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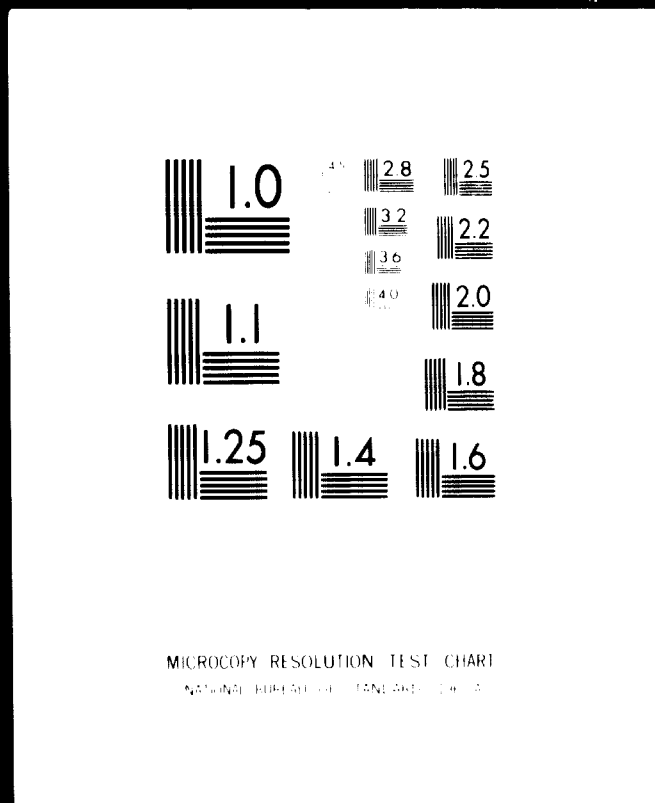
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COUNTRY STUDY REPORT

on the

STATUS OF AGRICULTURAL MACHINERY INDUSTRY

in

REPUBLIC OF KOREA

Information compiled  
during  
a fact finding survey.

UNIDO, Vienna  
January 1969

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\* Note: The opinions expressed in this document do not necessarily reflect the views of the Secretariat of ECAFE or that of UNIDO.

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## Summary of Country Study

### KOREA

#### I. Agricultural Pattern

Korea has only 3.5 million hectares of agricultural land of which 2.5 millions are cultivated. The total population is 30.1 millions and the population density is 13 persons per hectare of cultivated land.

About 60% of the population is engaged in agriculture. The main crops are paddy (1.2 million hectares or 54% of the total cultivated land area), wheat and barley (1.1 million hectares), potatoes and vegetables.

About 83% of the paddy fields are irrigated but multicropping is restricted due to the severe atmosphere conditions during winter.

In spite of intensive cultivation and increased use of fertilizers, self-sufficiency in rice is not yet attainable.

In approximately 2.5 million farm households where the average holding size is around 1 hectare. Only 30,000 holdings are more than 3 hectares and 170,000 are within 1-2 hectares. This is partly due to a large land reform programme which has resulted with more than 70% of the farmers becoming owners.

#### II. Farm Mechanization Pattern

Although most of the land cultivation is still done by animals, there are about 9,000 power tillers in use and the demand for them is estimated to be 10,000 units in 1970 and 20,000 in 1975. Diesel and gasoline engines are used in limited number. The market for tractors is negligible and it is not expected that both demand will reach 500 units a year by 1975.

Threshers operated by pedal and hand sprayers are very widely used. There is now an increasing number for these two implements with power units.

Irrigation pumps are also greatly needed. The government is providing them free of charge to the local communities. Most of the farm equipment are sold through the National Agricultural Co-operative Federation to local co-operatives and to farmers directly.

The government gives subsidies from 30 to 50% of the purchase price depending upon the types of implements. Credit facilities for loans at relatively low interest rate are also provided. The future market for costly farm machines depends mainly upon the continuity of these incentives.

### III. Manufacturing of Farm Machinery

Two local companies have plants for manufacturing power tillers having local contents of 60 and 75% respectively. Their production capacities are sufficed for the present market and they have plans for watching the future demand.

The production of engines and pumps is to be expanded and quality need to be improved. Small implements like threshers and sprayers are produced by many small manufacturers.

### IV. Conclusion

Korea appears to be able to supply its own requirements for power tillers and other farm machinery except tractors which are demanded in very few number. New facilities have to be provided for manufacturing diesel engines and pumps, and for fabricating, completing power tillers.

The small scale sector needs technical assistance and incentives for the improvement of their organizations and manufacturing techniques for other farm machineries in anticipation of the future requirements, for more sophisticated implements such as power sprayers, threshers, rice hullers, br....., etc.



## SECTION I.

### I. GENERAL PATTERNS OF AGRICULTURE

The Republic of South Korea having a total area of about 10 million hectares is divided into eight provinces and one island province of Cheju-do. The terrain of the country is mountainous. Rainfall is approximately 20 inches annually.

The population which was estimated to be 30.1 million in 1967 is growing at about 2 $\frac{1}{2}$ % yearly. Farm population however is growing at a slower rate 1 to 1 $\frac{1}{2}$ %

#### 1. Land utilization

About 35% of the total land area is utilized for agriculture of which 2.5 million hectares are cultivated. Of these, 52% are paddy fields and the rest are upland fields. Bare mountains, eroded soils, and large forest areas compose another 55% of the total land area and the remaining 10% are constituted by population spaces, roads, and wastelands. The amount of pastureland is insignificant.

#### 2. Land distribution by crop

About 3.1 million hectares are planted to food crops of which 1.2 million are for paddy, 1.1 million for barley and wheat, and the rest are for miscellaneous crops. Other crops planted are pulses, potatoes, vegetables, tobacco, fruits and mulberry fields for sericulture.

Since 1963 the cultivated land area has increased in five years by about 300,000 hectares. This represents a 13% increase of which 2/3 is accounted mainly to paddy, barley and wheat. The increase in the area of cultivated land is to a certain degree due to the achievement of land reclamation programs conducted by the government.

3. Land distribution by size of holding

Based on statistics compiled in 1967, 35% of all farm households are below  $\frac{1}{2}$  hectare in size. 32% within  $\frac{1}{2}$  - 1 hectare, 26% within 1 - 2 hectares 5 $\frac{1}{2}$ % within 2 - 3 hectares and the remaining 1 $\frac{1}{2}$ % beyond 3 hectares.

The average sizes of farms appear to be increasing. The population of holdings below one hectare has decreased from 73.3% in 1963 to 67.3% while the number of holdings of one hectare and above increased correspondingly. Most rapid was the increase in the number of farms of 3 hectares and above.

