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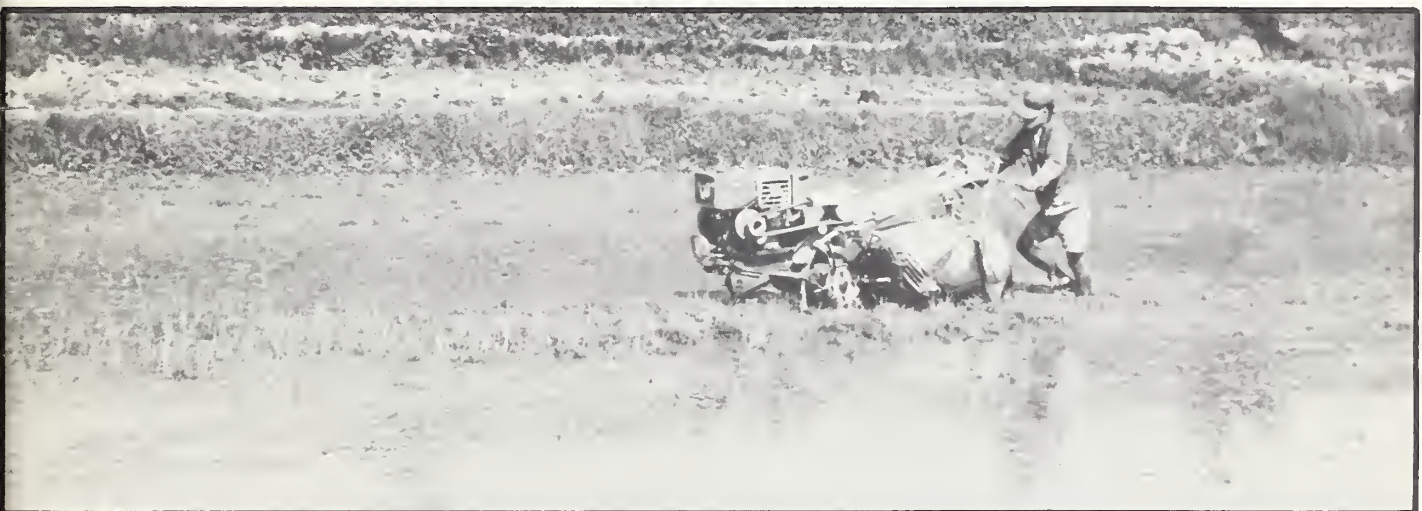
PLANNING KOREA'S AGRICULTURAL DEVELOPMENT

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ABSTRACT

The Third Five Year Economic Development Plan for the Republic of Korea, 1972-76, is based on forecasts of certain economic aggregates prepared by the Economic Planning Board. Total population is projected to exceed 35 million by 1976, compared with about 31 million in 1969--a gain of 13 percent. However, the urban segment is expected to account for nearly 60 percent of the total, compared with 50 percent in 1969. The Gross National Product in real terms is projected to increase more than 80 percent, with income per capita showing a gain of about 78 percent.

This population and income growth will generate a rapid rise in the demand for food (particularly livestock products, fruits, and vegetables), requiring an expansion of 25 to 30 percent in the total supply of farm products. But with a larger proportion of the population in the cities, the volume of farm products marketed through commercial channels will rise about 40 percent.

The requisite expansion in production and marketing can be achieved provided certain programs are fully implemented. These include: (1) expansion of rice production through paddy rearrangement, mechanization, better control of water supplies, and more effective use of fertilizers and pesticides; (2) importation of larger quantities of feed grains in conjunction with increased forage production; (3) complete modernization of the marketing system involving such things as vastly improved farm to market roads, adequate storage facilities, and effective regulation of grading, sanitation, and pricing practices; (4) accurate information on prices and marketings and intensive marketing research; and (5) greater emphasis on financial incentives to farmers and marketing agencies.

KEYWORDS: Korea, Economic development, Economic planning, Development planning, Long-range economic projections, Agricultural sector analysis, Sectoral analysis, Development assistance, Technical assistance.

PLANNING KOREA'S AGRICULTURAL DEVELOPMENT

*Analyses and Recommendations
for the Third Five Year Plan*

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FOREWORD

This is the report of the Agricultural Sector Analysis Team whose mission was to assist and advise the Ministry of Agriculture and Forestry (MAF) and other Republic of Korea agencies responsible for preparing the agricultural portion of the Third Five Year Economic Development Plan (FYP). The work of the team extended from May 3 to August 8. The team leader and one other member were in Korea for the entire period. Other members spent from two weeks to about two months on the project. The team members and their primary responsibility and length of stay were:

William R. Gasser, team leader	May 3 - August 8
James P. Cavin, assistant team leader, pricing and demand-supply projections	June 8 - August 6
Richard S. Magleby, marketing	May 3 - August 8
Edward S. Micka, livestock	May 3 - June 25
Troy Mullins, mechanization	May 3 - June 25
Charles A. Breitenbach, agronomic potential of rice and other cereals	June 1 - 13

The team, except for Dr. Breitenbach on temporary duty from USAID/Philippines, was assembled by the U.S. Department of Agriculture under a Participating Agency Service Agreement and funded by U.S. AID/Korea [PASA Agreement No. EA (AJ) 18-70, PIO/T No. 489-594-2-00028, April 2, 1970].

