11/28/73

DOCUMENT OF INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT
INTERNATIONAL DEVELOPMENT ASSOCIATION

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Report No. 213a-KO

AGRICULTURAL SECTOR SURVEY

REPUBLIC OF KOREA

(in four volumes)

VOLUME IV

ANNEXES 9 THROUGH 12

November 13, 1973

Asia Projects Department

GLOSSARY

CURRENCY EQUIVALENTS (1972)

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

WEIGHTS AND MEASURES

The metric system is used in this report.

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

ABBREVIATIONS

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

DESIGNATION OF ADMINISTRATIVE AREAS

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

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MARKETING

I. SUMMARY AND RECOMMENDATIONS

1. High rates of urbanization and income growth have created an unusually large expansion of demand for agricultural marketing services. There has been considerable public and private investment in physical facilities, some of which are excellent, but other facilities presently in use are outmoded and inadequate. Such inadequacies are found in facilities for assembly of produce and delivery of supplies to farms, for storage, for processing, and for wholesale and retail distribution in urban markets. Korea has a well developed transportation system including improved highways and railways for moving farm products to urban markets. But there is still need for improving rural roads to make markets more accessible to isolated villages.

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

3. The government role is of considerable importance. This includes implementation of price policy, with respect to both farm products and farm supplies, encouragement of exports, procurement for government use and inspection and other regulatory services. The National Agricultural Cooperative Federation (NACF) with policy direction and guidance from the Ministry of Agriculture and Forestry (MAF) is the most important agency in the implementation of the government role. The Central Federation of Fisheries Cooperatives (CFFC) and the Agriculture and Fishery Development Corporation (AFDC) have lesser roles. Finally, the Ministry of Commerce and Industry (MCI) is responsible for general supervision over central wholesale markets operated by municipalities. There appears to be some lack of coordination in planning the construction and use of marketing facilities by these government and semi-autonomous agencies.

4. NACF is a semi-autonomous government agency established in 1961 by a merger of the Agricultural Bank of Korea and the farmer cooperative system. In 1964 there were 18,963 multi-purpose primary cooperatives at the Ri-dong or local level. Since then the number of primary cooperatives has been reduced to about 1,800 in order to achieve greater efficiency. The objective is to have one primary cooperative for each Myon, the next largest administrative unit after the Ri-dong of which there are 1,376. In addition, there are 148 special primary cooperatives concerned with marketing livestock, horticulture, dairy and other special products. Primary cooperatives are supervised by Gun cooperatives of which there are 140, one of each of the administrative sub-division of the 9 provinces. Gun cooperatives are distinct legal and administrative entities but are closely integrated with NACF. The president of NACF appoints the presidents of Gun cooperatives and instructs them on local policies and procedures. Members of primary cooperatives gradually should be given increased authority and responsibility for business operations of cooperatives. The cooperative movement should ultimately be entirely in the private sector even though it may perform services for the public sector. Otherwise, much of the driving force of the cooperative movement will remain unmobilized. In view of the high educational levels of rural people, they should be well qualified to perform a larger role in managing the operations of cooperatives.

5. AFDC and other organizations have played a major role in expanding exports of marine products, raw silk, ginseng, tobacco, fruit and other agricultural products. Korea has large potentials for further increasing output of labor-intensive agricultural products because of its industrious and low-cost supply of labor. Consequently, Korea should continue to take advantage of expanding markets abroad. There are large potentials, for example, for expanding exports of fresh and processed vegetables to Japan.

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

7. It is planned to increase NACF's share of total marketings of farm products from 16% at present to 23% by 1976. This expansion may be desirable as a means of demonstrating new and improved methods and increasing price competition by providing alternative sales outlets to producers and retail services to consumers. It is important that the government role in planning investments in transportation, storage, processing and distribution facilities to be used by both private and semi-autonomous cooperative or public agencies, be exercised more effectively. This includes road construction and maintenance, construction of assembly area and central market warehouses, slaughter houses and other processing and urban wholesale and retail distribution facilities.

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

9. The mission concludes that there is need for better coordination of government activities concerned with marketing. Most conspicuous is the division of responsibility for central wholesale markets between two ministries. There are also underutilized cold storage, wholesale market and slaughter house facilities in Seoul and elsewhere, despite shortages overall. This should not halt investment but nevertheless should be taken into account in investment planning. Various regulations covering, for instance, taxes levied at slaughter houses, repayment of loans in kind at unattractive prices, and high inspection costs, divert produce from channels which would otherwise be most satisfactory. Changes in such regulations are needed.

10. Agricultural marketing is rightly accorded a high priority in the adjusted Third Five-Year Plan. Most of the proposed investment is in facilities for the cooperatives and for the government's own grain supply management and price stabilization program. Improvements in infrastructure, which serve marketing, such as rural road networks are included elsewhere in the plan but are no less important. The document, Prospectus for Improvement of Agricultural and Fisheries Marketing Structure Project, October, 1972, received by the mission while in Korea, proposes investments totaling 73.5 billion won for a variety of purposes during 1973-76 but it contains only limited information providing economic justification for investment projects. The components of this package have been examined from the standpoint of their general appropriateness in the context of needs and priorities as evaluated and summarized above. Many of the component projects merit more careful consideration on the basis of further information on their design and a broader approach to benefit-cost analyses. Mission evaluations of proposed projects based on available information are summarized below and discussed in detail in Chapter VII.

11. The need for additional warehouses for government food grains was evaluated by an IBRD/IDA mission in 1971. It was concluded that a USAID-financed program would meet the needs until at least FY-1974 and probably even longer. While the time is near when some additional storage

or upgrading of facilities will be needed, the proposed new building program appears excessive. There is a need for new facilities for some of the newly consolidated Myon cooperatives.

12. The proposal for additional NACF public sales centers requires further study to resolve the problems of coordination between NACF and municipally operated central markets.

13. The slaughter house project is not adequately justified in the presentation in view of the low level of use of existing facilities. More information is needed on how the supply of animals for the new facilities would be assured.

14. The proposal for expansion of collection facilities for fruits and vegetables is promising enough to justify detailed project preparation and evaluation.

15. The proposed supermarket for farm products is accorded low priority, as an NACF enterprise, on the ground that privately operated general supermarkets are already in this field and are gradually developing and supplying the demand for this higher class of service.

16. The buffer stock warehouse proposal should be further examined in terms of the present utilization of all existing storage facilities. There is evidence of lack of coordination among agencies operating cold storage facilities. The rice and barley mills for Myon cooperatives appear desirable if installation is phased with progress in primary cooperative consolidation. The same is true of the trucks for these cooperatives.

17. The CFFC public fish sales center project appears to be so large that it might encounter serious management problems as well as replacing parts of the distribution system that are now functioning reasonably well. The proposed 40 fish sales stores in Seoul may be excessive until the success of this kind of operation has been demonstrated, perhaps for the benefit of potential private operators of such stores.

18. The straw pulp mill proposal is discussed in Annex 10 on Forestry. The proposed integrated agricultural products processing project has been reviewed in detail and it has been decided that additional project preparation is required before it will be ready for appraisal.

II. BACKGROUND

19. The structural changes in the economy of Korea during the past decade have emphasized the importance of an efficient marketing system for agricultural products. Rapid industrialization has been accompanied by growth of urban areas which must be supplied with food mainly from numerous small farms each with only a small volume of produce to sell. Rapidly rising incomes have resulted in a demand for a more varied and higher quality

food supply. This means more perishable commodities available for longer periods. More rapid transport, better storage facilities and efficient distribution are necessary to meet this demand.

20. The nonfarm population increased from 10.4 to 17.8 million between 1960 and 1970. Average real earnings of urban workers more than doubled in a similar period. Exports of agricultural products also increased. Wholesale and retail trade in all commodities has exceeded the national economic growth rate, and this is probably also true of trade in agricultural commodities although comparable statistics are not published.

21. Rapid growth in volume and variety of marketing services has necessitated substantial investment in physical facilities for transport, storage, processing and distribution. While some of the newer facilities are modern and efficient, others still in use are poor and outmoded; for example, feeder roads, many older warehouses, small slaughter houses and urban central markets in congested areas need to be improved. Deterioration and spoilage in marketing channels is an economic loss which must be borne by producers or consumers. Agricultural progress may be hindered or advanced by the efficiency of the marketing system and the rate at which it can be modernized. This annex undertakes to evaluate agricultural marketing efficiency with particular attention to government programs for improvement.

22. Government has intervened in marketing in various ways and for a number of reasons. To implement price policy, grain and certain other storable commodities such as red peppers, sesame, onions, garlic and apples have been purchased and stored to support farm prices and to stabilize retail prices. The NACF acts as government agent in these operations as well as in procurement of commodities for direct government use. The Government owns and rents storage facilities in addition to those of NACF. CFFC performs similar functions for government on a much smaller scale in fish marketing. AFDC, a government corporation with some foreign and private domestic equity capital engages in processing, storage and sale of certain agricultural and fishery products. These semi-autonomous agencies are subject to policy control and general direction from the Ministry of Agriculture and Forestry.

23. The Ministry of Commerce and Industry supervises 54 urban wholesale markets operated by municipal governments. Seoul and some of the other larger cities have grown so rapidly that their market facilities are crowded and poorly located in relation to the needs of potential users.

24. The major portion of all marketing services is performed by private enterprise operating on a small-scale often with inadequate financing and deficient facilities. Market channels are diverse and frequently include as many as five or six middlemen transactions from producer to consumer. Government policy has been to improve the situation by means of increased financial support for the cooperative organizations, particularly NACF.

III. MARKETING ORGANIZATION AND FACILITIES

25. There is a wealth of published material on the agricultural marketing system of Korea. As a part of the Korean Agricultural Sector Study (KASS) by the Agricultural Economics Research Institute of the Ministry of Agriculture and Forestry and Michigan State University, Special Report 7, Organization and Performance of the Agricultural Marketing System in Korea, published in 1972. Another report, Preliminary Agricultural Marketing Survey in Korea, published in 1968, was the result of a study by NACF and the International Marketing Institute. This annex draws heavily on the above and other publications, which provide more detailed descriptions of the marketing system.

26. With the very rapid growth of nonfarm population and income strong incentives have been created for farmers to produce for the market. Since farms are small, however, many farm households have little choice other than to meet their own minimum food needs first, and are able to produce very little surplus for sale. Since rice is the dietary staple and most farmers have paddy land, only about half the rice is marketed. Additional quantities go to pay workers' wages, rent, taxes and to settle other obligations. It is not known how much of this bartered rice subsequently reaches cash markets. In 1970, 49% of the rice crop was sold by farmers and an additional 25% was used to pay obligations of the kind described above (Table 1). For barley, wheat, millet and sorghum the proportions marketed are smaller, but for corn and beans larger. Most of the milk, fruits and industrial crops are marketed but considerably less than half of the vegetables.

Table 1: RATIO OF MARKETED TO TOTAL PRODUCTION OF SELECTED COMMODITIES

Commodity	1969		1970	
	Narrow Sense /1	Broad Sense /2	Narrow Sense /1	Broad Sense /2
	----------per cent----------			
Rice	45.8	72.0	48.7	73.8
Barley	23.0	34.0	24.2	36.6
Wheat	25.0	34.0	20.7	29.6
Soybean	50.3	57.6	54.6	62.0
Sweet potatoes	30.1	36.3	29.8	35.3
White potatoes	21.8	25.7	26.9	30.8

/1 Includes sales, taxes and milling charges.

/2 Includes in addition to the above, payments in kind for wages, rent, and other items.

Source: NACF Monthly Review, September 1972.

27. Regional specialization is at an early stage. As long as rice is the main crop in all regions there is limited opportunity for specialization in other crops except on slopeland. The early stages of assembly are likely to involve high unit costs because of the numerous small individual farm marketings distributed over all significant farming areas. While the transportation network has been greatly improved in recent years, especially with the construction of the expressways, further improvement in secondary and feeder roads would facilitate assembly of produce.

28. Storage, wholesale and retail marketing facilities have not kept pace with the growing and changing needs of Seoul and other rapidly growing cities. Perishable foods are still preserved by traditional inexpensive methods. Cold storage is in an early stage of development and canning is too costly for the mass home market, but profitable for certain export products.

29. There are several alternative channels through which most commodities pass from producer to consumer. Charts depicting these flows are complex and also different for each commodity. They show many kinds of intermediaries, but the number and combinations of functions performed by each is highly variable. A frequently expressed official view is that producer-consumer price spreads are excessive because there are so many intermediaries. Considerable emphasis is placed on strengthening the role of the cooperative marketing system as a means of increasing the quality and reducing the cost of marketing services. NACF handles about 16% of all agricultural commodity marketing, and plans to reach 23% by 1976. A related goal is to reduce the number of stages in the marketing process from five or six to two or three.

30. While price comparisons are useful in evaluating marketing efficiency, data on actual costs with reasonably efficient methods are needed for comparison with charges for services. Costs may be excessive due to poor facilities, low volume and other shortcomings in organization and management, or imperfect competition may permit excessive profit margins. Productivity is probably low, but conclusive evidence is lacking as to whether this results in low returns in the private marketing sector or whether lack of competition permits the burden of inefficiency to be passed back to the producer or on to the consumer.

31. The analyses that have been made of producer-consumer price spreads, seasonal price variations and geographic price differentials must be interpreted with considerable care (see Appendix Tables 1-7). The same is true of comparisons of margins in cooperative and private channels. This can best be done on a commodity by commodity basis.

32. The NACF is a multipurpose organization providing credit, farm supplies, insurance and banking as well as marketing services. It was created in 1961 by combining the Korea Agricultural Bank and the agricultural cooperatives. The Ministry of Agriculture and Forestry has a considerable measure of authority and responsibility for its policies and operations. Officers are appointed or subject to government approval down to the primary

cooperative level. The organization acts as agent for the government in price stabilization operations and procurement of supplies for government use. This is in addition to and sometimes in conflict with cooperative functions on behalf of its farmer members. The government purchase price at times has been below the free market price. NACF is commissioned to provide inspection services for fees, and inspection of government purchased commodities is required. Farmers sometimes find that inspection costs, including extra handling, are burdensome. They can be avoided by selling through private channels.

33. General purpose primary cooperatives were originally organized by minor civil divisions called Ri-dong. There were several thousand, but a policy of consolidating small cooperatives has reduced the number to about 1,800. The objective is one strong primary cooperative for each Myon, the next larger civil division of which there are 1,376. Primary cooperatives are members of Gun cooperatives, of which there is one in each of the 140 Gun, the next larger civil division. Above the Gun level are the nine provincial branch offices of the NACF headquarters in Seoul. There are also 148 primary special cooperatives organized on a commodity basis. There is overlapping membership between primary and general purpose cooperatives. Over 90% of all farmers are members of cooperatives.

34. NACF receives funds from the government budget, including foreign aid; it borrows from the Bank of Korea and it generates funds from its own banking, insurance, credit and other types of operations including capital subscriptions of members 1/.

35. AFDC was established in late 1967 to promote agro-industrial development, to benefit farmers and fishermen and to expand exports. It identifies promising new ventures, encourages private investment from both domestic and foreign sources, provides both equity capital and loans and in some cases pioneers new ventures entirely on its own. The AFDC interest may be sold when the enterprise has become viable. As of the end of 1971, 15.5 billion won had been channeled through this organization. It has a relatively modest role in marketing, mainly export but also some domestic. The principal exports are mushrooms, ginseng, tobacco, raw silks and fishery products. Total value of exports in 1971 was $16.36 million and for 1972 the estimate is $22.86 million. Processed fruits are sold on the domestic market.

36. The Korea Cold Storage Company, Ltd. is a wholly owned subsidiary of AFDC. It operates a "cold storage chain" with four very modern plants with capacities as follows:

1/ KASS Special Report No. 1. The National Agricultural Cooperative Federation: An Appraisal, provides a comprehensive description of the organization and its activities.

Seoul	9,000 m ton
Busan	4,000 "
Mogpo	1,200 "
Mukho	750 "

The facilities were completed early in 1971. Except for the Busan facility they are not yet fully utilized. A large fish, fruit and vegetable wholesale market facility is operated as a part of the Seoul complex under Municipal and Ministry of Commerce and Industry auspices. Cold storage facilities for vegetables and fruit have been built at Daegu and Busan and on Jeju Island to complement the refrigeration complexes.

A. Commodity Market Channels

Grain

37. NACF acts as government agent in the market of domestic grain purchased to meet government needs and to accomplish price policy objectives. In 1971 just over a million tons of government grain and just over 200,000 tons of grain for NACF's own account were sold. These sales were from wholesale market centers. Both farm and retail prices of government grain are fixed with a view to controlling margins and seasonal fluctuations. In commercial trade, margins and seasonal variations are somewhat larger, although presumably less than they would be without the influence of government price stabilization program (see Appendix Tables 1 and 2).

38. An NACF study of November 9, 1968 found that farmers in the Honam area received 89.5% of the Seoul retail price when marketing through cooperative channels compared with 86.3% through commercial channels. For the Gyeonggi area, the corresponding figures were 92.7% and 89.6% respectively. It should be noted that subsidies mainly in the form of lower interest rates may contribute to the ability of the cooperative system to operate with narrower margins. Since the retail price used in the comparison was the official one, the benefits of the narrower margins in cooperative channels accrued to the farmers. The consumer price, in private markets, at times has been above the official price because demand at the government price was in excess of available supplies of government grain. This problem has not been encountered in 1972.

39. The government attempts to control grain storage charges at rates which are not attractive to private businessmen using non-institutional credit. The IBRD Agriculture Warehouse Appraisal Mission in December 1971 estimated the rate of return on investment in warehouse operations at 85% capacity as only 4% 1/.

1/ IBRD/IDA Office Memorandum, Korea - Agricultural Warehouse Project Appraisal Mission, Full Report December 1971, p. 7.

40. Estimates of storage losses vary widely. A 1968 study by Kansas State University estimated all losses of rice on the farm and in market channels, storage, and handling, at 17% of production 1/. The IBRD report, referred to above, estimated that good storage at the Gun cooperative level could reduce losses by 5% of the volume of grain stored. For grain stored in the open, losses could be reduced by 10% of volume stored. It is evident that rates of loss depend not only on storage conditions but length of time in storage. Data are lacking to show how much grain is stored for different lengths of time under different conditions. Generally the better storage facilities will be used for longer time storage. Thus, total losses as a proportion of the total supply may be much lower than observed for particular lots of grain stored for 8 or 10 months under poor conditions. Such losses may apply to only a small part of the crop. Even so there is an opportunity for significant reduction in storage losses by further upgrading grain storage facilities.

41. While, in principle, cooperative marketing channels, in which prices are not unduly depressed by excessive margins or by large volume sales following harvest, are open to farmers, in practice they may have financial obligations which can only be settled by marketing elsewhere. In rice years 1968, 1969, and 1970 the average government purchase price for November, December and January, was below the comparable free market farm price. In 1971 and 1972 this relationship was reversed. Another reason for choice of commercial outlets is strict application of grading standard in government procurement. NACF makes payments to farmers for grain purchased on government account.

42. Examination of the seasonal pattern of wholesale rice prices suggests that the average seasonal spread is not wide enough to make storage financially attractive when credit at commercial interest rates is used. In 1970, for example, the average wholesale price of rice increased 11% from January to October (see Appendix Table 2). Also variability from year to year in seasonal price patterns makes storage somewhat risky. Price differentials between urban markets fluctuate considerably suggesting the need for wider dissemination of market information.

43. Marketing channels for barley, the other major grain crop, are similar to those for rice. Price stabilization operations are also important in determining channels used as well as prices.

Vegetables

44. Next in importance to cereals which accounted for 57% of the gross value of agricultural (and livestock) products in 1970, vegetables accounted

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1/ Review of Grain Storage, Handling, Processing, and Distribution Problems and Proposals in the Republic of Korea, Kansas State University and USAID, Seoul, September 1968.

for 14%. For red peppers, the most important single vegetable, and sesame there are special government price stabilization programs which include purchasing and maintenance of buffer stocks. Aside from red peppers, radishes and cabbages are the two major vegetables. Though perishable they are marketed throughout the year, thanks to a combination of extended harvest periods and traditional underground storage, rather than to extensive use of modern cold storage facilities. Prices are seasonally low through the summer and early fall, when there is much home processing of kimchi. Peak prices in April 1970, averaged more than four times the June low for radishes and over five times for Chinese cabbage (see Appendix Table 7).

45. These commodities flow through a variety of commercial channels, and there is little information about price margins, spoilage and quality standards. Auction sales are held in central wholesale markets and NACF marketing centers, but the proportion of total volume handled in this way is probably too small to have more than limited effects on prices in other parts of urban markets.

Fruit

46. Although the volume of fruit production is small it is increasing rapidly and is thought to have considerable potential because it can be grown on slopeland, is a high value per hectare crop and may have further export potential, and there is a rapidly increasing domestic demand. Fruit farms are well above average size and production is primarily for the market. There are 53 special horticultural cooperatives. A special study in the Taegu area in 1971 showed 50% of the apple crop handled by consignment merchants in the area and only 22% handled by cooperatives.

47. Another special study showed the producer-consumer price spread for apples to be about 40% of the retail price with only a very small advantage of the cooperative over the commercial channel. Wholesale apple prices in five cities over a five year period increased an average of 51% from harvest time to the peak near the end of the market season 7 or 8 months later. Much of the storage is on the farm and seems to be satisfactory for several months at least. The storage season could probably be extended somewhat by the use of modern cold storage. Pricing of apples at the wholesale level appears well organized as indicated by modest day to day price fluctuations.

48. Peaches are highly perishable and their marketing season lasts only three months. A 1970 survey indicated that special cooperatives handled about 53% of the crop. Farmers were indicated to receive 50% of the retail price when marketing through cooperative channels, and 57% through other channels. Prices fluctuate considerably from day to day.

49. Pear, persimmon, and grape marketing are characterized by similar problems of small volume, high perishability, high market costs and price uncertainty.

Other Crops and Industrial Raw Materials

50. Soybeans and other pulses, sweet potatoes and white potatoes are mainly marketed through commercial channels with what appear to be wide margins and erratic price characteristics. Cooperative channels play only a minor role. NACF sales of industrial raw materials crops are shown in Table 2. The Office of Monopoly of the Ministry of Finance regulates production and marketing of tobacco and ginseng. NACF and AFDC both are concerned with expansion of production, processing, and export of mushrooms.

Table 2: NACF SALES OF INDUSTRIAL RAW MATERIAL CROPS

Year	Cocoon	Dried Sweet Potatoes	Sweet Potatoes	Other /1	Total
	million won				
1965	1,882	1,639	398	273	4,192
1966	3,052	1,073	605	610	5,340
1967	3,580	692	1,148	598	6,018
1968	6,382	1,255	1,352	925	9,914
1969	8,076	1,118	1,417	1,486	12,097
1970	9,369	1,260	1,140	669	12,438
1971	13,964	1,021	1,235	585	16,805

/1 Includes ramie, castor beans, rapeseed, flax, malting barley and corn.

Source: NACF Monthly Review, September 1972.

Livestock Products

51. Livestock and livestock products account for only about 12% of agricultural output, and farmers who sell cattle or hogs typically sell only one or two animals annually. Such sales are often to meet emergency cash needs 1/. There are 680 slaughter houses mostly very small with limited facilities, frequently used at much less than intended capacity. Special slaughterhouses in the Seoul area, with modern facilities, in 1971 operated at 26% of capacity for cattle and 13% for hogs. Central wholesale market charges and taxes cause a large portion of the cattle and hogs to be marketed outside legal channels in which the consumer is given some protection by health and sanitary inspection. The tax yield is small and it works to the detriment of the maintenance of health standards.

52. Poultry and eggs are a strong second to cattle in terms of gross value of production, but the marketing of these items has not attracted much attention as a subject for study. Hence very little descriptive information is available.

1/ The Marketing System for Cattle and Hogs, Agricultural Economics Research Institute, MAF, Seoul, 1972.

Fishery Products

53. A big change in domestic fish processing and marketing has been the introduction and expansion of freezing since 1960. All other processing such as drying, salting and cooking has been outstripped by freezing. The volume frozen in 1970 was 62,300 m ton of a total of 105,600 m ton of all processed products. A much larger volume is consumed fresh. Except for AFDC and CFFC operations, both fresh and processed fish flow through private channels. Ministry of Commerce and Industry (MCI) sponsored wholesale markets handle fish, as indicated in a subsequent section, but other channels are used as well. CFFC operates one public sales center in Seoul with annual sales of about 20,000 m ton. Total domestic sales in 1971 were 355,000 m ton.

B. Wholesale Markets

54. MCI has general jurisdiction over 54 central wholesale produce markets by virtue of 1951 and 1952 legislation. The Agricultural Cooperatives Law of 1957 resulted in the establishment after 1961 of NACF agricultural and fishery cooperative wholesale markets under the general jurisdiction of the Ministry of Agriculture and Forestry (MAF). NACF now has 9 main urban marketing centers and 6 branches. There has been an extended controversy over the roles of the two ministries in the central wholesale market field. Proposed legislation giving full responsibility to MAF failed to pass the last two National Assemblies.

55. The 54 MCI markets have 7 meat departments, 36 fruit and vegetable departments and 14 fish departments (Table 3). In the first half of 1972 their total sales volume was as follows:

	million won
Fishery products	8,934
Fruit and vegetables	5,648
Livestock products	12,326
Fruits and fishery products	853
Total	27,761

Table 3: WHOLESALE CENTRAL MARKETS UNDER AUSPICES OF MINISTRY OF COMMERCE AND INDUSTRY

Location	Number	Meat Depts.	Fruits & Vegetables Depts.	Fish Depts.	Volume of Sales 1970	Volume of Sales 1971
					----million won-----	
Seoul	6	2	3	3	13,370	6,053
Busan	17	1	16	-	1,341	940
Gyeonggi	2	1	1	-	500	636
Chung Bug	1	-	1	1	544	643
Chung Nam	4	-	2	2	/1	340
Gyeong Bug	6	-	4	2	2,567	2,698
Gyeong Nam	7	1	3	3	5,183	5,920
Jeon Bug	4	-	3	1	772	754
Jeon Nam	7	2	3	2	3,577	1,305
Total	54	7	36	14	27,854	19,289

/1 Less than 500,000 won.

Source: Statistics for Commercial Affairs, Ministry of Commerce and Industry, August 1972.

56. During the first half of 1972 cooperative markets had a sales volume of 60,219 million won, but 37,130 million won was from government grain and 16,355 million won from other grain. Thus, the remaining volume of fresh produce was much smaller than that handled in MCI regulated markets. Recent rapid increases in sales volume of the cooperative marketing centers are shown in Table 4. The volume of produce by-passing both these kinds of markets is not accurately measured but it is considerably greater than that for the two combined.

Table 4: NACF SALES BY COOPERATIVE MARKETING CENTERS (million won)

Year	Government Grain	Other Grain	Fruit	Vegetables and Potatoes	Livestock Products	Other	Total
1965	3,697	3,849	648	453	98	24	8,768
1966	9,351	4,024	746	564	51	40	14,776
1967	12,084	3,474	915	702	76	65	18,036
1968	20,598	4,089	1,208	919	112	5	26,941
1969	41,582	16,857	1,716	1,417	120	149	61,841
1970	46,854	10,453	2,050	1,622	110	1,295	62,383
1971	79,587	14,380	2,796	2,058	74	458	99,353

Source: NACF Monthly Review, September 1972.

C. Storage Facilities

Grain

57. Initial storage of domestic grain after threshing is in the farm home or other farm buildings. The large unmarketed portion must of course remain there until consumed in the farm household. Little is known of farm storage losses.

58. The heaviest marketings are in the months immediately following harvest, but some sales take place throughout the year. Since the rice harvest is in late fall and the barley harvest in early summer, peak storage requirements for the two grains are well separated. It is the much larger rice crop that mainly determines requirements. Table 5 shows one peak in April and May and a higher peak in December. Imported grain received at Pusan and Inchon is bagged and transported to commercial flour, feed and polishing mills where it is stored as necessary. Little government storage or handling is involved. The Kansas State Grain Storage Report (see para 40) states that both dock side storage and storage at the grain mills are inadequate, but these inadequacies are not considered too serious by grain importers.

59. The government-owned warehouses had a total capacity of 143,000 m ton at the end of September 1972, and 27,000 m ton additional capacity was under construction. NACF, private and Korea Express Corporation combined storage capacity was 993,000 m ton with 270,000 m ton additional under construction. This included 514,000 m ton of type C storage not suitable for storing grain and 276,000 m ton of type B which is not satisfactory and should be phased out of use for this purpose.

Table 5: VOLUME OF GRAIN AND FERTILIZER STORED BY NACF RELATIVE TO STORAGE CAPACITY, 1971-72
(000 m ton)

End of:	Capacity /1	Stored Grain	Stored Fertilizer	Storage All Commodities /2, % of capacity
July	1,016	94	708	76
August	1,018	173	731	95
September	1,018	80	784	91
October	1,017	30	742	93
November	1,017	285	781	n.a.
December	1,028	572	743	131
January	1,029	330	766	112
February	1,029	290	766	111
March	1,028	263	731	108
April	1,040	347	754	102
May	1,030	349	680	115
June	1,064	205	594	87

/1 Includes rented warehouses.

/2 Straw goods and other commodities are also stored in these warehouses but have not been included because the data as published, cannot be converted to space requirements.

Source: NACF Monthly Review, September 1972.

60. Estimates of requirements have differed substantially. The important assumptions relate to rate of increase in production, rate of increase in proportion of crop marketed and seasonal movement in and out of storage which finally determine maximum amount of storage at any one time. Since this maximum will not come at the same time all over the country aggregate capacity must be greater than the largest amount stored in all facilities at any one time.

61. NACF storage facilities are now located mainly at Ri-dong or Gun cooperative headquarters. Many of these, especially at the Ri-dong level are type C. With the consolidation of small cooperatives into larger Myon cooperatives and a shift in emphasis to this level, additional storage facilities are needed in new locations. This introduces a new locational and institutional consideration along with the aggregate capacity needed.

62. The government's estimate of storage capacity requirement in 1976 is 1,858,000 m ton of which 1,231,000 m ton is for rice and 627,000 m ton for other grains. It is not clear for reasons stated above why rice and other grain requirements should be added to arrive at total requirements. Included in the above totals are 58,000 m ton of imported grain. The IBRD

Agricultural Warehouse Appraisal Mission in December 1971, estimated requirements at 1,019,000 m ton. This estimate was based on rice alone and did not include provision for imported grain. The mission excluded government terminal facilities which are used for imported grains and emergency operations, all C type facilities and allowed for a 10% annual reduction in A and B type capacity to take care of deterioration. On this basis the deficit in 1976 was 159,000 m ton. Available capacity was taken as that owned by NACF only, although the government currently also uses rented facilities.

63. The government proposes to build facilities with a total capacity of 788,000 m ton in 1973-1975. While the methods of estimating both requirements and available capacity differ in several details, nearly all of the difference in results is due to adding storage requirements for other grains to those for rice in one case and not in the other. Some additional storage is clearly needed in addition to that under construction and planned in the USAID project, (see subsequent section on Foreign Assistance for brief description of this project), but probably less than the total estimated by adding rice and other grain requirements. The situation would be more healthy for private and cooperative investment in storage facilities if prices were allowed to advance during the rice year sufficiently to cover storage costs. It may be seen from Table 5 that in 1971-72 the volume of fertilizer stored in NACF warehouses was much greater than the volume of grain. Stocks were in excess of needs to service farmers. Average monthly movement out of storage during the 12 month period was 133,499 m ton, and the largest quantity moved out in any one month was 230,113 m ton in June, 1972. Requirements for fertilizer storage are not as high as for grain and it was necessary to use some facilities suitable for grain for the excess stocks of fertilizer. This should be avoided in the future.

Other Commodities

64. NACF publishes data on warehousing of grain, fertilizer and straw goods, but there is little available information on storage capacity or volume for other commodities. The Korea Cold Storage Company capacity at its four facilities was estimated to be about one-third of total cold storage capacity. This would make total capacity about 135,000 m ton. The government stored about 8,000 m ton of red pepper, sesame seed, onions and garlic purchased under the buffer stock program in 1971. As in many countries it has been traditional for consumption patterns to change with the seasonal availability of perishables. Only as income rise so that consumers will pay storage costs in order to consume fresh produce in off seasons will more storage become profitable. With rising incomes storage requirements may be expected to increase rapidly.

D. Transportation[1/]

65. Ministry of Construction data show that in January 1971, there were 537 km of super-highways, 8,122 km of national roads, 10,894 km of provincial roads and 15,216 km of city and Gun roads, (exclusive of special city roads in Seoul and Busan). Attention is directed here to the last category which includes roads connecting villages to national or provincial roads, roads connecting farms to villages and roads connecting villages. Construction of such roads comes under the Section of Rural Development of the Ministry of Home Affairs. New roads associated with paddy rearrangement are the responsibility of the Ministry of Agriculture and Forestry.

66. Of the 15,216 km of city and Gun roads over 12,000 km were improved but 2,600 km were unrepaired at the beginning of 1971. Even more important, a 1969 survey estimated a need for over 46,000 km of additional feeder roads. Table 6 shows that many villages could not have deliveries of supplies and pick-up of produce by truck. Good progress was made in 1970 and 1971 in meeting this need as 27,000 km were constructed. The remaining 19,000 km needed as of 1969 are being planned. Needs by 1976, however, may be expected to be greater.

Table 6: PROVINCIAL DISTRIBUTION OF VILLAGES BY ROAD CONDITION, 1969

Province	Number of Villages by Road Condition		
	1	2	3
Kyonggi	2,874	404	971
Kangwon	1,618	139	822
North Chungchong	1,676	194	881
South Chungchong	1,755	281	1,093
North Cholla	2,029	435	1,253
South Cholla	2,674	519	1,565
North Kyonsang	4,094	518	2,007
South Kyonsang	2,969	294	1,420
Total	19,689	2,784	10,012

1. Truck can go in and turn around.
2. Truck can go in but not turn.
3. Truck cannot go in.

Source: KASS, Rural Infrastructure, Special Report No. 2 by Kim, S.G. and Libby, L.W. page 9.

1/ This section is based quite largely on KASS Special Report No. 2, Rural Infrastructure by Kim, S. G. and Libby, L. W.

67. Rather striking evidence of the effects of access to roads is provided by a study of two villages, one (Hwengge-ri) on the Seoul to Gangneung City road and another (Yongsan-ri) 7 km off this road 1/. The village on the road had 70% commercial crops as compared with 41% for the other village. The higher rate of commercialization was due not only to farm to market transport but also to better communication of market information and new production practices essential to commercial operation. Average gross value of crops per hectare was 11,900 won in the first village compared with 6,800 won in the second. Not only were higher value crops grown by the first village but higher prices were received for the same crops because less of the market price went to pay for transport. More labor as well as more machinery and other inputs were used in the village on the road, and farm values were higher, in part because of larger investment in improvements. Off farm earnings were also higher.

68. Analyses of benefits and costs of feeder roads in Korea have shown attractive rates of return. This is mainly because high population density results in a large number of people served per km of road. Increasing use of power tillers in moving produce from farm to village and from village onward has increased the demand for roads suitable for this use, and such roads are being built at quite modest costs per km.

IV. DISTRIBUTION SYSTEMS FOR FARM EQUIPMENT AND SUPPLIES

69. Government policy is to encourage the use of purchased farm inputs by attractive, often subsidized, prices, liberal credit and a distribution system that is readily accessible to a large proportion of farmers. In July, 1972 the indices paid by farmers (1965 = 100) were fertilizer 96.6; farm chemicals, 129.1; farm implements, 202.4; equipping materials, 143.6; and feed, 223.3. These indices may be compared with prices received of 310.5 for rice and 286.6 for all farm products.

70. NACF has a major role in farm supply as a source of credit, as a commission agent and a dealer. It has a monopoly in fertilizer, and in 1971 handled a volume of 17.2 billion won of other supplies, of which feed accounted for more than half (Table 7). There are 3,314 NACF distribution points including one in every Myon.

1/ Lee, Kyung Won, Some Effects of Roads on Agricultural Production and Rural Life, Seoul National University, Department of Agricultural Economics, 1969.

Table 7: NACF SALES OF FARM SUPPLIES /1
(million won)

Year	Farm Chemicals	Farm Implements	Feed	Seed	Livestock	Other	Total
1965	32	273	157	529	106	517	2,363
1966	56	235	64	868	78	190	2,395
1967	78	827	251	1,226	-	201	3,699
1968	165	1,065	624	1,290	100	245	4,952
1969	440	2,042	1,105	1,975	329	366	9,207
1970	432	2,196	956	1,354	114	700	8,089
1971	648	4,102	8,316	1,146	-	249	17,175

/1 Excludes fertilizer of which the sales volume in 1971 was 30.6 billion won.

Source: NACF Monthly Review, September 1972.

A. Fertilizer

71. The government subsidizes about 60% of the selling price of fertilizer to NACF. Credit is available but about 65% of sales are for cash, and this proportion has been increasing. About one-fourth of the credit sales are for repayment in kind after harvest. This arrangement has not been very popular, and its use has been declining since the accounting price for the grain has often been below the market price.

72. Fertilizer is delivered on order by NACF to all distribution points by Korea Express Company. Transportation costs are pooled so that the farm price is the same throughout the country. There are 4,600 warehouses in which fertilizer is stored, all but 10% of which are owned by NACF. Sales of fertilizer in 1971 were 1,333,204 m ton and stocks in storage were over 700,000 m ton in all but one month. There have been problems of overestimating sales and excessive stock accumulation as noted in the section on grain storage. The same price is maintained throughout the year; the only incentive to advance purchases by farmers is that fertilizer purchased on credit in January and February bears no interest in those months. Commissions to NACF and member cooperatives total 156 won per m ton which does not cover costs.

B. Other Supplies

73. Other farm equipment and supplies are delivered to distribution points by the manufacturers. NACF negotiates an f.o.b. price to which transport costs are added. Formerly NACF made farm deliveries from distribution points to villages, but the volume was too small for this to be economic. Farmers now must pick up their purchases at the distribution points.

Commissions are received by NACF, and the Gun and primary cooperatives. Recent trends in sales volume are shown in Table 7.

74. NACF has 30 service centers for farm machinery, and it is planned to increase the number to 140 in 1973. There are also manufacturer licensed stations, but they are considered by NACF to be inadequate.

75. Despite the services provided by NACF at less than cost and with liberal credit a much greater volume of supplies (other than fertilizer) moves through private channels. The reasons for this are complex and not well documented.

V. GROWTH IN DEMAND FOR MARKETING SERVICES

76. The total population will be 9.7% larger in 1976 than in 1970 according to Economic Planning Board (EPB) projections. The rate of growth in nonfarm population will be much greater. This is indicated by employment in sectors other than agriculture, forestry and fisheries, which is estimated to increase 41% during the same period. This may be a fairly good indication of the increase in population to be served by the food marketing system. Also to be taken into consideration is the effect of increases in per capita income which affect both total demand and its commodity composition. The projected 23% increase in per capita GNP does not translate directly into spendable personal income but is indicative of the rate of increase. Taking the above factors into consideration the demand for marketing services is likely to be more than 50% greater in 1976 than in 1970, perhaps an increase of as much as 10% annually.

77. Household expenditure data for cities indicate that cereals accounted for 66% of all food expenditures in 1964. By 1971 this proportion was down to 42%. The cost of marketing cereals is much less per ton than the cost of marketing such perishable products as fruits, vegetables and livestock products which are becoming a relatively more important part of the food supply as incomes increase. Transport, handling and storage facilities must be much better to protect these commodities and get them to the consumer in good condition over more extended marketing seasons.

VI. FOREIGN ASSISTANCE

78. A USAID loan to finance commodity imports was negotiated in 1971 with a provision that part of the local currency proceeds from sale of the commodities would be used to construct grain storage facilities for Ri-dong cooperatives. Initially US$6 million was allotted for the construction of 450 warehouses in 1971-72. The program was later expanded to 675 such warehouses with a total capacity of 350,000 m ton over a period of three years. As of the end of September 1972 warehouses with a total capacity of 270,000 m ton were under construction. These facilities will be owned by NACF.

79. AFDC is active in promoting foreign investment from both public and private sources in production and marketing enterprises. Since its establishment in 1968 AFDC has induced commitments of $18,284,000 as equity and loans of which $9,823,000 had been spent by the end of 1971. An Asian Development Bank loan of $5 million for cold storage plants financed construction beginning in 1969 and completed in 1972. A total of $8,361,000 has been used or programmed for food production and processing projects, and $4,923,000 for processing nonedible products including silk, tobacco, laver and rush products. The food production and processing project total includes an IDA credit of $7 million for a dairy project. Negotiations are underway with Japan for a large credit for multiple product processing facilities. UNDP is assisting with the financing and operation of a food processing center 1/.

80. A package of projects for improvement of agricultural and fisheries marketing structure estimated to cost 47.66 billion won has been prepared for consideration by interested foreign aid donors. It is discussed in Chapter VIII of this Annex.

VII. INVESTMENT PRIORITIES

81. Despite the recent growth in the marketing activities of NACF and AFDC, these semi-autonomous organizations, which are partially supported by public funds and implement goverment marketing and price policies, carry on only a small share of agricultural product marketing. NACF volume of marketing was about 120 billion won in 1971 while AFDC export and domestic sales totaled 1.3 billion won. There are no recent figures on total volume of marketing through all channels. Total value of agricultural production in 1971, excluding fisheries, was estimated at 985 billion won at current prices and the retail value of marketings may have been half this amount.

82. Well-planned investment in physical marketing facilities including transport promises favorable rates of return. Rapid growth in volume of marketing provides an opportunity for upgrading as part of the process of expansion. The Government's proposal for investment in specific projects should be viewed in this framework. Also to be considered are additional private investments to expand and improve private marketing facilities, since the proposed investments through NACF and AFDC are in no way adequate to meet aggregate needs. For the next few years at least the role these two agencies can play is to introduce improved facilities and methods and to establish standards for minimum margins necessary to cover costs while providing farmers an alternative to regular commercial market channels. They cannot expect to take over all or most marketing services. Consideration might be given to the provision of credit on favorable terms to finance private investment in facilities that meet prescribed standards and fit into a well integrated national system.

VIII. PROJECT PROPOSALS

83. Project proposals are for improvements all along the marketing channel from transport, processing and storage at the primary cooperative level to retail distribution in large cities. Since the primary objective of NACF is to serve the interests of its farmer members this suggests higher priority for those investments through NACF at the producer rather than the consumer end of the marketing chain. At the present time even though 92% of all farmers are members of one or more cooperatives, they sell the greater part of their marketable surpluses to private traders. NACF, as has been noted previously, collects commissions which may not cover costs despite the various subsidies received. There appears to be a need to overcome the more serious constraints which influence farmers against using cooperative marketing channels in order that investments in cooperative facilities may have maximum productivity. Increased volume and availability of cooperative credit would probably reduce financial commitments that limit the choice of marketing channels.

84. The package of marketing projects presented to the mission for consideration represents an estimated total investment of 47,666 million won of which 18,263 million won would be private. These projects and their individual financial requirements are listed in Table 8. The justifications have been presented only very briefly and in rather general terms. Pro forma income statements for the operator of the facility are presented and rates of return are calculated from investment, revenue and operating expense projections. Debt amortization schedules are also provided. These data are of only limited value in determining the benefit-cost relationship in economic terms. NACF provides marketing services for farmer-members and its success may be reflected in reduced operating margins rather than profits that represent a high rate of return on invested capital. The method of estimating revenues and expenditures is not explained. Presumably it is based on the records of recent past operations.

Table 8: PROPOSED PROJECTS FOR IMPROVEMENT OF AGRICULTURE AND FISHERIES MARKETING

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

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

85. The projects will be considered one by one against the background of the earlier discussion of investment priorities. It is understood that detailed work on project preparation and justification must follow decisions regarding the kinds of investment that appear to offer the most promising possibilities.

A. Warehouses for Government Food Grains

86. It is proposed to construct 985 grain warehouses during the three years 1973 to 1975. Each would have a capacity of 800 m ton or a total addition to present capacity of 788,000 m ton. The cost is estimated at 8,870 million won of which 1,970 million won would be from private sources and 6,900 million won ($17,250,000) from government. These warehouses would each serve a large Myon cooperative created by merger of smaller Ri-dong cooperatives.

87. Present and prospective grain storage capacity and requirements have been analyzed in the earlier section on grain storage. It was concluded that at least part of the proposed additional facilities will be needed but probably not the total amount. Beyond the capacity justified by a consideration of overall needs is the question of such restructuring of facilities as may be necessary to fit the new pattern of fewer and larger primary cooperatives. These facilities would eliminate the need for storing grain in adequate facilities now in use by some of the Ri-dong cooperatives.

B. Improvement of Agricultural Marketing Structure

Public Sales Centers

88. NACF now operates 9 sales centers and 6 branches in five cities. Sales at these centers in 1971 accounted for 16% of total transactions in these markets. There was a 19% increase from 1969 to 1970 and a 62% increase from 1970 to 1971 to 99 billion won. It is proposed to construct 13 more centers, some in the same and some in other cities. Also teletype facilities for disseminating market information would be installed and a training program for sales personnel established. Total cost of the project would be 2,803 million won ($7,000,000). By the fifth year the new centers would be expected to handle about 30% of the value of commodities handled by the present 9 centers in 1971.

89. It appears that better handling of produce, especially perishable commodities, to reduce spoilage and waste, to permit economies in handling and perhaps more competitive price determination would produce benefits justifying a very considerable investment. This presumes that jurisdictional questions are resolved and plans are made which utilize all existing facilities, public and private, which can be used economically in a coordinated system.

Slaughter Houses

90. It is proposed to construct three slaughter facilities in Busan, Daegu and Gwangju at a cost of 640 million won ($1,603,000). In the third year these plants would each have a volume of 30,000 head of cattle and hogs and 1,050 m ton of poultry.

91. The presentation justifies the project mainly on the basis of rapidly increasing demand for meat and recent modest increases in livestock production. There are 680 slaughter facilities, all but 15 of which are designed as ordinary, simple slaughter houses. A sample of these facilities was found to be slaughtering an average of 8.5 hogs and 3.0 head of cattle per operating day which was less than 20% of their intended capacity 1/. Seoul has one facility which has been slaughtering 300 head of cattle and 800 hogs per operating day, which is about 20% of its capacity. This facility operates in connection with a central wholesale market where the market commission of 6% and tax of 6% of the value of the animal is said to divert livestock to other channels where facilities and sanitary standards are much poorer. Other countries have found it unprofitable to operate modern slaughter facilities with adequate inspection and health safeguards when volume is small and consumer demands are modest because incomes are low. The only satisfactory solution may be a public subsidy justified on public health grounds and the possibility of encouraging production until it reaches a more nearly viable level. The choice of locations and sizes needs to be reviewed in the light of the findings with respect to economic production potentials for expanding livestock production.

