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AGRICULTURAL SECTOR SURVEY

REPUBLIC OF KOREA

(in four volumes)

VOLUME I

GENERAL REPORT

November 13, 1973

Asia Projects Department

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## GLOSSARY

### CURRENCY EQUIVALENTS (1972)

US\$1.00	=	400 won
One won	=	US\$0.0025

### WEIGHTS AND MEASURES

The metric system is used in this report.

Korean statistics report land area in Cheongbo. One Cheongbo equals 0.9917 hectares. Cheongbos and hectares are considered equal in this report. Other land unit measures used in Korea are: Tanbo = 0.1 Cheongbo and Pyung = 35.56 square feet.

### ABBREVIATIONS

MAF	=	Ministry of Agriculture and Fishery
EPB	=	Economic Planning Board
MHA	=	Ministry of Home Affairs
MOC	=	Ministry of Construction
MCI	=	Ministry of Commerce and Industry
MHSA	=	Ministry of Health and Social Affairs
ME	=	Ministry of Education
ORD	=	Office of Rural Development
NACF	=	National Agricultural Cooperative Federation
ADC	=	Agricultural Development Corporation
AFDC	=	Agricultural and Fisheries Development Corporation
LIAs	=	Land Improvement Associations
OOF	=	Office of Forestry
OFA	=	Office of Fisheries Affairs
CFFC	=	Central Federation of Fishery Cooperatives
AERI	=	Agricultural Economics Research Institute
FFYP	=	First Five-Year plan, 1962-66
SFYP	=	Second Five-Year Plan, 1967-71
TFYP	=	Third Five-Year Plan, 1972-76

### DESIGNATION OF ADMINISTRATIVE AREAS

Do	=	Province
Gun	=	County
Myun	=	District
Ri-dong	=	Village

This report is based on findings of an agricultural sector survey mission that visited the Republic of Korea during the period of October 15 - November 17, 1972. Mission members were:

Mission Leader	R. P. Christensen
Credit and Marketing	R. Allen (Consultant)
Resource Economics	J. Anderson (Consultant)
Foreign Trade	E. Brook
Forestry	S. Draper (FAO/IBRD CP)
Crops	A. Jones (FAO/IBRD CP)
Livestock and Sericulture	D. Masterton (FAO/IBRD CP)
Price Policy and Mechanization	C. Nohre (Consultant)
Fisheries	R. Payne (Consultant)
Mission Secretary	Barbara Rigsby

S. Okabe, P. Scandizzo, and R. Christensen visited the Republic of Korea in August 1972 to collect data and information for use in the survey.

H. T. Chang and R. E. Welsh assisted the mission in analyzing resource development potentials during October 15-25. S. Asanuma joined the mission during November 7-17 to provide general economic consultation. H. T. Chang helped put the annexes on Natural Resources and Population, Crops, and Land and Water Resource Development into final form.

R. P. Christensen discussed the report with Korean Government officials in September 1973. The report makes frequent reference to the Third Five-Year Plan for 1972-76 published in 1971 and to the adjusted Third Five-Year Plan for 1972-76 prepared in 1972. On September 20, 1973, the Ministry of Agriculture and Fisheries published a new report, "An Outline of Long-Range Projections," for 1972-81 which revised some targets for 1976 and set new targets for 1981. It supplements data contained in the publication, "Major Economic Indicators of the Korean Economy, 1972-81", issued in June 1973 by the Economic Planning Board. This sector report refers mainly to targets set for 1976 in the adjusted Third Five-Year Plan but includes references to the new targets set for 1976 and 1981.



BACKGROUND DATA

Total population (1972) .....	32,359,000
Total population (1971) .....	31,849,000
Farm population, total (1971) .....	14,711,829
Farm population, share of total (1971) .....	46.2%
Total population growth rate (1961-71) .....	2.3%
Farm population growth rate (1961-71) .....	.1%
Urban population growth rate (1961-71) .....	4.7%
Total employment (1971) . . . . .	9,708,000
Employment in agriculture, forestry, and fishery (1971) .....	4,709,000
Share of employment in agr., forestry and fishery (1971) .....	46.5%
Agricultural employment growth rate (1961-71) .....	-.4%
Nonagricultural employment growth rate (1961-71) .....	7.2%
Unemployment rate, total labor force (1971) .....	4.5%
Unemployment rate, farm households (1971) .....	1.5%
Gross national product (1971) .....	3,086 bil won, 8.34 bil US\$
GNP per capita (1971) .....	96,900 won, 262 US\$
GNP compound growth rate in 1965 price (1961-71) .....	9.8%
GNP from agriculture, growth rate in 1965 prices (1961-71) ....	3.5%
GNP from agriculture, share of total (1971) .....	29.1%
Total land area .....	98,500 km <sup>2</sup>
Farm land (cultivated area) .....	23,100 km <sup>2</sup>
Paddy .....	12,750 km <sup>2</sup>
Upland .....	10,350 km <sup>2</sup>
Forest .....	66,400 km <sup>2</sup>
Other .....	9,000 km <sup>2</sup>
Population per km <sup>2</sup> of total area (1971) .....	329
Population per km <sup>2</sup> of cultivated area (1971) .....	725
Main agricultural exports .....	Marine products; silk, tobacco
Main agricultural imports .....	Rice, wheat, corn, soybeans, sugar



	<u>1961</u>	<u>1971</u>
<u>Farm households</u>		
Total number (000)	2,327	2,482
Population per farm household	6.23	5.93
Land per farm household (ha)	.881	.923
Paddy field (ha)	.525	.514
Upland (ha)	.356	.409
<u>Land use (000 ha)</u>		
Cultivated area	2,049	2,290
Paddy	1,221	1,275
One-crop	774	641
Two-crop	447	634
Upland	828	1,015
<u>Basic food crop production (000 m tons)</u>		
Total (polished rice and barley)	5,933	7,275
Rice	3,463	3,998
Barley and wheat	1,801	2,197
Miscellaneous cereals	96	110
Pulses	190	263
Potatoes	383	707
<u>Grain imports (000 m tons)</u>		
Total food grains	471	2,676
Rice (polished)	-	1,004
Wheat	348	1,672
Barley (polished)	123	-
Corn	-	311
Soybeans	-	62
<u>Marine production (000 m tons)</u>		
	436	1,074
<u>Livestock numbers (000)</u>		
Native cattle	1,096	1,247
Milk cows	1	30
Beef cattle	-	3
Horses	21	13
Pigs	1,256	1,333
Sheep	-	3
Chickens	11,218	25,903
<u>Farm prices 1965 = 100</u>		
Prices received, all farm products	47.1	235.9
Prices paid, all goods and services	55.5	227.2
Parity ratio	84.9	103.8



REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

THE GENERAL REPORT

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REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

THE GENERAL REPORT

SUMMARY

Rapid Economic Growth

i. The Republic of Korea has made extraordinary progress in modernizing its economy in the last decade. GNP measured in constant prices increased almost 10% a year during 1961-71. Total fixed investment as a share of GNP increased from 11% in 1960 to 25% in 1971. Because of the large investments made for education in earlier years, almost 90% of the adult population now is literate, nearly all children attend primary schools, and 40% attend secondary schools. Population growth has declined from 2.8% a year in the early 1960's to 1.7% in 1971 with increased education and industrial development.

ii. The agricultural sector has been greatly influenced by rapid industrial growth. Employment in other sectors doubled and GNP of these sectors rose 2.5 times from 1961 to 1971. Approximately 3.5 million rural people (more than one-fifth of the urban population in 1971) moved to urban areas to take advantage of better employment and income opportunities. Agricultural employment did not change during the early 1960's, but it has decreased about one percent annually since 1966.

STRUCTURAL CHANGES IN THE ECONOMY

	<u>Employment (Million)</u>			<u>GNP (Bil won, 1965 prices)</u>		
	<u>Total</u>	<u>Agr.</u>	<u>Other</u>	<u>Total</u>	<u>Agr.</u>	<u>Other</u>
1961	7.5	5.0	2.5	614	269	345
1966	8.7	5.0	3.7	914	346	568
1971	9.7	4.7	5.0	1,556	376	1,180

Korea reached a turning point in its economic development when the absolute decline in agricultural population and employment began in the mid-1960's. If the trend continues, fewer people will depend upon Korea's limited land resources for a livelihood. Potentials for raising productivity per worker in agriculture will increase. Employment projections by sectors differ, but agricultural employment is expected to decline one percent or more annually in the next decade.

iii. The Government's present emphasis on accelerating growth of the agricultural sector is a result of two developments: (a) agricultural production failed to keep pace with rising market requirements causing the trade deficit for food and raw agricultural products (excluding forestry and fishery products) to rise from US\$80 million in 1961 to US\$460 million

in 1971, and (b) incomes in rural areas failed to keep pace with those of salary and wage earner households in urban areas. Incomes of farm households declined relative to those of urban households during the first half of the 1960s. Not until after 1967 when prices of farm products increased greatly under Government programs did real farm incomes rise significantly. The Government also has been concerned with reducing congestion in large urban centers caused by the influx of people from rural areas, encouraging greater decentralized growth of the economy, and improving social services for rural families.

INCOMES PER FARM AND URBAN HOUSEHOLD  
( '000 won)

	<u>1963</u>	<u>1967</u>	<u>1971</u>
Farm households	93	149	356
Urban households	80	249	452
Farm/urban (%)	116	60	79

TFYP for 1972-76 and the Sae Maeul Movement

iv. Rapid industrial growth was the major objective of Korea's development strategy during the first (1962-66) and second (1967-71) plan periods. The urban industrial sector absorbed the lion's share of investment resources. But the Government decided to put much more emphasis on agricultural development in its Third Five-Year Plan (TFYP) for 1972-76. The original TFYP called for investments in the agricultural sector of 807 billion won in 1972-76 compared with only 262 billion won in 1967-71 and 127 billion won in 1962-66.

INVESTMENTS IN AGRICULTURE, FISHERY, AND FORESTRY  
(Billion won at 1972 prices)

	FFYP 1962-66 <u>Actual</u>	SFYP 1967-71 <u>Actual</u>	Original TFYP <u>1972-76</u>	Added Sae Maeul	Adjusted TFYP <u>1972-76</u>
Agriculture	94.8	170.7	553.4	262.1	815.5
Forestry	12.0	12.0	54.0	-	54.0
Fishery	16.3	62.8	130.9	-	130.9
Rural elec- trification	3.0	13.5	52.9	16.1	69.0
Rural hospitals	<u>1.0</u>	<u>3.1</u>	<u>16.1</u>	<u>6.7</u>	<u>22.8</u>
Total	127.2	262.1	807.3	284.9	1,092.2

Source: EPB.

v. In 1972, when the Sae Maeul Movement (New Community Making) was launched, new and enlarged projects involving additional investments in agriculture amounting to 285 billion won were added so the adjusted TFYP calls for a total investment of 1,092 billion won in agriculture during

1972-76, almost four times as much as during 1967-71 and eight times as much as during 1962-66. Investments in the agricultural sector are projected to rise from about 6% of the total for all purposes in the first and second five-year plans to 17% in the third. The Government estimates that external financing required to carry out the adjusted TFYP amounts to 429 billion won.

vi. In addition, the Sae Maeul Movement (New Community Making) includes increased financing by National and Provincial Governments for village improvements in housing, roads, bridges, schools, libraries, water supply, sanitation, drainage, and other rural facilities and social services. Rural villages are being encouraged to carry out self-help projects to improve rural living conditions.

vii. The TFYP set an average annual growth target for total agricultural output (including forestry and fisheries) of 4.5% compared with 4% reported by official statistics for 1961-71 (value added basis). Heavy emphasis was placed on accelerating rice production but targets set for other products also were large. It was anticipated that self-sufficiency in rice would be achieved by 1976 although wheat imports would total 1.5 million tons and feed grain imports would continue to rise.

#### New Long Range Projections

viii. In September 1973 MAF issued a report, "An Outline of Long Range Projections", which revised investment and production plans for 1972-76 and made new projections for 1977-81. Total investment in agriculture, fishery and forestry was set at 836 billion won for 1972-76 in these new projections compared with 1,092 billion won in the adjusted TFYP (referred to above) and 807 billion won in the original TFYP. The new projections reduced investments for land and water development projects from those indicated in the adjusted TFYP but provide for completion of these projects over a longer period. Investment outlays for agriculture, fishery, and forestry projected for 1973-81 account for 10.5% of the total for all purposes. GNP from the agricultural sector at 1970 prices is projected to rise 4.7% annually during 1972-81 compared with 3.5% annually during 1961-71. Total GNP is projected to rise 10-11% a year during 1972-81. The agricultural sector would account for about 10% of the increase in total GNP from 1972 to 1981, about the same as its share of total investment outlays according to these projections.

LONG RANGE INVESTMENT PROJECTIONS  
(Billion won at 1972 prices)

	Actual	-----Projections-----			
	1972	1973-76	1972-76	1977-81	1972-81
Agriculture	99.2	449.7	548.9	741.2	1,290.1
Forestry	10.5	31.8	42.3	48.5	90.8
Fishery	27.3	106.7	134.0	261.5	395.5
Rural electrification	8.9	49.8	58.7	16.9	75.5
Rural hospitals	3.2	49.0	52.2	30.6	82.8
<b>Total</b>	<b>149.1</b>	<b>687.0</b>	<b>836.1</b>	<b>1,098.7</b>	<b>1,934.8</b>

Source: EPB, September 1973.

Resources and Population

ix. Korea is a hilly and mountainous country. Of the total area of 9.9 million ha, 6.7 million ha are classified as forest. Korea has 2.3 million ha of cultivated land, only .07 ha per capita, about the same as Japan and Taiwan. About 60% is paddy and 40% is upland used to grow barley, wheat, fruit, vegetables and many other crops. About half of the cultivated area is double cropped during the winter and spring with barley, wheat, vegetables, and similar cold weather crops.

x. Major constraints to expanding crop production include low natural fertility and high acidity of soils which require large applications of fertilizer and lime to be productive, highly variable rainfall which often causes water shortages during rice planting periods in the spring and flood damage in the summer and fall, and inadequate irrigation and drainage systems which together with low temperatures prevent double cropping of much cultivated land.

xi. Nearly 15 million people, about 46% of the nation's total, live in about 35,000 rural villages. There are 2.5 million farm households. Land holdings per household averaged only .92 ha in 1971, including .51 ha of paddy land and .41 ha of dry fields. Each household usually has land in several small plots at different locations averaging only about 0.2 ha in size which makes mechanization difficult. Land reform was carried out in 1950 so almost all farm land now is owner-operated. Farm households receive about 20% of their income from side-line business and nonfarm sources.

xii. Korean farmers have achieved high crop yields. Rice yields, for example, average twice as high as those in Thailand, Indonesia, India, and the Philippines and only about 20% lower than in Japan. Fertilizer use more than doubled during the last decade and now averages about 190 kg of plant nutrients per ha of rice and about 170 kg per ha of other crops. These rates are much higher than in most developing countries although lower than in Japan and Taiwan. Well developed research

and extension (rural guidance) systems helped make possible high levels of technology. Farmers have done a good job of exploiting available research findings and additional research to find ways of increasing yields is needed.

#### Recent Performance

xiii. Official statistics show that gross output of crop and livestock products rose at a compound annual rate of 4.2% during 1961-71, a higher rate than in most countries. On a value added basis, crop and livestock output increased 2.6% a year. Basic food crops (rice, barley and other cereals, soybeans and other pulses, and potatoes) increased 2.5% annually, more than the population growth rate of 2.3%. Net imports of rice, barley and wheat increased from less than 500,000 tons a year in the early 1960's to 2.7 million tons in 1971 and 2.8 million tons in 1972. Per capita consumption of food grains increased from 200-215 kg annually in the early 1960's to 240 kg in 1968-70, 267 kg in 1971 and 281 kg in 1972. These per capita consumption rates are much higher than in other countries with similar income levels even after making allowance for losses, wastes, and nonfood uses. More food grains may have been used for livestock feed in recent years than formerly. However, feed grain imports also increased from small quantities in the early 1960s to over 500,000 m tons in 1972.

xiv. Estimates of increases in fruit and vegetable production also appear high. Only small quantities are exported. Production statistics indicate that per capita consumption of vegetables doubled and that of fruit more than doubled during 1961-71. Farm marketings of fruits and vegetables undoubtedly increased greatly as the urban population rose about 5% annually and real income per capita in urban areas doubled.

xv. Livestock production increased 7% annually. Numbers of native cattle declined slightly from 1963 to 1968 but have increased since then. High output growth rates were achieved for milk, hogs, poultry and eggs based mainly on larger feed imports. Products requiring little or no land such as tobacco, ginseng, mulberry, and mushrooms increased at high rates. Forestry production doubled but this has caused some reduction of timber resources despite large reforestation programs. Fishery production tripled due mainly to rapid growth of off-shore fishing in the China and Yellow Seas (replacing Japanese fishing vessels) and of deep-sea fishing in distant waters.

xvi. Korea's record of expanding agricultural output is outstanding considering its limited land resources. The most notable achievement was a rise in labor productivity of about 3% annually as measured by value added per farm worker to GNP. Major factors contributing to increased output per worker were diversification of production to include more fruits, vegetables, tobacco, sericulture, livestock and other labor-intensive enterprises to utilize available labor more fully throughout the year; increased use of fertilizer, pesticides, and other intermediate inputs to increase crop yields; and additional double cropping made possible by drainage and irrigation improvements.

Price and Income Policies

xvii. Government price support programs have raised farm incomes and reduced seasonal variations in farm product prices, but they have not accelerated growth in food grain production which has remained close to 4 million m tons annually in the last three years. They could not be expected to overcome constraints to increasing production described above. During the first half of the 1960's, producer prices of food grains averaged about the same as those at which imports were available, but with the increases under Government programs producer prices of rice, barley and soybeans in 1971 averaged 62-65% higher than those paid for imports using the nominal exchange to convert Korean won to U.S. dollars. Producer prices for food grains are lower than in Japan but higher than in Taiwan. Farm product prices in Korea increased 133% from 1965 to 1971 and net income per farm household in current prices tripled. Income distribution did not change as net incomes of small farms (less than 0.5 ha) averaged about one-third of those of large farms (over 2.0 ha) in 1971 as well as in 1965.

PRODUCER AND IMPORT PRICES OF SELECTED PRODUCTS, 1971  
(US\$ per m ton)

	Republic of Korea			Japan Producer Prices	Taiwan Wholesale Prices
	A Producer Prices	B Import Prices	A/B		
Rice, polished	254	157	1.62	390	168
Wheat	79	65	1.22	151	-
Barley, unpolished	104	63	1.65	165	-
Soybeans	213	123	1.73	251	168
Corn	88	62	1.42	-	-

xviii. Price support programs do not seem to have resulted in price relationships among commodities that distort resource allocation. Producer prices of fruits, vegetables, beef cattle, hogs, and cocoons increased as much as those of rice and barley since 1965. Prices of milk, poultry and eggs did not rise as much as those of other products, but restrictions have been put on imports of dairy products in 1972 to raise producer prices. Commercial poultry farms have benefited from enlarged feed imports made available at low prices. Beef cattle prices have increased more than those of rice, barley, and soybeans.

xix. There is economic justification for maintaining prices of import-substitution commodities (rice, barley, wheat, soybeans, corn, etc.) at levels above those at which imports are available at the nominal exchange rate. Export industries receive many kinds of Government assistance (interest subsidies, tariff concessions on imported materials, internal tax concessions, etc.). The nominal exchange rate needs to be adjusted upward

by about 30% when valuing import substitution commodities in order to compare them with prices at which imports are available. However, high domestic prices for food grains (US\$309 m ton for rice and US\$208 m ton for barley in 1972 at the nominal exchange rate) should not be used in measuring economic returns from investments to expand output of these crops.

xx. The Government has encouraged use of fertilizer, pesticides and lime to increase crop yields. Average fertilizer prices have not increased since 1965, pesticides are subsidized, and lime is distributed free. Only 0.5 kg of rice was required to purchase 1.0 kg of plant nutrients in 1972. The justification given for these programs is that small farmers cannot afford to pay higher prices. However, subsidized prices can result in wasteful use of resources. Physical potentials for increasing crop yields through the use of fertilizer and pesticides have been quite fully exploited and new high-yielding varieties responsive to increased use of fertilizer are needed. Prices of these inputs should gradually be increased, and other programs to improve incomes and welfare of rural people given increased support.

#### Food Grain Self-Sufficiency

xxi. The Government places high priority on achieving self-sufficiency in rice, barley and soybeans. However, imports of feed grains, soybeans, fats and oils, and many other farm products also have risen greatly in recently years. Consequently, there are large potentials for import substitution in other farm products and they also should be given high priority. Mission estimates indicate that Korea likely will need to import 2.3 to 2.8 million m tons of food grains annually, about the same as during the last three years, to meet food grain requirements in the next few years. Feed grain imports are expected to rise. As wheat imports cost only about half as much per ton as those of rice, substitution of wheat products for rice in Korean diets can reduce foreign exchange costs. Wheat imports were increased and rice imports reduced in 1972.

#### Diversification of Agriculture

xxii. Korea needs to help its farmers take advantage of opportunities to further diversify production and utilize labor resources more fully. Much progress has already been made in diversifying agriculture. Rice and barley accounted for only 49% of the total value of crops and livestock produced in 1971 compared with 76% in 1961. There are still large potentials for expanding output of fruits, vegetables, tobacco, ginseng, mushrooms, cocoons, and livestock products and provide productive use of labor during periods of the year when not required for food grain production. It will be desirable to take advantage of opportunities to increase livestock output by improving pasture and forage production on slopeland and to expand output of labor-intensive crops which have a high value per ha. Domestic demand for fruits, vegetables, and livestock products in urban areas will expand greatly in the years ahead.

Land and Water Resource Development

xxiii. Government plans call for a massive increase in investments for land and water development projects--380 billion won during 1972-76 (adjusted TFYP) compared with 44 billion won during 1967-71 (SFYP). Plans for 1973-76 under the Sae Maeul Movement are as follows:

	<u>Bil. won</u>	<u>Ha affected</u>
Paddy rearrangement	67	224,000
Expand small irrigation facilities	97	190,000
Four river basin projects	69	135,000
Eleven large scale irrigation projects	75	117,000
Slopeland development	<u>18</u>	<u>12,000</u>
Total	<u>326</u>	<u>678,000</u>

It is estimated that economic returns from these projects range from 10 to 22% annually using the current high domestic prices for rice and barley. However, much additional technical and economic analysis will be required to support these estimates. Clearly, it will not be possible to complete all proposed projects by 1976. The mission recommends that future projects for resource development be made a part of integrated area and regional development projects for river basins and watershed areas. It will be desirable to determine for watershed areas and river basins the appropriate sequences of projects for irrigation and drainage improvements, forest and slopeland development, and soil erosion and flood control structures required for building up the agricultural production base. Measures to improve credit, marketing, extension, and other supporting services need to be an integral part of area and regional development plans. Korea needs to build on its recent experience in carrying out integrated area development projects (e.g., Bank irrigation and area development projects and UNDP Upland Development and Watershed Management Projects).

xxiv. There is urgent need for land capability studies which indicate future production possibilities by areas and regions to provide a better basis for agricultural development planning. Development plans also should take into account changes in members of rural people who will be dependent upon agriculture for a livelihood. In four of Korea's nine provinces, where 75-80% of the population was classified as rural in 1966, total population has decreased since 1966. Marginal and sub-marginal areas for agriculture need to be identified to avoid excessive investment in such areas. They likely will be hardest hit by migration to cities accompanying general economic growth. Investment for agricultural development in such areas may be abandoned in a relatively short period causing substantial economic waste.

### Farm Mechanization

xxv. The Government has put increased emphasis on mechanization of farming operations because of rising farm wage rates and labor shortages in peak labor periods in the spring and fall. The adjusted TFYP calls for increasing the number of power tillers from 17,000 at the end of 1972 to 112,500 in 1976 and large increases in power threshers and sprayers. It is planned to mechanize field operations on one million hectares of cultivated land by 1976, almost half the national total, under the adjusted TFYP compared with 450,000 ha under the original TFYP. The mission believes that farm mechanization as projected in the original TFYP is most realistic. Farmers need to gain experience with power equipment, repair services need to be established, and arrangements for sharing the use of expensive machinery by farmers worked out. However, once these services are established farm mechanization could move ahead rapidly. The mission recommends that supplies of farm equipment be increased to meet expanding demands at prices that cover production and distribution costs and that additional credit be made available to help farmers finance the purchase of equipment and machinery.

### Agricultural Credit

xxvi. Farmers use only small amounts of credit to finance farming operations. However, lack of credit has not been a major constraint to increased purchases of fertilizer, pesticides, seeds or other inputs required to increase crop yields. Rising prices for farm products have increased cash incomes of farmers in recent years making possible the purchase of additional fertilizer, pesticides and other inputs without the use of credit. Nevertheless, farmers need more intermediate and long-term credit at reasonable terms to finance investments for mechanization, livestock, sericulture, buildings and land improvements. Farmers also would need much more credit if subsidy programs for fertilizer, pesticides, and other purchased inputs are reduced.

### Marketing

xxvii. The Government rightly places high priority on improvements in marketing facilities in its TFYP. Additional storage, transportation and processing facilities will be required as the urban population increases. The volume of farm products moving to market has gone up greatly during the last decade as urban population increased almost 60% and per capita consumption levels rose with higher real incomes. Commercial marketings of fruits and vegetables doubled and those of food grains increased almost one-half. Most marketing services are supplied by private enterprises. Storage facilities for Government purchased food grains under price support programs are being expanded. But there is need for improving milling, storage, and transportation facilities for rice and barley and marketing facilities for fruit and vegetables.

### Agricultural Administration

xxviii. Currently, administrative responsibility for planning and carrying out agricultural and rural development programs is widely diffused. Several Ministries in addition to the Ministry of Agriculture and Fisheries are concerned with resource development and improving rural living and employment conditions. Examples include Ministry of Construction (MOC) - roads, multi-purpose reservoirs and other civil works; Ministry of Commerce and Industry (MCI) - rural electrification and manufacturing centers; Ministry of Health and Social Affairs (MHSA) - water supplies, medical care, and family planning; Ministry of Education - agricultural colleges, primary schools, and libraries. The Ministry of Home Affairs has provincial and local authority over rural development projects including agricultural extension and finances village projects for improving housing, roads, bridges, small irrigation and drainage structures, community centers, and other social facilities. There is a need for centralization of agricultural and rural development planning functions in one agency with a capable staff to prepare detailed plans by areas and regions in cooperation with local officials. Also, there is need for carefully defining the functions of the many different agencies concerned with agricultural and rural development to achieve better coordination and to avoid duplication in carrying out projects and programs.

### Prospects

xxix. Korea will find it difficult to expand agricultural output by the 4.5% annually called for in the TFYP. It is not possible to increase the total area of paddy and it may decrease with industrial and urban growth. The planned annual increase of 3.6% in rice production requires that yield per ha increase one-fourth by 1976 over those in 1970-72. The TFYP projected yield of 4 tons of polished rice per ha in 1976 would be equivalent to 6 tons of unhulled rice per ha compared with the average yield of 5.64 tons per ha in Japan in 1970 where water control systems are much better developed than in Korea. The mission concludes after reviewing prospects for increasing yields by adopting improved agronomic practices and making improvements in irrigation, drainage, and flood control that are possible by 1976 that a compound annual increase in rice production of 1.5% a year from 1970 to 1976 is as much as can be expected. Longer-term prospects of increasing rice production will depend on the development of new higher-yielding varieties and improvement of water control facilities.

xxx. Output of upland crops (barley, wheat, soybeans, and other pulses, fruits, vegetables, mulberry, etc.) can be increased by improving drainage and irrigation systems to permit increased double-cropping, by bringing additional slopeland under cultivation, and by adopting agronomic practices to raise crop yields. Targets set for most upland crops can be achieved with continuation of ongoing programs. Those set for livestock production in 1976 will require continued increases in feed imports. But there are large potentials for increasing beef production from pasture and forage in slopeland areas over a longer period.

xxxi. Korea's dynamic fishing industries can be expected to grow at high rates. There are good prospects for exceeding targets set for deep-sea and off-shore fishing and for aquiculture. Coastal fishing areas have been heavily exploited so the government is wisely putting into effect measures to establish spawning grounds and protect fishing grounds. Coastal fishery production in 1972 almost reached the target set for 1976 and will greatly exceed it in 1973. Fishery products are the main source of high quality protein food. Per capita consumption of fishery products increased from 15 kg in 1960 to 22 kg in 1971 while that of meat rose from 4 kg to 7 kg.

xxxii. There are good prospects for increasing labor productivity in the years ahead as the agricultural labor force continues to decline and farming operations become more mechanized. Labor shortages are becoming more acute during peak labor periods in the spring when winter crops are harvested and rice is planted and again in the fall when rice is harvested and winter crops are planted. However, farm workers still are idle much of the year and there are opportunities to utilize labor resources more fully by diversifying agricultural production.

#### Priority on Agriculture and Rural Development

xxxiii. Agriculture and rural development have been relatively neglected and merit higher priority than received in the past. However, it is doubtful that the agricultural sector can effectively utilize the very large increases in capital investments proposed in the TFYP (four times as much as during 1966-71). Much additional technical and economic analysis is needed to determine what the financial and economic returns would be from the various investment projects proposed in the prospectuses prepared by the Government. It will not be possible for the Government to carry out all proposed projects by 1976 and consideration should be given to extending them over a longer period, say 9-10 years. Investments to modernize agriculture and increase productivity per worker should receive high priority, but it also should be recognized that investments in other sectors can benefit rural people by creating better nonfarm employment and income opportunities for them.

xxxiv. Korea's future economic growth depends mainly on maintaining the good momentum achieved in expanding its nonagricultural sectors. Manufacturing output increased 20% a year during 1961-71. Exports of manufactured goods have increased almost 40% a year since 1965 accounting for 86% of all exports in 1971 compared with only 22% in 1961. Investments in agriculture should be concerned chiefly with modernizing farming methods and raising productivity of farm workers.

xxxv. The mission did not study rural development programs in detail, but it believes that the promotion of "self-help" projects under the Sae Maeul Movement has much merit. There are potentials for utilizing idle labor and local materials for constructing community facilities (roads, water supply, sanitation, schools, etc.). Better medical facilities and electrification will directly benefit rural people. However, investments

for improving rural social services need to take into account the potentials for decentralized industrial development and future migration from rural to urban areas.