SUMMARY

The long-range projections of the Ministry of Agriculture and Forestry (MAF) represent a large input of competent statistical work. With certain improvements, they should provide a firm basis for supporting program and policy recommendations for agriculture during 1972-76.

On the policy and program side, two things repeatedly emerge. The first is the need for greater emphasis on price incentives to stimulate an adequate production response by farmers and greater investment and managerial effort in marketing. The second is the critical importance of a vastly improved system of rural roads to enable the farm production-marketing complex to handle the greatly increased commercial demands for farm products.

Improving the Long-Range Projections

The major task here is to fit the components into an overall plan which is internally consistent, technically feasible, and tied to efficient use of available economic resources. To attain these objectives, the team placed emphasis on the careful construction of supply-utilization tables for the major commodities (to provide a balanced picture of production, consumption, feed, industrial use, and foreign trade); evaluation of the food consumption pattern implicit in the commodity projections to ascertain the calorie content and the relationship between livestock products, fruits and vegetables, and grains; estimation of total farm output and farm income to determine their consistency with the rates of growth projected by the Economic Planning Board (EPB) for the agricultural component of the Gross National Product (GNP); and further analysis of the investment requirements for the agricultural sector as a whole.

Livestock Development Plans

The strong upward trend in the per capita consumption of livestock products in recent years is expected to continue as a result of rising consumer incomes and greater urbanization. Per capita demand for all meat is projected to increase 60 percent from 1970 to 1976. Demand for eggs is shown to rise 50 percent, while demand for milk may more than double. Prices of all these products will rise sharply, particularly if the recommended policy of dropping price controls on beef is followed.

Domestic supplies are projected to meet demands for all livestock products except beef, where the MAF preliminary projection of production fell about 25 percent short of projected demand.

The team's analysis indicates no great difficulties in meeting demands for poultry and eggs. This is also true for pork, though this is largely due to the fact that demand is projected on the basis of a relatively low income elasticity. The feed-forage problem and the inability to increase cattle numbers and slaughter will be the principal bottlenecks for beef supplies.

There is strong motivation for entering the dairy industry in terms of financial returns, but there are many barriers to be surmounted at all levels from the farmer to the consumer. These include insufficient domestic supplies of forage; poor storage conditions; farms and processing plants of less than optimum size; inadequate means of transporting milk; and need to improve the quality of both bottled milk and processed milk products by such means as higher standards of sanitation and better methods of processing and refrigeration.

For the livestock sector as a whole, increased feed supplies of better quality are essential. This will require larger imports of feed grains and protein supplements; marked increase in the domestic production of silage and other forage; and the development of a commercial feed industry capable of providing adequate supplies of balanced feed rations.

Problems Relating to Grains

At the time of the team's departure, a supply-demand balance had not been established for grains (principally rice, barley, and wheat). This was due to the fact that, in the demand projections, the prices of rice and barley were assumed to increase relative to wheat while, in the supply projections, it was assumed that the price of wheat (and also corn) would rise sharply in relation to rice and barley. Reconciliation of these demand-supply projections should not be a difficult matter once a common set of price assumptions is agreed upon. In any event, the total demand for food grains as a group will increase very substantially between now and 1976, even though consumption of fruits, vegetables, and livestock products will become more important in the Korean diet. Also, the demand for feed grains will rise sharply due to the increasing importance of livestock production.

It is likely that the combined effect of paddy rearrangement, irrigation, mechanization, fertilizer use, and better incentives to farmers can make Korea self-sufficient in rice, including carryover stocks needed for price stabilization. In addition, the ability to increase rice output will be greatly enhanced if the new high yielding indica-japonica cross (IR-667) can be successfully adapted to Korea. However, it is still in the testing stage and a number of defects have yet to be overcome.

The Breitenbach report on rice and other grains also brought out the fact that the potential for a rice-barley rotation is much

greater than for a rice-rice or a rice-wheat rotation. Barley is grown largely as food insurance against a poor rice crop, and yields are low due to poor cultural practices and failure to counteract the high soil acidity by application of lime. The potential for a larger barley output is high, and though demand for it as food is expected to decrease as the nation's standard of living rises, there are real possibilities for use as a livestock feed. It should receive much more attention than it has been given to date. A high level of production for rice and barley will not obviate the need to import larger quantities of wheat and corn, but it will help to minimize the foreign exchange requirements for grains taken as a whole.

It was not possible for the team to make an intensive study of the mechanization problem, but a limited survey yielded some preliminary conclusions. It appears that too much emphasis is being placed on the introduction and use of relatively large tractors as compared with the smaller power tillers. Real progress in mechanization will depend on the effective integration of a number of government programs, including improved rural roads, demonstration centers staffed with competent technical advisers and training personnel, adequate price incentives combined with provision of adequate capital at favorable rates, and a number of improvements in the marketing system, especially for rice.

Problems of Price Policy

In recent years, price policy has centered on reducing the sharp seasonal movements in the price of rice from the November-December harvest period to the seasonal peak in July-August. This program was designed to protect consumers rather than producers, but has only become successful during the past two years when sizable imports have provided the necessary buffer stocks.