Collecting Facilities for Fruits and Vegetables

92. There are now 14 collecting facilities operated by special horticultural cooperatives. They serve as intermediate assembly points for the wholesale markets in larger cities. It is proposed to install 12 more facilities at a cost of 60 million won ($150,000) in the same general specialized producing areas. These are simple facilities needed for the efficient assembly of apples, peaches, grapes, radishes and cabbages, the production of which is increasing fairly rapidly. This appears to be a desirable investment.

Supermarket for Farm Products

93. It is proposed to establish a supermarket in Seoul at a cost of 327 million won ($816,700) with a floor space of 600 pyong (about 2,000 m^2). Annual volume of sales in the tenth year is estimated at nearly 1.5 billion won. It would handle grain, fruits, vegetables, livestock products and processed foods.

1/ KASS, Special Report No. 7, page 53.

94. There are a number of privately operated supermarkets in Seoul which have food sections in which foods are well handled and perishables are displayed in refrigerated cases. This method of food retailing is gradually gaining acceptance even though prices are somewhat higher than in food stores where products are kept and displayed under less favorable conditions.

95. The question naturally arises as to whether a farmers' cooperative organization should attempt to compete with private retailers in this field especially in view of competing cooperative demands for capital. Private enterprise is pushing ahead with developing this kind of market demand. NACF should perhaps give higher priority to investments in the assembly, storage and wholesale part of the marketing chain.

Buffer Stock Warehouses

96. It is proposed to construct three warehouses, one each in Seoul, Busan and Daegu for storing the buffer stock commodities, red pepper and sesame, at a cost of 453 million won ($1,132,000). Under the operational plan 2,400 m ton would be stored in these warehouses. In 1971, 2,285 m tons of red pepper and sesame were stored under this program, some in facilities not considered entirely suitable. There are suitable unused facilities in Seoul at the Korea Cold Storage Company facility and the question arises as to why they should not be used for this purpose. The cost of the new Seoul site alone is estimated at 210 million won which is 46% of the entire cost of the facilities in the three cities. The situation may be different in Daegu and also in Busan where the KCSC facility is quite fully used.

Rice and Barley Mills

97. The policy of strengthening Myon cooperatives would be advanced by this project which would establish rice and barley mills with storage and transport facilities for 150 of these cooperatives. The cost would be 1.8 billion won of which 1.5 billion won ($3,863,000) is government and 255 million won private. Under the operational plan each mill would collect and mill 1,200 m ton of rice and 450 m ton of barley annually. Storage capacity would be for 1,060 m ton of grain. There are many Ri-dong coops which operate small mills under poor conditions. Installation of larger and better facilities at the Myon level would seem to be a move toward increased efficiency and thus a promising investment. Storage construction should be coordinated with the government foodgrain storage project.

Transportation Equipment

98. It is proposed to provide 1,400 four-ton trucks, one for each Myon cooperative over the next four years at a cost of 3.08 billion won ($7.7 million). The trucks would be made in Korea. This like the previous sub-title would further the policy of strengthening Myon coops and has strong justification on that basis. It is understood that there are 1,376 Myon and that not all have cooperatives organized on a Myon base. Hence the number of trucks may be larger than the immediate requirement.

C. Improvement of Fisheries Marketing Structure

Public Sales Centers

99. It is proposed to establish 6 centers, one each in as many cities, with facilities for processing, cooling, freezing and sales. Each center would plan to handle 10,000 m ton of sales annually with daily capacity of 50 m ton of ice, 20 m ton cooling and 800 m ton freezing. The cost is 2.4 billion won ($6 million). The centers would operate on a consignment basis with charges for specific services plus fees.

100. CFFC now has only one sales center which handles an annual volume of about 20,000 m ton. The six new centers could handle an additional 60,000 m ton. Annual consumption in nine large cities in 1971 is reported as about 78,000 m ton. The new centers would thus bring CFFC capacity up to reported 1971 sales in the nine large cities. The justification presented is that present private facilities are very poorly equipped for handling fish properly.

101. Good fish handling facilities are certainly needed but questions arise as to whether CFFC should be equipped too handle so large a portion of the market especially since there are other institutional fish markets now in operation.

Direct Sales Store

102. There are now nine direct sales stores for fish in Seoul and it is proposed to establish 40 more, also in Seoul, at a cost of 400 million won ($1 million). They would be in residential areas and would operate on a commission basis. Each store would sell 2,500 m ton of fresh and 200 m ton of dried fish. Thus their total new capacity would be 100,000 m ton of fresh and 800 m ton of dried fish annually by 1976. This may be excessive. It is not clear why such stores should be established only in Seoul, and further whether so large a portion of the retail trade in Seoul should be handled by CFFC when there are other facilities.

103. It is proposed to establish eight low temperature warehouses in as many cities. Each would have a floor space of 250 pyong (827.5 m^2). The estimated cost is 316 million won($790,000). There are now 118 low temperature warehouses for fishery products attached to freezing plants. Also there are 51 warehouses for seaweed and dried fish. The main justification given for this project is that present facilities are inadequate and not well equipped. Additional information is needed on present facilities and their use relative to requirements before it will be possible to evaluate the economy of investments for these warehouses.

D. Straw Pulp Mills

104. It is proposed to install 5 pulp mills at a total cost of 2,295 million won ($5,739,000) which includes working capital of 800 million won. Each plant would have a capacity of 6,000 m ton of pulp. One objective is to hold down the rapidly increasing imports of pulp. It is stated that it would also pay farmers a higher price for straw than its value to them in alternative uses. This project is discussed in the Annex 10 on Forestry.

E. Integrated Agricultural Products Processing Project

105. This project, sponsored by AFDC, would facilitate integrated development of an export oriented food industry including production of raw materials, processing and marketing. Mushrooms, asparagus and stawberries would be the commodities. The estimated cost is 24,050 million won of which the domestic (private) contribution would be 16,038 million won. This project proposal has been submitted for review by the Bank and it has been decided that additional information concerning it needs to be supplied before it will be ready for appraisal.

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

TABLE 1 - ESTIMATED MARKETING MARGINS FOR RICE THROUGH MERCHANT CHANNELS (YOUNGSANPO-SEOUL) NOVEMBER 9, 1968
(won per 80 kg bag)

Classification	Selling Price	Margin	Cost
Producer	4,742	-	-
Collector	4,792	50	14
Shipper	5,250	458	351
Wholesaler	5,300	50	25
Retailer	5,500	200	100
Total	-	758	490

Source: Organization and Performance of the Agricultural Marketing System in Korea, Special Reports No. 7, Agricultural Economic Research Institute, MAF, and Michigan State University, 1972, p.13

TABLE 2 - MONTHLY AND GEOGRAPHIC VARIATION IN WHOLESALE PRICES OF RICE, 1970
(won per 80 kg bag)

City	Month 1	2	3	4	5	6	7	8	9	10	11	12	Average
Seoul	5,796	5,826	5,827	5,892	5,902	6,029	6,191	6,132	6,401	6,390	7,042	6,987	6,199
Busan	5,579	5,714	5,750	5,745	5,702	5,700	5,700	5,700	5,700	5,079	6,654	6,916	5,911
Daegu	5,704	5,800	5,800	5,754	5,800	5,800	5,800	5,922	6,460	6,267	6,555	6,879	6,045
Gwangju	5,290	5,416	5,400	5,543	5,650	5,659	5,700	5,787	5,929	6,008	6,570	6,391	5,779
Daejeon	5,536	5,649	5,654	5,793	5,944	5,967	6,108	6,069	6,290	6,193	6,614	6,663	6,040
Average	5,581	5,682	5,681	5,746	5,800	5,831	5,900	5,922	6,156	6,187	6,687	6,767	5,995

Source: Same as Appendix Table 1, above, p.15

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

TABLE 3 - ESTIMATED MARKETING MARGINS FOR TABLE-USE SWEET POTATOES, 1968
(won per kwan, 3.75 kg)

Classification	Selling Price	Margin	Cost
Producer	24	-	-
Wholesaler	35	11	8
Retailer	45	10	3
Total	-	21	11

Source: Same as Appendix Table 1, p.31

TABLE 4 - MONTHLY AND GEOGRAPHIC VARIATION IN WHOLESALE PRICES OF SWEET POTATOES, 1970
(won per kwan, 3.75 kg)

City	Month												Average
	1	2	3	4	5	6	7	8	9	10	11	12	
Seoul	64	74	85	93	-	-	-	114	78	61	61	73	78
Busan	49	67	88	103	114	-	-	154	101	60	55	67	87
Daegu	84	100	105	105	120	-	-	133	99	71	67	74	96
Gwangju	47	51	60	76	-	-	-	86	68	50	43	48	59
Daejeon	72	75	77	78	135	-	-	116	76	59	51	64	80
Average	63	73	83	88	113	-	-	126	84	61	55	66	80

Source: Same as Appendix Table 1, p.32

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

TABLE 5 - ESTIMATED MARKETING MARGIN FOR APPLES, KUCHANG, 1971
(won per box of 18.75 kg)

Channel	Classification	Selling Price	Margin	Cost
Cooperative	Producer	1,070	-	-
	Marketing Center	1,530	460	380
	Retailer	1,750	220	N.A.
	Total		680	N.A.
Private	Producer	1,038	-	-
	Wholesaler	1,530	492	26.9
	Retailer	1,750	220	N.A.
	Total		712	N.A.

Source: Same as Appendix Table 1, p.39.

TABLE 6 - MONTHLY AND GEOGRAPHIC VARIATION IN WHOLESALE PRICES OF APPLES, 1970
(won per box of 18.75 kg)

City	Month												Average
	1	2	3	4	5	6	7	8	9	10	11	12	
Seoul	1,234	1,258	1,358	1,485	1,714	1,963	-	-	-	-	-	1,546	1,450
Busan	975	1,108	1,164	1,372	1,658	1,737	-	-	-	-	-	1,474	1,355
Daegu	1,158	1,232	1,249	1,445	1,533	1,716	-	-	-	-	-	1,436	1,396
Gwangju	890	965	950	1,064	1,281	1,634	-	-	-	-	-	1,217	1,143
Daejeon	1,045	1,230	1,250	1,280	1,527	1,592	-	-	-	-	-	1,180	1,301
Average	1,061	1,159	1,195	1,329	1,543	1,688	-	-	-	-	-	1,371	1,335

Source: Same as Appendix Table 1, p.42

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MONTHLY AND GEOGRAPHIC VARIATION IN WHOLESALE PRICES OF CHINESE CABBAGE, 1970
(won per kwan, 3.75 kg)

City	Month												Average
	1	2	3	4	5	6	7	8	9	10	11	12	
Seoul	90	117	112	163	104	36	34	41	56	67	66	106	85
Busan	95	103	134	219	100	30	38	47	87	92	74	114	94
Daegu	95	107	108	156	124	49	35	45	74	90	59	106	87
Gwangju	68	85	106	153	77	35	42	63	111	99	85	105	86
Daejeon	91	106	100	139	110	47	29	51	83	128	107	116	92
Average	87	103	118	166	103	39	36	49	83	96	78	109	89

Source: Same as Appendix Table 1, p.51

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ANNEX 10. FORESTRY

ANNEX 10

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FORESTRY

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AGRICULTURAL SECTOR SURVEY

FORESTRY

I. SUMMARY

Background

1. Two-thirds of the total land area of Korea is classified as forest land. Because of devastation through wars, severe overcutting and fuel removal, including litter raking by the rural population, most of the area has been denuded of any productive forest which may have existed. The annual production of industrial roundwood is currently around 1 million m^3 and is not expected to increase appreciably beyond this for several years. Korea has large physical potentials for greatly expanding output of timber, pulp wood, and fuelwood and at the same time for releasing substantial areas of forest land for pasture and forage production for livestock. But the economic costs and return from investments for expanding forestry production have not been analyzed in detail.

2. The growth in domestic consumption of wood-based products 1/ over the period 1960-72 has been from about 1 million m^3 roundwood equivalent to about 4 million m^3. This growth trend is expected to continue beyond 1980. The expected level of roundwood equivalent consumption in 1980 is over 7 million m^3. Imports of timber have been rapidly increasing to meet this expanding domestic market.

3. The rapidly increasing demand for forest products and lack of domestic wood supplies were the main justification for a Government decision to introduce a major reforestation program in the early 1960's. Seventy-five percent of the forest land is privately owned, with 95% of private ownership being in holdings of less than 10 ha. Since only 820,000 ha is effectively managed as National Forests, the main emphasis has been directed to reforestation of private forest lands through subsidy schemes in which private owners have received free seedlings and in some cases part payment of wage costs of planting.

4. Whilst an impressive area has been planted (the book entry is of the order of 500,000 ha on private forest lands and 100,000 ha on national forest land), the scheme has not been successful in creating industrial plantations. Many of the earlier plantations are stunted and badly stocked as a result of poor species selection and provenances, and maltreatment of the

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1/ Includes saw logs, ply logs, mining timber, pulp and paper but excludes poles and fuelwood.

planted area through the continuation of fuel gleaning practices. There has been no coordinated plan of siting plantations in relation to future industrial sites. The strategy has been to cover as large an area as possible with limited Government expenditures; there has been limited success with respect to the area covered but the problem of economic industrial plantations still remains to be tackled. The Government has enacted legislation which will enable 'Special Development Areas' for large-scale industrial plantation to be delineated and managed by a centrally controlled Forest Development Corporation. The fragmented pattern of private forest ownership is likely to be one of the main problems to be overcome if this objective is to be achieved.

5. A concurrent development has been an attempt to establish fuelwood blocks for local use through subsidy payments in the form of seed, seedlings and fertilizer, in order to eliminate the indiscriminate fuel gleaning. It is estimated that some 1 million ha of fuelwood blocks will be needed to supply the fuel needs of the rural population for the next 10-20 years. National records indicate that some 800,000 ha of fuelwood blocks now exist. A crash program for the establishment of a further 200,000 ha and the enrichment of existing area is now proposed. Substitute fuels of coal and oil are in increasing use but the speed of their adoption in the rural areas will be limited by low purchasing power and the cost of conversion of heating and cooking systems in the homes, particularly with respect to oil the supply position of coal and oil (domestic deposits of the former are limited and the latter requires foreign exchange). Never-the-less, potentials for expanding the supply of alternative fuels to reduce fuelwood requirements need to be studied.

6. Erosion control work is an important component of forest activities engaging some 18% of all forest staff and currently costing some US$3-4 million annually (about 20% of total expenditure in forestry). While a large area has already been treated, estimated at some 450,000 ha, there still remains a substantial area of severe erosion in the private forest land to be dealt with, estimated at 70,000 ha. There is also the problem of instituting and maintaining land use management regimes over the watershed areas which will not impair their water catchment function. A strategy is being developed of specializing this work through erosion control stations; 36 of these stations have been established.

7. The Korean hardwood plywood industry, based wholly on imported logs from Indonesia, Philippines and Malaysia, has developed rapidly; exports have risen from around 400 m^3 in 1960 to 1.1 million m^3 in 1972; Korea is now the world's largest exporter of this product. Plywood exports are currently valued at around US$140 million; 13% of the value of total exports and 88% of sales are to the USA. The remarkable success of the industry is attributable to the cost advantage it has been able to develop in producing hardwood plywoods for the special market for panelling.

Domestic Requirements

8. Preliminary estimates indicate that domestic roundwood consumption will be in the order of 7.3 million m^3 by 1980 and the demand for wood

products can be expected to continue to expand beyond this date. An estimate of the domestic demand for wood pulp alone is 1 million metric tons by 1990 1/. This would require an area of 500-600,000 ha of pulpwood plantations on the basis of an average growth rate of 8 m^3/ha per annum (mean annual increment) which is considered a reasonable estimate of plantation yield. The indications are that by 1990 a similar area will be required for sawlogs, and mining timber, so that a first target of around 1 million ha is realistic. Future planting targets should take into consideration the extent to which the forest industries are expected to be developed over the next 30-40 years. An overall study of all industrial roundwood requirements is needed.

Selection of Plantation Areas

9. The demarcation of plantation areas both with respect to absolute size and geographic location in relation to feasible and economic location of forest industries, is being tackled by the setting aside of 'Special Development Areas' under legislation recently enacted. These will receive priority for capital flows into reforestation. The actual location of the plantation areas will require evaluation with respect to the range of possible sites for forest industries. This will need to take account of the proposed size of plants, the availability of water, energy, communication and markets.

Ownership and Management of Plantations

10. The Office of Forestry have been purchasing private forest land to augment the area of National Forests. In 1971, 2,000 ha was purchased at an average cost of US$150 per ha. This price may be difficult to justify for forest plantations. The new legislation provides for a fund of US$5 million per year over ten years for low interest (3-1/2% to 7%), 20 year loans for reforestation investment which will be available to the private sector and the Forest Corporation. It envisages the separation of user rights from ownership rights for the private forests falling within 'Special Development Areas', with the Forest Development Corporation controlling the management of the area. Owners would receive 10% of gross revenues. With the long rotations which will be needed (20-30 years for pulp and up to 40-50 years for pulp and up to 40-50 years for saw timber) and the small scale ownership pattern such an arrangement will be very difficult to administer and does not appear to have any element of strong appeal to the owners. In short, the acquisition of large blocks of land for sustained industrial plantations development is likely to be a major problem. Outright purchase of private forest land by Government could be a possible solution. Another alternative could be a system of leasing (with or without an option to sell), with rentals based on the expected value of the 10% share of gross revenues. However, more attention also should be given to supporting the establishment of well-managed forest enterprises on small private ownership units as has been done successfully in European countries.

1/ Present imports of pulp and paper are costing some US$50 million.

11. The rapid growth of the plywood and particle board industries and the existence of a pulp-paper industry shows that adequate talent and organizational ability exists for expanding forest industries. However, it is not known to what extent Korea can supply industrial raw materials at competitive prices from existing timber stands and planned plantations. In order to answer this question, there is need for thorough land capability analysis, assessment of transportation costs to potential processing sites, and vertical cost analysis of the industry.

Profitability of Forestry

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

Fuelwood

13. Lack of sufficient fuel is a constant problem in the upland areas (synonymous with "forest area"). Besides the 1.5 million private forest owners a further 900,000 non-owners have collection rights over this area. This is the basic cause of the malpractices of lopping and litter raking. 1/

14. The Government's intention of creating village fuelwood blocks to meet the demands of all rural dwellers will help to overcome the fuelwood shortage. In most countries there is a gradual shift away from fuelwood to alternatives such as oil and the same trend can be expected in Korea over the long term. If this does happen, investment in fuelwood plantations need not have been waste of resources, if species suitable for either fuelwood or pulpwood or sawlogs were used and silvicultural systems adopted which enable objectives of management to be changed at some future date.

1/ The rural population is concentrated in the lower farming areas. Details of land area and population density are described in Annex 1.

15. The formulation of an indicative overall fuel and energy supply plan for the country is urgently needed. An evaluation of fuel consumption patterns and requirements of specific areas within the context of the plan would then indicate priorities for fuelwood establishment. The question of land availability for fuelwood establishment may be a problem in some areas where owners are reluctant to relinquish their land or where there are absentee owners who wish to keep their land 1/ as an easily saleable asset. In principle, the problem is similar to that for industrial plantations and the same strategy could be used for these areas. In formulating plans for the establishment of fuelwood blocks there is scope for integration with rural development projects.

Competing Claims for Use of Forest Land

16. Other forms of land development, such as upland grazing, appear at this stage to show better financial returns than forestry and competition for forest land is likely to become a major issue over the next 20 years. Preliminary calculation of land required for intensive forests indicates that there could be room for a transfer of some forest land to agriculture. This merits more detailed studies, and the question of the extent of the area and the selection of the locations for different uses will require coordination of the various proposals and an evaluation of the competing claims.

Erosion Control and Watershed Management

17. The problem of instituting land management regimes over the forest lands which will satisfactorily maintain their catchment function is directly related to the provision of adequate fuel supplies and supplies of composting material. The extent to which the removal of compost material is aggravating the erosion problem needs evaluating.

18. The techniques of repair work being used at present are costly and the areas being covered are small in relation to the areas reported to be in need of treatment. The development of lower cost techniques should be given a high priority. An evaluation of the expenditure on erosion control, separating the areas where costs and benefits are quantifiable from those where qualitative judgements only can be expressed, is required in order to (a) justify the expenditures; (b) assess the full extent of the likely expenditures required for this work; and (c) provide a basis for a priority ordering of the work.

19. With the accelerated fuelwood establishment program which is planned, there would be an early expectation of a substantial reduction in the practices causing erosion. This factor, together with the development of lower cost techniques, would enable an expanded program to be undertaken within the present resource allocations. This would require the introduction of such

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1/ There is no limitation on the size of holding of forest land.

techniques over a wide area which may be more effectively implemented by a central authority, representing the water resources, agriculture and forestry disciplines. The same authority could undertake the formulation and administration of an overall policy of watershed management.

The Future of the Plywood Industry

20. There are three main issues affecting the future of this industry:

(a) Log supply. Current log imports are in the order of 2.8 million m^3, 43% coming from Indonesia, 42% from Malaysia, and 15% from the Philippines. These imports are expected to increase to 3.5 million m^3 by 1980. With the assistance of the Office of Forestry, three Korean companies have recently negotiated concessions in Indonesia amounting to some 600,000 ha with the objective of securing log supplies in the future; surprisingly, none of the plywood manufacturers are involved in this development.

Based on FAO studies, estimates of plywood log availability in the Philippines indicate that the supply is limited to about 20 years at the present level of exploitations; Malaysia could maintain the present exploitation rate for more than 20 years and Indonesia could increase the present rate of exploitation, and still have sufficient to maintain the supply for more than 20 years.

However future supplies will involve higher extraction costs, although part of this higher cost may be offset by lower concession charges. The Government maintains a forestry attache in Indonesia for the purpose of keeping the log supply from that source under review. The supply position of the other sources, and in particular, their price competitiveness, is also important and justifies constant review.

(b) Waste. The industry is generating a minimum of some 300,000 m^3 of waste wood (of Lauan and Meranti logs) at the present time, of which only about 33% is planned for by-product manufacture into boards. This is a potentially valuable source of chip material to augment domestic supplies and justifies detailed study of the technical and economic problems of utilizing this material.

(c) Markets. Almost 90% of Korea's exports go to the United States with four importers accounting for 72% of the total. Korea needs to diversify its export market outlets.

II. MARKETS FOR FOREST PRODUCTS

A. Domestic Consumption

21. Domestic demand for all forestry products has grown through the period 1960 to 1971. Pulp consumption increased from 46,000 m ton to 293,000 m ton; paper and paperboard from 89,000 m ton to 434,000 m ton; plywood from 69,000 m^3 to 234,000 m^3; particle and fibre boards from 60 m ton to 27,000 m ton; roundwood for sawn timber and mining from 850,000 m^3 to 2,430,000 m^3. Details of the production, imports and consumption of the major forest products are detailed in Appendix Tables 1 - 6.

22. Expressed in terms of industrial roundwood equivalent, the estimated increase has been from 1.1 million m^3 in 1960 to 3.7 million m^3 in 1971, with average growth rates of 18% in pulp, 16% in paper and paperboard, 12% in plywood, 400% in particle and fibre board, and 10% for saw and mining timber.

B. External Trade [1/]

Imports

23. Forest based imports amounted to US$213 million in 1971, which was 8% of the total value of all imports. Of this amount pulp and paper/paperboard imports accounted for US$49 million, plywood peeler logs US$ 122 million, and saw log imports US$39 million. The balance of US$3 million was composed of imports of bamboo, sleepers, sawn timber and wood waste.

Exports

24. Forest based exports have increased from 6% of total value of exports in 1962 to 14% in 1971. Plywood is the dominant export accounting for US$139 million out of the total of US$150 million. The growth rate of exported plywood has been remarkable; an increase from around 400 m^3 in 1960 to an expected 1.1 million m^3 in 1972. Korea is at present the world's largest exporter of this product. A more recent development in exports is the manufacture of finished joinery timber for door frames (which is integrated with plywood production) amounting to US$1 million in 1971, and also manufactures from locally grown poplar of chopsticks, ice-cream spoons, toothpicks and other small items, the export value of which has risen to about US$4 million.

Future Markets

25. Domestic market projections [2/] indicate a continued expansion of all products, with the exception of poles for house building, which are being

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1/ Details of the items entering into imports and exports are given in Appendix Table 4.

2/ Based on price elasticity of demand and rate of growth of GNP.

displaced by more permanent materials. Paper and paperboard consumption is anticipated to increase from 356,000 m ton in 1970 to 900,000 m ton in 1980, an average growth rate of 10% compared with 16% in the previous decade; pulp consumption from 250,000 m ton to 890,000, with growth rate of 13% compared with 18% domestic consumption of plywood is expected to increase from 629 million to 1,000 million sq. ft. and for particle fibre board from 25,000 m ton to 45,000 m ton with average growth rates of 5% compared with 12% for plywood and 6% compared with 400% for the boards. Sawn lumber and mining timber is expected to increase from 2.2 million m^3 to 3.6 million m^3 with a growth rate of 5% compared with 10% in the decade 1960-70.

26. Export markets for plywood and dimension finished timber are expected to increase to 170% of the 1970 volume by 1980 and other manufactured wood products to increase by five times in volume. Exploratory marketing of furniture is currently being undertaken and this item is expected to increase to a value of US$5 million by 1975. The roundwood equivalent requirements to support these expansions are summarized in Appendix Table 5.

Main Features of the Markets

27. (i) Compared with many developing countries, Korea has a high level of per capita consumption of forest products. The annual growth rate of domestic consumption of all forest products, excluding poles and fuel wood and expressed in roundwood equivalent, during the decade 1960 to 1970 averaged 11% and is anticipated to continue at 8% during the period 1970 to 1980.

(ii) The forestry sub-sector constitutes a significant proportion of external trade - 14% of the value of all exports in 1971.

(iii) Plywood exports are currently contributing 13% of the total value of exports. This industry is wholly dependent on imported logs and markets 88% of its exports to the USA. These matters are discussed in Sections 3 and 4.

(iv) Imports of pulp and paper are a heavy drain on foreign exchange - US$ 50 million in 1972. This is expected to increase to an amount in excess of US$ 80 million by 1980.

(v) The future prospects for reducing imports of pulp, paper and paperboard will depend on the extent to which the country can establish industrial pulpwood plantations.

III. FOREST RESOURCES TO MEET MARKET DEMANDS

A. Forest Area

28. The area classified as forests is 6.6 million ha (67% of the total land area). Of this, come 840,000 ha is managed by the Office of Forestry as National Forest 1/, 830,000 ha is managed by the provincial and town administrations, 120,000 ha is used for defense, road/rail reserves, etc. and 4.9 million ha is private. Of the 840,000 ha of National Forests, preliminary estimates indicate that about 400,000 ha is suitable for conversion to industrial plantations, but this is distributed over a wide area.

29. The private forest lands are held in small ownership pattern. There are some 1.5 million heads of households owning forest land; 54% of private forest land ownership is less than 1 ha and 94% is less than 10 ha. In addition to these 1.5 million owners, there are some one million households, which form the balance of the rural population who do not own forest land but many of whom have developed the custom of gleaning over the forest areas for fuel gathering and collection of fodder and composting material.

30. Preliminary estimates made by the Office of Forestry indicate that of the total area of 6.6 million ha. some 1.5 million ha is unsuitable for productive purposes (about 0.2 million ha of which is being developed as National Parks); 0.8 million ha is too steep and remote for conversion to plantations and is to be managed as natural forest; the remaining 4.3 million ha has potential for development. In theory this land is fully usable for productive purposes and would greatly exceed the country's requirements for land for the establishment of industrial plantations. In practice, some of the area is too steep, inaccessible or scattered for forest plantations. Furthermore, any expansion in agriculture and livestock will have to be accommodated within this area. The ownership pattern and a broad outline of planned use of the forest areas is summarized in Table 1.

31. Surveying of the total area is currently proceeding and inventory surveys of the Gangweon province area in the northeast (1.2 million ha) and an area of some 1.5 million ha in the southwest have been completed. Soil surveys have also been carried out in Gangweon province (25,000 ha) and over some 250,000 ha in watershed management areas.

1/ The National Forest Areas are shown in Map IBRD 10380 in the General Report. These are demarcated areas legally set aside for state forests.

Table 1: OWNERSHIP AND OUTLINED PLANNED USE OF FOREST AREAS
(million ha)

1.	Ownership			
	(a) National Forests	1.300		
	less	.120	for defence, road/rail reserves, etc.	
		.340	is small fragmented area under Provincial Forest Administrations	.840 /1
	(b) Provincial and Township			
	Forests	.490		
	plus N.F. administered	.340		.830
	(c) Private Forests			4.880
			TOTAL	6.650
2.	Outlined Planned Use			
	(a) Protection Forest Areas, including National Parks, not producing timber	1.100		
	(b) Rock outcrops, roads, rivers, dams, etc.	.400		
	(c) Natural Forests to be managed on natural regeneration regime with low yield potential	.800		2.300
	(d) Industrial plantations /2			2.700
	(e) Farm forests for fuelwood /2			1.000
	(f) Areas of upland orchards pasture and cultivation /2			0.600
			TOTAL	6.600

/1 It is estimated that 0.400 million ha is suitable for industrial plantations.

/2 There is a wide scope for reclassification of land use within these groupings.

Source: Office of Forestries, Forest Policy, 1972.

32. The National Forests are mainly situated in the north-east (the Gangweon province area) and are composed of fragmented blocks ranging from one hundred to several thousand hectares. These have the highest standing volume, estimated at 33 million m^3 (average 30-40 m^3/ha), composed of 30% conifers, 50% hardwoods and 20% mixed. The Provincial Township Forests are widely scattered and largely protection areas. The standing volume of the Private Forests is estimated at 30 million m^3 (average of 7 m^3/ha), and over most of the area, the stocking is so poor as not to qualify for the description of forest in any productive sense.

33. The National Forests are currently contributing some 1.1 million m^3 (30%) of the total domestic roundwood consumption equivalent (excluding poles but including pulp and paper) of 3.7 million m^3, approximately 55% of which is softwood and 45% hardwood. The contribution drops to 20% if logs for plywood exports are included. Supply from these forests is of low-grade predominantly small dimension timber, suitable for poles, pitwood and pulp; 21% only is of saw-log size. About 60% of the supply is from the Gangweon province area.

34. There is little scope for increasing the production of the natural forests because of their generally poor quality with respect to species and provenances. A forward estimate of the supply of industrial wood likely to be available from the natural forests is in the order of 1.3 million m^3 by 1980. The natural forests are therefore being systematically replaced by faster growing industrial plantations.

B. Industrial Plantations

35. Plantations do not at present make any significant contribution to the supply. A serious attempt to establish plantations was begun in the early 1960's. Records indicate that some 500,000 ha of plantations in private and 100,000 ha in national forests have been planted between 1962 and 1971. The species planted are mainly softwoods of Larch (Larix), Pitch Pine (P. rigida), Korean White Pine (P. konaiensis), Red Pine (P. densiflora), with some hardwoods of Poplar and Alder. Areas have been computed by the method of the number of seedlings issued and some allowance has been made for failures. The areas planted are widely scattered and are not located in blocks suitable for industrial forest management. The earlier plantations have suffered damage from indiscriminate lopping of branches and removal of humus by litter raking for fuel supply. There are also of poor genetic quality. The more recent plantations, which have been established on the basis of a wider selection of species, seedlings raised from selected seed sources and more attention given to post-planting maintenance, show good vigour and form and demonstrate the growth potential. An average growth rate of 8 m^3 (mean annual increment) could be expected.

36. The work of plantation development in the private forests has been undertaken by the Provincial Forest Administrations with most of the finance being provided by the Office of Forestry in the form of subsidy payments

... ngs fertilizers, transport and a proportion of ... areas.

... been ... at a definite assessment of the ... these plantations can be expected to make, but ... earlier plantations will limit ... has been widely scattered ... industrial use so that harvest- ... those areas which will be productive are likely ... existing plantations is currently ... increase to 0.5 million m^3 by 1980.

... with the objective of establishing ... resulted in the concept of selected ... Development. Fourteen of these areas ... million ha of forest land, an area too ... efforts. Reforestation in these areas ... the third five-year plan the main targets of ...

... been further developed and the Govern- ... which will provide for the ... for large scale industrial ... under the direct control of a Forest Development ... will operate under the Office of Forestry.

Table 2: THIRD FIVE YEAR PLAN

Main Targets of the Forestry Program

	1972	1973	1974	1975	1976	Total
			(000 ha)			
Reforestation:						
Industrial plantations /1	82.5	83.4	83.9	84.3	84.5	418.6
Poplar plantations	4.0	4.0	4.0	4.0	4.0	20.0
Planting of chestnuts, walnuts, etc.	7.0	7.4	7.5	8.0	8.8	38.7
Maintenance operations on existing plantations	330.0	350.0	340.0	340.0	334.0	1,694.0
Erosion Control:						
Hill side, new work	5.0	6.5	8.0	9.5	11.0	40.0
Hill side, report work	5.0	5.0	5.0	5.0	6.0	26.0
Sand dune stabilisation	.1	.1	.1	.1	.1	.5
Grassland establishment	2.0	2.0	2.0	2.0	2.0	10.0
Stream channel improvement (Km)	400	400	400	400	400	2,000
Protection:						
Resettlement of forest families (Nos)	2,000	2,000	2,000	2,000	2,000	10,000
Control of pests/disease	360.0	360.0	360.0	360.0	360.0	1,800.0

/1 9,000 ha per year planned for National Forests.

Source: OOF

C. Resource Development and Potential

40. Despite the fact that the forest resource appears to be extensive, very little timber supply will be forthcoming to meet the expected growing demand up to 1980. The natural forests which do have a productive function are slow growing and the earlier plantations will not make any significant contribution. An optimistic estimate is that the supply from these forests will increase from the present level of 1.1 million m^3 to 1.8 million m^3 by 1980.

41. The new legislation providing for the establishment of concentrated plantations in the 'Special Development Areas' will provide a sound basis for rational planning of planting areas with respect to the absolute size of the plantations required and their geographic location in relation to forest industries and markets. The mission fully endorses this new approach.

42. The area required for fast-growing pulpwood plantations alone is likely to be of the order of 500,000-600,000 ha with a similar area required for saw logs and mining timber and poles.

43. A major problem is likely to be that of securing land which is at present under private ownership for inclusion in the 'Special Development Areas' or alternatively of devising an effective private forests program which will bring the private forest areas within the 'Special Development Areas' industrial plantations program.

44. Preliminary indications are that a rotation of about 25 years will be required to produce pulpwood; this compares with 10 to 15 years in tropical countries. This could pose problems in trying to bring private farmers within the 'Special Development Areas' scheme.

45. Small scale purchases of private forest land for addition to the area of National Forests have taken place over the past years. In 1971 the area purchased was some 2,000 ha at a cost of US$150 per ha. 1/ A unit cost of land of this order may be difficult to justify for forest plantations.

46. The new legislation, in addition to delineating the 'Special Development Areas' provides for a forest fund of US$5 million per year over a ten year period for the purpose of providing soft loans over 20 years to the Forest Development Corporation and the private sector for industrial plantations establishment. If this were used entirely for the purchase of private forest land and even assuming the high cost of US$150 per hectare, it would be sufficient for the acquisition of some 33,000 ha a year (330,000 ha over ten years) which would probably be more than would be required for establishing 5-600,000 ha of national forest pulpwood plantations. An alternative to outright purchase would be a leasing system with an option to sell. This is discussed further in Chapter VIII.

47. The plantation species presently being used provide a satisfactory basis for the establishment of industrial plantations.

IV. ROUNDWOOD SUPPLY AND DEMAND BALANCE

A. Overall Position

48. The estimated roundwood equivalent of domestically consumed forest products (excluding fuelwood and poles) increased from around 1.1 million m^3 in 1960 to 3.4 million m^3 in 1970 and is expected to increase to 7.3 million m^3 in 1980. The roundwood equivalent of imports to meet this demand over the same period are 0.69, 2.48 and 5.50 million m^3 respectively (Table 3).

1/ This compares with reported costs of some US$4,000/ha for irrigated paddy, US$2,400/ha for rainfed paddy, US$1,300/ha for terraced upland suitable for barley, and US$300/ha for unconverted upland.

Table 3: SUMMARY OF ROUNDWOOD SUPPLY AND DEMAND BALANCE
(million m^3)

	1960	1970	1980
1. Domestic roundwood consumption	1.1	3.4	7.3
2. Home production from indigenous forests	0.4	0.9	1.3
3. Home production from plantations	-	-	0.5
Deficit which is imported	-0.7	-2.5	-5.5

49. If the estimated roundwood equivalent of plywood and sawn-timber exports were included, the import balance becomes 4.06 million m^3 in 1970 and 8.31 million m^3 in 1980. Plywood logs and pulpwood are major items in the deficiency. Further details are given in Appendix Table 5.

B. Plywood Logs

50. The plywood industry specializes in the production of hardwood plywood and is wholly dependent on imported of Lauan and Meranti type species from Indonesia, Malaysia, and the Philippines. The present level of imports is around 2.8 million m^3. There is no prospect of the local production of this class of hardwood log, and if the industry is to continue to expand in this type of plywood production it will have to continue to rely on imported logs.

51. With this objective, the Government has encouraged and provided loans to the private sector to secure logging concessions overseas. Three concession areas amounting to 590,000 ha were secured in Indonesia by 1971 (one in South Kalimantan and two in East Kalimantan) under contracts negotiated with the Indonesian Government and some 400,000 m^3 was supplied from these concessions in 1971. The Office of Forestry maintains a forestry attache at Jakarta to keep this development under constant review. None of the plywood mills are directly participating in this development.

52. The Korean Government has shown sound judgment in developing the plywood log supply in Indonesia. Estimates based on data available at FAO indicate that the forest resources in Indonesia are very extensive and sufficient to sustain the present level of exploitation for several decades; FAO reports there are some 50 million ha of merchantable dipterocarp forests. The costs of exploitation are bound to increase as the more remote areas are exploited, although some of these increased costs may be offset by a reduction in the intermediate concession administration charges. The government's policy of maintaining a continuous review of this log supply

is wise. At the same time, the supply position and price competitiveness of logs from the other sources should not be overlooked.

53. As a long term planning aid, the Forest Research Institute has imported equipment and is designing a work program for evaluating the suitability of locally grown timbers, particularly poplar and pines, for plywood manufacture. These species would result in a different quality of plywood to that now being produced and therefore a new market orientation. There is a need for a coordinated approach by FRI and the industry to the question of the long-term log supply and the feasibility of diversifying plywood production into other grades of plywoods in addition to the hardwood presently produced.

54. This industry is now generating some 300,000 m^3 of wood waste annually of which only 100,000 m^3 is planned for processing into particle and fibre board. The remainder is burned as fuel, except for a small quantity exported to Japan for pulping.

Pulpwood

55. The roundwood equivalent of pulp and paper imports in 1972 is estimated at 1.3 million m^3. The projected figure for 1980 is 2.7 million m^3.

56. The volume of wood-waste (around 300,000 m^3 annually) being generated by the plywood industry and to a lesser extent the sawmill industry, justifies investigation to determine whether this can be used to supplement domestic pulping material. The pulping problems associated with Lauan, which have been a deterrent to the Korean attempts so far made in this direction, are being overcome in the new Picop Bislig mill in the Philippines. There is, therefore, a strong case for reappraising any technical problems.

57. Emphasis should be given to the feasibility of rapid establishment of pulpwood plantations to reduce the dependency on imported pump. The species now being used in plantations will require to be evaluated further for their suitability for this purpose.

V. FOREST INDUSTRIES 1/

A. Plywood

58. There are about 30 plywood plants with a total capacity of some 1.64 million m^3 finished plywood 2/. The eleven largest plants (all members of the Korean Plywood Industries Association), are situated at the ports of Busan (6), Incheon (2), and Gunsan (3). The capacities of these total 1.63 million m^3. These are the export-oriented plants based on imported logs

1/ The location of the major forest industries is shown in Map IBRD 10380 in the General Report.

2/ Assuming conversion of 1,000 sq ft x 4 mm = 0.3719 m^3.

and currently producing some 1.4 million m^3 per annum, 82% of which is exported. Details of the capacities and products of these plants are given in Appendix Table 7. The remaining twenty plants have a joint capacity of around 18,000 m^3 (1% of total). These obtain their raw material supply from the reject veneers of the exporting mills and produce for the domestic market only. The annual production and exports of plywood over the past decade are summarized in Appendix Table 6.

59. All eleven export mills have intergrated sawmills which utilize reject peeler logs and cores. The two largest mills have in addition integrated particle board mills based on plymill/sawmill waste. Eight mills produce decorative plywoods using paper overlay, vinyl lamination and printing processes and four are producing simulated parquet floor plywoods.

60. The proportion of decorative plywoods has increased from around 20% by volume (22% by value) of total exports in 1967 to 26% by volume (30% by value) in 1971; this proportion is expected to further increase. Five of the mills have formalin and resin plants to supply their own requirements and those of the other plymills.

61. Mills are equipped with modern equipment (mainly West German and Japanese manufacture) and operate on 2 x 11 hour shifts. They have been sited so as to be able to use water transport from off-loading of logs ex-ship through sea water log ponds into the plymills.1/ The largest mill, Dongmyong has under construction a deep water jetty (30 m) which will facilitate discharge from vessels up to 20,000 dwt direct into log ponds.

62. The remarkable expansion of the hardwood plywood industry is attributable to the cost advantage it has been able to develop in the production of panelling plywoods for the special USA market. This cost advantage is mainly explained by the high level of management and its capacity for absorbing new technology, an industrious and intelligent labor force which has achieved significant physical productivity increases (see Chapter VIII), the location of the plants at sea-board which has facilitated the installation of low cost log-handling systems and dispatching of finished products and the integration of plants for the manufacture of glues, sawmills and other by-product manufactures.

63. The industry is wholly owned and managed by Koreans and technical expertise in the formative years of production was augmented by employing expatriate exports on short-term contracts and securing overseas training posts for Korean staff. Most of the capital requirements for the industry have been generated locally; overseas loans of about US$29 million 1/ were obtained between 1966 and 1970 on repayment terms of from three to seven years and interest rates of from 6-8.5%.

64. The government is currently operating three forms of financial assistance to the industry; all plywood logs for export plywood are exempt from the normal 10% import duty on logs; in addition, saw logs imported

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1/ There is no pre-steaming treatment. Inventories of around 4-6 weeks log supply are maintained in the log ponds.

by the export plymills for conversion in their own plants are subject to a 5% duty only; low interest roll-over loans are provided for financing inventories of logs and finished products.

65. A recent report [1/] indicated that of the 88% of total exports marketed in the USA in 1970, some 44% was supplied to one importer and 72% to four importers. The imposition of a 10% surcharge on plywood by the U.S. Government in that year resulted in the Korean suppliers absorbing from 75-100% of the duty. This indicates a weakness in the present marketing outlets which can place a severe strain on the profitability of the industry and cut back the foreign exchange earnings. Production has been oriented to a specialized market for wall panelling and widening of both the product and geographic market will be necessary to achieve stronger market tenure.

B. Sawmilling

66. There are about 1,900 registered sawmills with an estimated installed capacity of 4.6 million m^3 per annum sawnwood output (one shift). With the exception of the Dongwha sawmill complex at Incheon (which is operated by the largest sawlog importing firm), with a capacity of some 345,000 m^3 (15 x 23,000 m^3 capacity identical units) and the integrated sawmills of the eleven major plywood plants with capacities ranging from 20,000-100,000 thousand m^3, mill capacities are small, averaging about 2,000 m^3 per annum.

67. The total installed capacity is about four times the present output of 1.1 million m^3 and with the exceptions mentioned, most mills are operating for about half the year only.

68. The Dongwha mill and the integrated sawmills of the plymills operate on imported logs. These mills are equipped with machinery to handle large diameter logs and provide the bulk of the sawn timber from imported logs to the domestic market.

69. The smaller mills, which rely mainly on domestic supplies of small dimension roundwood, have been sited away from the areas of log supply as a deliberate measure to reduce the incidence of overcutting by illegal removals. These mills operate with a minimum of capital, using manual methods for all operations except the actual sawing. However, with the present low-grade and limited supply of logs, there is no justification for installing high cost capital equipment.

70. The excess capacity in sawmilling has arisen because of the over-exploitation of the indigenous forests in the 1950's and early 1960's, which could not be sustained and the new capacities which have subsequently been installed in the coastal towns based on imported logs.

1/ Survey of Korean Plywood Industry, USAID, Korea, 1972 (Hadley E. Smith).

71. With the rapid expansion of the plywood industry, there is a danger that the integrated sawmill capacities of these sawmills could be expanded at a faster rate than the market for the product. This is the apparent position at the present time with the Dongwha complex operating only about half their capacity on a single shift.

72. The policy of licensing the small inland mills at some distance from the domestic raw material source, while understandable in the context of control over fellings, appreciably adds to costs and results in log downgrade consequent upon the delay of transporting logs from forest to mill. The issuing of sawmill licenses has been controlled by the Office of Forestry since 1969, and no new licenses have been issued since that date. The future objective should be to issue licenses for mill construction in relation to raw material supplies, with designed capacities to fully utilize the capital installed.

73. There is a need to institute some size standards for sawn timber, particularly for joinery products, which would enable mills to produce at lower unit cost and achieve better utilization. This would best be achieved by coordination between the construction and sawmilling industries.

C. Particle and Fiber Board

Particle Board

74. Production has increased from about 60 m ton in 1961 to 12,000 m ton in 1971. There are three plants currently operating, based on plymill and sawmill waste. Two of these plants are newly installed (1970/71) and are presently working up their production. The equipment is West German. Total installed capacity is now 65,000 m ton per annum. An earlier mill (Chungang) with a small capacity (7,000 m ton) situated in Seoul and based on purchased waste from sawmills, went out of production in 1966. Details of capacities, production and proposed expansions are described in Appendix Tables 7 and 8.

75. Up to the present time, all production has been for the domestic market. This is at present constrained by a 20% sales tax on domestic consumption. In addition, there is a transitory technical problem of brittleness of the board which renders it susceptible to fracture on nailing. This is considered by the manufacturers to be mainly associated with the qualities of the glues used, but may be related to over fracture of chips or insufficient consolidation of the material in the method of manufacture. The surface finish of the boards produced is of a high quality. There is scope for a large expansion in domestic consumption of this product, particularly in building construction and the large-scale production of furniture which is now being commenced.