4. Land distribution by type of holding

There is no available upto date information about land tenancy. Based on a survey in 1947, about 358,000 or 16 $\frac{1}{2}$ % of the total 2,172,000 farm households were farmer-owned households, while 42% were purely tenant-farm households and 38% were partly tenant or partly owner cultivators households. The remaining 3 $\frac{1}{2}$ % were represented by absentee landowners.

In tenant-operated farms, the landowners received for rentals the equivalent of 30 - 70% of the crop yield in cash or kind. On the average, the yield were divided evenly between tenant and landowner.

5. Land reform

Started in 1950, the land program is designed to provide land to the tillers by removing absentee landlords and creating owner cultivators. The government purchased lands owned by non-farmers, non-tillers and lands owned in excess of 3 hectares for household that were then redistributed to landless farmers mostly, and to farmers able to cultivate more up to a maximum of three hectares. The type of payment for land purchased was in terms of bonds stipulating that the government will pay in five annual instalments at a price equivalent to 150% of the average annual crop yield at that time. In turn, the farmers paid the government at nearly the same cost to the government in five annual payments.

The government was able to redistribute land equivalent to 38% of the total area under tenancy.

## II. Agricultural Production

A tabulation showing the crop production from 1962-67 is located at the end of this section.

In 1967 the overall annual increase in crop production was 5%.

Rice is the main crop. Despite occasional losses in harvests attributed to adverse climatic conditions, rice production during the past five years continued a healthy uptrend. But it will take a few more years before the country becomes self-sufficient. In 1967, rice production dropped by about 6% to 3.6 million tons since a draught occurred principally in the southeastern area of the country. Rice importations average 1.2 - 2.0 million tons yearly plus 400,000 million tons more for 1968. Rice yields have improved from 2.63 tons/ha in 1962 to 3.08 by 1967, for barley 1.67 to 1.79, pulses 0.53 to 0.56 and potatoes 3.99 to 4.29.

In 1966 agricultural exports valued at \$67 million accounted for 27% of the national exports. The volume of agricultural exports doubled in 3 - 4 years. The major exports are raw silk, dried laver, tobacco, livestock, fish and fish products.

## III. Draft Animal Population

Based on a survey made in 1965, the numbers of animals used for draft are as follows:

Cattle	1,313,500
Horses	27,700

/IV.

IV. Farm Incomes

According to a limited farm household economy survey conducted in 1967 by the Ministry of Agriculture and Forestry, the farm household income has been increasing since 1962 at an average of 12% yearly. The farm incomes as classified according to farm size are as follows:

	<u>Agricultural Incomes</u>		<u>Average Income per Capita</u>	
	(*000 won)	(U.S.\$)	(*000 won)	(U.S.\$)
1967 average	116.4	424	19.0	69
By size of cultivated land				
Less than ½ hectare	51.9	189	10.0	36
0.5 to less than 1.0 ha.	95.3	347	16.3	59
1.0 to less than 1.5 ha.	140.2	510	21.3	77
1.5 to less than 2.0 ha.	183.6	687	26.2	95
More than 2.0 ha.	248.5	902	32.1	117

\* Based on 275 won to one U.S. \$

The household income is based on an average household size of six of which three are engaged in the farm. Side business incomes range from 15,000 won or \$55 yearly for a household less than ½ hectare and 4,000 won or \$14 for a household have more than two hectares of land. Living expenses (food, clothing, housing, fuel & light, and miscellaneous) range from 50,000 won or \$180 for a household less than ½ hectare and 180,000 won or \$650 for a household having more than two hectares. This leaves a meager household surplus over expense of about 5,000 - 10,000 won or \$18 - 36 for the smallest household to about 40,000 won or \$145 for the largest household.

The increases in farmer incomes are attributed more to increase in farm prices than increases in crop production. As an example, grain prices increase by 40% from 1960 to 1966 and barley, about 140%. Yet during the same period agricultural production index increased only by 30%

V. Farming Practices

a. Fertilizers and pesticides

Since 1962, the importations of fertilizers has increased from \$55 to \$89 million dollars in 1966. During the same period the importations of insecticides increased from \$1.5 to 4.3 million.

Consumption of fertilizer per unit of cultivated land (183 kg) is fairly low compared to the fertility of the soils. Aside from the high prices of the fertilizers, a part of the explanation as reported might be the resistance of farmers to use balanced fertilizers. The consumption of fertilizers is expected however to increase since there will be more available supply coming from the production of three fertilizer plants that were recently established. In 1967, the production of area was about 315,000 tons, five times the production in 1961.

b. Liming of soils

The soils of Korea are generally acidic. It is estimated that at least about 550,000 tons of limestone need be applied yearly. Lime in sufficient quantities is available in the country but that is a shortage of transport facilities for bringing lime to the consuming areas.

c. Irrigation

At present, about 83% of the estimated 1.2 million hectares of paddy fields in Korea are irrigated. This accounts to the relatively high paddy yields as compared to other paddy-growing countries

The Second Plan (1967 - 71) includes a program to irrigate 140,000 hectares of land through large and small-scale projects. During the first three periods 90,000 hectares were targetted of which only 60% was achieved.

/Agricultural

Agricultural Production

Production of Agricultural Crops

(in thousand m. tons)

	Acreage			
	<u>1962-64</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>
<b>Cereals</b>	<u>5,261</u>	<u>5,747</u>	<u>6,401</u>	<u>6,301</u>
Rice	3,576	3,501	3,919	3,603
Barley	1,270	1,807	2,018	2,253
Wheat (unhulled)	268	300	315	310
Killets	80	70	67	43
Dye	37	29	41	27
Corn	24	30	34	60
Buckwheat	6	10	7	5
<b>Pulses</b>	<u>185</u>	<u>203</u>	<u>195</u>	<u>235</u>
Soya beans	158	174	161	201
Others	27	29	34	34
<b>Potatoes</b>	<u>2,193</u>	<u>3,577</u>	<u>3,373</u>	<u>2,237</u>
Sweet	1,735	2,997	2,690	1,671
White	458	580	688	566
<b>Fruits</b>	<u>200</u>	<u>305</u>	<u>325</u>	<u>353</u>
Apples	121	167	174	190
Peaches	25	54	63	71
Pears	27	39	41	41
Persimmons	18	25	22	24
Grapes	8	19	24	25
Oranges	1	1	2	2
<b>Vegetables</b>	<u>1,308</u>	<u>1,576</u>	<u>1,584</u>	<u>1,869</u>
Radish	460	585	597	580
Chinese Cabbage	415	480	520	609
Red pepper	39	46	67	67
Others	394	465	400	613