However, the goal of self-sufficiency in rice during the Third FYP will require that much more attention be given to stabilizing farm prices during the harvest season to provide the necessary incentives for larger output and marketings. To achieve the goals of self-sufficiency, higher farm income, and stable, noninflationary prices to consumers, a completely new program (probably involving a two-price system) needs to be constructed. The team recommended that top priority be given to developing a new price stabilization plan by a highly qualified Korean team. Such a plan should also include a price policy for barley which will stimulate its production for feed.

Although rice will continue to be the center of price programs, present plans call for stabilization efforts on some 19 agricultural products, including five grains, some fruits and vegetables, and certain specialty crops.

Evaluation of Marketing Needs

Difficult as the farm production problems will be under the Third FYP, modernization of Korea's market system presents even greater challenges. Not only will the volume of commercial marketings increase some 40 percent above 1969 levels, but certain products will have even more spectacular increases. The projections indicate that the marketing of vegetables will increase about 50 percent, fruits 70 percent, eggs 75 percent, meat over 90 percent, and milk nearly 200 percent.

The government will have to assume much of the responsibility for developing the means and incentives to bring about the requisite transformation of the present marketing system. Its responsibilities may be grouped under six broad headings:

1. Creation of a physical infrastructure capable of handling the great flow of farm products. Roads are an area of critical importance, including both the building of new rural roads and the widening of present ones to permit the passage of trucks. Also under this heading comes construction of adequate central markets and some storage and processing facilities to supplement private efforts.
2. Establishment of an environment conducive to expansion and modernization of the marketing system. This will include opportunities for profitable returns from investment and managerial effort in marketing comparable to those in other lines such as manufacturing. Also in this category are such elements as an adequate flow of statistical information on market prices and the volume of marketings; inspection, grading, and higher standards of sanitation; and trading rules which will make the central markets true barometers of the forces of supply and demand.
3. Large government investment in marketing facilities and explicit encouragement of private capital investment. The latter could well include subsidized interest rates and the underwriting of private bank loans by the central banking authorities.
4. A greatly expanded program of marketing research. One of the great barriers to modernizing the Korean marketing system is lack of in-depth analysis. What are the total marketing margins, including price, quantity, and quality margins, and what proportion of these goes for assembling, handling, storage, transportation, and merchandising? What are the earnings of workers and entrepreneurs in the marketing structure? How can marketing

efficiency be increased? What economies of scale are feasible in different segments of the system? What are the capital needs of marketing firms and how can these be satisfied? How can the operation of central markets be improved?

5. More and better training in marketing and agribusiness. This area badly needs upgrading as a profession. The field should be recognized at the university level; even the establishment of some two-year courses could prove invaluable.
6. Guidance for marketing firms. Extension work in marketing should parallel that in farming. Trained people should be available to advise on plant layout, management structure, cost accounting, and all phases of merchandising.

I. INTRODUCTION

Background

The economic growth of the Republic of Korea has been accompanied by a succession of long-range plans designed to stimulate and guide that growth. The most important effort has been a series of Five Year Plans.

The first plan, covering the period 1962-66, was a center of controversy and had little or no influence on the course of economic events. A second plan, covering 1967-71, was prepared by a new agency, the Economic Planning Board (EPB), headed by the Deputy Prime Minister. It was a marked improvement over the First FYP, but its growth targets were too low and the agricultural sector was largely neglected.

However, the spectacular but uneven growth of the Korean economy since the mid-1960's stimulated a new interest in adequate planning and, in 1970, the EPB began work on a third FYP to take effect during 1972-76. For these years, the EPB projected a general economic framework, including such critical aggregates as population, GNP, and income. Within this framework, the several ministries were directed to prepare plans for the economic sectors under their jurisdiction. However, the EPB would have final responsibility for reviewing the sector proposals and coordinating them into an integrated national plan.

The directives for the Third FYP put special emphasis on accelerating the rate of growth in the agricultural sector, attaining the maximum degree of self-sufficiency in food, and improving the income and living conditions of the rural population.

The preparation of a separate plan for agriculture imposed a severe burden on the resources for economic and statistical analysis available to the Ministry of Agriculture and Forestry (MAF) and affiliated agencies. This led to the suggestion that a U. S. team familiar with the economics of farming and program planning in agriculture could be of material assistance to the Korean technicians in the preparation of the sector study needed to support proposed policies and programs for agriculture. At the request of AID, USDA organized a five-man team in Washington. Four members of the team arrived in Seoul the first week in May, 1970.

Work of the Team

Initially, the team focused on study and appraisal of the statistical projections prepared in MAF (these are listed in Appendix A) but, subsequently, gave increasing attention to

preliminary plans for achieving the goals that emerged from the projections.

With respect to the projections, emphasis was placed on testing the overall consistency of the supply-demand estimates for the individual commodities in terms of their implications for such aggregates as total land use, total farm output, farm household income, and the national pattern of food consumption.