76. Attempts are now being made to export this product and decorative finishing equipment has been installed for some 15-20% of capacity to widen the market.

77. One of the new plants (Dongmyong) has been designed for further expansion. The present capacity of 23,000 m ton is from one production line and the factory has been constructed with sufficient space for a further three production lines of similar capacity. In addition, the Dongwha sawmill plant has obtained a license and is planning the early construction of a further plant of 36,000 m ton per annum to be integrated with the sawmill complex. Market studies into both domestic and export markets are needed before capacity is expanded further.

Fiberboard

78. One plant exists which has operated since 1960 and has increased capacity to the present 24,000 m ton per annum (on three shifts). Decorative equipment has been installed for 10% of this capacity. Production has increased from 2,000 m ton in 1963 to 6,500 m ton in 1972 (see Appendix Table 9). The plant has been shut down for a year between August 1971 and September 1972 because of financial difficulties and is now under new management. Production this year will be around 2,000 m ton only, although the target for 1973 is 16,000 m ton.

79. The plant is situated at Anyang and operates on sawmill waste from Incheon (25 miles) and Seoul (20 miles). Delivered wood costs are about US$7/m^3 solid wood equivalent, of which transport cost is around US$2.5. The location of the plant in relation to the raw material supply placed the firm in competition with other users of waste, particularly for the limited quantity of softwood waste, with resultant comparatively high raw material costs. The low utilization of capacity has also increased production costs. The new management are developing their own direct sales organization to improve on past sales performance of this product. All production has been for the domestic market and a 20% tax is levied on sales, the same rate as on sales of particle board. Imports of both particle and fiberboard are prohibited.

D. Furniture

80. Production of furniture has traditionally been a small-scale industry. Two new plants have recently been set up, one integrated with the Sungchang plymill at Incheon and the other integrated with a sawmill/joinery plant operated by the timber importing firm of Borneo Trading Co. These are developing large-scale furniture production. Emphasis is being given to the export market and sales of around US$350,000 have already been achieved this year. This type of product has a large potential in the domestic market, although no serious attempt has yet been made to evaluate this.

E. Pulp and Paper

81. Details of the location and capacities of the major pulp and paper units are described in Appendix Table 10.

Pulp

82. At the present time there are four groundwood pulp mills (3 x 15,000 and 1 x 40,000 m ton per annum), all operating and collectively producing around 80,000 m ton per annum; a semi-chemical mill with a capacity of 7,500 m ton and producing 5,000 m ton per annum and one rice straw and one de-inking mill, both of which are inoperative at present because of high production costs. These pulp mills appear to be too small to be economic. A pulp mill based on rice straw is not likely to be economic in a country that needs rice straw for livestock. There are no chemical pulp mills. The mills are situated in the west of the country in Seoul (3), Gunsan and Jeonju, using pulpwood supplies from over a wide area with road haulage distances of between 100 and 200 km. Production has increased from 20 m ton to 84,000 m ton between 1960 and 1971. Imports over the same period have risen from 36,000 to 209,000 m ton.

83. The four groundwood pulp mills are operating at full capacity. The scarcity of long fiber pulpwood prevents expansion of production. One of the mills (Daehan) has experimented with Lauan waste wood as part of the raw material base, but have found that bleaching costs are increased by some US$14/ton for this material. All mills are integrated with paper manufacture.

84. Pulp imports at present are subject to a 5% duty; there is no tax on domestic production.

85. Proposals are presently being formulated for the construction of a chemical pulp mill of 130,000 m ton per annum based on imported raw material, a chemi-groundwood mill of 30,000 m ton per annum capacity, and the expansion of the semi-chemical mill capacity by 13,000 m ton per annum.

Paper

86. There are 119 paper manufacturing firms with a total capacity of around 600,000 m ton per annum. Production in 1971 amounted to 390,000 m ton of which 320,000 m ton was produced by the 21 largest producers, all members of the Korean Paper Manufacturers' Association. Production capacities range from 600 m ton to 50,000 m ton per annum. The oldest plant was constructed in 1949 and most of the capacity has been established from 1965 onwards. Fourteen of the larger mills are situated in the area of Seoul and the nearby city of Anyang. The largest mill (50,000 m ton per annum) is at Jeonju. Total production has increased from 54,000 m ton to 393,000 m ton between 1960 and 1971; newsprint has increased from 27,000 to 105,000 m ton, cultural papers from 14,000 to 90,000 m ton and kraft and paperboard from 13,000 to 198,000 m ton. Total imports over the same period have increased from 35,000 m ton to 41,000 m ton only.

87. The excess capacity of the industry is in the cultural and industrial papers. The four mills producing newsprint are working at full capacity; these are the mills with integrated groundwood pulp plants. Despite the excess capacity in kraft and paperboard, imports of these in 1971 were the highest in paper products (27,000 m ton valued at US$11 million). This is partly explained by the more rapid growth rate for this class of paper, which was some 52% of total paper consumption in 1971 compared with 47% in 1968, with domestic demand running further ahead than supply.

88. Excess capacity is expected to be fully utilized by 1973. Thereafter the intention is to expand capacity to meet the level of domestic demand.

89. Studies are required to evaluate:

(a) an overall development plan for pulp and paper based on market studies for demand for these products;

(b) the pulping possibilities of the large volumes of plymill/sawmill wastes and the feasibility of using these to augment domestic supplies of raw materials;

(c) the possibility of utilizing large quantities of domestically produced hardwood pulpwood, which may become available for an intensification of reforestation in Special Development Areas;

(d) the technical and economic problems associated with the use of rice straw; and

(e) the feasibility of the early construction of a chemical pulp mill based on imported raw material which may later be converted to home produced pulpwood.

The possibility of making fuller use of the existing capacity of the kraft and paperboard plants merits attention.

Other Forest Industries 1/

90. There are some 200 small-scale wood using factories and 245 small-scale furniture workshops which, together, consume around 390,000 m^3 roundwood annually. Thirty-seven match factories, 41 chopstick factories, 9 pencil factories and 3 toothpick factories are utilizing locally grown poplar. Musical instruments and sports goods industries, based on imported timbers, have also been developed. Exports of these products have grown from zero to US$4 million between 1965 and 1971, which indicates the vigorous innovation of these industries.

1/ Details of the number of plants and types of products are described in Appendix Table 11.

VI. FUELWOOD

A. Background

91. The temperature in Korea is low during the months of November to March with minimum levels of -13.5°C in February. Heating is crucially important during this period. The traditional system of heating in rural houses is a combined cooking and heating installation with a sub-floor level hearth, (which can burn fibrous bulky material as well as logs and coal), above which is a cooking slab. The smoke and heat passes through under floor flues and is discharged on the opposite side of the house.

92. A study [1/] carried out in 1964 indicated that fuel consumption in the three colder months (January to March with average temperature of -2.8°) was 625 kg per month compared with 425 kg per month in the three hottest months (June to August with average temperature of 28.3°C). This would indicate that the traditional system is less efficient when used for cooking alone. However, there is a significant, but unquantified, amount of fuel use in cooking rice straw for feeding to native cattle, which may be a partial explanation. The cooking is carried out in order to improve the digestibility and is reported to be widespread. There are some 1.2 million heads of cattle kept by farm families which consumed an estimated 900,000 tons of farm byproducts in 1971, most of which was rice straw. The use of rice straw as cattle feed is reported to be declining with the increase of purchased concentrates, but is likely to remain as a significant absolute quantity for some years.

93. Fuelwood, branches, forest litter and farm residues such as grain straws, are the main sources of fuel for the rural population. Almost all urban households use coal with some using oil, electricity or bottled gas. Most fuel is gathered from the forest lands, farm residues providing from 5-30%. It is not a traded good, each family attending to its own fuel collection. Nonforest owners compete with owners for the limited supply and the scarcity of this material has led to denudation of hillsides in some areas with consequent erosion and the widespread practice of indiscriminate lopping of branches of trees.

94. The Government initiated a large-scale fuelwood plantation program in the early 1960's with the objective of establishing village fuelwood blocks and eliminating the practice of gleaning the hillsides. Planting is carried out by the villagers who are encouraged to form themselves into Village Forestry Associations whose function is to decide on the area to be planted, arrange for its maintenance and protection and be the agency for receiving subsidies provided by the Office of Forestry in the form of free seedlings and fertilizers. Subsidy payments in 1972 were some US$0.5 million. The VFAs are expected to provide for those who do not own forest

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1/ Research and Statistics Section, MAF, Korea, quoted in UN Korean Forest Survey Project (KOR 23), Timber Consumption Survey.

land and to supervise the arrangement of financial reward to the owners of the land used for the fuel blocks. The program has not achieved this objective and a new plan has been formulated.

95. Aggregate estimates indicate that about 1 million ha of fuelwood blocks are required to meet the needs of the rural population for the next 10 to 20 years. This area is based on yield estimates of 7 tons/ha/year on a 7-year rotation 1/. Some attempt has been made to quantify the growing substitution of coal and oil, which are expected to increase from the present level of 1.1 million m ton wood equivalent to 2.4 million m ton by 1981.

96. The consumption of forest fuel (Appendix Table 1) has risen from around 7 million m^3 in 1960 to some 8 million m^3 in 1970 and is expected to reach 9 million m^3 by 1980. Up to the present time these volumes have largely been composed of small branchwood and gleanings. Under the new plan the fuel blocks and pruning and thinning material from plantations are expected to provide the whole of the volume by 1981. Present and estimated future fuel consumption patterns of rural households are detailed in Table 4.

Table 4: ESTIMATED FUEL USAGE IN RURAL HOUSEHOLDS

	1972	1981
Number of families to be supplied (million)	2.8	2.7
Total fuel required ('000 metric tons) /1	11.8	11.4
Consumption of coal, gas, oil ('000 m ton) /2	1.1	2.6
Consumption of straw and other farm by-products ('000 m ton)	2.9	0.3
Fuel from thinning and pruning of industrial plantation ('000 m ton)	0.9	1.3
Forest gleanings/litter ('000 m ton)	2.7 /3	-
Fuelwood plantations ('000 m ton)	4.2 /3	7.2
TOTAL	11.8	11.4

/1 Dry wood equivalent assuming heat calorie value of 4,200 kcal/kg for fuel.

/2 Dry wood equivalent assuming heat calorie value of 5,300 kcal/kg for coal briquettes.

/3 Alternative source data from OOF yearbook 1971 indicates that fuel from gleanings provided over 95% of total fuel removals in 1970.

Source: Office of Forestry.

1/ Species commonly used as Black Locust (Robinia pseudoacacia) and Alder (Alnus hirsuta). Both have alternative uses as timber. Black locust has many thorns which is a disadvantage and work is being carried out by the Genetics Institute to develop a stock (vegetatively) which is thornless. Bushclover (Lespedeza bicolor) has also been successfully used for fuel production and has the merit of yielding fuel after one year without impairing the vigor of the plant.

B. Accelerated Fuelwood Program

97. Office of Forestry records indicate that 800,000 ha of fuelwood blocks have been planted or reserved 1/, but require extensive repair work and enrichment. Under the new plan a crash program is proposed to establish a further 200,000 ha by 1976 and carry out repair work over the estimated 800,000 ha of existing blocks. The subsidy element for these operations is to be increased by financing half of the calculated labor cost.

C. Urgency of the Problem and Possible Strategy

98. The provision of adequate fuel resources in the rural areas is a major problem. The lack of these has been a constraint on the development of the productive use of the land in many areas and led to erosion problems.

99. The Government's program to establish village fuelwood blocks to serve the whole community, including nonforest owners, through village organizations, is basically sound. At the present time any attempt to convert fuelwood into a marketed good would run into two difficulties, the inability of poorer families to pay and the deprivation of what has become a customary habit 2/ in many areas.

100. There is an urgent need for an indicative overall fuel and energy supply plan specifying the probable developments over the next 20 years of coal, oil, gas and electricity and the areas in which these are likely to be available.

101. Fuelwood requirements would then be determined on an area basis taking account of population, likely impact of alternative fuels and the extent to which existing fuel resources can contribute.

102. The use of the species proposed, which have an alternative use as pulpwood or lumber, would insure against the possibility of creating large blocks of fuelwood plantations which may later become partly redundant. The introduction of some additional timber species (e.g., poplar) into the fuel blocks would be an added inducement to the owners of the land used.

103. The possibility of more intensive use of coal and oil for cooking, particularly in the summer months when heating is not required, and the extent to which fuel is required for preparation of cattle feed, merits further investigation.

1/ Some 50% of the area is classified as natural forest.

2/ It has been pointed out that there is no customary right in land arising from usage in Korea, but this has not been verified for its general validity.

104. Fuelwood blocks are integral in rural development and could form part of a composite investment project.

VII. SPECIAL TREE CROPS

A. Generation of Cash Income

105. The development of the cultivation of chestnuts, walnuts, bamboo, paulownia, persimmon, oak and pine mushroom, and other orchard type crops is a responsibility of the Office of Forestry and is being encouraged to increase the direct income of farmers. Chestnuts, walnuts and bamboo are being given special emphasis; chestnuts and walnuts have an export potential in addition to a high domestic demand and bamboo is presently being imported for small handicraft industries. Imports of bamboo in 1971 were some US$1 million. Chestnut production is presently around 3-4,000 m ton and walnuts 200 m ton.

106. Records indicate that some 48,000 ha of chestnuts, 6,500 ha of walnuts and 11,000 ha of bamboo have been planted up to 1972, of which about 70% is estimated to be successful. Yields are now being obtained from the earlier plantings. All plantings have been established in the small private forests, with owners receiving subsidy to the extent of half the cost of seedlings and fertilizers and free extension advice. The subsidies and extension have been administered through the Provincial Forest Administrations.

107. Difficulties have been experienced with chestnut gall wasp and inhibited flowering in bamboo, and these problems are currently under investigation by the research institutes. Progress has been made with the development of hybrid chestnuts resistant to gall wasp damage and Provincial Forest nurseries are now bulking up and distributing this material to the private sector.

108. Implicit in the approach up to recent times has been the assumption that such crops do not require much skill and expertise. The set-backs experienced by the widespread chestnut gall and bamboo flowering difficulties have demonstrated that sound management practices with complementary applied research support are essential for economic production.

B. Future Development

109. An accelerated program of planting is now proposed which will establish a further 20,000 ha of chestnuts, 5,000 ha of walnuts, and 5,000 ha of bamboo between 1973 and 1977 in larger plantations, although the subsidy scheme for small-scale planting will still continue. The growing of these crops in more concentrated blocks would facilitate provision of disease control and intensive management aids. On the other hand, there

may be a difficulty of seasonal availability of labor if these crops are grown more intensively. These questions require further evaluation.

110. Export markets for chestnuts and walnuts will demand high quality standards, and it may be more profitable to concentrate on a smaller area which can be intensively managed for a high quality crop rather than a large area of lower quality.

111. There could be an additional incentive in growing these crops as both chestnut and walnut have a timber value which would increase their profitability.

112. These crops are directly linked with the farm family activities and the future crop development will require evaluation in the context of the overall rural development program. Recent studies carried out by the Office of Forestry indicate potentially high returns 1/ for chestnuts and walnuts and the expansion of these crops justifies further study for possible inclusion in an integrated rural development project.

VIII. OTHER FOREST ACTIVITIES

A. Erosion Control and Watershed Management

Relative Priority and Strategy

113. This area of forest activities receives a high priority; some 20% of the total of forestry expenditure and approximately 18% of all forest staff are directed to erosion control work. The hillside erosion and stream channel improvement work is carried out wholly in the private forests.

114. The work program 2/ is executed through 36 erosion control stations, which operate under the provincial forest administrations. Proposals for the program are formulated by the Provinces with the Office of Forestry exercising a supervisory function, approving expenditures within budget constraints and inspecting completed works.

115. Field work is carried out by villagers who receive wage payments for this work. Seedlings, seeds, fertilizer and building materials for stream bank improvement are provided free. Expenditures on current operations are detailed in Table 5.

1/ Financial rates of return of around 20%.

2/ The main areas of operation are in the four major watersheds of the Han, Geum, Yeongsan, and Nagdong rivers which have a total area of 6.3 million ha.

Table 5: ESTIMATED EXPENDITURE ON EROSION CONTROL - 1972

Office of Forestry Expenditure

Operation	Target Area	Expenditure (million won)	%
1. Hillside erosion, foundation work and replanting	4,000 ha	463	39
2. Hillside erosion, repair work	2,200 ha	65	5
3. Grass seeding on less severe sites	340 ha	52	4
4. Stream channel improvement	265 km	556	48
5. Sand dune stabilization	145 ha	23	2
6. Roadside rehabilitation	-	23	2
Total		1,182	100
Estimated Expenditure by Provinces		256	
TOTAL		1,438 (approx. US$3.6 million)	

Source: Office of Forestry

Methods

116. The watershed management component of the ongoing UN Forest Survey and Development Project (KOR 23) has contributed to techniques. One development, which is being used extensively on hillside erosion combines replanting of the area with a mixture of tree seedlings, (commonly P. rigida, Alder and Black locust), seeds of herbaceous plants (Arun dinella, Lespedeza and Black locust) and ground clovers and grasses in one operation using a straw matting for initial soil stabilization. The effect of the operation is to re-establish a vegetative cover with a productive capacity, which is additional to the protective functions of increasing precipitation absorption and preventing soil wash. Under controlled cutting, fuel yields of grasses and shrubs can be harvested from 2-3 years after treatment, and a sustained yield of fuelwood obtained from the seventh year onwards.

Costs

117. Costs of hillside erosion control work are currently estimated at between 150,000 (US$375) to 180,000 won (US$450) per ha 1/. In a typical site, the foundation work is undertaken in the autumn and the area is planted and seeded in the following spring. Records indicate that about 40% of the area treated in the past has required repair work, which is estimated at some 30,00 won (US$75) per ha. The stream channel improvement includes a series of check dams and the walling of the banks. Present average costs are estimated at some 2,300,000 won (US$5,600) per km. Labor

1/ Office of Forestry data. Foundation work is around 100,000 won per ha and planting and seeding 50,000 won per ha.

costs account for some 87% of the total costs of hillside erosion control and 83% of stream channel improvement. The UNDP (KOR 23) 1/ costs for similar work being carried out in the Dongjin Gang watershed are substantially the same as those quoted. The UNDP costs estimates do not include management costs.

Area Treated and Extent of Area of Existing Erosion

118. Records indicate that some 450,000 ha of hillside, 800 km of stream channel and 1,000 ha of sand dunes have been treated between 1961 and 1971; some of this work requires repair. At the beginning of 1972, the area of severely denuded and eroding land requiring treatment was estimated to be 70,000 ha 2/. A recent UNDP study 3/ carried out over 1.6 million ha of the Nagdong river basin evaluated the erosion position as follows:

High (over 68% of surface area denuded and eroding)	30,000 ha	2%
Medium (33-67% " " " " " ")	117,000 ha	7%
Low (15-33% " " " " " ")	196,000 ha	12%
Not eroding (less than 15% of surface area denuded and eroding)	1,306,000 ha	79%
TOTAL	1,649,000 ha	100%

119. The Nagdong Survey supports the overall estimate for the country of around 70,000 ha of severe erosion still existing. However, the survey indicates that the area of medium rating should also receive control measures and assumes treatment costs would be the same for both high and medium areas.

120. Targets for completion during the Third Five-Year Plan are 50,000 ha of hillside (40,000 ha to be re-established with forest cover and 10,000 ha with grasses), 2,000 km of streambank improvement and 500 ha of sand dunes.

Land Use and Watershed Management

121. In general, the geology of the forest lands of Korea, gneiss and schists giving rise to sandy loams, is susceptible to erosion. At the same time, the rate of release of soil nutrients is high because of the rapid weathering of the parent material and eroded areas very quickly recover once sustained management regimes are instituted. The key to the problem is the introduction of land use activities which will ensure sustained management. In areas where erosion is not severe, it is technically feasible 4/ to

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1/ Accomplishment of forest land rehabilitation works, Dongjingang Survey shed, 1968-72.

2/ By Office of Forestry.

3/ Foresty Survey and Development Project (KOR 23), Pre-Investment Survey of the Nagdong River Basin, 1971.

4/ Work carried out at the Alphine Experiment, Pyongchang-Gun, Gangweon Province.

institute alternative land use other than forestry, i.e., grazing and cultivation, on a sustained management basis which would not impair the catchments. To the extent that these productive functions can be shown to be economically viable, they have the merit of providing a direct incentive to the user to maintain the area at levels of fertility which could satisfactorily maintain the catchments.

Contributary Causes of Erosion

122. In addition to the removal of some 8 million m ton of raw material for fuel, a major cause of erosion, it is currently estimated that about 20 million m ton is removed for farm compost and 3 million m ton for green manure and forage. These removals are concentrated in the forest areas closest to villages. It is obviously difficult to measure and differentiate between removals for fuel and compost and it has not been possible to evaluate the accuracy of estimates of compost and forage materials. The comments in Chapter VI concerning the pattern of land ownership and user customs apply equally to the gathering of compost material. Cleaning and litter raking, which impair the efficiency of watersheds and carry a constant threat of erosion, reflect only the reality of the situation since villagers have had no alternative source of raw materials for their needs. Any attempt to effect repairs to the catchments and prevent further erosion by prohibitive legislation, which are not accompanied by an alternative source of raw material, is only partially successful. Failure to provide the alternatives has been a major reason for heavy expenditure which has been incurred on repair work.

Feature Management

123. Management of the watersheds to provide maximum stream flow and reduce siltation is vital to the maintenance of agricultural activity in the lower areas. The basic need is the establishment of vegetative cover to improve absorption of precipitation and prevent soil wash. This does not preclude the use of part of the area for nonforestry purposes. The early cash flows which could be expected from livestock production, for example, could be a more attractive land use to farmers than the longer term benefits from reforestation and could be instrumental in inducing better land use practices among the rural population.

124. The provision of a sustained fuelwood supply would be a major step in removing a primary cause of erosion. The question of the extent and significance of removals of composting materials and forage requires further evaluation and a strategy developed to provide alternative sources where these removals can be shown to have a deleterious effect.

125. The present methods of treatment over comparatively small areas are absorbing a large proportion of the available resources. A total staff of 800 are employed, 360 of whom are professionals and 400 technicians. In average terms, this indicates a small territorial charge for actual erosion control work of around 10 ha of hillside and 3 km of stream channel per man, and the existing staff could probably handle a considerably enlarged program. The hillside techniques being emphasized are those which transform an eroded

site into a productive one, giving a yield of raw material in addition to the protective function. The average costs of this technique are high. The development of lower cost techniques for the establishment of vegetative cover only, which could be used in erosion areas where there are existing supplies or alternative means of producing fuel and compost for farm use at lower cost, would release funds for treating larger areas and speed up the programs. In some areas, simple closure is sufficient to achieve a satisfactory vegetative cover 1/.

126. There is some doubt as to the extent of the area requiring the expenditure of physical inputs and there is a danger that expensive repair methods may be used in areas where such costs are not justified. A broad distinction can be made between areas in which the disbenefits can be measured in relation to the damage being incurred and general protection areas where these are not quantifiable. With the former, cost/benefit analysis, within the range of available techniques, will indicate the areas justifying expenditure on this work. The latter areas are more difficult to evaluate in cost/benefit terms because of the subjective estimates of the disbenefits, but this analytical approach would minimize the risk of uneconomic expenditures. The administration of this work is discussed in Chapter VIII.

B. Forest Protection

127. Some 22% of the total forest staff and 10% of expenditure on forests are directed to protection. The main activities are the prevention of illegal cultivation and resettlement of scattered forest households, control of illicit cutting, pest control and fire prevention and control. Expenditure in 1972 is detailed in Table 6.

Table 6: FOREST PROTECTION EXPENDITURE 1972

	Million Won
Administration	133
Resettlement of shifting cultivators	220
Control of forest pests	243
Control of illegal cutting	50
Fire protection	24
Purchase of protection equipment	90
TOTAL	760 /1 (US$1.9 Million)

/1 Includes both Provincial and Office of Forestry Expenditures.

1/ Forest areas in the de-militarized zone in the north of the country provide a good example of this.

Illegal Cultivation and Resettlement

128. It is estimated that there is currently about 46,000 ha of illegal cultivation; 16,000 ha in the national forests, 7,000 in provincial forests and 23,000 ha in private forests. This is shifting cultivation which formerly was commonly accompanied by the construction of homesteads in the proximity of the cultivation areas. There was a big upsurge in this practice following the inflow of refugees after the Korean War.

129. A positive policy was initiated in 1965 which was directed at providing alternative housing and permanent areas for cultivation for the scattered forest cultivators. Between 1965 and 1968, some 8,000 houses were constructed in villages and 10,000 ha of permanent farmland, mainly from the forest, made available for resettlement. For security reasons, the location of this development from 1969 has been specifically directed to village location of scattered forest homesteads in the northern part of the country. Between 1969 and 1972 a further 7,000 households and 4,000 ha of permanent cultivable land have been resettled. The administration of resettlement is jointly undertaken by the Ministries of Home Affairs, Agriculture, Health, Provincial Governments and Office of Forestry. Total expenditure in 1972 is estimated at 900 million won (US$2 million), of which 23% is being provided from Office of Forestry Funds.

130. There remain some 28,000 forest homesteads, requiring about 30,000 ha of permanent cultivable land, to be resettled in villages. The Third Five-Year Plan provides for 2,000 new homes a year up to 1976.

131. With some acceleration of the positive approach which has been pursued in dealing with shifting cultivation the problem can be solved. Besides the fund flows which have been required for the physical inputs, the transfer of forest dwellers to villages has entailed considerable effort in altering people's attitudes. At the present time, there are no full-time forest workers in the country; planting and tending operations are carried out by farm family labor on a casual basis, much of which is unpaid in the private forests 1/. The creation of the Special Development Areas and the Forest Corporation for the purpose of establishing large-scale plantations will require a full-time labor component of skilled workers. This development may be used for facilitating some of the resettlement of illegal cultivators.

Forest Pests and Diseases

132. The problem of insect attack, particularly the pine caterpillar (Dendrolinus spectusolis) and the pine gall midge, has been widespread. Control measures, based upon the limited research which has been available from the research institutes, have included the use of ground and aerial spraying, and the construction of larvae traps over wide areas. There are also problems with blister rust on white pine and shoot blight in larch.

1/ Discussed further in section D, Chapter IX of this Annex.

133. Control measures are difficult to implement because of the widespread location of the plantations and the problem of effective management in a fragmental ownership pattern. The technical problems associated with insect pests and disease require further evaluation. This is an area in which technical assistance can make a significant contribution, by the provision of foreign specialists in these fields.

Fire Protection

134. This is becoming an increasingly important problem as more areas become planted and successful closure gives rise to vigorous growth of grasses and herbaceous cover. There is a critical period during plantation establishment before the canopy closes when the ground vegetation is thick and is capable of rapidly carrying fire over large areas. This hazard will be new to Korea forestry and requires careful evaluation.

135. In the past, access roads have been kept to a minimum in national forests to prevent illegal fellings. This policy will require modification to provide a road system integrated with the laying out of five breaks in new plantations. In the private forests, fire protection depends entirely on the vigilance of the local owners. This will require reinforcing with other aids.

136. This aspect of protection is at present under study to evaluate the requirements of different areas, and is another problem on which technical assistance provided by specialist advice would make a significant contribution.

IX. INSTITUTIONS

A. Forest Administration

137. There are three lines of forest administration: the Office of Forestry, Provincial Forestry Administrations and the Forestry Associations. In the line administration of the Private Forests, the Office of Forestry has the advantage of the very effective public relations and communications systems of Central Government and the subsidy payments. These are, however, to some extent offset by the considerable degree of autonomy which the Provinces and Associations exercise in their forest activities. There are also problems of horizontal linkage between the three lines and a weakness in accountability in the system. A chart setting out the existing institutions of administration is included in Appendix Table 12.

Office of Forestry

138. The Office of Forestry operates as a semi-autonomous department of government and is responsible for formulating national forest policy. The department is organized into a Planning and Coordination Office, which controls budgetary allocations, and three Bureaus dealing with Forest Administration,

Reforestation and Forest Management. The Bureaus have direct line management with three national forest stations which manage the 840,000 ha of National Forest, and direct linkage with the Provincial Forestry Administrations and the Forestry Associations. Besides the Bureaus, there are three research units, a general unit covering forestry and forest industries, a genetics unit and a forest resource and survey unit. The office also maintains the overseas forestry attache in Jakarta. A total of 940 staff are employed; 150 in Office of Forestry, 240 in the research institutions and 550 in the national forests. The Office has no effective control over the staffing of the provinces and associations.

139. The subsidy payments are the main linkage in the coordination of the work programs of the provinces and associations for the Private Forests. The work proposals of the provinces and associations are submitted for approval and work schedules qualifying for subsidies are authorized by the Office of Forestry within the financial constraints of the annual budget. An inspection procedure is in operation for erosion control payments but this has not been applied to the other forestry operations.

140. The Office of Forestry also issues directives to the provinces concerning the implementation of regulations for forest land use, felling permits, game laws, etc. In addition, it prescribes the prices of seedlings for sale by private nurserymen. In the production of minor forest products, the Office of Forestry initiates policy and provides subsidy inducements through the Forestry Associations.

Provincial Forest Administrations

141. Each of the nine territorial provinces have their own forest administration which operates as a department of the Provincial Government. The administrations have direct control of the erosion control stations within their territorial boundaries and the provincial forest stations managing the Provincial Forests. They also undertake management of some scattered areas of National Forests. They all operate research stations, which have a loose technical linkage only with the national research institutes. The Provincial Forestry Administrations exercise line administration of the Private Forests through sub-offices which are maintained on an administrative (Town and County) basis. In total, there are some 240 staff at provincial offices, 400 employed at erosion control stations, 180 at provincial forest stations, 100 at provincial experimental stations and 1,430 at Town and County level. Recruitment of provincial staff is decided by the province.

142. The town and county staff administer the Private Forests for purposes of issuing felling permits, coordinating the reforestation work and arranging for the supply of tree seedlings with private nurseries 1/, and the subsidy payments for these, fertilizer issues, and labor costs.

1/ All seedlings for private forest plantations are supplied by private nurseries which raise stocks on contract at prices laid down by Office of Forestry.

143. In addition to the subsidy payments from Office of Forestry, the Provincial Forest Administrations have sources of funds from provincial budgets (which range from some 2-8% of total Provincial Government expenditure), the allocation of which is decided locally. These local funds are used for staff salaries and expenses, administering the Provincial Forests and research stations, and to augment the subsidies received from Office of Forestry for reforestation, erosion control and protection.

Forest Associations

144. These form the second line of administration between the Office of Forestry and the Private Forests. The three-tier organization is composed of the National Forestry Association, Town and County Forestry Associations and Village Forestry Associations. Originally the organization was formed to handle the production, collection and marketing of minor forest produce (oak and pine mushroom, cork, kudzu fiber for wallpaper, etc.), and encouraged to establish tree nurseries for self-supply and sale to the private sector. However, these nurseries do not supply any significant quantity of the seedlings used in the subsidized plantations program. In 1968, the Office of Forestry subsidy payments towards fuelwood plantations establishment was transferred from the Provincial Forestry Administrations to the Forestry Associations.

145. The organization employs a total staff of some 1,250, thirty of whom are headquarters staff and 1,220 are employed in the provincial branch offices and the county associations.

146. The objective of the organization is that every village should have its own Village Forestry Association (VFA) in which all heads of households are represented (both those with and without forest land) and whose function is to develop and protect the private forest lands for fuelwood, timber and minor forest products, with technical guidance being given by Provincial Forestry Association staffs. Each VFA elects a member of the County (Gun) Forestry Association which employs two or three trained foresters and an administrative staff to handle payment, collection and delivery of minor forest produce, receive subsidies and arrange inputs for fuelwood plantations establishment. The County Forestry Associations elect the President of the National Forestry Association. The National Forestry Association maintains a head office in Seoul and branch offices in each of the provinces. The President maintains direct communication with the Office of Forestry regarding policy issues concerning minor forest produce and fuelwood plantations establishment.

147. There are at present 21,500 Village Forestry Associations and 151 County Forestry Associations registered. However, a recent appraisal 1/ of the Forestry Associations indicates that about 50% of the County and 75% of the Village Association are ineffective.

1/ Forestry Policy and Major Works, 1972, OOF.

Proposed Forest Development Corporation

148. This proposed new institution under the legislation now being considered (para 38) would form an additional administrative chain. It would operate with its own management and funds in the proposed Special Development Areas. The President and executive staff would be appointed by the Office of Forestry. The Corporation's primary objective would be the establishment and management of industrial plantations; it would also administer the protection forests which form part of a Special Development Area. The Corporation would be directly accountable to the Office of Forestry for the efficiency of its work performance.

149. The new legislation envisages the separation of user rights from ownership rights for the private forests falling within "Special Development Areas," with the user right vesting in the Corporation for purposes of controlling the management of the area. Owners would receive a 10% share of the gross revenues from the plantations. Whilst this separation of user rights would be a significant change in land use patterns, the widespread custom of gleaning referred to in Chapter II(A) has to some extent conditioned owners for a development of this sort. There are however inherent difficulties, and the reforestation program would be continuously at risk, if the full cooperation of local owners were not secured. For this reason, alternative means of land requisition should be fully explored. These could include the outright purchase of land; a leasing system, in which the owner is paid a rental to be charged against his 10% share of gross revenue; a leasing system in which the owner is paid a rental but with an option to sell.

Separation of Functions

150. The present institutional structure has three inherent disadvantages. There is the possibility of conflicting priorities arising from the autonomy of the provinces and associations. These may be pursuing forestry programs which are desirable in the context of local objectives but do not fit within a national strategy. There is also the risk of duplication in some of the work areas; this is particularly relevant to the research stations.

151. In addition, there is the lack of accountability in the system of subsidy payments. These are paid through the long chain of indirect responsibility where wastages can easily occur, to recipients who are not under any enforceable contractual agreement to accept an obligation. Under the present system, should a forest owner fail to maintain a plantation for which he received a subsidy, the VFA would be authorized by the Forestry Administration to undertake the maintenance work. The VFA could then bring sanctions against the forest owner and the VFA costs would be a charge against gross revenues from future sales of the owner's trees. This would be difficult to implement for a number of reasons; the long period before benefits accrue, the problem of establishing effective VFAs in perpetuity and the further problem of protection of the plantations. This latter problem would probably be a growing function with the increase in the number of owners against whom sanctions were taken.

152. The proposed formation of a Forest Development Corporation would be a significant change in the administrative structure. This will make explicit the function of industrial plantation establishment and direct staff and fund flows to achieving this objective in areas which have been rationally selected with respect to future industrial locations.

153. The genesis of a similar development has already been introduced in erosion control work, with the setting up of a network of control stations. This could be further developed so as to bring responsibility for the management of erosion control into one authority whose function would be the evaluation of the competing claims for work in different areas, development of a range of techniques with the objective of minimizing costs, and direct control of and accountability for a national policy. This work spans the disciplines of water resources and agriculture as well as forestry, and the management of it would ideally be composed of an integration of these.

154. Both fuelwood blocks and nonwood tree crops (chestnuts, walnuts, etc.) are farm-forestry activities closely integrated with other farming activities. The network of communications with the private forest owners which the Provincial Forestry Administrations have developed appear to be well suited to continue with the implementation of policy relating to these activities. There is some doubt as to whether the VFAs can be expected to undertake the function of exercising a management role in determining land use for fuelblocks and providing management continuity. It may be possible to strengthen VFAs by merging them with other local institutions which have a broader responsibility for rural development and can be expected to safeguard the investments in fuelwood blocks more effectively.

155. Any separation of the function along the lines discussed would entail a redistribution of responsibilities within the internal structure of the Office of Forestry and the division of responsibilities between Office of Forestry and provinces. It is expected that most of the staff for the proposed Forest Development Corporation would be recruited from existing staff (both Office of Forestry and Provincial and Forestry Associations), and these redeployments would facilitate changes.

B. Research

Emphases and Weaknesses

156. Very considerable effort has been put into forest research and the facilities of the three national institutes are well developed. Current Office of Forestry expenditure on these is comparatively high, about 11% of the total expenditure, although some of this can be transposed to direct forest management. There is some overlapping of functions and improvements can be made in the orientation of the program. Closer links are needed between ongoing associated fieldwork and the forest industries.

Forest Research Institute, Seoul

157. The Institute employs 105 staff and operates sections dealing with (1) soils and soil chemistry (fertilizer trials, watershed management and erosion control); (2) protection (entomology, mycology and wild life); (3) reforestation (see production and storage, nursery practice and species trials); (4) utilization (wood technology and chemistry, suitability of species for industrial uses); (5) management (forest mensuration and thinning trials, and financial analysis of plantations and nonwood tree crops); and (6) minor forest products inspection. There are three branch stations, one in the northwest (Gwangnung) and two in the southeast (Jinju and Jinhae), which carry out nursery work, species trials and mensuration studies.

158. Mention has been made in Chapter VIII of the need for technical assistance to strengthen investigations into disease and pest problems.

159. The ongoing work of the UNDP (KOR 23) in three selected watersheds complements the work of the soils section. The exchange of information in this field has been disappointing and the project could be used to greater advantage in a critical analysis into erosion control methods and costs which is a priority area for study.

160. The utilization section has concentrated on the timber properties and possibilities of industrial use of local timbers. The important area of utilization of the large volumes of Lauan waste from the plywood industry has not yet been appraised and this justifies early investigation. A closer formal linkage with the forest industries and the Ministry of Commerce and Industry would provide a wider basis from which to identify the priority areas for investigation.

161. Important areas which are not being covered in the management section are methods study into basic reforestation operations; the development of the use of hand tools (a simple but widespread example is the apparent absence of any systematic pruning techniques); fire protection and forest roads. The yield tables which have been produced are based on mensuration studies in the scattered older stands which exist, which are not representative of potential yields which can be expected from intensively managed plantations, and can therefore be misleading 1/. The permanent sample plots now being established for Larix, P. koraiensis and P. rigida, would serve a wider purpose if they were expanded to enable study or different planting espacements, thinning and pruning regimes and other treatments. Permanent plots have yet to be established for the remaining timber and fuelwood plantation species, which are currently being planted. Plots should also be established in the species trials of exotics. Studies should include data to determine the volumes of merchantable timber (under bark to a 5 cm top diameter) as well as gross volume.

1/ Estimates of yield given in the UNDP (KOR 14) Interim Report are about double those quoted in the FRI Yield Tables for Japanese Larch, and P. densiflora and 30% higher for P. rigida, at rotation of 30 years.

162. There is an overlap with the Forest Genetics Institute in the work of the reforestation section in seed propagation and species trials and coordination of these is needed to prevent duplication, particularly as both institutes are operating three branch stations each.

Institute of Forest Genetics, Suwon

163. The Institute employs 51 staff and operates three tree-breeding stations, situated in the northwest, central and Jeju island. The institute has achieved international fame in the development of the species P. rigitaeda, which is a hybrid of P. rigida and P. taeda.

164. The principal activities of the institute are the establishment of seed orchards for the nine main species of the reforestation program, developing new hybrids by further back crossing of P. rigitaeda and crosses of upland and lowland poplars, development of a thornless variety of robina pecudoacacia (black locust) for fuelwood blocks, breeding of grasses for erosion control sites and establishment of species trials.

Seed Orchards and Collection

165. The three breeding stations have been established (Jeju in 1967 and the others in 1970) for developing the seed orchards and species trials. Records indicate that some 485 ha of orchards have been established to date with a further 265 ha planned for establishment by 1974. These are expected to become yielding by 1980-82 and eventually to produce sufficient seed to sustain a 70,000 ha annual planting program.

166. During the interim period until the seed orchards become productive, a system has been developed in recent years to restrict seed collection to some 1,200 ha of selected forest plantations in the National Forests and a similar area selected in the Provincial and Private Forests. The Institute has been involved in selection of the areas for tree qualities, but the collection and distribution are administered by the National Forest staff in the National Forests and the Provincial Administration working through the Village Forestry Associations in the Private Forests. Because of the importance of provenances in plantation development and in view of the prevalence of undesirable seed sources and the financial incentives of the private nurseries to produce given quantities of seedlings against firm orders, there would be some merit in introducing an inspectorate operated either by the Genetics Institute or FRI to supervise seed collection and supply.

Development of Hybrids

167. The results obtained so far with hybrids are very impressive; plantations of P. rigitaeda are indicating growth rates of some 200% higher than the P. rigida control plots, and those of hillside poplar (P. alba x P. glandlosa) some 500% higher than the P. alba control. Stocks from these new species are now becoming available for use in the plantations program and continuation of this work has a potentially high contribution.

Exotic Species Trials

168. Introduced hybrid poplar from Italy (I-214 and I-476) for lowland planting is indicating 250% growth rates over indigenous poplars and encouraging results have been obtained with direct importations of Japanese alders. Trials of exotic softwoods, with the exception of P. taeda, which has been found promising in the southern coastal area, have so far not shown any real promise of adaptation to commercial plantations. This area of the work justifies more rigorous study and would benefit from technical assistance in devising a strategy of species trials establishment.

Forest Resource Survey Research Center

169. This center was set up in 1969 on the completion of the first phase of the UNDP study (KOR 14-23). It employs 83 staff and is now equipped to undertake systematic inventory and soil suitability surveys.

170. The center is now undertaking the survey of the whole forest area operating to work schedules directed by the Office of Forestry; the present targets are to complete detailed inventory surveys by 1976 and soil suitability surveys by 1981.

171. The function of the center has now changed from one of research orientation into a management aid, and the future work it carries out will be predominantly in the management field. There seems to be no reason why this center should not now form an integrated part of forest management. It will have an important role in determining the location of the Special Development Areas.

Provincial Research Stations

172. Each of the provinces maintains its own research station. These stations also raise seedlings for the small planting programs in the Provincial Forests, bulk up supplies of grafting material of poplars and chestnut for the private nurseries and raise stocks of ornamental trees for amenity planting. In total, some 100 staff are employed at these stations. They maintain loose technical links with the FRI and Genetics Institute and cooperate in some field trials. The work programs of these stations are decided by the Provincial administrations and are not coordinated to any specific research problem areas. They are not making any significant contribution to the research problems associated with the forestry program and the questions of the need to operate all these stations and the work programs they should be undertaking justifies further clarification.

C. Education and Training

General Background

173. There are nine university colleges offering forestry degrees, six of which are state colleges and three private. The courses are usually of

four years, the first two years joint with agriculture and the second two years more specialized in forestry subjects. Entrance to university is commonly from agricultural high school which teaches forestry subjects. A further stream of formal training is provided by some of the agricultural junior colleges, which conduct 5-year courses for junior high school leavers, which are intended for junior staff training.

174. The major issue in education is the content of the courses. These are considered to be wholly academic and do not provide any technical training in practical forestry. To fill this gap, it is proposed to establish a Forestry Training Center 1/, under the control of the Office of Forestry, which will operate practical field work courses for graduates and non-graduates. Consideration should be given to providing more practical training at existing forestry schools.

175. There is a further problem of the employment possibilities for students; about 220 university students and 50 junior college students are graduating annually. The rate of turnover of professional and technical staff is estimated to be 5% per year, which creates vacancies in the existing posts of some 130 graduates and 20 college students. This situation could be eased by reducing the number of forestry faculties.

Position of Existing Staff

176. The present staff have reached their various levels of seniority with this general lack of practical training in their formal educational background. Nor is there existing an area of reforestation and forest exploitation which could serve as a model for in-service training. This lack of adequate understanding of the practical issues of forestry is a serious constraint to the reforestation program with respect to planting, organization and implementation. For example, the plantations program so far developed has not taken account of the location of the forest industries and the models used for financial analysis have omitted costs of roads, fire protection, management and the related profitability of the projected forest industries.

Provision of Technical Training

177. The Forestry Training Center, which the Government is proposing to establish with external assistance, would provide intensive specialist courses for senior staff, intermediate courses for junior staff and introductory courses for new recruits from both the universities and junior colleges. The proposed location is at the Gwangnung Forest Research Branch Station (where there is some 2,400 ha of National Forest) situated 24 km northeast of Seoul. Accommodation for some 130 students is envisaged.

1/ The proposal is probably being put forward in the UNDP country program for 1973 and is designed to provide staff and training facilities in the disciplines of plantation establishment, use of tools and equipment, logging, forest engineering and watershed management/erosion control.

178. The main arguments supporting the establishment of a new forest training institution rather than modifying the existing ones are: the structural changes which are required in the present curricula could not be implemented in the short-term because of the lack of suitable staff and equipment; there is the urgent need to provide intensive training courses to existing staff; there will be a continuing need to provide practical training to non-graduates.

179. The first argument is difficult to justify particularly as there is some concensus between university staff and the Office of Forestry on the need for changes in curricula. The problem of the provision of intensive training courses for existing staff and continuing courses for non-graduates are more readily associated with a separate training institution. There is in fact a requirement for both changes in the university courses, which will entail additional equipment and facilities and additional staff and the establishment of a forestry school for non-graduate forestry training.

180. An alternative approach which could provide an interim solution and meet the three immediate requirements would be the joint management of the proposed training center by the Office of Forestry and say the Seoul National University, providing courses for the three streams of students. This would have the advantage of building on to an existing institution and so facilitate the absorption of the new school when the expatriate staff leave, and also be a forceful influence in hastening the desired reorientation of university courses. It would also reduce the risk of adding to the present excess capacity. The mission recommends that this alternative be given serious study.

Assessment of Training

181. A complementary question is the future staffing requirements and suitable training facilities to meet these. At the present time there is no non-professional forester grade in the staff organization and there is a gap between forest guard duties and professional duties which tends to be filled on an ad-hoc basis by an upward or downward adjustment in the employment roles of these grades or by temporary posts. With the intensive management of large plantation areas which is contemplated in the proposed Special Development Areas a substantial expansion of this forester grade can be expected.

182. A thorough study of the future staffing requirements to implement the forestry program will be necessary before the proposed training school capacities can be assessed. This would include work schedules for the different tasks associated with the targets set by the program and the staffing categories needed to meet these. However, the preliminary formation of the Forest Training Center, which is considered to be sound in principle, should not be held up for the completion of such a study.

