ISSUES AND STRATEGIES FOR AGRICULTURAL GROWTH IN KOREA*

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I. CHANGES IN THE KOREAN FARM ECONOMY

The Korean economy has experienced a rapid transformation since the mid-1960's demanding concomitant changes in the rural sector. Generally, as an economy becomes industrialized to a level in which on one hand the wage rates and mobility of the rural labor forces go up significantly and on the other hand the demand for non-starch food increases, the farmers are forced to shift their emphasis from grain production to cash crops or livestock production whose demands are income-elastic, so as to maintain economic viability in their farm operations.

The Korean economy has grown at an average annual rate of 10 percent in terms of real GNP since the early 1960's. This economic achievement, which was primarily attributable to the expansion of the export industrial sector, caused a significant structural changes within the agricultural sector. These changes include increasing income disparity between the agricultural and industrial sectors, and the massive migration of the rural population to the cities.

The Korean agricultural sector has grown at an annual rate of 4.5 percent in the past 15 years. The contribution of the agricultural sector to the GNP at constant prices has decreased from 38.2 percent in 1961 to 20.3 percent in 1977. The contrasting growth rates of GNP and per capita GNP between national economy and agricultural sector are shown in Table 1.

The main factors accounting for the agricultural growth were increases in the application of cash inputs and improved varieties of crops. For example, the total consumption of chemical fertilizers increased at a rate of 7 percent per annum during the 1965–1977 period. The total quantity of agricultural chemicals used for controlling disease and insect pests expanded more strikingly at the annual rate of 20 percent during the same period (Table 2).

On the other hand, it has been observed that a gradual substitution of

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TABLE 1
ANNUAL GROWTH RATES OF THE NATIONAL ECONOMY AND AGRICULTURAL SECTOR

Unit: percent

Period	Growth Rates of GNP*		Growth Rates of Per Worker GNP	
	National Economy	Agricultural Agr. Sector	National Economy	Agricultural Agr. Sector
1963–71	9.8	4.6	6.4	4.3
1972–77	11.1	3.6	7.5	2.2

* Includes forestry and fisheries
Source: Economic Planning Board (EPB)

TABLE 2
APPLICATION OF AGRICULTURAL CHEMICALS PER HECTARE OF ARABLE LAND

Unit: *kg/ha*

Year	Total	Pesticide	Insecticide	Herbicide	Others
1965	1.34	2.34	0.94	0.02	0.05
1970	4.32	1.11	2.64	0.44	0.13
1977	10.76	2.24	6.57	1.67	0.29
Av. Annual Rate of Increase (1965–77)	19.6%	20.3	18.7	59.8	31.3

Source: Ministry of Agriculture & Fisheries (MAF)

machineries and herbicide for labor inputs has taken place since 1967 when the Seeond Five-Year Economic Development Plan was initiated. This trend has accelerated in recent years. For example, during the period of 1965 to 1976, the labor input per hectare of rice production decreased from 1,400 hours to 1,040 hours, and that of barley was reduced from 980 hours to 710 hours, while the average size of farm machinery increased from 0.17 H.P. to 0.88 H.P. per hectare of cultivated land during the same period (Table 3).

In recent years, the rural people have experienced significant changes in the quality of their living environment since 1971 when the Saemaul Undong was implemented. For Example, remarkable progress has been made in the improvement of farm land, feeder roads, housing, mass communication media, electrification and group farming in rural areas. It is believed that changes have created not only better amenities for rural residents but also have contributed to the modernization of agriculture through improved efficiency in production, marketing and communications. As Table 4 indicates, farm household assets nearly tripled and household disposable income doubled in real terms between 1963 and 1977. Moreover, as the farmers' consumption expenditures increased at a lower rate than their income, the farmers' saving capacity significantly increased. Despite these improvements in the rural standard of living and infrastructure, there

TABLE 3
AVERAGE SIZE OF FARM MACHINERY PER FARM-HOUSEHOLD AND PER HECTARE

Year	H.P. per Farm Household	H.P. per Hectare of Arable Land
1965	0.18	0.17
1970	0.32	0.38
1976	0.85	0.88

* Includes power tillers, tractors, sprayers and prime motors.
Source: MAF

TABLE 4
CHANGES IN FARM HOUSEHOLD ASSETS, NET INCOME AND SAVING BETWEEN 1963 AND 1977

Unit: 1,000 *Won* in 1970 prices

Classification	1963(A)	1977(B)	B/A
Assets	1,027	3,018	2.9
Fixed Assets	889	2,669	3.0
Liquid Assets	138	349	2.5
Liabilities	18	28	1.6
Farm-Household Income	253	494	2.0
Taxes & Interests Paid	8	16	2.0
Disposable Household Income	245	478	2.0
Consumption Expenditures	215	340	1.6
Savings	30	138	4.6
Av. Propensity to save	12.2%	28.9%	

Source: MAF

are strong contradictory pressures between the pull of the cities and changes in the country side. For instance, the total area of arable land has decreased in recent years despite government efforts to expand farm land, though there has been a significant improvement in irrigation and paddy land consolidation. However, the overall effectiveness of these improvements was partly reduced by the conversion of prime cultivated land for building and by increasing pollution.

The farm population has decreased by four million since 1967 despite the relatively high natural growth rate and the number of farm households has also declined at an average annual rate of one percent since the same year. Especially during the late 1960' to the early 1970's the migration force outpassed the absorption capacity of the industrial sector in cities. A considerable number of migrants, as a result, were unemployed or underemployed and at the same time there developed a labor shortage and increased labor costs in the farm sector particularly during the peak seasons. This problem of a labor shortage on farms has become grave in recent years.