/Special crops

Special crops	<u>38</u>	<u>41</u>	<u>57</u>	<u>62</u>
Cotton	14	12	14	12
Others	23	29	43	50
Tobacco	<u>38</u>	<u>56</u>	<u>72</u>	<u>66</u>
Silkworm	5.8	7.8	9.6	10.9

Section II

PATTERN OF FARM MECHANIZATION

1. Farm Machinery Population

a) Farm Machinery Census (1967)

1. Plow Machine	(units)
Plow	990,510
Power tiller	3,819
Tractor	34
2. Anti-insect Equipment	
Hand power sprayer	43,148
Hand sprayer	183,373
Power equipment	12,768
3. Threshing Machine	(units)
Rake thresher	528,799
Hand thresher	373,692
Power-driven	25,474
4. Winding Machine	
Hand	219,334
Power-driven	7,304
5. Straw Rope Machine	
Footing	67,698
Power-driven	340
6. Straw Bag Machine	
Handling	413,173
Footing	44,754
Power-driven	63



7. Pump	(units)
Hand	46,463
Power-driven	31,613

8. Other Agricultural Implements

Sewing machine	1,255
Woeder	450,078
Huller	23,708
Rice polishing	43,058

b) Growth Pattern of Agricultural Machinery Population

	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>
1. Plow Machine					
Plow	862,259	951,286	178,132	1,008,649	990,510
Power Tiller	386	653	1,111	1,555	3,819
Tractor	-	-	-	20	34
2. Protection Machine					
Hand Power Sprayer	26,466	29,813	31,653	39,073	43,148
Hand Sprayer	58,306	78,735	110,644	154,911	187,373
Power Equipment	3,071	5,133	7,579	8,798	12,768
3. Threshing Machine					
Reake Thresher	466,685	490,198	518,502	526,618	528,799
Hand Thresher	284,721	320,422	346,333	365,428	373,692
Power-Driven	9,495	14,610	18,909	22,338	25,404
4. Winding Machine					
Hand	150,392	170,921	203,562	204,666	219,334
Power-driven	4,350	5,766	6,461	6,254	7,304
5. Straw Rope Machine					
Footing	50,141	57,811	61,019	65,042	67,698
Power-driven	411	209	261	199	340
6. Straw Bag Machine					
Handling	353,718	433,829	423,392	420,092	413,173
Footing	45,993	37,672	41,288	42,845	44,754
Power-driven	65	42	88	35	63

7. Pump					
Hand	27,060	31,254	25,874	40,172	46,463
Power-driven	13,171	15,350	26,029	29,929	31,613
8. Other Machines					
Sewing Machine	190	177	303	973	1,255
Weeder	305,610	394,720	400,530	430,337	450,078
Huller	16,863	20,566	22,047	23,216	23,708
Rice Polishing Machine	32,589	38,658	41,034	43,119	43,058

## 2. Import, Production and Exports of Farm Machinery

### a) Import of Five Major Power Machinery Produced During Past Five Years

	<u>Automatic Cultivators</u>		<u>Tractors</u>		<u>Hand-operated Sprayers</u>		<u>Power Sprayers (n.e.s.)</u>	
	US\$1,000	Units	US\$1,000	Units	US\$1,000	Units	US\$1,000	Units
1963	141	-	76	-	-	-	316	-
1964	108	-	72	-	-	-	318	-
1965	42	23,542 <sup>x/</sup>	22	2	2	216	41	2,474
1966	38	5,577 <sup>x/</sup>	915	28	2	129	109	1,648
1967	257	709 <sup>x3</sup>	8	2	3	115	321	4,131

(Commerce and Industry Statistics Yearbook, 1968)

<sup>x/</sup> These figures are not very clear; they seem to refer to parts or components of power tillers.

Thus for past five years, the total import of power farm machinery are very few.

### b) Production of Farm Machinery

#### Five Major Power Machinery Produced During Past Five Years

	<u>Sprayers<sup>x/</sup></u>	<u>Threshers</u>	<u>Power Tillers</u>	<u>Engines</u>	<u>Rice Millers</u>	<u>Water Pumps</u>
1963	77,334	3,155	-	7,266	6,600	20,993
1964	66,652	3,897	263	8,186	8,102	14,301
1965	41,444	3,243	708	15,119	5,210	9,486
1966	50,845	2,966	748	9,434	4,065	3,566
1967	63,094	3,127	6,762	13,033	2,442	6,288

(Commerce and Industry Statistics Yearbook, 1968)

<sup>x/</sup> Including man-power.

/o) ...

c) Exports

Exports are reported for 1967 for 61 engines, 200 power tillers and 43,216 hand shovels.

3. Demand and Sales of Farm Machinery

a) Amount of the Demand

Complete figures are not available for the sales in 1968. The following table gives estimated data about the production in 1968:

Power tillers	5,000
Power sprayers	2,000
Hand sprayers	50,000
Irrigation pumps	5,000
Pedal threshers	5,000
1/2 automatic	500
Automatic	200
Husking, hulling, polishing machines	5,000

Since imports are very small this can give an idea of the demand.

b) Demand and Usage by Machine

1. 4-wheel tractors

Demand is very limited because of the small size of the holdings and lack of finance by the farmers. 58 tractors are reported to be in use in 1968 in the range of 35 HP to 47 HP (Ford and Bolinders; 40 other ones are being imported from Japan.

2. Crawler tractors and threshers

A few of them (16) have been imported for land development and land reform.

3. Power Tillers

Introduction of power tillers from Japan started in 1957. In 1961 30 units and in 1962 90 units have been used. In 1967

#### 7. Harvesting machines

Harvesting of paddy and other cereals is entirely made by hand.

#### 8. Threshing machines

Simple pedal-operated paddy threshers are widely used. Production in 1968 is around 5,000 for a production capacity of 20,000, this meaning that the market is almost saturated. Demand is now towards power threshers automatic or 1/2 automatic (as concerning the feeding) for about 5,000 a year.

#### 4. Future Demand and Trends in Design

##### a) Expected Demand

	<u>1968</u>	<u>1975</u>	<u>1980</u>
1. Power tiller	5,000	15,000	(50,000)
2. Tractor	40	400 - 500	800 - 1,000
3. Power Sprayer and duster	1,000 - 1,200	(8,000)	(20,000)
4. Automatic thresher	1,000	(5,000)	(20,000)
5. Irrigation pump	5,000	(10,000)	(20,000)

##### (a) power Tiller

All of them are above 10 Hp. Demand for higher Hp is strong. In 1975, 50% of sales will be above 10 Hp, 50% will be 8-10 Hp. Around in 1980, will be introduced range of 6-5 Hp tiller. 50% demand to be for this type because demand group will be down to small-scale farmers for increased income and short labour power.