D. Forest Employment

Forestry Staff

183. The total number of full time staff employees in forestry is some 4,500; 2,500 of them have professional training, 400 are technical personnel, 600 are administrative and 1,000 are employed on protection duties. Details of the distribution of employment and type of posts are given in Appendix Table 13. With the exception of a few special posts in the Office of Forestry, Office of Forestry and provincial staff are paid in the Government scale Grades 3 to 5 the maxima of which are currently 21,400 won (US$54) monthly to 43,000 won (US$107) monthly. About 50% of staff are paid in the Grade 5 scale, 40% in Grade 4 and 8% in Grade 3. The salaries of the Forestry Association staff are reported to be higher than those of the Government.

184. There is virtually no mobility between provincial staff and between provinces and Office of Forestry, and this is attributable to the very low turnover rate in staff and also the absence of any unified staffing organization, the provinces controlling their own staff requirements and composition. Because of the low turnover, the average age of staff tends to be clustered in the age groups 30-40 years, which accounts for some 65% of staff, 25% are in the age group 40-50 years and only 10% in the under 30 group.

185. The unusually high proportion of professionally trained staff is mainly explained by the absence of a technical (synonymous with non-professional) forester grade.

186. The fragmented areas in which staff are employed and the diversified nature of the tasks they undertake make it difficult to appraise the adequacy of the numbers of existing staff in relation to the actual forestry program. In overall terms, and assuming that there were free mobility of staff between different tasks and locations, the present numbers would be easily able to manage the targets of the present development plan. In plantations establishment, for example, a team of some 60-70 foresters would be expected to undertake an annual program of 10,000 ha of concentrated blocks.

Labor

187. With the exception of some nursery work, there is no full time employed forest labor, work being undertaken on a casual basis by farm families. About 60-70% of the labor input in forestry is paid labor, the rest being the contribution of the owner (or member of the VFA for fuel blocks), as the quid pro que of the subsidy payments. For this reason, it is difficult to estimate the labor employment being generated by forestry. A rough estimate 1/ indicates that the total number of paid man days in forestry employment in 1972 is in the order of 12 million, equal to some 40,000 man years. If the non-wage labor is included, this figure would

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1/ Based on expenditures by Office of Forestry and Provincial Governments.

increase by some 30-40%. These estimates are expanded in Appendix Table 14. The daily wage rate is currently from 360 won to 430 won equal to about US$1.00.

188. The absence of a permanent labor force, even on a part year basis, is a constraint to the development of technical expertise in carrying out forest operations. The casual system of employment used is not conducive to developing the skills of trade and with the emphasis now being placed on creating large blocks of plantations, in which work schedules will require to be tightly controlled on a seasonal basis, the future labor employment pattern will need to be re-appraised. For example, the present task for planting of 200 seedlings per man day could probably be improved upon. The technical training being planned for forest staff will give a broader basis for the dissemination of improved techniques.

189. A related question is the seasonal availability of labor. With the present casual basis, where a situation of bunched labor demands arises, the farm family labor can be expected to give precedence to their farming needs which adversely affects seasonal forestry operations such as planting and weeding. Labor availability for off-farm employment varies considerably in different areas and this question requires evaluation in relation to specific reforestation project areas.

190. Staff and labor together (45,000 to 60,000 man year equivalent) represent about 1-1.5% of the total employment in the agricultural sector, which is estimated at 4.5 million 1/.

Forest Industries

191. The total employment in forest industries is estimated at 77,000 persons. The plywood industry is the biggest single employer of labor with some 20,000 employed in the 11 major mills and around 1,000 in the remaining plymills. The pulp and paper industry is the next largest employer with an estimated 15,000 employees and sawmilling ranks third with some 14,000 employees. The employment pattern is detailed in Table 7.

1/ Bank of Korea Monthly Economic Statistics, August 1972.

Table 7: ESTIMATED EMPLOYMENT IN FOREST INDUSTRIES

	Total employed ('000)
Plywood	21.0
Pulp and paper	15.0
Sawmills	14.0
Wood panels	0.5
Furniture	5.0
Matches	3.5
Kudzu fiber wallpaper	2.5
Bamboo	1.0
Toothpicks, chopsticks, pencils	4.5
Farm tools, wooden utensils, cork, sports goods, boat building, etc.	10.0
TOTAL	77.0

192. The larger plymills operate their own training establishments and some provide accommodation and canteen facilities for their employees. The proportion of female employees in the plywood industry is around 40%, and it is a common practice that only unmarried women are employed, indicating an abundance of labor for this type of employment. Plants are commonly operated on a 2 x 11 hour shift basis for a six-day week. The number of workers in this industry appears to have remained fairly constant over the last 3 years at around 21-22,000, whilst total production has increased in the same period by some 50%, which indicates significant increases in labor productivity.

193. Wage scales of forest industrial employees are reported to range from 10-15,000 won per month for unskilled workers, 25-35,000 won for skilled workers, and 30-100,000 won for technicians.

194. The employment generated by forest industries is some 5-6% of total employment in manufacturing 1/ and some 4% of persons in regular paid employment.

X. FINANCIAL RESOURCES AND EXPENDITURES

A. Source of Finance

195. Total expenditure in forestry 2/ in 1971 was some 7.5 billion won and is expected to be 8 million won (US$20 million) in 1972. Office of Forestry expenditure accounts for about 80%, Provincial Governments 16%

1/ Estimated at 1.3 million - BOK Monthly Eco. Statis. August 1972.

2/ This does not include the major forest industries.

and the private sector 4%. About 25% of Office of Forestry expenditure is financed from the revenue generated by the National Forests. Some of the provincial expenditures are financed from provincial sources, and the remainder is financed from their budget allocations from the Ministry of Home Affairs.

196. The NACF provides loans for private forestry [1/] but these are limited to a ceiling of 50 million won a year (US$125,000) and have only been taken up to the extent of some 33% of this amount.

197. The sources of finance and expenditures on forestry are summarized in Table 8. Further details are given in Appendix Table 15.

Table 8: SOURCES OF FINANCE AND EXPENDITURE IN FORESTRY

Source	1971	1972 (committed)	1973
	.....(million won).....		
Office of Forestry			
(a) Revenue from National forests	1,641	1,575	1,530
(b) Central Government	4,226	4,833	5,519
Sub-total	5,867	6,408	7,049
Provincial Governments	1,395	1,283	1,719
Private			
(a) Own Finance	194	295	295
(b) NACF Loans	16	16	16
Sub-total	210	311	311
TOTALS	7,472	8,002	9,079

198. The revenue from National Forests is derived from sales of timber, which contribute about 40%, sales of miscellaneous items and rents 25% and the sale of isolated areas of National Forest Land, which have provided the balance of around 35%. The easily saleable land has been disposed of and it is becoming progressively more difficult to sustain revenue from this source. One of the objectives of these land sales has been to finance the purchase of private land to add to the larger blocks of National Forests for which about 20% of the revenue from land sales in 1971 was used 2/.

1/ Repayable in ten years, with a 5 year grace period, at a current interest rate of 9%.

2/ The area sold was 521 ha and the area purchased was 2,010 ha.

B. Stumpage

199. Most timber sales are of standing timber and there is no scale of stumpage rates for these sales. Sales are commonly conducted by auction of specified felling areas and the price paid is a combination of the estimates of the standing volume, the costs of extraction and the transport costs to sawmill. Since all these cost elements vary considerably between felling areas, it is difficult to arrive at representative stumpage rates. Estimates based on the volumes of timber sold at the Southern National Forest Station are summarized in Table 9.

Table 9: ESTIMATED STUMPAGE VALUES AT SOUTHERN NATIONAL FOREST STATION

	Softwoods			Hardwoods		
Year	Volume ('000 m^3)	Total Value (million won)	Estimated stumpage (won/m^3)	Volume ('000 m^3)	Total Value (million won)	Estimated stumpage (won/m^3)
1968	4.0	11.9	2,995	4.2	1.8	433
1969	4.1	11.9	2,930	15.9	7.2	454
1970	37.4	115.3	3,085	26.0	14.6	563
1971	38.2	134.2	3,517	13.7	7.8	567
1972	40.1	169.9	4,242	20.3	19.5	961

200. The increase in stumpage values is partly explained by the general price increase which has taken place during the period and partly by the increasing demand for timber. Sales of hardwoods are composed of small dimension timber much of which is used for mining. The current stumpage value for softwoods, equivalent to US$10.5 per m^3 is high and compares with values of US$3-6 per m^3 in Australia for similar material which is mainly composed of small dimension logs.

201. There is little expectation of the volume of sales increasing much above present levels in the next decade or so (this is discussed in Section 2), and revenues from this source cannot be expected to contribute much more than they are doing at present 1/.

1/ An accelerated planting program in the National Forests would give a higher yield as areas were cleared for planting, but the possibly higher extraction and transport costs may limit the value of the stumpage.

C. Expenditures

202. Expenditure in forestry is presently about 1% of the total of Central Government expenditure. Of the total current expenditure of the Office of Forestry of around 6.4 billion won (US$16 million), some 18% (US$3 million) is for management and overheads, 24% (US$3.9 million) is expended in the National Forests, 42% (US$6.6 million) is for subsidy payments to the Provincial Forest administration for the private forests 1/, 5% (US$0.8 million) is subsidy payments to the Forestry Association 2/, and 11% (US$1.7 million) is expended on research.

203. The present budgeted expenditure for 1973 provides for some small changes in the distribution of funds between these expenditures with some reduction in overheads and research. In addition there is an expectation of a further one billion won (US$2.5 million) for expenditure by the proposed Forest Development Corporation.

204. Expenditure in the National Forests is limited to the value of the revenue which they generate and the objective of this approach has been to induce self financed development of these forests. With the likelihood of revenues becoming more limited in the future, a reappraisal of this system will become necessary.

205. The provision of finance for industrial plantations establishment in the "Special Development Areas" will give rise to a review of the present flows into this work. Consideration should be given to reducing the overall size of the area to be planted annually from the present target figure of around 75,000 ha so as to concentrate resources in the "Special Development Areas". Some of these savings resulting from a smaller area being planted could be used for land acquisition purposes.

206. The present costing basis used for calculating plantation establishment costs is inadequate for calculating the amount of finance required for large-scale plantation establishment, since they only include the prices paid for seedlings, fertilizers, transport and assumed labor costs. They do not provide for management and overhead costs of roads, fire control and maintenance. The present establishment costs are reported to be around US$60-68 per ha, but these are likely to be more in the order of US$140-150 per ha when all cost elements are included.

207. Assuming that future investment in industrial plantations were to be in the "Special Development Areas" a program of 40,000 ha a year would give a requirement in the order of US$6 million a year, with a further requirement for maintenance in subsequent years. This compares with a current level of expenditure in plantation establishment of some US$4 million.

1/ Of this amount, some US$3 million is for plantations establishment, US$3 million for erosion control and US$0.6 million for protection.

2/ Of which 0.5 million is from fuelwood plantations.

208. The present level of expenditure on fuelwood plantations is insufficient to provide for the planned accelerated planting program and repair work to existing fuelwood blocks.

209. Establishment costs for fuelwood blocks could be expected to be less than those for industrial plantations because of the lower management and overhead costs. A figure of around US$75-80 may be a reasonable estimate. The proposed program of new fuelwood planting of around 50,000 ha a year will give a requirement of some US$3.75 million and the repair work to the existing fuelwood areas is likely to be of the same order.

210. The expenditures on erosion control work are unlikely to be able to be reduced for some years and there is still a substantial commitment outstanding for the resettlement of illegal cultivators.

211. Even with a readjustment within the present allocation of funds, a substantial increase in total funds would still be required to meet these development expenditures.

212. The Government has prepared preliminary drafts of three projects for international financing. One is for plantations development linked with exploitation and forest industries in Gangweon province. Another is for fuelwood plantations establishment and repair. The third is for special tree crops development. The Government is also seeking financial assistance for the continuation of the present UNDP (23) watershed management project, the establishment of a forestry training school, a reinforcement of their technical staff and facilities in forest protection, and is presently negotiating with the West German Government for a plantations development project of some 10,000 ha in Selected Area Number 10.

XI. RECOMMENDATIONS

A. Policy Oriented

Forest Land Ownership and Use

213. As mentioned earlier (para 10), recently enacted legislation provided for the establishment of a Forest Development Corporation which has responsibility for controlling the management of 'Special Forest Areas'. Private owners who have forest land in these areas would receive 10% of gross revenues. In view of the long periods required before trees can be harvested (20-30 years for pulp and up to 40-50 years for saw timber) and the small-scale ownership pattern such an arrangement may be difficult to administer and not appeal to owners. The acquisition of large blocks of land for sustained industrial plantation development is likely to be a major problem.

214. The mission believes that other alternatives should be considered including (a) purchase of land to expand national forest plantations, (b) long-term leases under which owners would receive annual rental payments and thus would be encouraged to put land in the special forest areas for management by the Forest Corporation, and (c) increased support for improved management of private forest plantations.

215. It is believed that large blocks of contiguous forestland are required to establish improved management practices and to overcome problems of protection from incendiarism, illegal cutting, and gleaning which restricts growth of vegetative cover. However, Korea's record of establishing improved forests does not appear to be much better for public land than for private land. Consequently, it is recommended that consideration be given to providing increased technical and financial support for establishing better management practices on private as well as on public forestland. It also will be desirable to expand the total forest area under public operation through purchase and long-term leases of private land. High priority should be placed on expanding fuelwood or alternative supplies of fuel for rural people to reduce destructive gleaning of both private and public forestland.

Industrial Plantations Establishment

216. It is recommended that:

(a) The present subsidy payments for private forest plantations be revised and emphasis be given to the provision of finance for concentrated plantations development under the management of the proposed Forest Development Corporation.

(b) Future plantations be justified by reference to financial and economic appraisal for both the plantations and the related forest industries.

Fuelwood

217. It is recommended that studies be undertaken to provide:

(a) An indicative overall fuel and energy plan over the next 20-30 years.

(b) Assessment of the impact of fuels, other than wood, in the rural areas, taking into consideration the difficulties of transportation.

(c) An estimate of the future fuelwood requirements for preparing rice straw for livestock feeding.

(d) An area breakdown of fuelwood block requirements in relation to population densities and availability of alternative fuels.

(e) Assessment of the possibility of providing subsidized fuel in areas where there is severe shortage whilst fuelwood blocks are being established.

Erosion Control and Watershed Management

218. The priorities in erosion control are the rapid completion of urgent works and a reduction in unit costs; there is also the longer term problem of establishing satisfactory management regimes over the wide areas of the watersheds which overlap into several provinces. It is recommended that this work be unified under a central authority which is representative of agricultural water resources and forestry interests.

Research

219. It is recommended that:

(a) The work of the provincial stations be reviewed with a view to reducing these and integrating their work with the FRI.

(b) The Resource Survey unit and Management Studies section of FRI be incorporated in the planning section and management section of OOF.

(c) More emphasis be given to species trials.

(d) Mensuration studies be extended to all commercial species.

(e) A formal consultative body be set up embracing the interests of the industries and related ministries and the OOF to formulate priority objectives and integrate the research program.

Particle and Fiber Board

220. These products, which can have a contribution in achieving cost reductions in building construction and furniture manufacture, are based wholly on waste residues. The capacities of these industries are presently underutilized and the current 20% sales tax is limiting demand. It is recommended this tax be lifted.

The Plywood Industry

221. The estimates of roundwood availability of the forests of Malaysia, the Philippines and Indonesia which indicate volumes of plywood logs sufficient to sustain the plywood industry well into the future are encouraging. At the same time, it must be recognized that a change of policy by those countries which might limit round log exports, could cripple the Korean industry.

222. Korea needs to maintain a continual review of market information regarding the log supply and pricing situations in the log-exporting countries. The appointment of a forest attache in Indonesia has been a significant step in this direction. It is recommended that a unified market intelligence unit be set up to cover the supply sources of the whole region.

223. A complementary and equally important function of the unit would be the development of expertise in market information and trends for plywood and plywood manufactures. Estimates of demand for imported hardwood plywood in the USA 1/ indicate that this will continue to increase through 1985, and future prospects in this market are encouraging. However, the tolerance of this specialized market with respect to any price increases which may be forced onto the industry by rising log or freight costs require carefull study. The possibilities of widening the market outlets for the existing types of products and developing production of other types, such as marine and waterproof plywoods, which may have a higher profitability, require further investigation.

224. At the present time there are obvious difficulties in coordinating the information and research which is being generated in different quarters by the individual producers, the KPIA 2/ the overseas logging concessionaires (who are not plywood manufactures) and the Office of Forestry. The KPIA could be strengthened with the addition of suitable marketing and technical personnel to undertake the log supply and products marketing aspects discussed and coordinate the related research activities. A consultative body representing the industry, the log suppliers and government would then be able to use this information for developing strategy and initiating policy decisions.

B. Investment Oriented

225. There are three main areas in which international financing would have an immediate impact on forestry development:

(a) The Establishment of Industrial Plantations

As indicated in Section I, a realistic first target for immediate establishment is in the order of 1 million ha. Detailed inventory and soil surveys have already been carried out in the Gangweon province area over some 250,000 ha and inventory surveys over a large area (1.5 million ha) in the southwest. In addition, a preliminary UNDP survey 3/ of the Nagdong river basin situated

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1/ "Current and Prospective Trends in Imports of Hardwood Timber Products into the U.S.A.," Dwight Hair, August 1969, Syracuse University.

2/ Korean Plywood Industries Association.

3/ Pre-Investment Survey of the Nagdong River Basin, 1971, Forest Survey and Development Project (KOR 23).

in the central and south of the country, indicates an area of some 500,000 ha suitable for industrial plantations. It is recommended that two areas of around 120,000 ha each be selected from the areas referred to for concentrated plantations development and projects prepared for these for possible international participation. Preparation of the basic data is more advanced in the Gangweon province area, (discussed further below), and a possible phasing of investment would be 1975 for Gangweon province and 1977 for second project area. At establishment costs of around US$150 per ha (excluding land values), and assuming a 10% addition for contingencies, the total cost for each project would be around US$20 million, of which half could be from international sources. This would include part of the local costs as well as the foreign exchange element.

(b) The Development of Forest Industries Associated with the Additional Volumes of Indigenous Timber Arising from the Concentrated Plantations Program

Estimates indicate that the standing volumes of timber in the proposed Gangweon province project area are around 40 m^3 per ha of which about half is softwood and half hardwood. With a planting program of 10,000 ha a year, this would generate annual volumes of some 350,000 m^3 of existing merchantable timber over a twelve-year period. This timber could be used for a number of purposes including saw timber, parquet flooring, particle and fiber board and pulp. There is also the possibility of augmenting this supply with the large annual volume of plywood waste, (some 300,000 m^3 of Lauan), for pulp production. This would largely depend upon the feasibility of establishing a pulpmill on the northeast coast which could be accessible for cheap sea transport of plymill waste and also be within the economic distance of the raw material supplies from the plantations when these become productive. The sawmills, flooring and boards factory, with the associated logging and roading is likely to require investment of a minimum of around US$10 million; a 100,000 TPA 1/ pulpmill complex using most of the combined supply of some 500,000 m^3 timber and waste, would require investment of around US$60-80 million. These possibilities require further study before firm proposals can be made. Assuming a 50% international involvement in the sawmills and factory, there would be a minimum requirement of around US$5 million; this could be phased for 1976.

(c) The Establishment of Fuelwood Blocks

The Government proposes to reserve 1.05 million ha for fuelwood blocks. Although the total area may be modified following an in-depth study of the likely fuel and energy resources of the country (discussed in Chapter VI), it is unlikely to be substan-

1/ Metric tons per annum.

tially reduced. Investment is required to upgrade the existing fuelwood areas, (estimated at around 800,000 ha) and to establish a further 200,000 ha. Establishment costs are likely to be in the order of US$80 per ha and upgrading costs may average about US$40 per ha, giving a total investment of around US$48 million, excluding the labor contribution provided by the villagers. The direct benefits from this investment would be a reliable fuel supply to the rural population, the release of a large area for other rural development, a reduction in erosion control expenditures and the improvement of the watersheds. There would also be the residual benefit of the timber value of the trees in future years. Fuelwood establishment is inter-related with other development activities of upland improvement for livestock and cropping and would form a sub-project of an integrated rural development package. The benefits would be early maturing, with fuel yields becoming available in from 3-6 years, and contain a high social content (see Chapter VI): for these reasons, the Government could be expected to provide the greater share of the investment. An international contribution of about 30% of investment costs would require some US$15 million 1/.

226. In addition to these investments, there are:

(a) The Forestry Training School

The Government, assisted by FAO, have prepared preliminary estimates of external financial assistance for this amounting to some US$800,000. This could form a special fund project and be linked with FAO technical assistance to carry out a manpower and training requirements study for forestry and forest industries.

(b) The Development of Special Tree Crops

The potentially high profitability indicated by the studies carried out by the OOF in the cultivation of chestnuts and walnuts, with financial rates of return of around 20%, would give a high priority to these in upland development programs. Extension of the areas of these crops would form part of an integrated rural development package. The Government 2/ has prepared draft preliminary loan requests for the plantations and forest industries development in Gangweon province (para 228 (a) and (b) above) fuelwood blocks (para 228 (c) and Special Tree Crops). In addition, the mission was requested to consider a request 3/ for a Bank loan for the establishment of five straw-pulp factories; this is not considered to be a viable project because barley

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1/ This could be supplemented by the provision of aid under the World Food Program.

2/ Prepared by OOF.

3/ Prepared by EPB.

straw, which would form a large part of the raw material base in the proposed project, is not considered suitable for pulping. These requests are summarized and commented on in Appendix 16.

(c) Plantations and Forest Industries Development, Gangweon Province

The Gangweon province area was the venue of the UNDP Forest Survey and Development Project (KOR 14 and 23); unfortunately the project did not complete a development plan, although this was considered to be its first priority, by the termination of the first phase 1/. The second phase, KOR 23, has concentrated on erosion control problems in other parts of the country with the consequent neglect of the industrial plantations issue. The present proposal is for the development of 120,000 ha of 1.2 million ha surveyed under the UNDP (KOR 14) project. Of the proposed 120,000 ha, 50,000 ha are expected to be in existing National Forests and 70,000 ha would be from Private Forest lands 2/. There is a presumption that the new legislation will be operative before the project commences and the proposed Forest Development Corporation would be constituted and become the executing agency for the Government. It is recommended that the proposed project be given a high priority for identification and preparation which could be undertaken by the FAO/IBRD Cooperative Program. A suitable team to undertake this work would be composed of a forest expert in large-scale plantations establishment, a logging, forest roads and sawmills expert, a forest industries expert with particular emphasis on pulp and production, and an economist. Suggested terms of reference for the team would include:

(i) Evaluation of land availability and suitability for plantations establishment which would include an appraisal of the areas mentioned in the UNDP report (KOR 14) with the objective of establishing a priority ordering of the plantations development area.

(ii) Market studies of future demand for all wood products.

(iii) Volumes of indigenous timber for exploitation arising from an accelerated plantations scheme in concentrated areas.

(iv) Expectation of yields and rotations for plantations species.

(v) Evaluation of forest industries development and possible areas for expansion with respect to present and future raw material supplies, availability of water and energy, communications and consumption centers; the preparation of terms of reference for feasibility studies for this

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1/ Interim Report UNDP (KOR 14-23).

2/ A new national road, which will pass through the area, is planned for construction in 1973/75.

development, which would include commercial pulping tests of the indigenous and exotic species.

(vi) Assessment of management and labor requirements for the project and whether any overseas staff would be needed to assist with implementation.

(vii) Assessment of a feasible annual plantations program for the project.

(viii) Economic and financial studies of plantations development and the associated forest industries. These would take account of the possibility of embracing re-settlement of illegal cultivators, improvement in watershed catchments and amenities for tourism, absorption of under-employed labor, effects on the commodity balance of trade and foreign exchange and secondary benefits arising from the improved road communications in the area.

227. These recommendations are summarized and tabulated in a suggested chronological order in Appendix Table 17.

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

INDICATIVE TABLE OF DOMESTIC SUPPLY, IMPORTS AND CONSUMPTION OF ROUNDWOOD

(Unit 000 m^3)

Year	Domestic Supply						Imported		Domestic Consumption (excl. pulp/paper)
	Mining Timber	Pulpwood	Sawlogs	House Building Scaffolding and Telegraph Poles 1/	Fuelwood	Plywood Logs 2/	Sawlogs	Log 3/ Equivalent of exported plywood	
1960	250	50	152	280	7,000	222	246	-	8,200
1961	100	30	100	280	7,000	88	228	32	7,794
1962	146	33	169	290	7,000	160	430	52	8,176
1963	269	26	178	300	7,000	218	205	110	8,086
1964	281	36	177	310	8,000	308	256	208	9,160
1965	304	41	158	320	8,000	511	245	345	9,234
1966	313	83	383	330	8,000	707	391	496	9,711
1967	335	111	345	340	8,000	993	536	735	9,925
1968	367	158	275	350	8,000	1,259	751	877	10,283
1969	386	200	298	360	8,000	2,020	630	1,420	10,474
1970	450	206	189	370	8,000	2,280	875	1,579	10,791
1971	470	281	284	380	9,000	2,851	905	2,078	12,093
1972 (estimated)	470	274	284	380	9,000	2,800	1,006	2,166	12,062 4/
Projections to:									
1975	450	500	300	350	9,000	3,120	1,512	2,353	12,879
1980	500	1,000	300	300	9,000	3,530	2,056	2,805	13,881

1/ Estimated figures derived from Timber consumption survey (KOR 23). This category is omitted from Office of Forestry Records.

2/ Includes approximately 16% of plywood log rejects which are used for saw timber (a further 10-20% of off-cuts and cores are also used for saw timber).

3/ Estimated on basis of 90% plywood log import adjusted for proportion of plywood exported.

4/ Estimated roundwood equivalent of imported pulp and paper are 1.192 and .093; the total estimated domestic consumption including these categories is 13.347.

Note: The totals of domestic supply and imports show wide variance in the different source materials.

Sources: Office of Forestry Statistical Yearbooks. Basic Forest Development Plan. Forest Research Note 11/1972 Pulp and Paper in Korea. U. N. Korean Forest Survey and Development Project (KOR 23) Timber Consumption Survey.

ANNEX 10
Appendix Tab1

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

PRODUCTION, IMPORTS AND CONSUMPTION OF PULP

(Unit '000 Metric Tons)

Year	Production		Imports		Consumption			
	GP 1/	SCP 2/	GP	CP 3/	GP	SCP	CP	TOTAL
1960	20		7	19	27		19	46
1961	25		1	47	26		47	73
1962	19		8	46	27		46	73
1963	21		7	57	28		57	85
1964	21		5	64	26		64	90
1965	27	1	3	55	30	1	55	86
1966	36	1	9	78	45	1	78	124
1967	38	1	12	92	50	1	92	143
1968	42	3	16	132	58	3	132	193
1969	61	5	13	160	74	5	160	239
1970	75	5	14	156	89	5	156	250
1971	79	5	8	201	87	5	201	293
1972 (Estimated)	93	8	9	234	102	8	234	344
1980	130	30/CP 130	100	490	230	30	620	880

1/ Groundwood Pulp

2/ Semi chemical Pulp

3/ Chemical Pulp

Source: Ministry of Commerce and Industry - Office of Forestry for 1980 Projections

ANNEX IO
Appendix Table 2

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

PRODUCTION, IMPORTS AND CONSUMPTION OF PAPER

(Unit '000's metric tons)

Year	Production			Imports			Consumption			
	N/P 1/	P/W 2/	Other 3/	N/P	P/W	Other	N/P	P/W	Other	TOTAL
1960	27	14	13	18	-	17	45	14	30	89
1961	33	13	23	9	1	8	42	14	31	87
1962	38	19	51	6	1	10	44	20	61	125
1963	42	28	52	3	-	3	45	28	55	128
1964	42	30	57	6	-	7	48	30	64	142
1965	45	31	63	2	-	3	47	31	66	144
1966	55	38	67	11	-	4	66	38	71	175
1967	58	48	79	14	-	4	72	48	83	203
1968	62	52	118	21	5	7	83	57	125	265
1969	79	62	140	12	1	11	91	63	151	305
1970	102	71	154	7	1	21	109	72	176	357
1971	105	90	198	13	1	27	118	91	225	434
1972 (estimated)	107	97	246	7	-	22	114	97	268	489
1975	167	137	431				167	137	431	735
1980	250	150	500				250	150	500	900

1/ Newsprint

2/ Printings and writings

3/ Kraft and Paperboards

Source: Ministry of Commerce and Industry. Office of Forestry for 1980 Projections.

ANNEX 10
Appendix Table 3

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

TABLE OF VALUE OF EXTERNAL TRADE (At Current Prices)

(Unit US$ Million)

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972 (Est.)
IMPORTS (CIF)												
Sawlogs)					8.6	13.6	17.8	27.9	24.4	37.1	38.9	40.0
Veneer logs) 1/					17.4	24.6	37.0	46.5	75.5	88.4	122.1	122.0
Sawn timber)	7.2	18.4	22.5	18.5	0.3	0.4	0.5	0.3	0.8	0.9	0.8	-
Sleepers)					0.1	0.5	1.3	2.1	2.4	0.6	0.4	-
Bamboo, wood waste and other 1/					0.2	0.2	0.8	1.0	1.0	1.5	1.5	1.5
Pulp 2/	5.0	8.3	8.6	7.3	8.8	12.3	15.6	21.7	24.4	31.2	35.1	42.0
Paper 2/			1.6	1.7	1.3	4.2	3.7	6.2	5.6	10.1	13.9	10.0
Total	12.2	26.7	32.7	27.5	36.7	55.8	76.7	105.7	134.1	169.8	212.7	215.5
Total value of Commodity Inputs				404.4	463.4	716.4	996.2	1,462.9	1,823.6	1,984.0	2,394.3	-
Percentage of forestry sub-sector				7%	8%	8%	8%	7%	7%	9%	8%	
EXPORTS (FOB) 3/												
Plywood	1.9	3.0	6.8	12.6	19.1	30.7	41.4	67.4	81.8	102.4	138.7	147.0
Dimension timber							0.1	0.1	0.2	0.3	0.9	1.3
Manufactured wood products						0.1	0.1	0.3	1.3	1.1	4.4	3.0
Kundzu Fibre Wallpaper	0.1	0.1	0.2	0.5	1.5	2.0	1.7	2.3	2.5	4.1	3.5	5.0
Oak Mushroom	0.4	0.4	0.3	0.5	0.3	0.5	0.5	0.6	0.9	1.4	1.7	2.0
Others						0.3	0.5	0.9	0.8	0.7	1.4	1.7
Total	2.4	3.5	7.3	13.6	20.9	33.4	44.3	71.6	87.5	110.0	150.6	160.0
Deficit on commodity trade balance	-9.8	-23.2	-25.4	-13.9	-15.8	-22.4	-32.4	-34.1	-46.6	-59.8	-62.1	-55.5
Total value of commodity exports					175.1	250.0	320.2	455.4	522.5	835.2	1,067.6	-
Percentage of forestry sub-sector					12	13	14	15	14	13	14	

1/ Data from Office of Forestry for 1965-1972; EPB for 1961-1964

2/ Data from Ministry of Commerce and Industry for 1963-1971 and 1972; EPB for 1961-1962

3/ Data from Office of Forestry

ANNEX 10
Appendix Table 4

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

ROUNDWOOD SUPPLY AND DEMAND BALANCE

(Unit Million m^3)

	Domestic Production			Imports			Exports 1/			Net Deficit		
	1960	1970	1980	1960	1970	1980	1960	1970	1980	1960	1970	1980
Sawlogs	0.15	0.19	0.30	0.25	0.88	2.06	-	-	0.20	0.25	0.88	1.86
Plywood logs	-	-	-									
Mining timber	0.25	0.45	0.50	0.22	2.88	3.53	-	1.58	2.61	0.22	0.70	0.92
Building, scaffold, telegraph poles	0.28	0.37	0.30	-	-	-	-	-	-	-	-	-
Fuel wood	7.00	8.00	9.00	-	-	-	-	-	-	-	-	-
Pulp:												
Mechanical (mn. mt.)	(0.02)	(0.08)	(0.13)	(0.01)	(0.02)	(0.10)	-	-	-	-	-	-
Round log eq (m^3) x 2.5	0.05	0.19	0.33	0.02	0.04	0.26	-	-	-	0.02	0.04	0.26
Semi chemical (mn.mt.)	-	(0.01)	(0.03)	-	-	-	-	-	-	-	-	-
Round log eq. (m^3) x 3.3	-	0.02	0.08	-	-	-	-	-	-	-	-	-
Chemical (mn. mt.)	-	-	(0.13)	(0.02)	(0.16)	(0.49)	-	-	-	-	-	-
Round log eq. (m^3) x 5.0	-	-	0.65	0.10	0.78	2.47	-	-	-	0.10	0.78	2.34
Paper:												
Newspring (mn. mt.)	(0.03)	(0.10)	(0.25)	(0.02)	(0.01) 3/	-	-	-	-	-	-	-
Round log eq. (m^3) x 2.8 2/	-	-	-	(0.05)	0.02	-	-	-	-	0.05	0.02	-
Printing & writing (mn.mt)	(0.01)	(0.07)	(0.15)	-	(-) 3/	-	-	-	-	-	-	-
Round log eq. (m^3) x 3.5 2/	-	-	-	-	-	-	-	-	-	-	-	-
Kraft & Others (mn. mt.)	(0.01)	(0.15)	(0.50)	(0.02)	(0.02) 3/	-	-	-	-	-	-	-
Round log eq. (m^3) x 3.25 2/	-	-	-	0.06	0.07	-	-	-	-	0.06	0.07	-
Total	7.73	9.22	11.16	0.70	4.07	8.32	-	1.58	2.81	0.70	2.49	5.38

Total Roundwood Equivalent	1960	1970	1980
Domestic Consumption	8.43	11.71	16.66

1/ Roundwood equivalent of plywood and sawn timber exports.

2/ Roundwood equivalent included in pulp.

3/ Assumed that total domestic demand will be met from domestic production in 1980.

ANNEX 10
Appendix Table 5

ANNEX 10
Appendix Table 6

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

ANNUAL PLYWOOD PRODUCTION, DOMESTIC SUPPLY AND PRODUCTION

(Unit Thousand m^3)

Year	Total Production	Domestic Supply 1/	Percent	Exports	Percent
1960	70	69	100	0.4	-
1961	62	38	61	18	39
1962	106	68	64	27	36
1963	125	55	44	70	56
1964	186	46	25	131	75
1965	271	67	25	213	75
1966	446	97	22	346	78
1967	554	145	26	421	74
1968	887	209	23	655	77
1969 2/	821	181	22	572	78
1970	1,056	234	23	835	77
1971	1,239	234	19	993	81
1972 (estimated)	1,339	245	18	1,100	82

1/ Does no include the domestic production of some 20 small-scale plywood plants which is estimated at between 15-18 thousand m^3 in 1972.

2/ Data before 1969 based on 1/8" thickness; 1969 onward on panel surface.

Note: Figures do not add to total production because of carry-over stocks. A conversion of 1,000 sq ft x 4 mm thickness = 0.3719 m^3 has been used.

Source: Office of Forestry

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

CAPACITIES AND PRODUCTS OF MAJOR PLYWOOD PLANTS - 1972

Plant and Location	Main Products	Other Products	Number of Employees	Annual Capacity '000 sq.ft of 1mm Thickness
1. Tae Sung Lumber Ind. Co. Ltd. Inchon	Plywood: Raw Panel, Prefinished, Printed, Vinyl Laminated, DAP Printed, Paper overlaid. Particle Board. Lumber	Formalin, Methanol	4,680	911,000
2. Tong Myung Timber Co. Pusan	Plywood: Raw Panel, Prefinished, Laminated, Fancy. Particle Board, Lumber.	Formalin	4,285	1,103,000
3. Sung Chang Enterprise Co. Ltd. Pusan	Plywood: Raw Panel, Melamine, overlaid, Prefinished, DAP overlaid Printed, Fancy, Hi-color, Mosaic Flooring, Lumber. Furniture	Formalin Hi-pool adhesives	2,095	515,000
4. Chung Koo Lumber Ind. Co. Ltd. Kunsan	Raw Panel Plywood. Lumber		850	140,000
5. Kwang Myung Lumber Co. Ltd. Pusan	Plywood: Raw Panel, Prefinished, Lumber	Formalin	1,035	236,000
6. Korea Plywood Mfg. Co. Ltd. Kunsan	Plywood: Raw Panel, Prefinished, Printed. Lumber	Urea Resin. Formalin	2,030	428,000
7. Shin Heung Lumber Co. Ltd. Kunsan	Plywood: Raw Panel. Prefinished Mosaic Flooring. Strip Flooring. Lumber.		1,040	240,000
8. Dae Myung Wood Industrial Co.Ltd. Pusan	Plywood: Raw Panel, Lumber		975	161,000
9. Sun Chang Industrial Co. Ltd. Inchon	Plywood: Raw Panel. Lumber		780	91,000
10. Tae Chang Wood Industrial Co. Ltd. Pusan	Plywood: Raw Panel, Paper Overlay, Fancy Mosiac Flooring Lumber		1,140	280,000
11. Ban Do Lumber Co., Pusan	Plywood: Raw Panel, Paper Overlay, Fancy, Mosiac Flooring Lumber		1,000	250,000
TOTAL			20,000	4,355,000

1/ Commenced Production in 1972.

Source: Korean Plywood Industries Association

ANNEX 10
Appendix Table 7

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

PARTICLE BOARD

CAPACITY, PRODUCTION, PROPOSED EXPANSION AND ESTIMATED FUTURE PRODUCTION
(Unit-Metric Ton)

Name of Plant and Location	Type of Product	Annual Capacity (22-hr day)m/t	PRODUCTION 1/ 1963	1964	1965	1966	1967	1968	1969	1970	ESTIMATES 1971	1972
Chung Whang, Seoul	Raw P/B	7,000	70	70	80	Production not recorded after 1965						
Tae Sung-A Incheon 2/	Raw P/B	18,000	1,300	5,660	6,000	14,800	21,000	22,000	19,000	18,000	18,000	9,000
Tae Sung-B Incheon 2/	Raw P/B	24,000 4/	-	-	-	-	-	-	-	-	3,000	12,000
	Decorative Finish	15% of capacity										
Tong Myung Busan 2/	Raw P/B	23,850 5/										
	Decorative Finish	20% of capacity	-	-	-	-	-	-	-	-	-	1,000
		TOTALS	1,370	5,730	6,080	14,800	21,000	22,000	19,000	18,000	21,000	22,000

ESTIMATED FUTURE PRODUCTION

			1973	1974	1975	1976
Tae Sung-A) Tae Sung-B) Incheon			39,000	39,000	39,000	39,000
Tong Myung Busan			20,000	20,000	20,000	20,000
Dongwha Enterprise 3/ Incheon	Raw P/B	36,000	-	This plant is proposed for construction in 1973		
		TOTALS	59,000			

1/ Production in 1961 and 1962 was 60 metric tons

2/ These plants are integrated with plywood mills, using lauan waste from ply production. The Tae Sung plants are situated within the one industrial complex.

3/ This plant is planned to be integrated with the sawmill, using waste from that mill.

4/ Based on conversion of 50 sheets x 8' x 4' x 6mm = 1 m/t.

5/ Based on conversion of 70 sheets x 8' x 4' x 6 mm = 1 m/t.

ANNEX 10
Appendix Table 8

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

FIBRE BOARD

CAPACITY AND PRODUCTION

(Metric Tons)

Plant and Location	Type of Product	Annual Capacity (m/t) (3-shift) 1/	1963	1964	1965	1966	1967	1968	1979	1970	1971	Estimate 1972 3/
Sam Yung	Raw hardboard	24,750	2,154	3,695	4,366	4,526	5,433	5,546	6,956	6,713	6,500	2,000
Anyang	Decorative 2/	2,500										

1/ Capacity increased in 1968 and 1970

2/ Decorative plant installed in 1970

3/ Plant shut-down 1971/72. Estimated output in 1973 is 16,000 tons working 2-shifts.

ANNEX 10
Appendix Table 9

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

LOCATIONS AND CAPACITIES OF THE MAJOR PULP AND PAPER PLANTS

	Location	Name of Plant	Nominal Pulp Capacity 000's m/ton	Nominal Paper Capacity 000's m/ton	Type of Product
1.	Seoul	Sampung Paper	G.W. 15	20	N.P. 1/
2.	Seoul	Daehan Paper	G.W. 15	20	N.P
3.	Seoul	Daehan Pulp	Not producing	15	Boards and Corrugated
4.	Seoul	Dongyang Paper		10	Boards and Corrugated
5.	Seoul	Sinyang Paper		5	Boards and Corrugated
6.	Seoul	Samyang Pulp	SCP 7.5	20	Boards and Corrugated
7.	Seoul	Poongkuk Paper		10	Boards
8.	Seoul	Murim Paper		15	Woodfree P/W 2/
9.	Sihung (Panyang)	Hankuk Paper		30	Woodfree P/W
10.	Sihung "	Sanduk Paper		15	Woodfree P/W Boards
11.	Sihung "	Kyungnam Paper		13	Kraft
12.	Daeduk	Namhan Paper		10	Woodfree P/W Kraft
13.	Pyungtaek	Kyesung Paper		21	Woodfree P/W Kraft
14.	Zinzyn	Zinzyn Paper		5	Kraft - Tissues
15.	Gunsan	Korea Paper	G.W. 15	50	N.P.
16.	Gunsan	Shinpoang Paper		20	Boards
17.	Jeonju	Jeonju Paper	G.W. 40	50	N.P. Woodfree P/W
18.	Osan	Samhwa Paper		30	Kraft
19.	Daejeon	Daewon Paper		30	Kraft
20.	Busan	Suchul Pojang		6	Corrugated
21.	Busan	Dong-A Paper		5	Printing
			92.5	400	

1/ Newsprint

2/ Printing and writing

Sources: Paper Manufacturers Association and OOF.

ANNEX 10
Appendix Table 10

ANNEX 10
Appendix Table 11

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

MINOR FOREST INDUSTRIES

Type of Production	Number of Plants	Main Timbers Used	Estimated Annual Roundwood Requirements ('000 m³)		
Wood block flooring	3	Oak	12		
Toothpicks	3	Aspen	6	1/	2/
Pencils	9	Poplar	13		2/
Chopsticks	41	Poplar	40		2/
Ice-cream spoons	1	Poplar	10		2/
Matches	37	Poplar	28		
Bobbins	13	Hardwoods	5		
Wooden ware	17	Hardwoods	2		
Sports goods	12	Hardwoods	2	1/	2/
Musical instruments	14		6	1/	2/
Picture frames	1	Mixed	2	1/	
Boat building	55	Cedar and Hardwoods	64	1/	
Furniture	245	Hardwoods	200	1/	
Total	446		390		

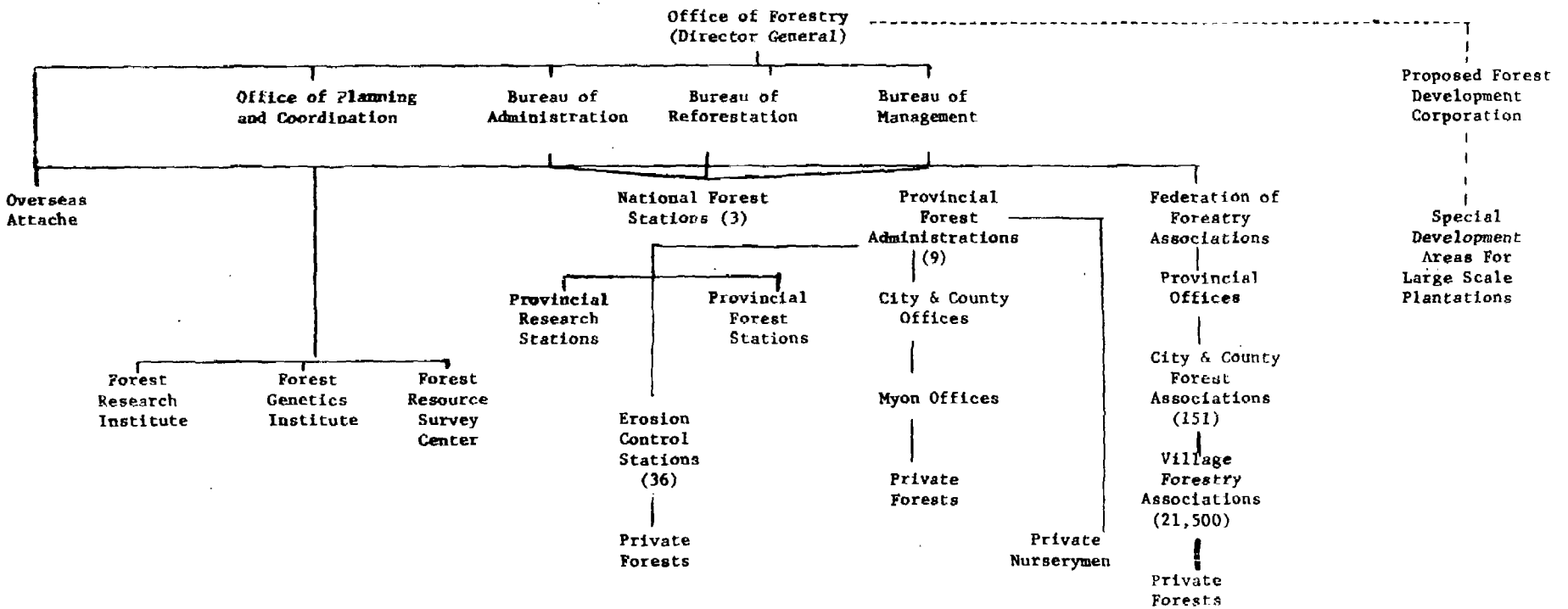
1/ Large proportion of imported timber.

2/ Export markets are being developed for these products.