As Table 5 shows, the total number of farm households, the farm population and the area of arable land decreased by 13, 22 and 13 percent

TABLE 5
DISTRIBUTION OF FARM HOUSEHOLD AND ARABLE LAND AREA BY SIZE OF HOLDING*

Year	Classification	Under 0.5ha	0.5–1.0 ha	1.0–1.5 ha	1.5–2.0 ha	2.0ha & Over	Total
1965	Farm Population	—	—	—	—	—	15,811,575
	Farm household	900,840	793,864	414,723	228,582	168,890	2,506,899
	Percentage	35.9	31.7	16.6	9.1	6.7	100.0
	Arable land (hectare)	281,217	603,026	517,775	397,331	460,888	2,260,237
	Percentage	12.4	26.7	22.9	17.6	20.4	100.0
1967	Farm population	—	—	—	—	—	16,078,086
	Farm household	919,348	829,258	446,393	218,706	173,159	2,586,864
	Percentage	35.4	32.1	17.3	8.5	6.7	100.0
	Arable land (hectare)	271,008	620,105	548,999	377,019	479,789	2,296,920
	Percentage	11.9	26.8	23.9	16.5	20.9	100.0
1977	Farm population	—	—	—	—	—	12,309,000
	Farm household	799,731	795,331	406,841	170,475	131,552	2,309,930
	Percentage	34.7	34.5	17.7	7.4	5.7	100.0
	Arable land (hectare)	217,265	583,155	495,871	292,577	365,807	1,954,675
	Percentage	11.1	29.8	25.4	15.0	18.7	100.0

* The size of holding is defined in hectare (*ha*).
Source: MAF, Statistical Yearbooks of Agriculture.

respectively, over the period of 1965 to 1977. With regard to changes in the distribution of farm households, the classes of "0.5–1.0*ha*" and 1.0–1.5*ha*" showed an increase in the percentages of household and arable land area in contrast with the decreases in both figures in other categories. It should be observed that the percentage of less-than-one hectare farms has increased by 1.6% points, reaching 69.2 percent in 1977. On the other hand, decreases in the labor force were notable in all classes, resulting in increase in farm land per worker which is most striking in the largest class of holding.

It is also noticeable that the average age of the farm population increased but that they were generally better educated. As shown in Table 6, the average number of school years of farm families has steadily increased for all classifications. That of small sized farmers under one hectare went up most significantly, narrowing the educational gap between the different classes of holding.

As shown in Figure 1, parity indexes which represent the terms of trade between the agricultural and non-agricultural sectors became unfavorable to farmers in the later period of the 1960's, but recovered in the begining of the 1970's when the government adopted a price support policy for rice and

TABLE 6
CHANGES IN AVERAGE NUMBER OF SCHOOLING YEARS OF FARM FAMILIES BY SIZE OF HOLDING*

Year	Under 0.5*ha*	0.5–1.0*ha*	1.0–1.5*ha*	1.5–2.0*ha*	2.0*ha* & Over	Average
1963	4.86	4.78	5.25	5.45	5.66	5.09
1977	5.91	5.98	6.23	6.34	6.36	6.12

* Calculated as zero is given to no schooling and not understanding Korean alphabet; 3-year is given to no schooling but understanding Korean alphabet; 6 for elementary school graduate; 9 for junior high school graduate; 12 for senior high school graduate; 16 for college graduate, and dividing the sum of schooling years by the number of family members excluding those who are under 6 years old.
Source: MAF

TABLE 7
PER CAPITA CONSUMPTION OF SELECTED FOODS

Unit: *kg*/Year

Commodity	1962	1972	1975	1977
Rice	126.5	130.2	125.3	131.8
Wheat	22.0	59.9	50.1	53.8
Potatoes	14.2	21.1	15.4	18.4
Soybean	6.7	7.8	10.3	12.0
Radish	17.1	24.5	24.3	21.8
Cabbage	15.7	27.6	23.4	23.6
Cucumber	1.1	3.1	3.4	3.9
Apple	4.3	7.8	8.8	9.6
Tangerine	0.03	0.4	2.3	3.2
Beef	0.6	1.2	2.0	2.2
Pork	1.4	2.6	2.8	3.9
Milk	0.1	2.5	4.6	7.0
Fish	10.6	23.7	30.3	30.6
Edible Oil	—	2.2	2.8	4.2
Ice cream	—	0.0	0.12	0.68

Source: MAF

barley producers. However, the growth rate of wages in the industrial sector has outpassed that in the agricultural sector since the Second Five-Year Development Plan period which started in 1967.

II. BACKGROUND AND CONSEQUENCES OF RURAL CHANGES

Five factors are combining to generate a structural transformation of Korean agriculture. These forces are changes in the demand for farm products, changes in the agricultural factor markets, technological advances, institutional supporting systems and the impact of nonagricultural sector

FIGURE 1
PARITY INDEXES OF FARM ECONOMY

Source: National Agricultural Cooperatives Federation (NACF)