#### External Assistance

xxxvi. The mission recommends that external investment projects be considered in two categories: (a) those that can proceed independently and (b) area development projects which provide for improved use of land and water resources in watershed areas. Area development projects should include better forest and vegetative cover in the most highly elevated areas to supply timber, help prevent soil erosion, and siltation of downstream rivers and reservoirs; fuelwood blocks, improved pasture and forage for livestock and upland crops in slopeland areas; and intensive cropping of lowland areas under irrigation. They also should provide for improvement of farm supporting services for marketing, credit, and extension and of rural community social services. These projects would be similar to irrigation and area development projects now being carried out with IBRD/IDA assistance and UNDP demonstration projects for upland development and watershed management. They will require careful preparation.

xxxvii. Independent projects, some of which can be prepared for early implementation, include a seeds project, an agricultural products processing project, a livestock/credit project on Jeju island and a forestry (timber and industry) project based on public forest lands. Ongoing agricultural credit and dairy-beef development projects may need to be expanded within the next year or two. Projects to help farmers finance mechanization of farming operations and to modernize marketing facilities and expand exports should also receive high priority.

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

THE GENERAL REPORT

I. INTRODUCTION

1.01 This report presents findings of a mission that visited the Republic of Korea during October-November 1972. It attempts to analyze the agricultural sector, both structurally and functionally, and to identify key constraints limiting agricultural development. Attention is given to the objectives and the investments proposed in the Third Five-Year Plan (TFYP) for 1972-76 and the Sae Maeul Movement for accelerating rural development initiated in 1972, but the sector also is viewed in the context of its longer term prospects and problems. The mission had two major objectives:

- (a) to identify and analyze policy issues relating to development of the agricultural sector (including forestry and fishery); and
- (b) in the context of this policy analysis, to investigate development possibilities where external assistance might be able to assist the Republic of Korea in moving towards its objectives, with particular emphasis on identifying projects for external lending and the steps the Government should take for project preparation.

1.02 Principal findings and conclusions of the mission are presented in this General Report. A brief description of the economic structure of the sector, its resource base, and Government institutions serving agriculture is presented in Chapter II. This is followed in Chapter III by an evaluation of the sector's performance during the last decade. Chapter IV reviews Korea's development strategy, plans and prospects. Policy issues relating to future growth of the agricultural sector and recommendations concerning them are discussed in Chapter V. External investment plans and projects are considered in Chapter VI.

1.03 Descriptive material has been kept to a minimum in this General Report but frequent reference is made to more detailed information contained in the annexes. Annex 1 describes natural resources and population changes. Annex 2 analyzes technical and economic aspects of crop production. Annexes 3 and 4 present similar information for livestock and sericulture. Price policies and programs are reviewed in Annex 5, and land and water resource development plans and prospects in Annex 6. Annex 7 examines farm mechanization plans and problems. Agricultural credit and marketing institutions and programs are reviewed in Annexes 8 and 9. Annexes 10 and 11 examine development potentials of the forestry and fishery subsectors. Each annex begins with a short summary of major findings and recommendations.

## II. THE AGRICULTURAL SETTING

### A. Agriculture's Role in the Economy

2.01 The Korean economy has grown rapidly in the last decade with GNP rising at a compound annual rate of almost 10%. Both public and private investments have increased greatly. Total fixed investments as a share of GNP increased from 11% in 1960 to 15% in 1965 and 25% in 1971. Manufacturing output rose almost 20% annually accounting for 18% of GNP in 1971 compared with only 12% in 1961. Exports of goods and services have increased almost 40% annually since 1965; they accounted for 25% of GNP in 1971 compared with only 4% in 1960.

2.02 These extraordinary growth rates were due to many factors among which the most important were large investments made in education in earlier years, Government policies and programs that stimulated savings and investments, and rapid growth of business enterprise based on entrepreneurial skill and initiative. 1/ Formal education in Korea in the early 1950's had reached a level attained only by most countries with income levels three times that of Korea. Almost 90% of the adult population now is classified as literate, nearly all children attend primary schools, over 40% attend secondary schools, and 33% of higher enrollment is in agriculture and engineering. 2/ These investments in education are paying off in economic development.

2.03 Major structural changes in the economy have occurred with rapid growth of employment and output in nonagricultural sectors. A large decline in the population growth rate has been associated with increased education and industrial development. The population growth rate declined from 2.8% a year in the early 1960's to 1.7% in 1971 and is expected to decline to 1.5% by 1976.

2.04 Korea's agricultural sector has been greatly influenced by rapid industrial growth in the last decade. Employment in nonagricultural sectors doubled and output of these sectors more than tripled from 1961 to 1971 (Table 2.1). As nonfarm employment opportunities increased, approximately 3.5 million people (about 20% of the urban population in 1971) moved from rural to urban areas. Agricultural population increased 1.2 million from 1961 to 1966 but it decreased 1.1 million from 1966 to 1971. Agricultural employment did not change in the early 1960's but it has decreased 1% annually since 1966.

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1/ The Economic Situation and Prospects of the Republic of Korea, Report No. EAP-33, IBRD, 1972.

2/ Education, Sector Working Paper, World Bank, September 1972, Table 9, pp. 36-37.

Table 2.1: CHANGES IN AGRICULTURE AND NONAGRICULTURE SECTORS

	<u>1961</u>	<u>1966</u>	<u>1971</u>	<u>1971/1961 (%)</u>
<u>Population (million)</u>				
Agricultural	14.6	15.8	14.7	1
Nonagricultural	<u>10.8</u>	<u>13.4</u>	<u>17.1</u>	<u>58</u>
Total	25.4	29.2	31.8	25
<u>Employment (million)</u>				
Agricultural	5.0	5.0	4.7	-6
Nonagricultural	<u>2.5</u>	<u>3.7</u>	<u>5.0</u>	<u>100</u>
Total	7.5	8.7	9.7	29
<u>GNP (bil. won, 1965 prices)</u>				
Agricultural	269	346	376	40
Nonagricultural	<u>345</u>	<u>568</u>	<u>1,191</u>	<u>345</u>
Total	614	914	1,567	255
<u>GNP Per Worker ('000 won, 1965 prices)</u>				
Agricultural	54	69	80	48
Nonagricultural	<u>138</u>	<u>156</u>	<u>238</u>	<u>72</u>
Total	82	106	161	98

Source: Yearbook of Agriculture and Forest Statistics, MAF, 1972; and Economic Statistics Yearbook, Bank of Korea, 1972.

2.05 The absolute decline in agricultural population and employment which began in the mid-1960's is a major turning point in Korea's economic development. It was made possible by rapid growth of employment opportunities in nonagricultural sectors. Nonfarm employment increased 7% a year from 1961 to 1971. Fewer people will be dependent upon Korea's limited land resources for a livelihood in the years ahead if employment opportunities in other sectors continue to rise at these high rates and rapid migration from rural to urban areas continues.

2.06 Because of the present age distribution of the rural population, an unusually large number of people will enter the labor force in the next few years. Projections of labor force in agriculture differ because it is not certain how rapidly employment opportunities will increase in other sectors. Total agricultural labor force may decrease slowly in the next few years because an unusually large number of people will enter the labor force, but it can be expected to decrease 1% or more annually over the next decade.

2.07 Further reduction in agricultural population and labor force would open up huge potentials for increasing labor productivity and incomes of farm people as more land would be available per worker and farm mechanization would become more profitable. In 1971, value added to GNP

per agricultural worker (measured in 1965 prices) averaged only one-third as high as that of workers in other sectors. Productivity of agricultural workers increased although not as rapidly as that of urban workers. Labor productivity as measured by value added per worker rose 48% in agriculture compared with 72% in nonagricultural sectors from 1961 to 1971. With the shift of workers from agriculture to nonagricultural sectors average output of all workers almost doubled (Table 2.1).

2.08 Official statistics show that total value added by the agricultural sector (including forestry and fishery) to gross national product increased 40% from 1961 to 1971, a compound annual rate of 3.5% (Table 2.2). Crop production, which accounted for 75% of total value added by agriculture in 1971, increased 2.5% a year. Livestock output rose 4.4% annually, forestry 9.1%, and fishery 12.1%. But the large increases in forestry and fishery started from relatively small bases in 1961. Expansion of forestry product output has caused some depletion of timber resources. The high growth rate for fishery was achieved by increased exploitation of off-shore and deep-sea fishing resources. Much of the growth in livestock production was based on larger feed grain imports.

Table 2.2: AGRICULTURAL OUTPUT GROWTH  
(Million won at 1965 prices)

	<u>Value Added</u>		<u>Composition (%)</u>		<u>Compound Annual Growth (%)</u>
	<u>1961</u>	<u>1971</u>	<u>1961</u>	<u>1971</u>	
Crops	224.1	284.1	83.5	75.5	2.5
Livestock	22.3	34.2	8.3	9.1	4.4
Agriculture	(246.4)	(318.3)	(91.8)	(84.6)	2.6
Forestry	9.4	22.6	3.5	6.0	9.1
Fishery	9.0	28.3	3.3	7.5	12.1
Other	<u>3.7</u>	<u>7.2</u>	<u>1.4</u>	<u>1.9</u>	<u>7.0</u>
Total	<u>268.5</u>	<u>376.4</u>	<u>100.0</u>	<u>100.0</u>	<u>3.5</u>

Source: Yearbook of Agriculture and Forestry Statistics, MAF, 1972, pp. 476-77.

2.09 Agriculture's overall growth rate of 3.5% annually appears favorable compared with a population growth rate of 2.3% during 1961-71. But production of food grains, feedstuffs for livestock, oilseeds, and other agricultural products did not rise rapidly enough to keep pace with expanding demand resulting from population and income growth. Although exports of forestry, fishery and specialty agricultural products such as mushrooms and raw silk rose greatly, the value of imports of rice, wheat, barley, soybeans, corn and other feed grains increased much more. Korea's net imports of food and raw agricultural products increased from US\$82 million in 1962 to US\$558 million in 1971.

2.10 Agriculture's importance in the economy as measured by share of total employment and GNP has declined in the last decade (Table 2.3). However, agriculture still is the largest sector of the economy measured in terms of either number of people engaged or contribution to gross national product. In 1971, it employed 48% of the total labor force, accounted for 29% of GNP and provided markets for a large share of Korea's dynamic industrial sector.

Table 2.3: AGRICULTURE'S SHARE OF THE ECONOMY

	<u>Percent of Employment</u>	<u>Percent of GNP</u>	<u>Agricultural<sup>/a</sup> Trade Balance US\$ Million</u>	<u>Agricultural Imports<sup>/a</sup> % of Total Imports</u>
1961	66.7	40.0	- 82	32
1966	57.5	36.0	- 95	20
1971	48.5	28.8	-558	24

/a Food and raw agricultural products excluding forestry and fishery products. See Table 5.6, Annex 12.

Source: Major Economic Indicators, Economic Planning Board, 1972.

2.11 Two developments in recent years have caused the Government to become concerned with achieving more rapid growth in agricultural sector: (a) failure of agricultural output to keep pace with rising market requirements (especially for food and feed grains) and (b) failure of incomes in rural areas to keep pace with those in urban areas. Incomes of farm households averaged higher than those of salary and wage earner families in urban areas in 1963 measured both in current and in 1965 consumer prices (Table 2.4). But the ratio of farm to urban household income declined abruptly from 1963 to 1967. Not until after 1967 when prices of farm products were increased greatly under Government programs did the farm-urban income ratio increase. Despite a large increase in incomes of farm households after 1967, absolute differences between farm and urban incomes remained high.

Table 2.4: INCOMES OF FARM AND URBAN HOUSEHOLDS  
( '000 won)

	<u>1963</u>	<u>1967</u>	<u>1971</u>	<u>1971/63</u>	<u>1971/67</u>
<u>Income at Current Prices</u>					
Per farm household	93	149	356	3.82	2.39
Per urban household /a	80	249	452	5.65	1.81
Ratio: Farm/urban (%)	116	60	79	-	-
<u>Income at 1965 Consumer Prices</u>					
Per farm household	133	113	174	1.30	1.54
Per urban household /a	113	202	233	2.06	1.10
Ratio: Farm/urban (%)	118	56	75	-	-

/a Salary and wage earner families.

Source: Appendix B, Tables 1 and 2.

2.12 Value added (GNP) per farm and urban household also measure income changes. Value added in current prices increased more for urban than for farm households from 1963 to 1971 (Table 2.5). But it increased much more in percentage terms for farm than for urban households from 1967 to 1971 as prices of farm products were increased greatly. However, absolute differences widened. Value added at constant prices also increased more for urban than for farm households. Thus it is evident that output has increased more for urban than for farm households and the relative rise in farm product prices has not been great enough to reduce absolute differences in incomes. Farm households are larger than urban households. In 1971 farm households averaged 5.9 persons and 2.0 workers while urban households averaged 5.1 persons and 1.5 workers. The share of total farm household income received from sideline enterprises and off-farm sources has averaged close to 20% in the last decade.

Table 2.5: VALUE ADDED PER FARM AND URBAN HOUSEHOLD  
( '000 won)

	<u>1963</u>	<u>1967</u>	<u>1971</u>	<u>1971/63</u>	<u>1971/67</u>
<u>Value Added at Current Prices</u>					
Farm households	85	153	362	4.26	2.37
Urban households	124	337	634	5.11	1.88
Ratio: Farm/urban (%)	69	45	57	-	-
<u>Value Added at 1965 Constant Prices</u>					
Farm households	112	126	152	1.36	1.21
Urban households	186	266	345	1.85	1.30
Ratio: Farm/urban (%)	60	48	44	-	-

Source: Appendix B, Tables 3 and 4.

2.13 The Government is also now concerned with slowing down the migration of rural people to large urban centers and reducing the congestion

caused by the influx of people to large cities. Decentralized growth of industry is being encouraged to provide employment opportunities for rural people in nearby small cities.

2.14 The Government is placing high priority on programs to raise productivity and incomes of rural people by making investments for land and water resource development to build up the agricultural production base, by applying advanced technology to raise output per unit of land area, by mechanizing farming operations to raise output per worker, and by improving marketing facilities so that farmers receive a large share of the retail value of agricultural products.

2.15 However, agricultural development proposals must take into account the needs of a rapidly industrializing economy and society. Reasonable efforts should be taken to expand agricultural output and reduce the income gap between the agricultural and nonagricultural sectors. But it should be clearly understood that the future welfare of the Korean people no longer mainly depends on expanding agricultural output and investments in agriculture must not become an obstruction to overall economic development. Growth of employment opportunities for rural people in nonagricultural sectors will continue to be a major factor influencing productivity and income levels in agriculture.

#### B. Natural Resources and Their Use

2.16 Korea is a hilly and mountainous country with about 67% of its land area classified as suitable only for forestry, grazing or other extensive land uses (Table 2.6). Altogether, about 23% of the land area is cultivated; about 10% is in urban and industrial uses, highways and other nonclassified uses. Paddy land, about 13% of total area, is located mainly in river valleys and in small plains along the western and southern coasts. Upland cultivated area, about 10% of the total, is located on slopeland usually not far from paddy land. Mountains rise to an elevation of around 6,000 feet but hillsides or slopeland ranging in elevation from 100 to 1,500 feet account for the bulk of the land classified as forest. Although once covered with forest and other vegetative growth that helped hold moisture from heavy rainfall during summer months, much forest land was denuded during the last 50 years causing rapid rainfall run-off, soil erosion of upper slopes, siltation of downstream rivers and reservoirs, and much flood destruction of human life, buildings, and other property.

Table 2.6: LAND USE  
(000 ha)

	<u>1951</u>	<u>1961</u>	<u>1971</u>
Cultivated land, total	1,958	2,049	2,290
Paddy	1,159	1,221	1,275
Upland	799	828	1,015
Forest, total	6,469	6,809	6,666
Wooded area	3,153	4,103	5,786
Denuded forest land	1,287	2,706	832
Not classified	2,029	-	48
Other	<u>1,496</u>	<u>1,066</u>	<u>973</u>
Total	<u>9,925</u>	<u>9,925</u>	<u>9,925</u>

Source: Yearbook of Agriculture and Forestry Statistics, MAF, 1966 and 1971.

2.17 Total rainfall is ample for agricultural purposes ranging annually from less than 800 millimeters in Gyeong Bug province in the east central part of the country to over 1,400 millimeters in the southern and western coastal area. However, it is poorly distributed throughout the year with almost 70% falling during June-September. Heavy rainfall from typhoons during summer months often causes much damage to crops and other property while lack of rainfall during other months limits crop production. Rainfall also fluctuates widely from one year to the next causing severe droughts in some years such as in 1949, 1967 and 1968. Reduction in crop production resulting from these droughts can only be overcome by more effective management of water resources. Major rivers flow westward from large river basins into the Yellow Sea (Han, Geum, and Yeongsan) and southward into the Korean Strait (Nagdong).

2.18 Korea has many small facilities for irrigating the many small paddy fields that dot the countryside. In 1970, for example, the 266 Land Improvement Associations (LIAs) had 1,351 reservoirs which on the average supplied irrigation water for 199 ha. They also had 757 pumping plants which on the average irrigated 115 ha, 443 weirs serving 52 ha on the average, and many tubewells and other facilities serving even smaller areas. Land Improvement Associations cover only about one-fourth of the paddy land. The remaining three-fourths of the total paddy area is served by even smaller facilities operated by Gun (county) offices and generally is less well irrigated. It is only with initiation of Pyongtaek-Geumgang and Yeongsangang irrigation and area development projects now being financed in part by IBRD that large-scale comprehensive projects covering several thousand ha have been undertaken.

2.19 Temperatures vary widely with severe winters in the north and mild winters in the south. The frost-free period ranges from mid-April to mid-October at Incheon located on the northwest coast to early April to mid-November at Mogpo located in the southwest, a difference of about

40 days. Consequently, there is much more double cropping with barley and wheat on paddy and upland areas during winter months in the south than in the north. About 50% of the total cropland area is double cropped. Long periods of sunshine, about 2,400 hours a year, is a favorable factor affecting growth and maturity of rice and other crops.

2.20 Soils are derived mainly from granite rock and generally are highly acid and low in fertility. Consequently, large applications of lime and fertilizer are required to achieve high yields. However, crop yields are high compared with those in other Asian countries indicating a relatively high level of farm technology. In 1970, rice yields per ha in Korea averaged twice as high as those in Thailand, Indonesia, India and the Philippines, about 10% higher than in Taiwan (where two rice crops each maturing in 4 months compared with one crop each year in Japan and Korea maturing in 5-1/2 months are grown) and only 20% lower than in Japan. Large quantities of fertilizer are used, about 190 kg of plant nutrients per ha for rice and 170 kg per ha for other crops. However, farm labor productivity still averages lower in Korea than in Taiwan and much lower than in Japan (see Annex 1, Table 4).

2.21 Rice and barley are the major crops grown, accounting for 66% of the total crop area and 57% of the total value of crop production (Table 2.7). These crops are grown throughout the country but the heaviest concentration is in western and southern coastal areas. Other food crops (soybeans and other pulses, potatoes and miscellaneous cereals) grown mainly in upland areas account for about 18% of the crop area but for only 9% of total crop value. Fruits, vegetables, tobacco, and ginseng are high value crops accounting for 23% of total crop value but for only 11% of crop area. Only small hectareages are used to grow corn and other feed crops. Livestock depend mainly upon crop residues, grazing of wastelands, rice bran and other by-products and imported feed supplies.

Table 2.7: PLANTED AREA AND VALUE OF CROPS PRODUCED, 1971

Crop	Area	Value	Value per Ha	% of Total	
	(1000 ha)	(Bil won)	(1000 won)	Area	Value
Rice	1,200	373.3	311	36.1	43.9
Barley and wheat	993	114.5	115	29.9	13.5
Misc. cereals	100	5.1	51	3.0	0.6
Pulses	341	22.1	65	10.2	2.6
Potatoes	165	51.3	311	5.0	6.1
Vegetables	258	147.6	572	7.8	17.3
Fruits	55	27.8	505	1.6	3.3
Special crops /a	91	13.9	152	2.7	1.6
Tobacco /b	41	23.9	582	1.2	2.8
Mulberry	81	-	-	2.5	-
Total /c	3,325	850.8	256	100.0	100.0

/a Includes cotton, hemp, ramie, flax, sesame, rape, etc.

/b Value data includes ginseng.

/c Includes value of byproducts.

Source: Yearbook of Agriculture and Forestry Statistics, MAF, 1972.

2.22 Barley and wheat are mainly winter crops grown on paddy as well as upland. The cropping intensity ratio averages about 1.5 but is much lower in the north than in the south where the growing season is longer. Poor drainage of much paddy in the fall limits double cropping in many areas. It will be difficult to improve drainage outlets except by constructing new drainage systems for watershed areas.

2.23 Because fuel is not available from other sources and soil fertility of cropland is low, forest and slopeland areas are gleaned intensively by rural people to collect fuelwood for heating and compost materials for building up the organic content and fertility of cultivated lowlands. It will be necessary to increase fuel supplies for rural people by increasing output of fuelwood blocks or by other methods and put into effect better management practices to effectively develop forest resources.

2.24 The coastal waters surrounding the country provide excellent fishing resources which have been intensively exploited. Numerous inlets, islands, and reefs along the extensive coastline provide favorable conditions for marine life. In addition, the convergence of the cold ocean current from the north and the warm ocean current from the south favors marine life. In recent years considerable attention has been directed toward development of beds of cultivation for shellfish. Conditions along the west coast are very advantageous for propagation of shellfish, including oysters and clams. There are few natural lakes of significant size. Rivers are all short, only the Nagdong being over 200 miles and most river navigation being impeded by either sand bars or rapids. Inland fishing is quite limited.

2.25 Korea has a well developed transportation system with expressways from Seoul to Busan on the southeast coast and Gwangju in the southwest and others under construction from Seoul to Gangneung on the northeast coast and from Gwangju to Busan in the south. However, many rural villages do not have roads that make them accessible by motor trucks. The long coastline with many small ports also make possible the transportation of products from one section of the country to another. Population density is greater in guns (counties) along the western and southern coasts where the most productive agricultural land and large cities are located.

### C. Structural Organization

2.26 Korea's 14.7 million farm people live in 2.5 million farm households mainly located in about 35,000 villages, although there is some scattered settlement in hilly and mountainous areas. Cropland per farm household averaged .92 ha of which .51 ha was paddy and .41 was upland in 1971. Farm households were classified as follows: rice farms 72%, upland farms 18%, agricultural laborers with little or no land 4%, and the remaining 6% as fruit, vegetable, special crop, livestock, sericulture, and other types of farms. Nearly two-thirds of the farm households have less than 1 ha of cropland and they account for almost 40% of all cropland (Table 2.8). Farm households usually have several small fields or parcels of land at different locations around villages. Average size of field is only about .2 ha making mechanization of farming operations difficult.

Table 2.8: NUMBER AND CROPLAND AREA OF FARM HOUSEHOLDS, 1971

<u>Size of Farm (ha)</u>	<u>Percent of Total Number</u>	<u>Percent of Total Cropland</u>	<u>Number of Paddy Fields per Farm</u>	<u>Average Size of Paddy Field (ha)</u>
0-0.5	33.6	11.4	2.9	.11
.5-1.0	31.7	27.3	4.4	.17
1.0-2.0	26.0	41.1	7.0	.21
2.0-3.0	4.8	13.4	9.3	.25
Over 3.0	1.5	6.8	8.4	.35
	<u>100.0</u> <sup>/a</sup>	<u>100.0</u>	-	-

<sup>/a</sup> Includes 84,000 farm households with no cropland.

Source: Yearbook of Agriculture and Forestry Statistics, MAF, 1972 and Prospectus for Paddy Rearrangement Project, MAF, October 1972, p. 20.

2.27 Most farmers own the land they cultivate. In 1965, almost 70% were classified as full owners, almost 24% as part owners who operated some rented land in addition to land they owned, and only 7% as tenants (Table 2.9). This contrasts sharply with the tenure situation in 1945 before land reform

took place when only 14% of all farmers were full owners, 35% were part owners, and 49% were tenants. When full independence was achieved in 1948, Korea was determined to establish a land tenure system whereby tenancy would be virtually abolished and opportunities to own farmland would be provided to all those farming as tenants. A revised farmland reform law was promulgated in March 1950 and implemented by February 1952. It provided that individual holdings cannot exceed 3 ha of cultivated land but there are no limitations on the areas of reclaimed land and forest or undeveloped sloped land an individual can own. Cultivated land area operated per household did not change as renters became owners.

Table 2.9: FARM HOUSEHOLDS CLASSIFIED BY LAND TENURE  
(Percentage)

	<u>1938</u>	<u>1945</u>	<u>1965</u>
Full owners	19.0	13.8	69.5
Part owners	25.3	34.6	23.5
Tenants	55.7	48.9	7.0
Slash and burn	-	<u>2.7</u>	-
Total	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>

Source: Jin Hwan Park, An Economic Analysis of Land Development Activities in Korea, Seoul National University, 1969, pp. 48, 87 and 131.

2.28 Only 27% of the 6.7 million ha classified as forest land is in public ownership. The remaining 73% is privately owned in many small tracts. National forest land is located mainly in the northeastern part of the country. Some 54% of the private forest holdings are less than 1 ha and 94% are less than 10 ha. About 1.5 million farm households own some forest land but the remaining one million have customary user rights for gathering fuel, forage and compost materials.

2.29 Major economic characteristics of farm households can be observed by referring to average data for all farm households (Table 2.10). In 1971, total net income was US\$964 per farm household and US\$163 per person. About 19% was from non-farm sources, including forest and marine products, wages, rents, donations and subsidies and other sources. Living expenses average US\$661 of which almost half was for food. Rice accounted for about 50% of total receipts, barley and wheat for 12% and other crops for 25%. The remaining 13% was from livestock, sericulture, handicrafts and other sources. Total farm expenses were only 18% of total farm receipts.

Table 2.10: INCOME, EXPENSES, ASSETS AND LIABILITIES PER FARM HOUSEHOLD, 1971

	1,000 won		US\$ /a	
	Total	Cash	Total	Cash
<u>Income and Expenses</u>				
Farm receipts	356.6	127.7	964	319
Farm expenses	64.7	37.4	175	93
Net farm income	291.9	90.3	789	226
Nonfarm receipts	70.8	61.4	191	153
Nonfarm expenses	6.3	5.8	17	14
Net nonfarm income	64.5	55.6	174	139
Total net income	356.4	145.9	963	365
Taxes and charges	4.1	1.9	11	5
Interest on debts	2.9	2.1	8	5
Living expenses	244.5	117.6	661	294
Other expenses	3.8	2.2	10	6
Balance	101.2	22.1	273	55
<u>Assets and Liabilities</u>				
Fixed assets	858	-	2,319	-
Liquid assets	196	-	530	-
Cash and noncash	46	-	124	-
Total assets	1,100	-	2,973	-
Liabilities	10	-	27	-
Net assets	1,090	-	2,946	-

/a Assumes nominal exchange rate of 370 won equal US\$1.00.

Source: Yearbook of Agriculture and Forestry Statistics, MAF, 1972, pp. 290-293.

2.30 A large share of production is for home use as cash sales accounted for only 36% of total farm receipts. Share of production sold for cash was 40% for rice, 25% for barley and wheat, and 61% for all other crops combined. Fertilizer was the major expense item averaging about US\$27 per household; other materials including pesticides averaged about US\$27, wages about US\$22, and other cash expenses for rent, irrigation and other items about US\$27. Farm households rely mainly on home produced food as purchases accounted for less than 20% of food expenses.

2.31 Total assets per farm household averaged US\$2,319 with land accounting for almost 80% of the total and averaging almost US\$2,000 per ha of cultivated land. Liquid assets, mainly farm products on hand at the end of the year, averaged US\$530 per household and cash assets US\$124. Debts or liabilities were low, only about US\$27 per household.

2.32 There are wide variations around these averages. For example, net income from farming averaged only 119,000 won (US\$322) for households with less than 0.5 ha compared with 618,000 won (US\$1,670) for households

with over 2.0 ha in 1971 (Table 2.11). Income from non-farm sources is almost as large as income from farming in the case of very small households. Total net income from all sources averaged over twice as high per person for households with over 2.0 ha as it did for those with less than 0.5 ha in 1971.

Table 2.11: NET INCOME PER FARM HOUSEHOLD BY SIZE OF FARM, 1971  
( '000 won)

<u>Size of farm (ha)</u>	<u>Net farm income</u>	<u>Net nonfarm income</u>	<u>Total net income</u>	<u>Persons per household</u>	<u>Income per person</u>
0-0.5	119	92	211	4.9	43
.5-1.0	236	58	294	5.7	52
1.0-1.5	371	46	417	6.2	67
1.5-2.0	455	64	519	6.7	75
Over 2.0	<u>618</u>	<u>65</u>	<u>683</u>	<u>7.2</u>	<u>95</u>
Average	292	64	356	5.8	62

Source: Yearbook of Agriculture and Forestry Statistics, MAF, 1972,  
pp. 292-310.

2.33 Most field work is done with hand tools and draft animals. At the end of 1972 there were only 17,000 power tillers, about one for each two villages and each 150 farmers. Only 1.0 million farm households have cattle. There are about 600,000 draft animals of working age, about one for each 3.8 ha of cultivated land, used to carry out plowing and other field operations for the farms where they are located as well as the land of other farm households. Farm families often work together under labor exchange arrangements in performing field work. Labor requirements are very uneven throughout the year with peak loads in the spring during harvesting of winter crops (barley and wheat) and planting of rice and in the fall during the harvesting of rice and planting of barley and wheat. Although there are labor shortages during these peak periods, it is estimated that farm workers are employed on the average only about 100 days during the year, so many farm workers do not have productive work to perform during much of the year.

2.34 Marketing of farm products is carried out mainly by private firms although cooperatives have handled increasing quantities of farm products in recent years. Cooperatives purchase large quantities of rice and barley and small quantities of soybeans and other crops for the Government under price support and stabilization programs in addition to purchases under their own operations. The Government has a monopoly on the distribution and sale of all fertilizer and a monopoly program for production, marketing and processing of tobacco and ginseng. The distribution and sale of pesticides, hand tools and equipment, small machines, other farm supplies and consumption goods are carried out by private dealers as well as by cooperatives.