With respect to plans for reaching the projected goals--such as greater mechanization of agriculture, higher farm income, and improvements in the marketing system--numerous sources were tapped. These included discussions with research personnel in such agencies as the Agricultural Development Corporation (ADC) and the National Agricultural Cooperative Federation (NACF), as well as with university advisors to MAF. Also, team members made several field trips which provided direct observation of such activities as paddy rearrangement, livestock cooperatives, and demonstration dairy farms. These trips also provided opportunities to discuss production and marketing problems with many local people, including provincial officials of ADC and NACF.

The team's mission as ultimately delineated was to assist and advise the MAF in the preparation of the agricultural portion of the Third FYP. Due to time and resource limitations, it was not feasible for the team to undertake a complete, independent sector analysis as originally considered.

However, the analytic work underlying the plan for the agricultural sector, as well as the formulation of final programs (including investment requirements), fell behind schedule due to large unanticipated demands on the research personnel of the various Ministries from other sources, notably the Special Session of the General Assembly during May and June. This meant that the first complete draft of the agricultural sector plan for EPB review could not be completed before the end of the team's stay in Seoul.

In this situation, MAF requested that the team prepare a report summarizing its findings to date, including a discussion of problems still to be resolved and recommendations on policies needed to solve these problems. It was obviously not possible for the team to submit a detailed appraisal of the great volume of economic and statistical material made available to it, as some of the material was completed and translated only within the last few weeks of the team's tour. Rather, attention was focused on a number of broad areas where certain problems needed to be considered and resolved before MAF's submission of the agricultural sector plan for initial review by EPB.

The first step in this direction was preparation of a report on the livestock sector by the team's livestock specialist, as the MAF projections and plans were further advanced in this sector

than in other commodity areas. At the same time, the marketing specialist stepped up his work on the problems of this important sector, as these had not received sufficient attention in the planning process. Meanwhile the team leader and his deputy drew up plans for the report as a whole and began summarizing various aspects of the team's work. These included their own work in the areas of demand-supply projections, production plans, and price policy, as well as Breitenbach's special report on potential production of rice and other grains, an early survey of the mechanization problem, and the livestock report referred to above. Finally a substantial portion of the marketing report was added.

Also in the reporting picture were a number of important oral briefings of Korean Government officials. The team as a whole presented a summary of its findings to the bureau chiefs of MAF and also to the Vice-Minister and the Assistant Vice-Ministers of MAF. In addition, the team leader made a special presentation to the Deputy Prime Minister, who is also the Minister of EPB.

II. GENERAL IMPROVEMENT OF THE LONG-RANGE PROJECTIONS

At the time this report was being prepared, at least a preliminary draft of the major components of the plan had been completed by the various bureaus and sections within MAF. A major task remained, however, to fit the components together into an overall plan which is internally consistent, technically feasible, and to the extent possible within the limitations of available time and data, provides for the most efficient use of resources in achieving the established targets. This task probably will require a series of successive approximations and adjustments among the various components.

Supply-Utilization Tables

One method of testing the consistency of the demand and supply projections of the major commodities is the preparation of supply-utilization tables. These tables would show, for each year of the plan period, the supply picture of the commodity in terms of carryover from the previous year, plus production, plus an adjustment for trade. The import requirements and export availabilities could be the balancing mechanism between the projected supply and utilization pictures but, on the import side, foreign exchange limitations may force the adjustment to some other category. Similarly, the export availabilities ought to be evaluated in terms of the proposed long-range export program for agricultural products and the likely world market for a particular commodity. The utilization picture would indicate quantities used for food, seed, industrial uses, feed, and losses.

MAF has prepared a preliminary set of tables of this type for rice, barley, wheat, corn, soybeans, other cereals, and a total for all grains. These tables, however, were prepared using a constant percentage distribution among the alternative uses for each of the years of the Third FYP period. It is very unlikely that the ratio among possible uses that existed in the 1970 rice year will remain constant through 1976. The set of tables ought to be re-computed, making "best estimates" of likely changes in the distribution pattern. The feed use category, for example, ought to be consistent with the estimate of feed requirements included in the livestock sector development plan. Similarly, seed use ought to reflect any proposed shifts in the acreage distribution pattern by 1976. An important factor to be considered in the processing category for wheat, for example, is the extent to which wheat flour will be used in the production of "makolli," a common alcoholic beverage in Korea. Some estimates indicate that at least one half million tons of wheat, much of it imported, are used in this process. Will this pattern continue or will there be a shift to other types of grains? (Some additional com-

ments on achieving a supply-demand-price balance for grains will be found in Part IV, "Problems Relating to Grains.")

Evaluation of the Food Consumption Pattern

A second, but closely related, check on the projections is an evaluation of the food consumption pattern implied by the projections for the years of the Third Five Year Plan period. Per capita food consumption estimates, based on "first draft" projections of production, were prepared for the following food categories--rice, barley, wheat, beans, miscellaneous grains, potatoes, sugar, vegetables, fruits, meat, eggs, fish, milk, oil and fat, and seaweed. These quantity estimates then were converted to a caloric equivalent and summed. Lack of time prevented a detailed, critical analysis of these findings (they became available in the last week of the team's tour while this report was in preparation), but some preliminary comments can be made. The estimates show the more rapid increase that can be expected in the so-called "quality" foods--vegetables, fruits, and animal protein--with a leveling off or decline in some of the grains and starch component of the diet. The projected increase in the caloric total, from about 2,300 calories per capita per day at the present time to an estimated 2,500 in 1976, appears reasonable. But for a number of food categories the estimates of quantities to be consumed do not appear to match with estimates provided in the supply-utilization tables or in the production estimates. In the process of integrating the plan components, revised estimates can be made. This is an example, however, of the kinds of internal consistency cross-checks that will be required.