TABLE 8
INCOME ELASTICITY OF DEMAND FOR FOODS

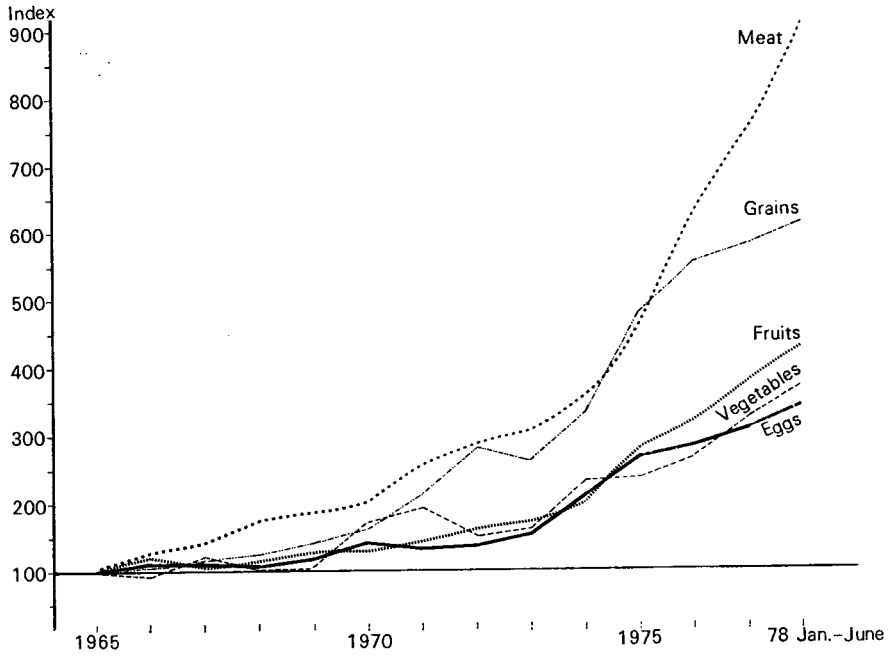
Classification	Elasticity
Rice	0.15
Wheat	0.48
Soybean	0.03
Fruit	0.44–1.31
Meat	1.02
Milk and egg	0.96
Processed food	0.45
Eating outside home	1.20

Source: Milk, eggs, processed food and eating outside home are from NACF's studies based on urban household cross-sectional data.
Others are from National Agricultural Economics Research Institute studies based on time series data.

development.

As the per capita disposable income and the urban population has increased, the demand for income-elastic foods such as meat, dairy products and fruits has gone up substantially. Table 8 shows the current income elasticities of demand for food, though these figures tend to be smaller as income grows. Figure 2 indicates the price behavior of five major food

FIGURE 2
CONSUMER PRICE INDICES OF FOODS



products since 1965 in which the prices of meat, fruit and vegetables recently tended to go up sharply.

The Korean farmers who are increasingly market-oriented have allocated more acreage to the production of commodities such as vegetables and fruits in response to the market price movements. The food processing industry, cold storage facilities for food marketing and the area devoted to green houses have notably expanded in recent years especially since the early 1970's (Tables 9, 10, 11).

TABLE 9
GROWTH OF FOOD PROCESSING INDUSTRIES

Year	Canned Products			Processed Meat	Processed Milk
	Fruits	Vegetables	Mushroom		
	M/T	M/T	C/T	M/T	M/T
1969	8,161	8,890	92,148	1,583	32,439
1972	28,484	26,508	904,727	1,508	77,115
1976	22,581	47,265	1,763,106	5,904	197,334

Source: MAF

TABLE 10
GROWTH OF FREEZING AND COLD STORAGE CAPACITY

Year	Freezing	Cold-Storage	Ice-Making	Ice Storage	Total Number of Plants
1968	836 M/T*	26,742 M/T	2,515 M/T	32,210 M/T	114
1972	1,958	63,842	3,265	45,786	126
1977	3,551	169,290	5,121	91,565	276

* Production capacity per day in terms of metric tons.
Source: Office of Fisheries, MAF

TABLE 11
EXPANSION OF GREEN HOUSE FOR VEGETABLES PRODUCTION

Unit: Hectare

Year	House Area	Planted Area
1969	646	4,418
1973	1,745	5,297
1978	3,970	10,589

Source: MAF

TABLE 12
CHANGES IN THE DISTRIBUTION OF AREA DEVOTED TO CROPS

Unit: Percent

Year	Rice	Other grains	Pulses & Potatoes	Vegetables	Fruits	Industrial Crops	Others
1965	34.6	39.7	16.2	4.2	1.2	1.7	1.4
1970	34.6	34.4	15.7	7.3	1.7	2.6	2.5
1977	38.9	26.8	16.0	8.5	3.0	3.5	1.3

Source: MAF

TABLE 13
CHANGES IN THE COMPOSITION OF FARM RECEIPTS

Unit: Percent

Year	Rice	Other grains & potatoes	Vegetables	Fruits	Livestock Products	Others
1965	58.2	22.1	4.6	0.6	2.8	11.7
1970	56.3	17.8	9.0	1.6	3.7	11.6
1977	62.0	9.5	11.2	3.4	4.1	9.8

Source: MAF

Accordingly, an increasing portion of farm income has been generated from the cash crops and livestock enterprises(Tables 12, 13).

TABLE 14
CHANGES IN RELATIVE PRICES OF FACTORS OF PRODUCTION AND RICE

Year	Price of Factors and Rice					Ratio				
	Paddy Land (L)	Farm Wage (Male) (W)	Power Tiller (8HP) (M)	Urea (F)	Rice (R)	M/R	W/R	L/F	M/W	R/F
	Won/ Pyong	*Won/ Day*	*Won/ Set*	*Won/ kg*	*Won/ kg*					
1966	132	256	259,000	27	42	6,167	6.10	4.89	1,012	1.56
1970	203	579	314,357	27	79	3,979	7.33	7.52	543	2.90
1977	2,202*	2,350	632,500	122	325	1,946	7.23	18.05	269	2.66

* Exchange rate: 485 wons equal US$1.00.
Source: MAF & NACF

TABLE 15
CHANGES IN YIELDS OF SELECTED CROPS

Unit: *Kg/ha*

	1955–57 Ave.	1960–62 Ave.	1965–67 Ave.	1970–72 Ave.	1975–77 Ave.
Rice	2,557	2,823	3,030	3,337	4,370
Barley	1,333	1,783	1,870	1,997	1,963
Sweet Potato	14,860	14,493	16,687	17,313	20,417
Corn	537	653	933	1,527	2,360
Soybean	557	530	600	797	1,197
Peanut	360	490	717	810	913

Source: MAF, Statistical Yearbooks of Agriculture

Phenomenal changes have been taken place in the agricultural factor markets as shown in Table 14. As mentioned before, labor has become scarce on farms especially during the peak farming seasons and in the rural areas near industrial complexes, resulting in rapid increases in wage rates.