D. Government Programs and Institutions

2.35 Korea has many Government agencies concerned with carrying out agricultural and rural development programs. Government financial support for agriculture was 250 billion won in 1971, an amount equivalent to almost one-fourth of total value added by agriculture to GNP (Table 2.12). Direct financial support for agricultural research and guidance (extension), land and water resource development, supplying inputs, credit, marketing and processing, infrastructure improvement and other programs amounted to 120 billion won in 1972. Indirect support for programs to carry out the purchase of farm products to support prices and the sale of fertilizer amounted to 178 billion won. The Government recovers most of the funds used for indirect support programs through repayment of loans for fertilizer and sale of farm products but a little over half of those for direct support are subsidies or grants.

Table 2.12: GOVERNMENT FINANCIAL SUPPORT FOR AGRICULTURE  
(Billion won)

	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>
Direct support	93	81	119	120
Indirect support	<u>80</u>	<u>116</u>	<u>131</u>	<u>178</u>
Total	173	197	250	298

Source: 1972 Fund Support Plan for Agriculture, Forestry, and Fishery, EPB. See Appendix B, Tables 5 and 6, for detailed data on allocation of funds by programs.

2.36 The Ministry of Agriculture and Fisheries (MAF) has major responsibility for carrying out agricultural development programs but other ministries also are concerned with improving rural infrastructure, employment, and living conditions. <sup>1/</sup> Examples include Ministry of Construction (MOC) - civil works and roads; Ministry of Commerce and Industry (MCI) - manufacturing centers and rural electrification; Ministry of Health and Social Affairs (MHSA) - water supplies, medical aid, and family planning; Ministry of Education (ME) - libraries and schools; and Ministry of Home Affairs (MHA) - provincial and local government authority over numerous local programs, agricultural research and rural guidance and for improving housing, roads, bridges, community centers, and other social facilities.

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<sup>1/</sup> The Ministry of Agriculture and Forestry was renamed Ministry of Agriculture and Fisheries on February 23, 1973, with the transfer of the Office of Forestry to the Ministry of Home Affairs.

2.37 Bureaus within MAF have authority for planning and budgeting, statistics, land and water resource development, food grain and other price support and purchase programs, fertilizer distribution, credit, marketing and production expansion programs for crops, livestock, sericulture and fishery. MAF has responsibility for planning and supervising agricultural development programs but they are carried out mainly by semi-public agencies which include Office of Fisheries Affairs (OFA), Office of Rural Development (ORD), Central Federation of Fishery Cooperatives (CFFC), Agricultural and Fisheries Development Corporation (AFDC), National Agricultural Cooperative Federation (NACF), Agricultural Development Corporation (ADC) and formerly the Office of Forestry (OF). Government corporations engage in business activities and have other sources of finance in addition to the Government. They help finance the establishment of subsidiary corporations for carrying out agricultural development projects which when financially successful and viable may become private corporations. In addition, the MAF plans, supervises, and helps finance other semi-public agencies and institutes concerned with agricultural products and materials inspection, animal quarantine, silk conditioning offices, livestock breeding, agricultural economics research and agricultural engineering and utilization research.

2.38 The ORD has responsibility for agricultural research and rural guidance (extension) employing about 830 research scientists and about 6,500 rural guidance workers. There are six experiment stations at Suwon concerned with research in veterinary science, plant environment, horticulture, crops, sericulture, and livestock and four regional research stations. ORD has offices for rural guidance work in each of the nine provinces and in each of the 172 guns (counties). It gets financial support from Provincial Governments as well as the National Government. In 1970 there was one rural guidance worker at the gun level for each 385 farm households.

2.39 ADC carries out large scale integrated projects for irrigation and drainage improvements and works closely with Land Improvement Associations (LIAs) and Provincial Government agencies concerned with small irrigation and drainage works. In 1970 there were 266 LIAs covering 408,000 ha of land and 310,000 ha of the national total of 1.2 million ha classified as irrigated. Gun (county) offices of Provincial Governments have responsibility for design, construction, operation and maintenance of facilities for irrigation and drainage of about three-fourths of the irrigated land.

2.40 The NACF is a nationwide organization made up of about 1,800 primary cooperatives at local levels and 148 special purpose cooperatives for marketing, livestock, horticultural and other crops. About 90% of all farmers are members. In addition to national headquarters in Seoul it has branch offices in each of the nine provinces. NACF carries out distribution and sale of all fertilizer, and purchases and sells food grains under MAF's program for price support and stabilization called Grain Management Special Account. It also carries out other Government price support programs, provides credit and insurance to farmers, markets farm products on its own account and distributes production inputs to farmers. NACF was created in 1961 by combining the Korean Agricultural Bank and Agricultural Cooperatives.

2.41 The AFDC is a Government owned non-banking corporation which makes equity investments and loans for development of industries concerned with products of agriculture, forestry, and fisheries for export and domestic use. It was established in 1967 to promote agro-business development, to benefit farmers and fishermen, and to expand exports. AFDC carries out its operations through subsidiary corporations with the use of some foreign and private equity capital as well as capital supplied by the Government.

2.42 The OFA has general responsibility for plans and programs concerned with improving fishery production and marketing. The CFCC is a nationwide organization of coastal fishery cooperatives, concerned chiefly with improving the productivity and welfare of about 200,000 fishing households which supply over 50% of total fishery production.

2.43 The OF which recently was transferred to the Ministry of Home Affairs supervises activities on the 1.5 million ha of public forest land and has responsibility for improving forest management practices on private forest land.

2.44 More than one Government agency often have similar functions. For example, both MOC and ADC carry out water management projects but MOC is mainly concerned with flood control and multi-purpose works and ADC mainly with large-scale irrigation projects. Both NACF and AFDC have been active in dairy and sericulture projects. Although NACF is the most active farm credit agency, AFDC also provides credit to farmers for special purposes. At the farm level, several agencies of MAF as well as several other ministries carry out programs to improve rural facilities and living conditions.

2.45 Government agencies do an effective job of carrying out agricultural programs at the local, provincial, and national levels. Research and extension services are much more advanced than in most countries with similar income levels. A highly developed system of farmer cooperatives has enabled the Government to carry out successful programs for supporting prices of farm products, distributing fertilizer and other inputs required to expand crop and livestock production and increasing commercial marketings of agricultural products. Government agencies have been effective in carrying out programs to improve the use of land and water resources, but better coordination will be required to carry out planned large-scale projects. The good performance record of Government agencies concerned with agricultural development owes much to the high educational levels of civil servants and to the high literary levels of rural people.

III. PERFORMANCE IN THE LAST DECADE

A. Production and Consumption Trends

3.01 Official statistics indicate that Korea has an outstanding record of expanding agricultural production during the last decade. They show that gross agricultural production increased at a compound annual rate of 4.2% during 1961-71, a higher rate than in most countries (Table 3.1). Production of basic food crops (cereals, soybeans and other pulses and potatoes) increased 2.5% annually, more than the population growth rate of 2.3%. Vegetable production rose 9.2% annually and fruit production 12.3% annually. Special crops (cotton hemp, sesame, rape, etc.) increased 3.3% a year and monopoly crops (tobacco and ginseng) 6.5%. Livestock production rose 6.9% annually.

Table 3.1: COMPOSITION AND GROWTH RATES IN GROSS AGRICULTURAL PRODUCTION

<u>Items</u>	<u>Composition (%)</u>		<u>Compound Annual</u>
	<u>1961</u>	<u>1971</u>	<u>Growth (%)</u>
			<u>1961-71</u>
Food Crops			
Rice	59.1	37.9	1.5
Barley and wheat	17.1	11.6	4.3
Miscellaneous cereals	.5	.5	1.0
Soybeans and other pulses	1.2	2.3	5.7
Potatoes	<u>6.0</u>	<u>5.2</u>	<u>3.9</u>
Food Crops, Subtotal	83.9	57.5	2.5
Vegetables	3.5	15.0	9.2
Fruits	.9	2.8	12.3
Special crops (cotton, hemp, rape, etc.)	.7	1.4	3.3
Monopoly crops (tobacco, ginseng)	1.6	2.4	6.5
Byproducts	<u>3.8</u>	<u>7.2</u>	<u>4.8</u>
All Crops, Subtotal	94.4	86.3	3.0
Cocoons	.2	1.4	20.0
Livestock	<u>5.4</u>	<u>12.3</u>	<u>6.9</u>
Total	<u>100.0</u>	<u>100.0</u>	<u>4.2</u>

Source: Computed from data reported in Yearbook of Agricultural and Forestry Statistics, MAF, 1972, pp. 432-435. Composition based on values at current market prices. Growth rates based on linear trend of values at 1965 constant prices.

3.02 Net imports of rice, barley, and wheat rose from less than 500,000 m ton in 1961 to 2.7 million m ton in 1971 and 2.8 million m ton in 1972 (Table 3.2). Imports supplied 25% of total consumption of these food grains in 1971 and 1972 compared with only 10% in 1961. Official statistics show that per capita consumption of rice, barley and wheat increased from 200-215 kg annually in the early 1960's to 240 kg in 1968-70, 267 kg in 1971, and 281 kg in 1972. These estimates include disappearance in all uses. It is reported that losses of grain in storage and processing are high, amounting to 20% of production, so human consumption rates are lower than those indicated above. However, these consumption rates when reduced by 20% to allow for losses and wastes indicate that per capita consumption of food grains increased from 160-170 kg in the early 1960s to 215-225 kg in 1971 and 1972. These food grain consumption levels are much higher than in other Asian countries.

3.03 It is likely that the quantities of barley, rice, and wheat used for feed increased with expansion of poultry, swine, and dairy production. However, feed grain imports increased from only 20,000 m ton annually in the early 1960s to 464,000 m ton in 1971. Imports of soybeans and other feedstuffs also were increased. It is likely that increased use of food grains for livestock feed accounts for only a small share of the large rise in per capita disappearance of food grains described above. It appears that food grain production increased less than indicated by official estimates. Because of the rise in food grain imports beginning in 1967, the Government has put high priority on measures to expand output and achieve greater self-sufficiency in rice.

Table 3.2: PRODUCTION, NET IMPORTS, AND CONSUMPTION OF FOOD GRAINS

	<u>1961</u>	<u>1966</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>
	-----'000 m ton -----				
<u>Production</u>					
Rice	3,047	3,501	4,090	3,939	3,957
Barley	1,478	2,018	1,974	1,858	1,971
Wheat	<u>280</u>	<u>315</u>	<u>357</u>	<u>322</u>	<u>244</u>
Total	4,805	5,834	6,421	6,119	6,169
<u>Net Imports</u>					
Rice	-	31	541	1,004	495
Barley	123	-	-	-	387
Wheat	<u>355</u>	<u>503</u>	<u>1,254</u>	<u>1,672</u>	<u>1,900</u>
Total	478	534	1,795	2,672	2,782
<u>Per Capita Consumption</u>	-----kg-----				
Rice	119	121	130	150	144
Barley	60	64	60	62	64
Wheat	<u>24</u>	<u>21</u>	<u>50</u>	<u>55</u>	<u>73</u>
Total	<u>203</u>	<u>212</u>	<u>240</u>	<u>267</u>	<u>281</u>

Source: Appendix B, Table 7.

3.04 Official production statistics indicate that per capita consumption of vegetables doubled and that of fruit more than doubled during 1961-71. Some increases in per capita consumption undoubtedly occurred with rising incomes. The quantities sold annually by farmers rose greatly with rapid industrial and urban growth during the last decade. Exports of fruits and vegetables still account for a small share of total production.

3.05 The high growth rate for livestock production of almost 7% annually includes very large increases in dairy products, eggs and poultry based mainly upon larger imports of feed grains and other high protein feeds. Numbers of native cattle declined from 1963 to 1968 but have increased since then. Korean cattle are fed mainly crop residues but there are 1.2-2.0 million ha of native grass rangelands from which areas suitable for establishing improved pasture and forage production could be selected.

3.06 Korea has made much progress in expanding sericulture and mushroom production. Cocoon production increased at a compound annual rate of 20% while mushroom production rose from no commercial production in the early 1960's to 4,000 m ton in 1971. Ginseng and tobacco production for export also have gone up greatly.

3.07 Forestry production increased 8% annually during 1961-71 according to official statistics causing further depletion of forest resources. Some reforestation programs have been carried out but the very large potentials for expanding forest product output from the 6.7 million ha classified as forest land still are not being fully exploited. Korea depends almost entirely on imported logs for its rapidly growing plywood industry and also on imports of timber, pulp and paper products for domestic consumption.

3.08 The very high growth rate in fishery product output of 13% a year during 1961-71 was achieved by greatly expanding deep-sea fishing in distant waters and off-shore fishing in the nearby China and Yellow Seas. Aquiculture also increased greatly. Coastal fishing production has declined since 1968. Total number of coastal fishermen also has decreased in recent years. Despite the growth in livestock output, fish still is the major source of protein food from animal products. Per capita consumption of fishery products increased from 15 kg in 1960 to 22 kg in 1971. Over the same period per capita consumption of meat rose from 4 kg to 7 kg.

#### B. Sources of Crop Output Growth

3.09 Growth in total crop production was from four sources: (a) expansion of cultivated area, (b) increased double cropping, (c) higher yields per ha, and (d) shifts in land use from low to high value crops. Although total area of paddy land has not changed greatly in the last 50 years, it appears that development of new paddy land more than offset reductions due to use of land for highways and urban and industrial growth and that total paddy area increased about 50,000 ha or about 4% during the last decade

(Table 3.3). Over 150,000 ha of upland were developed for cultivation so the total cultivated area was increased by about 200,000 ha or nearly 10% from 1961 to 1971.

Table 3.3: CULTIVATED AND PLANTED CROP AREA  
( '000 ha)

	<u>1961</u>	<u>1966</u>	<u>1969</u>	<u>1971</u>
Paddy land	1,221	1,298	1,284	1,275
One-crop	774	702	647	641
Two-crop	447	596	647	634
Upland	828	1,014	1,037	1,015
One-crop	240	440	440	614
Two-crop <u>/a</u>	588	574	597	401
Total cultivated area	2,049	2,312	2,330	2,290
Total planted area	3,084	3,482	3,574	3,325
Cropping intensity <u>/b</u>	1.51	1.51	1.53	1.45

/a Total paddy plus two-crop paddy and total upland subtracted from total planted area. See Table 5, Annex 2.

/b Total planted area divided by total cultivated area.

Source: Yearbook of Agricultural and Forestry Statistics,  
MAF, 1972.

3.10 Projects carried out to provide improved irrigation, drainage, and flood control made it possible to double crop an additional 200,000 ha of paddy land, an area equivalent to 6% of the total planted crop area. Over 70% of the upland was double cropped in the early 1960's, but the share that is double cropped declined in 1971 so cropping intensity for the total cultivated area did not increase. Nevertheless, additional double cropping of paddy land was a major source of additional crop production.

3.11 Yields per ha have increased significantly for most crops. They rose 1.0% annually for rice, 1.5% for wheat and over 4% for barley and soybeans according to official statistics (Table 3.4). Yields increased significantly for fruits but slowly for vegetables and tobacco. However, expansion in the area of these high value crops was an important source of additional crop output.

Table 3.4: COMPOUND ANNUAL GROWTH RATES IN CROP AREA  
YIELD PER HA, AND PRODUCTION, 1961-1971  
(% per year)

	<u>Area</u>	<u>Yield</u>	<u>Production</u>
Rice	0.5	1.0	1.5
Barley	0.6	4.5	5.1
Wheat	1.6	1.5	3.2
Soybeans	0.3	4.7	5.0
W. Potatoes	1.6	2.0	3.6
Apples	6.6	2.3	9.8
Peaches	14.2	1.7	16.9
Pears	6.9	0.3	7.6
Radishes	7.2	0.3	7.4
Cabbage	10.9	0.4	11.3
Red Pepper	12.6	-2.6	7.9
Tobacco	7.8	-	7.1

Source: Appendix Tables 1, 2 and 3 of Annex 2, Crops.  
Growth rates are based on linear trends for  
1961-71.

3.12 Increased use of fertilizer, lime and pesticides helped make possible higher crop yields. Fertilizer use doubled, application of lime tripled, and use of pesticides to control plant diseases and insects rose five-fold. Fertilizer application rates now average about 190 kg of plant nutrients per ha for rice and about 170 kg per ha for other crops. Prices of fertilizer are low relative to those of crops. In 1971 only 0.5 kg of rice was required to buy one kg of plant nutrients compared with 1.2 kg in Taiwan where fertilizer application rates per hectare are about the same as in Korea. Pesticides also are made available to farmers at low prices and lime is distributed free. The high crop yields being achieved in Korea result from intensive use of limited land resources and a high level of crop technology.

### C. Foreign Trade

3.13 Korea's agricultural exports consist mainly of marine products, raw silk, plywood, and labor intensive crops such as tobacco, mushroom and ginseng (Table 3.5). Imports include food grains, feedstuffs, raw sugar, livestock products, oilseeds and vegetable fats and oils, ginned cotton, logs for the plywood industry and other purposes, timber and pulp and paper. Although exports have increased in the last decade, imports have increased much more. The trade deficit for food and agricultural raw materials increased from US\$82 million in 1962 to US\$558 million in 1971 (see Table 5.6, Annex 12). The increased trade deficit in agricultural products accounts for a large share of the increased trade deficit for all products which rose from US\$275 million in 1961 to US\$1.3 billion in 1971.

Table 3.5: FOREIGN TRADE IN AGRICULTURAL PRODUCTS  
(Million US\$)

	<u>1961</u>	<u>1966</u>	<u>1971</u>
<u>Major Agricultural Imports</u>			
Rice	1	3	150
Wheat	24	40	115
Corn	1	-	23
Other feeds	-	-	39
Raw sugar	6	5	31
Beef tallow	2	5	16
Ginned cotton	29	41	84
Wood and cork	7	43	158
Pulp and paper	5	13	37
<u>Major Agricultural Exports</u>			
Marine products	7	38	104
Raw silk	3	12	39
Tobacco and its products	-	6	14
Ginseng	-	2	10
Plywood (veneer sheets)	1	30	124
<u>Total Commodity Trade</u>			
Imports	316	716	2,394
Exports	41	250	1,062
Trade balance	-275	-466	-1,327

Source: Major Economic Indicators, 1961-71, EPB, 1972.

3.14 The growing deficits in food grains and feedstuffs are among the most noteworthy changes in Korea's trade in recent years. Imports of food and feed grains increased from US\$26 million in 1961 to US\$327 million in 1971. However, other imports such as raw sugar, animal and vegetable fats and oils, and ginned cotton to supply the rapidly growing textile industry also have increased greatly. Growth in wood imports consists mainly of logs to supply the plywood export industry, but there also has been growing deficits of timber, pulp and paper for domestic use. These rising imports have caused the Government to put increased emphasis on expanding domestic production of grains, oilseeds, and forest products.

3.15 On the export side, very large increases in marine products, raw silk, tobacco, ginseng and mushrooms are especially noteworthy. Effective use has been made of a large industrious labor supply to expand output and exports of these labor intensive products. Mulberry, tobacco, and ginseng have a high value of production per ha and therefore can compete effectively with other crops for use of scarce land resources.

D. Structural Changes in Agriculture

3.16 The structural organization of farming did not change much in the first half of the 1960's but it began to change significantly in the second half (Table 3.6). Total number of farm households increased slightly during 1961-66. Total farm population also increased in the early 1960's but it has declined by over one million since 1966. As explained earlier, total agricultural labor force remained almost constant during the early 1960's but it declined 6% from 1966 to 1971. The large net migration from farm households to urban areas during the last decade of about 3.5 million and the net reduction of employment on farms helped make possible higher levels of output and incomes for those who remained. Because of limited land resources, it would have been very difficult to raise output and income per worker in agriculture with an increasing total labor force. Thus, growth of nonfarm employment opportunities was a major factor contributing to higher levels of productivity and incomes for farm people.

Table 3.6: CHANGES IN STRUCTURAL ORGANIZATION AND PRODUCTION

	<u>1961</u>	<u>1966</u>	<u>1971</u>
<u>Structural Organization</u>			
Number of farm households ('000)	2,327	2,540	2,482
Farm population ('000)	14,509	15,781	14,712
Agricultural labor force ('000)	5,021	5,013	4,709
<u>Production and Inputs (1965 prices)</u>			
Gross agricultural production (Bil won)	326	431	504
Intermediate inputs (Bil won)	58	85	128
Value added by agriculture (Bil won)	269	346	376
Value added per household ('000 won)	115	136	152
Value added per worker ('000 won)	54	69	80

Source: Computed from data reported in Yearbook of Agriculture and Forestry Statistics, 1972, MAF, and Economic Statistics Yearbook, 1972, Bank of Korea.

3.17 Labor productivity in agriculture as measured by value added per farm worker has increased significantly in the last decade. Value added to gross national product by the agricultural sector, measured in 1965 prices, increased 32% per farm household and 48% per agricultural worker from 1961 to 1971. Increased use of fertilizer, pesticides, and other current inputs together with investments to improve land and water resources contributed to the rise in average labor productivity. The gains in labor productivity are especially noteworthy considering that there has been little mechanization of farming operations or changes in size of farm units.

3.18 Farming has become more commercialized in the last decade as farmers purchased more inputs and marketed a larger share of their production. The total volume of intermediate inputs (fertilizer, pesticides, tools, equipment, etc.) purchased annually for use in agriculture more than doubled from 1961 to 1971. However, farms continue to be small, increasing in average size only from .88 ha in 1961 to .92 ha in 1971, a condition that limits the economic possibilities of farm mechanization. However, cultivated land per farm worker would have decreased in the last decade had it not been for the large migration of workers to jobs in urban areas.

3.19 Diversification of agricultural production to include more of the labor intensive crops such as fruits, vegetables, tobacco, mulberry, mushrooms, ginseng, and others that can be grown in upland areas as well as more livestock helped make possible fuller use of available labor supplies. The outstanding progress achieved in diversifying farming is indicated by the fact that rice, barley, and wheat accounted for only 49% of the total value of crop and livestock production in 1971 compared with 76% in 1961.

3.20 Marketing facilities to move larger quantities of farm products to markets were expanded greatly in the last decade as the urban population increased 55%. The Government played a leading role in improving transportation facilities but most marketing services are performed by private enterprise.

3.21 Real disposable income per farm household was 57% higher in 1971 than in 1962 (Table 3.7). Real incomes of farm households have increased not only because of higher levels of productivity but also because of more favorable prices to farmers. Real disposable income per farm household did not rise significantly and lagged behind that of urban households during the first half of the 1960's. But incomes rose greatly from 1966 to 1971 when prices of farm products were increased greatly.

Table 3.7: INCOME PER FARM HOUSEHOLD AND PRICES RECEIVED AND PAID BY FARMERS

	<u>1962</u>	<u>1966</u>	<u>1971</u>
<u>Income per farm household ('000 won)</u>			
Net farm income	54	101	292
Nonfarm income	14	29	64
Farm household income	68	130	356
Taxes and interest	2	5	7
Disposable income	66	125	349
Real disposable income (1965 prices)	106	111	167
<u>Prices (1965 = 100)</u>			
Prices received	52	106	236
Prices paid for all items	61	112	227
Parity ratio	84	95	104
Prices paid for household goods	62	112	208

Source: Yearbook of Agriculture and Forestry Statistics, MAF, 1972, and Major Economic Indicators, 1961-71, EPB, 1972, p. 97.

3.22 Government programs to raise prices and stabilize them during the year for rice, barley and other basic crops have helped improve farm incomes. Prices received by farmers averaged 4.5 times higher in 1971 than in 1962 while prices paid by them rose only 3.7 times causing the parity ratio to increase from 84% in 1962 to 104% in 1971 (1965 = 100). Government programs, under which prices of fertilizer have been held stable since 1965 and pesticides were made available at little or no cost to farmers, helped keep prices paid by farmers for production inputs from rising greatly.

#### IV. DEVELOPMENT STRATEGY, PLANS AND PROSPECTS

##### A. The New Strategy

4.01 Rapid industrial growth was the major objective of Korea's development strategy during the first (1962-66) and second (1967-71) plan periods. The urban industrial sector absorbed the lion's share of investment resources. Starting from a small base, manufacturing output rose 20% annually. Industrial exports have increased 40% annually. However, the Government was not satisfied with the performance of the agricultural sector and decided to put higher priority on agriculture and rural development in the TFYP (1972-76). Major objectives of the new development strategy are:

- (a) to achieve more equitable income distribution and improve rural infrastructure to meet social needs;
- (b) to accelerate expansion of food grain production and in particular to achieve self-sufficiency in rice;
- (c) to develop land and water resources so that there will be a resource base for expanding agricultural production in the future;
- (d) to modernize farming and increase labor productivity through increased mechanization; and
- (e) to improve marketing facilities to provide the services needed by commercialized agriculture.

4.02 Under the recently launched Sae Maeul Movement (New Community Making) for rural development Korea's 35,000 villages are being encouraged to carry out self-help projects to improve rural living conditions. The Government is supplying technical and financial assistance to rural communities for improving facilities for education, health, housing, sanitation, roads, electrification, communication, and similar services. Objectives of the Sae Maeul Movement are to make rural communities better places to live, to slow down migration to the large urban centers, and to help bring about decentralized economic growth.

##### Investment Plans

4.03 The original TFYP for 1972-76 called for a total investment in agriculture, forestry, and fishery of 807 billion won compared with actual investments of 261 billion won in the Second Five Year Plan (SFYP) for 1967-71 and 217 billion won in the First Five Year Plan (FFYP) for 1962-66, all in 1972 prices. In 1972 Korea adjusted its TFYP to include new and enlarged projects for agricultural development as a part of the Sae Maeul Movement. Additional investment plans for eight project groups amounting 285 billion won during 1973-76 were added so the adjusted TFYP now calls

for a total investment of 1,092 billion won in the agricultural sector during 1972-76, nearly four times as large as during the SFYP and eight times as large as during the FFYP (Table 4.1). Investments in the agricultural sector are projected to rise from about 6% of the total for all purposes during the first and second five year plans to 17% in the third. 1/

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1/ However, new projections made in September 1973 reduce investments for agriculture, forestry and fishery from those indicated in the adjusted TFYP (see page iv above). The new projections provide for a total investment in agriculture, forestry, and fishery during 1972-76 of 836 billion won compared with 1,099 billion won in the adjusted TFYP and 807 billion won in the original TFYP. The new projections reduce investments for land and water development projects from those indicated in the adjusted TFYP but provide for completion of most of these projects over a longer period. Investment outlays for agriculture, forestry, and fishery would account for 10.5% of investment outlays for all purposes during 1972-81 according to these new projections. Agriculture, forestry and fishery would be the source of about 10% of the total increase in GNP from 1972 to 1981.

Table 4.1: INVESTMENT PLANS FOR AGRICULTURE, FORESTRY, AND FISHERIES,  
1972-76  
(Billion won in 1972 prices)

<u>Project Categories</u>	<u>TFYP</u> <u>1972-76</u>	<u>Added</u> <u>Sae Maeul</u> <u>1973-76</u>	<u>Adjusted</u> <u>TFYP</u> <u>1972-76</u>	<u>Additional</u> <u>Finance</u> <u>Required</u> <u>1973-76</u> <sup>/a</sup>
<u>Sae Maeul Projects</u>				
1. Expansion of irrigation facilities	22.3	87.6	109.9	94.5
2. Comprehensive watershed dev.	77.8	100.8	178.6	105.7
3. Slope land dev.	4.8	13.9	18.7	15.7
4. Paddy rearrangement	55.4	17.8	73.2	60.5
Sub-total (1-4)	160.3	220.1	380.4	63.0
5. Farm mechanization	49.5	36.1	85.6	29.4
6. Marketing improvement	30.5	7.6	38.1	55.3
Sub-total (1-6)	240.3	263.8	504.1	5.0
7. Rural electrification	52.9	16.1	69.0	-
8. Rural hospitals	16.1	5.0	21.1	-
Total	309.3	284.9	594.2	429.1
<u>Other Agriculture</u>				
Food grain (seeds, etc.)	31.0	-	31.0	
Cash crops (seeds, etc.)	44.5	-	44.5	
Livestock	41.8	-	41.8	
Sericulture	28.4	-	28.4	
Production base (dams, dike, etc.)	51.5	-	51.5	
Roof improvements (1,400,000 houses)	51.2	-	51.2	
Feeder roads (7,900 km)	8.4	-	8.4	
Research and extension	22.5	-	22.5	
Miscellaneous	33.8	-	33.8	
Total	313.1	-	313.1	
<u>Forestry</u>				
Reforestation	19.5	-	19.5	
Erosion control	12.0	-	12.0	
Maintenance and protection	13.2	-	13.2	
Miscellaneous projects	19.3	-	19.3	
Total	54.0	-	54.0	
<u>Fisheries</u>				
Fishing vessels and equipment	85.8	-	85.8	
Expansion of aquiculture	8.2	-	8.2	
Fishing port improvement	17.3	-	19.3	
Marketing and processing	19.6	-	19.6	
Total	130.9	-	130.9	
Grand Total	807.3	284.9	1,092.2	429.1

/a Additional financing required from foreign sources.

Source: Economic Planning Bureau table given to mission, November 13, 1972.

4.04 Eight project groups are referred to as Sae Maeul projects. Prospectuses describing projects in each group have been published. <sup>1/</sup> The project groups are:

- (a) Paddy Rearrangement - These projects involve consolidation of scattered small plots of paddy into larger fields, land leveling, improvement of drainage and irrigation structures, and construction of roads to provide better access to fields for 224,000 ha of paddy.
- (b) Expansion of Irrigation Facilities - These projects involve improvement of 5,239 small-scale irrigation systems for 190,000 ha by land improvement associations and local government units.
- (c) Comprehensive Watershed Development - There are two categories: (1) Four River Basin Projects involving construction of structures in four major river basins to reduce flood damage to crops on 135,000 ha and make possible cultivation of 8,700 ha of additional land to be carried out by MOC, and (2) Eleven Large-Scale Projects involving irrigation, drainage, and associated improvements for 117,000 ha to be carried out by ADC and MAF.
- (d) Slopeland Development - These include 52 projects for bringing under cultivation 12,300 ha in hillside areas for growing up-land crops.
- (e) Farm Mechanization - This project provides for increasing the number of power tillers from 17,000 at the end of 1972 to 112,500 in 1976 and comparable increases in other types of farm machinery.
- (f) Marketing Improvements - This category includes several projects for storage, transportation, processing, and other facilities for modernizing the marketing system.