Consistency of Larger Aggregates

Farm Income Projections

Projections for individual commodities were preceded by overall projections of farm household income, which are the sum of income from farming and income from non-farm sources. The first was projected to increase from 1972 to 1976 at the 4.5 percent annual rate specified by EPB for the agriculture, forestry and fishery sector of the Gross National Product (GNP). The second was projected to increase at the 9.7 percent rate specified for the non-agricultural sector. In effect, MAF based its farm income projections on a 5 percent growth rate for the agricultural sector compared with the 4.5 percent rate in the overall GNP projections. The projections of total farm income were divided by estimates of the number of farm households to obtain final projections on an income per household basis. The number of households had been derived from projected trends in the farm population and in the number of persons per household. The net result of the foregoing was to project a rise in real farm income per household during 1972-76 at an annual rate of 6.3 percent.

Production Growth and Income

Also needed is an aggregation of the supply projections to test whether the rate of growth in total farm production is consistent with the rates of growth projected for the agricultural component of GNP and for farm income.

As a step in this direction, MAF prepared a preliminary index of the total value of agricultural production. Annual projections of production of individual crops for 1969 through 1976 were multiplied by the 1969 price weights for each of these commodities and an index of total value for crops was computed. Similar calculations were made for the production of cocoons, eggs, and milk, and the number of cattle, hogs, and poultry slaughtered for meat to arrive at an index of total value for livestock and sericulture. These were added to form an index of total value for agriculture (excluding forestry and fisheries). The crops component of the index shows a projected average annual growth rate of about 4.5 percent during the 1972-76 period, compared with a 6.8 percent growth rate for the livestock component. The index for total agriculture indicates an average annual growth rate of about 6.5 percent for the plan period. This overall growth rate implies a much greater weight for the livestock component than would be expected--i.e. crops at 4.5 percent, livestock 6.8 percent, and total at about 6.5 percent. These calculations should be carefully checked to see if there has been an error in the entry of production data or in the weighting system used in the calculation of these preliminary indices.

An annual increase of 6.5 percent indicates a faster annual rate of growth than the 5 percent projected for the agricultural segment of GNP and the 4.5 percent increase for the farm income component of household income. This is due to the very rapid rise of 6.8 percent in livestock and sericulture compared with the 4.5 percent rise in crops. This may be due in part to the combined effect of the 1969 price weights and the very large increases projected for livestock and sericulture, but in any case, the consistency of these relationships should be carefully examined before submission of the final set of projections.

Implications of the Price Assumptions

MAF has made considerable progress in bringing out the overall implications of the demand and supply projections for such aggregates as total farm output and the national pattern of food consumption. This should be paralleled by aggregation of the commodity price projections to see what they mean in terms of the general level of prices received by farmers.

Price increases are projected for beef, pork, dairy and poultry products, fruits, vegetables, and grains. The price advances for all groups except the grains are predicated on large

increases in consumer demand stemming from rising per capita incomes and a further shift of population into the urban areas. These demands will tend to run ahead of domestic supplies, thereby exerting continued upward pressure on prices. For the grains, projected price increases appear to be more closely associated with the objectives of increasing output, attaining self-sufficiency in grains, and raising the incomes of growers.

It is evident that the projected increases in production will aid farm income. It now remains to be seen if the commodity price projections result in a rise in the index of prices received by farmers relative to prices paid by farmers. To the extent this is so, the real income of farmers will be further improved and progress will have been made toward the stated policy of improving the "terms of trade in favor of farmers."

Comments on Investment Plans

At the present stage of pulling the pieces of the plan together, a clear picture of the total level and pattern of investment was not available. In some cases, the estimation of the investment requirements had not been completed. The drafts of the various components of the plan also appeared to contain some overlap of investment categories and, on occasion, even within the same general categories, the proposed levels of investment appeared to differ. As a first approximation, the sum of the preliminary, first draft estimates of investment requirements by the individual bureaus in the MAF indicated a total Third FYP investment requirement in agriculture of about 650-700 billion won. (This total excludes the projected investment requirement for the forestry and fisheries sectors.) The comparable figure for the Second FYP period (1967-71) is about 265 billion won (adjusted to comparable 1969 prices).^{1/}

The very tentative nature of these first estimates must be emphasized. Obviously the goal in drawing up the set of investment requirements is the selection of the optimum combination of investments to achieve the established targets. It will be necessary, as was done in the preparation of the Second FYP, to assess the relative costs (in terms of scarce resources) and benefits (additional output, social returns, etc.) for the various proposed targets, both within and between subsectors of agriculture. For some projects it will be necessary at some point to decide whether the primary effort will be concentrated in a particular region where the rate of return can reasonably be expected to be the largest, or whether it will be necessary to disperse the effort to provide more general benefit. In some cases, for example in irrigation projects, this choice has already been made.