The price of arable land also has gone up steadily, while that of manufactured farm inputs such as fertilizers, chemicals and machinery moved slowly. As a result, the change in relative prices favored an increased use of these inputs. Thus, labor saving technology, together with productivity generating technology, has been actively induced in rural Korea. Because of the relatively low prices of manufactured farm inputs, and government supported grain prices, the price ratios of the products such as rice relative to inputs have also encouraged an increase in rice production. At the same time as noted before, factor substitutions have taken place between machinery or herbicide and labor inputs, and between land and chemical inputs.

Steady progress has been made in the field of biological, chemical

TABLE 16
ACREAGE AND YIELDS OF HIGH-YIELDING VARIETIES (HYV) OF RICE

Year	Acreage of HYV	Yields of Rice(polished)	
		HYV	Conventional Varieties
	...'000*ha*...	.....Kilogram per Hectare.....	
1972	111 (9)*	3,860	3,210
1973	82 (7)	4,810	3,500
1974	181 (15)	4,730	3,530
1975	274 (23)	5,030	3,510
1976	533 (45)	4,790	3,960
1977	660 (55)	5,530	4,230

* Percentage of HYV acreage to total area planted of rice.
Source: MAF

and mechanical technologies suitable for Korean farmers. Until 1971 chemical technology seemed to be the dominant force driving agricultural productivity upward. In the meantime, high-yielding strains of rice represented by IR-667 have been developed and widely made available to farmers since 1972. Farm mechanization also accelerated from this time. In addition, managerial and institutional innovations have contributed to laying down the foundation for the technological advances in agriculture.

The changes in price ratios of the manufactured inputs shown in Table 14 reflect the technological improvements in respective factors. Because the man-land ratio is high and small-scale farms are dominant in Korea, biological technology which is neutral to scale has been readily accepted by farmers. Thus, varietal improvements of food crops have been given a high priority in agricultural research. Table 15 indicates a notable increase in yields of selected crops including rice since the 1950's. Especially, acreage and yields of high-yielding strains of rice have soared since 1972 as shown in Table 16. The story of how the high-Yielding varieties of rice were developed and made available to farmers during such a short period of time in recent years may be regarded as one of the most successful dramas in Korean agricultural history.

The chief actor in this drama was the Office of Rural Development (ORD), Ministry of Agriculture and Fisheries. The ORD, which was established in 1962 by absorbing research and all extension-type services related to agriculture carried out by various agencies, is responsible for agricultural research and the extension of improved know-how to farmers. The ORD has 12 experimental stations which produce new packages of technology, 9 provincial ORD offices, 171 county rural guidance offices and 1,471 branch offices at the township level through which new know-

ledge is promptly disseminated to farmers.

The National Agricultural Cooperatives Federation (NACF) has also carried out a wide range of supporting activities to assist farmers including provision of credit and material inputs such as fertilizers, various chemicals and farm machineries.

The land institutions which relate to agricultural development may be classified into four categories: land resource developments and improvements; the land tenure system; the farmland protection system; and the land inheritance system. Historically, the Korean government has emphasized the first and the second categories. But the third measure, farmland protection has been called for urgently since the late 1960's and effectively implemented from 1973.

With respect to land resource development, the government has played a dominant role in large and medium scale projects including forest land reclamation, tidal land development, irrigation and drainage facilities, and farm land rearrangements. Eighty-six percent of paddy land is now irrigated and 26 percent of paddy land is rearranged so as to facilitate technological advances.

Land reform was implemented in 1950 with an emphasis on improving the equity position of tenant farmers with small holdings and transformed the rural social structure toward a more unimodal nature. The problem of absentee landlordism, which had been claimed as a primary barrier to agricultural productivity and income equity in rural Korea before 1945, was solved in the 1950's and the dominance of an owner-operator principle was institutionalized (Table 17).

TABLE 17

CHANGES IN THE PERCENT DISTRIBUTION OF FARMS AND FARMLAND BY TYPE OF TENURE, 1945, 1960 AND 1970

Unit: Percent

Type of Tenure	Farm Household			Farmland Area		
	1945	1960	1970	1945	1960	1970
Full owner	13.9	73.6	66.5	na[b]	73.8	66.1
Part-owner	34.7	19.6	23.8	na	21.8	27.2
Tenant	51.4[a]	6.8	9.7	na	4.4	6.7
Total	100.0	100.0	100.0	100.0	100.0	100.0
Arable land of Tenancy	—	—	—	63.4	12.0	17.2

a) Includes the percentage of slash and burn farmers, who equalled 2.8%.

b) Not available.

Source: Bank of Korea and MAF, Agricultural Census Reports

At present, small farmers can gain rather easy access to productive opportunities on the land, which is facilitated by increased rural-urban

migration. Group farming or group operation of farm work also has been encouraged and accepted by an increasing number of rice growers.

Farm household income increased approximately 2,000 percent nominally during the 1962–1977 period as Table 18 shows, but there were differences in the growth rates of income between the various farm classes. Farm household income of the large holding sizes over 1.5 hectares grew more significantly than that of smaller sized farm classes. Thus, the income differentials between sizes of farm holding became larger. The farm

