70	70	93	93	37
2.2 P	40	38	34	34	16
2.3 K	12	12	12	12	8
2.4 Manure	62	61	61	61	61
2.5 Sub-total	184	181	200	200	122
3. Agro-chemicals	13	7	19	20	215
4. Farm labors					
4.1 Family	2,375	500	227	580	1,475
4.2 Hired	684	108	267	432	288
4.3 Sub-total	3,059	608	494	1,021	1,763
5. Others <sup>/1</sup>	178	104	174	273	299
6. Total 1 to 5	3,630	1,040	2,670	1,550	2,420

Table F 74 ECONOMIC PRODUCTION COST OF REPRESENTATIVE RAINFED UPLAND CROPS

Unit: W 10<sup>3</sup>/ha

Item	Soybean	Sweet Potato	Chiness Cabbage	Red Pepper	Apple
1. Seed	5	525	140	45	21
2. Fertilizer					
2.1 N	9	17	64	82	37
2.2 P	10	15	35	34	16
2.3 K	4	12	17	12	8
2.4 Manure	15	21	48	42	45
2.5 Sub-total	38	65	164	170	106
3. Agro-chemicals	3	5	7	17	185
4. Farm labor					
4.1 Family	100	377	400	550	1,050
4.2 Hired	36	72	72	144	288
4.3 Sub-total	136	449	472	694	1,338
5. Others <sup>/1</sup>	28	196	67	224	280
6. Total 1 to 5	210	1,240	850	1,150	1,930

Remarks; <sup>/1</sup> : Same as the mention in Table 68.

Table F 75 GROSS AND NET PRODUCTION VALUES OF RICE

Unit: W 10<sup>3</sup>/ha

		Nagdong			
		Han	Northern	Central & Southern	Seomjin
1. High-Yielding Rice					
1.1 Reservoir, Consolidated	Gross value	1,320	1,290	1,340	1,320
	Production cost	510	510	510	510
	Net value	810	780	830	810
1.2 Reservoir, Unconsolidated	Gross value	1,200	1,170	1,220	1,200
	Production cost	590	590	590	590
	Net value	610	580	630	610
1.3 River, Main Stream, Consolidated	Gross value	1,240	1,220	1,270	1,240
	Production cost	510	510	510	510
	Net value	730	710	760	730
1.4 River, Main Stream, Unconsolidated	Gross value	1,120	1,100	1,150	1,120
	Production cost	590	590	590	590
	Net value	530	510	560	530
1.5 River, Tributary, Consolidated	Gross value	1,130	1,100	1,150	1,130
	Production cost	510	510	510	510
	Net value	620	590	640	620
1.6 River, Tributary, Unconsolidated	Gross value	1,010	980	1,030	1,010
	Production cost	590	590	590	590
	Net value	420	390	440	420
2. Traditional Rice					
2.1 River, Tributary, Unconsolidated	Gross value	780	750	790	780
	Production cost	510	510	510	510
	Net value	270	240	280	270
2.2 Supplementarily, Unconsolidated	Gross value	620	590	640	620
	Production cost	530	530	530	530
	Net value	90	60	110	90

Table F 76 GROSS AND NET PRODUCTION  
VALUE OF UPLAND CROP

Unit: W 10<sup>3</sup>/ha

Item	Han	Nagdong			Seomjin
		Northern	Central	Southern	
<b>Irrigated Upland, Main Stream</b>					
Gross value	4,266	4,002	4,390	3,910	4,415
Production cost	3,343	3,108	3,406	2,968	3,466
Net value	923	894	984	942	949
<b>Irrigated Upland, Tributaries</b>					
Gross value	4,154	3,896	4,253	3,797	4,309
Production cost	3,344	3,109	3,407	2,968	3,466
Net value	810	787	846	829	843
<b>Rainfed Upland</b>					
Gross value	805	923	1,393	889	844
Production cost	751	889	1,309	815	780
Net value	54	34	84	74	64



Table F 77 ANNUAL INVESTMENT AND O &amp; M COST

Unit: W 10<sup>3</sup>/ha

Item	Reservoir	Pump	Land Con- solidation	Land Re- clamation	Upland Irrigation
1. Financial Investment Cost	5,800	3,400	2,100	2,300	3,200
2. Economic Cost					
2.1 Investment cost <sup>/1</sup>	4,960	2,910	1,800	1,970	3,040
2.2 Replacement less salvage value <sup>/2</sup>	9	12	5	9	8
2.3 O & M cost <sup>/3</sup>	62	87	18	20	87
3. Annual Equivalent of Cost <sup>/4</sup>					
3.1 Capital cost <sup>/5</sup>	455	267	165	181	279
3.2 Replacement cost	9	12	5	9	8
3.3 O & M cost	62	87	18	20	87
Total	526	366	188	210	374

Remarks; <sup>/1</sup> : Transfer payment excluded.

<sup>/2</sup> : All investment cost excluding dam cost replaceable every 30 years less salvage value (10 % of replacement cost)

<sup>/3</sup> : Fixed cost (1.0 % - 2.2 % of investment) plus energy cost. For supplementarily irrigated paddy field, O & M cost was assumed to be W 60 x 10<sup>3</sup>/ha.

<sup>/4</sup> : Discount rate 8 %. Evaluation period 50 years.

<sup>/5</sup> : Equal disbursement in two years assumed.