##### (b) Tractor (4-wheel tractor)

Demand for 1969 will be about 100 in the range of 35 Hp for co-operation use and is expected to increase to 400 - 500 in 1975 if the Government provides subsidies. This situation will be continued also about in 1980. At that time, private demand will be appearing in range 15 Hp - 20 Hp.

/(c) ...

(c) Protection Machinery

Protection activities are very important. Therefore, this demand will be increased rapidly with progressive of agricultural techniques and the price is not so expensive. Almost all of them should be knapsack type because the efficiency is very high.

(d) Automatic Thresher

They have a trend of shortage in farm labour. This demand will be increased year by year. The power tiller should be used to power source.

(e) Irrigation Pump

Drought is frequently in this country. Demand of small pumps are expected. Also the power tiller should be used to power source.

b) New Machinery to be Introduced

(a) Transplanter

Manpower transplanter and power tiller attached type planter have been introduced in the Institute. Seeding method of paddy is not suitable because climate is cool. Therefore the development of transplanting machine will be required also for labour shortage.

(b) Harvesting Machinery

There is a necessity to do save farm labour. Small type combine and binder should be introduced.

(c) Drier

Grain drier should be introduced for improvement of rice quality.

(d) Transportation Equipment

Tiller attached trailer and bicycle attached rear car should be introduced for transportation in a village.

Section III

MANUFACTURING INDUSTRIES AND ANCILLARY  
FACILITIES

I. Farm Machinery Manufactures

a) General information about farm machinery industry

Although it is reported that there are as many as 250 manufacturers of which about 5 are medium scale, and the rest are small-scale manufacturers.

Power tillers, oil engines, pumps, rice and barley polishing machines, flour mills, power diesel threshers, power sprayers, etc. and many hand-operated and animal-drawn equipment are manufactured.

There are only two manufacturers of power tillers. It is estimated that there are about 10-15 manufacturers of other power equipment such as engines, pumps, threshers, polishing machines, sprayers, etc. The rest are very small-scale manufactures devoted to hand tools and animal-drawn equipment.

Total number of farm machinery mfgs	250
Medium-scale manufactures	- about 5
Small-scale	about 15
Very small manufacture	about 230

Number of members of Association of Korea Farm Tool & Machinery Industrial Corp - 78

<u>Item</u>	<u>No. of mfgs</u>	<u>Claimed Prod. Company</u>	<u>1968 Production</u>	<u>Import Export</u>
1. Power tiller	2	10,000	5,000	30
2. Power sprayer	2	10,000	2,000	50
3. Hand sprayers	4	100,000	50,000	nil
4. Power pumps	10	20-30,000	5,000	"

/5. Manual ...

<u>Item</u>	<u>No. of mfgs</u>	<u>Claimed Prod. Company</u>	<u>1968 Production</u>	<u>Import</u>
5. Manual thresher	10	20,000	5,000	nil
6. Automatic thresher	2	1,000	200	"
7. Semi-automatic thresher	3	2,000	500	"
8. Diesel engine (include 2 power tillers)	4	20,000	5,000	Raw material
9. Grain polishing, husking, milling, etc.	4	10,000	500	nil
10. Hand tools, etc.	37	-	-	-

Total employment is 5,000 men and total turnover 2-3 billion won/year.

b) Manufacturing of power tillers

The two major manufacturers of power tillers are Daedang Industrial Co. Ltd (Chinju) and Dongyang Machinery Works (Seoul). They produce also engines and some other farm equipment.

1. Details of product lines

Table 3.1  
Details of Manufacturing Activities of  
Two Major Farm Equipment  
Manufacturers in Korea

1. Name of the company	Daedang Industrial Co., Ltd.	Dongyang Machinery Works
2. Plant at	156, Juyak-dong, Chinju Republic of Korea	Seoul, Korea
3. Branch at	Seoul, Pusan	-
4. Date of establishment	20 May 1947	-
5. Total ground	115,000 sq. m	-
6. Building area	17,000 sq. m	-
7. Capital	₩ 300,000,000 (US\$1,111,000)	-
8. Line of business	1) Manufacture, sell & service land use and marine engines, power tillers, tractor &	Manufacture of power tillers and agri- culture machinery.

/other ...

	other agri. implements, & machine tools.	transmission for trucks, gear motors.
	2) Import & export	-
9. Moved to present plant	1961	-
10. Manufacture of farm machinery	1964	-
11. Technical collaboration	a) power tillers - Mitsu- bashi, Japan	a) Power tiller - Iseki, Japan b) Diesel Engine - Kawasaki Aircraft Co. Japan
12. Capital participation	100% local	100% local
13. Available facilities in plant	Foundry, steel casting shop, heat treatment, forging, welding & fabrication, press shop, machine shop assembly, paint shop, inspection, store, tool room, etc.	
14. Total staff	Total 975 Engineers & technicians 78 Gen. Adm. 47 Factory operators 341 Trainees 123 Other staff 117	Total 650 Production staff 500 Engineers 50 Sales staff 100
15. Wage structure per month	Skilled technicians & engineers W20,000- 30,000 Operators W 8,000- 14,000 Trainees - start on W8,000	
16. Sales net work	Total points - 73 Sales office - 2 Service center - 15 - 2 3 people each Consignees dealers - 56 Covering 3/4 area of Korea. About 130 total sales & service people.	Technical training, service etc. undertaken to by the firm. In 1968, about 1,000 drivers trained at the rate of 250 men per week, 4 times. Has sales out- let points 16 who deal with all products.
17. Training program	Started in 1967, Poedong Training Institute for pri- mary school graduates and vocational training school for graduates of Jr. & Sr. high. Training in all aspects of machine shop, foundry etc.	