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<sup>1/</sup> They are as follows: Prospectus for Expansion of Irrigation Facilities, October 1972, MAF; Prospectus for Comprehensive Watershed Development Project (Volume I, Eleven Large Irrigation Projects) MAF, October 1972; Integrated Development Plan for Four Major River Basins (Volume II, River Improvement Works), MOC, November 1972; Prospectus for Paddy Rearrangement Project, MAF, October 1972; Prospectus for Comprehensive Development of Slopeland, MAF, October 1972; Prospectus for Farm Mechanization Project, MAF, October 1972; Prospectus for Improvement of Agriculture and Fisheries Marketing Structure Project, MAF, October 1972; Prospectus for Rural Electrification Projects, Government of Republic of Korea, December 1972; and Prospectus for Rural Sanitary and Clinical Facilities, Government of Republic of Korea, December 1972.

- (g) Rural Electrification - This project would accelerate ongoing projects so that 80% of all farm households would have electricity by 1976.
- (h) Rural Sanitary and Clinical Facilities - This project would increase the number of rural medical centers so that health services would be within reach of all rural people by 1976.

4.05 In order to provide funds for these investments, Government investments originally planned for other sectors were reduced. However, it estimated that additional financing required from abroad during 1973-76 to carry out the expanded investment plans for agriculture amount to 429 billion won.

4.06 Rural community development will receive high priority. In addition to the investments indicated above, the Sae Maeul Movement includes increased financing by Central Government Ministries and Provincial Governments for such improvements as housing, local roads, and bridges, schools and libraries, rural manufacturing enterprises, water supply, communication networks, methane gas for fuel, and small projects for erosion control, drainage, and flood control. Altogether, Central Government financing for these purposes is budgeted at 29.7 billion won in 1973 compared with 15.4 billion won in 1972. Local Government financing for these purposes is budgeted to increase from 5.8 billion won in 1972 to 9.4 billion won in 1973.

#### Production Targets

4.07 The original TFYP published in 1971 set an annual growth target of 4.5% for total agricultural output including crops, livestock, forestry and fishery during 1972-76. 1/ Preliminary estimates of production by commodities were made for 1972 in the TFYP to show annual increases projected for 1972-76. However, 1972 preliminary production estimates were not realized for most commodities so 1976 targets are compared here with production reported for 1970 (Table 4.2).

4.08 The production target set for rice in 1976 is 4.86 million tons, a compound annual increase of 3.6% for 1970-76 compared with the 1.5% annual increase reported for 1961-71. Barley production was projected to increase 3.3% annually, somewhat less than reported in the last decade. Altogether, food grain production was projected to rise 3.7% annually. Plans called for fruit to increase 9.4% and vegetables 5.5% annually during 1970-76, both somewhat less than reported for 1961-71. Plans also called for beef and pork to increase more rapidly than in recent years, but milk, chicken, and egg production were projected to rise less rapidly. Cocoon production was expected to continue to rise at the very high rate of 20% annually. Output of marine products was expected to rise nearly 10% annually compared with 13% annually during 1961-71. Timber production was not expected to increase for several years.

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1/ The Third Five-Year Economic Development Plan, 1972-76, Government of the Republic of Korea, 1971.

4.09 The plan anticipated that self-sufficiency in rice would be achieved with expansion of rice production to 4.86 million m ton in 1976 and that barley production would exceed requirements for food making an additional 430,000 m ton available for livestock feed. Demand and production projections shown in the published plan indicate that 1.5 million tons of wheat would need to be imported in 1976 to meet food grain requirements. Corn imports are expected to rise to about 600,000 tons in 1976. Imports of other feedstuffs also would rise in order to meet livestock production targets contained in the plan. Feed grain imports (including by-products of food grain imports) increased from 85,000 m ton in 1961 to 845,000 m ton in 1971.

Table 4.2: HISTORICAL AND TFYP AGRICULTURAL PRODUCTION TARGETS  
(000 m ton)

	1970 <u>Actual</u>	1972 <u>Preliminary</u>	1976 <u>Targets</u>	<u>Annual Increases (%)</u>	
				<u>Plan</u> 1970-76	<u>Historical</u> 1961-71
<u>Food Grains</u>	(6,693)	(7,330)	(8,369)	(3.7)	(2.5)
Rice	3,939	4,276	4,860	3.6	1.5
Barley	1,974	2,147	2,406	3.3	5.1
Wheat	357	378	488	5.3	3.2
Soybeans	232	287	321	5.6	5.0
Other grain	191	242	294	7.4	1.0
<u>Other Crops</u>					
Special crops	72	115	168	15.0	3.3
Vegetables	2,354	2,642	3,246	5.6	9.2
Fruit	412	535	706	9.4	12.3
Potatoes	2,740	3,478	3,790	5.6	3.9
Tobacco	56	88	103	10.7	7.8
<u>Livestock</u>					
Beef	37	44	64	11.4	7.2
Pork	83	98	144	11.8	9.4
Chicken	45	56	87	14.0	-
Milk	53	66	112	17.2	78.0
Eggs (million)	2,456	2,941	4,305	9.9	37.0
Cocoon	21	35	47	20.1	20.0
<u>Marine products</u>	935	1,096	1,457	7.7	13.3

Notes: Production was much less for most items than preliminary estimates for 1972 made in 1971 when the plan was prepared. Therefore, annual growth rates from 1970 to 1976 planned production are shown here. Historical growth rates presented for comparison are for 1961-71 except those for livestock production which are for 1965-70.

Source: Data furnished mission by EPB. Targets set for rice, barley, soybeans, and wheat in 1976 in Major Economic Indicators of the Korean Economy, 1972-81, EPB, June, 1973 are lower than those indicated above and are as follows (000 m ton): rice - 4,603; barley - 2,207, soybeans 270, and wheat 248. The above publication projects an annual increase in GNP from agriculture, forestry, and fishery of 4.8% for 1973-76 and 4.7% for 1977-81 compared with 4.5% in the original TFYP and 3.5% during 1961-71.

4.10 These production targets have not been adjusted to take into account increased production that would result from additional investments planned under the Sae Maeul Movement. The prospectuses indicate that total rice and barley production, measured in polished rice equivalent, would rise about 840,000 tons with completion of the land and water resource development projects. A large part of this production increase would be from investments included in the original TFYP. However, it would take 9-10 years to complete all of the resource development projects so much of the projected increases in rice and barley production would not occur until after 1976.

#### Income Goals

4.11 A long-term goal is to raise real incomes of farm households from 308,000 won in 1971 to 975,000 won in 1981 (according to the publication, "International Economic Cooperation Plan for Sae Maeul Movement - New Community Making," Government of the Republic of Korea, August 1972). This is equivalent to an annual increase of 12.5% and would require a much more rapid increase in productivity than occurred in the last decade, or more favorable prices for farmers, or a decline in number of farm households. It was envisioned that this income growth could be achieved from higher levels of productivity, more income from non-farm sources, a decline in the number of farm householders, and more favorable prices for farmers. 1/

#### B. Market Prospects

4.12 Lack of markets is not a constraint to expanding agricultural output. The large increases in imports of agricultural products in the last few years mean that Korea has large opportunities for import substitution. Moreover, domestic markets will continue to expand with population and income growth. Commercial markets for farm products will increase greatly with continued urban and industrial development.

4.13 Domestic demand for agricultural products will be influenced by changes in consumption patterns as well as by population growth. When the original five year plan was prepared it was anticipated that annual population growth rate would decline to 1.5% in 1976 compared with 2.3% annually in the last decade, but more recent information indicates that the population rate may decline less than expected.

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1/ The report, An Outline of Long Range Projections, issued by MAF in September 1973 projects a rise in farm household from 418,000 won in 1972 to 1,401,000 won in 1981 including an annual inflation rate of 5%. Almost half of total farm household income would be from non-farm sources in 1981.

4.14 Per capita consumption projections based on historical data from the Food and Agricultural Organization have been prepared taking into account information about income elasticities of demand and projected income growth (Table 4.3). They indicate that per capita consumption of rice and the total for all food grains are likely to remain about the same as in 1970. But consumption of wheat is expected to rise while consumption of barley and other grains, generally considered to be inferior foods, is expected to decline. Per capita consumption of fruit, livestock products, and fish is expected to rise as incomes rise. These per capita consumption rates differ from those indicated earlier for food grains which were based on food grain supply and disappearance data (Table 3.2). The Government now is encouraging consumption of barley to reduce imports of rice and wheat by making polished barley available at retail prices 50% of those for polished rice and by requiring the mixing of polished barley with rice served in restaurants. Continuation of these programs obviously would affect food grain consumption changes.

Table 4.3: HISTORICAL AND PROJECTED PER CAPITA CONSUMPTION ESTIMATES (kg)

<u>Products</u>	<u>Historical</u>		<u>Projections</u>	
	<u>1964-66</u>	<u>1970</u>	<u>1975</u>	<u>1980</u>
Rice	121.3	125.5	126.0	126.2
Wheat	20.4	29.1	40.9	57.1
Barley	33.2	34.0	25.3	21.0
Other grains	27.5	27.3	23.3	20.6
Fruit	9.1	11.7	15.2	19.5
Pulses	0.7	0.8	1.0	1.0
Vegetables	85.4	94.3	105.1	110.4
Potatoes	27.0	37.0	37.6	37.8
Beef	1.3	1.4	1.9	2.2
Milk <u>/a</u>	2.8	5.4	11.3	14.0
Pork	2.7	3.9	4.7	5.4
Chicken	0.7	1.5	1.9	2.3
Eggs	1.9	2.5	3.5	4.8
Fish	18.1	22.8	24.9	27.2

/a Skim milk and whole milk.

Source: Historical data are from publications by the Food and Agriculture Organization. Projections are mission estimates.

4.15 Foreign markets for products Korea exports in large quantities - marine products, raw silk, tobacco and ginseng - also are favorable. However, Korea faces stiff competition in expanding exports of mushrooms and processed fruits and vegetables. Production and marketing methods for these commodities need to be improved. Japan has become a more

favorable market with revaluation of the Japanese yen. It is reported that Japan is a promising export market for fresh fruits and vegetables, but quality standards for Korean produce will need to be improved to meet Japanese market specifications.

4.16 In the case of forestry, there are large opportunities for import substitution because of large imports of timber, pulpwood and paper for domestic consumption. There also are opportunities for substituting locally produced logs for those imported for the plywood industry but because of the many years required for log production, this cannot be achieved except over a very long period.

### C. Production Prospects

#### Rice

4.17 Self-sufficiency in rice could be achieved if rice production increases 3.6% annually from 1970 to 1976 and wheat imports total 1.5 million tons annually as projected in the adjusted TFYP plan. However, the mission concludes that an annual increase of 1.5% in total rice production is as much as can be expected from improvements in agronomic practices and resource development projects. The mission estimates that imports of food grains will need to total 2.2 to 2.8 million m ton annually in 1976 in order to maintain recent per capita consumption levels (see Table 11 and paras 89-93, Annex 2, Crops). Imports of rice and wheat could be lower if consumption of barley is increased, but this would mean that less barley would be available for livestock feed, and feed grain imports would need to be larger. 1/

4.18 The mission made estimates of yields and production of rice by land categories for 1970, 1976, and 1980 (Table 4.4). The estimates for 1976 and 1980 include the effects of planned projects for improving irrigation systems and the adoption of better agronomic practices. All of the growth in rice production will need to result from higher yields as it is not possible to expand the total rice area. It is estimated that yield per ha could rise from 3.25 m ton in 1970 to 3.53 m ton in 1976 and 3.72 m ton in 1980 (polished basis). These estimates are much less than the plan projection of 4 m ton per ha in 1976. The plan projection of 4 m ton per ha is equivalent to 6 m ton per ha of unhulled rice compared with 5.64 m ton per ha in Japan in 1970. The mission does not believe it will be possible to increase rice yields to Japan's level by 1976 because natural fertility of soils is lower

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1/ Korean officials with whom the report was discussed in September 1973 believe that rice production can be increased 2.7% a year during 1972-81 by applying new technology including wider use of higher yielding varieties such as IR-667, earlier planting in the northern part of the country which would make possible earlier harvesting and reduction of frost damage, the use of more fertilizer and pesticides to control plant diseases and pests and by giving incentive awards to farmers who achieve high yields.

and water control facilities will not be as well developed in Korea as in Japan even after planned irrigation and drainage improvement projects are completed. Korean farmers already have achieved high yields considering the low level of soil fertility and the lack of adequate irrigation facilities for much paddy land.

#### Upland Crops

4.19 Further expansion in production of barley, wheat, soybean, and other field crops will be influenced by improvements of drainage systems to make possible additional double-cropping of paddy land and by higher yields resulting from the distribution of additional lime to reduce soil acidity, the development of new high-yielding varieties, and the application of improved agronomic practices to control plant diseases and pests. The mission concludes that it will be possible to increase barley production by 3.3% annually as projected in the plan. Improvement of drainage systems now planned should make possible double-cropping of an additional 200,000 ha, enough to produce an additional 500,000 tons of barley and wheat, almost as much as the increase over 1970 called for by the plan.

**Table 4.4: 1970 AND PROJECTED RICE PRODUCTION BY RICE AREAS CLASSIFIED BY TYPE OF IRRIGATION**

<u>Rice Areas</u>	<u>Area (000 ha)</u>	<u>Yield (m ton/ha)</u>	<u>Production (000 m ton)</u>
<b>A. <u>1970 Situation</u></b>			
LIAs	307	3.75	1,150
Non-LIAs	548	3.50	1,907
Fully irrigated, total	(855)	(3.57)	(3,057)
Partially irrigated	225	2.80	630
Rainfed	113	2.00	226
Sub-total	1,193	3.27	3,907
Upland	20	1.63	32
Total	1,213	3.25	3,939
<b>B. <u>1976, Partial Completion of Planned Irrigation Projects</u></b>			
Large projects	56	4.30	240
Small projects and land consolidations	265	4.10	1,087
Small projects only	690	3.55	2,450
Fully irrigated, total	(1,001)	(3.77)	(3,777)
Partially irrigated	122	2.90	354
Rainfed	60	2.00	120
Sub-total	1,193	3.56	4,251
Upland	20	1.63	32
Total	1,213	3.53	4,283
<b>C. <u>1980, Completion of Planned Irrigation Projects</u></b>			
Large projects	155	4.50	698
Small projects and land consolidations	265	4.15	1,100
Small projects only	673	3.60	2,423
Fully irrigated, total	(1,093)	(3.86)	(4,221)
Partially irrigated	60	2.90	174
Rainfed	50	2.00	100
Sub-total	1,203	3.72	4,495
<b>D. <u>Plan Projections</u></b>			
Total	1,213	4.00	4,860

Source: Tables 15, 16 and 17 of Annex 2, Crops.

However, annual increases of 5.6% for soybean, 7.4% for miscellaneous grains, and 15% for special crops (cotton, hemp, flax, etc.) are much higher than realized during the last decade and may be difficult to achieve. The annual increase of 11% in tobacco appears feasible as tobacco is a high value crop that could displace lower value crops. It has been estimated that there are 320,000 ha of upland suitable for bringing under cultivation but development costs would be high, and it is planned to bring only about 12,000 ha of this land under cultivation. Consequently, increased production of upland crops will need to result from higher yields per ha and increased double-cropping.

### Fruits and Vegetables

4.20 Land is not a serious constraint to expansion of fruits and vegetables as they occupy only a small share of the total cultivated area and can be grown in upland areas. Because of their high values per ha, they can compete effectively with other crops for land resources, including irrigated land. Mushroom production also could be greatly increased as it does not require cultivated land.

4.21 The planned annual increases of 9.4% for fruits and 5.6% for vegetables are lower than those reported by official statistics during the last decade. They assume that per capita consumption will continue to rise at high rates. Commercial market demand undoubtedly will rise rapidly with urban and industrial growth. Also, there should be opportunities to expand exports of fresh vegetables to Japan and processed fruit and vegetable products to several countries. Consequently, the targets appear realistic for commercial marketings.

### Livestock

4.22 Feed supplies will be a major constraint to attaining the high growth rates set for livestock products. The targets for chicken, eggs, and pork can be achieved if imports of feedstuffs continue to rise as they have in the last five years, but domestically produced supplies of feed concentrates cannot be expected to increase greatly unless land is shifted from food grains to feed crops. Both dairy and beef production could be greatly increased over a period of 5-6 years by developing slopeland areas for pasture and forage production. It has been estimated that there are 1.2-2.0 million ha of semi-utilized native pasture that could be developed to produce much more roughage feeds for beef and dairy cattle (see Annex 3, Livestock). But programs to do this on a large enough scale to realize beef and dairy production targets have not yet been initiated. It also will take time to increase cattle numbers. Consequently, the beef and dairy production targets (11% and 17% annually) may not be realized.

### Sericulture

4.23 There are good prospects for achieving the planned annual increase of 20% in cocoon production by expanding ongoing programs. With silk production declining in Japan and Italy because of labor shortages and rising labor costs and favorable foreign markets, Korea's sericulture industry has

enormous potentials for future growth. The silk industry provides supplemental incomes for half a million families. It provides employment complementary with demands of annual crop production without competing with crops for land. Agronomic conditions are highly suitable for growing more mulberry. Silk worm production is carried out on a seasonal basis, peak labor requirements do not overlap with paddy and barley production, and sericulture enterprises help diversify family labor use and income. Productivity of the Korean silk industry, however, is low compared with Japan where similar natural conditions exist. Yields of cocoon per ha averaged only 30% of Japanese yields in 1969. Although a 25% yield increase was achieved in 1970, there is still a tremendous potential increase which could be achieved by fully adopting Japanese methods. Moreover, Korea has ample upland resources for expanding its mulberry area.

### Forestry

4.24 Production of industrial roundwood is not expected to increase from the current level of around 1 million m<sup>3</sup> in 1972. Requirements are expected to rise to over 7 million m<sup>3</sup> in 1980. The Government initiated a major reforestation program in the early 1960's, and statistics show that plantings have been made on 100,000 ha of the 836,000 ha in national forests and on 500,000 ha of private forest land. But much of the early plantations are stunted and badly stocked as the result of poor species selection and provenances and maltreatment of the planted area by continuation of fuel gleaning practices. Consequently, imports of timber and wood-based products for domestic use as well as logs for the plywood export industry are expected to rise.

4.25 Fuelwood shortages in rural areas will continue to be a serious problem. The Government has attempted to establish fuel wood blocks for local use through subsidy payments in the form of seed, seedlings, and fertilizer in order to eliminate indiscriminate fuel gleaning from forest land. It is estimated that some 1 million ha of fuelwood blocks will be needed to supply fuelwood needs of the rural population for the next 10-20 years. National records indicate that some 800,000 ha of fuelwood blocks now exist. A crash program to establish an additional 200,000 ha and improve existing areas has been proposed. Consequently, there are potentials for overcoming shortage problems in 4-5 years if fuelwood blocks are effectively managed.

### Fisheries

4.26 Prospects for expanding fishery production to the target of 1.46 million m ton in 1976 compared with 1.1 million m ton in 1971 are favorable. Targets set in the past have been exceeded. However, the projected annual increase of 3% in coastal fisheries production, which in 1971 accounted for one-half of the total, may be over-optimistic in view of a decline during 1969-71 from the record high of 525,000 m ton in 1968 (para 18, Annex 11, Fisheries). It is not known whether excessive harvests in the past have limited catch in recent years. A reduction in number of coastal fishermen may have contributed to the decline in coastal fishery production.

4.27 The catch from off-shore fisheries in the Yellow and China Seas has grown at the same time that the number of Japanese vessels fishing the same waters has declined. Although the waters being fished have limited resources, additional displacement by lower cost Korean vessels can be expected. The projected annual increase of 4.8% appears modest since targets set for 1973 were exceeded in 1970 when catch in this sub-sector totaled 201,000 tons.

4.28 Deep sea fisheries, initiated in 1965, increased to 160,000 m ton in 1971 and is projected to double by 1976. The growth has been based mainly on tuna long line and Alaska pollock fishing in oceanic waters not seriously affected so far by the extension of seaward dominion. However, they are affected by multinational movements towards conservation and as stocks approach or pass their maximum sustainable yields further protective measures, unilateral, bilateral or multinational, can be expected. Further growth in tuna catch is expected to come from the surface swimming specie, skipjack, available to live bait and purse seine methods rather than long line. Training in skipjack and pole line fishing and development work in carrying bait from Korea to fishing grounds is underway.

4.29 Korea also has large potentials for expanding output of the aquiculture sub-sector. The recent Korean-U.S. agreement which permits exports of frozen oyster meat to the U.S. should encourage production of this product. Japanese markets for a wide variety of aquiculture products also should stimulate production.

4.30 Inland fisheries are quite limited, amounting to only about 1,000 m ton annually in recent years but it is projected to rise to 10,000 m ton by 1976. Expansion of eel production to supply Japanese markets could become an important source of foreign exchange earnings. There also are potentials for increasing inland fishing utilizing ponds, reservoirs, and rivers more fully for fish culture.

#### D. Labor Productivity and Incomes

4.31 Further reduction in the number of people dependent upon farming for a livelihood will be a major factor contributing to increased output and income per farm worker in the next few years. Although the total number of farm households can be expected to decrease slowly and sizes of farms increase slowly, as has been the case in Japan and Taiwan, total labor force in agriculture likely will decline 1% or more annually over the next decade. Projections of agricultural labor force during the next few years differ widely but they agree that a reduction of about 10% from 1971 to 1981 can be expected (see Annex 7, Farm Mechanization, Table 7 and para 27).

4.32 If an annual growth rate of 4% in gross agricultural output can be achieved at the same time that labor force declines 1% annually, gross output per worker would rise 5% annually, much more than in the last decade. Increased mechanization of farming operations and fuller use of labor

throughout the year will be required to expand agricultural output at the same time that labor force declines. Mechanization of farming operations to reduce labor requirements during harvesting and planting seasons in the fall and in the spring will be difficult. However, there are opportunities for utilizing labor more fully throughout the year by putting increased emphasis on production of livestock, sericulture and crops that do not have peak labor periods that conflict with rice production.

4.33 Labor shortages will become an increasingly important constraint to expanding crop production. It is reported that farm workers are employed only about 100 days a year on the average so there is much opportunity for raising output per worker by diversifying agriculture to provide more productive work throughout the year. Labor shortages and rising wage rates can be expected to encourage farm mechanization. However, farmers will find it difficult to mechanize field operations for planting and harvesting rice, barley, and other crops because of the many small scattered fields, lack of repair services and experience with mechanized equipment, and the capital requirements for increased mechanization. Korean farmers have high peak-labor periods in the spring when barley and other winter crops are harvested and rice is planted and again in the fall when rice is harvested and winter crops are planted. Additional research is needed to find ways of mechanizing these operations and reducing hand labor requirements. Development of rice varieties which mature in a shorter period and thereby provide a longer time for harvesting and planting operations would increase the possibilities of double cropping and help make fuller use of labor. Consolidation of small paddy plots into larger fields also will increase economic potentials for using power machinery.

4.34 Opportunities for raising output and income levels of rural people will be influenced by growth of nonfarm employment opportunities. Although a decline in farm labor force may cause total agricultural output to expand somewhat less than it would with no decline in agricultural employment, shifts in employment that raise output per worker will be in the economic interest of rural people as well as the nation. There appear to be good prospects for raising real incomes of farm households 5% a year with a net movement of workers from agriculture to other sectors and further gains in productivity of farm workers.

## V. POLICY ISSUES AND INVESTMENT PROPOSALS

### A. Priority on Agriculture and Rural Development

5.01 Agriculture and rural development have been relatively neglected and should receive higher priority than in the past. The mission did not study how public investments need to be distributed among sectors to maximize national economic growth, but increased investments in agriculture and rural development relative to those of other sectors may be required to improve the welfare of rural people who have not shared equally in the benefits of economic growth in the past. However, the mission emphasizes that other measures in addition to larger investments in agriculture will be required to raise incomes of rural people. Structural changes in the economy involving further reduction in numbers of farm workers will be necessary to raise productivity rapidly. Industrial development programs that provide nonfarm employment opportunities in rural areas also should receive high priority.

5.02 The economic viability of investment projects proposed by the Government are considered briefly below in this report and in detail in the Annexes. However, the mission believes that projected level of total public investment in agriculture (four times as large as during 1967-71 and eight times as large as during 1962-66) is much larger than can be planned and carried out effectively during 1972-76 even with foreign assistance and supervision in project preparation and implementation. Consequently, attention should be given to extending projects over a longer term. This is especially true with respect to land and water resource development projects which have long gestation periods.

5.03 Although the mission did not review rural development programs in detail, it believes that promotion of "self-help" rural development efforts under the recently launched Sae Maeul Movement have much merit. There are potentials for utilizing idle labor and local materials for constructing community facilities (roads, water supply, schools, etc.). However, some programs for improving the welfare of rural people have been planned, financed, and carried out under the direction of Government agencies with little local community initiative or participation. In a few instances, almost complete reconstruction of village buildings, roads, water supply, drainage and other structures has been carried out at little or no cost to villages. Expectations of rural people with respect to the benefits they will gain from the Sae Maeul Movement may be built up far beyond those than can be realized. There is need for detailed analyses of how rural development programs can be planned and carried out effectively.

5.04 Land capability studies should be made to identify areas that can support a prosperous agriculture or provide the basis for nonagricultural development. It will be especially important to consider probable future migration from rural to urban areas in planning investments for improving rural social services. Investments in marginal or submarginal areas could cause wasteful use of scarce resources.

B. Price Policies and Programs

5.05 Because of price policies and programs followed in the last decade, producer prices of farm products now are generally high compared with those at which imports are available. In 1971, for example, prices received by producers for rice, barley, and soybeans were 62-65% higher than prices paid for imports, if the nominal exchange rate of 370 won per US\$ is used to convert won to dollars (Table 5.1). Prices of livestock products also are high compared with those at which imports would be available. Farm prices of foodgrains averaged much higher in Korea than in Taiwan but much lower than in Japan in 1971.

Table 5.1: FARM PRODUCT PRICES, 1971  
(US\$ per m ton)

<u>Products</u>	<u>Republic of Korea</u>			<u>Japan</u>	<u>Taiwan</u>
	<u>Producer Prices(A)</u>	<u>Import Prices(B)</u>	<u>A/B</u>	<u>Producer Prices</u>	<u>Wholesale Prices</u>
Rice, polished	254	157	1.62	390	168
Wheat	79	65	1.22	151	-
Barley, unpolished	104	63	1.65	165	-
Corn	88	62	1.42	-	-
Soybeans	213	123	1.73	251	168
Apples	177	-	-	160	-
Hogs	599	-	-	650	578
Eggs	562	-	-	490	549

Source: Korea-Producer prices reported by NACF, 370 won = US\$1.00;  
Japan-Producer prices reported by statistical Yearbook of  
Ministry of Agriculture and Forestry, 1971/72, 351 yen = US\$1.00.  
Taiwan-Wholesale prices reported in Industry of Free China  
February 1973, 40 NT\$ = US\$1.00.

5.06 Farm product prices in Korea have been increased greatly in relation to prices at which imports were available since 1965. In the case of rice, for example, the producer price at nominal exchange rate was only \$145 per metric ton in 1965, about the same as the per unit value of imports compared with US\$254 per m ton in 1971. Producer prices for polished barley (also at nominal exchange rates) increased from US\$100 per m ton in 1965 to US\$160 per m ton in 1971.

5.07 The general rise in producer prices for farm products that has occurred under price support programs since 1965 has been the major factor causing farm incomes to rise. Commodity purchase programs also have greatly reduced price variations during the year for rice and barley. But they have not been effective in accelerating rice production as total output has averaged close to 4 million m ton annually in the last three years. They could not be expected to overcome constraints to expansion of output caused by limited land resources, inadequate irrigation and drainage facilities, and other physical conditions.

5.08 Government price support programs do not seem to have resulted in price relationships among commodities that distort resource allocation. Producer prices of fruits, vegetables, beef cattle, hogs, and cocoons have increased about as much as those of rice and barley since 1965 (Table 5.2). Lower relative prices for rice and barley probably would not have caused land and labor used to produce these crops to shift to higher value uses for the nation. Rice is by far the most profitable crop for farmers to grow on irrigated land and barley is the most profitable winter crop. Actually, there has been some reduction in the rainfed rice area despite the rise in rice prices. Prices of poultry, eggs, and dairy products have not risen as much as those of most other products since 1965 due to expanded output based mainly on enlarged imports of feedstuffs at low prices, but restrictions were recently placed on dairy product imports to raise domestic prices. Only in the case of wheat and soybeans does it appear that prices have lagged behind the general rise in the farm product price level.

Table 5.2: INDEX NUMBERS OF PRICES RECEIVED BY FARMERS

	<u>1965</u>	<u>1970</u>	<u>1971</u>
Rice	100	187	235
Barley	100	153	215
Wheat	100	111	137
Soybeans	100	180	182
Tobacco	100	131	175
All fruits	100	217	254
All vegetables	100	250	241
Beef cattle	100	245	289
Hogs	100	182	227
Chickens	100	157	174
Eggs	100	139	136
Cocoons	100	170	211
All farm products	100	192	233

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Source: Yearbook of Agriculture and Forestry Statistics,  
MAF, 1972.

5.09 The general rise in farm product prices has not changed income distribution within the farming sector. Net income per farm household tripled for all farm size categories from 1965 to 1971 (Annex 5, Price Policies and Programs, Table 24). Net income per farm household with over 2.0 ha averaged three times as high as those with less than .5 ha in 1971 as well as in 1965. It has been estimated that a 10% increase in the price of rice alone would increase household income of farms with 0.5 ha or less by only 1-2% compared with 3-5% for farms with over 2.0 ha. But because of the general rise in farm product prices, incomes of farm households in different size categories have increased by about the same percentages although not by the same absolute amounts.