Table F 78 INCREASE IN BENEFITED AREA, RESERVOIR IRRIGATION

Unit: ha

Item & Basin		1977/81	1982/86	1987/91	1992/96	1997/01
<b>1. Paddy Field</b>						
<b>1.1 Irrigation (Supplementarily to irrigated)</b>						
Han	Whole	1,080	160	1,550	1,000	1,250
	North	120	110	200	150	150
	South	810	0	1,050	750	800
Nagdong	Whole	4,960	4,600	4,850	4,700	4,950
	Northern	1,280	1,300	1,150	1,150	1,300
	Central	1,920	1,850	1,850	1,950	1,900
	Southern	1,760	1,450	1,850	1,600	1,750
Seomjin		740	990	920	940	990
<b>1.2 Consolidation (Unconsolidated to consolidated)</b>						
Han	Whole	3,120	2,860	3,360	3,130	3,310
	North	410	410	440	450	460
	South	2,650	2,150	2,570	2,560	2,640
Nagdong	Whole	8,600	8,330	10,170	9,620	10,250
	Northern	1,670	1,870	1,760	1,920	1,980
	Central	3,970	3,720	4,140	4,160	4,370
	Southern	2,960	2,740	4,270	3,540	3,900
Seomjin		2,390	2,230	1,890	2,210	1,770
<b>1.3 Reclamation (Rain-fed upland to irrigated)</b>						
Han	Whole	590	250	250	350	400
	North	270	100	100	100	150
	South	320	100	150	250	250
Nagdong	Whole	400	150	500	250	300
	Northern	220	50	300	150	200
	Central	180	100	200	100	100
	Southern	-	-	-	-	-
Seomjin		130	60	90	20	40

Table F 79 INCREASE IN BENEFITED AREA, MAINSTREAM PUMP IRRIGATION

Unit: ha

Item & Basin		1977/81	1982/86	1987/91	1992/96	1997/01
<b>1. Paddy Field</b>						
<b>1.1 Irrigation (Supplementarily to irrigated)</b>						
Han	Whole	2,190	7,180	1,160	1,350	1,350
	North	80	20	70	70	30
	South	1,530	5,050	490	500	720
Nagdong	Whole	1,380	1,210	1,150	960	850
	Northern	380	360	350	300	250
	Central	490	540	400	460	400
	Southern	510	310	400	200	200
Seomjin		-	-	-	-	-
<b>1.2 Consolidation (Unconsolidated to consolidated)</b>						
Han	Whole	4,010	6,210	3,060	3,240	3,390
	North	20	50	30	40	20
	South	900	3,030	1,890	1,980	2,110
Nagdong	Whole	2,650	2,980	3,080	2,820	2,760
	Northern	500	620	580	570	520
	Central	1,080	1,300	1,230	1,370	1,250
	Southern	1,070	1,060	1,270	880	990
Seomjin		-	-	-	-	-
<b>1.3 Reclamation (Rain-fed upland to reclaimed and irrigated)</b>						
Han	Whole	-	750	-	-	-
	North	-	-	-	-	-
	South	-	750	-	-	-
Nagdong	Whole	-	-	-	-	-
	Northern	-	-	-	-	-
	Central	-	-	-	-	-
	Southern	-	-	-	-	-
Seomjin		-	-	-	-	-
<b>2. Upland Field</b>						
<b>2.1 Irrigation (Rain-fed upland to reclaimed and irrigated)</b>						
Han	Whole	690	650	740	690	650
	North	10	20	10	10	20
	South	330	330	330	330	330
Nagdong	Whole	810	980	920	830	870
	Northern	220	230	190	170	180
	Central	380	570	530	490	540
	Southern	210	180	210	180	140
Seomjin		50	60	80	90	110

Table F 30 INCREASE IN BENEFITED AREA, TRIBUTARY PUMP IRRIGATION

Unit: ha

Item & Basin		1977/81	1982/86	1987/91	1992/96	1997/01
<b>1. Paddy Field</b>						
<b>1.1 Irrigation (Supplementarily to irrigated)</b>						
Han	Whole	1,390 (0)	1,510 (0)	2,390 (70)	2,480 (100)	2,150 (130)
	North	360 (0)	810 (0)	780 (70)	580 (100)	720 (130)
	South	300	0	910	1,000	930
Nagdong	Whole	2,710	4,260	3,050	3,740	3,450
	Northern	1,180	1,590	1,300	1,550	1,600
	Central	400	930	700	740	950
	Southern	1,130	1,740	1,050	1,450	900
Seomjin		900 (0)	930 (40)	1,000 (90)	980 (70)	850 (100)
<b>1.2 Consolidation (Unconsolidated to consolidated)</b>						
Han	Whole	7,680	5,890	6,520	6,830	6,450
	North	1,080	1,240	1,130	1,210	1,220
	South	4,850	2,830	3,830	3,810	3,800
Nagdong	Whole	7,570	7,940	8,500	7,930	7,820
	Northern	2,540	2,560	2,510	2,510	2,650
	Central	1,890	2,180	1,930	2,070	1,980
	Southern	3,140	3,200	4,060	3,350	3,190
Seomjin		2,480	2,460	2,270	2,310	2,090
<b>2. Upland Field</b>						
<b>2.1 Irrigation (Rain-fed upland to irrigated)</b>						
Han	Whole	1,760	1,850	1,710	1,860	1,800
	North	330	320	330	330	310
	South	1,130	1,130	1,130	1,130	1,130
Nagdong	Whole	3,610	5,790	3,840	3,830	3,790
	Northern	1,060	1,810	880	870	860
	Central	1,770	2,930	2,080	1,950	1,970
	Southern	780	1,050	1,030	990	830
Seomjin		190	190	250	280	300

Remarks; Figures in parentheses indicate the area where traditional rice varieties are grown on irrigated paddy field.

Table F 81 NET INCREMENT BENEFIT, RESERVOIR IRRIGATION

Unit: W 10<sup>3</sup>/ha

	Han	Nagdong			Seomjin
		Northern	Central	Southern	
<b>Irrigation</b>					
Net value irrigated	610	580	630	630	610
Net value supplementarily	90	60	110	110	90
Net incremental value	520	520	520	520	520
Irrigation cost increased	466	466	466	466	466
Net incremental benefit	54	54	54	54	54
<b>Consolidation</b>					
Net value consolidated	810	780	830	830	810
Net value unconsolidated	610	580	630	630	610
Net incremental value	200	200	200	200	200
Consolidation cost increase	188	188	188	188	188
Net incremental benefit	12	12	12	12	12
<b>Reclamation</b>					
Net value reclaimed	810	780	830	830	810
Net value rainfed upland	54	34	84	74	64
Net incremental value	756	746	746	756	746
Reclamation & irrigation costs increased	736	736	736	736	736
Net incremental benefit	20	10	10	20	10