18. Main production lines

- a) Marine engine HP 250-70 a) Power tiller 11 HP  
     60-35 b) Gear Motors  
     30-7 c) Equipment  
     64-7½
- b) Engines diesel for  
     land use  
     Kerosene 10 - 5  
     H.S.D. 12 - 4½
- c) Power tiller 6 - 8½  
     Kerosene eng. 8 - 11  
     10 - 14
- d) Threshers power foot operate
- e) Water pump 2"-8"
- f) Machine tools - 9 kinds

19. Exports of power tiller

	<u>Target</u>	<u>Actual</u>
1965	-	5
1966	-	13
1967	270	100
1968	600	100

20. Imports

All special steels Power tiller, main gear  
 For diesel engine - Fuel engine compounds, oil  
 inj. system seals, shafts, bearings,  
 plunger hardware.  
 power tiller - Carbura- 40% of imported com-  
 tor, pounds.  
 kerosene - Manago to  
 1 set of gears  
 30% import bearing oil  
 gears

21. Ancillary purchase

Tyres & tubes, only

Foundry products, types,  
 rubber & plastic parts,  
 certain press parts.  
 Casting 7--120 W/kg.  
 (CI - MI)  
 Five plants for tyres  
 also available piston,  
 piston rings, muffler,  
 elect. connection, head  
 lamps etc. out of 60%  
 of local manufacture,  
 70% is made in plant &  
 30% bought Ancilla-  
 ry industry.  
 (Note: Nozzle for fuel  
 injection made by Munich  
 Mac. Co. but not used)

2. Production of Power Tillers - 1968

a) Total production

	Dongyong Mac Company Power Tiller <sup>*/</sup>	Daedong Mac. Co. Power Tiller	Total
Claimed			
Production Capacity	10,000	20,000	
1968	1,100	6,000	7,100

\* One model 11 HP with Kawasaki Diesel Aircooled engine \$200 per set 125 kg. Price of power tiller with rotary tiller to Govt. agencies \$720 and domestic private market \$920 out of 1100 tractors sold in 1968, 921 sold to Govt. and 100 Nos. to private.

b) Production with respect to horse power 1968

	<u>6-8 HP</u>	<u>8-11 HP</u>	<u>11-14 HP</u>	<u>Total</u>
Daedong	1,500	3,000	1,500	6,000
Dongyong	-	1,100	-	1,100
Total	1,500	4,100	1,500	7,100
Percentage of total	15%	60%	15%	100%

Thus today about 60% of power tiller manufactured is in the range of 8-11 HP and 15% is above 11 HP.

3. Some Important Production Statistics of Production of One Major Manufacturer - Daedong Ind. Co.

a) Production

Table 3.2

Production Number of Major Items

Item	Model	Prod. Capacity	Details of Production			
			1965	1966	1967	1968
Engine for land use	D-64-7 $\frac{1}{2}$ HP	1,700	1,200	1,110	553	1,200
	K-10-5	1,450	1,550	671	547	600
	HDS-12-4 $\frac{1}{2}$	280	50	145	100	2,000
Power tiller*	CT-83 6-8 $\frac{1}{2}$	2,000	553	383	300	1,500
	CT-85 8-11	3,000	-	151	1,623	3,000
	CT-95-10-14	1,500	-	47	350	1,500

/Thresher ..

Item	Model	Annual Prod. Capacity	Details of Production			
			1965	1966	1967	1968
Thresher	Power thresher	700	700	200	-	-
	pedal thresher	7,000	3,000	800	-	-
Water pump	2"-8" C. Pugal	2,000	200	15	-	All to weather
Tractor	25-30	450	1	-	-	200*

\* Claims 20,000 production capacity  
 † 200 for 1969

b) Local manufacturing plans for power tiller

	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>
Imported content %	26%	15	10	10	5
Local content %	74%	75	90	90	5
Production plans Nos.	2,303	6,000	6,000	6,000	6,000

It is claimed that local power tillers are 20% cheaper than imported power tillers from Japan.

4. Future Trend - Views

	A	B
	Dong Yong Lae Co.	Dae Dong Industrial Co. Ltd.
Power tiller	a) Popular HP will be 9 HP instead of existing 11  b) Power tiller market will increase and requirement for the period 1969-75 will be about 150,000 units, i.e. about 25,000 units by 1975.	a) Popular HP today is 8-11 and 10-14 HP will produce 6,000 a year and can expand to 10-15,000.  b) Power tiller market will increase to 20-25,000 by 1975.
Riding Tractor	1) Demand for 20-35 HP riding tractor now is low. By 1975, demand may be about 300. By 1980, demand will be about 500 units.	1) Demand of 20-35 HP riding tractors will be about 200 by 1975 and may increase to 500 by 1980.

/.....

A

Long Yong Mae Co.

B

Dae Dong Industrial Co. Ltd.

Other equipment	1) Pumps with diesel engines 2) Engine driven rice and wheat threshers. 3) Rice planters/ferti drills 4) Sprayers 5) Rice hullers 6) Rice combines	1) Pumps 2) Diesel engine 3) Sprayers
-----------------	---	---

#### 5. Future Plans of Existing Manufacturers

It is interesting and encouraging to know that the existing major manufacturers are aware of the marketing mix and the dynamic nature of ever-changing agricultural pattern. For example - as reported - Dae Dong Industrial Co. were manufacturing threshers, straw bag knitting machine, paddy weeder, feed cutter, plow, potato cutter, barley presser etc. a few years back. When the small scale manufacturers entered the field and made price competitive, the company discontinued the above, and are now making power tillers, V-Diesel, Horizontal diesel, H.S. engines, pumps, kerosine engines, auto gas and diesel engines, etc. and can make H.S. sprayers and water pumps when required. Again the firm is aware that it may have to gain for more complicated machinery at a later date.

The following is the summary of plans of two manufacturers:

#### Future Plans of Existing Major Manufactures

	Dong Yong Mae Co.	Dae Dong Industrial Co. Ltd.
1. Power tiller	Continue production of 8-12 HP power tiller on an expansion program basis.	Continue power tiller production
2. Riding tractor	Has plans to make 4 wheel tractor. Has brought an "Isaki" 4 wheel tractor. Has plans to make a similar 20-30 HP air-cooled diesel tractor.	Has signed a contract with Ford Motor Co. U.S.A. on 18 Oct. 68 to manufacture fordson 35-40 HP tractor starting with 200 a year and going up to 600 a year in 4-5 years.
3. Other equipt.	Has plans to make 0.75-1 HP. Knap sack type of sprayer.	Can make high speed sprayers if sufficient demand arises.
4. Other items	-	a) Has plans for 1/2 ton truck manufacture b) Riding tractor c) Bulldozer (Isikawashima Co. Ltd. Japan)

## 2. Ancillary industries and raw material

### a) Imported Components for Power Tiller & Engines.

The ancillary industry has made only a limited headway and hence all components are either manufactured in the plant or imported. Usually 40-45% components are imported. The imported components - if manufacturing facilities are not available in the plant itself - are engine components, special gears and shafts, oil seals, bearings, high tensile fasteners, tine component for tillers, fuel injection system, head lamps, nozzle.

In general it is to be pointed out that all critical items are usually imported except in one plant where manufacturing facilities are there for most of the components.

### b) Items available through Ancillary Industry.

Foundry products, tyres, tubes, certain rubber and plastic components, certain press components, certain electrical components.