5.10 Price support programs were designed to raise incomes of farm people generally and not to bring about a more equitable distribution of income within the farming sector. A more equitable distribution of income could be achieved by gradually reducing the number of very small farms. Numbers of farms in the different size categories have not changed significantly in the last decade. The total number of farm households increased 9% from 1961 to 1966 but decreased 2% from 1966 to 1971. Looking ahead, potentials for reducing numbers of very small farms as farm people shift to other occupations and the total farm population declines need to be utilized as a means of achieving a more equitable income distribution within agriculture. However, this will be difficult to achieve as rural people near large cities where nonfarm employment opportunities are most numerous tend to migrate from farms first while those in more isolated farming areas migrate last. Rural development programs that improve communication and transportation facilities and industrial employment opportunities in isolated areas also are needed to raise incomes of the less-advantaged rural people.

5.11 As Korea plans to make large investments to expand food grain production to achieve greater self-sufficiency, a major question is: What prices should be placed on increased food grain production in measuring economic returns to investments? Because of the large increases in Government purchase prices and domestic market prices in recent years, producers' prices for rice and barley have averaged much higher than import prices in US dollars (Table 5.3). However, export industries receive many kinds of government assistance (interest subsidy, tariff exemptions, internal tax concessions, liberal wastage allowances, etc.) so the nominal exchange rate needs to be adjusted upward by about 30% when valuing import substitution commodities in dollars in order to compare them with prices at which imports would be available (see Appendix A).

Table 5.3: DOMESTIC AND IMPORT PRICES FOR RICE AND BARLEY  
(US\$ per m ton)

	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>
Rice, polished basis				
Government purchase price	211	276	291	309
Market price	223	237	251	317
Import price	190	174	157	166
Barley, polished basis				
Government purchase price	144	159	171	208
Market price	128	136	161	193
Import price	-	-	-	99
Exchange rate, won per US\$1	304	317	373	400

Source: Domestic market and purchase prices reported by MAF converted to US\$ at nominal exchange rates. Import prices are import unit values. The import prices for rice in 1972 is for early in the year and world prices have increased since then.

5.12 The mission believes that a price of US\$215-220 per m ton for rice, 30% above the total of the 1980 projected IBRD price for better quality Thailand rice of US\$135-140 per m ton and US\$25-30 to cover transportation and handling costs, should be used in estimating economic returns from investments to expand rice production. 1/ It should be noted that world prices of food grains have increased in the last year and a projected price of US\$160-170 per m ton for better quality Thailand rice in 1980 may be appropriate. On this basis, it may be appropriate to use a price of US\$240-250 per m ton for better quality rice in valuing additional production from investment projects in Korea. However, economic returns from investments should not be based on the high Government purchase prices of US\$309 per m ton for rice and US\$208 for barley in 1972.

5.13 The mission recommends that more emphasis be placed upon structural changes in agriculture involving reduction in the number of farm workers and the use of improved technology and mechanization of farming operations to raise output for worker and upon expansion of off-farm employment opportunities and that less emphasis be placed upon raising farm product prices as a means of improving incomes of farm households. Government actions in setting purchase prices for rice and barley for marketing late in 1972 and 1973 are commendable. The purchase price was increased only 13% for rice and 10% for barley, much less than in earlier years and barely enough to allow for general price inflation. In 1971 purchase prices were increased 25% for rice and 30% for barley from those set for 1970. 2/

5.14 Government programs under which fertilizer is made available to farmers at very low prices, pesticides are distributed at low costs and sometimes at no cost to farmers, and lime is free should gradually be eliminated as they can cause wasteful use of resources. The economic justification given for these programs is that small farmers cannot afford to pay higher prices and that these inputs are needed to increase production. The mission recommends that the policy of maintaining very low prices for fertilizer gradually be eliminated as they can cause wasteful use of resources and that other programs to improve the incomes and welfare of rural development people be given increased support. At this stage in Korea's agricultural development, lack of adequate flood control, drainage and irrigation facilities is a major constraint to expanding food grain production. Fertilizer application rates already are very high and only after better water control systems are put into effect and new yield responsive varieties are developed will much higher fertilizer application rates cause yields to rise significantly (see Annex 2, Crops).

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1/ The projected price is from "Market Prospects for Rice, Framework for Commodity Lending in 1973-74", IBRD, October 16, 1972.

2/ The report, An Outline of Long Range Projections, issued by the Ministry of Agriculture and Fisheries on September 20, 1973, rightly places emphasis on raising farm household incomes by increasing incomes from off-farm sources and by mechanizing farming operations.

C. Food Grain Self-Sufficiency

5.15 Korean officials believe that self-sufficiency in rice, barley, and soybeans can be achieved by 1976 but they expect that imports of wheat and feed grains will continue to be large. Imports of feedstuffs, oil seeds, fats and oils and other agricultural products also have increased greatly in recent years and there are opportunities for import substitution in other farm products as well as in food grains. It should also be noted that overall self-sufficiency in food production is not likely to be economic because of the high costs of greatly expanding food production. Korea gradually is becoming an industrialized nation similar to Japan and because of limited land resources will find it economic to rely on industrial exports to finance imports of a large share of its food requirements.

5.16 As wheat imports cost much less per ton than rice imports, further substitution of wheat for rice in Korean diets will reduce foreign exchange costs for food grains. Korea recognized the opportunities of reducing food grain import costs by importing much more wheat and less rice in 1972 than in 1971 and this policy should be continued. Additional facilities for preparing wheat products desired by consumers will be required to increase per capita wheat consumption.

5.17 The present policy of supporting prices for barley at 70% of those for rice to producers and of making barley available to consumers at 50% of those for rice at the retail level may be necessary as a temporary measure to meet food grain shortages. But this policy should gradually be eliminated and relative prices of the different food grains allowed to reflect consumer preferences. High prices for barley will discourage its use for feed.

D. Diversification of Agriculture

5.18 The mission recommends that Korea continue to place high priority on diversifying the agricultural sector by expanding production of fruits and vegetables, livestock, sericulture, and forestry products to utilize land and labor resources more fully throughout the year. Much progress has been made in raising output per farm worker in the last decade by expanding labor intensive farm enterprises. This has reduced dependence of farmers on food grains as a source of income. Rice and barley accounted for 76% of the total value of crop and livestock production in 1961 compared with only 49% in 1971. Farmers should be encouraged to continue to diversify their farming operations to utilize their labor resources more fully and increase their incomes.

5.19 Labor shortages during peak periods will become an increasingly important constraint to expanding food grain production, but there are ample supplies of labor to expand output of other products which require labor during other periods of the year. Domestic market demand for fruits, vegetables, and livestock products will expand much more than demand for food

grains in the years ahead as per capita incomes rise and urban population increases. Foreign markets for raw silk, tobacco, ginseng, and other traditional export commodities also can be expected to expand. There are opportunities for expanding exports of processed fruits, vegetables, and mushrooms but Korea should expect stiff competition in finding foreign markets for these products.

5.20 In addition to expanding livestock production on specialized farms, livestock production at low costs in supplementary enterprises on general farms should be encouraged by utilizing slopeland for pasture and forage production. It should be noted that producer prices for beef and dairy products now are high because imports are limited. High prices probably are needed to get livestock production established on more farms, but they could encourage high-cost production if continued over a long-period and thereby limit market outlets for livestock products.

5.21 Government programs to supply additional credit and technical assistance will be required to take advantage of opportunities to expand mulberry, fruit and vegetable production as well as livestock in slopeland areas.

#### E. Area and Regional Development

5.22 The mission emphasizes that there is urgent need for detailed studies to determine the long-term economic use of land and other resources by areas and regions to avoid making investments that have low economic returns. In planning future resource use, it should be recognized that the number of people dependent upon agriculture for a livelihood may decline greatly in some areas. There already has been much migration of rural people from hilly and mountainous areas and more can be expected in the future with continued growth of employment opportunities in urban areas. Total population has decreased since 1966 in four of Korea's nine provinces where rural population accounted for 75-80% of total population. Investment for roads, schools, and other public services should take into account long-term development prospects for industry as well as agriculture. Fortunately, Korea has a strong educational base that provides a good foundation for decentralized economic development.

5.23 The mission recommends that an area and regional approach to agricultural and rural development be adopted in planning and carrying out projects to raise agricultural productivity and improve rural living conditions. An integrated approach to development problems by areas and regions will help maximize returns from investment projects and make certain that they complement each other. It will be desirable to determine for watershed areas and river basins the appropriate sequences of projects for irrigation and drainage improvements, forestry and slopeland development, and soil erosion and flood control structures required for effective conservation and development of natural resources. To maximize use of limited land resources, land use plans generally should include intensive cropping of lowland areas, less intensive use of cultivated upland, conversion of some

sloped land to pasture and forages for expanding livestock production, fuelwood blocks on hilly land near rural villages, and forest and other vegetative cover on higher elevations to supply timber and reduce rapid rainfall run-off, soil erosion, and siltation of reservoirs and rivers.

5.24 Comprehensive planning for agricultural development by areas and regions also should give attention to needs for improving facilities for communications, marketing, credit, extension (or rural guidance as it is called in Korea) and other supporting services. Measures concerned with improving community facilities for education, medical care, housing, water supply, sanitation, electrification and the like should be an integral part of area and regional development plans. Improved coordination between agricultural production expansion and rural development programs are essential now that Korea plans to increase investments in the rural sector dramatically and to extend the horizon of its agricultural planning effort beyond short-term economic gains to include considerations of income distribution, regional balance, and long-term management of natural resources.

5.25 Currently, responsibility for planning and carrying out agricultural and rural development programs is widely diffused among Government agencies. Several Government ministries, in addition to the Ministry of Agriculture and Fisheries, are concerned with improving rural living and employment conditions. Examples include Ministry of Construction (MOC) - multi-purpose reservoirs, flood control, roads and other civil works; Ministry of Commerce and Industry (MCI) - rural electrification and manufacturing centers; Ministry of Health and Social Affairs (MHSa) - water supplies, medical aid, and family planning; and Ministry of Education (ME) - schools and libraries. The Ministry of Home Affairs has provincial and local government authority over rural development projects including those carried out by ORD and helps finance village projects for improving housing, roads, bridges, community centers and other social facilities. The Economic Planning Board (EPB) has overall responsibility for all development planning activities. However, there is need for centralization of agricultural and rural development planning functions in one government agency with a capable staff to prepare detailed plans for agriculture and rural development by areas and regions in cooperation with local officials. There is also need for carefully defining the functions of the many different agencies concerned with agricultural and rural development to achieve better coordination to avoid duplication in carrying out programs and projects.

5.26 Korea has had some experience in carrying out integrated agricultural development projects. The irrigation projects now being carried out with IDA-IBRD financial assistance are comprehensive area development projects involving improvement of drainage as well as irrigation facilities, some upland and forestry development, and strengthening of supporting services for extension, credit, and marketing. The UNDP watershed demonstration projects scheduled to be completed at the end of 1973 are very intensive rural development projects involving improvement of irrigation, drainage, and flood control facilities, upland conversion for pasture and forage production for livestock, fishery production in reservoirs and ponds, and reforestation of denuded hillsides, in addition to expansion of community

social services for health, education, roads and the like. It is recommended that Korea build on these experiences and utilize trained staff from UNDP watershed projects as well as from other sources in planning future area and regional development projects. In making development plans future migration from rural areas needs to be considered and investments for land improvements which later may be abandoned avoided.

#### F. Land and Water Development Projects

5.27 The Ministry of Agriculture and Fishery is in charge of land and water resources development, except in the case of multi-purpose projects which are the responsibility of the Ministry of Construction (MOC). Under MAF, the Farm Land Bureau oversees the nation-wide land and water programs. The Agricultural Development Corporation (ADC) is the main construction and technical agency under MAF. In Provincial Governments, the Industrial Departments are responsible for small agricultural construction projects. Table 5.4 shows the general pattern of administrative responsibilities of various agencies and sources of finance for irrigation projects (see also para 2.40 above). Until initiation of the Pyongtaek-Geumgang and Yeongsangang irrigation projects financed in part by IBRD/IDA, Korea did not carry out large-scale irrigation projects. Land Improvement Associations (LIAs) were responsible for administration of irrigation and drainage systems covering 310,000 ha and gun (county) offices for about 900,000 ha of the 1.2 million ha classified as paddy in 1970. Irrigation systems operated by gun officers are very small, averaging only around 50 ha each. LIAs average about 1,200 ha in size.

Table 5.4: ADMINISTRATIVE RESPONSIBILITY AND SOURCES OF FINANCE FOR IRRIGATION PROJECTS /a

	<u>Sizes of Projects</u>		
	<u>Small</u>	<u>Medium</u>	<u>Large</u>
Size of command area (ha)	50 or less	50-1,000	over 1,000
Responsibility:			
Design	Gun office	ADC	ADC
Execution of construction	"	LIA	ADC
Operation and maintenance	"	LIA	LIA
Source of finance (%):			
MAF subsidy	50	70	70
MAF loan	-	20-25	20-25
Province subsidy	30	-	-
Land owner	20	5-10	5-10
Total	100	100	100

/a ADC refers to Agricultural Development Corporation and LIA to Land Improvement Associations.

Source: Information compiled by mission.

5.28 Korea plans to make large investments for land and water development to expand its agricultural production base, help achieve self-sufficiency

in food grains, control soil erosion, reduce flood damage and improve incomes of rural people. Altogether, the proposed projects for 1973-76 would require a total investment of 326 billion won (35% of the total planned for agriculture, forestry and fishery), affect 678,000 ha (about half the total paddy area), and increase food grain production 841,000 tons annually when completed (Table 5.5). The Government spent only 44 billion won for land and water development projects in 1967-71 so project plans for 1973-76 are several times larger than those carried out during the SFYP. 1/

Table 5.5: LAND AND WATER DEVELOPMENT PROJECTS PROPOSED FOR 1973-76

Project Groups	Investment Cost <sup>/a</sup> (Bil. won)	Area Affected (1000 ha)	Added Grain (1000 m ton)	Investment Cost		Internal Rate of Return (%)
				Per ha (1000 won)	Per Ton (1000 won)	
1. Paddy rearrangement	67.2	224	208	300	320	12-17
2. Expansion of irrigation facilities	96.9	190	219	510	442	12-22
3. Comprehensive Watershed:						
A. Four river basin projects	69.3	135	128	513	693	-
B. Eleven large irrigation projects	75.1	117	310	641	242	10-19
4. Slopeland development	<u>17.5</u>	<u>12</u>	<u>27</u>	<u>1,450</u>	<u>-</u>	<u>11-15</u>
Total	326.0	678	841	-	-	-

/a Investment costs at 1972 prices. Total investment cost indicated here is lower than shown in Table 19 because 1972 investments are not included.

Source: Prospectus for Expansion of Irrigation Facilities, October 1972, MAF; Prospectus for Comprehensive Watershed Development Project (Volume I, Eleven Large Irrigation Projects, MAF, and Volume II, Integrated Plan for Four Major River Basins, MOC), November 1972; Prospectus for Paddy Rearrangement Project, MAF, October 1972; and Prospectus for Comprehensive Development of Slopeland, MAF, October 1972.

1/ The government revised its plans for land and water resource development in 1973 to extend large scale projects over a longer period. See "An Outline of Long Range Projections", MAF, September 20, 1973, pp. 29-30.

5.29 It is not possible to determine the economic viability of the project proposals given the limited and tentative nature of the technical and economic information about them contained in the prospectuses (see source of Table 5.5 for a list of these prospectuses). Mission estimates based on data contained in the prospectuses indicate that investments would yield an average return of 13% assuming the high current domestic prices for rice and barley but only 10% assuming import prices adjusted upward to allow for the import substitution value of food grains (see Table 23, Annex 6). These estimates are based on the investment costs shown in Table 5.5 but these costs appear much too low in view of recent experience with similar projects in Korea. Each project group is discussed briefly below and in more detail in Annex 6.

5.30 Paddy Rearrangement - These projects involve consolidation of scattered small plots of paddy into larger fields, land levelling, improvement of drainage and irrigation structures, and construction of access roads to fields for 224,000 ha. Paddy rearrangement had been carried out for 202,000 ha by the end of 1972, but only limited information about the effects on crop yields and labor savings of paddy rearrangement in the past are available. It is estimated that rice and barley yields would increase 0.9 m ton per ha which seems reasonable. However, estimated costs of 300,000 won per ha appear much too low. Consequently, the internal rates of return of 12-17% may be much too high (see Table 5.5).

5.31 Expansion of Irrigation Facilities - These projects would improve 5,239 small scale irrigation and drainage systems for 190,000 ha. They would be carried out by land improvement associations and local government units. About 31 billion won of the total of 44 billion won spent for irrigation and land reclamation during 1967-71 were concerned with improving small irrigation systems (see Table 4, Annex 6) so the investment of almost 96 billion planned for 1973-76 represents a large increase over previous programs. Detailed information about the location of areas that would be affected and investment costs and returns by areas is not available. Presumably, areas affected would not overlap with areas where paddy rearrangement would be carried out but this is not clear from the prospectuses. Some paddy rearrangement undoubtedly also would be desirable on the 190,000 ha covered by this proposal.

5.32 Four River Basin Projects - These projects would provide flood control protection for 126,000 ha of cultivated land in watershed areas of the Han, Nagdong, Geum, and Yeongsan rivers. In addition, 8,700 ha of farmland would be formed by straightening river channels and reclaiming land used by meandering river channels. Added grain production estimated at 128,000 m ton would annually result from reducing crop losses due to floods. River improvement projects also would protect buildings, roads, bridges and other property and reduce loss of human life caused by floods. These benefits are not included in estimated rates of return but would be substantial. The projects would be carried out by MOC.

5.33 Eleven Large Scale Irrigation Projects - These projects are similar to the Pyongtaek-Geumgang and Yeongsangang irrigation projects now being carried out by ADC and financed in part by the Bank. They provide for

improvement of irrigation and drainage facilities, paddy rearrangement and land consolidation, a small expansion in the cultivated area, irrigation of some upland, construction of roads, and associated improvements in marketing, credit and other services. Preparation of these projects is more advanced than the others described above, but detailed feasibility studies of them likely will show higher investment costs and lower rates of economic return than those cited in Table 5.5 (and in Table 20, Annex 6).

5.34 Slopland Development - Altogether 52 projects averaging 238 ha each and covering 12,360 ha of slopland would be brought under cultivation under this proposal. Investment costs are very high averaging 1,450,000 won per ha (equivalent to US\$3,625 per ha at 400 won = US\$1.00). Most of the land would be used to grow soybeans, barley, and similar upland crops but some would be used for orchards, vegetables, and intensive pasture and forage for livestock production. Economic returns from investments for slopland development likely will be low except for labor-intensive crops like fruits, vegetables and tobacco.

5.35 Major conclusions concerning proposals for land and water development are as follows:

- (a) Better Coordination in planning projects and in carrying them out is needed. Project proposals seem to overlap. For example, river basin projects for flood control planned by MOC would reduce crop losses in areas where large scale irrigation projects also are being planned by MAF/ADC. MOC and MAF/ADC have prepared project plans independent of each other so the estimates of investment costs and economic benefits are not very meaningful. Some of the land included under paddy rearrangement projects and improvement of small irrigation facilities may also be included in the large scale irrigation and flood control projects. In addition, there may be duplication with areas covered by projects for paddy rearrangement and small irrigation facilities. To achieve effective coordination in preparing and carrying out projects for land and water resource development, a central government agency or board should be established with responsibility for planning and supervising resource development projects. Present Government agencies should be able to carry out projects but they will need a larger well-trained staff of agricultural technicians, engineers, and economists.
- (b) Investment Costs of proposed projects are underestimated. As pointed out above, this is especially true with respect to paddy rearrangement. Additional technical and economic analyses are urgently needed to find ways of reducing project costs and to prepare more precise estimates of costs and benefits.
- (c) The proposed program for land and water resource development is much larger than can be carried out during the TFYP. Even with technical assistance from abroad, time will be required to carry out engineering studies and design projects that will make efficient use of scarce capital and labor resources. It

should be recognized that even if all proposed projects are found to be economic, which seems doubtful, it will not be possible to complete them and realize the estimated increase in food grain production of 841,000 m ton by 1976. However, proposed projects that are determined to be economical could be completed over a period of 5-6 years.

- (d) Large scale irrigation and area development projects likely will have the highest conomic returns. Projects for paddy rearrangement and improvement of small scale irrigation systems will have limited value until an area and regional approach is adopted to overcome drainage and irrigation water supply problems. River improvement works for reducing flood damage should be planned together with large-scale irrigation and area development projects.
- (e) In preparing plans for rual area development attention should be given to potentials for expanding fuelwood and timber production as well as pasture and forage for expanding livestock production. Present project proposals place heavy emphasis on expanding food grain production in lowland areas and not enough on potentials for utilizing slopeland productively and achieving forest and vegetative cover in hilly and mountainous areas to reduce soil erosion and rapid rainfall runoff. However, development of slopeland for intensive cultivation will not be economic except for high-value and labor intensive uses such as fruits, vegetables, and sericulture.

#### G. Farm Mechanization

5.36 The Government has given increased attention to mechanization of farming operations in recent years because of rising farm wage rates and labor shortages during peak labor periods in June/July and October/November. Nominal farm wage rates tripled during 1966-71. Real farm wage rates rose 50%. Although there has been a small decline in the total farm labor force in the last 5 years, it is not certain that this trend will continue in the next few years as population pyramids showing age distributions indicate that an unusually large number of young farm people will be entering the labor force. However, if an increase in farm labor force occurs, it likely will be temporary and a large decline can be expected after 1975 (see para 27, Annex 7, Farm Mechanization).

5.37 The original TFYP for 1973-76 called for a total investment of 49.5 billion won in farm mechanization and the adjusted TFYP for 1972-76 for a total investment of 85.6 billion won (see Table 4.1 above). The number of power tillers to be supplied during 1973-76 under the original TFYP was 33,240 but this number was increased to 90,000 under the adjusted TFYP compared with 17,000 on hand at the end of 1971 (Table 5.6). Similar large increases were projected for power threshers, power sprayers, irrigation pumps, and other equipment. The original plan anticipated that field

operations would be mechanized for 450,000 ha by 1976 but the adjusted plan increased the goal to one million ha, an area equivalent to almost half the total cultivated area. <sup>1/</sup>

Table 5.6: NUMBERS OF POWER EQUIPMENT ON FARMS

<u>Numbers on hand</u>	<u>Power Tillers</u>	<u>Power Threshers</u>	<u>Power Sprayers</u>
1961	30	4,794	310
1966	1,555	22,338	8,798
1971	16,842	63,350	69,407
<u>Numbers to be Supplied</u>			
1972	5,500	2,000	16,300
1973-76 TFYP	33,240	24,800	-
1973-76 adjusted plan	90,000	60,000	213,500
<u>Number on hand</u>			
1976 adjusted plan	112,500	125,000	299,800

Source: Tables 1, 21 and 22 of Annex 6, Farm Mechanization.

5.38 The Government has supported farm mechanization beginning in 1965 by making subsidies covering 30-40% of the purchase price for farm equipment but this subsidy was reduced to 10% in 1971 and eliminated in 1972 except for a partial subsidy on irrigation pumps. Beginning in 1967, NACF made loans to buyers for 28-40% of the purchase prices of farm equipment usually at an interest rate of 9% a year.

5.39 In 1972, Government funds provided by a USAID loan were used to set up a Farm Mechanization Fund amounting to 2.3 billion won for dispersal by NACF. Farmers could apply for loans of 70% of the purchase price of power tillers and 50% of the cost of other equipment. Repayment is amortized over 5 years for tillers and over 3 years for other equipment. The interest rate is 9%. Distribution of machinery under this program is mainly by local machinery dealers with NACF being responsible for financing.

5.40 The NACF also granted short-term credit totaling one-half billion won for farm equipment purchases in 1972 under its own program. About 2,000 power tillers and other equipment were distributed under this program. Some purchases were made for cash but most involved down payments of 30% with credit at 15-1/2% for the remainder which must be repaid within one year.

<sup>1/</sup> In June 1973 the Ministry of Agriculture and Fisheries issued a report "Prospectus for Farm Mechanization Project," which calls for more rapid mechanization of farming operations. The revised plan, for example, calls for 167,000 power tillers in 1976, compared with 112,500 shown above (Table 5.6). See Annex 7, Appendix Tables 8B, 9B, 10B and 11B for additional details.

5.41 A recently completed study reports that an accelerated program of farm mechanization similar to that proposed in the original TFYP will be economic to the nation and profitable to farmers because of animal power and labor savings and increased yields of rice and barley. <sup>1/</sup> However, the study points out that little information is available to show how yields would be affected by mechanization and that it is not certain that alternative employment opportunities at the wage rates assumed in the study would be available for the displaced labor. Consequently, the study recommends a mechanization program involving the addition of about 38,000 power tillers during 1973-76 to the 17,000 on hand at the end of 1972 and similar increases in other farm machines.

5.42 In view of the limited information available concerning future demand for farm machinery and the profitability of using more farm machinery, it is difficult to establish fixed targets for mechanization in the near future. The mission believes that targets set in the TFYP should be followed until additional experience with mechanization is gained. There is a need for continual review to determine the optimum rate of mechanization and develop Government programs to generate and sustain continued progress. Such review should include review of success in establishing adequate infrastructure for training operators and service personnel and repair facilities as well as studies of future demand for farm machinery and equipment.

5.43 The seasonality of labor requirements in Korean agriculture suggests that emphasis be placed on mechanizing the operations performed during the peak labor periods of June/July and October/November. The most time-consuming operations are rice transplanting and rice and barley harvesting, functions for which technology adapted to Korea conditions is lacking. Expanded research and field trials are needed to advance the time when machinery and procedures suitable to Korean conditions become available.

5.44 The mission recommends that the Government take steps to expand the supply of credit made available for financing the purchase of farm machinery. In view of the limited capital position of most Korean farmers, a Government financial credit program for mechanization of about the same size or slightly larger than in 1972 should be carried out. Supplies of farm machinery should be readily available for purchase at prices that cover production and distribution costs. As there are few farms large enough to make profitable use of power machinery, including small power tillers, the Government also should continue to help small farm operators obtain the use of these implements under cooperative purchase and custom

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<sup>1/</sup> The study was carried out under a contract dated October 14, 1971 between the Government of Korea and Exotech Systems, Inc., Surveys and Research Division with financing by the U.S. Agency for International Development. The report, entitled Farm Mechanization Program for Korea, was submitted by the contractor in August 1972.

hiring arrangements. Programs already underway to provide training, maintenance and repair services should be expanded. The fact that many farmers are accustomed to hiring field work by draft animals should help make possible the substitution of power tillers for draft animals.

5.45 The farm machinery manufacturing industry has grown rapidly in Korea in recent years. Manufacturers have imported some parts and components for assembly of powered machinery through arrangements with foreign firms but it was expected that most machinery will be completely locally produced in 1973. Manufacturers should be encouraged to establish training and service facilities for farm machinery.

#### H. Agricultural Credit

5.46 Korean farmers use only small amounts of credit to finance their farming operations. At the end of 1970, for example, borrowings for agricultural purposes amounted to only 13.5% of farming expenses during the year and to only 2.9% of farming receipts. Total borrowings for agricultural purposes doubled from 1965 to 1970 but prices also doubled so borrowings measured in real terms did not increase (Table 5.7). Borrowings to help cover living and other expenses still are larger than those for agricultural production.

Table 5.7: FARM HOUSEHOLD BORROWINGS AT END OF YEAR  
(Won per household)

	<u>1965</u>	<u>1970</u>
<u>Purpose</u>		
Agricultural production	3,686	7,287
Living and other expenses	<u>6,884</u>	<u>8,626</u>
Total	10,570	15,913
<u>Source</u>		
Cooperatives and public agencies	2,284	4,913
Individuals	7,627	9,802
Other	<u>659</u>	<u>1,198</u>
Total	10,570	15,913

Source: Tables 1 and 10, Annex 8, Agricultural Credit.

5.47 The mission concludes that lack of credit has not been a major constraint to farmer purchases of seeds, fertilizer, pesticides, and other capital inputs required to increase crop yields. These inputs are made

available to farmers at subsidized prices and farmers have purchased greatly increased quantities as their cash incomes increased in recent years with higher farm product prices. However, lack of sufficient intermediate and long-term credit at reasonable terms limit farmer investments for mechanization, livestock, buildings, and land improvements.

5.48 The National Agricultural Cooperative Federation (NACF) formed in 1961 by the merger of the Agricultural Bank and the farmer cooperative system is the main institution for meeting rural credit needs and for providing marketing, supply, insurance and other services. More than 90% of all farmers are members on a voluntary basis, but there is a high degree of Government and Headquarters control as well as considerable public financial support.

5.49 NACF is a semi-autonomous Government Agency. It operates principally on deposits of both members and non-members and on loans from Government and the Bank of Korea (BOK) rather than on capital subscriptions. Member equity is nominal. While strong efforts to increase deposits have met with some success the effective limitation on loan funds is Government policy with respect to volume of loans to NACF from Government and BOK. Volume of NACF lending has increased nearly six-fold since 1965 but still accounts for only about a quarter of outstanding farm credit. Most of the remainder is from non-institutional sources and carries interest rates ranging from 60% to over 100% annually. The Government makes loans at 3.5% for irrigation improvements, but most NACF and other Government loans to farmers are at 9% although NACF also makes many commercial loans at 15.5%. Delinquency rates on NACF loans to farmers have been low, only 1-2% annually. This distinguishes the cooperative credit system from that in other countries where delinquency rates often are much higher. It reflects good management and has established confidence in the banking system.

5.50 Ninety percent of NACF loans made in 1971 and over 60% of those outstanding at the end of the year were for one year or less. The volume of longer time loans, however, has been increasing steadily. It is the longer term loans for capital improvements that should be especially encouraged. NACF funds available for lending fall far short of demand for loans on current terms. This creates problems of allocation by areas, purposes and individual borrowers. It has frequently been suggested by previous study groups, and this mission agrees that some upward revision of interest rates would be desirable. Only if this were done would there be justification for sufficient Government and/or BOK financing to permit NACF to approve all well supported loan applications.

5.51 NACF makes an excessive number of different types of loans by purpose and terms depending in part on source of funds. Administration and accounting could be greatly simplified by pooling of funds and reducing the number of types of loans. Interest rate differences could be reduced by raising the lower ones as part of the process.