TABLE 18
FARM HOUSEHOLD INCOME, OFF-FARM INCOME, ECONOMIC SURPLUS AND AVERAGE SAVING-PROPENSITY BY SIZE OF HOLDING

Unit: Won

Year	Classification	Size of Holding: Under 0.5*ha*	0.5–1.0*ha*	1.0–1.5*ha*	1.5–2.0*ha*	2.0*ha* & over	Average
1962	Farm Household Income	42,497	61,346	78,506	94,778	132,783	67,885
	Off-farm income	16,345	13,811	11,121	12,113	12,825	13,859
	(%)	(38.5)	(22.5)	(14.2)	(12.8)	(9.7)	(20.4)
	F.H. economic surplus[a]	2,015	7,320	12,357	13,412	28,301	10,166
	Ave. Saving-propensity[b]	0.048	0.123	0.163	0.147	0.222	0.154
1968	Farm household income[c]	118,089	144,464	202,064	257,051	346,273	178,959
	(Index)[d]	(278)	(235)	(257)	(272)	(261)	(264)
	Off-farm income	39,957	29,276	30,934	28,501	46,634	33,590
	(%)	(33.8)	(20.3)	(15.3)	(11.1)	(13.5)	(18.8)
	F.H. economic surplus	7,406	14,741	38,285	56,809	78,019	27,999
	Ave. Saving-propensity	0.070	0.121	0.205	0.236	0.263	0.175
1977	Farm household income(Index)	872,393 (2,053)	1,192,873 (1,945)	1,651,503 (2,104)	2,162,803 (2,282)	2,993,356 (2,254)	1,432,809 (2,106)
	Off-farm income	507,763	363,224	332,890	409,473	432,887	396,673
	(%)	(58.2)	(30.4)	(20.2)	(18.9)	(14.5)	(27.7)
	F.H. economic surplus	116,999	286,948	494,544	756,868	1,105,840	400,826
	Ave. Saving-propensity	0.138	0.247	0.309	0.364	0.388	0.289

a) F.H. income-(Living expenditures + Taxes + Interest paid + Contingency expenditures)

b) Savings/disposable income

c) Indicates at current price. For deflating, wholesale price indexes can be used. The wholesale price indexes 1962 as base year: 1968 = 223.4, 1977 = 820.2

d) 1962 = 100

Source: MAF

household income consists of two sources, farm and off-farm incomes. The latter had been kept relatively low at approximately 20 percent of the total household income until 1976 despite the remarkable industrial development, which has been attracting large number of the labor force from the rural sector since the 1960's.

Since 1977, however, the off-farm income has tended to increase rapidly and generated nearly 28 percent of the household income. This trend is especially notable in the "under 0.5 *ha*" class who now have nearly sixty percent of their income generated from off-farm sources. As a result, the income disparity between "under 0.5*ha*" and "0.5 to 1.0 *ha*" classes has narrowed.

The primary portion of the off-farm income is constituted by wage earnings and donations from outside the farms. The wage earnings have increased in the face of decreases in working hours due to increased wage rates. Table 19 indicates that working hours per farm worker, as well as the labor input per hectare, have declined by 13 to 40 percent for all farm classes during the 1965–1977 period. However, the portion of family labor has increased from 78.5 percent in 1965 to 81.0 percent in 1977. Some of the reasons for this fact may be the reduction of the rural labor force and the increasing opportunity cost of labor in rural Korea.

It is observed in Table 20 that the average capital intensity per hectare and capital input per working hour on farms have soared to

TABLE 19

WORKING HOURS PER FARM WORKER AND LABOR INPUT PER HECTARE BY SIZE OF HOLDING

Unit: Hour

Year	Classification	Size of Holding					
		Under 0.5ha	0.5–1.0ha	1.0–1.5ha	1.5–2.0ha	2.0ha & over	Average
1965	Per hectare labor input	3,149	2,506	2.149	1,951	1.589	2,174
	Per worker farm labor	424.8	599.5	746.9	897.0	988.1	662.4
	Per worker nonfarm labor	187.9	159.9	136.7	164.0	144.8	158.1
	Total	612.7	759.4	883.6	1,961.9	1,132.9	820.5
1977	Per hectare labor input	2,243	1,799	1,614	1.421	1.215	1,569
	(1965 = 100)	(71.2)	(71.8)	(75.1)	(72.8)	(76.5)	(72.2)
	Per worker farm Labor	321.5	519.3	669.7	755.6	939.3	572.8
	Per worker nonfarm labor	44.2	45.8	46.8	46.0	40.3	45.5
	Total	365.7	565.1	716.5	801.6	979.6	618.3
	(1965 = 100)	(59.7)	(74.4)	(81.8)	(75.5)	(86.5)	(75.4)

Source: MAF

18.6 and 26.0 times their base values, respectively, during the period 1965 to 1977 which are much higher than the inflation rate of 583 percent. Nonetheless, the land and labor productivities in terms of nominal net farm income per unit of input went up moderately by 11.2 and 15.4 times, respectively. With respect to land productivity, the smallest class increased capital input per hectare at the highest rate but gained the lowest increase in land productivity. By contrast, the largest class gained the most notable increase in net farm income per hectare with the least increase in capital input. These contrasting trends between the smaller and larger sizes of holding were observable in the relation of capital input per working hour and labor productivity.

TABLE 20
COMPARISON OF CAPITAL INTENSITY AND RESOURCE PRODUCTIVITY BETWEEN SIZES OF HOLDING, 1977

Unit: Won

Size of Holding	Capital input per hectare	Capital input per working hour	Farm income per hectare	Farm income per working hour
Under 0.5*ha*	2,092,230	933	1,125,400	502
(Index)*	(1,982)	(2,744)	(909)	(1,287)
0.5–1.0*ha*	1,584,130	881	1,080,270	601
(Index)	(1,759)	(2,447)	(1,050)	(1,466)
1.0–1.5*ha*	1,557,870	965	1,077,380	667
(Index)	(1,907)	(2,539)	(1,191)	(1,588)
1.5–2.0*ha*	1,576,910	1,103	1.036,860	730
(Index)	(1,831)	(2,507)	(1,176)	(1,622)
2.0*ha* and over	1,352,140	1,113	935,500	770
(Index)	(1,748)	(2,271)	(1,242)	(1,638)
Average	1,549,150	987	1,036,140	660
(Index)	(1,861)	(2,597)	(1,119)	(1,535)

* 1965 = 100
Source: MAF

The Current Problems Facing Korean Agriculture

First, the macro goals of food security in terms of increased levels of self-sufficiency in the food supply and the supply of food at low costs-through international trade need to be reconciled with appropriate measures. The level of self-sufficiency of grains and pulses has declined from 80 percent in 1970 to around 70 percent at persent, and as indicated in Table 21, the import of grains and soybean has rapidly increased since 1965. Beef began to be imported from 1976 and even vegetables such as onion, garlic, sesame, red pepper and peanut were added to the list of imported food items from 1978 (Table 22).