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

CHART OF FOREST ADMINISTRATION



ANNEX 10
Appendix Table 12

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

FULL TIME EMPLOYMENT OF STAFF IN FORESTRY - 1972

Employer	Type of Post					TOTAL
	Administration	Professional	Research	Technical and Temporary	Forest Security	
Office of Forestry						
HQ staff	74	65	-	12	-	151
Forest research institute	13	8	58	20	6	105
Forest genetics institute	6	-	37	6	1	50
Forest survey institute	3	-	20	5	-	28
Forest survey institute (all temporary)	3	-	15	37	-	55
National forest stations	48	191	-	36	276	551
Sub-total	147	264	130	116	283	950
Provincial forests						
HQ staff	21	181	-	11	27	240
Erosion control stations	50	337	-	10	-	397
Research stations	13	16	47	25	-	101
Forest stations	18	128	-	33	-	179
Cities and counties	7	740	-	3	674	1,424
Sub-total	109	1,402	47	82	701	2,341
Forest Associations	353	731	-	173	-	1,257
TOTAL	609	2,397	177	371	984	4,538

ANNEX 10
Appendix Table 14

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

ESTIMATED PAID EMPLOYMENT IN FORESTRY - INDUSTRIAL WORKERS - 1972

	000 man days	
Office of Forestry Funds Flows :	Paid	Unpaid
9,000 ha plantations at 46 man days/ha[1] National Forests	414	-
Maintenance of plantations $\frac{116 \text{ million}}{400 \text{ p/day}}$	290	-
64,000 ha private forest at[2] 10 man days paid	640	2,300
15,000 ha fuelwood " at[3] 2 " " "	30	1,970
9,000 ha special tree " at[2] 10 " " "	90	360
Roads, boundaries and firelines in National Forests	138	-
Protection, all forests	100	-
Working plans, all forests	31	-
Nursery work " " (assume 275 million seedlings at 7,000 man days per million)	1,952	-
Seed collection $\frac{275,000,000}{20,000/\text{kg}}$ = 13,750 kg at 4 days per kg	55	-
Erosion control hillside and sand dune[4]		
4,100 ha x 200 m/days 820		
Repair 2,200 ha x 60 m/days 132		
Stream Channel 265 ha x 4,500 m/d 1,192	2,144	
	5,880	
Miscellaneous duties and private wage payments add 10%	590	
Sub-total (2)	6,470	4,630
Add employment generation from provincial funds at 20% of above	1,300	
Sub-total (2)	7,770	
Felling extraction and transport of timber (assume 2 man days per m^3) x 1.3 million	2,600	
Minor forest products harvesting and processing[5]	1,400	
Total	11,700	

1/ All paid labor.
2/ Only 10 days paid.
3/ Only 2 days paid.
4/ Based on UNDP (KOR 23) Vol. 8:7 for unit costs and labor breakdown and O.O.F. Estimates for subsidy payments.
5/ Estimates of O.O.F.

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

REVENUE AND EXPENDITURE[1] OF OFFICE OF FORESTRY 1971-1973
(million won)

	1971	(Estimated) 1972	Budgeted for 1973
Expenditures			
1. Office of Forestry H.Q.s:			
Management and overhead expenditures	1,078	1,156 (18%)	1,011
2. National Forests:			
Management	217	434	363
Nurseries	113	141	211
Plantation Establishment	180	228	233
" Maintenance	124	116	143
Protection	224	117	123
Roads Construction/Maintenance	52	76	45
Costs of Exploitation	77	113	100
Purchases of Land	120	162	135
Other	337	168	173
Sub-total	1,444	1,555 (24%)	1,526
3. Subsidies Paid to Provincial Forest Administrations for Private Forests:			
Plantations Establishment and Special Tree Crops	1,122	1,196 (19%)	1,188
Erosive Control and Protection	1,378	1,459[2] (23%)	1,330
Sub-total	2,500	2,655 (42%)	2,518
4. Subsidies Paid to Village Forest Associations:			
(a) Fuelwood blocks	233	218 (3%)	224
(b) Others	59	87 (2%)	134
(c) Forest By-Products	36	40	31
Sub-total	328	345 (5%)	389

1/ Approximately 1% of the total central government expenditures is expended on Forestry.
2/ 1.2 million (equal to 19% of total) is expenditure on Erosion Control.

	1971	(Estimated) (1972)	Budgeted for 1973
5. Expenditure on Research:			
(a) Forest Research Institute	319	468	329
(b) Forest Genetics Institute	124	144	175
(c) Forest Resource Survey Institute	74	85	101
Sub-total	517	697 (11%)	605
6. Proposed Expenditure by New Forest Development Corp.	-	-	1,000
Totals	5,867	6,408 (100%)	7,049
Revenues (All derived from National Forests)			
1. Sales of Standing Timber	521	447	537
2. Sales of Logs	59	152	73
3. Sales of thinnings and miscellaneous items including rents	514	126	205
4. Sales of Land	547	850	715
Totals	1,641	1,575	1,530

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

DRAFT PRELIMINARY LOAN REQUESTS

1. Gangweon Province Forest Development

(a) Object

(i) To establish large-scale industrial plantations of around 120,000 ha.

(ii) To develop more intensive use of the existing forest.

(iii) To develop forest industries based:

(a) The immediate yields from the existing forest, which can be expected to increase with the introduction of an intensive plantations establishment program;

(b) The longer-term yields from the plantations.

(b) Cost Estimates (US$ million)

These are given as	Capital Costs	36
	Maintenance Costs	118
	Total	154

Over a twenty-year disbursement period.

(c) Method

The project would be implemented by the Office of Forestry; the Forest Corporation proposed under the new legislation would be the executing agency.

(d) Comments

(i) The Gangweon province area was the venue of the UNDP Forest Survey and Development Project (KOR 23). The area has been surveyed for inventory and soil suitability and type maps are available.

(ii) Of the 120,000 ha proposed for plantations, 50,000 ha are expected to be available in existing National Forest areas and 70,000 ha would be from Private Forest lands which would be taken over for management by the Forest Corporation as part of the Special Development Areas.

(iii) Preliminary indications are that Gangweon province would be a suitable area for large-scale plantations development. However, there are some alternative areas, (e.g. The Nagdong basin and an area in Yeongsangang county in the East of the country), which should be evaluated before finally ordering priorities of areas to be dealt with.

(iv) The rate of plantations establishment could be increased; this would bring forward the years of harvesting benefits. Since the production of pulpwood would almost certainly be a primary objective, the quicker this could be made available, the earlier would be the benefits of an expanded pulp/paper industry and savings in foreign exchange.

(v) The costs of the project require to be analyzed and justified by reference to the constituent costs of the various elements. Stumpage values for the plantations will require to be calculated.

(vi) The forest industries which are proposed, (sawmills, particle board and floor-block factories and a pulpmill), will require to be justified on a profitability analysis. Such an exercise would form part of a larger study into forest industries development for the country and the industrial plantations required to support these.

2. Fuelwood Blocks

(a) Objective

To achieve sustained annual production of 7.2 million m ton of woodfuel from fuelwood blocks distributed throughout the whole rural area. This production target is based upon projections of total rural demand for fuel and the extent to which this may be expected to be met by the substitute fuels of coal, kerosene and gas.

Demand and Composition of Fuels for Rural Population
1971 and 1981

	1972	1981
Number of families to be supplied (million)	2.8	2.7
Total fuel required ('000 m ton)	11.8	11.4
1. Consumption of coal, gas, oil ('000 m tons)	1.1	2.6
2. Consumption of straw and other farm byproducts (" " ")	2.9	0.3
3. Fuel from thinning and pruning of industrial plantation (" " ")	0.9	1.3
4. Forest gleanings/litter (" " ")	2.7	-
5. Fuelwood plantations (" " ")	4.2	7.2
Total	11.8	11.4

(b) Method

Improvement of the existing fuelwood blocks, which are estimated to be 845,000 ha in extent, and establishment of a further 205,000 ha, making a total area of 1.05 million ha of fuelwood blocks.

(c) Cost estimates

Total project cost of US$80 million, of which US$58 million would be contributed by Government and expended in:

50% of cost of labor
100% of cost of seedlings
100% of cost of fertilizers
100% of cost of transport

and US$22 million is the estimated cost of 50% of the labor input to be provided by VFA members.

Project Area, Costs and Period

	Period	Area ('000 ha)	Total costs Government (US$ million)	Total costs Private (US$ million)
1. Fuelwood plantation establishment	1973-76	205	13	5
2. Tending operations over existing fuelwood blocks	1973-81	845	16	12
3. Fertilizer application over entire area	1973-82	1,050	29	5
Total			58	22

(d) Comments

(i) The area proposed for fuel-block establishment, 1.05 million ha, is a large part of the land area available for upland development (about 25%).

(ii) Before committing capital flows of this magnitude into permanent fuelwood blocks, a rigorous study of the future development of other energy sources is needed so as to produce an indicative overall fuel and energy supply plan. Ministry of Commerce and Industries have projections of supply and demand for household consumption of coal and oil up to 1976 only. This is not sufficiently ahead. Furthermore, these do not differentiate between urban and rural demand.

(iii) There is some indication that coal production could be increased beyond the levels forecast if Government (which mines about 30% of coal production) took over some of the private mining concessions which are at present not being worked, because of lack of capital. The off-shore drilling now taking place will have a probability rating and may alter the longer term oil consumption pattern. The further development of hydro power and the proposed rural electrification project may also alter the picture.

(iv) The fuel requirements of specific areas could then be determined in relation to the availability of alternative fuels and from this analysis a total fuelwood area compiled.

(v) The costs of the project require to be justified by reference to the constituent elements.

(vi) The expectation of fuelwood yields require further elaboration; these are assumed to be 7 m ton/ha per year in the proposal which compares with only six quoted in the UNDP (KOR 23) references.

(vii) The project represents a subsidy payment to the rural population in exchange for freeing the upland area for alternative development. Fuelwood establishment costs can then be a measurement of the opportunity cost of that land for other uses.

(viii) The project is part of the rural development package and could form one of the elements of a composite project.

3. Special Cash-Crop Trees (Chestnuts, Walnut and Bamboo)

(a) Object

The establishment of 30,000 ha of these tree species in large production units; 20,000 ha of chestnut, 5,000 ha of walnut, 5,000 ha of bamboo, the areas being distributed throughout the provinces.

(b) Method

Planting of the area over a five-year period, 1973 to 1977, with further maintenance of the area up to 1983. Private participation of farmers is envisaged although the manner of this is not elaborated.

(c) Cost Estimates (US$ million)

Costs of establishment:	Nurseries	1.75
	Plantations	7.75
Post planting aftercare		7.5
	Total	17.0
Over 10 year disbursement period		
Sources of Funds:	Government	12
	Private	5
		17

(d) Comments

(i) Preliminary market studies undertaken by OOF indicate that there are favorable prospects for expansion in both domestic

and export markets. These studies should be further evaluated by a marketing authority, e.g., NACF and AFDC and checked for export markets.

(ii) The size of the production units proposed and the method of achieving management over the units requires further explanation.

(iii) OOF calculations indicate financial rates of return of around 20% for these crops. These require to be expanded to take account of management and overhead costs and an economic analysis undertaken to take account of the opportunity cost of land, employment effects and foreign exchange effects.

(iv) The project is inter-related with farm development and could form part of an integrated rural development package.

4. Straw Pulp Factories

(a) Object - To construct 5 factories of 6,000 m ton/year capacity to produce straw pulp and hand-board paper from barley and rice straw 1/.

(b) Costs of Project - (US$ million)

	Per Factory	Total
Cost of buildings	.19	
" " plant	.45	
" " utilities	.04	
" " vehicles	.07	
Fixed Capital	.75 x 5	3.75
Working Capital	.50 x 5	2.50
Total		6.25

(c) Funding

Loan Funds	4.50
Domestic Funds	1.25
Total	5.75

(d) Location - Mills to be established in the provinces of Chung Nam, Jeon Bug, Gyeong Nam and Jeon Nam (2).

1/ The proposal emphasizes the use of barley straw.

(e) Comments:

(i) There are technical difficulties associated with the use of barley straw which are connected with the greater proportion of leafy material found in this, compared with other grain straws.

(ii) A recent study carried out by FAO (now under preparation for the IBRD Pulp and Paper Industry Sub-Sector Study) indicates that barley straw is unsuitable for pulping because of poor drainage and strength of the pulp.

(iii) Another recent study carried out of the Malaysian Pulp and Paper Industry (Sandwell) indicates that the cost per ton of bleached chemical pulp manufactured from rice straw was some 55% higher than that produced from Bagasse, 100% higher than that produced from indigeneous hardwood and 320% higher than pulp produced from sawmill waste wood. Rice straw pulp costs are higher because of the higher transport and manufacturing costs associated with this raw material.

(iv) At the present time in Korea, the rice straw mill which already exists is not operative because of excesive costs in bleaching and transport (Korean Paper Manufacturer Association.

(v) The size of the mills proposed will be too small to achieve benefits of scale.

(vi) The capital cost estimates are considered to be too low and would probably be upwards of 50% more than those given.

(vii) The question of a strategy for developing the future pulp and paper capacities of Korea is integral to the question of forest and forest industries development, which is being further examined. Straw may be able to make a valid contribution to the raw material base particularly on admixture with other fibers.

(viii) The proposal has not attempted to evaluate whether the removal of the straw would result in any loss of productivity in farming. In some areas, this is an important question with respect to soil absorption and rate of precipitation runoff, and is discussed in Section VIII (A).

ANNEX 10
Appendix Table 17

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

SUGGESTED PROGRAMME OF IMPLEMENTATION OF POLICY

		Possible Assisting Agency
1973	Policy decision on land acquisition for industrial plantations and fuelblocks	FAO
	Formulation of long-term indicative fuel and energy plan	UN or Bi-lateral
	Establishment of centralized Erosion Control and watershed management authority	FAO or Bi-lateral
	Coordination of research and review of priorities in consultation with industrial sector	FAO
	Abolition of sales tax on particle and fiber board	
	Establishment of plywood market research unit	
	Establishment of Forest Training Center and evaluation of manpower requirements	FAO or Bi-lateral
	Technical assistance for pests and diseases	FAO or Bi-lateral
	Identification and preparation of plantation and forest industries project, Gangweon province	FAO/IBRD Co-op Programme
	Preparation of fuelwood block sub-project	FAO/IBRD CP
1974	Feasibility studies for Gangweon province project	Consultants
	Preparation of loan request for Gangweon province project	FAO/IBRD CP
	Identification of Special Tree Crops sub-project	FAO/IBRD CP
1975	Implement Gangweon province project and fuel wood project	
	Preparation of second industrial plantations project	FAO/IBRD CP
1976	Feasibility studies for second industrial plantation project	Consultants
1977	Implement second plantation project	

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

ANNEX 11. FISHERIES

ANNEX 11

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

FISHERIES

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REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

FISHERIES

I. SUMMARY AND RECOMMENDATIONS

1. Total production of the fisheries industry in 1971 was over one million tons, more than double the production in 1961. During the same period, marine products became a major source of foreign exchange earnings with exports rising from US$7 million to US$107 million. The performance of the fisheries sub-sector during the last decade highlights Korea's remarkable capacity to utilize new economic opportunities with technical assistance and investments from abroad. Total fishery production increased to 1.3 million m tons in 1972 and total value of exports to US$187 million.

2. Traditional coastal fishing which supplies the domestic market still produces about half of the total catch. Production from middle-distance, off-shore fishing has been increasing annually and now accounts for about 25% of total production. Aquiculture of oysters, hard clams and seaweed (particularly laver) contributes about 15% of total production, primarily for export. Fresh water catch has rarely exceeded 1,000 m ton. By far the most significant growth in the sector has come from deep sea fishing by the expanding tuna long line fleet and deep sea trawling of Alaska pollock. Begun in 1965, deep sea fishing produced 224,000 m ton in 1972 compared to 27,000 m ton in 1966.

3. The Office of Fisheries (OOF) in the Ministry of Agriculture and Fisheries is responsible for fisheries administration. Research and development is undertaken by its Fisheries Research and Development Agency. Education and training, carried out through the Pusan Fisheries College, the UNDP/FAO assisted Deep Sea Training Center and Coastal Fisheries Training Center, has provided well-trained fisheries personnel to man the country's expanding fleets. The Central Federation of Fisheries Cooperatives (CFFC) provides banking and insurance services, purchases fisheries products for price support purposes and makes loans to fishermen.

4. Marketing of the products of the coastal, off-shore and fresh water fisheries is generally on an auction basis at or near, landing points. Secondary wholesale auctions take place at central interior points from where distribution is made through wholesalers and retailers. In attempts to simplify the system, reduce marketing costs and improve sanitation, CFFC has built a secondary market and ice-making facility at Taegu and initiated a pilot distribution chain in Inchon-Seoul. Almost all exports have gone to Japan and US although Europe has recently become a significant market.

5. Rapid advances were made in fisheries during the Second Five-Year Plan period, 1967-71. Production rose from 0.7 million m ton to over 1 million m ton and export values more than doubled from US$42 million to US$100 million. The Third Five-Year Plan (TFYP) (1972-76) calls for an increase of 36% in total output in 1976 (1.46 million m ton) compared to 1971. Total investment during the TFYP is projected as 107 billion won, compared to 55 billion won in SFYP, about 45% of which would come from central and local governments.

6. TFYP projections for coastal fisheries production estimate that output will rise by about 3% annually. The 1976 target was almost reached in 1972 when coastal fishery production rose to 663,000 m tons and will be greatly exceeded in 1973 when production is expected to rise to 770,000 m tons. Government policies for promotion of coastal fisheries include measures to establish spawning grounds, protection of fishing grounds, and motorization of fishing vessels.

7. The catch of the off-shore fisheries is expected to rise by about 4.8% annually to 233,000 m ton. The off-shore fleet fishing in the Yellow and China Seas has grown at the same time as the Japanese fleet fishing the same waters has declined. Although the waters being fished have limited resources, some additional replacement by the lower labor cost Korean vessels can be expected. The projected TFYP growth rate appears modest since targets set for 1973 were exceeded in 1970.

8. There is a great potential for expansion of aquiculture although prospects for the future growth of laver exports to Japan are not favorable. They will depend mainly on Japanese demand and production. However, the recent Korean/US agreement on exports of frozen oysters to the US should provide a growing market for this product. Aquiculture output is expected to rise by over 15% annually.

9. Inland fishery output is expected to rise to 10,000 m ton in 1976. Expansion of eel production to supply Japanese markets can become a major source of export earnings but substantial investments will be required. A potential source of inland fishing production could come from a more intensive use of ponds, reservoirs and rivers for fish culture.

10. About 45% of total investment under the TFYP would be for deep sea fisheries and production is expected to increase by about 19% annually to 320,000 m ton in 1976. Tuna long line and Alaska pollock fishing are oceanic fisheries not seriously affected so far by the extension of seaward dominion. However, they are affected by multinational movements towards conservation and as stocks approach or pass their maximum sustainable yields further protective measures, unilateral, bilateral or international, can be expected.

11. World demand for tuna is expected to rise and export market prospects are excellent. However, most tuna species are being extensively fished and most of the increased output is expected to come from the surface swimming specie, skipjack, available to live bait and purse seine methods rather than long line. Training in skipjack pole and line fishing and development work

on carrying bait from Korea to fishing grounds are underway. While agreeing with the priority given to this labor-intensive method of tuna fishing, the mission emphasizes the need for accelerating development of bilateral agreements with countries with resources in excess of their domestic needs. Purse seining of tuna should also be considered for priority development. Although more technically demanding and capital intensive, its high productivity can add another viable element to the industry and entry into this field will become more difficult in future.

12. The remarkable growth of the deep sea trawler fleet was a result of high catch rates of North Atlantic Alaska pollock and initial high domestic prices. Prices have declined with increased catch to the point where small local water producers are seriously affected. Future growth will depend upon pollock stocks which are believed to be reaching maximum sustainable yield and finding alternative markets. The shortage of frozen cod block supplies in the US which is expected to continue may provide an opportunity to export frozen pollock blocks. Japanese exports to the US in 1972 are expected to be about 12,000-14,000 m ton although potential exports could be much greater. A comparison of costs shows that Korean exports would be viable but there are constraints. Korean fishermen are 2-3 days further from the fishing grounds than Japanese and are thus handicapped more than the Japanese in supplying "fresh fish" (the catch taken on the last day or two of the voyage) to shore plants. Unsuccessful attempts to fully process blocks at sea have been made, requiring large quantities of labor at 2-1/2 times shore cost. The export to North America of minced fish blocks has not yet been successful. Fish meal production has not yet proven viable.

13. Domestic demand for marine products will continue to rise with population and income growth. Fishery products are a low cost source of animal protein compared to livestock products and consumption of seafood will continue to increase unless prices rise greatly. Export markets are also favorable. The future growth of the industry will, therefore, depend upon overcoming constraints to expanding output.

14. Government project proposals for international financing, set out in Chapter V, require further study and preparation, although, in many cases, the mission agrees with the priority given to them.

II. BACKGROUND

A. Major Features

15. Korean coastal waters have traditionally been fished by means of gillnets, straw nets, beach seines, boat seines, long lines, set nets and angling. The major species are corvena, hairtail, mackerel, horse mackerel, anchovy and Alaska pollock. The shallow waters produce numerous seaweeds, molluscs and crustacea. Off-shore fishing is carried out by a

fleet of intermediate-range, powered vessels operating in the Yellow and South China Seas. Over the last ten years, the fleet has been improving in size, range, power and effectiveness. Fresh-water fishing is a minor source of production. The coastal, off-shore and fresh-water fisheries serve primarily the domestic market. The culturing of seaweeds, molluscs and crustacea has long been practiced but recently achieved export significance based on sales of laver (a seaweed) and hard clams to Japan and oysters to the US and other countries.

16. The most spectacular segment of the industry, however, is the deep-sea fishing element. Beginning with the introduction of tuna long lining in 1965, it has expanded to world significance and now includes distant-water trawling. Plans are now underway to introduce pole and line skipjack fishing on a substantial scale.

17. The fisheries industry produces about two-thirds of total animal protein consumed by the population. Per capita consumption of meat, for example, more than doubled during 1962-1970 to 6.4 kg; during the same period per capita consumption of seafood rose from 14.6 kg to 22.1 kg.

18. Total production of fish and seafood was over 1 million m ton in 1971, more than double the production of 1961. Most of the growth has been in the off-shore, deep-sea and aquiculture segments of the industry (Table 1). Fishery output rose to over 1.3 million tons in 1972.

Table 1: PRODUCTION OF FISH AND SEAFOOD BY SUB-SECTORS
('000 M ton)

	1961	1966	1968	1970	1971	1972
Coastal Fisheries	377	481	552	525	505	663
Off-shore Fisheries	58	103	136	201	261	295
Deep-sea Fisheries	-	27	50	90	159	224
Aquiculture	12	91	113	119	147	160
Inland Fisheries	-	-	1	-	1	1
Total	447	702	852	935	1,073	1,344

Source: Office of Fisheries.

19. Marine products have become a major source of foreign exchange earnings, growing from US$7 million in 1961 to US$107 million in 1971. The fisheries industry accounted for 7.6% of total value added to gross national product by the agricultural sector in 1971 compared with 3.3% in 1961. Value added by the fisheries sub-sector has grown at an annual rate of 13.3% since 1961.

20. Total numbers of fishing households, fishermen, and fishing population increased during the early 1960s, reached a peak in 1967, and has declined since then (Table 2). The population of fishing households now accounts for about 3.5% of the national total. However, fishing is

the sole source of income of less than one-third of all fishery households and fishermen. Statistics on national employment show that the number employed in fishing declined from 220,000 in 1968 to 112,000 in 1971.

21. A large share of population classified as engaged in fishing are coastal fishermen's families employed in preparing gear, catching, curing, and selling fish as a family unit. Of the 367,000 fishermen (broadly defined) active in 1970, only about 50,000 were occupied full-time in catching fish, 104,000 were mainly but not wholly occupied in fishing and the remainder were part-time fishermen mainly employed in other work. Coastal fishing provides much more employment than does off-shore or deep-sea fishing. Only about 8,000 fishermen are engaged in off-shore fishing and about 7,000 in deep-sea fishing.

Table 2: FISHING HOUSEHOLDS, FISHERMEN AND FISHING POPULATION ('000)

	1962	1966	1968	1969	1970
Fishing households					
Operators, total	153	186	173	175	149
Sole income	39	63	52	61	23
Side job	114	123	121	114	116
Employees, total	42	50	46	48	46
Sole income	-	-	-	-	15
Side job	-	-	-	-	31
Total	194	236	220	223	194
Fisherman					
Operators, total	376	464	445	408	307
Sole income	90	144	122	136	51
Side income	286	320	323	272	256
Employees, total	86	112	96	102	60
Sole income	-	-	-	34	23
Side income	-	-	-	68	37
Total	462	576	541	510	367
Fishing Population					
Operators, households	885	1,141	1,064	1,052	913
Employees' households	209	301	282	272	252
Total	1,094	1,442	1,346	1,326	1,165

Source: Yearbook of Fishery Statistics, Office of Fisheries, 1971.

22. In addition to the fishing population described above, there were 64,000 people in 10,400 households classified as fishery processor

households in 1970 compared with 44,700 people in 7,600 fishery processor households in 1962.

23. The fishing fleet at the end of 1972 was approximately as follows:

Coastal vessels			
Unpowered	54,270	totalling	90,183GT
Powered	13,500		
Off-shore vessels			
Trawlers	450		50 to 120 GT
Purse seiners	26		each plus service
Small trawlers	120		vessels about
Shrimp trawlers	25		60GT each
Deep-sea vessels			
Tuna long liners	350		100 to 400GT each
Skipjack vessels	2		200GT each (commer-
	2		cial Government- owned
Stern trawlers			
North Atlantic	44		300-3500GT each
Atlantic, based at Canary Islands	15		300-1500GT each
New entrants	15		
Shrimp trawlers	5		(Atlantic)

B. Coastal Fishing

24. Coastal fishing remains the most important supply source for the domestic market and the most important employer of fishing and processing labor. Although almost everything which swims or grows is utilized, about a dozen species comprise the bulk of volume and value. Many types of gear and boats are employed (Appendix Table 1).

25. Although production declined from 1968 to 1971, it increased to 663,000 m tons in 1972 and is expected to total 770,000 m tons in 1973. Coastal fishery production varies widely from one year to the next because a number of species, such as macherel, anchovy and squil, typically demonstrate wide annual fluctuations in abundance. Total production may not increase greatly in the future since the regime, although rich, is being harvested extensively and has been so for some time. The Office of Fisheries very wisely places a high priority on conservation of stocks as provender for future generations.

26. Coastal fishing is carried out by many small family enterprises with small capital investments for boats and equipment. Although the number and tonnage of fishing boats with motors has tripled in the last decade, most coastal fishing boats still do not have motors (Table 3).

Table 3: NUMBER AND TONNAGE OF FISHING BOATS
('000)

Year	Number of Boats			Tonnage of Boats		
	Total	Motor	Non-Motor	Total	Motor	Non-Motor
1960	34	4	30	107	58	49
1965	51	8	43	203	120	83
1970	68	14	54	358	268	90

source: Major Economic Indicators, 1961-1971, EPB, 1972.

27. The Central Federation of Fishing Cooperatives (CFFC) has been concerned with improving productivity and incomes of coastal fishermen by supplying credit to help finance the purchase of better fishing equipment, providing technical assistance, and improving marketing facilities. However, it is reported that loans for gear, vessels, and operating expenses often are difficult to collect. The CFFC feels that it requires additional funds to raise productivity and incomes of coastal fishermen, but economic returns from additional investments in this subsector of the fisheries industry are quite uncertain.

28. The statistics referred to earlier show large reductions for 1970 in number of fishing households and fishermen dependent solely on fishing as a source of income. The total fishing population decreased 20% from 1966 to 1970. Many fishermen apparently have moved to other occupations. Although coastal fishery production was 5% less in 1970 than the record high in 1968, it increased about 10% from 1966 to 1970 so coastal fishery output per member of the fishing population was about 25% higher in 1970 than in 1966. If the fishing population continues to decline, additional capital investments for coastal fisheries will be required to expand total output and raise output per fisherman.

C. Aquiculture

29. Aquiculture of laver (a seaweed), oysters and hard clams, although modest in quantity compared with coastal fisheries, has grown remarkably in recent years (Table 4). Korean waters are extremely favorable for these species and productivity is high. In addition, these activities are labor-intensive and both of these factors give Korea a production cost advantage in export markets.

Table 4: AQUICULTURE PRODUCTION
(m tons)

	1969	1970	1971	Projected 1972
Oysters (In shell)	26,814	36,981	45,663	71,000
Laver	16,204	35,782	34,801	30,000
Hard Clams (In shell)	2,199	5,602	8,521	11,300
Others	40,379	40,846	58,236	34,800

30. Laver, hard clams and oysters are primarily for export. In recent years, export prices of laver to Japan, the principal market, have shown declines. In 1969, the price was about 42,000 won/m ton; in 1971 the price was about 39,000 won/m ton and 1972 projections estimated a price of about 32,000 won/m ton. These declines are a result of increases in Japanese domestic production. Future growth in laver exports will depend upon annual market growth and production in Japan as well as the seasonal growth characteristics in Korea. Government has had to use price stabilization funds in recent years and the limited market has made growers aware of the need to emphasize quality in future.

31. The value of oyster exports rose from US$150,000 in 1970 to US$1.5 million in 1971. Most exports were canned boiled and canned smoked oysters to the US. However, in 1972 about 300 tons of frozen oysters were exported to Japan. In November 1972, agreement was reached between Korea and the US, which will permit export of frozen oysters to the US, making Korea the third country to so qualify (after Canada and Japan). The US market consumed about 100 million pounds of fresh oyster meat at the turn of the century, but due to adverse conditions in the growing areas and rising production costs, consumption has fallen to about 60 million pounds. Thus, the agreement, which requries that US imports meet stringent sanitary conditions (both in growing areas and processing plants), will open up a substantial potential market for frozen oyster meat.

32. Hard clam exports to Japan are growing, based on their high prices in that market and the inherent productivity and cost characteristics of the Korean environment.

33. Other marine molluscs, crustacea and fishes may be candidates for aquiculture (such as blue crabs and scallops) but further development work is necessary. The limitation for aquiculture growth, particularly for export, is the market; supply constraints are thus far insignificant.

D. Off-Shore Fishing

34. Off-shore fisheries output has increased annually over the last decade (Table 5). It now accounts for 25% of total production and is the second largest source of domestic supply. The area harvested by the middle-distance fleet is off the south, east and west coasts and into the Yellow

and China Seas. The area continues to expand with the improvement and expansion of the fleet which now includes about 450 trawlers (50-120 gross tons) and 26 seine trawlers. These vessels account for 70% of the catch while 120 small trawlers (below 50GT) and 25 shrimp trawlers account for the remainder. The 80-120 GT trawlers are the most significant component. Production of off-shore trawlers in Korea has increased each year since 1966.

Table 5: OFF-SHORE FISHERIES AND TRAWLER PRODUCTION
(000 m tons)

	1966	1967	1968	1969	1970
Off-Shore Fisheries Production	102.6	121.8	135.8	179.4	200.8
Off-Shore Trawler Production	38.7	76.8	83.8	93.6	114.4
Number of Off-Shore Trawlers	346	320	411	444	457

35. In 1970, trawler vessel size and age were as follows:

Vessel Size	Number	Vessel Age	Number
50GT	68	Under 5 years	64
60GT	27	5-10 years	88
70GT	77	10-15 years	181
80GT	104	15-20 years	71
90GT	144	Over 20 years	53
100GT	37		
	457		457

36. The fleet s privately owned and has grown with little foreign or governmental financial assistance. Financing has been through personal equity buttressed to a minor degree (about 30%) in some cases by domestic bank loans. The growth of the fleet fishing the Yellow and China Seas has been accompanied by a decline in the Japanese fleet fishing the same waters from 900 to 600 vessels. Thus, this is a displacement phenomenon and the growth in output does not represent an increased capture of stock but rather a diversion of catch from Japan to Korea. The trend is based on the relatively lower Korean labor costs and, although production may continue to grow in accord with this cost advantage and an increase in power, size and range of Korean vessels, it will ultimately be circumscribed by the limits of economic range of the vessels and the marine productivity of the area. The government now feels that the fleet should expand numerically to about 500 vessels, but that unit productivity should be improved by upgrading vessel size, power and equipment. This view is shared by the mission.

E. Fresh Water Fishing

37. Fresh water fishery production is small amounting to less than 1,000 m tons annually in most years according to official estimates. Because of Korea's long coastline and concentration of population in lowland areas along the coasts, inland fishery development has not received much attention until recently.

38. Chum and cohoe salmon eggs have been imported from the US in an attempt to induce a sufficient stock but returns are thus far modest. The outlook is not particularly promising because of the difficulty of introducing a stock which will be self-perpetuating. Trout farming, based on eggs imported from Japan and the US, is now commercially successful but production is thus far insufficient to supply other than special domestic customers such as tourist hotels and US military forces. Prospects for growth and export are good, depending on feed costs relative to Japan, and suitable water supplies.

39. Eel culture, based on the capture of wild seed of anguilla japonica, and growing them in ponds to 150-200 gram size for export to Japan produced the following export values:

1971	15 m ton	US$0.928 million (Japan)
1972	29 m ton	US$1.931 million (Japan and Taiwan)

Eighteen hectares are now utilized as eel ponds and 85 additional hectares of ponds are planned at a cost of US$10 million. Projected total income over 5 years is US$24 million. The Japanese market is substantial and this sub-sector justifies encouragement through improved research, extension services and credit.

F. Deep Sea Fishing

40. The emergence of Korea's deep-sea fishing fleet is one of the more spectacular aspects of the fisheries development. Beginning in 1956, with the acquisition of a tuna long liner, financed by a US bank and guaranteed by a tuna purchaser, fishing was begun in the South Pacific and the vessel was subsequently successful. By 1962, the fleet consisted of about five vessels. In the same year, the government established the Korean Marine Industry Development Corporation (KMIDC) to stimulate growth of the deep sea sector.

41. KMIDC, assisted by an Italian-French loan of US$35 million, landed its first catch in 1965. By October, some 70 vessels, trawlers, long liners, and service craft were in operation. In 1970, KMIDC acquired the assets of the Sam Yang Co. consisting of 14 small stern trawlers, a factory ship and two refrigerated transporters. A joint venture agreement was signed with the Government of El Salvador in 1971. The government is now negotiating to turn KMIDC over to private enterprise.

42. In addition to KMIDC, more than 50 corporations operate vessels in the deep sea sector. In 1971, the 350 vessels which they operated accounted for 15% of total fisheries production and 55% of foreign exchange earnings. Although KMIDC initially had financial problems arising from the size, design, cost and financing of its fleet and management difficulties concerned with bringing a large fleet into operation in a short time, and one private firm had similar problems on a smaller scale for essentially the same reasons, only one small firm in the sector has failed. The debt repayment record is good and expansion had been extraordinary.

Tuna Long Line Fishing

43. The tuna long liner fleet now stands at about 400 vessels, almost all imported from Japan and the fleet is the backbone of the deep sea fisheries. Japan has restricted the export of used vessels over 6 years old, and, in 1972, Korea implemented regulations restricting, but not prohibiting, imports. At the present time there are an additional 70 tuna long liners under construction or in various stages of planning. Most of these are of 380-400 gross tons.

44. Almost all tuna are exported. Exports increased to 90,000 m tons in 1970 and value of exports to US$38 million (Table 6).

Table 6: EXPORTS OF TUNA

	1963	1964	1965	1966	1967	1968	1969	1970
Quantity (000 m ton)	2.3	1.3	6.4	28.9	36.2	50.0	80.8	89.6
Value (US$ mil.)	.6	.3	2.4	8.0	12.0	15.6	24.1	37.7

Source: Office of Fisheries.

45. Although world population since 1950 has grown at an annual rate of 2%, fish production has grown at an average annual rate of about 7% but now appears to be slackening. Tuna production, however, has increased at an average annual rate of 8% and recently, despite a period of re-adjustment due to world concern over mercury in tuna, demand has been growing more rapidly. As a result, price levels in the last two years have risen dramatically. Six major species comprise 90% of the world catch, yellow fin (thunnus albacares), skipjack (katsuwonus pelamis), albacove (thunnus alalunga), bigeye (thunnus obesus), northern bluefin (thunnus thynnus) and southern bluefin (thunnus maccoyi). They are found throughout the world's major temperate and tropical oceans, generally between 35°N and 30°S latitudes.

46. Long line fishing, which tends to catch the deeper, mature fish, accounts for about 50% of all tuna catch. Japan, Korea, and the Republic of China account for almost all world catch by this method. Live bait fishing is next in importance and Japan is the leader in the field; next is purse seining, a technique in which the US is dominant. Prior to World War II, the world catch was about 300,000 m ton annually. By 1952, it had

reached 450,000 m ton and rose steadily due to the expansion in number and area of influence of the Japanese fleet until 1961 when it levelled off at about 900,000 tons a year. In 1969, it rose to 1.1 million m ton and gains since then have been insignificant.

47. Japanese and US fleets took 65% of the total world catch of major species in 1970. In 1969, these two countries accounted for about 70% of world consumption and about the same proportion of production of major species. Japan caught 50%, but utilized only 30%, while the US caught 20% and utilized 40%. Western Europe consumed about 20% of the catch and the rest of the world, 10%.

48. In 1970, Korea with about 9% of world tuna boat tonnage produced about 8% of the catch. From 1965-1970, however, its rate of fleet growth and output growth were the highest among major producers. Japan retained almost constant fleet tonnage. The US tuna fleet increased by about 50%, that of the Republic of China by about 420%, while the Korean fleet increased by about 500%.

49. The major reasons for this spectacular growth are the adaptability of the industrious Korean fishermen to the deep sea environment, the availability and quality of training, and the availability of capital which flowed to initial high returns and relatively low costs of labor. Labor cost is a significant element in tuna long line fishing. Appendix Table 2 shows that crew costs were about 19% of gross sales, exclusive of food and insurance. The annual return on gross investment was about 11% and the investment pay-back period 4-1/2 years. Tuna sales prices used in the claculations are below current market levels.

50. Recent studies indicate that Korea has significant cost advantage over Japan in long line tuna fishing. Appendix Table 3 shows cost estimates for a Japanese vessel for 1968 and for a Korean vessel for 1972. Tuna prices were significantly different at these times. The important fact is that the Japanese vessel returned 35% of gross proceeds to the crew whereas the Koreans returned 17.6%. Thus, if the catch rates and days at sea are similar for both vessels, the Korean has a significant cost advantage.

51. It is expected that most increases in world tuna supply will come from catches of the skipjack specie 1/. The skipjack is a surface swimming specie available to live bait and purse seine fishing methods rather than to long lining. Past experience of deep sea fishing demonstrates the competence of Korean fishermen and there appears to be no insurmountable technological barrier to prevent entry into skipjack fishing. Four pole and line skipjack vessels are presently in the country, two small units engaged in a Japanese-Korean joint venture in the Atlantic and two more for training purposes. Eight skipjack vessels are planned under a recent ADB loan and another seven under joint ventures and corporate arrangements.

1/ Economic Projections of World Demand and Supply of Tuna, 1970-1990, Frederick W. Bell, US Bureau of commercial Fisheries, 1969.

52. A start has also been made at purse seining by one company which purchased two old US vessels for operation in the Eastern Tropical Pacific from a base in Panama. KMIDC has a joint venture purse seine agreement wwith the Government of El Salvador and others with two US fishing companies, none of which has thus far commenced operations. Korean purse seine crew members have been trained aboard US ships under a KMIDC arrangement with a US fishing company.

Trawl Fishing

53. Deep sea trawling was initiated by KMIDC when, in 1966, it acquired two 1472GT stern trawlers which it assigned to the Atlantic base at Las Palmas. In 1969, private operators added a 1574GT and an 824GT vessel assigned to fish Alaska pollock in the North Pacific for the domestic market. These vessels were very successful and 4 additional vessels, each more than 400GT, were imported in 1970 and 5 more in the same category in 1971. Simultaneously, a number of smaller vessels were imported from Japan, and at the end of 1971, 85 vessels had been imported, totalling 30,021GT, and representing an investment of about US$32 million.

54. At December 31, 1971, the deep sea segment of the trawler fleet consisted of 33 vessels, totalling 19,174GT based at Pusan, 15 vessels toalling 6,578GT based at Las Palmas and 5 small shrimp vessels based at Paramaribo. Catch of this fleet increased to over 75,000 m tons in 1971 and export value to US$3.5 million (Table 7).

Table 7: DEEP SEA TRAWLERS: NUMBER, CATCH, AND EXPORT VALUE

	1966	1967	1968	1969	1970	1971
No. of vessels, total	8	26	27	28	27	60
Catch ('000 m ton)	1.4	2.0	6.6	16.1	18.3	75.5
Export ($'000)	3	238	584	109	1,855	3,533

Source: Deep Sea Fisheries Association.

55. In 1971, the Atlantic fleet produced octopus and cuttlefish for the Japanese and European markets and bream and fin fish primarily for the European market. The North Pacific fleet produced Alaska pollock for the domestic market. Number of vessels and catch of the North Pacific fleet increased greatly from 1970 to 1971 (Table 8).

Table 8: DEEP SEA TRAWLERS BY REGIONS

	Number of Vessels		Catch ('000 ton)		Exports (US$ mil)	
	1970	1971	1970	1971	1970	1971
North Pacific	10	33	12.7	73.0	-	-
Atlantic	17	20	5.6	7.3	1.9	3.5

Source: Deep Sea Fisheries Association.

56. Ten additional trawlers ranging from 300-3,500 GT were to be added to the fleet in 1972, plus an additional three smaller units and planning is well developed for an additional 6 vessels totalling 11,000 tons, ranging from 1,500-3,000GT each. The 1972 catch target in the Atlantic is 19,135 m ton and in the North Pacific, 135,883 m ton. Exports are planned to reach about US$8 million.

G. Marketing and Prices

57. Marketing of products of the off-shore, coastal, and freshwater fisheries is generally on an auction basis at or near the landing, with primary major market at Pusan and Inchon and many smaller markets around the coast. Secondary wholesale auctions take place at central interior points, most notably Seoul and Taegu, from where distribution is made through wholesalers and retailers to consumers. In order to simplify the distribution system, improve sanitation and decrease distribution costs CFFC has built a secondary market and ice-making facility at Taegu and initiated a pilot distribution chain in Inchon-Seoul, both of which are now in operation.

58. Almost all exports have historically gone to Japan and US although Europe has recently become a significant market. Volume and value of exports doubled from 1968 to 1971 (Table 9). The gross value of exports was expected to total US$155 million for 1972.

Table 9: EXPORTS OF SEA PRODUCTS

	1967	1968	1969	1970	1971
Quantity ('000 m ton)	66.4	76.4	108.7	134.9	146.4
Value (US$ million)	57.5	57.3	73.9	90.1	115.0

Source: Appendix Table 4.

59. Domestic demand for marine products has grown greatly in the last decade with population and income growth. Wholesale prices for marine products increased nearly five-fold during 1961-71, about the same as those for livestock products and much more than those for all agricultural foods and all products (Table 10). Fishery products continue to be a low cost source of high protein food compared with livestock products.

Table 10: INDEX NUMBERS OF WHOLESALE PRICES
(1970 = 100)

	Marine Products	Livestock products	All Agricultural products	All products
1961	20.7	22.2	27.6	35.1
1966	57.2	52.5	61.5	74.6
1971	117.7	123.3	121.9	108.6
1971/1961	5.7	5.5	4.4	3.1

Source: Economic Statistics Yearbook, 1972, Bank of Korea.

60. Prices of different kinds of fish have fluctuated widely from one year to the next in recent years, depending upon production (Appendix Table 5). The most notable recent change is 50% drop in the prices of Alaska pollock, with a tripling of supplies since 1970, resulting from the newly operational freezer stern trawler fleet in the North Pacific.

III. INSTITUTIONAL SERVICES AND POLICIES

A. Government Agencies

61. The Office of Fisheries (OOF) in the Ministry of Agriculture and Fisheries is responsible for fisheries administration. Its functions are to establish policy and develop plans, manage facilities and equipment, guide vessel and port facility construction, provide extension services, administer subsidies and loans and guide training, research and development. OOF was organized in 1945 and reorganized in 1966 at the beginning of the Second Five Year Plan.

62. The Fisheries Research and Development Agency (FRDA), subordinate to OOF, had an operating budget of about 446 million won for 1972. It has primary facilities at Pusan, several secondary facilities and a substantial fleet, which was provided from the post-World War II of Japanese-Korean Properties and Claims Fund. FRDA has carried out work on development programs for aquiculture products, oceanographic studies, stock assessment in the marine environment, patrol duties, skipjack bait assessment and, more recently, a joint Indonesian-Korean scientific investigation of fisheries potential in Indonesian Waters.

63. The cooperative movement among fishermen dates to 1937. The present Central Federation of Fisheries Cooperatives (CFFC) was established in 1962 and was associated with OOF in 1966. CFFC is concerned with both social and economic aspects of fishermen's activities and is a principal channel for governmental support to the industry. Although its activities primarily concern the coastal and aquiculture segments, some impact has been made on deep sea fishing and domestic marketing. CFFC has 121,000 member cooperatives

organized under 9 branches; 2,244 "kye" fishing villages or groups of villages are gathered into regional cooperatives.

64. Through its member cooperatives, CFFC provides banking and insurance services, makes sales of fishing equipment, purchases fishing products for price support purposes, and makes loans to fishermen. Business activities planned for 1972 amounted to US$163 million, approximately US$150 per member of the fishing population. (Table 11).

Table 11: CENTRAL FEDERATION OF FISHERIES COOPERATIVE, BUSINESS ACTIVITIES PLANNED FOR 1972 (US$'000)

Business Activity	Amount	% of total
Banking services	65,658	40.0
General, total	(29,063)	(18.0)
Sales	24,063	14.7
Procurement	5,388	3.0
Utilization and processing	480	.3
Mutual insurance	55,553	34.0
Foreign loan operations (ROK-Japan Fishery Cooperation)	11,948	8.0
Total	163,090	100.0

Note: Exchange rate - US$1.00 = 400 won.

Source: Central Federation of Fisheries Cooperative.

65. Education and training in fisheries is well developed in Korea. The Pusan Fisheries college has for sometime been graduating highly trained administrators, captains and scientists. A large number of sea-going senior personnel graduated from this institution. The Deep Sea Training Center, supported by UNDP/FAO, was established in 1964 and by December, 1971, had graduated 657 trainees, almost all of whom are active in the deep sea fishing fleet, many serving as masters, chief engineers and mates. The Coastal Fisheries Training Center, also assisted by UNDP/FAO, was opened in 1968 and graduated about 400 trainees up to December 1971. Many graduates are employed in deep sea operations as well as in coastal fishing. A government sponsored training program for processing and supplementary activities is also in operation. The Fisheries training program is one of the most successful of its kind and has had a significant role in fulfilling the country's need for trained fisheries personnel.