5.52 The operating and accounting practices of NACF do not permit an adequate evaluation of the financial results of credit operations separately from marketing, supply and other operations. Attention was

called to this in the appraisal of the new IDA credit project. Provision was made in this project for assistance in evaluating accounting procedures and making any necessary changes.

5.53 Future credit needs of farmers will be heavily influenced by price policies. If prices of fertilizer and other inputs are raised and prices of farm products reduced relative to those of inputs, farmers will need more credit financing. More reliance on credit would have the advantage of making possible a price structure more nearly reflecting free market forces. Government costs of subsidies also could be reduced.

5.54 While it is evident that credit needs will expand fairly rapidly with proposed large public investment in land and water development and with accelerated progress in the adoption of modern technology, the recent rate of expansion in NACF lending seems reasonably adequate pending action on the measures discussed in preceding paragraphs. The IDA credit project for expanding output and marketings of several farm products is just starting. It provides for some pioneering in credit for enterprises which involve further diversification of production. This should prepare the way and indicate directions for credit expansion. Preparations should be made for such an expansion with Bank Group or other external assistance in the next few years to help farmers finance investments in mechanization, livestock enterprises, and other improvements required for modernizing and increasing the efficiency of the agricultural sector.

## I. Marketing

5.55 Rapid urbanization and income growth have caused an unusually large expansion of demand for agricultural marketing services. There has been considerable public and private investment in physical facilities, some of which are excellent, but other facilities presently in use are outmoded and inadequate. Such inadequacies are found in facilities for assembly of produce and delivery of supplies to farms, storage, processing, and wholesale and retail distribution in urban markets.

5.56 Most marketing services are provided by strictly private enterprise. Market channels exhibit great diversity, not only as between commodities, but even in alternative channels through which any one commodity may move from the farm to the urban consumer. While this may be inefficient, examination of price spreads and variations does not provide conclusive evidence to this effect. There is a dearth of cost data to compare with price differences. Keen competition appears to be effective in holding down margins and profits. Use of poor facilities affects quality of services. This, together with the small-scale of operations, probably results in low returns to those engaged in marketing. It is essentially a low cost system, except its costs are increased by the effect of high interest costs on commodities, like grain, which may be in commercial storage for up to 10 or 11 months, and the small volume of sales per farm.

5.57 Continued rapid growth in demand for marketing services is anticipated as a result of further urbanization and per capita income growth. The food consumption pattern is being diversified as incomes increase to include more fruits, vegetables and livestock products. These are more perishable than grain, and it is more expensive to deliver them to consumers in good condition. Planning for investment in marketing must include improvement in quality of facilities as well as expansion of their capacity.

5.58 It is planned to increase NACF's share of total marketings of farm products from 16% at present to 23% by 1976. The mission believes this expansion will be desirable as a means of demonstrating new and improved methods and increasing price competition by providing alternative sales outlets to producers and retail services to consumers. It is important that the Government's role in planning investments in transportation storage, processing and distribution facilities to be used by both private and semi-autonomous cooperative or public agencies, be exercised more effectively. This includes road construction and maintenance, construction of assembly area and central market warehouses, slaughter houses and other processing and urban wholesale and retail distribution facilities. Members of primary cooperatives gradually should be given increased authority and responsibility for business operations of cooperatives. The cooperative movement should ultimately be entirely in the private sector even though it may perform services for the public sector. Otherwise, much of the driving force of the cooperative movement will remain unmobilized. In view of the high educational levels of rural people, they should be well qualified to perform a larger role in managing the operations of cooperatives.

5.59 The mission recommends that private marketing enterprises be supported and encouraged in various ways, such as collection and dissemination of market information, inspection, grading, research and access to credit on terms as favorable as those received by institutional marketing agencies. NACF supplies some of these services, but is not adequately financed and may not even be the appropriate agency to meet all such needs of private, non-cooperative marketing. More research on market organization, costs and physical commodity losses and waste is needed. If NACF is to be solely responsible for such work more resources are needed, but greater MAF involvement is also desirable. NACF is a multi-purpose organization with many responsibilities, both to its members and to the Government. It is natural for NACF to look upon strictly private marketing firms as competitive. This agency should not be expected to be the main source of information concerning agricultural marketing in general. There is inadequate information about all existing physical facilities, private as well as public. It is premature to be severely critical of private marketing on the basis of available information.

5.60 The mission concludes that there is need for better coordination of Government activities concerned with marketing. Responsibility for supervision of central wholesale markets has been divided between two ministries (MAF and MC&I) but new legislation provides that a MAF will have sole responsibility for these markets in the future. There are under-utilized cold storage, wholesale market and slaughter house facilities in

Seoul and elsewhere, despite shortages overall. This should not halt investment but nevertheless should be taken into account in investment planning. Various regulations covering, for instance, taxes levied at slaughter houses, repayment of loans in kind at unattractive prices, and high inspection costs, divert produce from channels which would otherwise be most satisfactory. Changes in such regulations are needed.

5.61 Agricultural marketing is rightly accorded a high priority in the adjusted Third Five-Year Plan. Most of the proposed investment is in facilities for the cooperatives and for the Government's own grain supply management and price stabilization program. Improvements in infrastructure, which serve marketing, such as rural road networks are included elsewhere in the plan but are no less important. A study made in 1969 showed that nearly 13,000 rural villages did not have roads on which trucks could enter and turn around. Other studies show that improved transportation facilities greatly reduce costs of delivering production supplies to farmers and farm products to markets.

5.62 Korea should continue to place high priority on improving marketing facilities for export products such as fruits, vegetables, and mushrooms which are labor intensive and require little land. AFDC efforts to expand output and exports of processed agricultural products merit continuing support. Possibilities for exporting larger quantities of fresh vegetables to Japan especially deserve more attention.

5.63 Proposed projects for improving agricultural and fishery marketing facilities during 1973-76 total 47.7 billion won (Table 5.8). This appears to be a modest amount since the volume of farm products moving through commercial marketing channels may rise 10% annually with further urbanization and income growth. However, it is anticipated that private marketing services will expand rapidly enough to meet most requirements. Mission comments on the proposed marketing projects based on the limited information available concerning them are as follows (numbers refer to those in Table 5.8):

1. Management of Government Food Grains. An IBRD/IDA mission which evaluated the need for additional warehouse facilities for food grains purchased by the Government concluded that the USAID financed project would meet needs until 1974 and perhaps longer. Some newly consolidated Myon (county) cooperatives need new facilities but a project of 8.8 billion won appears excessive.
- 2-A. NACF Public Sales Centers. This proposal requires further study. Problems of coordination between NACF and municipally operated central markets need to be resolved.
- 2-B. Slaughter Houses. Existing facilities are only partially utilized and could handle a much larger number of animals. More information is needed on how the supply of animals for the new facilities would be assured.

- 2-C. Collection Facilities for Fruits and Vegetables. In view of the expected continued growth in marketings and inadequate marketing facilities currently available, this proposal merits detailed study.
- 2-D. Supermarkets for Farm Products. Low priority is placed on this proposal as an NACF enterprise because privately operated general supermarkets are already in this field and are gradually supplying the demand for this higher class of service.
- 2-E. Buffer Stock Warehouses. This project would involve construction of three warehouse by NACF for storage of Government buffer stock purchases of red pepper and sesame. Although NACF storage facilities for these commodities are inadequate, the Korea Cold Storage Company (a subsidiary of AFDC) has large unused storage facilities at Seoul which might be used to store these commodities. AFDC has responsibility for buffer stocks of garlic and CFFC for dried squid and canned snipe fish so responsibility for buffer stock programs is divided.
- 2-F and G. Processing facilities (rice mills) and Transportation Facilities. These two project proposals are concerned with strengthening milling, storage, and transportation facilities of Myon cooperatives (members of NACF). The many small cooperatives (Ri-dong) are being combined into fewer but larger cooperatives (Myon) in order to reduce marketing costs and improve services to farmers. There is need for installation of modern milling and transportation facilities. These project proposals appear promising and merit more detailed preparation.
3. Improvement of Fishery Marketing Structures. These proposals would involve establishment by CFFC of public sales centers for processing, cooling, freezing, and selling fish in six cities; 40 direct sales stores for fish in Seoul; and eight low temperative warehouses for fish in as many cities. Modernization of fishery marketing facilities certainly is needed but additional information concerning these proposals is required to show that they are economically viable.
4. Straw Pulp Mills. Korea already has some rice straw mills which are inoperative because of high costs. There are technical difficulties in using barley straw for pulp. Consequently, this project proposal does not appear viable and requires critical evaluation. (See Annex 10, Forestry, Appendix Table 16).
5. Integrated Agricultural Products Processing. This project proposal has been submitted to the Bank and reviewed in detail. It has been decided that additional project preparation is required before it will be ready for appraisal.

Table 5.8: PROPOSED PROJECTS FOR IMPROVEMENT OF AGRICULTURE AND FISHERIES MARKETING

	<u>Required Funds</u>		
	<u>Total</u>	<u>Government</u>	<u>Private</u>
	-----million won-----		
1. <u>Management of Government Food Grains</u>	8,870	6,900	1,970
2. <u>Improvement of Agricultural Marketing Structure</u>			
A. Public sales centers	2,803	2,803	
Teletype facilities	64	64	
Training for professional salesmen	107	107	
Sub-total Sub-item A	2,974	2,974	
B. Slaughter houses	641	641	
C. Collecting facilities for fruits and vegetables	60	60	
D. Supermarket for farm products	327	327	
E. Buffer - stock warehouses	453	453	
F. Processing facilities (rice mills)	1,800	1,545	255
G. Transportation equipment	3,080	3,080	
Sub-total Item 2	9,335	9,080	255
3. <u>Improvement of Fisheries Marketing Structure</u>			
A. Public sales centers	2,400	2,400	
B. Direct sales stores	400	400	
C. Low temperature warehouses	316	316	
Sub-total Item 3	3,116	3,116	
4. <u>Processing Industries for Agricultural By-Products (straw pulp mills)</u>	2,295	2,295	
5. <u>Integrated Agricultural Products Processing</u>	24,050	8,012	16,038
Total	47,666	29,403	18,263

Source: Prospectus for Improvement of Agricultural and Fisheries Marketing Structure Project, MAF October, 1972.

## J. Forestry

5.64 Korea has physical potentials for greatly increasing forestry production on its 6.7 ha classified as forest land. There are three major interrelated problems that must be overcome to realize these potentials:

1. User rights to forest land. Rural people have traditional rights to collect firewood and materials for making compost from forest land in public as well as private ownership. There are one million farm families who own no forest land in addition to 1.5 million who own some forest land dependent almost entirely upon fuelwood gleaned from private and public forest land. This practice severely restricts the effectiveness of Government reforestation programs.
2. Small size of ownership units. About 95% of the 5 million ha of forest land in private ownership is in holdings less than 10 ha, much of it held by absentee owners. Owners naturally want to retain title and use of their forest land. Widespread ownership of forest land in small units makes it difficult for the Government to get improved forest management practices established over large areas.
3. Capital investment requirements. The long periods required for trees to mature (20-30 years for pulp and up to 40-50 years for saw timber) together with high interest rates mean that capital investment costs are high for private forest land owners and limit their investment in reforestation and adoption of improved management practices.

5.65 The Office of Forestry prepared preliminary drafts of three project proposals for consideration by the mission. They are described in Annex 10, Forestry (para 228 and Appendix Table 16) and summarized below:

1. Gangweon Province Forest Development. It is proposed to establish large-scale industrial plantations of around 120,000 ha, to develop more intensive use of existing forests and to develop forest industries based on immediate yields from existing forest. The project would be implemented by the Office of Forestry and the recently established Forest Corporation would be the executing agency. The project would involve capital costs estimated at US\$36 million and maintenance costs of US\$118 million over a 20-year disbursement period. Preliminary indications are that the Gangweon Province would be a suitable area for large-scale plantations development, but alternative areas such as in Nagdong basin also need to be studied.
2. Fuelwood Blocks. It is proposed to improve existing fuelwood blocks which are estimated to total 845,000 ha and establish an additional 205,000 ha at a total project cost

of US\$80 million of which US\$58 million would be contributed by the Government and US\$22 million by Village Forest Associations mainly in the form of labor. The project is viewed as a part of a comprehensive rural area development programs. Detailed analysis of fuel costs from alternative sources is needed.

3. Special Cash-Crop Trees - Chestnuts, Walnuts and Bamboo.  
The objective is to establish 30,000 ha in large production units distributed throughout the country at a total cost of US\$17 million of which US\$12 million would be from the Government and US\$5 million would be from private sources. Preliminary studies indicate that there are favorable domestic and export markets but they need to be further evaluated by marketing agencies, e.g., NACF and AFDC. The Office of Forestry estimates financial returns of around 20% for this project proposal. Cash tree-crops could be included as a part of integrated rural development projects.

5.66 The mission believes that Government plans for creating village fuelwood blocks to overcome the shortage are commendable. In most countries there is a gradual shift away from fuelwood to alternatives such as oil and the same trend can be expected in Korea over the long term. If this does happen, investment in fuelwood plantations need not have been waste of resources, if species suitable for either fuelwood or pulpwood or sawlogs were used and silvicultural systems adopted which enable management objectives to be changed at some future date. In formulating plans for establishing fuelwood blocks there is scope for integration with rural development projects concerned with increasing rural employment opportunities.

5.67 The mission believes that formulation of an indicative overall fuel and energy supply plan for the country is urgently needed. An evaluation of fuel consumption patterns and requirements of specific areas within the context of the plan would then indicate priorities for fuelwood establishment.

5.68 Recently enacted legislation provides for setting aside "Special Development Areas" which will receive priority for capital flows into reforestation. The actual location of the plantation areas will require evaluation with respect to the range of possible sites for forest industries taking into account the proposed size of plants, the availability of water, energy, communication and markets.

5.69 The new legislation envisages the separation of user rights from ownership rights for the private forests falling within "Special Development Areas," with the Forest Development Corporation controlling the management of the area. Owners would receive a 10% share of gross revenues. With the long rotations which will be needed and the small scale ownership pattern, such an arrangement will be difficult to administer and may not appeal to the owners. Outright purchase of private forest land by the Government could be a possible solution. Another alternative could be a system of leasing (with or without an option to sell) with rentals based on the expected value of the 10% share of gross revenues. However, more attention also should be

given to supporting the establishment of well-managed forest enterprises on small private ownership units as has been done successfully in European countries.

5.70 Current legislation also provides for a fund of US\$5 million per year over ten years for low-interest (3-1/2% to 7%) 20-year loans for reforestation investment which will be available to the private sector and the Corporation. If it were decided to use the fund for land purchase this would be sufficient for the purchase of around 33,000 ha per annum (330,000 ha over ten years). There is also the possibility of reducing the level of the planting program and subsidy payments and using some of these finances for land acquisition.

5.71 There has been no rigorous attempt so far to establish criteria and measure profitability. The resource flows into plantation species planted up to the present could not be justified using normal methods of evaluation. However on the basis of available data, a preliminary assessment of pulpwood grown on a 25-year rotation at establishment costs of US\$150 per hectare and a stumpage of US\$ 6/m<sup>3</sup> gives an internal rate of return of about 8% on a plantation investment. In order to earn the same rate of return on sawlogs grown on a 40-year rotation, stumpage prices in the order of US\$9 to US\$11 per m<sup>3</sup> would be required. These estimates need further study in relation to specific plantation areas. Import prices of pulpwood have averaged around US\$10/m<sup>3</sup> and prices of pulpwood as well as sawlogs likely will increase in the future. Further studies should take account of full establishment costs, including management and overhead costs, and take into consideration the profitability of the related industries. They should also include an evaluation of the employment which the plantations and related industries will generate, the extent to which forestry can be used in the resettlement of illegal cultivators, possible reduction in erosion control expenditures and benefits from improvement in watershed quality and the effects on foreign exchange savings.

5.72 Preliminary estimates indicate that other forms of land development, such as upland grazing, show better financial returns than forestry and competition for forest land is likely to become a major issue over the next 20 years. But estimates of land required for intensive forests indicates that there is room for a transfer of some forest land to agriculture and at the same time meet domestic requirements for forest products.

5.73 The planned expansion of fuelwood blocks and forest plantations will help reduce soil erosion and make possible better use of water resources. The techniques now used for erosion control are very costly and the areas covered small in relation to needs. The mission believes there are opportunities for achieving more effective erosion control and better use of land and water resources for forestry as well as for crop, pasture, and livestock production by carrying out well integrated area and regional development projects referred to earlier (see above paras 5.23-5.26).

K. Fisheries

5.74 Korea's policy of making large capital investments to expand its deep-sea and off-shore fishing fleets in recent years and its plans for large additional investments for these purposes appear sound to the mission. Korea will continue to have competitive advantages over most other countries in deep-sea fishing because of its well-trained and low-cost labor supply. There are large potentials for increasing exports and foreign exchange earnings by further expansion of aquiculture as well as deep-sea fishing.

5.75 Deep-sea and off-shore fishing are capital intensive industries with high levels of output per fisherman but they provide employment for few workers compared with coastal fishing. Only approximate estimates of employment by sub-sectors are available, but it is evident that growth of employment in deep-sea, off-shore, and aquiculture fishing has not been great enough to off-set the decline of employment in coastal fishing (Table 5.9). Although capital requirements per worker employed in deep-sea and off-shore fishing are high, investments for these purposes have yielded high economic returns. Korea has been successful in attracting capital investments from abroad into these industries and lack of capital does not appear to have been a serious constraint on their growth.

Table 5.9: PRODUCTION AND EMPLOYMENT IN FISHERIES

	<u>Production ('000 m tons)</u>		<u>Employment ('000)</u>	
	<u>1966</u>	<u>1971</u>	<u>1966</u>	<u>1971</u>
Coastal	481	505	(170)	(87)
Off-shore	103	261	--	8
Deep-sea	27	159	--	7
Aquiculture	<u>91</u>	<u>147</u>	<u>--</u>	<u>(10)</u>
Total	702	1,073	187	112

Source: Production data are from Table 1, Annex 11, Fisheries. Total employment data are from Major Economic Indicators, 1961-71, EPB, 1972. Estimates of employment in off-shore and deep-sea fishing were supplied to mission by Office of Fisheries. Data in parenthesis are approximate estimates.

5.76 Coastal fishing often is described as an economically depressed low-income industry. Because coastal waters already are intensively exploited, there may not be much scope for further expansion of coastal fishery output. But it should be noted that average labor productivity of coastal fisheries

has doubled in recent years as employment declined. The mission recommends that additional investments be made to modernize and raise the average productivity of coastal fishermen. Further reduction of employment also will be required to raise productivity and income levels. Consequently, high priority needs to be placed on finding alternative employment opportunities for members of the nearly 200,000 fisherman families.

5.77 As in the case of other export industries, the Government makes many taxation concessions, preferential monetary conversion rates, and short-term credit at low interest rates to encourage fishery exports. These favorable financial and trade policies provide ample incentives for investment in fishery export industries.

5.78 The Office of Fisheries requested that consideration be given to six project proposals including the proposal for improvement of fishery marketing structures discussed above (para 5.63). Mission comments on these preliminary draft proposals are presented in Annex 11, Fisheries, paras 99 - 109 and summarized below:

1. Tuna Long Line Development. This project would involve an investment of US\$12.5 million for 58 vessels of 120-250 GT. Korea has expanded tuna fishing rapidly in recent years and can continue to do so because of its labor cost advantages over other countries even though total world catch by tuna long-line methods may not increase much. The proposal merits additional preparation.
2. Skipjack Vessel Construction. This project would involve construction of 10 vessels a year over three years, at a unit cost of US\$800,000 for a total investment of US\$24 million. Korea has no skipjack vessels operating commercially but training of skipjack crews presently is taking place. The proposal merits additional preparation.
3. Eel Culture. This proposal involves expanding the present 18 ha devoted to eel culture by 85 ha over a five-year period at a cost of US\$3.9 million for construction and US\$6.3 million for operation, for a total of US\$10.2 million. Availability of feed for eels may be a constraint to development of the industry as about 7 pounds of fish are required to produce one pound of eels. Eels are high priced and can be marketed in Japan.
4. Factory Fish Meal Ships. It is proposed to build two 5,500 GT factory trawler fish meal ships in foreign yards for a total investment cost of US\$15.4 million. They would produce fillets for export as well as fish meal for domestic use by the livestock industry. The proposal requires much additional preparation giving attention to sources of supply of fish, export markets for fillets, and domestic markets for fish meal.

5. Prosperous Fishing Villages. This is a comprehensive proposal for modernizing all segments of the coastal and off-shore fishing industries under the direction of CFFC. It proposes investments and expenditures of 57.9 billion won (about US\$145 million). The proposal is very large and general and it is not possible to say what aspects merit high priority from the information contained in the broad proposal. Some aspects such as those relating to expansion of aquiculture likely would yield high financial and economic returns.

## VI. MAJOR INVESTMENT OPPORTUNITIES FOR FOREIGN FINANCING

6.01 Ongoing international lending projects concerned with agricultural development are summarized in Table 6.1. Agricultural projects accounted for US\$120.5 million, about one-third of total World Bank Group lending to Korea at the end of 1972.

6.02 The adjusted TFYP and the prospectuses on project proposals discussed above provide much useful information, but they do not present packages of projects that could be submitted to international agencies in their present form. Further project preparation will be required giving more detailed and precise technical and economic information concerning investment costs and benefits.

6.03 Investment planning for the agricultural sector should take into account the effects that rapid economic growth of other sectors is having on agriculture. High priority should be placed on investment projects that help modernize the agricultural sector and raise labor productivity by improving marketing, credit, research and extension, and other supporting services. High priority also should be placed on projects to utilize land and water resources more effectively for expanding timber, fuelwood, and livestock production. But large investments per ha for expanding food grain production in lowland areas likely will yield low economic and financial returns in many instances.

Table 6.1: INTERNATIONAL LOAN PROJECTS IN AGRICULTURE

### A. World Bank Group

1. Pyongtaek-Geumgang Irrigation Project - IBRD, US\$45 million loan of May 23, 1969, closing date of June 30, 1975. ADC is the executing agency. The project involves establishment of large scale irrigation facilities, reclamation, paddy rearrangement, and associated improvements for 37,350 ha.
2. Yeongsangang Irrigation Project - IBRD-IDA, US\$33 million Loan and US\$15 million credit of February 2, 1972. Closing date of September 30, 1977. ADC is the executing agency. This is a comprehensive agricultural development project for irrigation and associated improvements for 33,000 ha.
3. Integrated Dairy Beef Development Project - IDA, US\$7 million credit of February 11, 1971. Closing date of March 31, 1977. Korean Dairy Beef Company is the executing agency. The project involves establishment of 700 dairy farms and two milk processing plants.

4. Agricultural Credit Project - IDA, US\$10.5 million credit of September 29, 1972. Closing date of September 1, 1976. NACF is the executing agency. Project involves development of orchards, sericulture, mushroom, swine and poultry production.
5. Sericulture Development Project - IFC, US\$1.4 million. Project initiated in 1970. Loan to Honam Silk Company for establishing silk mill and expanding mulberry production on 3,000 ha.
6. Construction of Deep Sea Tuna Long Liners and Trawlers - Development Finance Corporation, IBRD, US\$10 million through Korea Development Finance Corporation to September 1972.

#### B. Asian Development Bank

1. Cold Storage and Refrigeration - US\$5 million. Project was initiated in 1969 and is administered by AFDC. Cold storage and refrigeration plants have been established in three major cities.
2. Fisheries Development Project - US\$13.3 million. Project was initiated in 1972 and is administered by Office of Fisheries. The project finances importer of Marine Engines and other equipment for construction of fishing vessels.

#### C. Others

1. United States - USAID Agricultural Development - US\$14.4 million. The project was initiated in 1972 and is administered by MAF and NACF. It provides financing for construction of grain storage warehouses and the supply of farm machinery.
2. Canada - Dairy Development Project - US\$925,000. Project was initiated in 1967 and administered by NACF. It financed the import of 1,478 dairy cattle, forage crop seed, and farm machinery.
3. Republic of Germany - Dairy Development Project - US\$4,563,000. The project was initiated in 1972 and is administered by NACF. It provides for the establishment of feed grain processing and livestock slaughter facilities.
4. Japan - Agricultural Development Project - US\$5 million. The project was initiated in 1972 and is administered by NACF. It finances importation of dairy processing facilities, farm machinery, and equipment for livestock.

Source: MAF.

A. Project Recommendations

6.04 The mission recommends that projects be considered in two categories: (a) those that can proceed independently, some of which can be prepared for early implementation; and (b) area development projects which include several sub-projects. Table 6.2 presents a tentative list of projects suitable for external financing.

Table 6.2: TENTATIVE LIST OF PROJECTS FOR EXTERNAL FINANCING

	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>
Seeds production	x				
Agricultural product processing	x				
Livestock/credit (Beef and dairying)		x			
Forestry (Timber and Industry)		x		x	
Agricultural credit, stage 2		x			
Marketing		x		x	x
Farm mechanization/credit			x		x
Fisheries			x		
Area development I			x		
Area development II			x		
Area development III				x	
Area development IV					x

Independent Projects

6.05 The Seeds Project has been appraised for Bank Group financing and the Agricultural Processing Project should be ready for appraisal later this year so both projects likely can be implemented in 1974.

6.06 The Livestock/Credit Project proposed for 1975 would include a beef project for Jeju island and possibly an expansion in the present Bank dairy-beef development project. An IBRD/FAO Cooperative Program mission has been proposed to assist with project preparation in 1973. Jeju island has 50,000 ha of native grasslands in the interior suitable for development of which only 9,250 ha are improved pasture. An investment project covering some 20,000 ha at a cost of US\$10-15 million could be quickly prepared (see Annex 3, Livestock, paras 114-117).

6.07 The Forest Timber and Industry Projects proposed for 1975 and 1977 would include financing for industrial plantations of around 120,000 ha each at separate locations linked with forest industries which could utilize indigenous timber at the outset. Detailed forest inventory and soil surveys already have been conducted in the northeast, southwest, and Nagdong basin which indicate that large areas are suitable for industrial plantations. Much forest land already is in public ownership but additional private land needs to be purchased or leased. A preliminary project proposal has been drafted (see Annex 10, Forestry, para 54 and Appendix Table 16).

An IBRD/FAO Cooperative Program mission will help in project preparation in 1973.

6.08 The Agricultural Credit Project, Stage 2, listed for 1975, is an expansion of the present IDA project which provides credit for financing expansion of orchards, sericulture, mushroom, swine and poultry production. Korean farmers will gain experience with the use of intermediate term credit under the present project but they will require much more credit to finance long-term improvements for expanding output in the future. See Annex 8, Agricultural Credit, paras 66-72 for a discussion of prospective credit needs.

6.09 The Marketing Projects include a project for expansion and improvement of food grain milling, storage, and transportation in 1975 for Myon cooperatives under the direction of NACF and additional projects for Integrated Agricultural Processing Facilities for export products in 1977 and 1978 under the direction of AFDC. USAID is helping finance construction of grain storage warehouses owned by NACF (see Annex 9, Marketing, para 78) but facilities for grain milling, storage, and transportation of Myon cooperatives need to be modernized. USAID may want to expand its current grain storage project to cover the proposal for grain milling, storage, transportation facilities for Myon cooperatives. Other proposals for modernizing agricultural marketing facilities discussed above (para 5.63) require additional study, but proposals for modernizing central market facilities for fruits and vegetables appear to merit high priority.

6.10 The Farm Mechanization/Credit Project for 1976 would provide additional financing for the Farm Mechanization Fund administered by NACF and would supplement the current USAID project listed in Table 6.1 under C-1. USAID may want to expand its current project before 1976 if credit requirements for farm mechanization rise rapidly. See Annex 7, Farm Mechanization, paras 87-107 and Appendix Tables 8 and 9 for details of a farm mechanization project proposed by the Government.

6.11 The Fishery Project proposed for 1976 could include sub-projects for tuna long line development, skipjack vessel construction and aquaculture development. Some of the sub-projects could be prepared quickly. However, additional discussions need to be held with Government officials regarding its policies for fishery development and with enterprises active in this field on lending channels and procedures. See Annex 11, Fisheries, paras 99-108, for detailed discussion of project proposals.

#### Area Development Projects

6.12 Area development projects are of two types: (a) large scale irrigation and area development projects similar to ongoing Bank irrigation projects and (b) upland development and water management projects similar to

those now being completed by UNDP which include erosion control and re-forestation in the basin's catchment area, bench terracing for rainfed development of orchards and field crops along with pasture on lower slopes, small reservoirs for irrigation, land consolidation, fish ponds, construction of farm roads and community development. Features of the UNDP projects which show acceptable economic returns should be incorporated into the large scale irrigation and area development projects so both sets of projects would provide for comprehensive rural development and help achieve objectives of the Sae Maeul Movement. All projects listed under area development required detailed feasibility studies.

6.13 Area Development Project I listed for 1976 would cover the proposed Ogseo Irrigation Project and associated improvements for agricultural and rural development. The project would improve irrigation and drainage on some 80,000 ha presently irrigated mainly by gravity from a large number of small reservoirs and provide for construction of an irrigation and drainage system to serve about 52,000 ha presently cultivated under rainfed conditions. A feasibility study plan of the project has been reviewed by the Bank and steps are underway to complete a detailed study in 1974.

6.14 Area Development Project IV listed for 1978 would be stage 2 of Yeongsangang irrigation project now being prepared with assistance of consultants.

6.15 Area Development Project II listed for 1976 includes upland development and watershed management projects in two watershed areas located in the Nagdong river basin. They would be along the lines of the UNDP demonstration projects. Korean counterparts of the UNDP projects could perform feasibility studies in about 18 months with minor assistance from foreign consultants on short-term assignments. A detailed plan of operation for carrying out the feasibility study is being prepared by UNDP/Korea. Area Development Project III listed for 1977 would be similar. Institutional arrangements for implementing these projects would need to be established.

#### B. Preinvestment Requirements

6.16 Many studies of agricultural development potentials have been carried out in Korea. Completed and ongoing projects by UNDP and bilateral agencies in cooperation with Korean institutions are summarized in Table 6.3 (end of this section).