Although this is a stop-gap measure to cope with the poor harvests

to stabilize food prices, the underlying long-run policy strategy needs to be thoroughly studied. For more reliable food security with reasonable costs, we should find a workable alternative, supplementing the maintenance of high levels of staple foodgrain production, *e.g.*, of rice and barley, which has been done at a high cost and often at the expense of cash crops. In other words, more realistic workable strategies need to be designed for the optimum protection of the agricultural sector in Korea.

Second, agricultural productivities in terms of net farm income per worker and per hectare should be continuously increased so as to contribute to the sustained growth of the national economy. A labor surplus rural economy is no longer existent in Korea and land resources have become a limiting factor in meeting the increasing demand for various uses including food production. The two goals of labor and land productivity are often in conflict in farm operations. Under current economic conditions in rural Korea, however, it appears that increases in production per hectare can be made feasible only through labor saving practices on farms. There are only a small number of large-scale farms in Korea, which concentrate mostly on fruit, cattle fattening and dariy farming. Farmily farms are still the dominant type of farm and are supposed to be so for the foreseeable future. Labor productivity on farms has soared up at an annual rate of 7.2 percent and land productivity has increased by 4.6 percent in the 1970's as disclosed in Table 22. However, these rates have shown a downward trend compared with the 1960's.

TABLE 21
IMPORT OF SELECTED FOOD COMMODITIES

Commodity	Unit	1965	1968	1971	1974	1977	1978
Rice	'000M/T	—	216	907	206	—	—
Wheat	'000M/T	496	1,026	1,532	1,592	1,900	1,577
Barley	'000M/T	71	106	—	299	300	—
Corn	'000M/T	62	131	383	569	1,271	1,971
Soybean	'000M/T	—	17	61	66	151	223
Peanut	M/T	—	—	—	—	—	7,000
Red Pepper	M/T	—	—	—	—	—	57,000
Sesame	M/T	—	—	1,020	—	—	15,000
Onion	M/T	—	—	—	—	—	34,000
Beef	M/T	—	—	—	—	6,538	44,435
Pork	M/T	—	—	—	—	—	8,642
Dairy Cattle	Head	600	1,111	1,755	5,460	12,150	21,600

Source: MAF

Traditionally, the ownership of land has been sought as an important goal for the security of family life in Korea. Also a partible land inheritance system has prevailed for a long time. A Korean farm is generally com-

posed of many small plots scattered around near a village. This physical structure of the family farm has been improved a little, thanks to paddy land rearrangement and consolidation programs. A small-sized farm with a number of scattered plots is unsuitable for the introduction of mechanical technology and there is a need for managerial and institutional innovations if such labor saving technology is to be introduced with economic feasibility.

TABLE 22
ANNUAL GROWTH RATES OF FARM LABOR AND FARM LAND PRODUCTIVITIES

Unit: Percent

Period	Labor Productivity[a)]	Land Productivity[b)]
1965–67~1970–72	8.7	5.3
1970–72~1975–77	7.2	4.6

a) Annual growth rate of net farm income (constant price) per working hour.
b) Annual growth rate of net farm income per hectare of arable land.
Source: The original data are from the Report on Farm Household Economic Survey, MAF.

The development of biological technology, whose emphasis has so far been placed upon the improvements of crop strains in Korea, is called for to tackle the improvement of soil fertility without causing environmental pollution.

Third, the farmers' income must steadily increase to a level comparable to that of their counterparts in other sectors. The goals of family farms may not be compatible with maximizing labor income. However, the object of obtaining the level of returns to each of the factor inputs, including family labor and capital investment on farms, as in any business, should undoubtedly be the primary goal of an economically viable farm. The family farm should also value the security of family life, seeking for a stabilized flow of household income over time.

It has been often observed that the macro-goals of the government *e.g.*, foodgrain self-sufficiency, were in conflict with the individual goals of increased farm income by an expansion of cash crop production. These two goals can be attained simultaneously only if the differences between the private costs incurred in increased food production and the social returns are compensated for in appropriate ways.

The question of farm household income is therefore two-dimensional in nature, relating intersectoral and intrasectoral income disparities. The income disparity between farm regions and between farms in a region tends to increase as the industrial growth and commercialization of farming are differentiated among regions and between farms.

III. STRATEGIES FOR AGRICULTURAL GROWTH

In the past three decades, there have been numerous arguments, models and strategies proposed by economists and other social scientists for the modernization of the tradition-bound peasant economies of the developing world. This diversity may reflect the fact that various academic disciplines place emphasis on the subject, and that the peasant farmers' problems are so diversified in terms of the stage of commercialization and of socio-cultural background, so that no general theory can be formulated. Although the stock of knowledge on the process of intercultural innovation has significantly increased in recent years due to a host of empirical inquiries, there is still insufficient information to design workable development strategies for farmers in various settings.

One of the basic criteria for engineering the transformation of an economy which includes a tradition-bound agricultural sector would be that of "minimum social costs". For this purpose, the dynamics of the socio-economic behavior of the target system under specific conditions should be well understood before any action program is introduced.

The majority of Korean farmers are still semi-subsistence and partially commercialized. Thus, they are "partial economic men" in a modern sense and are characterized by having dual standards in goal-seeking. That is, they wish to obtain sustenance and increase their cash income, and at the same time possess a limited capacity to make adjustments in the uses of their productive resources in response to changes in production technology and markets for products and factors.