### c) Proprietary items available locally.

Tyres, tubes, pistons, piston rings, electrical connections, nozzles. Normally about 30-40% of local content is obtained through the local ancillary industry. It is to be pointed out that the local ancillary industry is limited and hence the two factories of power tiller have most of the facilities required for manufacture. Most of the components except the critical items which have to be imported.

### d) Availability of Machine Tools.

Some of machines such as single lathes, milling and shaper, grinders, welding machine, saw, etc. are manufactured locally. Other equipments are usually imported.

e) Availability of Raw Material.

All special steels, structural steels, etc. are being imported. There is limited facilities for rerolling, quality single castings are available. There is also limited capacity for malleable castings.

3. Availability of technical personnel

a) Wages

Engineers	30,000-40,000 W/PM
Supervisors etc.	20,000-30,000 W/PM
Operators	8,000-14,000 W/PM
Trainees starting	8,000 W/PM

b) Technical man power

Technical man power availability is not adequate. Operators and other skilled personnel has to be trained in plant. There are not enough technical training and vocational training schools and institute.

There is also a shortage of managerial personnel, industrial and tool engineers, quality control and inspection personnel, production engineers, production planning engineers etc. on a large scale. It appears that this is one of major reason coupled with financial resources for slow progress in ancillary and engineering industries.

## Section IV

### POLICY TOWARDS FARM MECHANIZATION

#### I. Incentives and policy by the government for

##### a) Subsidies and loans to the farmers

##### 1. Government Subsidy and Loan Program Towards Farm Machinery

It is the opinion of the Ministry of Agriculture that Korean Agricultural is in the stage of semi mechanization. Hence there is subsidy and loan system for manufacture and purchase of farm machinery. This assistance is given to manufacturers through National Association of Cooperative Federations on one hand to end users through country and village cooperatives. Nearly 90% of the farmers are the members of cooperatives. N.A.C.F. handles agricultural credit, marketing of farm produce on one hand and making available the inputs such as seeds, fertilizers, pesticides and farm equipment on the other. There are 139 country cooperative unions.

The following is the pattern of assistance given towards manufacture and usage of farm machinery:

<u>Assistance</u>	<u>Tractor</u>	<u>Power tiller</u>	<u>Pumps, Dusters Feeds Mills etc.</u>
1) Subsidy by Govt.	30%	30%	50%
2) Loans	50%	30%	Nil
3) Payback period	4 years	4 years	Nil
4) Grace period	1 year	1 year	Nil
5) Farmers contribution	20%	40%	50%
6) Interest rate on loan	9%	9%	-
		/It	

e) Availability of Raw Material.

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		/It	

It is to be pointed out that in case of power tillers, pumps etc., the subsidy is in terms of import of CKD components to the manufacturers. Also it is to be pointed out that the Bank and Private Source interest rate is normally 26%. Subsidy for tractors are 100% and pumps are 100% which are supplied to provincial self governing body which passes the title to village self governing body, which hires out to farmers.

## 2. Plans for Future Subsidy and Distribution

According to NACF, the Government proposes to budget 2.2 billion won for machinery and tools out of which 1.7 billion won is for power tillers, power sprayers, power driven pumps etc. A total of 5,450 power tillers, 2,200 power sprayers, 450 power pumps are to be imported for distribution.

### b) Organization for import, production and Sales

#### 1. Government channels for import, production and distribution of farm Machinery

- (1) National Agricultural Cooperative Federation.
- (2) National Association of Land Development Association - For import of CKD components and distribute.
- (3) Korea Farm Tool and Machinery Industrial Cooperation - For manufacture and supply
- (4) Office of Rural Development and Agricultural Machinery Utilization Experiment Station - For extension and performance analysis.

The first two and the last and within the perview of Ministry of Agriculture. The first two organizations are from the users side which falls under the agricultural cooperative law.

The third organization is an organization of manufacturers from the supply side and comes under Industrial Cooperation Law controlled by Ministry of Commerce and Industry. Import of components and distributor is channeled as follows:

#### /I. Power tiller

### 1. Power Tiller

A subsidy of 30% is given by the government to the National Agricultural Cooperative Federation by granting 30% of C&D imported components. The national Agricultural cooperative Federation (NACF) in turn import the component through the subsidy and allocate the components to the power tiller manufacturers who are the members of Korean Farm Tool and Machinery Manufacturers Association. The Power tiller manufacturers who manufacture about 70% of components sell the assembled power tiller to NACF which in turn sells to the farmers.

### 2. Pumps

The government grants a subsidy of 50% through import allocation of C&D components to the National Union of Land Development Corporation. The corporation allots the components to the manufacturers to assemble with the balance 50% of local component and is sold to the Development Corporation. The Corporation sells to the provincial self governing bodies which gives to the farmers through county bodies.

### 2. Mode of Selection of Farm Equipment to be Manufactured and Distributed

Normally the Ministry of Agriculture, Office of the Rural Development and National Association of Cooperative Federation chooses the type of machines. The Ministry of Agriculture decides the items to be distributed or manufactured on the basis of quality, price, capacities of plants. There is no governmental subsidy on small tools. Manufacture is scheduled in consultation with Korean Farm Tool and Machinery Manufacturers Association.

### 3. The National Agricultural Cooperative Federation (NACF)

The NACF is a national organization of agricultural cooperatives that handles the purchasing and distribution of agricultural supplies to its members. The NACF also markets farm outputs and also extends loans to farmers.

/The NACF

### 3 The National Agricultural Cooperative Federation (NACF)

The NACF is a national organization of agricultural cooperatives that handles the purchasing and distribution of agricultural supplies to its members. The NACF also markets farm outputs and also extends loans to farmers.

The NACF is reported to have 9 branch offices. It operates through 139 county and village cooperatives. About 90% of the total number of farmers in the country are affiliated to it.

Briefly, the accomplishments of the NACF in 1967 are as follows:

- (1) Financial assistance to cooperatives amounting to 509 million won or \$1.8 million and guidance for developing 111 major production areas planted to 22 selected crops.
- (2) Merging small unit cooperatives to expand their business operations. As a result, the number of self-supporting cooperatives increased from 356 at the end of 1966 to 362 in the year 1967.
- (3) Operations of a savings and mutual insurance that provides life and fire insurances and a special livestock insurance.

a) Purchasing of Supplies In 1967 the NACF handled 24,990 million won or about \$98 million worth of purchases, an increase of 15% over the previous year. About 85% of this were government-entrusted purchases, 12% by the NACF proper and the remaining 2% as consignment purchase for its members. The items purchased were 85.2% in fertilizer, 5.4% in farm chemicals, 4.6% in seedlings, seeds and breeding livestock, and 3% in farm equipment, the latter equivalent to about \$3 million. The major items of farm implements supplied in 1967 were 2,160 power tillers and 1982 power duster sprayers, of which 40 to 90% were subsidized by the government. Other farm equipment such as weeders, threshers, shouldering sprayers, shovels and sickles were supplied on consignment to members.

b)

b) Distribution of Farm Machinery. The NACF delivers the machine to the particular county cooperatives; in turn it leases the equipment to the farmer. NACF receives for its services a 3% commission to be shared with the county and village cooperatives.