Table F 82 NET INCREMENT BENEFIT, MAIN STREAM PUMP IRRIGATION

Unit: W 10<sup>3</sup>/ha

	Nagdong				Seomjin
	Han	Northern	Central	Southern	
<b>Irrigation</b>					
Net value, irrigated	530	510	560	560	530
Net value, supplementarily	90	60	110	110	90
Net incremental value	440	450	450	450	440
Irrigation cost increased	306	306	306	306	306
Net incremental benefit	134	144	144	144	134
<b>Consolidation</b>					
Net value, consolidated	730	710	760	760	730
Net value, unconsolidated	530	510	560	560	530
Net incremental value	200	200	200	200	200
Consolidation cost increased	188	188	188	188	188
Net incremental benefit	12	12	12	12	12
<b>Reclamation</b>					
Net value, reclaimed	730	710	760	760	730
Net value, rainfed upland	54	34	84	74	64
Net incremental value	676	676	676	686	666
Reclamation & Irrigation costs increased	576	576	576	576	576
Net incremental benefit	100	100	100	110	90
<b>Upland Irrigation</b>					
Net value, irrigated	923	894	984	942	949
Net value, rainfed upland	54	34	84	74	64
Net incremental value	869	860	900	868	885
Irrigation cost increased	740	740	740	740	740
Net incremental benefit	129	120	160	128	145

Table F 83 NET INCREMENT BENEFIT, TRIBUTARY PUMP IRRIGATION

Unit: W 10<sup>3</sup>/ha

	Nagdong				
	Han	Northern	Central	Southern	Seomjin
Irrigation (Traditional to High-yielding)					
Net value, irrigated	420	390	440	440	420
Net value, supplementarily	90	60	110	110	90
Net incremental value	330	330	330	330	330
Irrigation cost increased	306	306	306	306	306
Net incremental benefit	24	24	24	24	24
Irrigation (Traditional to Traditional)					
Net value, irrigated	270	240	280	280	270
Net value, supplementarily	90	60	110	110	90
Net incremental value	180	180	170	170	160
Irrigation cost increased	306	306	306	306	306
Net incremental benefit	-126	-126	-136	-136	-146
Consolidation					
Net value, consolidated	620	590	640	640	620
Net value, unconsolidated	420	390	440	440	420
Net incremental value	200	200	200	200	200
Consolidation cost	188	188	188	188	188
Net incremental benefit	12	12	12	12	12
Upland Irrigation (Rainfed to Irrigated)					
Net value, irrigated	810	787	846	829	843
Net value, rainfed upland	54	34	84	74	64
Net incremental value	756	753	762	755	779
Irrigation cost	740	740	740	740	740
Net incremental benefit	16	13	22	15	39

Table F 84 IRRIGATION BENEFIT BUILD-UP IN  
EACH FIVE-YEAR PERIOD

Unit: W 10<sup>6</sup>

Item	1977/81	1982/86	1987/91	1992/96	1997/01
<u>(1) Han River Basin</u>					
1. Reservoir Irrigation					
1.1 Irrigation	58.32	8.64	83.70	54.00	67.50
1.2 Consolidation	37.44	34.32	40.32	37.56	39.72
1.3 Reclamation	11.80	5.00	5.00	7.00	8.00
1.4 Sub-total	107.56	47.96	129.02	98.56	115.22
2. Pump Irrigation (Main Stream)					
2.1 Irrigation	293.46	962.12	155.44	180.90	180.90
2.2 Consolidation	48.12	74.52	36.72	38.88	40.68
2.3 Reclamation	-	75.00	-	-	-
2.4 Upland irrigation	89.01	83.85	95.46	89.01	83.85
2.5 Sub-total	430.59	1,195.49	287.62	308.79	305.43
3. Pump Irrigation (Tributary)					
3.1 Irrigation	33.36	36.24	46.86	44.52	32.10
3.2 Consolidation	92.16	70.68	78.24	81.96	77.40
3.3 Upland irrigation	28.16	29.60	27.36	29.76	28.80
3.4 Sub-total	153.68	136.52	152.46	156.24	138.30
Total	691.83	1,379.97	569.10	563.59	558.95
(\$ 10 <sup>3</sup> Total)	(1,426)	(2,845)	(1,173)	(1,162)	(1,152)
(\$ 10 <sup>3</sup> Annual)	(285.2)	(569.0)	(234.6)	(232.4)	(230.4)
<u>(1-2) North Han River Basin</u>					
1. Reservoir Irrigation					
1.1 Irrigation	6.48	5.94	10.80	8.10	8.10
1.2 Consolidation	4.92	4.92	5.28	5.40	5.52
1.3 Reclamation	5.40	2.00	2.00	2.00	3.00
1.4 Sub-total	16.80	12.86	18.08	15.50	16.62
2. Pump Irrigation (Main Stream)					
2.1 Irrigation	10.72	2.68	9.38	9.38	4.02
2.2 Consolidation	0.24	0.60	0.36	0.48	0.24
2.3 Reclamation	-	-	-	-	-
2.4 Upland irrigation	1.29	2.58	1.29	1.29	2.58
2.5 Sub-total	12.25	5.86	11.03	11.15	6.84
3. Pump Irrigation (Tributary)					
3.1 Irrigation	8.64	19.44	8.22	-1.08	-2.22
3.2 Consolidation	12.96	14.88	13.56	14.52	14.64
3.3 Upland irrigation	5.28	5.12	5.28	5.28	4.96
3.4 Sub-total	26.88	39.44	27.06	18.72	17.38
Total	55.93	58.16	56.17	45.37	40.84
(\$ 10 <sup>3</sup> Total)	(115.3)	(119.9)	(115.8)	(93.5)	(84.2)
(\$ 10 <sup>3</sup> Annual)	(23.1)	(24.0)	(23.2)	(18.7)	(16.8)



Table F 84 Continued (2)