6.17 Completed UNDP projects include nationwide surveys of soil, water, forestry, and fishery resources, studies of potentials for their development, field demonstrations, and training. Ongoing UNDP projects include strengthening plant protection services and research, additional soil and forestry studies, additional training in coastal fishery, the first phase of a food processing center, and work on applied nutrition.

6.18 Important bilateral technical assistance projects include training in use and repair of farm machinery by the United Kingdom, a dairy demonstration farm and grasslands research by West Germany, a dairy demonstration farm by New Zealand, and sheep breeding demonstration project by Australia. USAID projects are concerned chiefly with strengthening agricultural research and economic planning capabilities.

6.19 Important studies required for agricultural and rural development planning include:

- (a) Land Use Capability. Estimates of slopeland areas suitable for upland crops, forage and pasture, and forest development vary widely. It is reported that about 320,000 ha classified as forest land would be suitable for cultivation but it also is estimated that 1.5-2 million ha would be suitable for forage and pasture for expanding beef production (see Annexes 2, 3, and 10 on Crops, Livestock, and Forestry). Both technical and economic potentials for utilizing land resources more effectively need to be analyzed. FAO would be a suitable agency to help carry out this study.
- (b) Fuel and Energy Requirements and Resources. Fuelwood blocks are being established to expand fuel supplies for rural people and reduce gleaning of forest land. However, there may be less expensive ways of supplying rural people with fuel. A comprehensive study of national energy requirements and costs of meeting needs from alternative sources is required for effective planning for use of land and water resources. UNDP would be suitable agency for carrying out the study together with the Korean Government.
- (c) Rural Roads and Transportation Facilities. It estimated that about 13,000 of Korea's 35,000 rural villages do not have roads on which motor trucks can enter and turn around. A few studies indicate that improved roads have large economic benefits for rural people. A comprehensive study of present road facilities and of costs and benefits of improving them is needed for rural development planning. UNDP together with Korean Government agencies could carry out this study.
- (d) Export Markets for Fruits and Vegetables. Korea has large potentials for expanding output of fresh vegetables produced in the southeast for export to Japan and processed fruits, vegetables, mushroom and other labor-intensive crops for export to several countries. However, export market outlets have not been studied in detail to find out what prices can

be obtained and what quality standards are required. The current food processing project being conducted with UNDP assistance needs to be expanded to include economic intelligence concerning foreign market prospects.

- (e) Rural Community Development. Korea is placing high priority on improving rural social services and living conditions under the Sae Maeul Movement. Many different Government agencies are participating in rural community development programs. However, no comprehensive studies of the economic and social benefits of investments for rural community development have been made and they are required to provide guidance for future programs. These studies need to take into account long-term agricultural development potentials by areas and regions and prospective population migration from rural to urban areas that will be desirable in view of the growth of employment and income opportunities in other sectors. UNDP and FAO would be suitable agencies to assist with these studies.

6.20 All of the projects listed under area development require detailed technical, economic and financial feasibility studies.

Table 6.3: UNDP AND BILATERAL TECHNICAL ASSISTANCE

A. UNDP Projects Completed

1. Survey of Tideland and Reclamation, 1962-66, MAF. Cost: Local currency - 63,142,000 won and UNDP - US\$628,100. Description: Completed a series of detailed surveys on land conditions, weather, hydrology, tide control, sea-dike construction and drainage for 140,000 ha in western coastal areas. Designed construction works for 20,000 ha. Conducted experimental and demonstration works in a construction area.
2. Survey of Upland Development, 1962-67, MAF. Cost: Local currency - 87,749,000 won and UNDP - US\$683,200. Description: Surveys were concentrated in areas of the Ansung River and Duggin River basins which included data concerning fertilizer use, weather, crops cultivated, reforestation and grassland for livestock. Demonstration works were established in two areas.
3. Survey of Forestry, 1964-68, Office of Forestry. Cost: Local currency - 71,145,000 won and UNDP - US\$641,900. Description: Made aerial photographs of one million ha of forest areas in Gangweon province. Based on this information a detailed forestry inventory was made and a program for efficient forest management was drafted. Conducted training programs for local technicians engaged in forest management.
4. Survey of Fishery Development, 1968-69, Office of Fisheries. Cost: Local currency - 11,184,000 won and UNDP - US\$121,000. Description: A consulting team composed of 11 FAO fishery specialists provided consulting services and formulated a comprehensive plan for fishery development.
5. Soil Fertility Survey, 1964-70, ORD. Cost: Local currency - 410,075,000 won and UNDP - US\$1,004,200. Description: Experimental fertilizer response studies were carried out for major crops by central and provincial offices of ORD.
6. Soil Survey, 1964-70, ORD. Cost: Local currency - 410,075,000 won and UNDP - US\$923,100. Description: Surveys were conducted to formulate an overall soil map for most of the country. Detailed soil maps were completed for 850,000 ha and subsequently used for soil conservation programs, tideland reclamation, and research on soil productivity and for rural extension. Soil surveys were made for 1,270,000 ha regarded as low productivity land.

7. Deep-Sea Fishery Training, 1965-72, Office of Fisheries. Cost: Local currency - 510,000 won and UNDP - US\$1,296,400. Description: Completed training program of local fishermen to be engaged in deep-sea fishing.
8. Tube Well Development, 1969-71, MAF. Cost: Local currency - 568,425,000 won and UNDP - US\$835,200. Description: 47,000 ha were intensively surveyed for potential tube well development.

#### B. UNDP Ongoing Projects

1. Strengthening of Plant Protection and Research, 1971-75, ORD. Cost: Local currency - 420,000,000 won and UNDP - US\$1,067,000. Description: Research is being conducted on decrease and insect damage of major crops, weed control, rodent control and plant quarantine. Under the project 186 technicians will be granted fellowships for study abroad.
2. Soil Survey and Soil Fertility Studies, 1971-74, ORD. Cost: Local currency - 40,500,000 won and UNDP - US\$296,500. Description: Research on soil physics, soil analysis, and fertility promotion.
3. Coastal Fishing Training Center, 1968-73, Office of Fisheries. Cost: Local currency - 749,323,000 won and UNDP - US\$1,596,700. Description: Conduct training programs for senior fishermen to be engaged in coastal and off-shore fishing and for junior and senior fishermen in skipjack fishing.
4. Upland Development and Watershed Management, 1968-73, MAF. Cost: Local currency - 2,454,673,000 won and UNDP - US\$1,846,389. Description: Demonstrate comprehensive agricultural development in watershed areas including upland reclamation, farmland rearrangement, slope land development, and rural community services.
5. Food Processing Center (Phase I), 1971-73, AFDC. Cost: Local currency - 101,528,000 won and UNDP - US\$365,675. Description: Conduct research on food processing and propagation of technical knowledge to food processing industries.
6. Forest Survey and Development, 1968-73, Office of Forestry. Cost: Local currency - 2,566,332,000 won and UNDP - US\$729,600. Description: Conduct forest surveys on a regional basis and subsequently utilize information for formulating comprehensive watershed development plans.
7. Applied Nutrition, 1968-73, ORD. Cost: Local currency - 196,529,000 won and FAO-UNICEF - US\$297,218. Description: Studies of how to improve nutritional levels of farm people.

C. Bilateral Projects

1. United Kingdom, Farm Machinery Training, 1972-74, ORD. Cost: Local currency - 602,469,000 won and US\$446,900. Description: Training in operation and repair of farm machinery and supply of some equipment.
  2. New Zealand, Dairy Demonstration, 1969-73, AFDC. Cost: Local currency - 167,811,000 won and US\$260,000. Description: Demonstrate dairy farm to introduce advanced dairy production technology.
  3. Australia, Sheep Breeding Demonstration, 1971-76, ORD. Cost: Local currency - 232,553,000 won and US\$620,000. Description: Explore potentials for sheep production and distribute information on sheep production.
  4. West Germany, Dairy Demonstration Farm, 1968-72, NACF. Cost: Local currency - 300,465,000 won and US\$475,000. Description: Demonstrate advanced dairy production technology.
  5. West Germany, Grasslands Research, 1972-75, ORD. Cost: Local currency - 177,800,000 won and US\$600,200. Description: Develop improved grass varieties adapted for local environment.
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Source: MAF.



FOREIGN EXCHANGE RATES AND PRICES FOR PROJECT APPRAISALS

1. The prospectuses for agricultural development projects prepared by the government indicate that internal rates of returns of proposed comprehensive watershed development projects are expected to range from 12 to 22% if current prices and nominal exchange rates are used as bases for calculations. However, if international prices of agricultural products converted to won at the nominal exchange rates are used to measure benefits, estimated internal rates of returns would be much lower. This statement is concerned with the problem of what prices and exchange rates should be used in evaluation of proposed investment projects that would increase output of import substitution commodities. Attention is focused on rice and barley, important imports commodities in recent years, but the conclusions also apply to soybeans and other agricultural imports.

2. Table 1 compares domestic and international prices of rice and barley in Korea on the basis of nominal exchange rates. Both series of prices are not appropriate for use in investment decision making. Domestic producer prices are much higher than those at which imports have been available. International prices based on nominal exchange rates also are not appropriate for answering resource allocation questions. Investment resources could alternatively be used for food grain production and import substitution or for export production. Investments in import substitution industries are protected by import duties and other measures including quantitative restrictions. Investments for export industries are encouraged by export subsidies such as tax exemptions and preferential credits. Under such circumstances, the use of international prices in estimating expected rates of returns for development projects would discriminate against investments for expanding food grain production.

3. To avoid undue discrimination against food grain production, benefits of investments for expanding production should be measured by international prices converted to won, not at the nominal exchange rate, but at the average effective exchange rate. The effective exchange rate is defined as inclusive of the effects of import barriers and export incentives. Nominal exchange rates and approximate estimates of effective exchange rates are shown in Table 2. Differences between the nominal and effective exchange rates are smaller in the case of the import rate mainly because quantitative import restrictions are not incorporated into calculation of the import rate. For this reason it is logical to use the export rate as the average effective rate in estimating benefits from investments for expanding food grain production.

4. Table 3 compares domestic and international prices of rice and barley on the basis of the effective export exchange rate. It may be noted that domestic prices of rice were 1.46 - 1.50 times international prices on this basis in 1972 and not 1.87 - 1.92 times on the basis of the nominal exchange rate as shown in Table 1. The comparison for barley is similar.

5. The ratio of the effective buying rate to the average nominal rate as shown in Table 2 varied from 1.28 to 1.33 during 1969-72. If this ratio continues in the future, international prices for import substitution products like rice and barley need to be increased by about 30% in estimating the economic returns from investment projects to increase production of these import substitution commodities.

6. In November 1972, the Government purchases for rice harvested in late 1972 and barley to be harvested in 1973 were announced. These prices are for the year ending October 31, 1973 which is referred to as the 1973 rice year. Government purchase prices for 1973 are compared with import prices of rice and barley in 1972 below:

	<u>Rice</u>	<u>Barley</u>
Government purchase prices (1973 rice year)		
Won per 100 liter	9,888	6,993
Won per m ton	123,600	91,398
Import prices in 1972		
US\$ per m ton	511.4	511.4
Effective buying rate for 1972	84,688	50,577

Thus it is evident that purchase prices announced for 1973 are substantially above import prices in 1972. However, international prices for rice rose greatly late in 1972 and in 1973 and Korea probably will have to pay much higher import prices for rice in 1973 than it did in 1972. The effective buying rate has increased in recent years and probably will be higher for 1973 which also will affect comparisons.

Table 1: DOMESTIC AND INTERNATIONAL PRICES FOR RICE AND BARLEY  
BASED ON NOMINAL EXCHANGE RATE

	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>
<u>Rice per metric ton</u>				
Domestic prices in 000 won <sup>1/</sup>				
Government purchase price	64.4	87.5	108.8	123.6
Market price	67.9	75.0	93.8	126.9 <sup>2/</sup>
Exchange rate (nominal)				
Won per US\$	304.5	316.7	373.3	399.7
Domestic prices in US\$:				
Government purchase price	211.5	276.3	291.5	309.2
Market price	223.0	236.8	251.3	317.5
International prices in US\$ <sup>3/</sup>				
c.i.f., Korea	190.0	173.7	156.6	165.6
Price ratio (Domestic/International)				
Government purchase price	1.11	1.59	1.86	1.87
Market price	1.26	1.36	1.60	1.92
<u>Barley per metric ton</u>				
Domestic prices in 000 won <sup>1/</sup>				
Government purchase price	43.8	50.3	63.9	83.1
Market price	38.9	42.9	59.9	77.3 <sup>2/</sup>
Exchange rate (nominal)				
Won per US\$	304.5	316.7	373.3	399.7 <sup>2/</sup>
Domestic prices in US\$				
Government purchase price	143.8	158.8	171.2	207.9
Market price	127.8	135.5	160.5	193.4
International prices in US\$ <sup>3/</sup>				
c.i.f., Korea	105.9	n.a.	n.a.	98.9
Price ratio (Domestic/International)				
Government purchase price	1.36	n.a.	n.a.	2.37
Market price	1.21	n.a.	n.a.	2.20

<sup>1/</sup> In polished equivalent. The data in 100 l. bags are converted into metric ton basis by the following conversion factors: Rice (polished) - 100 l. bag = 80 kg. Barley 100 l. bag = 76.5 kg. Market prices refer to the annual average.

<sup>2/</sup> Mid-year data.

<sup>3/</sup> Derived from trade data.

Source: NACF, "Monthly Review," September 1972 and data supplied by Foodgrain Division, MAF.

Table 2: NOMINAL AND EFFECTIVE EXCHANGE RATES  
(Won per US\$)

	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u> <sup>3/</sup>
Buying rate (nominal)	303.7	315.9	372.5	398.9
Selling rate (nominal)	305.2	317.4	374.1	400.5
Average	304.5	316.7	373.3	399.7
Cost per \$ export <sup>1/</sup>	87.5	105.2	112.5	112.5
Cost per \$ import <sup>2/</sup>	33.7	34.6	31.2	31.2
Effective buying rate	391.2	421.1	485.0	511.4
Effective selling rate	338.2	352.0	405.3	431.7
Average	364.7	386.6	445.2	471.6

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<sup>1/</sup> Includes interest subsidy, tariff exemptions, internal tax concessions, liberal wastage allowance, etc.

<sup>2/</sup> Includes effective tariff and interest cost of pre-deposits.

<sup>3/</sup> Mid-year data. Costs of import and export are assumed unchanged from the previous year.

Source: Bon-ho Koo, "Korea's Foreign Exchange Policies: An Evaluation and Proposal," Working Paper 7207, KDI.

Table 3: DOMESTIC AND INTERNATIONAL PRICES FOR RICE AND BARLEY  
BASED ON EFFECTIVE BUYING RATE

	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>
<u>Rice (per metric ton)</u>				
Domestic prices in US\$:				
Government purchase price	164.6	207.7	224.3	241.7
Market price	173.6	178.1	193.4	248.1
International price:				
c.i.f., Korea	190.0	173.7	156.6	165.6
Price ratio (domestic/int'l)				
Government purchase price	0.87	1.20	1.43	1.46
Market price	0.91	1.03	1.23	1.50
Exchange rate used <sup>1/</sup>				
Won per US\$	(391.2)	(421.1)	(485.0)	(511.4)
<u>Barley (per metric ton)</u>				
Domestic prices in US\$:				
Government purchase price	112.0	119.4	131.8	162.5
Market price	99.4	101.9	123.5	151.1
International price:				
c.i.f., Korea	105.9	n.a.	n.a.	98.9
Price ratio (domestic/int'l)				
Government purchase price	1.06	n.a.	n.a.	1.64
Market price	0.94	n.a.	n.a.	1.53
Exchange rate used <sup>1/</sup>				
Won per US\$	(391.2)	(421.1)	(485.0)	(511.4)

<sup>1/</sup> Effective buying rates indicated in Table 2.



REPUBLIC OF KOREA  
AGRICULTURAL SECTOR SURVEY

INCOMES OF FARM AND URBAN HOUSEHOLDS AT CURRENT PRICES  
(won)

	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>
<u>Farm</u>										
A. Per household	93,179	125,692	112,201	130,176	149,470	178,959	217,874	255,804	356,382	429,394
B. Per capita	14,582	19,517	17,838	20,929	24,423	29,727	36,373	43,210	61,129	
C. Per worker	29,209	38,438	35,619	41,723	47,907	59,653	73,606	87,905	122,049	
<u>Urban</u>										
D. Per household	80,160	97,200	112,560	161,520	248,640	285,960	333,600	381,240	451,920	517,440
E. Per capita	14,417	17,482	20,245	29,528	45,538	52,566	61,550	71,393	85,591	
F. Per worker	67,361	77,760	90,048	129,216	192,744	219,969	254,656	286,647	339,789	
A/D (%)	116.2	129.3	99.7	80.6	60.1	62.6	65.3	67.1	78.9	
B/E (%)	101.1	111.6	88.1	70.9	53.6	56.6	59.1	60.5	71.4	
C/F (%)	43.4	49.4	39.6	32.3	24.9	27.1	28.9	30.7	35.9	

Note: Incomes of salary and wage-earner families were used to indicate incomes of urban households.

Sources: Farm Household Income - Report of the Results of Farm Household Survey and Production Cost Survey, MAF, 1971;  
Urban Household Income - Annual Report on the Urban Family Income and Expenditure Survey, EPB, 1971.

REPUBLIC OF KOREA  
AGRICULTURAL SECTOR SURVEY

INCOMES OF FARM AND URBAN HOUSEHOLDS AT 1965 CONSUMER PRICES  
(won)

	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>
<u>Farm</u>									
A. Per household	133,494	139,194	112,201	102,099	112,893	122,323	136,513	140,474	174,185
B. Per capita	20,891	21,614	17,838	16,415	18,446	20,319	22,790	23,729	29,877
C. Per worker	41,847	42,567	35,619	32,724	36,184	40,774	46,119	48,273	59,652
<u>Urban</u>									
D. Per household	113,220	105,882	112,560	144,991	202,146	209,495	216,905	213,819	223,391
E. Per capita	20,363	19,044	20,245	26,506	37,023	38,510	40,020	40,041	42,309
F. Per worker	95,143	84,706	90,048	115,993	156,702	161,149	165,576	160,767	167,963
A/D (%)	117.9	131.4	99.6	70.4	55.8	58.3	62.9	65.6	77.9
B/E (%)	102.5	113.4	88.1	61.9	49.8	52.7	56.9	59.2	70.6
C/F (%)	43.9	50.2	39.5	28.2	23.0	25.3	27.8	30.0	35.5

Note: Incomes of salary and wage earner families are used to indicate incomes of urban households.

Source: Farm household income data in Appendix B, Table 1 were adjusted by the index of prices paid by farmers for consumer goods prepared by NACF to obtain income estimates at 1965 consumer prices. Urban household income data in Appendix B, Table 1 were adjusted by Seoul consumer price index for 1963-64 and by the all urban consumer price index for 1965-71.

POPULATION, EMPLOYMENT AND GNP OF FARM AND URBAN HOUSEHOLDS

Year	Households (000)	Population (000)	Employment (000)	GNP at Current Prices			
				Total (Bil won)	Per Household (000 won)	Per Person (000 won)	Per Worker (000 won)
<u>A. Farm Households</u>							
1963	2,416	15,266	5,021	206	85	14	41
1964	2,450	15,553	5,084	320	131	21	63
1965	2,507	15,812	5,000	312	124	20	62
1966	2,540	15,781	5,013	372	146	24	74
1967	2,587	16,078	4,924	395	153	25	80
1968	2,579	15,908	4,863	455	176	29	94
1969	2,546	15,589	4,798	589	231	38	123
1970	2,488	14,432	4,834	714	287	49	148
1971	2,482	14,712	4,709	898	362	61	191
<u>B. Urban Households</u>							
1963	2,273	11,918	2,926	282	124	24	96
1964	2,319	12,405	3,126	377	163	30	121
1965	2,337	12,762	3,522	494	211	39	140
1966	2,652	13,412	3,646	660	249	49	181
1967	2,514	13,989	3,990	847	337	61	212
1968	2,655	14,839	4,398	1,121	422	76	255
1969	2,870	15,821	4,549	1,458	508	92	321
1970	3,376	17,037	4,740	1,832	543	108	386
1971	3,453	17,137	4,999	2,188	634	128	438
<u>C. All Households</u>							
1963	4,688	27,184	7,947	488	104	18	61
1964	4,770	27,958	8,210	697	146	25	85
1965	4,844	28,574	8,522	806	166	28	95
1966	5,192	29,193	8,659	1,032	199	35	119
1967	5,101	30,067	8,914	1,242	243	41	139
1968	5,234	30,747	9,261	1,576	301	51	170
1969	5,416	31,410	9,347	2,047	378	65	219
1970	5,864	31,469	9,574	2,546	434	81	266
1971	5,935	31,849	9,708	3,086	520	97	318

Sources: Yearbook of Agriculture and Forestry Statistics, MAF, 1972;  
Major Economic Indicators, 1961-71, EPB, 1972; Economic Statistics Yearbook, Bank of Korea, 1972.

POPULATION, EMPLOYMENT AND GNP OF FARM AND URBAN HOUSEHOLDS

Years	Households (000)	Population (000)	Employment (000)	GNP at 1965 constant prices			
				Total (Bil won) (Bil won)	Per household (000 'won)	Per person (000 'won)	Per worker (000 'won)
<u>A. Farm Households</u>							
1963	2,416	15,266	5,021	271	112	18	54
1964	2,450	15,553	5,084	314	128	20	62
1965	2,507	15,812	5,000	312	125	20	62
1966	2,540	15,781	5,013	346	136	22	69
1967	2,587	16,078	4,924	327	126	20	66
1968	2,579	15,908	4,863	331	128	21	68
1969	2,546	15,589	4,798	370	145	24	77
1970	2,488	14,432	4,834	367	148	25	76
1971	2,482	14,712	4,709	376	152	26	80
<u>B. Urban Households</u>							
1963	2,273	11,918	2,926	422	186	35	144
1964	2,319	12,405	3,126	436	188	35	140
1965	2,337	12,762	3,522	494	211	39	140
1966	2,652	13,412	3,646	568	214	42	156
1967	2,514	13,989	3,990	668	266	48	167
1968	2,655	14,839	4,398	796	300	54	181
1969	2,870	15,821	4,549	936	326	59	206
1970	3,376	17,037	4,740	1,055	312	62	222
1971	3,453	17,137	4,999	1,190	345	69	238
<u>C. All Households</u>							
1963	4,688	27,184	7,947	693	148	26	87
1964	4,770	27,958	8,210	750	157	27	91
1965	4,844	28,574	8,522	806	166	28	95
1966	5,192	29,193	8,659	914	176	31	106
1967	5,101	30,067	8,914	995	195	33	112
1968	5,234	30,747	9,261	1,127	215	37	122
1969	5,416	31,410	9,347	1,306	241	42	140
1970	5,864	31,469	9,574	1,422	243	45	149
1971	5,935	31,849	9,708	1,567	264	49	161

Sources: Yearbook of Agriculture and Forestry Statistics, MAF 1972; Major Economic Indications, 1961-71 EPB, 1972; and Economic Statistics Yearbook, Bank of Korea, 1972.

GOVERNMENT FINANCIAL SUPPORT FOR AGRICULTURE  
(Million Won)

	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>
<u>Direct Support</u>				
1. Establishment of the land base	25,875	13,539	18,133	19,296
2. Food crop production increase	2,170	5,670	13,475	6,101
3. Economic crops	1,777	2,345	3,432	3,399
4. Livestock	9,469	5,929	6,387	7,421
5. Sericulture	1,844	2,362	2,852	2,553
6. Fisheries	9,657	8,948	12,956	15,120
7. Forestry	3,833	3,853	5,589	5,923
8. Agricultural research and guidance	2,053	1,723	4,971	3,885
9. AFDC projects	4,777	4,913	2,204	2,745
10. 4 big rivers watershed development	1,716	1,992	13,958	16,861
11. Farm business and home industry	113	140	1,360	587
12. Improvement of rural life environment	1,808	1,290	3,709	16,474
13. Self-help projects	4,787	4,141	3,883	3,476
14. Short term agricultural and fisheries loan	7,488	7,439	14,517	10,149
15. Compensation of interest of agricultural loan	350	744	1,802	6,155
16. Local budget projects	9,217	16,116	-	-
17. Contingency	8,424	-	9,800	-
Sub-Total				
<u>Indirect Support</u>				
1. Purchase fund	68,115	104,178	118,652	166,531
2. Fertilizer sale on credit	12,192	11,896	12,278	12,170
Sub-Total	80,307	116,074	130,930	178,701
GRAND TOTAL	175,665	197,218	249,958	298,846

Source: "1972 Fund Support Plan for Agriculture, Forestry and Fisheries"

APPENDIX B  
Table 6

1971 FUND SUPPORT PLAN FOR AGRICULTURAL DEVELOPMENT  
BROKEN INTO SUBSIDY AND LOAN  
(Million Won)

	<u>Subsidy</u>	<u>%</u>	<u>Loan</u>	<u>%</u>	<u>Total</u>	<u>%</u>	<u>Responsible Ministries</u>
1. Establishment of the land base	11,438	63	6,695	37	18,133	19.3	MAF, MOC, MHA
2. Food crop production increase	10,193	31	3,282	69	13,475	16.3	MAF, MOST
3. Economic crops	1,655	48	1,777	52	3,432	2.7	MAF, MHA
4. Livestock	2,668	42	3,719	58	6,387	9.1	MAF, MHA
5. Sericulture	1,754	62	1,098	38	2,852	4.0	MAF, MHA
6. Fisheries	4,515	35	8,441	65	12,956	11.9	OFA
7. Forestry	5,319	95	270	5	5,589	6.1	OF
8. Agricultural research and guidance	4,971	100	-	-	4,971	3.9	MHA, ORD, MOST
9. AFDC projects	500	29	1,704	71	2,204	5.7	
10. 4 big rivers watershed development	12,176	87	1,782	13	13,958	3.2	MAF, MOC, MHA
11. Farm business & home industry	160	12	1,200	88	1,360	1.1	MAF, MOC, MHA
12. Improvement of rural life environment	1,709	85	2,000	15	3,709	2.8	MCI, MOC
13. Self-projects	3,883	100	-	-	3,883	4.9	MHSA, MHA
14. Short term agricultural & fisheries fund	-	-	14,517	100	14,517	3.2	NACF, CFFC
15. Compensation of interest of agricultural loan	1,802	100	-	-	1,802	0.8	MAF, MHA
16. Contingency	-	-	9,800	100	9,800	-	MAF
TOTAL	62,743	53	56,285	47	119,028	100.0	

Notes: MOC: Ministry of Construction      MOST: Ministry of Science and Technology  
MHA: Ministry of Home Affairs      OFA: Office Fisheries Affairs  
OF: Office of Forestry      MCI: Ministry of Commerce and Industry  
MOCs: Ministry of Communications      MHSA: Ministry of Health and Social Affairs

Source: 1971 Fund Support Plan for Agriculture, Forestry & Fisheries

PRODUCTION, NET IMPORTS AND CONSUMPTION OF RICE, BARLEY AND WHEAT

Domestic production (1000 m ton)

<u>Year</u>	<u>Rice</u>	<u>Barley</u>	<u>wheat</u>	<u>Total</u>
1961	3,047	1,478	280	4,085
1962	3,463	1,378	268	5,109
1963	3,015	918	228	4,161
1964	3,758	1,515	309	5,582
1965	3,954	1,807	300	6,061
1966	3,501	2,018	315	5,834
1967	3,919	1,916	310	6,145
1968	3,603	2,084	345	6,032
1969	3,195	2,066	366	5,627
1970	4,090	1,974	357	6,421
1971	3,939	1,858	322	6,119
1972	3,957	1,971	241	6,169

Net imports (1000 m ton)

<u>Year</u>	<u>Rice</u>	<u>Barley</u>	<u>Wheat</u>	<u>Total</u>
1961	0	123	355	478
1962	0	30	406	436
1963	118	170	826	1,114
1964	0	151	630	781
1965	0	71	517	588
1966	31	0	503	534
1967	113	0	922	1,035
1968	216	106	1,067	1,389
1969	755	67	1,369	2,191
1970	541	0	1,254	1,795
1971	1,004	0	1,672	2,672
1972	495	387	1,900	2,782

(Continued on next page)

Consumption (1000 m ton)

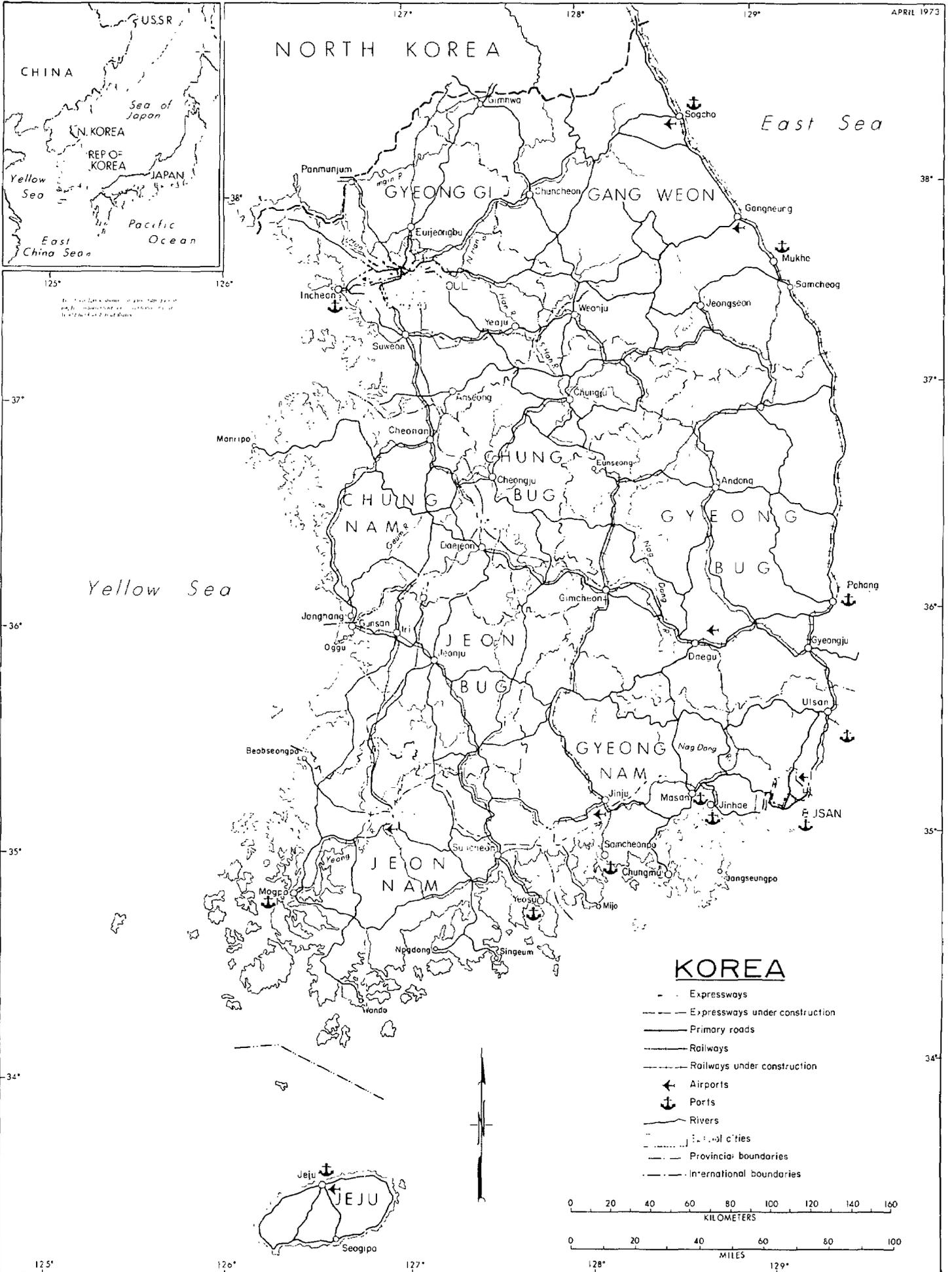
<u>Year</u>	<u>Rice</u>	<u>Wheat</u>	<u>Barley</u>	<u>Total</u>
1961	3,062	696	1,535	5,213
1962	3,407	697	1,500	5,604
1963	3,136	1,067	1,338	5,541
1964	3,709	896	1,305	5,910
1965	3,925	798	1,725	6,448
1966	3,531	774	1,874	6,179
1967	3,954	1,110	2,085	7,149
1968	3,822	1,476	2,106	7,404
1969	3,956	1,621	2,142	7,709
1970	4,394	1,559	1,880	7,833
1971	4,777	1,754	1,992	8,523
1972	4,652	2,087	2,353	9,092

Consumption per capita (kg)

<u>Year</u>	<u>Rice</u>	<u>Wheat</u>	<u>Barley</u>	<u>Total</u>
1961	119	24	60	203
1962	129	26	57	212
1963	115	39	49	204
1964	133	32	47	211
1965	137	23	60	225
1966	121	27	64	212
1967	132	37	69	238
1968	124	48	69	241
1969	126	52	68	246
1970	130	50	60	240
1971	150	55	62	267
1972	144	64	73	281

Note: Data are for rice years which begin October 1. Thus production shown for 1961 refers to 1960 production which is available for consumption mainly in 1961.