The Components of Agricultural Growth

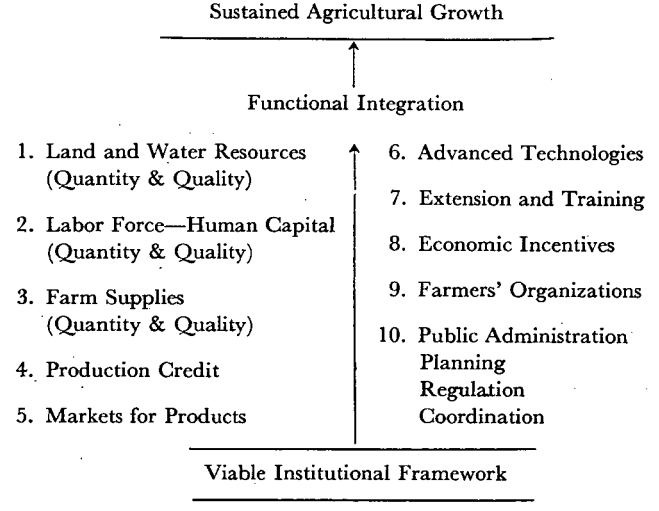
In view of the resource endowments and current problems, technological changes would seem to be the most feasible approach to agricultural growth in Korea. But a fundamental question arises on how to help the farmers or farm units transform themselves into a viable economic system in which technological change is a continuing process.

Figure 3 summarizes the ten key elements necessary for agricultural development. Until now, it seems that emphasis has been placed upon all the components listed with differentiated degrees, except for the supply of a quality labor force and the modernization of product marketing in Korea. From the commodity point of view, foodgrains, especially rice, and exportable products such as silk have been given top priorities in agricultural policy until recently. High rice price policies have been effective from the 1969 harvest year and were later reinforced by the introduction of bonus payments for high-yielding record producers. The provision of these economic incentives, together with high-yielding rice varieties and improved irrigation and manufactured inputs, played the key role in boosting rice production. In other words, the merit of the functional in-

tegration of various elements for technological breakthroughs in Korean agriculture was verified in the case of rice production.

At this stage, deep concern and systematic efforts need to be directed toward the increased production of income-elastic nongrain foods, maintaining quality labor forces on farms and the improvement of product marketing. For sustained agricultural development, viable institutional settings are also essential elements. Some of the improtant institutions relevant to agriculture are stated in Figure 4. The legal and administrative institutions, markets for production inputs, credit and products, and tax systems are found to exert the most pervasive influences on the important variables of agricultural development. These points may invite a host of arguments, theoretical and empirical. For example, suppose that a successful research team develops a high-yelding strain of a crop and contributes to increased production significantly. Because of increased supply, the price of that product should go down substantially if the income and price elasticities of the demand are low like most grains, and no actions are taken in the price support policy and market outlets. As a result, it would be evident that both the intersectoral terms of trade and intrasectoral income distribution are modified in an unfavorable direction for the crop producers who adopted the new technology.

FIGURE 3
COMPONENTS OF AGRICULTURAL GROWTH



Approaches to Increasing Farm Household Income

From a farmer's standpoint, farming is a way of making a living. An increasing number of Korean farmers have two sources of income, farm and off-farm. For very small-farmers the off-farm income has become a more

important source of earnings than farming. Therefore, it is required to deal with the farmers' problems differently based on the specific conditions under which the farms operate.

With the limited land and labor resources available on farms, increased productivities will remain as the first concern for the agricultural policy makers, which may be often in conflict with individual interests.

FIGURE 4

DIRECT RELEVANCE OF INSTITUTIONS OF SELECTED INSTRUMENTAL VARIABLES OF AGRICULTURAL DEVELOPMENT

Type of Institution	Productivity growth	Viable size of farm business	Equitable labor income between sectors	Equitable labor income between farms	Development of human capital
Land tenure systems	×	×		×	
Research institutions	×		×	×	
Education & extension institutions	×	×		×	×
Production input markets	×	×	×	×	
Credit markets	×	×	×	×	
Product markets	×	×	×	×	
Tax systems	×	×	×	×	
Legal and administrative institutions	×	×	×	×	×

Figure 5 shows a host of means for increasing and stabilizing farm household income. Listed are four categories of factors or conditions which are related to activating each of the relevant means. Industrial development, for example, creates the necessary conditions of agricultural growth in terms of absorbing the redundant labor force from rural areas, adequate supplies of material inputs and credit, and enlarging outlets for farm products.

The importance of the role in sustained agricultural development of the government cannot be overemphasized. However, over-intervention of the government in the functioning of commodity markets including farm products and inputs should be resisted except for stop-gap measures in an emergency case.

With respect to the adoption of a technology, the size of a farm is a significant constraint and often an adaptive change is required in the prevailing institution to internalize the potential gains of a technology. However, generating an institutional innovation calling for technological ad-

FIGURE 5
MEANS FOR INCREASING AND STABILIZING
FARM HOUSEHOLD INCOME

Classi-ficton	Means		Condition or responsible agent*			
			1	2	3	4
Farm Income	(1) Increased yields of crops and producing capacity of livestock	Improved varieties		×		×
		Irrigation & drainage facilities		×	×	
		Fertilizer & chemicals	×	×		×
		Improved cultural or raising methods		×		×
	(2) Change in cropping systems	Profitable crop or enterprise mix		×	×	×
	(3) Reduction of Production costs	Reduced losses of material inputs			×	×
		Reduced labor inputs	×	×	×	×
		Improved credit market	×	×	×	
		Increased yields (1)				
	(4) Improved marketing efficiency and market expansion	Reduced losses & wastes		×	×	×
		Reduced costs of marketing	×	×	×	
		Timely deliveries of products to markets			×	×
		Expanded product markets	×	×	×	
	(5) Expansion of farm size	Reduced number of farmhouseholds	×	×		
		Expansion and protection of arable land		×		×
	(6) High product prices	Price support programs	×	×		
	(7) Guarding against product loss from disaster	Crop insurance		×	×	
Off-Farm Income	(8) Increases off-farm job opportunities	Decentralization of industrial plants	×	×		
	(9) Increased income transfer	Social security programs	×	×		

*1. Development of industrial sector and agri-business industry
2. Gov't investment programs, policies, service and legal systems
3. Farmers' group actions
4. Individual farmers' actions

vance is not easy for individual farmers because of its psychological and social costs. This difficulty is greater in the case of adopting an indivisible technology package like farm mechanization.