Unit: W 10<sup>6</sup>

Item	1977/81	1982/86	1987/91	1992/96	1997/01
<u>(1-2) South Han River Basin</u>					
1. Reservoir Irrigation					
1.1 Irrigation	43.74	-	56.70	40.50	43.20
1.2 Consolidation	31.80	25.80	30.84	30.72	31.68
1.3 Reclamation	6.40	2.00	3.00	5.00	5.00
1.4 Sub-total	81.94	27.80	90.54	76.22	79.88
2. Pump Irrigation (Main Stream)					
2.1 Irrigation	205.02	676.70	65.66	67.00	96.48
2.2 Consolidation	10.80	36.36	22.68	23.76	25.32
2.3 Reclamation	-	75.00	-	-	-
2.4 Upland irrigation	42.57	42.57	42.57	42.57	42.57
2.5 Sub-total	258.39	830.63	130.91	133.33	164.37
3. Pump Irrigation (Tributary)					
3.1 Irrigation	7.20	-	21.84	24.00	22.32
3.2 Consolidation	58.20	33.96	45.96	45.72	45.60
3.3 Upland irrigation	18.08	18.08	18.08	18.08	18.08
3.4 Sub-total	83.48	52.04	85.88	87.80	86.00
Total	423.81	910.47	307.33	297.35	330.25
(\$ 10 <sup>3</sup> Total)	(873.8)	(1,877.3)	(633.7)	(613.1)	(680.9)
(\$ 10 <sup>3</sup> Annual)	(174.8)	(375.5)	(126.7)	(122.6)	(136.2)
<u>(2) Nagdong River Basin (Whole Basin)</u>					
1. Reservoir Irrigation					
1.1 Irrigation	267.84	248.40	261.90	253.80	267.30
1.2 Consolidation	103.20	99.96	122.04	115.44	123.00
1.3 Reclamation	4.00	1.50	5.00	2.50	3.00
1.4 Sub-total	375.04	349.86	388.94	371.74	393.30
2. Pump Irrigation (Main Stream)					
2.1 Irrigation	198.72	174.24	165.60	138.24	122.4
2.2 Consolidation	31.80	35.76	36.96	33.84	33.12
2.3 Reclamation	-	-	-	-	-
2.4 Upland irrigation	114.08	141.84	134.48	121.84	125.92
2.5 Sub-total	344.60	351.84	337.04	293.92	281.44
3. Pump Irrigation (Tributary)					
3.1 Irrigation	65.04	102.24	73.20	89.76	82.80
3.2 Consolidation	90.84	95.28	102.00	95.16	93.84
3.3 Upland irrigation	64.42	103.74	72.65	69.06	66.97
3.4 Sub-total	220.30	301.26	247.85	253.98	243.61
Total	939.94	1,002.96	973.83	919.64	918.35
(\$ 10 <sup>3</sup> Total)	(1,938.0)	(2,068.0)	(2,007.9)	(1,896.3)	(1,893.6)
(\$ 10 <sup>3</sup> Annual)	(387.6)	(413.6)	(401.6)	(379.3)	(378.7)

Table F 84 Continued (3)

Unit: W 10<sup>6</sup>

Item	1977/81	1982/86	1987/91	1992/96	1997/01
<u>(2-1) Nagdong River Basin (Northern Zone)</u>					
1. Reservoir Irrigation					
1.1 Irrigation	69.12	70.20	62.10	62.10	70.20
1.2 Consolidation	20.04	22.44	21.12	23.04	23.76
1.3 Reclamation	2.20	0.50	3.00	1.50	2.00
1.4 Sub-total	91.36	93.14	86.22	86.64	95.96
2. Pump Irrigation (Main Stream)					
2.1 Irrigation	54.72	51.84	50.40	43.20	36.00
2.2 Consolidation	6.00	7.44	6.96	6.84	6.24
2.3 Reclamation	-	-	-	-	-
2.4 Upland irrigation	26.40	27.60	22.80	20.40	21.60
2.5 Sub-total	87.12	86.88	80.16	70.44	63.84
3. Pump Irrigation (Tributary)					
3.1 Irrigation	28.32	38.16	31.20	37.20	38.40
3.2 Consolidation	30.48	30.72	30.12	30.12	31.80
3.3 Upland irrigation	13.78	23.53	11.44	11.31	11.18
3.4 Sub-total	72.58	92.41	72.76	78.63	81.38
Total	251.06	272.43	239.14	235.71	241.18
(\$ 10 <sup>3</sup> Total)	(517.6)	(561.7)	(493.1)	(484.8)	(497.3)
(\$ 10 <sup>3</sup> Annual)	(103.5)	(112.3)	(98.6)	(97.0)	(99.5)
<u>(2-2) Nagdong River Basin (Central Zone)</u>					
1. Reservoir Irrigation					
1.1 Irrigation	103.68	99.90	99.90	105.30	102.60
1.2 Consolidation	47.64	44.64	49.68	49.92	52.44
1.3 Reclamation	1.80	1.00	2.00	1.00	1.00
1.4 Sub-total	153.12	145.54	151.58	156.22	156.04
2. Pump Irrigation (Main Stream)					
2.1 Irrigation	70.56	77.76	57.60	66.24	57.60
2.2 Consolidation	12.96	15.60	14.76	16.44	15.00
2.3 Reclamation	-	-	-	-	-
2.4 Upland irrigation	60.80	91.20	84.80	78.40	86.40
2.5 Sub-total	144.32	184.56	157.16	161.08	159.00
3. Pump Irrigation (Tributary)					
3.1 Irrigation	9.60	22.32	16.80	17.76	22.80
3.2 Consolidation	22.68	26.16	23.16	24.84	23.76
3.3 Upland irrigation	38.94	64.46	45.76	42.90	43.34
3.4 Sub-total	71.22	112.94	85.72	85.50	89.90
Total	368.66	443.04	394.46	402.80	404.94
(\$ 10 <sup>3</sup> Total)	(760.1)	(913.5)	(813.3)	(830.5)	(834.9)
(\$ 10 <sup>3</sup> Annual)	(152.0)	(182.7)	(162.7)	(166.1)	(167.0)

Table F 84 Continued (4)