66. In addition to the government-owned Korea Marine Industry Development Corporation in the deep sea sector, another government-owned corporation, the Agricultural and Fisheries Development Corporation (AFDC) is engaged in a number of pilot commercial enterprises. These include hard clam culturing for the Japanese market and oyster culture development in hitherto underdeveloped areas of West and South coasts. AFDC owns the Korea Cold Storage Company, whose substantial faiclities in Pusan, Seoul, Mok Po, and

Muk Ho are part of the fish processing and distribution appratus. The AFDC also acts through the Korean Aquiculture Company Ltd. (a pilot plant operator which has laver, hard clams, and oyster culturing facilities), the Metropolitan Marketing Center (a large but presently underutilized urban market), and the Food Processing Institute (a technological development organization in its formative stages).

B. Sources of Finance

67. Korea has relied heavily upon finance from abroad to expand its fisheries industry. Major foreign loans and other assistance are as follows:

(a) French-Italian Loan - US$40 million to the Korea Marine Industry Corporation for establishment of its fleet. The loan was made in January 1963 and by 1967 had been expended. The loan had been repaid except for a balance of US$4.5 million by the end of June 1972.

(b) Japan Properties and Claim Fund - Japan made US$100 million available for support services, subsidies, research, and development.

(c) Japan Cooperative Loan - US$90 million for coastal and deep sea fishing beginning in 1967. Originally US$40 million was allocated for coastal fishing but later was reduced to US$30 million, of which US$14 million has been loaned through CFFC for boats, equipment and facilities purchased in Japan. Originally US$50 million was allocated for the deep sea sector but it later was increased to US$60 million, of which US$51 million has been loaned.

(d) Asian Development Bank Loans - In 1970 the ADB made a loan of US$7 million for construction of cold storage plants. In 1972 it made a loan of US$13.3 million for construction of 8 skipjack boats and the supply of engines and trawler equipment.

(e) Development Finance Corporation IBRD - US$10 million through Korea Development Finance Corporation to September 1972 for construction of deep sea tuna long liners and some trawlers.

(f) US Operations Mission and USAID - US$750,000 for construction of Pusan fish market and for assistance in culture development.

68. In addition, private banks and trading companies have supplied amounts of funds for development of private fishing corporations in Korea.

C. Trade and Price Policies

69. The government has encouraged exports of fisheries products by granting the following reductions: 50% in corporate tax, 50% in income tax, 100% in business tax, 100% in excise tax, and 100% in tariffs on imports required to produce exports. These reductions are on that portion of business and profits related to exports. In addition, an exporter is entitled to a preferential monetary conversion rate and short-term credit at 6% a year.

70. Price stabilization of distressed fisheries commodities is provided through CFFC. In 1970 CFFC made purchases amounting to nearly 600 million won for laver, dried squid, and pickled shrimp in order to support market prices (Appendix Table 6). In 1971 its purchases of dried Alaska pollock amounted to 118 million won. Purchase targets for dried squid and canned saury amounted to 5.5 million won for 1972.

IV. PLANS AND PROSPECTS

A. Development Plans

71. Rapid advances were made in fisheries during the Second Five Year Plan for 1967-71 (SFYP). Approximately 59 billion won, 3 billion more than planned, was invested in the sector. Production rose from 700,000 m ton in 1967, to more than 1 million m ton, and exports grew from US$42 million to more than US$100 million.

72. The Third Five Year Plan for 1972-76 (TFYP) calls for an increase in total fishery production to 1.46 million m ton in 1976, an increase of 36% over output in 1971 (Table 12). Coastal fishery is projected to rise 3.1% annually, off-shore fishing 4.8%, deep-sea 18.8%, and aquiculture 1.54%. Inland fishery output is expected to rise to 10,000 m tons in 1976 compared with less than 1,000 m ton annually in recent years.

Table 12: FISHERY PRODUCTION TARGETS
('000 m ton)

	1972	1973	1974	1975	1976
Coastal fishery	588	605	625	645	665
Off-shore	190	201	212	222	233
Deep-Sea	173	226	277	302	320
Aquiculture	144	175	211	206	229
Inland	/1	4	6	9	10
Total	1,096	1,211	1,331	1,384	1,457
Fishes	724	801	877	927	969
Shell fish	129	158	193	188	210
Sea weed	117	122	126	131	135

/1 Less than 1,000 m ton.

Source: Office of Fisheries.

73. The TFYP calls for exports to rise from US$109 million in 1972 to US$200 million in 1976 (appendix Table 7). However, the Office of Fisheries reports that gross value of fishery exports was over US$150 million 1972 and is projected to rise to US$325 million in 1976.

74. Total investment in the fisheries sector is projected to rise from 55 billion won in the SFYP to 107 billion in the TFYP (Table 13). About 55% of the total would be from private sources and 45% from central and local governments. It is estimated that US$190 million of foreign capital will be required. Investment for deep-sea fishing facilities accounts for 45% of the total; nearly all of it, US$155 million, would be foreign capital supplied by private enterprises (Appendix Table 8). Other foreign capital requirements are: US$13 million for coastal fisheries, US$15 million for off-shore fisheries and US$6 million for marketing and processing facilities.

75. The overall program is subject to revision year by year in the light of changing circumstances. The 1972 deep-sea fishery programs called for the following:

20 - 350GT tuna long liners
20 - 500GT tuna long liners
2 - 500GT tuna purse seiners
23 - 500GT stern trawlers
5 - 50GT shrimp trawlers
3 - 1600GT carriers
2 - 1000GT carriers
1 - 3000GT carriers

Table 13: INVESTMENT PLANS FOR FISHERIES
(1970 prices)

A. Targets

	1970	1976	% increase
Fishery production (000 m ton)	935	1,457	55.8
Exports (US$ million)	90.1	200	121.9
Fishing Vessels (000 GT)	358	572	59.7

B. Investments and Loans

	1967-71		1972-76		% increase
Domestic capital (mil. won)	26,821	(49)	48,307	(45)	80
Foreign capital (000 US$)	100,131	(51)	189,935	(55)	90
Central government (mil. won)	29,493	(53)	45,129	(42)	52
Local government (mil. won)	-		2,612	(3)	-
Private enterprise (mil. won)	25,695	(47)	59,565	(55)	141
Total (mil. won)	55,188	(100)	107,306	(100)	94

C. Investments by categories, 1972-76

	Mil. won	%
Port facilities	14,212	13
Fishing facilities		
Coastal	12,671	12
Off-shore	8,572	8
Deep-sea	48,453	45
Equipment improvement	708	1
Aquiculture		
Tideland development	5,875	5
Inland water development	863	1
Marketing and processing facilities	3,457	3
Development of fishery techniques	2,767	3
Miscellaneous	9,828	9
Total	107,306	100

Source: Office of Fisheries.

76. Plans for 1973 are similar to those for 1972, except that three 250GT and two GT skipjack vessels are included. In fact, the skipjack vessel program is being accelerated and the purse seine program delayed. The interest of the private sector is illustrated by the fact that 86 tuna vessels are planned or in construction late in 1972 in addition to the large trawler program described elsewhere in this report.

B. Major Factors Affecting Future Growth

Markets

77. Domestic demand for fishery products will continue to rise with population and income growth. As noted earlier, wholesale prices of fishery products have increased as much as those of other foods, despite a rise in per capita consumption of fishery products of about 50% during the last decade. Fishery products are a low cost source of animal protein food, compared with livestock products, and consumption of fishery products will continue to rise unless prices rise greatly. Export markets also are favorable. Future growth of the fisheries industry therefore depends heavily upon overcoming contraints to expanding output.

Coastal Fisheries

78. The projected growth in coastal fisheries production from a little over 500,000 m tons in 1970 and 1971 to 665,000 m tons in 1976 should easily be possible since production rose to 663,000 m tons in 1972. Additional capital investments for motor boats, other modern equipment, and improved processing and other marketing facilities will be required to raise efficiency. As the population dependent upon fisheries for a livelihood declines, there will be opportunities to raise productivity and incomes of fishery households by increased mechanization and other modernization.

Off-Shore Fisheries

79. In view of the very rapid growth in off-shore or middle distance fishing in the last decade, the projected growth in production of 4.8% annually by this sub-sector appears modest. The target set for 1973 was exceeded in 1970. As pointed out earlier, harvesting off the east, south, and west coasts into the China and Yellow Seas is a replacement of fishing by the Japanese and the waters being fished have limited fishery resources. However, additional replacement can be expected.

Aquiculture

80. Korea has large potentials for expanding output of the aquiculture sub-sector. The Korean-US agreement, concerning exports of frozen oyster meat to the US, should provide a growing market for this product. Japanese markets for a wide variety of aquiculture products also are expanding. However, prospects for future growth of laver exports are not favorable. They will depend mainly upon future demand and production in Japan.

Inland Fisheries

81. Expansion of eel production to supply Japanese markets can become a major source of export earnings, although large investments will be required. There also are potentials from increasing inland fishery production by utilizing ponds, reservoirs, and rivers more fully for fish culture.

Deep Sea Fishing

82. Future growth of Korea's deep sea fishing industry will be influenced by its ability to develop skipjack and purse seining fishing for tuna and further growth of trawler fishing.

83. Tuna. Export market prospects for tuna are excellent. A recent study of the relationship between tuna consumption, prices and per capita income in nine countries concluded that, with projected population and income changes, consumption would rise to 5 million m ton annually by 1990 compared with 1.3 million m ton in 1966. If, however, the maximum sustainable yield on a world-wide basis is 2.6 million m ton and most of the increases in output will be skipjack, costs and prices will rise and demand will be less than 5 million m ton. The study concludes that world consumption of tuna would expand to about 2.1 million m ton, at an ex-vessel price of 38$ price per pound (US$850 per ton), if production is increased to this level by 1990 (Appendix Table 9).

84. The continuous move of many riparian nations to extend their seaward dominion is a constraint upon all countries whose fleets range far from home, such as those of Korea. For the tuna long line and Alaska pollock fisheries, however, this is not presently a serious factor since they are oceanic fisheries carried out well beyond the most imaginative boundaries yet conceived. These fisheries will, however, be affected by multinational movements towards systems of conservation. The International Commission for the Conservation of Atlantic Tuna is currently considering the establishment of a system of national tuna quotas in its region. Similarly, the Inter-American Tropical Tuna Commission is deliberating ways and means of controlling the fishing effort in its area. The International Commission for North Atlantic Fisheries (ICNAF) has recently set national quotas. As more and more stocks approach or pass their maximum sustainable yield, additional protective measures, unilateral, bilateral or international, can be expected.

85. Since most increases in tuna catch are expected to come from skipjack, the mission agrees with the present move of Korea into this field. It considers that the present pace of the program is realistic and balanced.

86. Since skipjack tend to congregate around or near tropical land masses, it will be necessary to accelerate the development of bilateral fishing agreements with various countries, which have resources available in excess of their domestic needs, such as Indonesia, the Pacific Trust Territories, etc. Some agreements, which should enable Korean Fishermen to harvest, in due course, stocks within the national boundaries of other

countries have already been made. An Indonesian-Korean survey has been implemented, funded by Korea with scientists of both countries using a Korean vessel, to survey Indonesian fisheries resources. It is intended to precede the entry of Korean commercial fishing companies into the region. Korea has also established a bilateral fisheries relationship with Spain on an official basis and with Sri Lanka unofficially. An arrangement with Uruguay is under discussion.

87. Tuna Seining. Tuna purse seining requires substantial capital commitment and is a technically demanding technique. Although it is more capital intensive than long lining and the Korean labor cost advantage, therefore, less striking, the high productivity of this method can add another viable element to the Korean program. Despite the higher priorities which should be given to skipjack development, it is in the interest of the country to press for early development of the tuna seining program which has been slow in starting. Entry into this type of fishing will become more difficult as time goes by.

88. Tuna Long Line Sharp Freezer Vessels. More than 20 of the 300 Korean long liners are equipped as extra low temperature vessels. Although the Japanese market pays premium prices for their products, an unlimited expansion of this element of the fleet may bring repercussions from the Japanese industry. Future construction programs should be based on a careful evaluation of this potential hazard.

89. Trawl Fisheries. The remarkable growth of the deep sea trawl fleet has been based on high catch rates of North Pacific Alaska pollock and initial high domestic prices. The price has now declined under pressure of increasing volumes of catch and current price levels are causing distress among the small domestic local water producers of Alaska pollock. Therefore, it is useful to consider the question of Alaska pollock stocks in the North Pacific and alternative markets for the product.

90. Japan is the dominant element in Alaska pollock fishing. Japanese catch of this specie has risen from 1.9 million m ton in 1969 to 2.7 million m ton in 1971. In 1970, mothership operations in the Bering Sea accounted for nearly half of Japanese catch. (Table 14).

91. Although the Japanese fishery originally produced fish meal from factory ships, the bulk of the catch is now converted to surimi (minced fish), production of which, in 1971, amounted to 321,000 m ton. The remainder was either dried, shipped to kamaboko (fish cake or sausage) manufacturers in the chilled form, or made into meal. Fillet-block production for export to the US from Japan began in 1967-68 and has since been stimulated by the growing shortage of cod blocks in the US market. About 60 Japanese plants are potential producers and in 1972, the 6 leading producers are expected to export 12,000-14,000 m ton of product, or 25-28 million pounds. The production of fillets, assuming favorable prices and product acceptability, is projected to increase to over 50 million pounds in 1975.

Table 14: JAPANESE POLLOCK CATCH BY SOURCES, 1970
('000 m ton)

Source	Catch	% of Total
Small-scale operations in Japanese coastal areas (particularly Hokkaido)	368	16
Small-scale and trawler operations in Okhotz and Kamchatka areas	713	31
Trawler operations in Bering Sea	184	8
Mothership operations in Bering Sea	1,035	45
Total	2,300	100

Source: Alaska Pollock, Environment Canada Fisheries Service.

92. The f.o.b. plant cost of Japanese production is estimated at 27-28¢ per lb, with c.i.f. prices of 35¢ per lb in Los Angeles and 37¢ per lb in Gloucester. Although accurate cost figures are not available it would appear that Alaska pollock blocks with a round fish cost Japan of about US$100/m ton, a plant cost of 27-28¢/lb. and a Los Angeles price of 35¢/lb is a viable industry. US imports of cod frozen blocks have remained steady at a little under 200 million pounds annually in the last few years because cod supplies have not increased but imports of other frozen blocks, including Alaska-Pollock, have increased from about 75 million pounds in the late 1960s to nearly 150 million pounds in 1972. Prices for Alaska-Pollock in US markets increased from 22 cents per pound in 1969 and 1970 to 33 cents in 1972 (Appendix Table 10).

93. The growth in the US market stems from the increase in per capita consumption of seafood products based on fish blocks. Cod block supplies are unlikely to increase and may, in fact, decrease if recently instituted conservation measures in the North Atlantic are unsuccessful in maintaining stocks.

94. There are numerous constraints for the Korean pollock producer contemplating entry into this market. Japanese scientists believe that the North Pacific pollock stock is reaching its maximum sustainable yield. Japan is taking 2.7 million m ton annually, the USSR more than 0.5 million m ton, and Korea less than 200,000 m ton. Japanese pollock fillets are generally made from "fresh fish" (the catch taken on the last day or two of the voyage) and iced and boxed separately for conversion in shore plants. The quantity available is thus limited and attempts to fully process blocks at sea, requiring large quantities of labor at about 2-1/2 times shore cost, have so far been unsuccessful. The export to North America of factory ship produced minced fish blocks has not yet been successful.

95. Korean vessels are 2-3 days further from the fishing grounds than Japanese vessels and are thus even more handicapped in the supply of "fresh fish" for shore plant operation. To offset the distance penalty, one company has commissioned a factory ship, which will receive fish from 4 smaller trawlers (300-400GT) and head, gut, skin, mechanically fillet and freeze the catch in blocks. It is planned that the blocks will be thawed at a shore plant in Ulsan, trimmed, canned, packed and refrozen for shipment abroad. Although tests indicate that the quality of product handled in this fashion, i.e. thawed and refrozen, is satisfactory, the operation has not proceeded long enough to be certain of commercial acceptance. Two other firms have plans for similar operations and a second plant is under construction at Masan.

96. It would appear that the larger Korean vessels in the 3000 GT class, two of which caught 10,483 m ton and 16,636 m ton (90% pollock), respectively, in 1971, were profitable using a fillet market price of US$100/m ton for round fish landed value. Their gross value of landing per vessel would be about US$1 million annually and the round fish price of US$100/m tons is slightly lower than the current domestic price of about 50 won/kg. The foregoing cost figures are estimates and only demonstrate that US market prospects at current price levels are not likely to be the source of extraordinary earnings although the program may be viable.

97. The Japanese surimi market is expanding at about 10% annually and Japanese demand, generally, at a higher rate. This would provide an alternative outlet for Korean production if Japanese import restrictions are relaxed.

98. The growth of the trawler fleet, at a rate similar to that enjoyed in the recent past, will be dependent upon solving the quality and cost problems related to harvesting Alaska pollock for markets other than the domestic market or finding alternative fisheries as rewarding as pollock fishing was in 1969-70 prior to flooding the domestic market. Substantial alternative markets, such as the growing US fillet block market, have not yet proven commercially viable, although development work is proceeding swiftly. Fish meal production has not yet proven viable.

V. PROJECT PROPOSALS

99. In furtherance of the development plan the Director General of Fisheries and the Office of Fisheries requested that consideration be given to several project proposals for international financing. They are summarized below with mission comments.

A. Tuna Long Line Development

100. This project would involve an investment estimated at US$12.5 million for 58 vessels of 120-250GT. This proposal requires additional preparation. Several points, some made earlier in this report, are germane:

- Construction of tuna longliner vessels is mainly to replace existing old vessels and to expand the fishing fleet. It was estimated in August 1973 that about 100 of the 400 vessels need to be replaced.

- Tuna supply from long line methods of capture is unlikely to increase in total but increasing demand is causing tuna prices to increase.

- Costs and returns, compared with Japan, the leading producer, are good and historically proven.

- The number of sharp freezer type long liners should be expanded only after careful consideration of its effect on total supply of sharp frozen tuna on the Japanese market and an evaluation of the possibility of market repercussions.

101. On balance, the proposal is meritorious and, in the opinion of the mission, deserves consideration. Identification of the project, however, would require extensive discussions with the Korean Government, regarding its policies of development of this sector, and with the enterprises active in the field on lending channels and procedures. The coordinating role of government must be defined.

B. Skipjack Vessel Construction

102. This project would involve construction of 10 vessels a year, over three years, at a unit cost of US$800,000 for a total investment of US$24 million. It estimates that production per vessel would average 1,427 m tons and export earnings US$522,000 annually. Operating costs are estimated at US$323,000 annually and net returns to capital investment at US$199,000, giving a rate of return of 38.1%. The proposal is not prepared in sufficient detail to enable specific evaluation. The following observations, also made elsewhere in this report, are relevant:

- Korea has two shipjack vessels now operating in the Atlantic Ocean but it will be necessary to gain additional experience and technology from other countries such as Japan.

- Proven Korean skipjack crews are not yet available but training presently is taking place.

- Bait development work has been carried out and Korean fishery experts report that live bait now can be carried to South Pacific fishing grounds on a commercial scale. Formerly, live bait could be carried only a short distance from Korea and a supply of bait near fishing areas was essential.

- The world skipjack population is underexploited and is the only major tuna stock in this condition. However, Korea will need to make certain it has access to waters for skipjack fishing, which often are claimed by nearby countries.

- By the time the proposed project is ready for final decision many unknowns such as catch rates and bait problems will be removed.

103. The mission believes the proposal has much merit and warrants further development and scrutiny. But as in the case of the long line proposal, additional project preparation will be required. Extensive discussions will need to be held with the Korean Government regarding its policies for development of this sector and with the enterprises active in this field on lending channels and procedures before it will be possible to evaluate the project proposal.

C. Marketing Facilities

104. The Office of Fisheries, the CCFC, and MAF place high priority on program to improve the quality and efficiency of the domestic market distribution system. It is proposed to build 6 fish markets, at a cost of US$6 million, 40 direct sales markets at a cost of US$1 million, and 8 refrigerated fishery warehouses for US$790,000; altogether project costs are estimated at US$7.79 million. The benefits potentially available, through an improved distribution chain would be substantial, but the organization and operation of the proposed program were insufficiently detailed to enable preliminary evaluation.

D. Eel Culture

105. This proposal involves expanding the present 18 ha devoted to eel culture by 85 ha over a five year period, at a cost of US$3.9 million for construction, and US$6.3 million for operation, for a total of US$10.2 million. It is estimated that exports of eel would rise to 2,000 m ton annually and have an export value of US$24 million. Most of the conditions for success of such a project are present. They include seed stock (which may limit growth rate of the industry), the labor force, the prospect of

intensive use of available water, and the amenability of the type of development to be organized in numerous small enterprises. However, availability of feed for eels may be a constraint to growth of the industry, as about 7 pounds of fish are required to produce 1 pound of eels. Eels are very high priced and can be marketed readily in Japan. This proposal merits more detailed technical and economic study by the Office of Fisheries.

E. Fishmeal Factory Ship

106. It is proposed to build two 5,500 GT factory trawler fish meal vessels in foreign yards for total investment of US$15.4 million. They would produce both fishmeal for domestic use in feeding livestock and fillets for export. Important consideration are:

- The Korean demand for fishmeal is large and expanding. More than 50% is imported and import value was about US$10 million in 1972. The quality of domestically produced meal is poor because of processing methods and not because of the inherent characteristics of the coastal fish used for its production.

- The stock of North Pacific pollack, which is the proposed basis of operation, is about 16 million m tons compared with current catch of about 6 million m tons.

- Korea has a fish meal factory capable of producing 5,500 m tons annually which will be supplied by seven ships under construction.

107. The proposal does not include sufficient data on costs and returns to judge its economic viability. In order to evaluate the proposal it would be necessary to know what would be the annual costs of operation, what the likely catch rates would be based on experience of other similar ships now in operation, and what markets there would be for fillets in North America and for surimi in Japan. Large fishmeal factory ships are highly capital intensive. Consequently, Korea would not have as great an advantage in this type of enterprise as it does in the case of other fishery industries because of its high-quality and low-cost labor supply. The mission recommends that this proposal be given lower priority than the others.

F. Prosperous Fishing Villages

108. This is a comprehensive program for strengthening all segments of coastal, off-shore, and aquiculture fishing industries under direction of the CFFC. It proposes investments and expenditures of 57.9 billion won (about US$145 million) for construction and import of fishing vessels,

motorization of fishing boats, replacement of equipment, improvement of marketing facilities, and breakwater and other port facilities. The program is very large and general and it is not possible to say what aspects merit high priority from the information contained in the broad proposal. Some aspects such as those related to expanding aquiculture of hard clams, oysters, shellfish, laver, and dulce undoubtedly justify investment. Other parts of the proposal are concerned chiefly with improving the social welfare of fishermen's households.

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

COASTAL FISHERIES PRODUCTION BY TYPES OF EQUIPMENT
(Unit: Metric tons)

	1962	1966	1967	1968	1969	1970	1971
Production	387,318 (100.0)	481,372 (124)	490,074 (127)	552,284 (143)	513,320 (133)	525,412 (136)	504,931 (130)
First Class Boat Seines	32,253	30,160	26,913	25,363	55,030	21,789	27,014
Non-Powered trawls	5,635	9,469	11,996	10,145	10,061	17,539	17,026
Staw Nets	36,206	82,535	109,837	96,060	78,436	99,455	103,562
Anglings	40,734	76,760	42,393	88,941	61,756	72,397	35,984
Long Lines	34,973	32,162	27,825	41,132	21,139	30,356	19,797
Gill Nets	61,223	105,305	106,269	119,164	133,427	113,138	125,047
Diving	4,381	11,025	15,292	11,194	9,118	28,582	29,040
Set nets	32,517	30,654	23,812	15,832	15,560	5,896	6,351
First Category Public Fisheries	25,782	62,731	69,396	89,382	77,875	89,636	90,953
Second Category Public Fisheries	6,697	7,048	8,620	6,630	8,749	12,510	12,487
Third Category Public Fisheries	25,652	12,460	16,816	17,359	19,414	8,354	10,436
Other Fisheries	81,265	21,063	30,905	31,082	22,755	25,760	27,234

Source: Office of Fisheries

ANNEX 11
Appendix Table 1

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

FINANCIAL PROJECTION FOR A 300 GROSS TON TUNA LONG LINER OPERATED FROM AN ATLANTIC BASE

I. Operation Plan

(a) Trip Schedule

Pusan — 40 days — 2 days Panama — 10 days — Fishing Ground

(Fishing - 100 days
(Moving - 14 days

10 days — 7 days Base — From 2nd to 6th Trip 10 days — Fishing Ground — 7 days Base

(Fishing - 100 days
(Moving - 14 days

45 days for main docking and crew replacement — Pusan

(b) Fishing Plan

	Days Required for 1st Trip	Days Required for 2nd to 6th Trip
Sailing	40	
Fishing	100	500
Moving	14	70
Trips between base and fishing ground	20	100
Staying in Ports	9	28
Temporary Docking		12
Main docking and crew replacement	—	—
Total	183	755

Total for one fishing period: 938 days

Estimated catches per fishing day: 2.0 metric tons

Total Fishing days: 600 days

Estimated total catches: 1,200 metric tons

Rejection:	10 metric tons
Saleable quantity:	1,190 metric tons
Price estimation:	$660/metric ton
Total Sales Amount:	$785,400

II. Composition of Fish Species and Price

Species	Composition	Price per M/T	Amount
Albacore	40%	$800	$320
Yellowfin	35%	$720	$252
Bigeye	15%	$380	$ 57
Others	10%	$310	$ 31
Total	100%		$660

III. Income and Outgo Plan

1. Income: 1,190 M/T x $660 = $785,400

Total: $785,400

2. Outgo:

A. Direct Expense

(a) Fuel Cost $77,934

(i) F.O.
600 fishing days x 1.8KL x $35 = $37,800

244 sailing days x 3KL x $35 = $25,620

50 days (in ports) x .5KL x $35 = $875

(ii) L.O.
1,837KL x 2% x $350 = $12,859

(iii) R.O.
2 D/M x 6 trips x $65 = $780

(b)	Bait	$86,400	24 c/s x 600 fishing days x $6/cs of 10 kg. = $86,400
(c)	Expendable Fishing Gear	$ 3,600	$600 x 6 trips = $3,600
(d)	Foodstuff	$24,388	26 men x 938 days x $1
(e)	Vessel Maintenance	$18,000	Main docking: $10,000 Temporary docking: $2,500 x 2 = $ 5,000 Temporary repair: $500 x 6 trips = $3,000
	(Company share: (Company and Crew Share:	$10,500) $ 7,500)	
(f)	Expendable Supplies	$ 5,400	$900 x 6 trips = $5,400
(g)	Crew Expense	$ 600	$100 x 6 trips = $ 600
(h)	Medical Supplies	$ 300	$50 x 6 trips = $ 300
(i)	Port charges, etc.	$ 3,500	$500 x 7 times = $3,500
(j)	Communication Expenses	$ 300	$50 x 6 trips = $ 300
(k)	Air ticket fares for crew's return trip	$ 8,554	$329 x 26 = $8,554
	Sub-total	$228,976	
B.	Crew Share	$131,063	$785,400 -($785,400 x 8% + $218,476) x 26% = $131,063
	Sub-total	$131,063	
C.	Crew Bonus	$17,475	$131,063 x $\frac{4}{30}$ = $17,475
	Sub-total	$17,475	

D. Indirect Expense

(a)	Basic Fishing Gear	$15,000		
(b)	Crew insurance	$ 1,612	26 men x $2 x 31 months = $1,612	
(c)	Vessel insurance	$42,625	$500,000 x 110% x 3% x $\frac{31}{12}$ = $42,625	
(d)	Overhead cost	$62,000	$2,000 x 31 months = $62,000	
(e)	Interest on running capital (Sailout loan)	$10,000	Sail-out Loan: $\frac{9}{12}$	Other Loans
			$50,000 x 8% x $\frac{9}{12}$ = $3,000	$1,500
			$40,000 x 8% x $\frac{5}{12}$ = $1,333	$ 800
			$30,000 x 8% x $\frac{5}{12}$ = $1,000	$ 600
			$20,000 x 8% x $\frac{5}{12}$ = $ 667	$ 400
			$10,000 x 8% x $\frac{5}{12}$ = $ 333	$ 367
(f)	Depreciation	$145,312	$450,000 x 8 x $\frac{31}{12}$ = $145,312	
	Sub-Total	$266,549		
Total Outgo:		$644,063		

Net Profit $785,400 (Total Income) - $644,063 (Total Outgo)
= $141,337

(i) Annual Return on Investment: $141,337 ÷ $500,000 x $\frac{12}{31}$ = 11%

(ii) Years required to pay back of equity investment:
$500,000 ÷ [(145,312 ÷ 141,377) x $\frac{12}{31}$] = 4.5 years

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Source: Private industry communication

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

COMPARISION OF TUNA LONG LINER OPERATIONS
PER YEAR AND VESSEL

	Japan	Korea
Vessel Scale	320 G/T	300 G/T
Number of Crew	28	26
Operating days	304	254
Fish Catch	450 ton	457 ton
Fish Proceeds	$213,247	$332,239
Operating Expenses:		
Crew Salaries	$ 74,640	$ 58,743
Vessel Expenses	$ 20,000	$ 29,225
Fuel and Oil	$ 21,669	$ 31,112
Depreciation	$ 25,805	$ 54,000
Miscellaneous Expense	$ 36,872	$ 81,399
Total	$178,986	$254,479
Operating Income	$ 34,261	$ 77,760

Exchange Rate: $1 = ¥ 360 $1 = ₩ 400

Sources: Japan - Japanese Fishery Almanac for 1968
Korea - Private Firms Accomplishment for 1972

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

EXPORT OF SEA PRODUCTS
(Unit: Tons, $1,000)

Commodity	1967		1968		1969		1970		1971	
	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount
Total	66,425	57,499	76,439	57,323	108,695	73,916	134,862	90,052	146,434	114,981
Alive Fish	13,307	6,721	13,877	7,232	11,884	6,764	14,805	11,353	24,458	18,217
Frozen	4,518	6,084	3,679	4,653	4,581	4,556	8,394	5,994	11,528	8,001
Squid	4,678	4,630	1,780	1,970	3,616	4,156	6,325	10,335	4,377	9,361
Pickled	1,724	1,730	866	1,217	854	1,224	479	1,566	1,247	2,629
Canned	665	519	1,846	2,221	2,053	2,184	377	375	991	1,885
Agar-Agar	804	5,800	415	1,851	425	1,780	322	1,227	342	1,171
Sea-weed	3,055	929	1,855	588	3,100	998	2,939	1,525	4,085	2,678
Laver	672	14,371	1,243	17,054	969	21,721	5,813	11,592	1,257	4,749
Tuna	36,200	11,969	50,074	15,559	80,800	24,072	89,621	37,663	90,725	55,103
Others	802	635	804	732	413	492	834	1,109	1,429	2,074
Fish-net	-	4,111	-	4,246	-	5,969	4,953	7,313	5,995	9,113

Source: Office of Fisheries

ANNEX II
Appendix Table 4

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

PRODUCTION AND PRICES OF MAJOR FISHES
(Unit: Production = metric tons)
Price = won per kilo)

Species	1965	1966	1967		1968		1969		1970		1971		1972	
	Amount	Amount	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price
Alaska Pollock	26,696	21,021	17,506		30,030	58	17,934	78	26,492	110	71,327	60	113,291	55
Saury	32,281	39,404	27,858	55	29,893	58	29,478	78	25,036	110	30,592	60	38,242	53
Squid	68,398	75,473	38,945	42	84,864	33	59,898	38	72,142	54	37,825	77	88,701	82
Corvenia	42,465	54,422	37,521	-	53,846	37	43,398	120	55,173	144	43,784	173	57,442	191
Hair Tail	37,683	45,384	48,713	-	18,592	76	47,922	75	69,082	71	82,868	79	54,072	62
Mackerel	7,399	2,078	2,772	-	10,482	69	42,103	54	38,256	66	60,599	62	37,823	46
Horse Mackerel	26,496	10,058	5,280	-	2,543	99	2,042	96	883	122	8,904	61	4,383	62
Anchovy Hair Tail	56,761	66,349	78,538	-	63,127	19	115,056	14	54,047	18	66,904	20	82,872	23
Bastard Halibut	2,117	2,625	3,897	-	3,738	-	2,510	126	3,123	132	4,336	138	3,400	162
Croaker	3,163	2,840	2,150	-	2,526	136	1,142	154	1,597	188	967	231	2,796	199
Pomfret	4,974	7,852	6,196	-	6,077	-	1,432	102	4,727	111	4,492	107	6,172	104
Swellfish	6,262	3,105	4,241	-	5,229	-	5,691	-	4,096	69	3,127	85	6,718	96
King Mackerel	3,608	7,590	7,581	-	5,126	-	3,367	86	5,276	94	6,584	110	6,700	90
Yellow Tail	1,136	1,331	1,654	-	2,942	-	2,247	123	1,718	235	761	137	2,233	291
Red Sea Bream	1,706	2,033	2,984	-	3,722	104	1,768	150	1,874	189	2,010	212	4,570	219
Eel	3,757	5,364	6,381	-	8,377	-	7,113	-	8,184	75	6,732	76	5,955	77
Shrimp	3,181	2,478	4,378	-	3,308	-	1,261	149	1,063	198	1,172	172	2,483	314
Laver	11,642	7,638	14,574	18	16,400	23	7,771	42	19,750	37	14,831	39	12,754	32

Source: Office of Fisheries

ANNEX 11
Appendix Table 5

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

CENTRAL FEDERATION OF FISHERIES COOPERATIVES
PRICE STABILIZATION FUND - PURCHASING BUSINESS BY YEAR
(Unit: 1,000 won)

Year	Kind	Quantity	Amount
1970	Laver	2,042 - 1,000 bundle	559,524
	Dried Squid	32,670 - chook*	18,958
	Pickled shrimp	358 - D/M	17,384
Total			595,866
1971	Dried Alaska Pollock	3,117 - JJack**	118,466
1972 Target	Dried Squid	350,000 - chook*	315,000
	Canned Saury	150,000 - C/S	200,000
Total			515,000

* Chook: a unit or bundle comprising 20 pieces of squid
** JJack: a unit or bundle comprising 20 pieces of dried Alaska Pollock

Source: Office of Fisheries

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

A LONG-RANGE PLAN FOR EXPORT OF SEA PRODUCTS: 1972-1976

(Unit: US $,000) 1/

Commodity	1972	1973	1974	1975	1976
Alive and Fresh Fish	11,800 (24,000)	13,300 (28,000)	15,300 (30,000)	17,300 (32,000)	19,000 (37,000)
Frozen	5,700 (8,500)	6,000 (9,700)	6,400 (10,000)	6,700 (11,000)	7,000 (14,000)
Squid	4,200 (10,000)	4,400 (12,000)	4,600 (12,000)	4,800 (12,500)	5,000 (14,000)
Salted and Preserved	1,600 (4,000)	1,700 (4,800)	1,800 (5,000)	1,900 (5,500)	2,000 (7,000)
Canned	1,600 (5,500)	2,200 (6,000)	2,800 (7,000)	3,400 (7,500)	4,000 (9,000)
Agar-Agar	3,000 (2,000)	3,000 (2,200)	3,000 (2,500)	3,000 (3,000)	3,000 (4,000)
Seaweeds	1,300 (3,000)	1,500 (3,600)	1,600 (4,000)	1,800 (4,200)	2,000 (5,000)
Laver	25,000 (3,500)	27,000 (5,000)	28,500 (5,500)	35,000 (5,800)	35,000 (8,000)
Tuna	45,500 (80,000)	65,600 (96,000)	85,000 (128,000)	99,000 (165,000)	106,000 (200,000)
Other Fishery Products	2,400 (4,000)	3,400 (4,800)	3,900 (5,000)	4,600 (5,500)	5,000 (7,000)
Fish Net	6,900 (10,500)	7,900 (13,000)	9,100 (15,000)	10,500 (17,000)	12,000 (20,000)
Total	109,000 (155,000)	136,000 (185,000)	162,000 (224,000)	188,000 (269,000)	200,000 (325,000)
Ratio compared the previous year	134.7	119.3	121.0	120.0	

1/ Figures in parentheses from Office of Fisheries Plan. Other figures from Government Plan.

Source: Office of Fisheries

ANNEX 11
Appendix Table 7

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

INVESTMENT PLAN FOR FISHERY DEVELOPMENT, 1972-76

(1970 prices; foreign capital in US$ 1,000 and domestic in million won)

Project	Quantity	Domestic Capital	Foreign Capital	Total	Central Gov't	Local Gov't	Private Enterprise
Total		48,307	189,953	107,306	45,129	2,612	59,565
Fishing Port Facilities		14,212	-	14,212	11,633	2,579	-
1. Fundamental Facilities	29,800 m	13,201	-	13,201	10,622	2,579	-
2. Functional Facilities	137 Place	1,011	-	1,011	1,011	-	-
Fishing Facilities		13,191	183,880	70,404	13,213	-	57,191
1. Coastal Fishery	30,000 G/T (1,000 unit)	8,533	13,000	12,671	10,053	-	2,618
2. Off-shore Fishery	90,000 HP 18,600 G/T (155 unit)	3,860	15,170	8,572	2,202	-	6,370
3. Deep-Sea Fishery	131,950 G/T (271 unit) 10 Place	267	155,140	48,453	250	-	48,203
4. Equipment Improvement	1,750 sets	531	570	708	708	-	-
Aquiculture		6,738	-	6,738	5,119	33	1,586
1. Tideland Development	22,700 sets 7,918 ha	5,875	-	5,875	4,426	-	1,449
2. Inland Water Development	63 Place	863	-	863	693	33	137
Marketing and Processing Facilities	3,747 sets 21 place	1,574	6,073	3,457	2,569	-	888
Development of Fishery Technique		2,767	-	2,767	2,767	-	-
Miscellaneous		9,828	-	9,828	9,828	-	-

Source: Office of Fisheries

ANNEX II
Appendix Table 8

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

PROJECTED TUNA CONSUMPTION
(1,000 MT)

	Actual 1966	Projected 1990
USA		
Can	382.8	565.0
Japan		
Raw	353.0	433.0
Can	25.8	2.0
Total	378.8	435.0
E.E.C.		
Can	159.0	305.0
Spain		
Raw	31.8	66.0
Can	37.8	13.0
Total	69.6	79.0
Peru		
Raw	50.2	167.0
China (Taiwan)		
Raw	38.0	39.0
Can	6.8	143.0
Total	44.8	182.0
Turkey		
Raw	16.0	0.4
Canada		
Can	9.7	14.0
U.K.		
Can	7.6	2.6
Total - Selected Countries	1,118.5	1,750.0
Grand Total *	1,320.0	2,100.0

* Projected at 120 percent of total for selected countries.

Source: "Economic Projections of the World Demand and Supply of Tuna, 1970-1990" by F.W. Bell, U.S. Bureau of Commercial Fisheries, 1969

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

US BLOCK PRICES OF ALASKA POLLOCK
(Unit: US$/lb.)

	Jan. 1966	Jan. 1969	Jan. 1970	Jan. 1971	Jan. 1972
Cod blocks	29.5	21.5	26.5	40.0	46.5
Haddock blocks	36.5	34.0	36.5	41.5	47.0
Ocean Perch blocks	27.0	25.5	30.5	38.5	38.5
Flounder blocks	31.0	31.5	42.5	39.5	43.5
Atlantic Pollock blocks	22.5	18.5	19.5	29.5	32.5
Whiting blocks	23.7	22.0	22.5	29.0	33.0

Source: "Alaska Pollock", Fisheries Service, Department of the Environment, March 1972

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

ANNEX 12. STATISTICAL ANNEX

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

STATISTICAL ANNEX

TABLE OF CONTENTS

SECTION I: POPULATION AND EMPLOYMENT

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 1.1: POPULATION OF THE REPUBLIC OF KOREA
(000)

Year	Mid-year Estimates	Increase over Previous year		Density Number per sq. km	End of Year Estimate
		Number	%		
1961	25,402	707	2.9	256	25,700
1962	26,125	723	2.8	263	26,432
1963	26,868	743	2.8	271	27,184
1964	27,631	763	2.8	278	27,958
1965	28,377	746	2.7	286	28,754
1966	29,086	709	2.5	295	29,375
1967	29,784	698	2.2	303	30,067
1968	30,469	685	2.0	309	30,747
1969	31,139	670	1.9	316	31,410
1970	31,317	554	1.8	318	32,056
1971	31,849	532	1.7	323	32,743
1972	32,359	510	1.6	329	-

Source: Economic Planning Board

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 1.2: POPULATION OF THE REPUBLIC OF KOREA 1920-1970

Census Date	Population		Rate of Growth (per five-year period)	
	Entire Country	Republic of Korea	Entire Country	Republic of Korea
	(000)		%	
1920 (Oct. 1)	17,264	-	-	-
1925 (Oct. 1)	19,020	-	10.2	1.9
1930 (Oct. 1)	20,438	-	7.5	1.4
1935 (Oct. 1)	22,208	-	8.7	1.7
1940 (Oct. 1)	23,547	-	6.0	1.2
1944 (Oct. 1)	25,120	25,120	6.7	1.8
1949 (May 1)	29,907	20,167	19.1	-
1955 (Sept. 1)	30,532	21,502	2.1	1.0
1960 (Dec. 1)	35,024	24,989	14.1	2.9
1966	-	29,193	-	2.7
1970 (Mid-year)	-	31,469	-	1.9

Source: World Population Prospects as Assessed in 1963, New York, United Nations, 1966, p. 61; Yearbook of Agriculture and Forestry Statistics, 1970, Seoul, Korea; and Mimeographed Fact Sheet, Korean Facts at a Glance. Data through 1960 are from the United Nations publication and the 1970 figure in an estimate, subject to refinement.

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 1.3: REGIONAL POPULATION DISTRIBUTION AND CHANGES

City and Province	1970 Distribution 000	1970 Distribution %	1970 Density Persons Per km^2	Changes 1966-70 000	Changes 1966-70 %
Seoul	5,536	17.6	9,031	1,733	45.6
Busan	1,881	6.0	5,039	451	31.5
Gyeonggi	3,358	10.7	307	250	8.1
Gangweon	1,867	5.9	112	34	1.9
Chung Bug	1,482	4.7	194	-68	-4.4
Chung Nam	2,861	9.1	329	-44	1.5
Jeon Bug	2,435	7.7	302	-78	-3.5
Jeon Nam	4,006	12.7	332	-44	-1.1
Gyeong Bug	4,560	14.5	230	83	1.9
Gyeong Nam	3,119	9.9	201	57	-1.8
Jeju	366	1.2	200	29	8.4
Total	31,469	100.0	318	-	7.8

Source: Major Statistics in Charts, Economic Planning Board, p. 17.

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 1.4: LABOR FORCE AND EMPLOYMENT
(000)

Year	(A) Population of 14 Years Old and Over	(B) Labor Force Population Total	Male	Female	(C) Non Labor Force Population	(D) Employed Total	Male	Female	(E) Unemployed Total	Male	Female	Labor Participation Rate (B/A)	Employment Rate (D/B)	Unemployment Rate (E/B)
							(Total)							
1965	16,591	9,199	6,001	3,198	7,392	8,522	5,499	3,023	677	502	175	55.4	92.6	7.2
1966	16,840	9,325	6,130	3,195	7,515	8,659	5,634	3,025	666	496	170	55.4	92.9	7.1
1967	17,169	9,504	6,173	3,331	7,665	8,914	5,763	3,151	590	410	180	55.4	93.8	6.4
1968	17,433	9,757	6,216	3,541	7,676	9,261	5,867	3,394	496	349	147	56.0	94.9	5.1
1969	17,579	9,818	6,318	3,500	7,761	9,347	5,998	3,349	471	320	151	55.9	95.2	4.8
1970	17,936	10,020	6,394	3,626	7,916	9,574	6,052	3,522	446	342	104	55.9	95.5	4.5
1971	18,369	10,165	6,431	3,734	8,204	9,708	6,095	3,613	457	336	121	55.3	95.5	4.5
1972	18,764	10,500	6,682	3,818	8,264	10,026	6,304	3,722	474	378	96	56.0	95.5	4.5
							(Farm Household)							
1965	9,353	5,437	3,440	1,997	3,916	5,270	3,308	1,962	168	131	37	58.1	96.9	3.1
1966	9,266	5,426	3,408	2,018	3,840	5,258	3,274	1,984	168	134	34	58.6	96.9	3.1
1967	9,057	5,315	3,276	2,039	3,742	5,191	3,189	2,002	124	87	37	59.7	97.7	2.3
1968	8,874	5,323	3,174	2,149	3,551	5,223	3,108	2,115	100	66	34	60.0	98.1	1.9
1969	8,572	5,228	3,146	2,082	3,344	5,115	3,065	2,050	113	81	32	61.0	97.8	2.2
1970	8,393	5,109	2,964	2,145	3,284	5,029	2,912	2,117	80	52	28	60.9	98.4	1.6
1971	8,015	4,918	2,871	2,047	3,097	4,846	2,823	2,023	72	48	24	61.4	98.5	1.5
1972	8,035	5,137	2,936	2,201	2,898	5,068	2,888	2,180	69	48	21	63.9	98.7	1.3
							(Nonfarm Household)							
1965	7,238	3,762	2,561	1,201	3,476	3,252	2,191	1,061	509	371	138	51.9	86.4	13.6
1966	3,574	3,899	2,722	1,177	3,675	3,401	2,360	1,041	498	362	136	51.5	87.2	12.8
1967	8,112	4,189	2,897	1,292	3,923	3,723	2,574	1,149	466	323	143	51.6	88.9	11.1
1968	8,559	4,434	3,042	1,392	4,125	4,038	2,759	1,279	396	283	113	51.8	91.1	8.9
1969	9,007	4,590	3,172	1,418	4,417	4,232	2,933	1,299	358	239	119	51.0	92.2	7.8
1970	9,543	4,911	3,430	1,481	4,632	4,545	3,140	1,405	366	290	76	51.5	92.5	7.5
1971	10,354	5,247	3,560	1,687	5,107	4,862	3,272	1,590	385	288	97	50.7	92.7	7.3
1972	10,729	5,363	3,746	1,617	5,366	4,958	3,416	1,542	405	330	75	50.0	92.4	7.6

Source: Economic Planning Board. Data are based on sample surveys of economically active population.