^{1/} Official exchange rate in August 1970 was about 310 won = U.S. \$1.00. However, MAF planners frequently used the rate of 288 ₩/dollar.

In the development of the investment plans, it is important to consider means of stimulating farmer's own investments in addition to the planned public investment, both by central and provincial governments. Policies and measures often can be adopted which will promote and facilitate both monetary and non-monetary investments by individual farmers.

III. LIVESTOCK DEVELOPMENT PLANS^{1/}

During the Third FYP period, per capita consumption of livestock products is expected to continue its strong upward trend. As per capita income rises, there will be a sharply increased market for animal protein foods. Although this report covers only the livestock product component of animal protein intake, the importance of marine products should not be underestimated in the Korean situation where livestock and marine products are highly substitutable on the consumers' preference scale. Professor Jin Hwan Park believes that, in the urbanization-industrialization process in Korea, an increase in production of marine foods is equally as important as the increase in livestock products. In fact, he speculates that, in view of the need for expanding imports of feed grains to support the growing livestock sector, it is possible that marine foods may have an advantage in saving on foreign exchange. ^{2/} But an analysis of the Korean fishing industry was not included in the team's assignment, so this report concentrates only on the livestock industry and its prospective role in satisfying a part of the demand for animal protein in the Korean diet.

The MAF has three stated livestock policies to be pursued in the Third FYP program:

1. No direct or indirect price controls on beef.
2. Reorganization of the meat demand structure by increasing the demand for pork and poultry meat.
3. An increase in the demand for milk, whereby, for example, a school lunch program will be initiated.

^{1/} Much of the analysis included here is based on a more detailed report prepared by Edward S. Micka, "An Evaluation of the Livestock Sector in the Third Five Year Plan of the Republic of Korea," June 1970.

^{2/} Working draft of a paper by Professor Park, "Problems and Policy Programs in the Agricultural Sector for the 3rd Plan Period."

Moreover, in the absence of specific reference to their termination, it may be inferred that the following policies relating to the livestock sector will also be continued:

1. Importation of required concentrate feeds such as corn and protein supplements.
2. The native Korean cattle slaughter law whereby cows less than five years of age or males less than two years old cannot be legally slaughtered.
3. Concentration of livestock production in the main feed-forage production areas.

Demand Projections

Per capita total meat demand is projected to increase from about five kilograms in 1970 to slightly over eight kilograms in 1976, about a 60 percent increase from a relatively low base. The projected increases in per capita demand for beef, pork, and chicken for the same period are 70, 50, and 70 percent respectively. The estimates of per capita demand were projected by regression analysis using per capita GNP and product prices relative to the price index for all meats. The equations actually used were selected from a number of alternative formulations --with those for beef and chicken representing essentially "middle of the road" increases in per capita demand, but a relatively high rate of increase for pork.

During the Third FYP period, real prices of animal protein products are projected to increase rather substantially. Beef prices are projected to increase progressively relative to pork and chicken; poultry prices are projected to increase relative to pork. In 1970, the ratio of beef price to pork is about 2.0, while projections for 1972 and 1976 are 2.3 and 2.7, respectively. Poultry meat price ratios relative to pork for the same years are 1.18, 1.24, and 1.29, respectively.

The per capita demand for milk and eggs is projected to increase by 50 and 140 percent, respectively, during the period 1970-76. Per capita demand for eggs was projected in the same manner as meat, described above, while milk demand was obtained by projecting the consumption of fluid milk, powdered milk, and condensed milk as a function of time, and summing the results. The equations used, chosen from several alternatives, yielded a "middle of the road" increase for eggs but a relatively high rate of increase in the projected demand for milk.

Supply Projections

On the supply side for livestock products, MAF projections for production during the Third FYP meet the demand projections for pork, poultry, and eggs (in the case of pork, about 9,000 tons are programmed in 1976 for an anticipated export market). In the case of beef, however, the MAF projection of production in 1976 meets only about three-fourths of the projected demand. As indicated in Micka's report on the livestock sector, the projected slaughter rate for cows appears fairly high. If this rate were reduced, particularly during the early 1970's, there would be a larger herd base to provide more beef during the latter part of the Third FYP period and into the last half of the 1970's when the beef deficit will be greatest and increasing yearly. Even this adjustment, however, would fail to completely close the gap between the projected demand and supply.

In view of the tight Korean foreign exchange position, it appears unlikely that beef will be imported. In this situation, assuming adherence to the policy of no price controls on beef, the price of beef probably would rise sharply, curtailing the demand and probably providing some additional incentive for cattle raising, and perhaps bringing some balance to supply/demand estimates for beef.

In the last couple of years, the Korean Government has begun taking measures to halt the decline in numbers of Korean cattle which has been under way since 1964. Numbers at the beginning of 1970 reportedly showed a slight increase over the previous year, but it is too early to tell if this is a permanent break in the recent downward trend. MAF plans include a number of programs for increasing the number and productivity of Korean cattle, and the projected increases in live weight per animal and dressing percentage should be attainable, assuming continued emphasis on improvement of the feed base and the breeding program.