Unit: W 10<sup>6</sup>

Item	1977/81	1982/86	1987/91	1992/96	1997/01
<u>(2-3) Nagdong River Basin (Southern Zone)</u>					
1. Reservoir Irrigation					
1.1 Irrigation	95.04	78.30	99.90	86.40	94.50
1.2 Consolidation	35.52	32.88	51.24	42.48	46.80
1.3 Reclamation	0	0	0	0	0
1.4 Sub-total	130.56	111.18	151.14	128.88	141.30
2. Pump Irrigation (Main Stream)					
2.1 Irrigation	73.44	44.64	57.60	28.80	28.80
2.2 Consolidation	12.84	12.72	15.24	10.56	11.88
2.3 Reclamation	-	-	-	-	-
2.4 Upland irrigation	26.88	23.04	26.88	23.04	17.92
2.5 Sub-total	113.16	80.40	99.72	62.40	58.60
3. Pump Irrigation (Tributary)					
3.1 Irrigation	27.12	41.76	25.20	34.80	21.60
3.2 Consolidation	37.68	38.40	48.72	40.20	38.28
3.3 Upland irrigation	11.70	15.75	15.45	14.85	12.45
3.4 Sub-total	76.50	95.91	89.37	89.85	72.33
Total	320.22	287.49	340.23	281.13	272.23
(\$ 10 <sup>3</sup> Total)	(660.2)	(592.8)	(701.5)	(579.6)	(561.3)
(\$ 10 <sup>3</sup> Annual)	(132.0)	(118.6)	(140.3)	(115.9)	(112.3)

(3) Seomjin River Basin

1. Reservoir Irrigation					
1.1 Irrigation	39.96	53.46	49.68	50.76	53.46
1.2 Consolidation	28.68	26.76	22.68	26.52	21.24
1.3 Reclamation	1.30	0.60	0.90	0.20	0.40
1.4 Sub-total	69.94	80.82	73.26	77.48	75.10
2. Pump Irrigation (Main Stream)					
2.1 Irrigation	-	-	-	-	-
2.2 Consolidation	-	-	-	-	-
2.3 Reclamation	-	-	-	-	-
2.4 Upland irrigation	7.25	8.70	11.60	13.05	15.95
2.5 Sub-total	7.25	8.70	11.60	13.05	15.95
3. Pump Irrigation (Tributary)					
3.1 Irrigation	21.60	15.52	8.70	11.62	3.40
3.2 Consolidation	29.76	29.52	27.24	27.72	25.08
3.3 Upland irrigation	7.41	7.41	9.75	10.92	11.70
3.4 Sub-total	58.77	52.45	45.69	50.26	40.18
Total	135.96	141.97	130.55	140.79	131.23
(\$ 10 <sup>3</sup> Total)	(280.3)	(292.7)	(269.2)	(290.3)	(270.6)
(\$ 10 <sup>3</sup> Annual)	(56.1)	(58.5)	(53.8)	(58.1)	(54.1)

Table F 85 NET AGRICULTURAL BENEFIT FOR ESTIMATE OF LAND ENHANCEMENT BENEFIT

Unit: W 10<sup>3</sup>/ha

Frequency	Less than 1/10	1/10-1/5	1/5-1/3	1/3-1/2	More than 1/2
<b>Paddy Field</b>					
Han	180	138	121	81	0
Nagdong, Northern	130	124	109	73	0
Nagdong, Central	200	158	140	93	0
Nagdong, Southern	200	158	140	93	0
Seomjin	180	138	121	81	0
<b>Upland Field</b>					
Han	110	93	82	55	0
Nagdong, Northern	90	77	67	45	0
Nagdong, Central	140	119	105	70	0
Nagdong, Southern	130	110	97	65	0
Seomjin	120	102	90	60	0

Table F 86 PRODUCTION FOREGONE IN THE PROPOSED RESERVOIR AREAS

Unit: W 10<sup>3</sup>/ha

Name of Dam	Paddy Crop			Upland Crop			Orchard Crop		
	GPVL	PCS	NPVL	GPVL	PCS	NPVL	GPVL	PCS	NPVL
Bamseonggol	620	530	90	1,100	980	120	2,705	2,130	575
Inje	620	530	90	1,100	980	120	2,705	2,130	575
Hongcheon	620	530	90	1,100	980	120	2,705	2,130	575
Gujeoi	620	530	90	1,100	980	120	2,705	2,130	575
Dalcheon	620	530	90	1,100	980	120	2,705	2,130	575
Ganhyeon	620	530	90	1,100	980	120	2,705	2,130	575
Bonghwa	590	530	60	1,030	930	100	3,130	2,130	1,000
Imha	590	530	60	1,030	930	100	3,130	2,130	1,000
Hamyang	640	530	110	1,140	980	160	2,555	2,130	425
Juam	620	530	90	1,110	990	120	2,330	2,130	200

Remarks; GPVL : Gross Production value to be lost.  
 PCS : Production cost to be saved.  
 NPVL : Net production value to be lost.