The NACF maintains 35 farm machinery service stations which are apart from 37 service centers operated by the farm equipment dealers. The latter provide warranty visits twice yearly.

c) Training Facilities. Technical training for farm mechanization is directly provided by the NACF; although it depends to some extent to the training provided by the farm equipment manufacturers. The NACF obtains training assistance from the Rural Development Office.

d) 1968 Purchase Program. It is reported that 2.2 billion won or \$8 million worth of farm equipment were purchased during 1968, of which about 75% were for power tillers, dusters and other major farm equipment.

For 1969, it is reported that the purchase budget for farm machinery will be increased to about \$14.5 million for the purchase among others of 5,450 power tillers, 2200 sprayers, and 450 pumps.

e) Financing of Cooperative Activities. At the end of 1967, the NACF had a total amount of available funds of 73.7 billion won or \$268 million, of which 60% are loanable funds. The latter represents an increase of 24% over the previous year.

f) Farm Equipment Financing. It is reported that the government provides a 30% subsidy for tractors. The buyer advances 40% against a loan equipment to 30% of the purchase price. There are four yearly instalment payments after a one year grace period. Rate of interest is 9%. This financing is provided through the cooperative.

g) Indicated trend in farm machinery by NACF

<u>Items</u>	<u>1969</u>	<u>1970-1975</u>
a) Power tiller	8-10 thousand demand. 8-10 Hp diesel engine most popular	Demand may group to 100,000 during period of 1970-75. i.e. average demand is 20,000/year. 10 HP most popular.
b) Tractors, 35 HP	100 tractors to be imported	Tractor demand will go up.
c) Power sprayers (Knapsack)	Demand 7,000 units	Demand will be at the rate of a minimum of 5,000 units.
d) Rice power thresher	Foot operated, locally made in use 200 power threshers in use.	Demand will be average 8,000/yr.

4. Association of Korean Farm Tool and Machinery Industrial Corporation

The Association has about 78 members, engaged in primarily manufacture of agricultural machinery. Total employment is about 5,000 men and sales worth about 2-3 billion won.

The manufacturers sell their products to the association to National Agricultural Cooperative Federations and also sell the same directly to farmers, a small volume, power tillers and sprayer sale are through cooperatives only. The Association has 2 inspectors. There are 37 service centers for after sale services is operated by the Association. The total strength of staff of the Association is about 13, out of which 3 are technicians. The large buyers are NACF and Irrigation Associations. Financing of the Association is through membership fees of 5000 W/year and 1-3% commission on sales and purchase of farm machinery and other inputs. The Association feels that the Korean power machinery field is favourable for foreign participation.

II. Incentives and Policy for Manufacturing Farm Machinery

a) Economic Planning Board, Ministry of Planning

/Except

Except for broad policies, no exact planning or policies have been directed towards agricultural machinery manufacture. Out of the 100 million dollar loan "Japanese Economic Cooperation Funds" expected next year, a significant percentage will be utilized towards ground water replenishment schemes. No plans have been directed towards expansion of the existing big manufacturers, a small percentage of funds of "Japanese Economic Cooperation Fund" may be utilized for loans through medium and small rural banks. The balance of loan is expected to be utilized for local currency stabilizations. Regarding the subsidy for farm equipment purchase, the same will continue for next 5 years after which period, subsidy will be out off and long term agricultural loans will start.

b) Future plans for power tiller demand and supply

It is the target of the government that one out of every 3 holdings which has more than 2 ha should have a power tiller by 1973. There are 173,000 holdings above 2 ha per holdings. Thus approximately 57,700 sets of power tillers are required during 1969-1973. In other words about 3,000-10,000 sets of power tiller of 8-10 HP are required each year.

c) Plans to import CKD components of power tiller and other equipment

Government has availed a special budget of \$1,500 million in 1968 through aid of Japanese government. It is proposed to import 4,921 power tiller units at 30% CKD pack content at the cost of \$300 per pack in the following HP ranges.

HP 6	Nos. 400 sets
8	2380
9	921
10	220

The local manufacture of power tillers especially the import packs depends upon the availability of foreign exchange and to this extent the local manufacture as long as it is not 100% locally made has limitations in achieving the desired volume of production.

d) Research and testing institutions

Agricultural Machinery Division at the Suwon Agricultural College

This division that was started recently conducts research on farm machinery. With a staff of nine and with limited facilities, the division is now experimenting with its own designs of a sweet potato drier and a rice transplantation.

The division hopes to receive soon \$50,000 worth of testing equipment from Japan. They also plan to establish an Agricultural Machinery Training Centre.

They are not faced with lack of equipment and a dearth of skilled personnel.



## Section V

### CONCLUSIONS

1. Agricultural production and growth appears to have made a significant progress in Korea.
2. It is also evident that the cooperative system for distribution of farm machinery has been fairly successful.
3. Although there is generous subsidy and loan on farm machinery now, continuation of the same on a national scale appears to be uncertain.
4. Thus the sale of farm machinery and the market in general in the field of power machinery largely depends upon the government policies. However, considering the general agricultural pattern there is a good market for power machinery in Korea.
5. There is a necessity to continue subsidy on an extended scale for all power machinery for at least 5 years. It may be necessary to continue subsidy for power tillers and other small power machinery for 5 years and for tractors, for a 10 years period.
6. Although the team did not visit small manufacturers, it can be said that Korea today is capable of locally producing power tillers and other simple power machinery.
7. The existing capacity to manufacture power tillers is capable of meeting the need of the country. However there is necessary to reinforce quality control and it is necessary to buy additional balancing equipment, machinery and quality control equipment.
8. There is a demand for irrigation pumps, - submerged type and centrifugal type; paddy threshers, diesel engines and rice processing equipment.
9. There is a limited demand for 30-40 HP riding tractors. Although there is a necessity for the same and potential for effective usage, the actual demand will depend upon the magnitude of subsidy.

- -

10. Although the present governmental system for supply of imported components to private manufactueres seems to be fairly efficient some flexibility could certainly achieved in the future by partly liberalizing the imports for farm machinery manufacturing.