The income elasticity for beef is high, implying a rapidly increasing demand for beef as consumer income increases. The income elasticity for pork, however, is comparatively low. Professor Jin Hwan Park speculates that the form of cooking pork -- by boiling -- may be an important factor in explaining the comparatively low demand for pork in spite of its lower price relative to beef; he suggests that present Korean kitchen facilities are suitable for boiling meat but not for frying or roasting. 1/

1/ Working draft of a paper by Professor Park, "Problems and Policy Programs in the Agricultural Sector for the 3rd Plan Period."

Professor Park believes that, as kitchen facilities improve in urban households and the method of cooking pork changes, there will be a substantial increase in pork consumption in the 1970's. This trend will be strengthened by the likely comparative increase in beef prices relative to those for pork. The supply of pork is relatively more elastic than beef because less time is required for farmers to expand hog production. In the past, feed for hogs has consisted primarily of kitchen waste and byproducts of grain milling. Some improvement in the feed base, including commercial mixed feed, can be expected in the Third FYP period, which will shorten the length of time required to produce a hog for slaughter. Much of the projected expansion in production will take place on the larger farms capable of providing a better feed base.

The Korean poultry industry has been the most rapidly developing livestock sector, with most of the expansion occurring among commercial producers using imported feeds. Per capita chicken consumption has more than doubled during the past decade, compared with about a two-thirds increase in per capita beef consumption. During 1970-76, MAF projects about a 70 percent increase in per capita demand for chicken, and on the basis of past achievements of the poultry industry and the supporting measures outlined in the plan, including importation of feeds, this sector should have no major problems meeting the projected demand. Measures must be taken, however, to ensure that concentrate requirements are in adequate supply to maintain relatively stable seasonal feed prices. The government could also help the industry by providing more market and price information and more information for decision makers on the current status of the industry, e.g., number of broilers on farms, number of broiler eggs in incubators, and so on. In marketing of broilers, there has been some movement to broiler shops, but improvements over a broader range will be necessary in the future. ^{1/}

Dairying in Korea is an infant industry experiencing numerous problems that span the entire spectrum, from problems at the farm level to problems at the consumer level. Lack of silage and other forage crops has been a factor in dampening the increase in milk production. Improvements in sanitation and in the marketing of dairy products are badly needed, including a more efficient delivery system for fresh milk. ^{1/} At the present time, however, dairying appears to be a comparatively lucrative enterprise. Milk prices in Korea are about \$8 per hundredweight, one of the highest prices anywhere. There is strong motivation for entry into dairying and strong pressure for those already in the business to expand.

^{1/} See sections on milk and meat marketing in Part V, "Evaluation of Marketing Needs," for additional comments on these subjects.

With the planned cessation of dairy cattle imports in 1972, the expected growth in dairy cattle numbers during the Third FYP period thus depends mainly on natural increase. The plan projections for dairy cattle numbers and milk production, as originally prepared by MAF in a preliminary draft, provided for a near balance in the projected demand and supply of milk during the plan period. However, as indicated in Micka's paper on the livestock sector, there appears to have been an error in calculating the number of dairy cattle at the beginning of each year (the error involving a double counting of calves in the calculations). The result of this apparent error is an overestimation of the number of animals slaughtered for beef and an underestimation of the number of cattle at the beginning of each year and, hence, an underestimation of milk output. Preliminary revised calculations eliminating the double-counting error indicate a supply of milk in 1976 more than 50 percent above the projected demand. Additional analysis is needed to verify these preliminary calculations and to make adjustments to bring the projected supply and demand for milk more nearly into balance.

Feed Supply

As indicated above, a lack of silage and other forage has been a major deterrent to increased milk production. The hay and other forage that is available frequently is of low quality. Hence, concentrates are being over-fed to make up for the shortage of forage, resulting in comparatively low and inefficient milk production. The feed-forage problem is a dilemma facing not only dairying but the entire livestock sector.

With the limited arable land base in Korea, there are, and will continue to be, heavy demands on this land resource for food production.

Livestock feeding in general tends to be inefficient because the small farms do not produce an adequate and properly balanced supply of feed. Progress toward expanded and efficient livestock production will depend on imports of feed grains and protein supplements and the development of a commercial feed industry capable of providing a stable supply of quality feeds and an efficient feed mixing service. The MAF livestock plan envisions that, in 1976, the terminal year of the plan period, imports of feed grain, primarily corn, will approach one-half million tons, in addition to the bran available from imported wheat. In addition, imports of about 50,000 tons of protein supplements (primarily fish meal and soybean cake) are projected. The plan also provides good proposals for pasture development, with inclusion of funds for reseeding some of the pasture projects the following year and for the application of fertilizer and the much-needed limestone.

IV. PROBLEMS RELATING TO GRAINS

The Demand-Supply Balance for Grains

This is the principal area where a demand-supply balance had yet to be firmly established in MAF planning. The difficulty appeared to stem in considerable degree from the fact that the group making projections of the demand for grains made its price assumptions independently of the group making the supply projections. The latter constructed a different set of price assumptions.