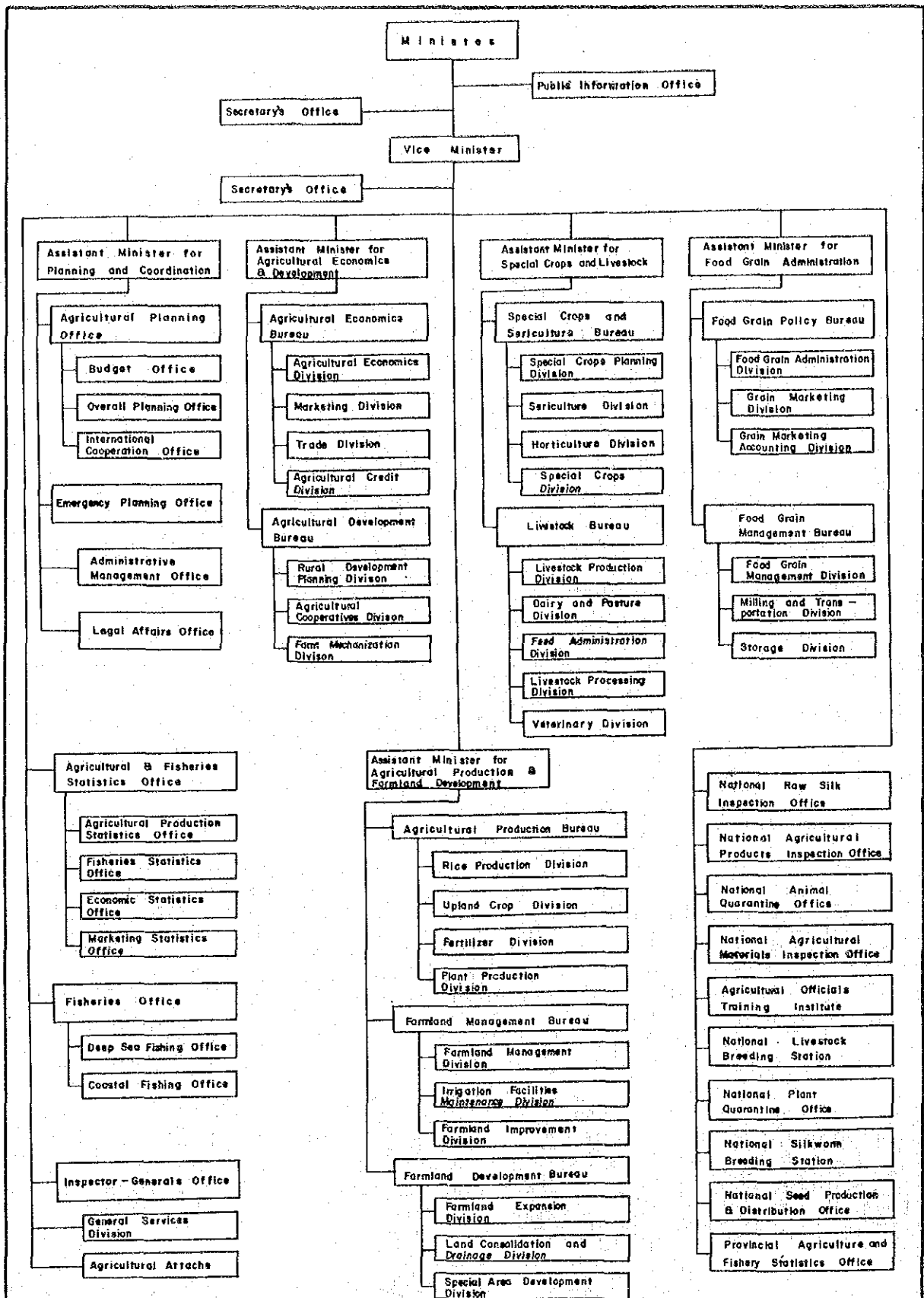


Fig. F 1 Organization Chart of Ministry of Agriculture and Fishery

MINISTRY OF CONSTRUCTION  
 GOVERNMENT OF THE REPUBLIC OF KOREA  
 THE LONG-TERM MULTIPURPOSE DAM SCHEMES  
 PRELIMINARY FEASIBILITY STUDY  
 JAPAN INTERNATIONAL COOPERATION AGENCY