/Appendix A

Appendix - A

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Appendix -- B

PERSONS & ORGANIZATIONS VISITED IN KOREA

I. Manufacture of Farm Equipment

1. Dae Dong Industrial Co. Ltd.,

156, Juyak-dong, Chiuju

Korea

- a) Mr. Kim Han Hung - Vice President
- b) Mr. Kim Sung Moon - Managing Director
- c) Mr. Sa Ok Kim - Executive Director, Internal Vice President

Korea Junior Chamber of Commerce

- d) Mr. Lee Wuh Sang - Official translator and interpreter

2. Dong Yang Machinery Works

Seoul, Korea

- a) Mr. Kim Ryang Bak - Managing Director
- b) Mr. Doo Hoon Kim - Director

II. Ministry of Commerce & Industry

- a) Mr. Jung Suk Yung, - Technical Officer, Industrial Machinery,  
1st Section, Industrial Bureau IInd,  
Govt. of Korea (Tel. 74-4895)

Ministry of Science and Technology

- a) Mr. Eung Sun Lee (not met) - Director of Technical Cooperation  
Bureau, Ministry of Science &  
Technology, Rep. of Korea

IV. Ministry of Agriculture

- a) Mr. Fang Hai Kul - Chief, Agricultural Production Section,  
1, Sea Jong-ro, Chang Ro-ku, Seoul, Korea

/b)

- b) Mr. Nam Goo Hi
- c) Mr. Hong Sang Lee
- d) Mr. Yong Hwan Kim - Asst. Minister, Agricultural Administration,  
Ministry of Agri. & Forests, Seoul, Korea

V. Korea Farm Tool and Machinery Industrial Cooperation (KFTMIC)

19-6, Ika do-dong

Choong-ku, Seoul, Korea

- a) Mr. Ahn Yung Lee - Head of General Division
- b) Mr. Kim Chong Woo - Engineer (inspection)
- c) Mr. Lee Ho Sik, Agricultural Engineer (Inspection)

VI. National Agricultural Cooperative Federation (NACF)

- a) Mr. Yum Tai Keun - Section Chief - Purchasing
- b) Mr. Chung - Assistant Section Chief
- c) Mr. Lee - Engineer
- d) Mr. Lim Hia Sung - (did not meet) - Dept. Manager
- e) Mr. Kim Yong Kun (did not meet) - Executive Director
- f) Mr. Chung Joe Ho - Vice Chief of Section (Supply)
- g) Mr. Khee Dok. W. - Agricultural Engineer

VII. UNDP

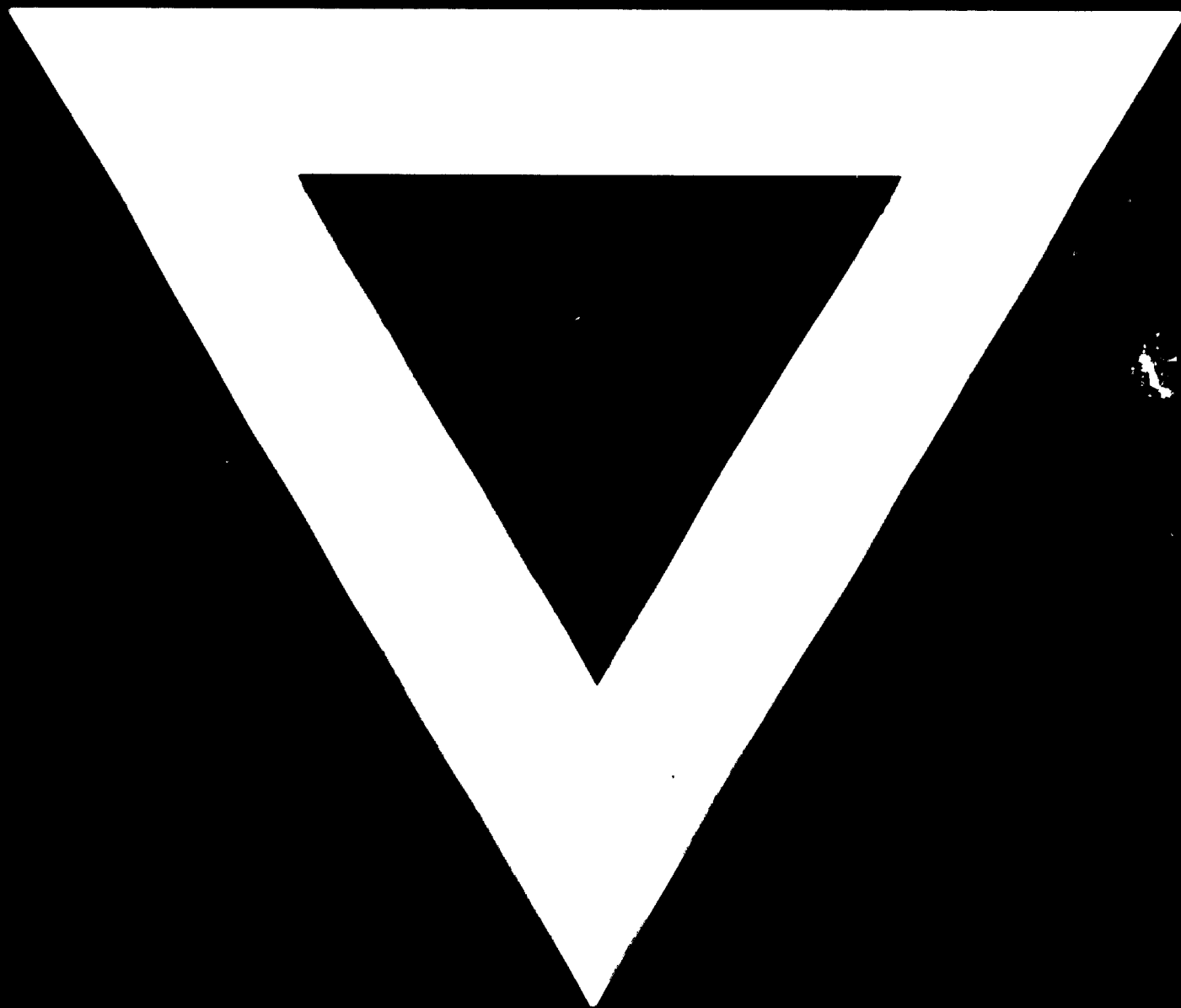
- a) Miss Nina Nash - Deputy Res. Rep. UNDP, P.O. Box 143  
Seoul, Korea

VIII. Ministry of Planning

- a) Mr. Young-Hai Woo - Asst. Minister for Planning, Economic  
Planning Board, Seoul, Korea.



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