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 1.5: EMPLOYMENT BY SECTORS
(000)

Year	Total	Agriculture, Forestry and Fishery			Mining and Manufacturing			Social Overhead Capital and Other Services				
		Sub-total	Agriculture & Forestry	Fishery & Hunting	Sub-total	Mining & Quarrying	Manufacturing	Sub-total	Construction	Electricity, Gas, water & Sanitary Services	Transportation, Storage & Communications	Commerce and Services
						Employed Persons						
1964	8,210	5,084	4,906	178	726	55	671	2,400	191	14	162	2,033
1965	8,522	5,000	4,785	215	879	79	800	2,643	264	19	204	2,156
1966	8,659	5,013	4,826	187	940	83	857	2,706	213	22	180	2,291
1967	8,914	4,924	4,706	218	1,138	95	1,043	2,852	264	28	192	2,368
1968	9,261	4,863	4,643	220	1,295	114	1,181	3,103	317	23	234	2,529
1969	9,347	4,798	4,660	138	1,335	113	1,222	3,214	333	28	273	2,580
1970	9,574	4,834	4,745	89	1,369	109	1,260	3,371	279	25	343	2,724
1971	9,708	4,709	4,597	112	1,375	88	1,287	3,624	333	24	354	2,913
1972	10,026	5,078	4,853	225	1,423	51	1,372	3,525	371	-	-	-
						Composition (%)						
1964	100.0	61.9	59.7	2.2	8.9	0.7	8.2	29.2	2.3	0.2	2.0	24.7
1965	100.0	58.7	56.2	2.5	10.3	0.9	9.4	31.0	3.1	0.2	2.4	25.3
1966	100.0	57.9	55.7	2.2	10.9	1.0	9.9	31.2	2.5	0.2	2.1	26.4
1967	100.0	55.2	52.8	2.4	12.8	1.1	11.7	32.0	3.0	0.3	2.1	26.8
1968	100.0	52.5	50.1	2.4	14.0	1.2	12.8	33.5	3.4	0.3	2.5	27.3
1969	100.0	51.3	49.8	1.5	14.3	1.2	13.1	34.4	3.6	0.3	2.9	27.6
1970	100.0	50.5	49.6	0.9	14.3	1.1	13.2	35.2	2.9	0.3	3.6	28.4
1971	100.0	48.5	47.3	1.2	14.2	0.9	13.3	37.3	3.4	0.3	3.6	30.0
1972	100.0	50.6	47.4	-	14.2	0.5	13.7	35.2	3.7	-	-	-

Source: Economic Planning Board

ANNEX 12
Table 1.5

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 1.6: PROJECTIONS OF POPULATION AND EMPLOYMENT
(Third Five-Year Plan)

	1970(A)		1971		1972		1973		1974		1975		1976(B)		
	No.of Persons	Composition	No.of Pers.	Comp.	No.of Pers.	Comp.	No.of Pers	Comp.	No.of Pers.	Comp.	No.of Pers.	Comp.	No.of Pers.	Comp.	B/A x100
	'000	%	'000	%	'000	%	'000	%	'000	%	000	%	'000	%	%
Total Population /1	31,317	100.0	31,849	100.0	32,359	100.0	32,844	100.0	33,377	100.0	33,837	100.0	34,345	100.0	109.7
(Growth Rate) %	(1.8)		(1.7)		(1.6)		(1.5)		(1.5)		(1.5)		(1.5)		
Labor Population	10,420	33.3	10,720	33.7	11,015	34.0	11,309	34.4	11,620	34.8	11,950	35.3	12,290	35.8	117.9
Employment	9,941	100.0	10,240	100.0	10,532	100.0	10,823	100.0	11,131	100.0	11,456	100.0	11,792	100.0	118.6
(1) Agr.Forestry & Fisheries	(4,753)	(47.8)	(4,704)	(45.9)	(4,667)	(44.3)	(4,613)	(42.6)	(4,558)	(41.0)	(4,501)	(39.3)	(4,442)	(37.7)	(93.5)
(2) Mining & Mfg.	(1,596)	(16.1)	(1,717)	(16.8)	(1,840)	(17.5)	(1,972)	(18.2)	(2,111)	(19.0)	(2,257)	(19.7)	(2,413)	(20.5)	(151.2)
(3) S.O.C. and other services	(3,592)	(36.1)	(3,819)	(37.3)	(4,025)	(38.2)	(4,238)	(39.2)	(4,462)	(40.0)	(4,698)	(41.0)	(4,937)	(41.8)	(137.4)
Unemployment Rate %	4.6 %		4.5		4.4		4.3		4.2		4.1		4.0		

/1 As of middle of the year.

Source: Overall Planning Bureau, Economic Planning Board

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 1.7: POPULATION DISTRIBUTION BY SETTLEMENT GROUP, 1960 AND 1971 AND PROJECTIONS FOR 1986

Settlement Size Group	1960			1971			1986			Incremental Population /1			
										1960- 1971		1971-1986	
	No.of Places	Population	Percentage	No.of Places	Population	Percentage	No. of Places	Population	Percentage	Increase	Percentage	Increase	Percentage
		'000	%		'000	%		'000	%	'000	%	'000	%
Over 1,000,000	2	3,608	14	3	7,977	24	4	16,552	39	4,369	121	8,575	107
Between 250,000 and 1,000,000	3	1,391	6	4	1,807	6	7	3,273	8	416	30	1,466	81
Between 100,000 and 250,000	4	704	3	11	1,523	5	18	2,721	6	819	116	1,198	79
All settlements over 100,000	9	5,703	23	18	11,307	35	29	22,546	53	5,604	99	11,239	99
Remainder	-	19,286	77	-	21,111	65	-	20,179	47	1,825	9	- 932	-4
Total	-	24,989	100	-	32,418	100	-	42,725	100	7,429	29	10,307	32

/1 Incremental populations in 1966-71 and actual of those in 1971-86 projected.

Source: 1960 Census and Economic Planning Board, in Mark Fortune Mobilizing for Urbanization, 1971

ANNEX 12
Table 1.7

SECTION II: NATIONAL INCOME ACCOUNTS AND FISCAL DATA

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 2.1: MAJOR ECONOMIC INDICATORS

Year	Population Mid-year (000)	Gross National Product: Current Prices (Bil won)	Gross National Product: 1970 Prices (Bil won)	Gross National Product: Per Capita (US$)	Domestic Savings Rate (%)	Industrial Production (1965=100)	Wholesale Price index (1970=100)	Foreign Transactions (Mil US$): Exports	Imports	Invisible Receipts	Foreign Investments and loans	Gross Tax Burden % of GNP
1961	25,498	297	1,184	83	3.9	59.4	35.1	41	316	124	-	9.5
1962	26,231	349	1,221	87	1.6	69.4	38.4	55	422	122	-	10.8
1963	26,987	489	1,328	98	6.3	78.6	46.3	87	560	92	-	8.9
1964	27,678	700	1,442	102	7.4	84.8	62.3	119	404	97	-	7.3
1965	28,327	805	1,530	106	7.5	100.0	68.5	175	463	126	-	8.6
1966	28,962	1,032	1,719	126	11.8	122.3	74.6	250	716	238	350 1/	10.8
1967	29,541	1,270	1,853	143	12.0	155.7	79.4	320	996	375	237	12.1
1968	30,171	1,598	2,087	168	13.7	203.0	85.8	455	1,463	425	358	14.4
1969	30,738	2,082	2,400	208	17.5	245.6	91.6	623	1,824	497	560	15.1
1970	31,298	2,589	2,589	242	16.3	286.7	100.0	835	1,984	491	548	15.4
1971	31,847	3,152	2,827	275	14.5	340.0	108.6	1,068	2,394	487	691	15.7
1972	32,416	3,860	3,024	303	14.6		123.8	1,624	2,522	579	718	13.9

Source: Major Economic Indicators, Economic Planning Board, July 1973, p. 95.
Note: 1/ Includes loans & investment from 1959 to 1966.

ANNEX 12
Table 2.1

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 2.2: INDUSTRIAL ORIGIN OF GNP AT CURRENT PRICES
(Bil won)

Year	Total GNP	Agriculture, Forestry, and Fisheries	Mining and Manufacturing	Social Overhead Capital and Other Services	Percentage Distribution: Total GNP	Agriculture, Forestry, and Fisheries	Mining and Manufacturing	Social Overhead Capital and Other Services
1961	297	119	45	132	100	40	15	45
1962	349	128	58	164	100	37	17	47
1963	489	206	81	201	100	42	17	41
1964	700	321	123	256	100	46	18	37
1965	805	309	159	338	100	38	20	42
1966	1,032	365	207	460	100	35	20	45
1967	1,270	399	260	611	100	31	20	48
1968	1,598	455	348	795	100	29	22	50
1969	2,082	597	454	1,030	100	29	22	49
1970	2,589	725	591	1,274	100	28	23	49
1971	3,152	911	719	1,522	100	29	23	48

Source: Major Economic Indicators, Economic Planning Board, May 1972, p. 19.

ANNEX 12
Table 2.2

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 2.3: INDUSTRIAL ORIGIN OF GNP AT 1965 CONSTANT PRICES
(Bil won)

Year	Total GNP	Agriculture, Forestry, and Fisheries	Mining and Manufacturing	Social Overhead Capital and Other Services	Percentage Distribution: Total GNP	Agriculture, Forestry, and Fisheries	Mining and Manufacturing	Social Overhead Capital and Other Services
1961	613	269	91	253	100	44	15	41
1962	635	252	106	277	100	40	17	43
1963	693	271	123	299	100	39	18	43
1964	750	314	130	306	100	42	17	41
1965	806	311	157	337	100	39	19	42
1966	914	346	181	387	100	38	20	42
1967	995	327	222	446	100	33	22	45
1968	1,127	331	280	516	100	29	25	46
1969	1,306	370	339	597	100	28	26	46
1970	1,422	367	398	657	100	26	28	46
1971	1,566	376	471	719	100	24	30	46

Source: Major Economic Indicators, Economic Planning Board, May 1972, p. 20.

ANNEX 12
Table 2.3

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 2.4: CONTRIBUTION OF AGRICULTURE TO GNP AND GROWTH RATES

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	Growth rate[1] 1961-1971
						(Billion won)						(Percent)
At 1965 prices												
1. GNP at market prices	614	635	693	750	806	914	995	1,127	1,306	1,433	1,567	11.4
2. Agriculture and forestry	260	242	260	301	298	331	309	311	350	344	350	3.5
3. Hunting and fishing	9.0	9.6	11.4	12.9	13.6	15.1	17.8	20.0	20.8	23.8	28.3	13.3
At current prices												
4. GNP at market prices	297	349	488	697	806	1,032	1,242	1,576	2,047	2,546	3,113	
5. Agriculture and forestry	117	123	201	311	298	356	371	425	554	668	834	
6. Hunting and fishing	2.0	3.5	5.1	9.5	13.6	16.7	24.0	30.0	35.0	46.4	62.3	
						(Percent)						
Line 5 as a % of line 4	39	36	41	45	37	34	30	27	27	26	27	
Line 6 as a % of line 4	0.7	1.0	1.0	1.4	1.7	1.16	1.9	1.9	1.7	2.0	2.0	

1/ Annual compound.

Source: Economic Planning Board.

ANNEX 12
Table 2.4

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 2.5: VALUE ADDED IN AGRICULTURE, FORESTRY AND FISHERY AT CURRENT MARKET PRICES
(Million won)

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Value added in agriculture, forestry and fishery	22,788	26,935	51,998	71,906	89,296	85,340	76,759	90,689	119,489	127,715	206,017	321,012	309,108	365,141	399,263	455,176	597,454	724,588	916,732
Value added in agriculture	21,199	24,204	48,701	67,351	84,185	79,815	70,834	84,632	113,372	118,552	193,112	299,309	280,312	325,658	346,021	393,268	521,764	634,184	800,584
Cultivation																			
Output	23,228	26,764	52,723	71,569	90,578	85,551	78,355	91,204	123,795	129,747	210,334	324,237	317,668	380,314	393,200	430,812	580,816	678,388	850,206
Intermediate goods	2,733	3,993	7,348	10,710	13,347	13,832	15,179	14,809	19,162	22,476	28,109	41,520	57,003	67,339	69,699	78,637	99,811	110,984	125,058
Value added	20,495	22,771	45,375	60,859	77,231	71,719	63,176	76,395	104,633	107,271	282,225	282,717	260,665	312,975	323,501	352,175	481,005	567,404	725,148
Livestock																			
Output	989	2,026	4,573	7,764	8,701	10,074	9,738	11,579	13,130	17,153	19,403	26,179	36,136	42,658	57,443	77,034	88,427	115,596	131,958
Intermediate goods	740	1,147	2,501	2,821	3,453	3,707	3,884	5,203	6,333	8,131	11,085	13,528	21,867	35,290	41,314	46,564	60,111	66,121	76,462
Value added	249	879	2,072	4,943	5,248	6,367	5,854	6,376	6,797	9,022	8,318	12,651	14,269	7,368	16,129	30,470	28,316	49,475	55,496
Straw goods																			
Output	117	38	83	127	175	119	144	31	-	136	449	369	347	207	559	837	482	1,102	1,250
Value added	70	23	50	76	105	71	86	19	-	82	269	221	208	124	359	502	289	661	750
Agricultural services																			
Value added	385	531	1,204	1,473	1,601	1,658	1,718	1,842	1,942	2,177	2,300	3,720	5,170	5,191	6,032	10,121	12,154	16,664	19,190
Value added in forestry	1,160	1,960	2,277	2,797	3,063	3,377	3,417	3,879	4,075	5,659	7,781	12,165	15,177	22,828	29,212	32,036	41,007	43,979	48,757
Output	1,289	2,178	2,530	3,108	3,403	3,752	3,976	4,310	4,528	6,288	8,645	13,517	16,863	25,364	32,459	35,595	45,563	48,866	54,174
Value added in fishery	429	771	1,020	1,758	2,048	2,148	2,508	3,178	2,042	3,504	5,124	9,538	13,619	16,655	24,029	29,872	34,683	46,425	61,391
Output in fish catch	595	948	1,458	2,265	2,583	2,869	2,904	3,125	3,779	5,565	7,191	12,090	15,926	18,554	24,299	30,238	34,013	42,761	51,608
Value added	394	690	918	1,577	1,882	1,991	2,271	1,857	1,785	3,166	4,568	8,655	11,276	12,984	17,550	21,030	23,792	31,308	36,932
Output in agriculture	58	134	169	301	276	255	380	503	408	530	772	1,253	3,093	3,160	6,691	9,635	7,902	10,562	13,140
Value added	35	81	102	181	166	154	229	303	245	319	464	754	1,863	1,902	4,028	5,800	4,757	6,358	7,910
Output in deep-sea fishery	-	-	-	-	-	4	12	26	15	27	129	182	676	2,491	3,452	4,285	8,640	12,337	23,309
Value added	-	-	-	-	-	3	8	18	11	19	92	129	480	1,769	2,451	3,042	6,134	8,759	16,549

Source: Economic Planning Board (EPB)

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 2.6: CENTRAL GOVERNMENT LOANS AND INVESTMENTS BY INDUSTRY
(Million won)

Year	Gross Government Loans and Investments	Agriculture, Forestry, and Fishery	Mining and Manufacturing	Social Overhead Capital and Other Services	Percentage Distribution: Gross Government Loans and Investments	Agriculture, Forestry, and Fishery	Mining and Manufacturing	Social Overhead Capital and Other Services
1962	27,155	7,889	5,863	13,403	100	29	22	49
1963	27,328	6,286	5,409	15,633	100	23	20	57
1964	23,785	4,968	4,920	13,897	100	21	21	58
1965	29,500	8,394	7,111	13,995	100	29	24	47
1966	62,579	17,357	11,656	33,566	100	28	18	54
1967	79,023	20,035	13,650	45,338	100	25	17	58
1968	117,588	32,303	12,081	73,204	100	28	10	62
1969	175,551	48,972	20,100	106,479	100	28	11	61
1970	184,332	44,965	22,557	116,810	100	25	12	63
1971	213,330	52,494	32,340	128,496	100	22	15	63
1972	333,177	60,546	94,009	178,622	100	21	15	64

ANNEX 12
Table 2.6

Source: Major Economic Indicators, p. 33, Economic Planning Board, May 1972.

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 2.7: INTEREST RATES ON DEPOSITS OF BANKING INSTITUTIONS
(percent per annum)

Effective from --	Time Deposits			Passbook Deposits	Savings Deposits	Notice Dep	Extra Depo-sits	Instal-ment Saving Dep	New House-hold
	3 months	6 months	Over one Year						
Jan.1,1960	6.0	8.0	10.0	1.8	3.6	3.65	1.1	4.0	--
July 10,1961	9.0	12.0	15.0	1.8	3.6	3.65	1.1	4.0	--
Feb. 1, 1962	9.0	12.0	15.0	1.8	3.6	3.65	1.1	10.0	--
March 16, 1964	9.0	12.0	15.0	1.8	3.6	3.65	1.0	10.0	--
Sept.30, 1965	18.0	24.0	30.0	1.8	12.0	5.0	1.0	30.0	--
Dec. 30, 1967	14.4	24.0	30.0	1.8	--	5.0	1.0	30.0	--
April 1, 1968	15.6	20.4	26.4	1.8	--	5.0	1.0	28.0	12.0
Oct. 1, 1968	14.4	19.2	25.2	1.8	--	5.0	1.0	25.0	12.0
June 1, 1969	12.0	16.8	22.8	1.8	--	5.0	1.0	23.0	9.6
June 28, 1971	10.2	14.4	20.4	1.8	--	5.0	1.0	21.0	8.7
Jan. 17, 1972	8.4	11.4	16.8	1.8	--	5.0	1.0	17.0	6.6

Note: Maximum rates are decided by the Monetary Board

Source: Economic Planning Board, P. 38

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 2.8: INTEREST RATES ON LOANS AND DISCOUNTS OF BANKING INSTITUTIONS
(percent per annum)

Effective from --	Discounts on bills	Loans for Export trades	Loans for Purchase of Aid Goods	Loans for Suppliers of U.S. Offshore Procurement	Rice Lien Loans	Loans on other Bills	Over-drafts	Loans Over-due	Call Loan	Loans for Military Supply Goods Production
Oct.25, 1960	13.82	13.87	13.87	--	10.59	17.52	18.25	20.09	13.87	--
Apr. 1, 1962	13.87	12.78	13.87	--	10.59	16.43	18.25	20.00	13.87	--
July 3, 1962	13.87	10.95	13.87	10.95	17.59	16.43	18.25	20.00	13.87	16.43
Dec. 1, 1962	13.87	9.13	13.87	9.13	10.59	15.70	18.25	20.00	13.87	13.87
May 17, 1963	13.87	8.03	13.87	8.03	10.59	15.70	18.25	20.00	13.87	13.87
March 16, 1964	14.00	8.00	14.00	8.00	11.00	16.00	18.50	20.00	12.00	14.00
Feb. 5, 1965	14.00	6.50	14.00	6.50	11.00	16.00	18.50	20.00	12.00	14.00
Sept. 30, 1965	24.00	6.50	26.00	6.50	11.00	26.00	26.00	36.50	22.00	26.00
Feb. 1, 1966	24.00	6.50	26.00	6.50	11.00	26.00	28.00	36.50	22.00	26.00
June 29, 1967	24.00	6.00	26.00	6.00	11.00	26.00	28.00	36.50	22.00	26.00
Oct. 1, 1968	26.00	6.00	25.20	6.00	11.00	25.20	28.00	36.50	22.00	25.20
June 1, 1969	24.60	6.00	24.00	6.00	--	24.00	26.00	36.50	21.00	24.00
June 28, 1971	22.00	6.00	24.00	6.00	--	22.00	24.00	36.50	19.00	--
Jan. 17, 1972	19.00	6.00	24.00	6.00	--	19.00	22.00	31.20	19.00	--

Note: Maximum rates decided by the Monetary Board

Source: Economic Planning Board

SECTION III: STRUCTURAL ORGANIZATION AND RESOURCE USE

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 3.1: FARM HOUSEHOLDS, POPULATION, AND CULTIVATED LAND AREA

Year	Number of Farm Households (000)	Farm Population		Cultivated Area			Cultivated Area Per Farm Household		
		Total (000)	Per Household	Total	Paddy	Upland	Total	Paddy	Upland
				(000 Cheongbo)					
1961	2,327	14,509	6.23	2,049	1,221	829	.869	.525	.356
1962	2,469	14,097	6.11	2,080	1,233	847	.881	.499	.343
1963	2,416	15,266	6.33	2,097	1,238	859	.842	.513	.355
1964	2,450	15,553	6.35	2,189	1,272	917	.868	.519	.374
1965	2,507	15,812	6.31	2,275	1,297	978	.893	.517	.390
1966	2,540	15,781	6.21	2,312	1,298	1,014	.907	.511	.399
1967	2,587	16,078	6.22	2,331	1,301	1,030	.910	.503	.398
1968	2,579	15,908	6.17	2,338	1,300	1,038	.901	.504	.403
1969	2,546	15,589	6.12	2,330	1,294	1,037	.907	.508	.407
1970	2,488	14,432	5.80	2,132	1,205	927	.857	.484	.373
1971	2,482	14,712	5.93	2,290	1,275	1,015	.923	.514	.409
1972	2,452	14,677	5.99	2,261	1,270	991	.922	.518	.404

Source: Yearbook of Agriculture and Forestry Statistics, MAF, 1972, p. 27.

ANNEX 12
Table 3.1

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 3.2: NUMBER OF FARM HOUSEHOLDS AND CULTIVATED LAND AREA BY SIZE OF FARM

Size of Farm (Cheongbo)	1960				1965				1969				1971			
	Number of Farm Households		Area		Number of Farm Households		Area		Number of Farm Households		Area		Number of Farm Households		Area	
	(Thousands)	(% of Total)	(Thousand Cheongbo)	(% of Total)	(Thousands)	(% of Total)	(Thousand Cheongbo)	(% of Total)	(Thousands)	(% of Total)	(Thousand Cheongbo)	(% of Total)	(Thousands)	(% of Total)	(Thousand Cheongbo)	(% of Total)
0 - 0.5	1,006.4	42.9	337.0	16.6	900.8	35.9	281.2	12.4	842.2	33.1	258.4	11.5	809.8	33.6	247.1	11.4
0.5 - 1.0	736.7	31.1	565.7	27.9	793.9	31.7	603.0	26.7	807.4	31.7	602.0	26.7	736.3	31.7	592.1	27.3
1.0 - 2.0	485.9	20.7	749.1	37.0	643.3	25.7	915.1	40.5	667.6	26.2	918.6	40.8	645.2	26.0	890.7	41.1
2.0 - 3.0	141.4	6.0	350.3	17.3	139.6	5.6	346.0	15.3	130.5	5.1	314.5	14.0	120.1	4.8	290.3	13.4
Over 3.0	6.9	0.3	24.8	1.2	29.3	1.2	114.9	5.1	39.4	1.5	158.6	7.0	36.2	1.5	147.3	6.8
TOTAL	2,349.5	100.0	2,026.9	100.0	2,506.9	100.0	2,260.2	100.0	2,546.2 /1	100.0	2,252.1	100.0	2,481.5 /2	100.0	2,167.5	100.0

1/ Total includes 59,110 non-crop farms.
2/ Total includes 83,965 non-crop farms.

Source: Yearbook of Agriculture and Forestry Statistics 1970, Ministry of Agriculture and Forestry.

ANNEX 12
Table 3.2

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 3.3: FISHERIES HOUSEHOLDS, FAMILIES, AND FISHERMEN 1/

Year	Households			Number in Families			Number of Fishermen		
	Sub-Total	Full-Time	Part-Time	Sub-Total	Full-Time	Part-Time	Sub-Total	Full-Time	Part-Time
1962	194,565 (41,749)	39,009	113,762	1,093,663 (208,950)	226,252	658,461	462,525 (85,636)	89,811	287,078
1963	202,096 (45,846)	47,448	106,802	1,224,499 (253,081)	279,364	692,054	515,367 (99,439)	111,485	304,443
1964	202,901 (45,455)	46,574	110,872	1,210,991 (246,637)	275,080	689,274	529,780 (98,015)	114,031	317,734
1965	215,114 (49,968)	48,272	116,874	1,276,808 (286,858)	280,142	709,808	546,394 (113,307)	117,030	316,057
1966	236,505 (50,146)	62,643	123,716	1,441,734 (300,897)	370,789	770,039	575,665 (111,670)	144,175	319,820
1967	241,500 (55,752)	62,407	123,341	1,477,012 (334,251)	373,022	769,739	590,854 (123,467)	147,432	319,955
1968	219,631 (46,302)	52,128	121,201	1,346,369 (281,859)	312,758	751,752	540,857 (96,148)	121,894	322,815
1969	223,011 (47,930)	61,208	113,873	1,325,395 (273,510)	367,156	684,729	510,020 (101,747)	136,155	272,118
1970	194,601 (45,494)	22,739 (15,238)	126,368 (30,256)	1,165,232 (252,620)			367,645 (60,018)	73,388 (22,791)	294,257 (37,227)

1/ This is an aggregate table which includes (a) fishing employers' households, (b) aquiculture employers' households, and (c) fishery employers' households. In the parenthesis the figures indicate the fishery employees' households, families and fishermen, which are, however, not embodied into full-time and part-time numbers. So the sub-total numbers minus the parenthetical numbers of each column are equivalent to only employees' households, families, and fishermen, which are divided into full-time and part-time statistics in this table.

Source: Office of Fisheries.

Table 3.3

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 3.4: NUMBER OF FARM HOUSEHOLDS CLASSIFIED BY TYPE OF FARM
(000)

Type of Farm	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Paddy Field	1,930	2,019	1,966	1,970	1,898	1,868	1,814	1,836	1,824	-	1,793
Upland	357	403	405	429	549	594	616	527	512	-	466
Fruits	8	9	9	10	12	12	13	17	17	-	21
Vegetables	13	14	12	13	13	14	14	24	21	-	26
Special Crops	3	4	4	5	4	7	8	15	12	-	16
Greenhouse Vegetables	-	-	-	-	-	-	-	3	5	-	6
Livestock	6	7	5	4	3	4	8	15	11	-	17
Sericulture	1	1	1	2	2	2	3	8	8	-	9
Agricultural Laborers	-	-	-	-	-	-	-	80	83	-	99
Others (incl. firewood)	9	12	13	17	26	39	112	54	52	-	28
Total	2,327	2,469	2,415	2,450	2,507	2,540	2,587	2,579	2,546	(2,488)	2,482

Note: Numbers may not add to totals due to rounding. The figure in ( ) is preliminary result of the 1970 Census of Agriculture.
Source: Yearbook of Agriculture and Forestry Statistics, MAF, 1972, pp. 38-9.

ANNEX 12
Table 3.4

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 3.5: CULTIVATED LAND AREA AND PLANTED LAND AREA BY CROPS
(000 Cheongbo)

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Cultivated Land Area, Total	2,049	2,080	2,097	2,189	2,275	2,312	2,331	2,338	2,330	(2,132)	2,290	2,261
Paddy, Total	1,221	1,233	1,238	1,272	1,297	1,298	1,301	1,300	1,294	1,205	1,275	1,270
One-Crop	774	763	750	745	711	702	684	659	647	-	641	648
Two-Crop	447	470	488	527	586	596	617	641	647	-	634	622
Upland, Total	828	847	859	917	978	1,014	1,030	1,038	1,036	(927)	1,015	991
One-Crop 1/	240	269	265	266	251	440	437	465	439	-	614	583
Two-Crop 2/	588	578	594	651	727	574	593	573	597	-	401	408
Planted Crop Area, Total	3,084	3,128	3,179	3,367	3,588	3,482	3,541	3,552	3,574	3,504	3,325	3,291
Food Crops, Total	2,764	2,828	2,916	3,062	3,248	3,116	3,135	3,103	3,065	2,972	2,799	2,766
Rice	1,138	1,148	1,165	1,205	1,238	1,242	1,246	1,160	1,230	1,213	1,200	1,201
Barley and Wheat	970	1,012	1,070	1,119	1,211	1,148	1,151	1,161	1,119	1,085	993	987
Miscellaneous	205	202	205	219	216	171	162	200	144	124	100	86
Pulses	341	340	339	338	368	345	380	384	379	368	341	343
Potatoes	110	125	138	181	214	210	196	198	193	182	165	149
Special Crops	82	103	66	65	61	68	74	72	89	89	91	82
Vegetables	172	124	121	139	151	154	177	193	226	254	257	248
Tobacco	20	23	21	30	34	37	38	39	39	43	41	58
Fruits	23	23	24	29	43	45	48	51	56	60	55	59
Mulberry Field	23	27	31	42	51	62	69	94	99	85	81	78
Cropping Intensity (%)												
Total 3/	150	150	152	154	158	151	152	152	153	164	145	146
Paddy Land 4/	137	138	139	141	145	146	147	149	150	-	150	149
Upland 5/	171	168	169	171	174	157	158	155	158	-	140	159

1/ Two-crop upland subtracted from total upland.
2/ Total of all paddy land plus two-crop paddy and total upland cultivated area subtracted from total planted area.
3/ Total planted area divided by total cultivated area
4/ Total of one-crop and two times two-crop paddy land divided by total paddy land.
5/ Total of one-crop and two times two-crop upland divided by total upland cultivated area.
Note: Numbers may not add to totals due to rounding. The figure in ( ) is preliminary result of the 1970 Census of Agriculture.
Source: Yearbook of Agriculture and Forestry Statistics, MAF, 1971 and 1972, pp. 68-9 and pp. 78-9.

ANNEX 12
Table 3.5

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 3.6: FERTILIZER CONSUMPTION BY NUTRIENT COMPONENTS
(000 m ton)

Year	Nitrogen	Phosphorus	Potash	Total
1961	210.9	80.8	16.8	308.5
1962	20.0	40.0	-	59.9
1963	191.7	94.4	21.0	307.1
1964	173.2	153.6	37.4	364.1
1965	217.9	123.5	51.7	393.1
1966	239.7	124.8	58.8	423.3
1967	277.6	132.7	76.2	486.5
1968	285.9	121.4	71.2	478.5
1969	320.2	130.7	83.7	534.7
1970	355.6	124.4	83.0	562.9

Source: Yearbook of Agriculture and Forestry Statistics, MAF.

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 3.7: FARM CHEMICAL CONSUMPTION BY TYPES
(m ton)

Year	Fungicides	Insecticides	Herbicides	Others	Total
1961	3,422	2,121	9.6	4.6	5,557
1962	4,604	2,789	9.5	18.1	7,421
1963	15,099	3,587	52.0	33.6	18,772
1964	18,358	4,886	39.1	72.6	23,355
1965	9,433	3,200	25.3	70.8	12,729
1966	7,787	4,514	130.5	118.2	12,549
1967	1,965	7,676	274.5	73.2	9,989
1968	2,159	7,285	470.5	68.2	9,983
1969	8,613	7,578	1,225.8	114.0	17,531
1970	11,058	8,864	4,957.6	144.6	25,024
1971	7,282	13,937	8,280.5	459.9	29,959.

Source: Yearbook of Agriculture and Forestry Statistics, MAF.

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AGRICULTURAL SECTOR SURVEY

Table 3.8: MAJOR AGRICULTURAL MACHINERY OWNED BY FARMERS
(000)

	Plow Machine	Anti-Insect Equipment	Threshing Machine	Winding Machine	Straw Rope Machine	Strawbag Machine	Pumps	Motors
1961	618	31	652	91	39	413	31	4
1962	845	56	704	142	49	467	42	27
1963	863	88	761	155	50	400	40	25
1964	952	114	825	177	58	472	47	38
1965	979	150	884	210	61	465	52	40
1966	1,010	203	914	211	65	463	70	54
1967	994	243	928	227	68	458	78	56
1968	1,029	283	928	238	72	439	86	62
1969	1,022	391	933	259	74	416	112	67
1970	1,015	494	884	264	79	382	111	72
1971	1,036	644	923	278	88	351	110	78
1972	1,032	589	824	284	98	337	110	84

Source: MAF.

ANNEX 12
Table 3.8

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 3.9: NUMBER OF POWER TILLERS IN JAPAN, TAIWAN, AND KOREA

Year	Japan Power Tillers in Use		Taiwan Power Tillers in Use		Korea Power Tillers in Use	
	Total Number	Number Per 1,000 ha of Paddy Land 1/	Total Number	Number Per 1,000 ha of Paddy Land 2/	Total Number	Number Per 1,000 ha of Paddy Land 3/
1947	8,000	2.3	-	-	-	-
1949	10,000	2.9	-	-	-	-
1951	16,000	4.7	-	-	-	-
1953	35,000	10.2	-	-	-	-
1955	89,000	26.1	-	-	-	-
1956	-	-	51	0.1	-	-
1957	227,000	66.5	171	0.3	-	-
1958	-	-	591	1.1	-	-
1959	514,000	150.5	2,253	4.3	-	-
1960	-	-	3,699	7.0	-	-
1961	1,020,000	298.7	5,304	10.1	30	0.02
1962	1,414,000	414.1	7,495	14.2	93	0.07
1963	1,812,000	530.6	9,070	17.2	386	0.3
1964	2,183,000	639.2	10,192	19.3	653	0.5
1965	2,490,000	729.1	12,204	23.1	1,111	0.9
1966	2,725,000	797.9	14,263	27.0	1,555	1.2
1967	2,971,000	870.0	17,231	32.5	3,819	3.0
1968	3,030,000	887.3	21,144	39.8	6,225	4.9
1969	-	-	24,631	46.7	8,832	6.9
1970	3,159,000	925.0	-	-	11,884	9.3
1971	3,197,000	936.2	-	-	16,842	13.2

1/ 3,415,000 ha
2/ 528,927 ha
3/ 1,205,023 ha

Source: Japan: Farm Machinery Yearbook, 1971.
Taiwan: Peng Tien Song, J.C.R.R., Agricultural Mechanization in South East Asia, spring, 1971, Farm Machinery Research Corp., Tokyo.
Korea: "Prospects for Farm Mechanization in Korea," AERI Report 1, MAF, October 1, 1970; English translation by USAID/Korea.

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 3.10: DOMESTIC PRODUCTION OF MAJOR FARM MACHINES

Machine	1963	1964	1965	1966	1967	1968	1969	1970	1971	No. of Mfrs in 1971 [1]
Stationary Engines	5,083	10,620	10,120	3,860	5,820	8,200	9,600	11,933		10
Power Tillers [2]	305	267 266	455 340	533 677	2,361 2,616	4,529 5,371	580	1,914 3,717	5,000	2
Irrigation Pumps	2,251	14,301	20,500	3,825	6,710	9,300	8,300	13,699		9
Power Sprayers [2]	560	2,030	1,645	997	1,982	2,062	13,990	24,010		5
Manual Sprayers	38,368	58,440	45,000	49,500	67,000	75,000	46,000	73,093		5
High Pressure Sprayers	8,600	300	2,500	4,500	5,000	11,000	16,000	34,531		7
Manual Duster	5,500	7,500	980	500	350	300	3,000			3
Power Thresher	738	918	1,430	1,470	1,570	1,800	2,000	1,537		7
Manual Thresher	30,103	22,861	32,500	30,700	32,000	29,500	17,000	4,238		5

1/ From Korea Farm Machinery and Tool Industry Cooperative, Seoul.
2/ From manufacturers.

Source: NACF.

ANNEX 12
Table 3.10

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 3.11: LABOR INPUT PER HECTARE BY CROPS IN 1969 AND PERCENTAGE DISTRIBUTION IN 1965

Crop	Labor Input (Hrs/ Cheongbo)	% of Labor Input by Operations (1965)														
		Seed bed	Plow-ing	Seed-ing	Trans-plant-ing	Fert. Appli-cation	Irrig. & Drain.	Disease Preven-tion	Weed-ing	Thin-ning	Ridging	Cutting & Binding	Trans-porting Crop	Threshing & Harvesting	Dry-ing	Other
Rice	1,282	12.9	3.7	-	13.8	4.6	7.6	1.0	17.5	-	-	9.5	7.1	12.4	3.2	6.7
Common barley	892	-	2.8	14.9	-	14.3	-	0.8	22.0	-	-	14.1	8.6	14.4	3.2	4.9
Naked barley	889	-	3.4	19.2	0.5	13.9	-	-	18.6	-	-	16.0	8.2	14.4	3.6	2.2
Wheat	951	-	2.9	15.2	-	13.0	-	-	23.5	-	-	14.3	7.9	14.0	4.6	4.6
Millet	1,027	-	2.7	14.7	-	5.3	-	-	30.6	-	5.1	12.3	8.4	17.4	3.3	0.2
Corn	1,108	-	2.3	13.5	-	6.1	-	-	18.2	-	6.1	10.5	9.2	28.7	5.4	-
Soy beans	665	-	3.4	18.3	-	-	-	-	25.8	-	2.8	17.4	4.8	22.0	5.5	-
Red beans	620	-	3.8	20.6	-	-	-	-	22.4	-	2.8	18.1	4.5	18.0	4.8	-
White potatoes	974	-	2.5	16.3	-	14.6	-	1.4	20.4	-	8.0	-	11.6	17.9	3.0	4.3
Sweet potatoes	1,004	9.6	2.6	-	24.8	5.7	1.0	-	19.3	1.1	1.1	-	9.0	18.8	6.0	1.0
Radish	947	-	2.7	20.9	-	9.5	-	2.7	26.1	-	4.6	0.3	9.7	14.9	4.4	4.2
Chinese cabbage	1,034	-	2.8	19.2	2.3	13.2	1.0	3.6	24.3	-	-	7.3	10.0	11.9	4.4	-
Red pepper	1,151	-	2.2	15.8	1.6	9.2	-	1.6	26.7	-	4.5	6.2	6.5	18.2	7.5	-
Garlic	1,442	-	2.1	23.8	-	6.8	-	0.9	23.7	-	-	-	5.4	17.0	9.6	10.7
Cotton	1,297	-	2.4	13.0	-	5.4	-	-	20.2	8.7	5.4	5.2	5.9	25.1	8.7	-
Sesame	1,141	-	2.2	15.7	2.5	5.8	-	-	24.0	-	3.8	19.2	9.0	14.1	3.7	-
Perilla	848	2.7	2.9	8.7	12.4	4.2	-	-	25.6	-	3.3	17.1	7.6	10.8	4.7	-
Flax	1,830	-	3.3	9.8	-	1.6	-	-	31.7	-	-	-	-	52.5	-	1.1
Ramie	5,990	-	-	-	-	7.0	-	1.0	14.3	-	-	-	-	71.1	-	6.6
Mat rush	7,210	-	3.4	-	31.2	7.3	-	-	3.5	-	-	-	-	17.5	19.2	17.9
Tobacco	1,926	7.4	1.6	-	11.4	3.7	0.2	1.1	10.3	2.8	3.2	1.4	5.3	11.5	32.7	7.4

Sources: 1. For the four crops from rice to wheat, "Report on the Production Cost Survey of Agricultural Products," 1970, MAF.
2. For the crops from millet to perilla and tobacco, "Type of Farming in Korea," 1969, NACF.
3. For the three crops from flax to mat rush, "Report on the Farm Management Survey," 1969, NACF.

ANNEX 12
Table 3.11

SECTION IV: AGRICULTURAL PRODUCTION

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 4.1: INDEX NUMBERS OF GROSS AGRICULTURAL PRODUCTION AND GROWTH RATES, 1961-71

	1959-61 distribution	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972 1/	Growth Rate 2/ 1961-71
Total grain	68.55	107.8	97.2	107.8	128.1	120.0	134.4	121.2	118.9	137.4	132.8	130.4	129.8	2.5
Rice	46.50	107.8	93.5	116.6	122.7	108.6	121.6	111.8	99.1	126.9	122.2	124.0	122.7	1.5
Barley & Wheat	14.63	105.2	98.1	68.3	108.4	124.9	138.3	131.4	141.9	142.5	135.9	126.9	128.5	4.3
Misc.cereals	.89	108.6	109.6	119.6	134.4	132.4	113.6	111.4	174.2	136.7	120.4	105.6	94.8	1.0
Pulses	2.03	114.3	109.3	110.1	115.3	123.2	119.2	145.0	178.6	170.1	171.9	163.3	162.0	5.7
Potatoes	4.50	113.2	124.6	141.7	252.1	279.0	265.6	176.9	211.0	214.9	216.5	197.4	185.2	3.9
Vegetables	6.52	115.0	121.7	112.6	144.6	153.6	189.2	201.6	238.6	239.9	232.3	278.1	268.1	9.2
Fruits	1.79	94.	123.8	113.0	147.0	201.0	217.8	235.4	260.2	284.1	284.8	278.7	350.4	12.3
Special Crops	1.19	109.6	89.3	73.7	79.9	77.5	107.3	111.2	104.1	116.4	117.0	116.6	116.9	3.3
Monopoly Crops	2.96	105.5	119.7	105.2	167.0	184.8	235.8	214.4	227.1	205.1	199.7	227.6	407.8	6.5
By Products	7.31	103.1	98.9	114.2	130.9	112.6	118.1	131.7	133.7	160.1	155.1	157.2	172.4	4.8
Total Crops	88.32	107.6	100.3	108.5	130.6	128.2	141.8	133.3	135.3	150.7	147.1	149.6	156.5	3.9
Livestock and Cocoons	11.68	102.5	107.1	128.1	133.7	114.4	120.5	140.5	136.1	192.6	192.5	188.5	-	6.9
Total Agriculture	100.00	107.0	101.1	110.8	131.1	127.2	140.1	134.1	135.4	155.6	152.4	154.1	-	4.2

1/ Preliminary
2/ Annual Compound.

Source: Yearbook of Agriculture and Forestry Statistics, MAF, 1972, pp. 432-436.

ANNEX 12
Table 4.1

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 4.2: LIVESTOCK PRODUCT OUTPUT

Item	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	Growth Rate 1961-1971 2/
	(thousand metric tons)												(percent)
Beef	13.3	16.8	21.1	31.9	27.3	29.4	31.9	35.8	33.1	37.3	39.5	40.2	4.4
Pork	60.0	38.0	55.1	62.5	55.9	95.8	72.1	61.8	76.1	82.5	80.9	90.2	5.1
Chicken	18.5	15.7	20.3	18.8	14.5	18.7	23.9	33.7	42.3	45.2	50.0	54.3	16.0
Other meat	2.7	1.6	4.0	3.4	1.5	1.0	1.9	2.7	2.6	1.8	1.7	1.5	0.5
Milk	1.17	2.65	4.51	7.13	10.69	14.60	19.19	24.36	35.47	51.88	65.31	79.8	52.1
Eggs 1/	818	839	976	943	856	1,298	1,349	1,504	2,430	2,456	2,536	2,790	16.9

1/ In million units.
2/ Annual compound.

Source: Ministry of Agriculture, Livestock Bureau.

ANNEX 12
Table 4.2

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 4.3: TOTAL NUMBERS OF LIVESTOCK AND POULTRY

Year	Native Cattle	Milk Cow	Beef Cattle (000)	Horses	Hog	Chicken
1955	867	0.3	-	17	1,232	8,924
1956	917	0.4	-	17	1,161	9,031
1957	887	0.4	-	18	1,233	9,352
1958	1,003	0.6	-	19	1,324	9,894
1959	1,023	0.5	0.7	19	1,439	12,041
1960	1,010	0.9	0.7	20	1,397	12,030
1961	1,096	1.1	0.2	21	1,256	11,218
1962	1,253	2.4	0.0	25	1,672	13,047
1963	1,363	3.5	1.0	27	1,510	11,097
1964	1,351	5.2	0.9	27	1,256	10,282
1965	1,313	6.6	0.8	28	1,382	11,893
1966	1,290	8.5	1.1	28	1,457	14,008
1967	1,243	10.4	2.1	25	1,296	17,079
1968	1,193	13.8	3.3	20	1,396	25,968
1969	1,202	18.8	3.9	18	1,338	22,651
1970	1,271	22.8	3.0	-	1,121	23,477
1971	1,247	30.0	2.9	13	1,333	25,903
1972	1,333	36.1	4.9	11	1,248	24,537

Sources: Yearbooks of Agriculture and Forestry Statistics, MAF.

ANNEX 12
Table 4.3

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 4.4: PLANTED AREA OF FOOD CROPS

Year	Rice	Common Barley	Naked Barley	Wheat	Millet	Corn	Soy Beans	Red Beans	White Potatoes	Sweet Potatoes	Total Grains
1955	1,098	474	286	122	152	23	271	28	48	44	2,546
1956	1,106	503	293	124	151	24	272	26	49	46	2,594
1957	1,114	516	305	145	147	25	280	26	58	47	2,663
1958	1,118	467	314	128	152	23	271	28	49	49	2,599
1959	1,122	469	318	126	151	22	273	27	48	53	2,609
1960	1,130	472	327	125	142	23	275	28	48	60	2,630
1961	1,137	477	333	125	145	24	292	29	48	62	2,672
1962	1,148	475	363	134	141	26	290	29	49	76	2,731
1963	1,165	487	408	138	140	32	285	30	46	92	2,823
1964	1,205	519	423	147	138	43	284	31	47	134	2,971
1965	1,238	545	486	153	125	50	311	32	61	154	3,155
1966	1,242	498	471	154	97	43	278	37	61	149	3,030
1967	1,246	502	477	153	86	50	313	38	59	138	3,062
1968	1,160	479	507	159	117	42	316	40	61	138	3,019
1969	1,230	446	503	154	76	45	308	40	56	137	2,995
1970	1,213	423	488	159	56	47	298	38	54	128	2,904
1971	1,200	382	457	143	42	40	277	35	52	112	2,740
1972	1,201	363	512	103	35	36	284	32	44	105	2,715

Sources: Yearbooks of Agriculture and Forestry Statistics, MAF.