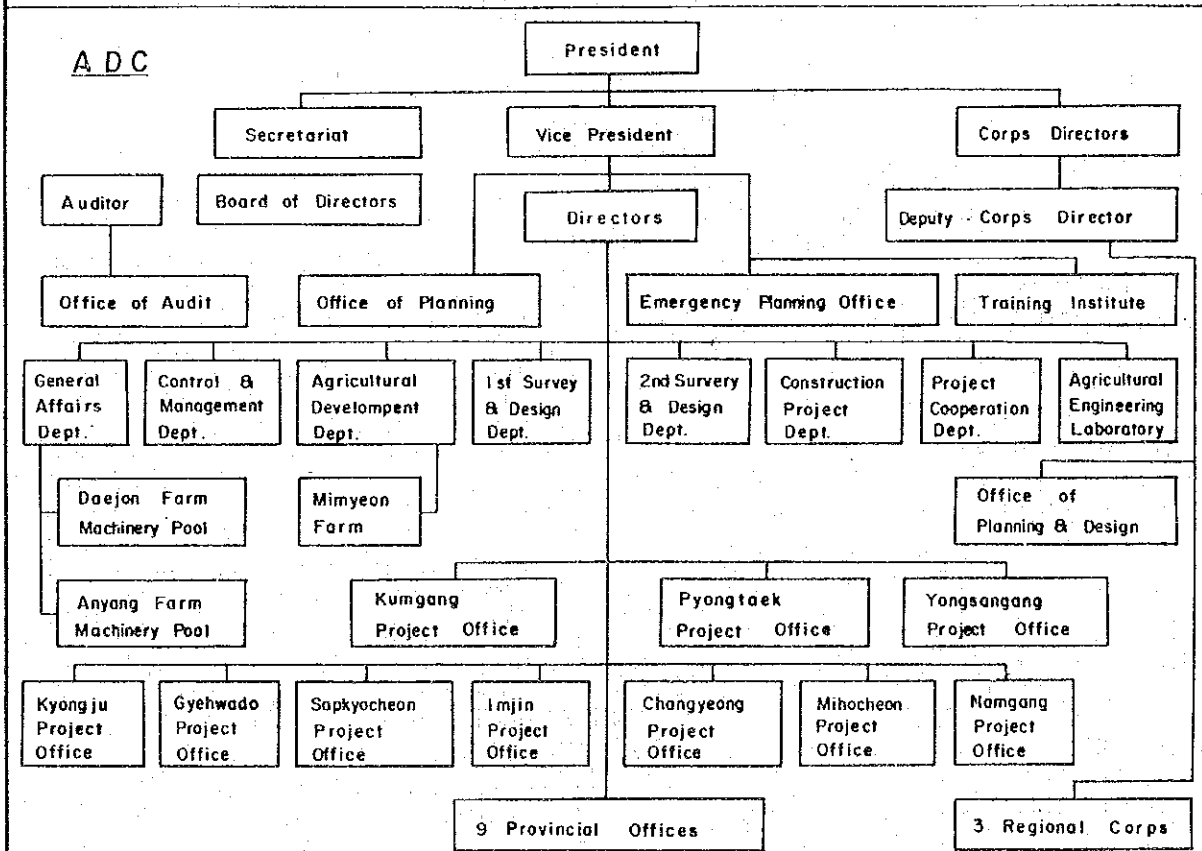
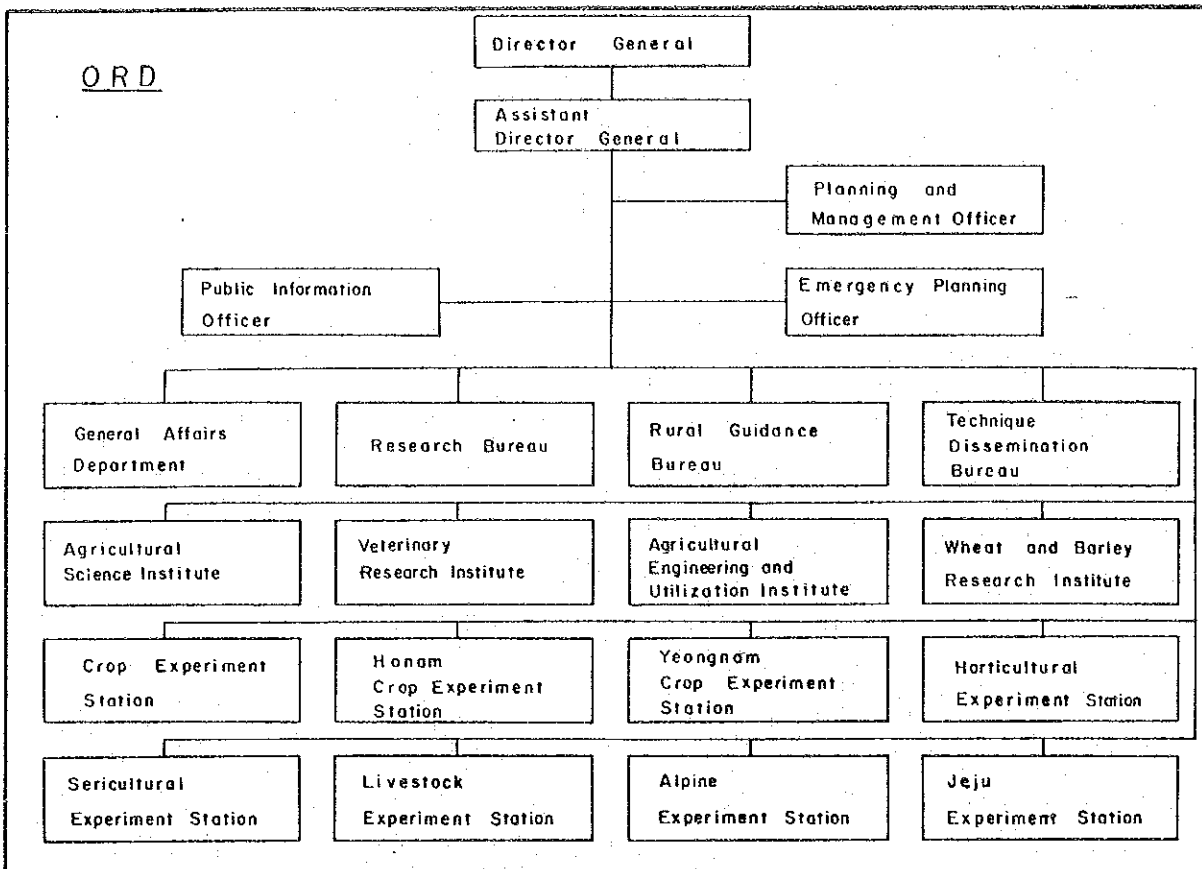


Fig. F 2 Organization Charts of ORD and ADC

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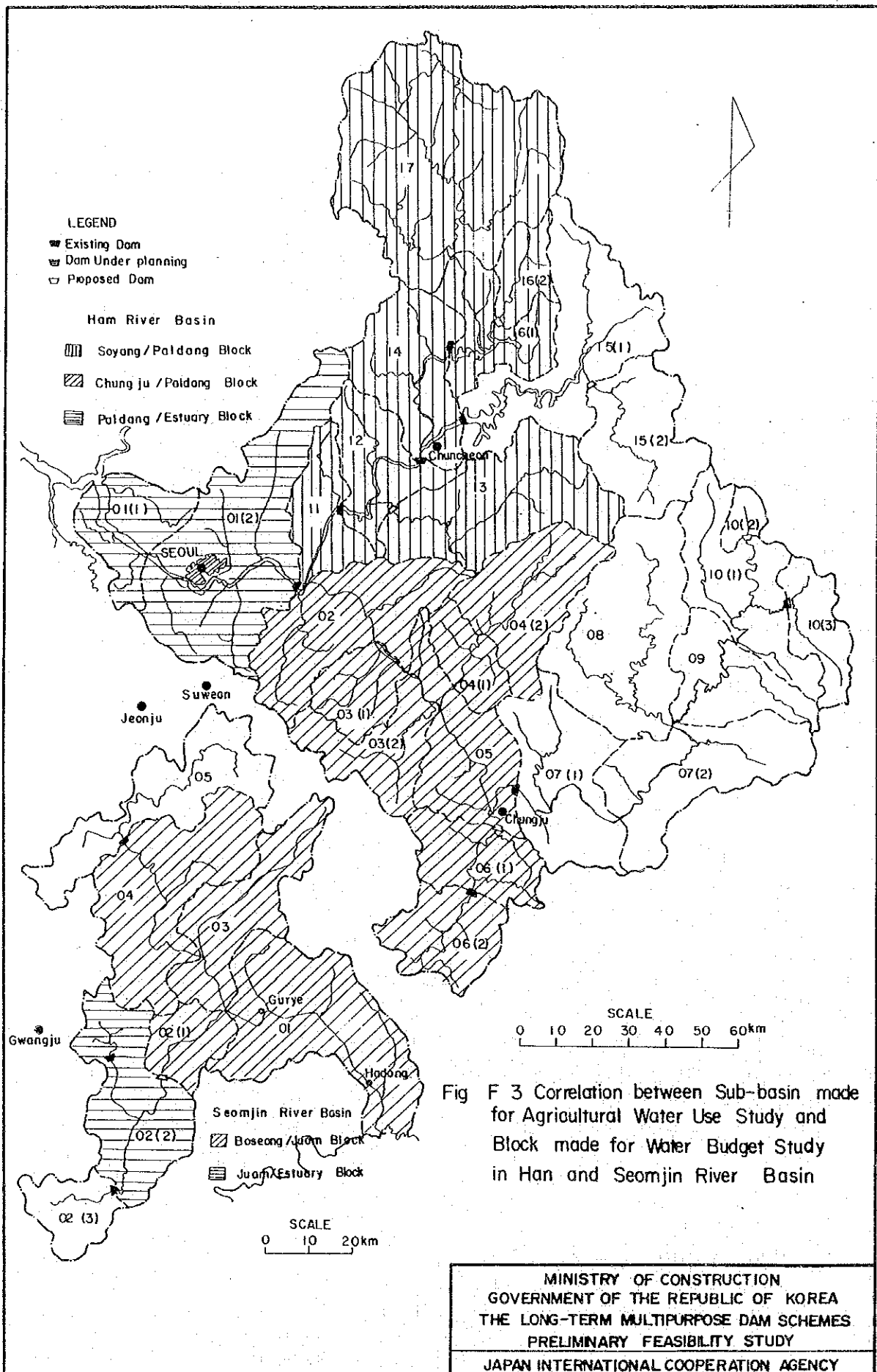