A large area of paddy land has been rearranged and farm roads have

been improved in recent years. These improvements in physical infrastructure, together with favorable changes in machinery prices, facilitated the dissemination of farm machinery by providing farmers with financial incentives. Nevertheless, many of the farmers who purchased power tillers, for example, have failed to meet expectations and have thus been transformed into the operational setting of custom work which is more adaptive to existing local conditions. Farm mechanization is undoubtedly one means for solving seasonal labor shortage problems in farm operations, but is not the only feasible alternative. There is a need for the development of new ideas which do not require high energy and high costs.

The individual farms may need to be assisted in terms of technical and managerial know-how, institutional and financial supports based on their specific resource conditions, managerial capacity and personal readiness.

Through the grain management program the government has continued to purchase a substantial quantity of rice and barley from producers at prices higher than market prices current at harvest seasons and sold the grain at lower prices for the consumer's benefit, generating accumulated financial deficits in the grain special accounts. The problem is that this program has been financed by borrowing from the central bank instead of the government budget. Thus, the income effect of the high grain price policy have been partially reduced due to inflation. The government is also studying the introduction of a crop insurance scheme starting with rice, so as to help farmers guard against losses from disasters.

The decentralization of labor intensive plants have been encouraged by the provision of financial incentives as a measure for creating job opportunities for rural residents. However, the achievements of some of these small-scale plants located in rural localities have been far from satisfactory. As an increasing number of industrial parks have been established in local cities, the farm families have increased their off-farm income by seeking jobs in factories.

The Korean family farms may be classified into 4 or 5 group in terms of economic viability.

Group I. Those farms operating as commercial enterprises with an average profitability similar to that prevailing in other sectors.

Group II. Those which have the potential to become profitable enterprises if access to markets and modern forms of inputs including technology at market prices are provided.

Group III. Those farms capable of becoming profitable enterprises if special incentives such as subsidized prices or interest rates were provided over a certain period of time in addition to access to technology, inputs and product markets.

Group IV. Those which have very small land area and are unlikely to

be economically viable farm units even if improved access to technology and markets, and subsidized prices are provided.

Group V. Landless farm laborers.

Group II and Group III are potentially commercially viable farmers. Farmers within Group IV and Group V should shift to non-farm employment for better earnings.

There are three paths open to Korean farmers desiring a higher income: (1) a full-time farm or a part-time farm with emphasis on farm enterprises, (2) a part-time farm with emphasis on off-farm business, and (3) out-migration from farming.

The factors affecting the choice of path by individual families during a specific period of time may be the stage of economic development, government policies, and the motives and preparedness of individual farmers. What is desirable from the viewpoint of long-run efficiency is that those who possess the potential as good farmers are given opportunities to climb up the ladder step by step, and those who lack that potential are provided with job opportunities in other sectors. It appears realistic in the Korean context that cases(1) and (2) be termed "the development of family farms" and only case (1) be termed "the growth of family farms."

What Should We Do?

1. Farm land resource development should continue to be given a high priority in public investment programs. A large area of paddy land needs to be equipped with good drainage facilities in addition to irrigation facilities for multiple uses, rice and upland crops. A strict control over the conversion of farmland also needs to continue, while workable strategies are called for new land developments and the control of pollution affecting soil and water quality.

2. A combined technological and institutional package adapted to the specific resource endowments and managerial capability of the individual farmers should be available. The enforcement of a uniform plan designed by a central planning agency is usually risky and often ineffective.

3. Farm assistance programs aiming at the full-time and part-time farmers need to be differentiated. There is a need for special programs for part-time farmers in the regions where they are increasing in number.

4. There should be a set of policies and programs to keep quality farm operators and labor forces on the farms. For these purposes, a series of modifications is necessary in the existing policies and institutions including legal, educational, financial and systems guarding against unexpected financial losses in farming.

5. An effective measure should be introduced to conserve the soil fertility by combining crop and livestock production on a farm or in a farm locality.

6. Increased investment and more dynamic management are required for the improvement of efficiency in agricultural research and extension services so as to meet the farmers' changing demands.

7. The information base of agricultural policy formulation and decision-making on farms needs to be upgraded through improved statistics and analysis of agriculture and related economic facts.

8. There is a need for relaxing government regulations or modifying the existing institutions to improve the mobility of farm resources and price formation in free markets.

9. International trade policies on agricultural products should be carefully planned in harmony with domestic farm production and income policies. In this process, adequate attention should be paid to the appropriate uses of marginal farm resources and the socio-political goals of the nation in addition to consideration of comparative advantages in the international perspectives. In particular, increases in the import of agricultural products which are competitive with the domestic production need to be gradual so as to avoid an abrupt impact on the farm economy.

10. Functional linkages between the market system and the public sector including research and administration should be well developed by a conscious effort. This is important because of the benefits of competitive systems in term of factor mobility and pricing based on scarcity costs. Scientists and policy makers should maintain close communication with farmers, traders and agri-business firm managers to assure the continuous flow of technological and institutional innovations.