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 4.5: PLATED AREA OF VEGETABLES

Year	Radish	Chinese Cabbage	Garlic	Pumpkin	Sweet melon	Red pepper	Water melon	All vegetables
				(in thousand cheongbo)				
1955	34.1	32.7	5.4	3.2	3.1	10.0	1.0	108
1956	34.2	32.5	5.5	3.4	3.0	13.5	1.1	111
1957	36.5	36.3	5.5	3.2	2.9	13.5	1.1	117
1958	32.8	30.6	6.2	3.0	3.5	13.1	1.3	113
1959	33.2	31.1	5.4	2.8	3.2	12.3	1.4	110
1960	34.2	31.7	6.6	2.7	3.8	14.2	2.6	118
1061	35.5	32.4	7.5	2.9	4.1	14.9	2.4	118
1962	35.8	34.2	7.9	6.2	4.4	16.5	2.4	124
1963	34.9	32.9	7.5	6.5	4.7	16.1	2.7	121
1964	38.1	35.5	8.9	9.4	5.8	19.4	3.8	139
1965	41.6	39.0	8.8	7.7	6.0	19.6	4.9	151
1966	42.2	39.1	10.6	7.4	6.2	23.1	4.0	154
1967	44.6	49.3	13.2	6.9	6.6	28.6	4.9	177
1968	49.3	50.7	13.3	7.8	6.6	33.8	5.8	193
1969	54.4	67.3	14.2	8.8	7.5	31.8	6.4	226
1970	66.4	71.3	15.4	8.8	8.9	37.0	7.3	254
1971	62.7	74.4	15.3	8.4	8.1	41.0	7.3	257

Sources: Yearbooks of Agriculture and Forestry Statistics, MAF

ANNEX 12
Table 4.5

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 4.6: PLANTED AREA OF FRUITS

Year	Apples	Peaches	Pears	Grapes	Persimmons	All Fruits
			(in thousand cheongbo)			
1955	8.6	2.8	4.7	0.5	1.7	19.4
1956	8.7	2.8	4.5	0.4	2.7	20.3
1957	8.8	2.9	4.6	0.5	2.7	20.5
1958	11.0	2.7	4.6	0.5	2.6	22.5
1959	11.9	2.7	4.5	0.5	2.5	23.3
1960	11.5	2.6	4.3	0.6	2.8	22.5
1961	11.5	3.3	4.0	0.8	2.4	23.1
1962	11.6	3.4	3.7	1.2	2.6	23.2
1963	11.7	3.5	3.6	1.0	2.9	23.7
1964	12.8	5.1	3.8	2.1	4.0	28.6
1965	19.0	10.6	5.2	3.5	2.7	42.8
1966	19.5	10.8	5.6	3.8	3.3	45.2
1967	19.8	11.4	5.9	4.3	3.8	46.1
1968	20.2	11.6	6.2	4.5	4.5	51.2
1969	20.8	11.6	6.2	5.2	5.0	55.7
1970	21.0	11.8	6.7	6.2	5.2	60.2
1971	20.2	9.0	6.8	7.1	3.0	55.3

Sources: Yearbooks of Agriculture and Forestry Statistics, MAF

ANNEX 12
Table 4.6

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 4.7: PLANTED AREA OF INDUSTRIAL CROPS

Year	Cotton	Hemp	Black Rush	Sesame	Perilla frutescens	Rape	All industrial
			(in thousand cheongbo)				
1955	112.8	9.3	1.8	4.9	4.8	-	-
1956	116.1	9.5	1.6	4.8	4.9	-	-
1957	77.6	9.0	1.3	5.0	4.5	-	-
1958	56.5	9.5	1.2	6.0	5.2	-	-
1959	60.8	9.5	1.5	5.8	5.2	-	-
1960	50.8	8.1	1.1	5.8	6.0	-	-
1961	48.5	7.2	2.1	7.2	6.4	1.8	81.6
1962	52.7	7.1	2.4	8.1	7.1	9.2	102.7
1963	25.3	6.6	2.6	7.7	6.7	5.7	66.1
1964	23.2	6.0	2.8	9.2	7.6	7.1	64.6
1965	19.2	5.7	1.3	10.3	8.3	6.9	60.9
1966	18.8	5.7	1.6	11.4	9.5	12.3	68.2
1967	17.3	6.0	1.9	13.5	10.6	16.4	74.2
1968	16.4	5.7	1.8	13.6	10.5	17.6	72.1
1969	16.8	5.8	1.8	17.4	10.6	27.9	88.8
1970	16.0	5.3	1.6	25.8	11.6	23.2	89.2
1971	13.8	3.9	1.1	27.7	10.8	28.7	90.6

Sources: Yearbooks of Agriculture and Forestry Statistics, MAF.

ANNEX 12
Table 4.7

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 4.8: PLANTED AREA OF MULBERRIES AND TOBACCO 1955 - 1971

Year	Mulberries	Tobacco
	(in thousand cheongbo)	
1955	32.4	-
1956	34.5	-
1957	36.2	21.5
1958	36.7	21.1
1959	36.1	20.4
1960	36.4	20.1
1961	23.4	20.2
1962	27.3	22.5
1963	30.9	21.9
1964	42.3	29.4
1965	50.5	34.4
1966	61.7	36.7
1967	68.5	37.6
1968	94.4	38.7
1969	99.3	39.1
1970	85.0	43.0
1971	81.4	41.0

Sources: Yearbooks of Agriculture and Forestry Statistics, MAF.

ANNEX 12
Table 4.8

REPUBLICE OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 4.9: YIELDS PER TANBO OF FOOD CROPS

Year	Rice	Common Barley	Naked Barley	Wheat	Millet	Corn	Soy Beans	Red Beans	White Potatoes	Sweet Potatoes
					(kg)					
1955	269	143	127	164	42	57	55	46	197	526
1956	220	137	136	175	38	47	56	49	148	429
1957	269	116	115	150	38	55	55	50	161	416
1958	283	152	150	175	51	60	57	48	172	452
1959	281	177	167	211	39	61	50	43	162	420
1960	269	181	158	2077	38	59	47	43	176	402
1961	304	189	174	224	46	67	56	51	193	468
1962	263	162	168	200	49	67	54	54	169	467
1963	323	120	82	165	53	64	55	52	170	474
1964	328	173	146	210	54	80	57	57	242	614
1965	283	175	176	196	49	80	56	51	191	604
1966	316	196	221	205	60	79	58	51	226	559
1967	289	185	207	203	48	118	64	51	193	376
1968	275	176	245	217	67	149	78	64	204	462
1969	333	205	229	237	80	140	74	62	212	482
1970	325	193	236	224	78	144	78	65	224	518
1971	333	194	244	224	82	160	80	66	224	526

Note: 1 tanbo is equal to 0.1 cheongbo.

Sources: Yearbooks of Agriculture and Forestry Statistics, MAF.

ANNEX 12
Table 4.9

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 4.10: YIELDS PER TANBO OF VEGETABLE CROPS

Year	Radish	Chinese Cabbage	Garlic	Pumpkin	Sweet Melon	Red Pepper	Water Melon
1955	-	-	-	-	-	-	-
1956	-	-	-	-	-	-	-
1957	-	-	-	-	-	-	-
1958	-	-	-	-	-	-	-
1959	-	-	-	-	-	-	-
1960	-	-	-	-	-	-	-
1961	1,295	1,199	437	1,043	907	250	1,096
1962	1,985	1,252	498	1,110	928	212	1,039
1963	1,197	1,118	486	1,632	827	210	1,205
1964	1,315	1,266	532	1,187	849	241	1,213
1965	1,411	1,230	508	1,094	882	237	1,176
1966	1,413	1,329	626	1,174	969	290	1,369
1967	1,301	1,235	549	1,204	1,034	234	1,755
1968	1,398	1,381	564	1,117	1,118	249	1,787
1969	1,326	1,176	560	1,137	1,206	196	1,824
1970	1,152	1,117	508	1,216	1,092	145	1,625
1971	1,394	1,329	534	1,273	1,234	181	2,077

Note: 1 tanbo is equal to 0.1 cheongbo.

Sources: Yearbooks of Agriculture and Forestry Statistics, MAF.

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 4.11: YIELDS PER TANBO OF FRUIT CROPS

Year	Apples	Peaches	Pears	Grapes	Persimmons
			(kg)		
1955	-	-	-	-	-
1956	-	-	-	-	-
1957	-	-	-	-	-
1958	-	-	-	-	-
1959	-	-	-	-	-
1960	-	-	-	-	-
1961	694	591	753	677	561
1962	1,019	580	728	651	639
1963	941	555	657	655	486
1964	971	687	746	521	589
1965	878	512	764	536	876
1966	893	583	737	589	661
1967	958	620	693	581	621
1968	984	615	775	609	763
1969	1,055	591	738	716	680
1970	1,008	660	777	551	584
1971	1,095	734	709	473	753

Note: 1 Tanbo is equal to 0.1 Cheongbo.

Sources: Yearbooks of Agriculture and Forestry Statistics, MAF

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 4.12: YIELDS PER TANBO OF INDUSTRIAL CROPS

Year	Cotton	Hemp	Black Rush	Sesame	Perilla Frutescens	Rape
			(kg)			
1955	-	-	-	-	-	-
1956	-	-	-	-	-	-
1957	-	-	-	-	-	-
1958	-	-	-	-	-	-
1959	-	-	-	-	-	-
1960	-	-	-	-	-	-
1961	57	79	82	39	38	71
1962	33	79	69	38	40	57
1963	47	78	78	39	35	32
1964	55	82	97	42	41	73
1965	61	98	166	40	42	88
1966	73	102	249	46	50	99
1967	69	102	232	45	43	108
1968	77	111	228	48	50	119
1969	80	126	248	44	54	112
1970	83	125	207	40	55	108
1971	87	125	224	48	61	128

Note: 1 Tanbo equals 0.1 Cheongbo

Sources: Yearbooks of Agriculture and Forestry Statistics, MAF

ANNEX 12
Table 4.12

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 4.13: PRODUCTION OF FOOD CROPS

Year	Rice	Common Barley	Naked Barley	Wheat	Millet	Corn	Soy beans	Red beans	White potatoes	Sweet potatoes	Total Grains	Yield per Tanbo
				(thousand metric tons)								(kg)
1955	2,959	679	362	201	64	13	149	13	95	230	4,817	182
1956	2,438	692	400	218	57	11	153	13	73	198	4,310	160
1957	3,002	600	351	218	55	14	153	13	93	194	4,744	172
1958	3,161	712	471	223	78	14	153	13	85	220	5,189	193
1959	3,150	829	530	268	58	14	138	12	77	222	5,359	198
1960	3,047	852	518	258	54	14	130	12	84	242	5,271	193
1961	3,463	898	580	280	68	16	165	15	93	291	5,933	215
1962	3,015	768	611	268	63	18	156	16	82	357	5,223	192
1963	3,758	583	335	228	74	20	156	5	78	435	5,742	197
1964	3,954	895	619	309	75	35	163	17	114	822	7,066	231
1965	3,501	951	856	230	61	40	174	16	116	929	7,006	216
1966	3,919	975	1,043	315	58	34	161	19	138	834	7,568	243
1967	3,603	931	945	310	42	60	452	19	113	518	6,836	218
1968	3,195	841	1,243	345	78	63	245	26	123	635	6,357	221
1969	4,090	916	1,150	366	60	63	229	25	120	658	7,737	252
1970	3,939	819	1,154	357	44	68	232	24	121	662	7,476	252
1971	3,998	742	1,115	322	34	64	222	23	118	589	7,274	260

Note: 1 tanbo equals 0.1 cheongbo

Sources: Yearbooks of Agriculture and Forestry Statistics, MAF.

ANNEX 12
Table 4.13

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 4.14: PRODUCTION OF VEGETABLE CROPS

Year	Radish	Chinese Cabbage	Garlic	Pumpkin	Sweet melon	Water melon	Red pepper	Total	Yield per Tanbo
				(thousand metric tons)					(kg)
1955	-	-	-	-	-	-	-	-	-
1956	-	-	-	-	-	-	-	-	-
1957	-	-	-	-	-	-	-	-	-
1958	-	-	-	-	-	-	-	-	-
1959	359	309	26	27	26	15	26	1,010	915
1960	392	333	32	26	33	30	21	1,088	925
1961	460	389	33	30	37	26	37	1,235	718
1962	460	423	39	69	41	32	35	1,300	1,049
1963	413	445	37	105	39	32	34	1,167	983
1964	381	450	47	112	49	47	47	1,436	1,032
1965	587	480	45	85	53	58	46	1,576	1,046
1966	597	520	66	87	60	55	67	1,717	1,114
1967	580	609	72	83	69	86	67	1,869	1,055
1968	690	700	75	87	74	104	84	2,150	1,116
1969	722	791	79	100	91	117	62	2,428	1,073
1970	765	797	78	107	98	119	53	2,520	991
1971	874	989	82	107	99	152	74	2,918	1,134

Sources: Yearbooks of Agriculture and Forestry Statistic, MAF.

AGRICULTURAL SECTOR SURVEY

Table 4.15: PRODUCTION OF FRUIT CROPS

Year	Apples	Peaches	Pears	Grapes	Persimmon	Total fruit	Yield per Tanbo
			(thousand metric tons)				
1955	-	-	-	-	-	-	-
1956	-	-	-	-	-	-	-
1957	-	-	-	-	-	-	-
1958	-	-	-	-	-	-	-
1959	104.0	14.8	26.0	3.4	13.2	166.8	716
1960	104.1	13.8	26.8	3.6	13.5	166.4	741
1961	179.9	19.7	29.9	5.6	13.3	149.9	648
1962	117.9	19.6	27.2	7.5	16.6	195.3	843
1963	110.2	19.2	23.6	6.4	14.1	138.1	750
1964	124.7	34.8	28.4	10.9	23.6	288.7	800
1965	166.8	54.3	39.5	18.6	23.5	310.0	723
1966	174.4	63.1	41.4	22.6	22.1	331.1	733
1967	189.7	70.7	40.8	25.1	23.6	358.9	765
1968	198.7	71.5	47.8	27.5	34.6	392.4	760
1969	219.4	68.3	46.0	37.4	33.9	416.8	743
1970	212.0	78.1	52.0	34.1	30.3	423.3	703
1971	220.7	66.0	48.3	33.6	22.9	404.3	731

Sources: Yearbooks of Agriculture and Forestry Statistics, MAF

ANNEX 12
Table 4.15

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 4.16: PRODUCTION OF INDUSTRIAL CROPS

Year	Cotton	Hemp	Black Rush	Sesame	Perilla Frutescens	Rape	Total	Yield per Tanbo
				(thousand metric tons)				(kg)
1955	-	-	-	-	-	-	-	-
1956	-	-	-	-	-	-	-	-
1957	-	-	-	-	-	-	-	-
1958	-	-	-	-	-	-	-	-
1959	24.6	6.8	2.6	2.1	1.9	-	-	-
1960	19.0	5.6	1.5	2.1	2.3	-	-	-
1961	27.9	5.7	1.7	2.8	2.4	1.3	46.7	57
1962	17.6	5.7	1.6	3.1	2.8	5.3	41.2	40
1963	12.0	5.2	2.0	3.0	2.3	1.8	32.5	49
1964	12.7	4.9	2.7	3.8	3.1	5.2	38.8	60
1965	11.8	5.6	2.2	4.2	3.5	6.0	40.7	67
1966	13.7	5.8	4.0	5.2	4.8	12.0	56.7	83
1967	11.9	6.1	4.3	9.1	5.1	17.7	62.2	84
1968	12.7	6.3	4.1	6.5	5.3	21.0	66.8	93
1969	13.5	7.3	4.5	7.7	5.7	31.2	82.7	93
1970	13.3	6.6	3.3	10.4	6.3	25.1	72.6	81
1971	12.1	4.8	2.5	13.4	6.5	36.9	82.6	91

Sources: Yearbooks of Agriculture and Forestry Statistics, MAF

ANNEX 12
Table 4.15

SECTION V: INTERNATIONAL TRADE

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 5.1: SUMMARY OF EXPORTS AND IMPORTS
(000 US$)

Year	Exports	Imports	Trade Deficit
1961	40,878	316,142	-275,264
1962	54,813	421,782	-336,969
1963	86,802	560,273	-473,471
1964	119,058	404,351	-285,293
1965	175,082	463,442	-288,360
1966	250,334	716,441	-466,107
1967	320,229	996,246	-676,017
1968	455,400	1,468,166	-1,012,766
1969	622,516	1,823,611	-1,201,095
1970	835,185	1,983,973	-1,148,788
1971	1,067,607	2,394,320	-1,326,731

Note: Exports are valued at f.o.b., imports at c.i.f. Both exports and imports include trade without draft and exclude sales of goods to military forces in Vietnam. The figures are based on trade statistics in the Office of Customs Administration.

Source: Major Economic Indicators, 1961-71, Economic Planning Board, May 1972, p. 67.

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 5.2: EXPORT STRUCTURE
(000 US$)

Year	Total	Agricultural Products	Marine Products	Mining Products	Manufacturing Products	Total	Agricultural Products	Marine Products	Mining Products	Manufacturing Products
1961	42,901	8,151	7,293	18,018	9,439	100.0	19.0	17.0	42.0	22.0
1962	56,702	13,041	12,474	15,877	15,310	100.0	23.0	22.0	28.0	27.0
1963	84,368	11,222	13,090	16,446	43,610	100.0	13.3	15.5	19.5	51.7
1964	120,851	12,562	24,090	21,917	62,322	100.0	10.4	19.9	18.1	51.6
1965	180,450	15,695	24,738	27,645	112,372	100.0	8.7	13.7	15.3	62.3
1966	255,751	24,336	37,536	34,195	159,684	100.0	9.5	14.7	13.4	62.4
1967	358,592	16,971	52,834	37,612	251,175	100.0	4.7	14.7	10.5	70.1
1968	500,408	21,607	50,856	41,005	386,940	100.0	4.3	10.2	8.2	77.3
1969	702,811	29,748	66,052	51,956	555,055	100.0	4.2	9.4	7.4	79.0
1970	1,003,803	30,056	82,324	52,059	839,369	100.0	3.0	8.2	5.2	83.6
1971	1,352,037	37,992	103,983	47,207	1,162,855	100.0	2.8	7.7	3.5	86.0

Note: Includes both simple remittances, exports of bonded processings, sales of goods to military forces in Vietnam and exports without drafts. The figures are based on settlements of transactions in the Ministry of Commerce and Industry.

Source: Major Economic Indicators, 1961-71, EPB, p. 68.

ANNEX 12
Table 5.2

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 5.3: VALUE OF AGRICULTURAL EXPORTS
(000 US$)

	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Agricultural Products										
Cereals	9,901	912	2,270	3,361	7,852	855	649	1,340	855	270
Beans	233	71	33	1,222	839	220	23	169	905	3,333
Apples	173	86	127	71	359	658	565	559	889	296
Fresh Fruit & Dried Fruit	-	-	54	47	68	98	44	97	191	176
Canned Food	-	-	105	8	335	568	401	1,624	3,436	5,191
Raw Silk	4,966	5,099	6,685	8,312	13,232	21,963	24,745	31,286	50,895	48,040
Crude Vegetable Materials	425	382	928	374	295	281	532	699	221	370
Other Agricultural Products	72	143	10	160	195	406	551	2,089	5,054	3,836
Sub-Total	14,960	6,693	10,212	13,555	23,175	25,049	27,510	37,863	62,446	61,512
Livestock Products										
Pork	20	293	-	6	-	-	70	692	337	457
Pig Hair	1,026	1,570	1,736	880	996	1,065	871	965	901	653
Live Animals	1,517	3,870	1,007	92	29	146	32	275	-	-
Hide and Skin	145	157	203	201	164	96	110	94	75	52
Other Livestock Products	673	1,849	2,219	767	563	395	548	709	530	475
Sub-Total	3,381	7,739	5,865	1,746	1,752	1,702	1,631	2,815	1,843	1,637
Forestry and Hunting Products										
Plywood	2,973	6,782	12,550	19,055	30,683	41,404	67,408	81,758	102,395	138,724
Mushroom	375	259	528	309	342	506	594	929	1,414	1,702
Lumber and Cork	-	-	38	11	43	99	50	231	346	891
Arrow Root Wall Paper	128	224	542	1,458	1,973	1,678	2,363	2,500	4,114	3,477
Wood Manufactures	-	-	-	26	144	59	261	1,313	-	3,342
Birds and Animals	-	-	-	-	84	122	177	245	296	188
Others	-	-	-	-	221	336	714	565	1,268	1,410
Sub-Total	3,476	7,265	13,658	20,859	33,490	44,204	71,567	87,541	109,833	149,734
Marine Products										
Live Animals	n.a.	658	984	1,091	1,755	2,456	2,750	3,025		
Fresh Fish	4,327	3,532	5,075	6,298	5,212	5,265	4,482	3,739)	11,853	18,217
Frozen Fish	1,381	1,763	2,255	2,368	3,872	6,084	4,653	4,556	5,994	8,001
Cuttle Fish	2,371	2,078	5,010	5,452	6,290	4,630	1,970	4,156	10,335	9,361
Dried Fish	295	384	264	419	390	533	646	343	599	776
Salted Fish	-	843	519	882	1,368	1,730	1,217	1,224	1,566	2,629
Canned Fish	272	372	826	1,406	1,655	519	2,221	2,184	375	1,885
Agar-Agar	1,420	1,641	1,849	2,176	2,753	5,800	1,851	1,780	1,227	1,171
Seaweed	352	328	654	819	1,002	929	588	998	1,525	2,678
Laver	1,267	1,343	5,391	3,781	6,838	14,373	17,054	21,721	11,592	4,749
Tuna	-	625	320	2,404	7,971	11,969	15,559	24,072	37,663	55,103
Others	656	21	138	142	87	102	86	149	510	1,298
Fishing Nets	-	103	381	1,254	2,843	4,111	4,246	5,969	7,313	9,113
Sub-Total	12,341	13,691	23,666	28,492	42,036	57,499	57,323	73,916	90,052	114,981
Total Agricultural, Livestock, Forestry and Fishing	34,158	35,388	53,401	64,652	100,453	128,454	158,031	202,135	264,174	327,864
Total Merchandise Exports	56,702	84,368	120,851	180,450	255,751	358,692	500,408	702,811	1,003,808	1,352,037

Source: Ministry of Agriculture and Forestry (MAF).

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 5.4: VOLUME OF PRINCIPAL AGRICULTURAL IMPORTS
(m ton)

	1965	1966	1967	1968	1969	1970	1971
Powdered Milk	7,639	4,635	855	5,988	5,568	6,328	798,434 3/
Wheat	476,245	425,828	635,718	813,465	1,342,906	1,178,066	1,654,090
Flour of Wheat	47,532	105,361	13,747	54,582	199,024	27,053	123,706
Rice	20	18,034	138,977	246,803	631,261	769,604	1,007,448
Barley	105,755	7,231	2,996	154,610	107,105	10,892	60,707
Raw Sugar	39,857	85,739	143,055	156,519	202,447	229,074	260,308
Molasses	16,294	27,130	17,221	30,442	81,137	145,591	213,377
Cattle Hides	84	1,541	3,291	6,977	8,724	9,933	11,657
Soybeans	193	150	25,760	4,014	17,660	29,590	61,780
Rubber	12,662	15,647	18,211	24,898	27,427	27,081	38,018
Wood and Lumber	536,477	1,082,450	1,338,420	1,982,198	3,225,635	2,901,922	3,305,825
Pulp	59,146	96,597	104,225	149,474	162,900	171,763	209,398
Sheep and Lamb's Wool 1/	1,015	1,522	2,132	2,690	3,884	2,953	2,649
Wool and Animal Hair 2/	1,148	1,636	2,790	3,392	3,390	3,111	3,106
Raw Cotton	70,685	74,119	90,764	86,440	98,584	108,453	124,422
Manila Fiber	4,416	4,024	3,471	4,841	3,749	2,991	2,613
Beef Tallow	14,233	21,314	28,998	34,758	37,805	45,313	66,607

1/ Grease basis
2/ Except wool
3/ This is the figure appearing in the source, but it appears to be in error as value increased from $6,625,000 in 1970 to $9,136,000 in 1971 (see p. 283 in 1972 source).

Source: Economic and Statistics Yearbooks, 1965-1972, Bank of Korea (BOK).

ANNEX 15
Table 5.4

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 5.5: VALUE OF PRINCIPAL AGRICULTURAL IMPORTS
(000 US$)

	1965	1966	1967	1968	1969	1970	1971
Live Animals	293	759	554	1,044	1,846	2,297	2,344
Meant and Meat Preparations	205	167	262	384	986	1,043	1,666
Powdered Milk	2,976	2,085	439	2,403	1,492	6,625	9,136
Fish and Fish Preparations	23	125	843	102	159	436	317
Wheat	35,890	40,482	46,294	62,788	90,345	79,528	115,101
Flour of Wheat	5,171	11,752	2,510	5,337	22,177	2,499	10,129
Rice	4	3,088	24,902	43,305	120,465	145,367	150,164
Barley	5,759	657	291	11,806	7,454	956	4,150
Raw Sugar	3,459	5,434	8,964	10,169	17,454	23,479	31,069
Molasses	510	701	592	1,258	3,359	4,781	4,464
Bovine Skin	19	682	1,207	2,106	3,001	3,350	3,606
Soybeans	49	12	3,231	214	3,880	3,455	8,944
Rubber	6,353	7,589	7,930	9,419	13,889	13,244	14,718
Wood and Lumber	20,771	43,131	58,437	91,487	108,422	125,306	153,700
Pulp	8,814	12,296	15,620	21,539	24,474	31,191	35,108
Sheep and Lamb's wool, Greasy or Fleece Washed	2,592	3,982	5,781	7,181	10,136	8,422	6,093
Wool and Animal Hair, Except Greasy Wool	1,812	2,753	5,368	7,168	7,655	6,343	4,773
Raw Cotton	40,839	42,774	49,328	49,052	52,038	62,669	84,188
Manila Fiber, Tow and Waste	1,271	2,086	874	1,104	1,021	931	793
Beef Tallow	3,294	4,651	5,327	5,269	7,219	10,554	15,797

Source: Economic and Statistics Yearbooks, 1969 and 1972, Bank of Korea (BOK).

ANNEX 12
Table 5.5

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 5.6: IMPORTS AND EXPORTS OF FOOD, BEVERAGES, AND AGRICULTURAL RAW MATERIALS
(Million US$)

Direction and Commodity Group	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Imports											
Food (Including Feed)											
Live Animals	0.7	0.2	0.4	0.3	0.8	0.6	1.0	1.8	2.3	2.3	2.9
Meat	0.2	0.2	0.1	0.2	0.2	0.3	0.4	1.0	1.0	1.7	3.0
Dairy Products and Eggs	2.5	3.1	1.8	3.1	2.1	0.6	7.0	3.7	7.0	9.5	3.8
Cereals	40.1	107.2	60.8	54.4	61.3	76.6	129.3	250.3	244.8	304.0	518.0
Fruits and Vegetables	0.3	0.4	0.4	0.5	0.5	0.9	0.9	1.3	1.9	2.3	7.0
Sugar	4.5	4.7	3.8	4.0	6.2	9.7	12.3	21.4	28.9	38.4	50.0
Coffee, Cocoa, Tea and Spices	0.1	0.1	0.2	0.3	0.3	0.5	1.0	1.9	4.3	3.9	5.0
Animal Feed	0.1	4.2	0.4	0.4	0.6	3.7	12.9	16.2	23.2	33.9	9.0
Misc. Food Preparations	0.1	0.5	0.4	0.3	0.3	0.6	2.6	3.8	5.5	3.2	3.3
Beverages	0.1	0.2	0.1	0.2	0.2	0.5	0.5	0.7	0.8	0.4	0.7
Agricultural Raw Materials											
Unmanufactured Tobacco	-	0.1	-	-	-	0.1	0.7	0.7	0.4	3.0	8.5
Hides and Skins	0.4	0.3	0.2	-	0.7	1.3	2.1	3.0	3.4	4.0	20.0
Oilseeds	0.7	0.6	1.2	0.3	1.4	4.3	1.7	4.8	5.4	11.9	22.5
Natural Rubber	5.5	6.9	4.7	6.4	7.6	7.9	9.4	13.9	13.2	14.2	16.0
Natural Fibers	43.2	45.8	42.7	47.1	52.2	62.3	65.1	68.6	80.4	100.6	140.0
Crude Materials	1.6	1.2	0.8	1.5	1.5	4.1	7.6	5.7	5.8	5.5	5.5
Oils and Fats	3.9	4.8	3.9	3.8	5.5	6.9	8.3	12.3	15.2	21.3	21.0
Total Agriculture	104.0	180.5	121.9	122.8	141.4	180.9	262.8	411.1	443.5	560.1	840.0
Exports											
Food (Including Feed)											
Live Animals	1.5	3.7	1.1	-	-	0.1	0.1	-	-	-	0.2
Meat	0.1	0.2	0.2	0.2	0.1	0.1	0.8	1.6	1.4	2.5	10.7
Dairy Products and Eggs	0.1	0.1	-	-	-	-	-	-	-	-	0.1
Cereals	9.0	1.3	2.4	3.6	7.3	0.8	0.8	1.5	1.3	2.4	1.5
Fruits and Vegetables	2.2	2.2	6.8	5.5	10.4	9.0	15.6	16.4	19.5	20.7	19.1
Sugar	0.7	1.3	0.7	0.8	0.7	0.8	0.8	1.0	1.5	0.9	2.1
Coffee, Cocoa, Tea and Spices	-	-	-	0.1	-	0.1	0.1	0.4	0.4	0.6	1.0
Animal Feed	-	0.2	0.1	0.2	0.2	0.1	0.3	0.1	0.1	0.1	0.2
Misc. Food Preparations	-	-	-	-	0.1	-	0.1	0.2	0.6	0.2	1.7
Beverages	0.1	-	-	-	0.4	0.4	0.8	1.3	0.8	1.1	1.4
Agricultural Raw Materials											
Unmanufactured Tobacco	0.1	0.2	0.1	0.9	6.5	6.6	7.6	13.6	13.4	14.1	12.6
Hides and Skins	0.1	0.1	0.2	0.2	0.2	6.1	0.1	0.1	0.1	-	0.4
Oilseeds	0.1	-	-	-	-	-	-	-	0.1	0.2	-
Natural Rubber	-	-	-	-	-	-	-	-	-	-	-
Natural Fibers	4.3	5.1	6.7	7.6	12.7	16.7	19.7	26.7	39.2	43.2	60.7
Crude Materials	3.9	7.2	6.4	6.9	7.7	10.9	9.3	11.7	15.6	15.9	18.7
Oils and Fats	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.3
Total Agriculture	22.3	21.7	24.8	26.1	46.4	45.8	56.2	74.7	94.1	102.0	130.6

Source: United States Department of Agriculture.

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 5.7: IMPORTED AND DOMESTICALLY PRODUCED FEED SUPPLIES
(000 m ton)

Year	Imported Grains	Byproducts from Imported Grains	Local Grains and Concentrates	Sub-Total	Roughages (Local Only)	Total
1962	21	87	869	977	2,017	2,994
1963	18	265	617	900	2,222	3,122
1964	5	189	978	1,172	2,195	3,367
1965	0	131	1,082	1,213	2,135	3,348
1966	3	82	1,337	1,422	2,193	3,615
1967	45	210	1,263	1,518	2,258	3,776
1968	82	300	1,469	1,851	3,093	4,944
1969	196	344	1,757	2,297	3,233	5,530
1970	259	307	1,802	2,368	3,381	5,749
1971	464	381	1,850	2,695	3,490	6,185
1972	493	534	2,561	3,588	4,031	7,619

Source: MAF.

SECTION VI: PRICES, INCOME, AND CONSUMPTION

REPUBLIC OF KOREA

AGRICULTURAL SECTOR SURVEY

Table 6.1: INDEX NUMBERS OF PRICES RECEIVED AND PAID BY FARMERS
(1965=100)

	Prices Received						Prices Paid				
Year	(A) All Farm Products	All Farm Products Excl. Vegetables	Grains	Fruits and Vegeta-bles	Livestock, Cocoon & Poultry Products	Others	(B) All Goods and Services	Farm Supplies	House-hold Goods	Farm Wage & Charges	Parity Ratio (A/B)
1961	47.1	47.4	50.7	42.1	42.3	40.2	55.5	57.1	57.0	48.4	84.9
1962	51.8	52.3	53.8	45.1	49.4	48.6	61.4	65.1	62.3	53.9	84.4
1963	76.7	76.1	86.5	83.4	51.7	63.2	68.1	64.7	69.6	67.6	112.6
1964	96.0	96.7	110.4	86.4	65.4	77.3	86.5	75.6	89.8	91.0	111.0
1965	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1966	106.1	104.8	105.1	123.3	108.8	91.3	112.2	111.7	112.1	114.3	94.6
1967	121.5	122.3	117.8	109.4	140.5	102.6	127.0	124.8	126.4	133.8	95.7
1968	142.3	144.0	133.6	116.7	182.4	110.3	152.2	163.4	145.7	163.4	93.5
1969	162.4	163.5	162.5	135.2	178.5	132.7	167.7	173.7	159.0	200.0	96.8
1970	191.4	188.3	182.7	244.8	211.1	158.3	193.1	194.9	181.5	248.6	99.1
1971	235.9	233.6	228.8	287.2	254.5	192.7	227.2	240.5	208.3	297.3	103.8

Source: Major Economic Indicators, 1961-71, Economic Planning Board, May 1972, p. 96.

ANNEX 12

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Table 6.2: PRODUCER PRICES OF FARM PRODUCTS

	Won per	1965	1966	1967	1968	1969	1970	1971
Food Crops								
Rice	100 ltr	3,210	3,386	3,730	4,390	5,435	6,000	7,503
Common Barley	"	2,133	2,026	2,342	2,564	2,974	3,282	4,580
Naked Barley	"	1,650	1,520	1,940	2,133	2,618	3,014	4,172
Wheat	"	1,653	1,722	1,884	1,926	1,865	1,843	2,263
Millet	"	2,128	2,226	2,575	2,636	2,946	3,401	4,467
Corn	"	1,456	1,769	1,898	2,050	1,976	2,121	2,440
Soybeans	"	3,254	3,659	4,863	3,402	3,709	5,847	5,914
Red Beans	"	4,082	3,445	4,480	4,027	4,027	7,275	7,577
White Potatoes	3.75 kg	51	52	57	58	54	62	79
Sweet Potatoes	"	31	34	42	43	48	55	76
Fruits								
Apples	18.75 kg	520	502	593	747	773	970	1,154
Peaches	"	80	73	110	94	123	124	164
Pears	3.75 kg	612	543	689	783	857	1,071	1,206
Grapes	"	169	199	232	204	309	290	310
Vegetables								
Radish	3.75 kg	21	27	43	38	47	77	87
Chinese Cabbage	"	27	34	52	45	48	85	110
Garlic	"	753	538	382	454	476	404	619
Sweet Melon	"	92	81	81	87	106	139	148
Red Pepper	"	767	1,435	789	820	1,147	2,829	2,521
Water Melon	"	79	73	76	76	86	136	146
Pumpkin	"	46	38	39	39	44	50	60
Industrial Crops								
Cotton	600 g	99	67	72	79	83	121	148
Hemp	3.75 kg	486	440	504	454	467	450	639
Black Rush	"	250	356	436	421	477	1,333	1,299
Sesame	100 ltr	8,472	11,047	9,988	8,359	17,144	19,612	24,503
Rape	1 kg	52	62	50	58	54	60	61
Others								
Mulberries	3.75 kg	150	152	177	142	-	168	286
Tobacco, 1st grade	1 kg	254	258	258	256	284	360	482

Source: Yearbook of Agriculture and Forestry Statistics, MAF.

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Table 6.3: INDEX NUMBERS OF PRODUCER PRICES OF FARM PRODUCTS

	1965	1966	1967	1968	1969	1970	1971
Food Crops							
Rice	100	105	116	137	169	187	234
Common Barley	100	95	110	120	139	154	215
Naked Barley	100	92	118	129	159	183	253
Wheat	100	104	114	117	113	111	146
Millet	100	105	121	124	138	160	210
Corn	100	121	130	141	136	146	168
Soybeans	100	112	149	105	114	180	182
Red Beans	100	84	110	99	99	178	186
White Potatoes	100	102	112	114	106	122	155
Sweet Potatoes	100	110	135	139	155	177	245
Fruits							
Apples	100	97	114	144	149	187	222
Peaches	100	91	138	118	154	155	205
Pears	100	89	113	128	140	175	197
Grapes	100	118	137	121	183	172	183
Vegetables							
Radish	100	129	205	181	224	367	414
Chinese Cabbage	100	126	193	167	178	315	407
Garlic	100	71	51	60	63	54	82
Sweet Melon	100	88	88	95	115	151	161
Red Pepper	100	187	103	107	150	369	329
Water Melon	100	92	96	96	109	172	185
Pumpkin	100	83	85	85	85	96	130
Industrial Crops							
Cotton	100	68	72	80	84	122	149
Hemp	100	91	104	93	96	93	131
Black Rush	100	142	174	168	191	533	520
Sesame	100	130	118	99	202	231	289
Rape	100	119	96	112	104	115	117
Others							
Mulberries	100	101	118	95	-	112	191
Tobacco, 1st grade	100	102	102	101	112	142	190

Source: Yearbook of Agriculture and Forestry Statistics, MAF.

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Table 6.4: PRICES PAID BY FARMERS FOR FERTILIZER
(Won per ton)

Year	Nitrogen[1/]	Phosphate[2/]	Potash[3/]	Weighted Average[4/]
1961	23,650	13,320	7,010	23,480
1962	39,400	24,440	12,780	29,410
1963	39,660	24,440	12,780	33,150
1964	44,160	29,980	17,540	35,440
1965	65,300	46,600	24,330	54,040
1966	63,940	46,600	23,920	53,270
1967	52,370	42,270	21,650	44,800
1968	54,550	47,930	37,600	50,350
1969	58,120	44,010	33,130	50,750
1970[5/]	58,120	44,010	33,130	50,560

1/ Based on the price of Ammonium Sulfate, Urea and Compound Fertilizers.
2/ Based on the price of Triple Super Phosphate, Fused Magnesium Phosphate and Compound Fertilizers.
3/ Based on the price of Potassium Chloride, Potassium Sulfate and Compound Fertilizers.
4/ Reflects quantities utilized per year.
5/ Actual 1970 utilization figures for the various fertilizer compounds are unavailable. It is assumed that usage proportions within categories are equal to 1969 proportions, i.e., out of a total Nitrogen usage the proportion obtained from Urea, etc., is the same in 1969 and 1970.

Source: U.S. Agency for International Development.

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Table 6.5: INDICES OF FARM WAGE RATES, PRICES PAID FOR FARM HOUSEHOLD GOODS AND REAL FARM WAGE RATES (1965=100)

Year	(A) Index Farm Wages	(B) Prices of Farm Household Goods	Real Wages (A)/(B)
1959	42.6	51.0	83.5
1960	43.1	53.3	80.9
1961	47.6	57.0	83.5
1962	51.5	62.3	82.7
1963	65.2	69.6	93.7
1964	88.5	89.8	99.6
1965	100.0	100.0	100.0
1966	116.9	112.1	104.3
1967	142.7	126.4	113.0
1968	178.3	145.7	122.4
1969	216.4	159.0	136.1
1970 1/	285.5	187.8	152.1

1/ As of October

Source: Monthly Economic Statistics, Bank of Korea.

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Table 6.6: COMPARISON OF PER CAPITA INCOMES OF FARM AND NONFARM HOUSEHOLDS (won)

Classification	1967	1968	1969	1970	1971
A. Farm Household Income	149,470	178,959	217,874	255,804	356,382
B. Per Capita Income	24,423	29,727	36,373	43,210	61,129
C. Per Worker Income	47,907	59,653	73,606	87,905	122,049
D. Nonfarm Household Income	248,640	285,960	333,600	381,240	451,920
E. Per Capita Income	45,538	52,566	61,550	71,393	85,591
F. Per Worker Income	192,744	219,969	254,656	286,647	339,789
A/D	60.1	62.6	65.3	67.1	78.9
B/E	53.6	56.6	59.1	60.5	71.4
C/F	24.9	27.1	28.9	30.7	35.9

Note: Nonfarmers mean salary and wage-earners.

Source: EPB

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Table 6.7: FOOD BALANCE SHEET

Food Items	Supply: Production	Import	Changes in Stock	Total	Deficits* or Surplus	Balance in Percentage	Demand: Household Use	Industrial Use	Export	Feed	Waste	Total	Per Capita Year: Present Study (kg)	FAO 1/ (kg)
						(1964)								
Grains														
Rice	3,758	-	176	3,934	302	7.7	3,437	53	14	9	119	3,632	130	126
Barley	1,514	167	63	1,774	733	42.0	904	25	-	30	52	1,011	36	41
Wheat	280	625	3	908	179	19.7	545	143	-	14	27	729	26	30
Bean	190	9	-	199	35	17.6	94	56	-	8	6	164	6	7
Millet	75	-	-	75	32	42.7	41	-	-	-	2	43	2	-
Potatoes	936	-	-	936	294	31.4	454	63	-	31	94	642	23	84
White Potatoes	114	-	-	114	-	-	104	-	-	-	-	-	-	-
Sweet Potatoes	822	-	-	822	-	-	350	-	-	-	-	-	-	-
						(1965)								
Grains														
Rice	3,954	-	318	4,272	422	9.9	3,632	69	19	11	119	3,850	134	130
Barley	1,807	79	7	1,893	864	45.6	907	32	-	33	57	1,029	36	55
Wheat	268	512	3	783	36*	4.6*	593	188	-	15	23	819	29	26
Bean	203	-	-	203	5	2.5	104	74	5	9	6	198	7	6
Millet	61	-	-	61	13	21.3	45	-	1	-	2	48	2	-
Potatoes	1,045	-	-	1,045	311	29.8	513	83	-	34	104	734	26	85
White Potatoes	116	-	-	116	-	-	122	-	-	-	-	-	-	-
Sweet Potatoes	929	-	-	929	-	-	391	-	-	-	-	-	-	-

Food Items	Supply				Deficits* or Surplus	Balance in Percentage	Demand						Per Capita Year	
	Production	Import	Changes in Stock	Total			Household Use	Industrial Use	Export	Feed	Waste	Total	Present Study (kg)	FAO 1/ (kg)
						(1966)								
Grains														
Rice	3,501	32	530	4,063	265*	6.5*	4,013	151	44	17	103	4,328	147	116
Barley	2,018	-	38	2,056	962	46.8	913	68	1	50	62	1,094	37	58
Wheat	289	493	-8	774	309*	39.9*	631	406	-	23	23	1,083	37	24
Bean	195	-	-	195	106*	54.4*	117	160	4	14	6	301	10	6
Millet	58	-	-	58	5	8.6	50	-	1	-	2	53	2	-
Potatoes	972	-	-	972	61	6.3	583	179	-	52	97	911	31	77
White Potatoes	138	-	-	138	-	-	143	-	-	-	-	-	-	-
Sweet Potatoes	834	-	-	834	-	-	440	-	-	-	-	-	-	-
						(1967)								
Grains														
Rice	3,919	113	-	4,032	389*	9.6*	4,094	178	-	28	121	4,421	146	-
Barley	1,999	-	-	1,999	770	38.5	907	78	-	184	60	1,229	41	-
Wheat	330	919	-	1,249	139	11.1	678	358	-	39	35	1,110	37	-
Bean	236	-	-	236	116*	49.2*	134	186	1	23	8	352	12	-
Millet	42	-	-	42	15*	35.7*	56	-	-	-	1	57	2	-
Potatoes	631	-	-	631	399*	63.2*	630	176	-	87	87	1,030	34	-
White Potatoes	113	-	-	113	-	-	175	-	-	-	-	-	-	-
Sweet Potatoes	518	-	-	518	-	-	505	-	-	-	-	-	-	-
						(1968)								
Grains														
Rice	4,402	-	-	4,402	318*	7.2*	4,369	190	-	29	132	4,720	153	-
Barley	1,901	-	-	1,901	780	41.0	895	81	-	88	57	1,211	36	-
Wheat	331	-	-	331	819*	247.4*	725	374	-	41	10	1,150	37	-
Bean	279	-	-	279	102*	36.6*	152	197	-	24	8	381	12	-
Millet	41	-	-	41	23*	56.1*	63	-	-	-	1	64	2	-
Potatoes	864	-	-	864	282*	32.6*	786	183	-	91	86	1,146	37	-
White Potatoes	132	-	-	132	-	-	209	-	-	-	-	-	-	-
Sweet Potatoes	732	-	-	732	-	-	577	-	-	-	-	-	-	-

Food Items	Supply: Production	Supply: Import	Supply: Changes in Stock	Supply: Total	Deficits* or Surplus	Balance in Percentage	Demand: Household Use	Demand: Industrial Use	Demand: Export	Demand: Feed	Demand: Waste	Demand: Total	Per Capita Year: Present Study (kg)	Per Capita Year: FAO[1] (kg)
						(1969)								
Grains														
Rice	4,523	-	-	4,523	467*	10.3*	4,623	202	-	29	136	4,990	158	-
Barley	1,916	-	-	1,916	797	41.6	43	85	-	89	57	1,119	35	-
Wheat	355	-	-	355	859*	242.0*	771	390	-	41	12	1,214	38	-
Bean	303	-	-	303	106*	35.0*	169	207	-	24	9	409	13	-
Millet	36	-	-	36	34*	94.4*	69	-	-	-	1	70	2	-
Potatoes	970	-	-	970	295*	30.4*	885	190	-	93	97	1,265	40	-
White Potatoes	146	-	-	146	-	-	242	-	-	-	-	-	-	-
Sweet Potatoes	824	-	-	824	-	-	643	-	-	-	-	-	-	-
						(1970)								
Grains														
Rice	4,651	-	-	4,651	609*	13.1*	4,876	214	-	30	140	5,260	162	-
Barley	1,933	-	-	1,933	819	42.4	878	88	-	90	58	1,114	34	-
Wheat	366	-	-	366	914*	249.7*	816	407	-	42	15	1,280	40	-
Bean	336	-	-	336	102*	30.4*	186	218	-	24	10	438	14	-
Millet	32	-	-	32	44*	137.5*	75	-	-	-	1	76	2	-
Potatoes	1,137	-	-	1,137	255*	22.4*	986	198	-	94	114	1,392	43	-
White Potatoes	150	-	-	150	-	-	276	-	-	-	-	-	-	-
Sweet Potatoes	987	-	-	987	-	-	710	-	-	-	-	-	-	-
						(1971)								
Grains														
Rice	4,778	-	-	4,778	761*	15.9*	5,138	228	-	130	143	5,539	167	-
Barley	1,911	-	-	1,911	806	42.2	866	92	-	90	57	1,105	33	-
Wheat	376	-	-	376	971*	258.2*	862	424	-	44	17	1,347	41	-
Bean	361	-	-	361	110*	30.5*	206	230	-	24	11	471	25	-
Millet	28	-	-	28	55*	196.4*	82	-	-	-	1	83	3	-
Potatoes	1,285	-	-	1,285	244*	19.0*	1,099	206	-	96	128	1,529	46	-
White Potatoes	156	-	-	156	-	-	314	-	-	-	-	-	-	-
Sweet Potatoes	1,129	-	-	1,129	-	-	785	-	-	-	-	-	-	-

1/ Korea FAO Association Study Grain Consumption by Industrial Uses and Feed, December 1967, pp. 72-79.

Source: An Analysis of Food Consumption in the Republic of Korea, Yonsei University, Seoul, Korea, 1969.