Source: MAF.



NORTH KOREA

East Sea

Yellow Sea

### KOREA

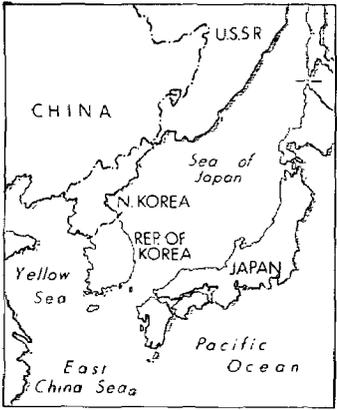
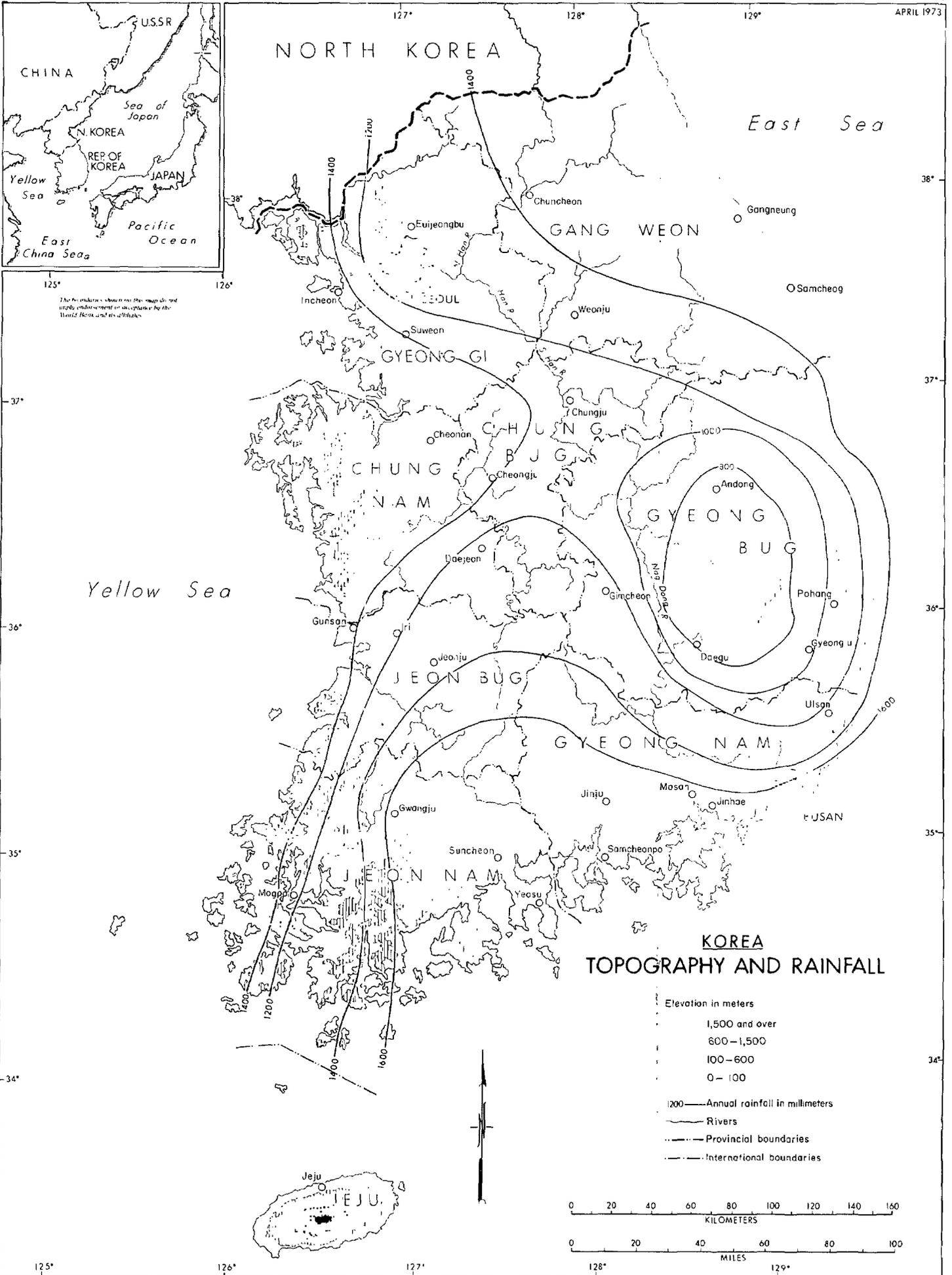
- - - Expressways
- - - Expressways under construction
- Primary roads
- Railways
- - - Railways under construction
- ✈ Airports
- ⚓ Ports
- Rivers
- ⋯ Special cities
- - - Provincial boundaries
- - - International boundaries

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KILOMETERS

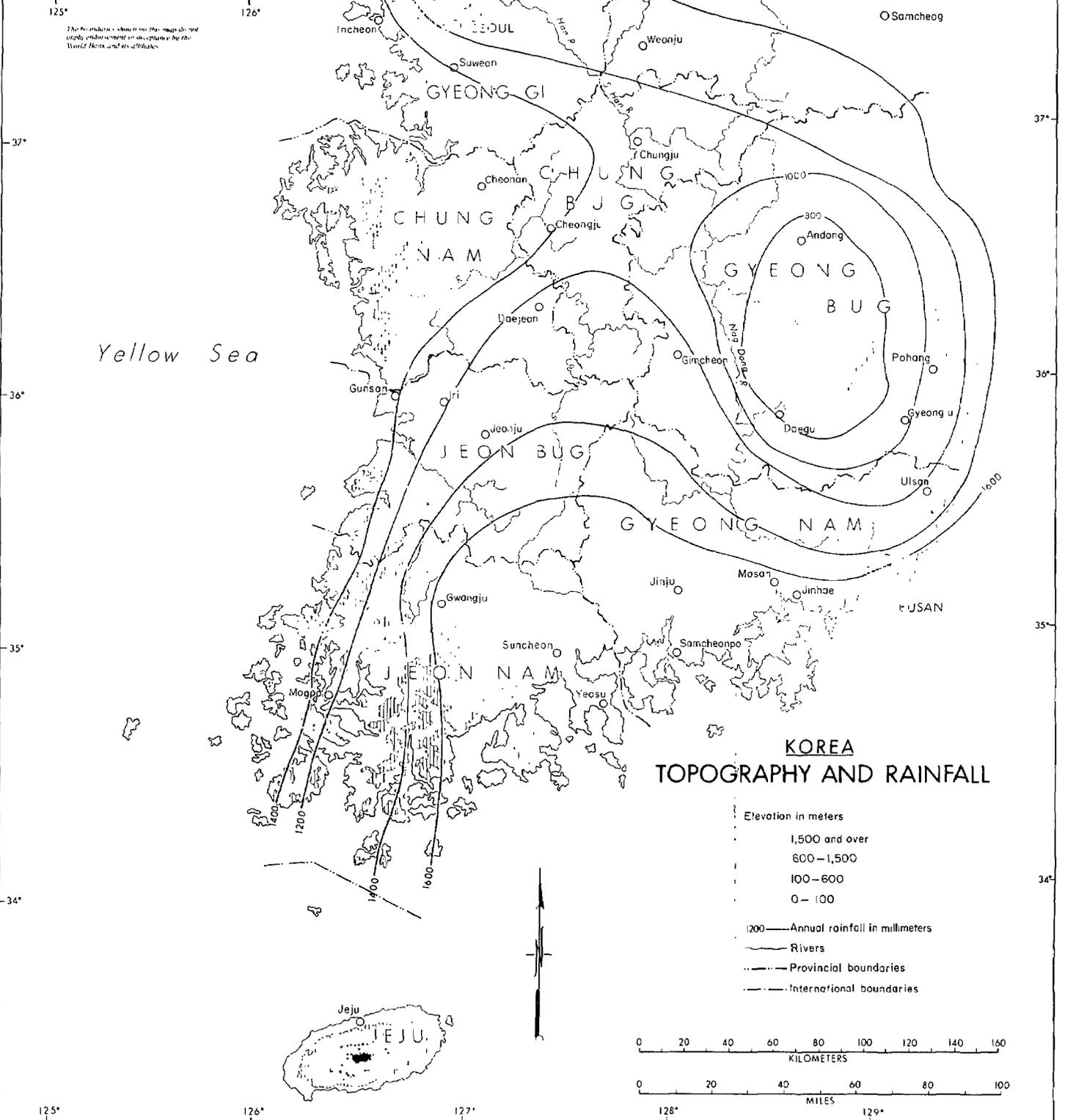
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MILES

Scale: 1:500,000  
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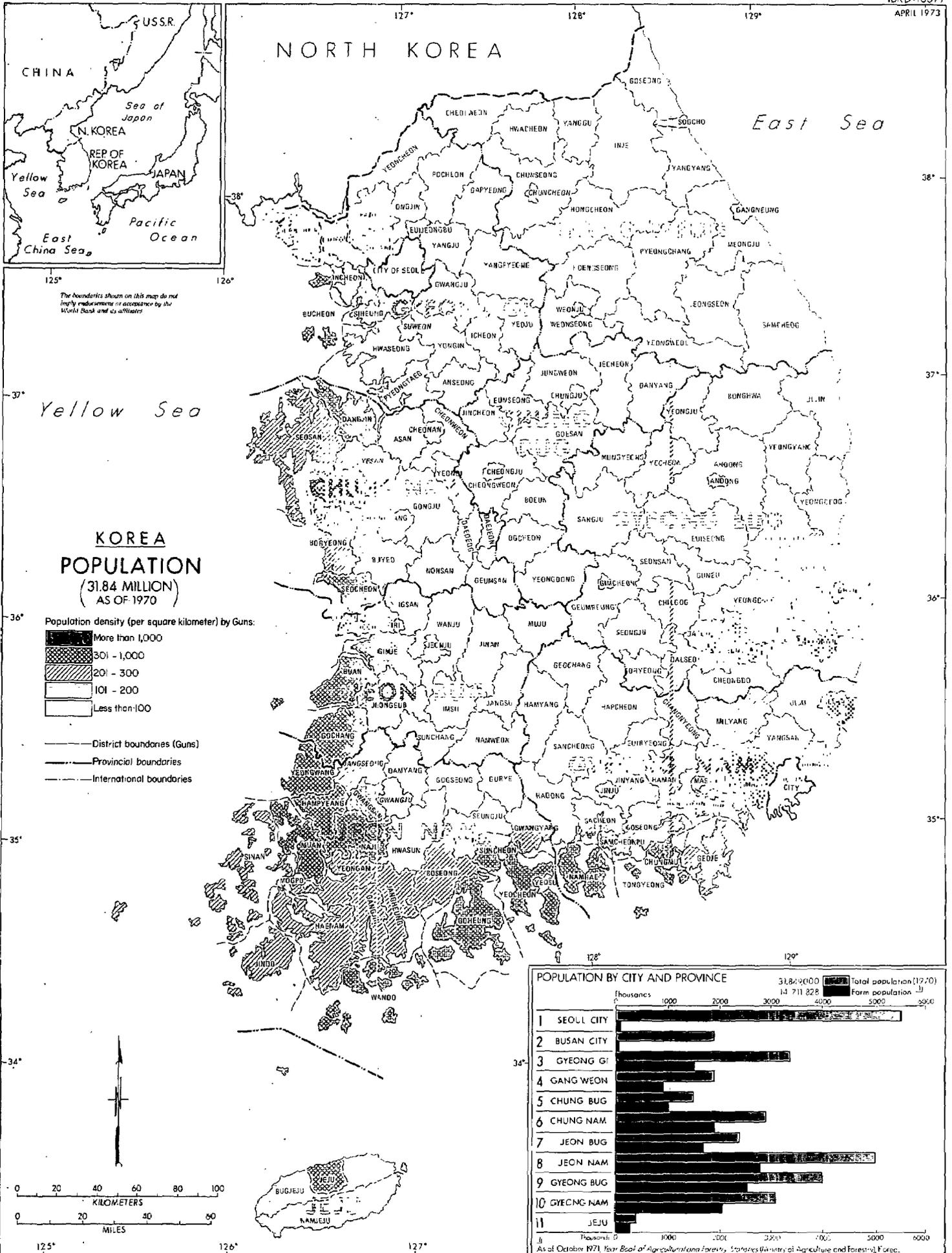






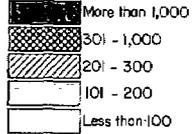
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# NORTH KOREA



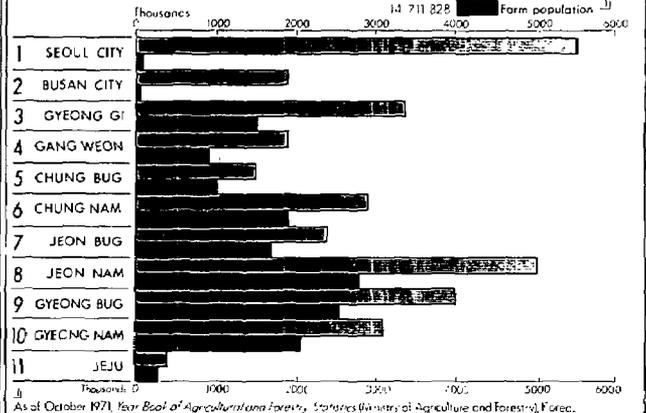
## KOREA POPULATION (31.84 MILLION) AS OF 1970

Population density (per square kilometer) by Guns:



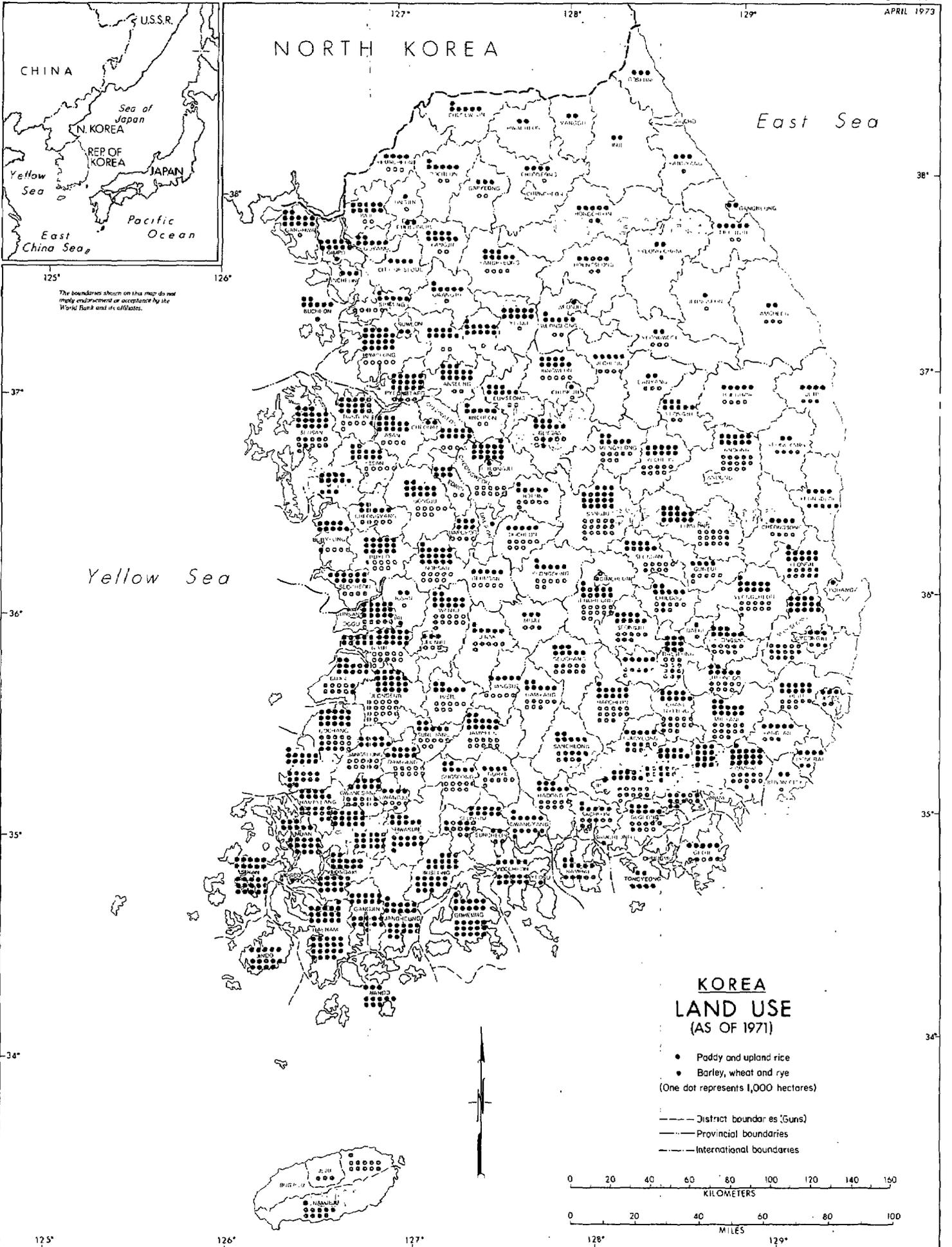
— District boundaries (Guns)  
— Provincial boundaries  
— International boundaries

### POPULATION BY CITY AND PROVINCE



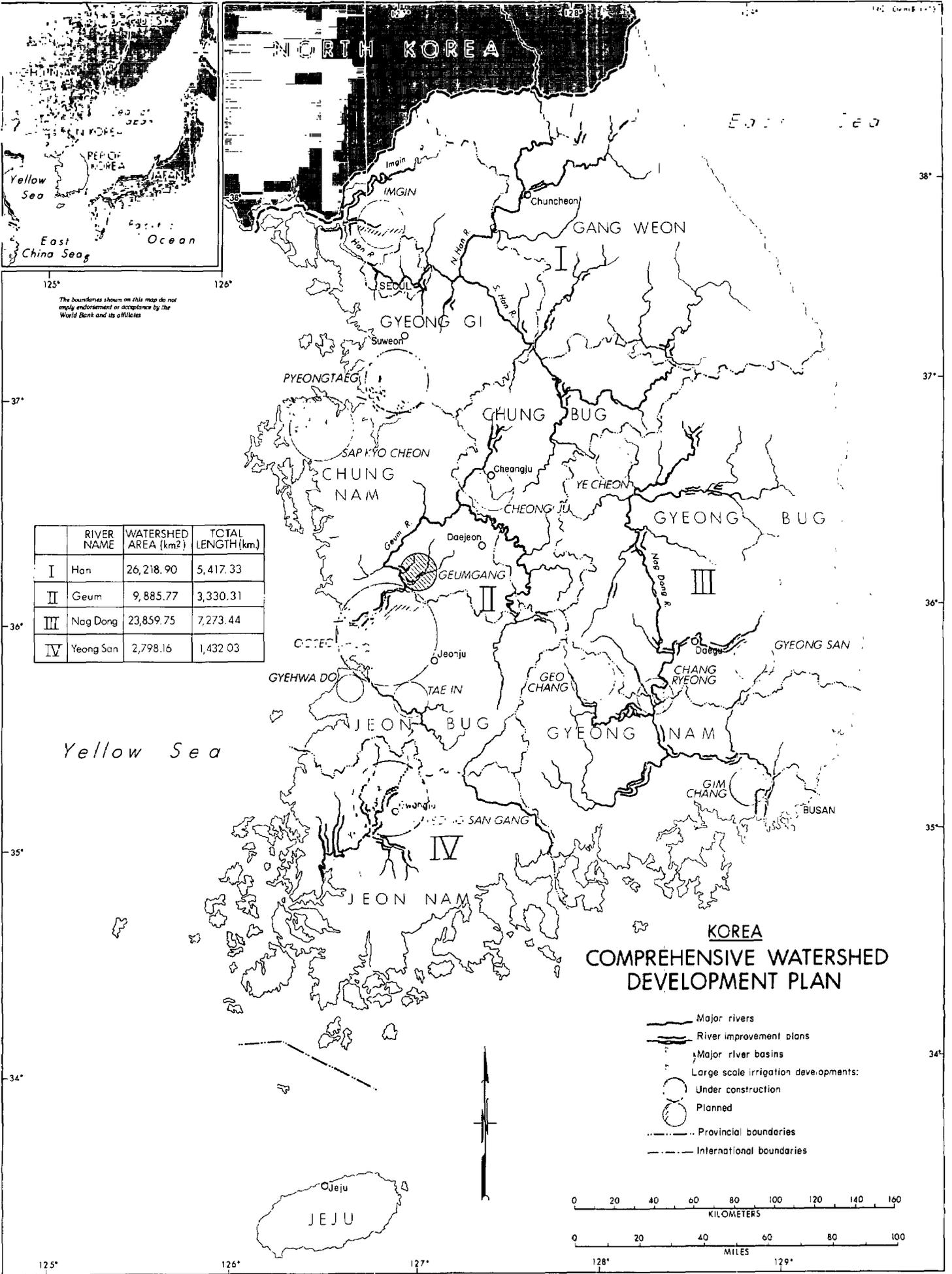
As of October 1971, Year Book of Agriculture, Forestry, Statistics Directorate of Agriculture and Forestry, Korea.





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	RIVER NAME	WATERSHED AREA (km <sup>2</sup> )	TOTAL LENGTH (km)
I	Han	26,218.90	5,417.33
II	Geum	9,885.77	3,330.31
III	Nag Dong	23,859.75	7,273.44
IV	Yeong San	2,798.16	1,432.03

### KOREA COMPREHENSIVE WATERSHED DEVELOPMENT PLAN

- Major rivers
- River improvement plans
- Major river basins
- Large scale irrigation developments:
  - Under construction
  - Planned
- Provincial boundaries
- International boundaries

0 20 40 60 80 100 120 140 160  
KILOMETERS

0 20 40 60 80 100  
MILES

125°

126°

127°

128°

129°

37°

36°

35°

34°

38°

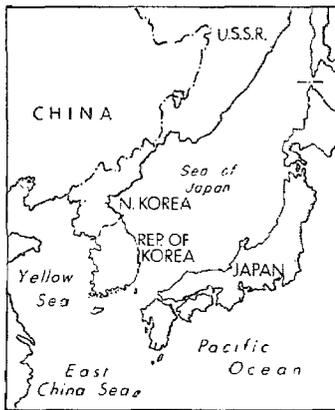
37°

36°

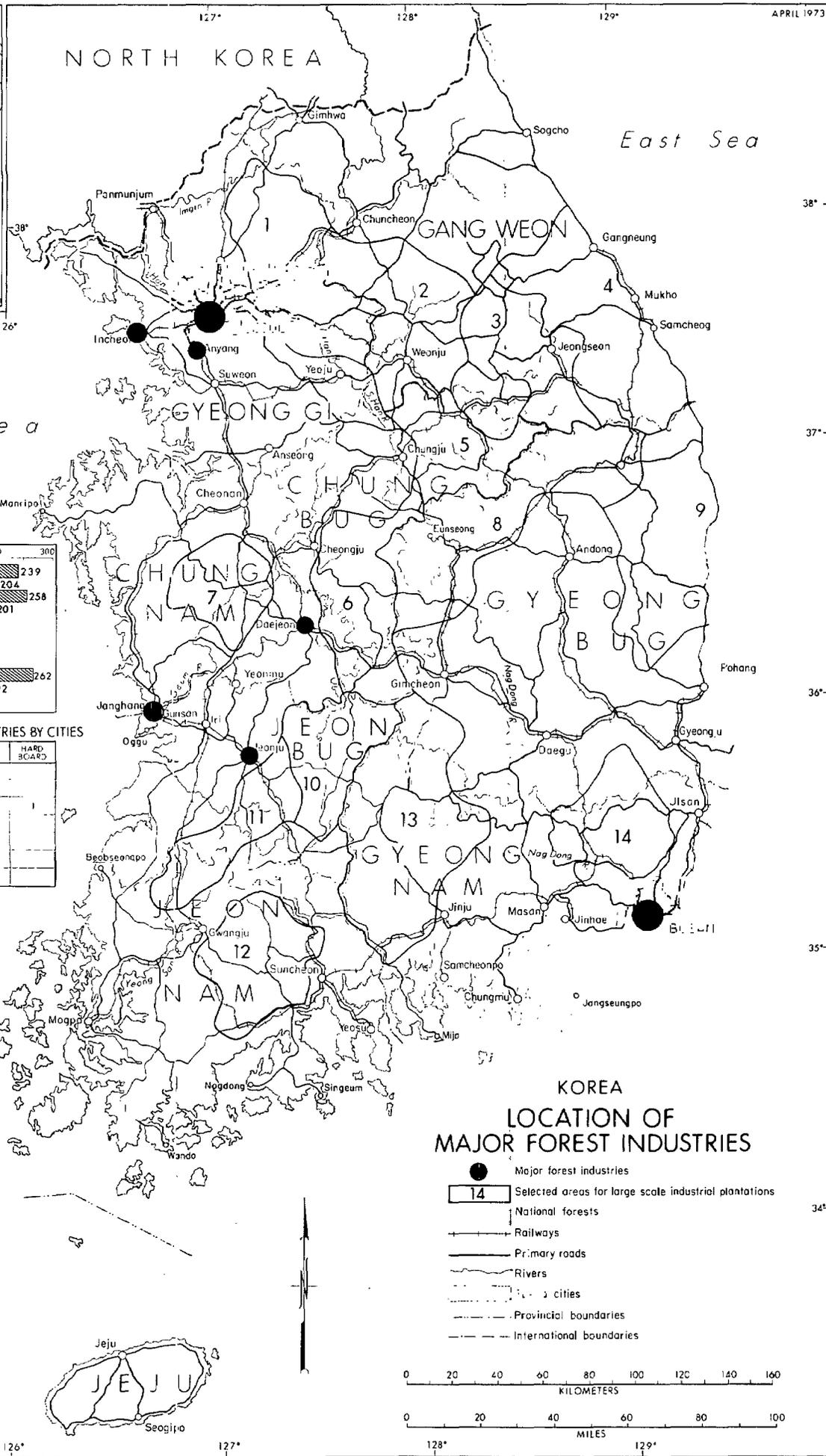
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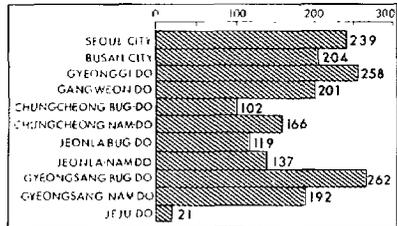




The boundaries shown on this map do not imply endorsement or disapproval by the World Bank and its affiliates.



SAWMILLS BY PROVINCES



LOCATIONS OF MAJOR FOREST INDUSTRIES BY CITIES

CITY	PLY MILLS	PULP MILLS	PAPER MILLS	CHIP BOARD	HARD BOARD
SEOUL		3	7		
INCHEON	3			2	
ANYANG			7		1
DAEJEON			1		
DAEJONG	3	1	2		
JEONJU		1	1		
BUSAN	6		2	1	

KOREA  
LOCATION OF  
MAJOR FOREST INDUSTRIES

- Major forest industries
- 14 Selected areas for large scale industrial plantations
- National forests
- Railways
- Primary roads
- Rivers
- Cities
- Provincial boundaries
- International boundaries