Fig F 3 Correlation between Sub-basin made for Agricultural Water Use Study and Block made for Water Budget Study in Han and Seomjin River Basin

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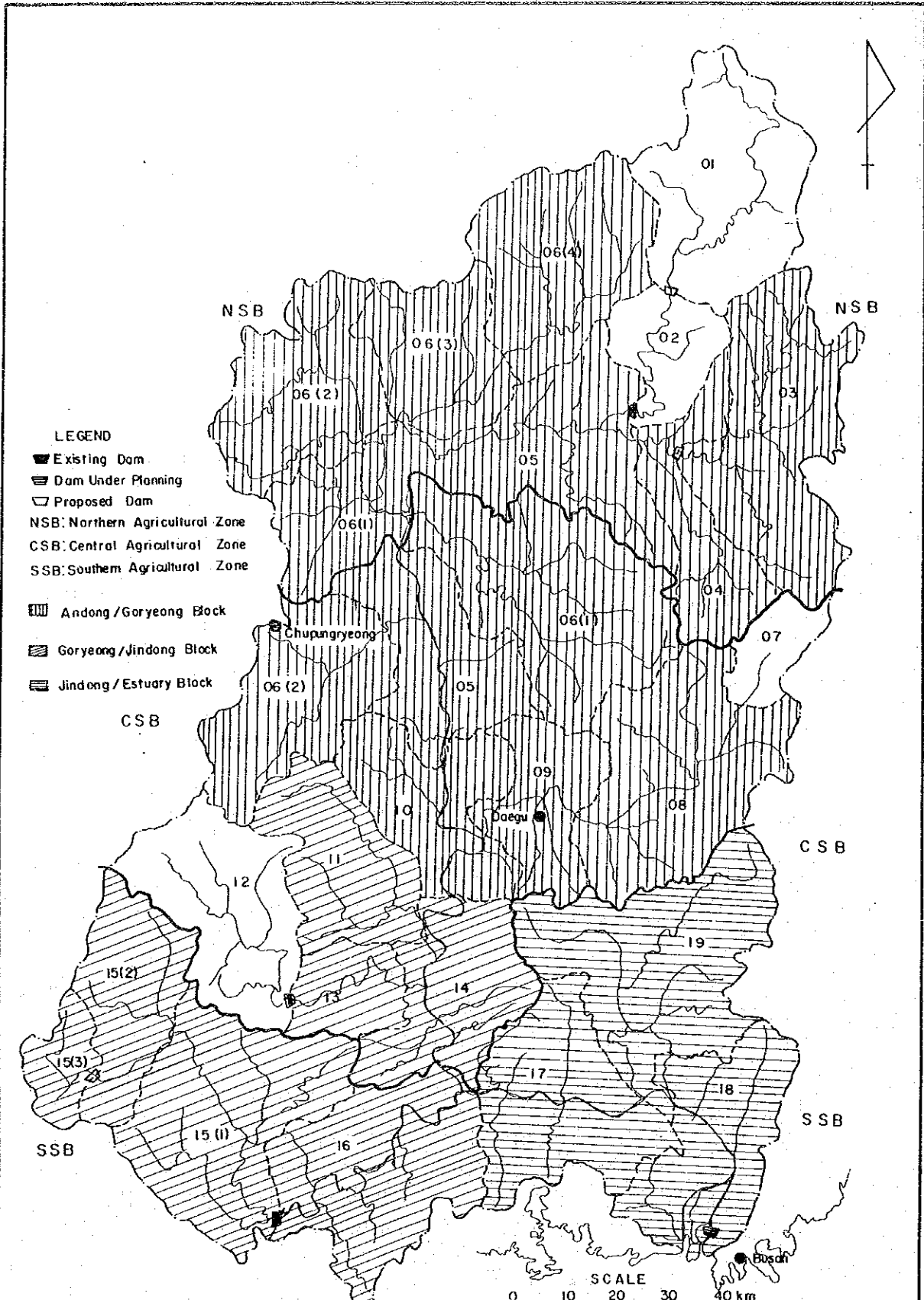


Fig. F4 Correlation between Sub-basin made for Agricultural Water Use Study and Block made for Water Budget Study in Nagdong River Basin

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