In the demand projections, the real price of rice is shown to be rising at a 10 percent annual rate during 1970-73 and at 5 percent during 1974-76. On this basis, the real price of rice in 1976 would be more than 50 percent above the 1970 level. Meanwhile, the real price of barley rises at a 3 percent rate in both periods, while the real price of wheat remains constant throughout. Thus, rice becomes more expensive relative to barley, and even more so relative to wheat.

Projecting per capita consumption of rice with a regression that includes the ratio of rice prices to wheat prices tends to dampen the demand for rice, perhaps too much so. On the other hand, a price rise of this magnitude reflected in prices received by rice producers would be in excess of the level required to attain the stated goal of self-sufficiency. ^{1/} The result, of course, would be surpluses that would have to be disposed of on the world market.

The small but steady increase in the price of barley relative to wheat would provide some incentive for expansion in the output of barley. MAF suggested that more could be used for feed. With the price ratios of rice and barley unfavorable to wheat, little or no expansion could be expected in the domestic production of the latter.

^{1/} See section on "Problems of Price Policy" in Part IV for additional comments on price stabilization for rice and barley.

Turning now to the supply projections, a completely different picture emerges. As a result of reclamation, cultivated land is expected to increase by about 100,000 hectares ^{1/} during the plan period, but none is projected to go to rice or barley. Rice acreage contracts in 1972, then gradually increases to about the 1971 level by 1976. Barley acreage declines steadily throughout most of the period. However, heavy investment for improved inputs are expected to bring marked improvement in the yields of these crops. Some imports of rice will be required during 1972-74, but self-sufficiency will be attained in 1975 and 1976 at about the levels indicated by the demand projections. Supply and demand of barley will be in balance throughout the period. Though not explicit, it appears that prices held constant at about the 1969 level are deemed adequate to achieve a demand-supply balance for both rice and barley.

By contrast, the supply projections allocate a considerable amount of additional acreage for wheat and corn. This will be induced by extremely sharp increases in the price of these crops. Wheat acreage rises nearly 90 percent from 1971 to 1976, while corn acreage rises about 55 percent. Production increases at an even faster rate as yields also increase due to improved factor inputs. The projected expansion of wheat results in a small reduction of the supply-demand gap by 1976, but corn imports will continue their rise, despite the gains in domestic production.

Obviously, a reconciliation of the demand-supply-price projections is needed. The basis for food consumption is fairly well established, but this is less true for feed and other uses. The feed uses of barley and corn need to be tied more directly to the livestock projections. This is particularly true of corn, where the projection of demand as a function of egg consumption is not satisfactory. Also, the basis on which the distillery demand for wheat is projected is rather unclear. Careful preparation of the supply-utilization tables as suggested in Part II should go a long way toward the required reconciliation.

Agronomic Potential of Rice and Other Cereals ^{2/}

One of the stated goals for the Third FYP is food self-sufficiency, or more accurately, self-sufficiency in rice.

^{1/} 1 hectare (ha.) = 2.471 acres

^{2/} Much of the analysis included here is based on a more detailed report prepared by Charles A. Breitenbach during an assignment in Korea in June 1970; the title of his report is, "An Evaluation of the Potential for Increasing Rice and Secondary Cereal Grain Production in the Republic of Korea."

Continued imports of wheat are planned as well as substantial quantities of corn to support the expanding livestock industry. The opportunity for developing new areas for small grain production is limited so that the major effort must be concentrated on improving production on presently available land. The ratio of paddy land to upland is now about 1.25 to 1, which means that priority should be given to increasing rice yields and yields of rotation crops following rice. Barley is the primary rotation crop with rice, occupying about 60 percent of the paddy land following rice in the southern half of the Republic where the frost-free season is long enough to support such a rotation. Wheat can, in part, also occupy a similar role.

Rice

Korea has high hopes that it may be the nation to develop a temperate zone "miracle" rice. These hopes are based on a new indica-japonica cross, IR-667, developed in cooperation with the International Rice Research Institute in the Philippines. IR-667 is a cross of IR-8, the so-called "miracle" rice of the Philippines, with a japonica hybrid IR-568 (which is a cross of a Japanese variety, Yukara, with a Taiwan variety, Taichung Native No. 1). IR-667 will be the first indica-japonica cross to be released on commercial scale. It appears to have additional gene factors for high yield from the indica parent which probably do not exist in the japonica varieties now being grown. It is also of short stature, which should permit high nitrogen application without lodging. Despite the likelihood of success for IR-667, it is still only in the testing stage and will not be released to farmers until 1972. Yet there has been considerable advance publicity on what the new variety will do. The plant breeders feel there has probably been more publicity than the actual concrete research results warrant at this stage.

Certain defects have been observed in IR-667 and research should be started immediately to eliminate these problems as quickly as possible. For example, a higher percentage of sterile grains has been noted in many lines of IR-667 than in most pure-breeding indica or japonica varieties. This is probably an effect of the wide genetic incompatibility which results on making the original indica x japonica inter-specie cross, but every effort must now be made to eliminate the sterility factor before commercial seed is released. Also, it is claimed that IR-667 shatters more on being harvested than do most of the Korean varieties now in production. This, too, is an indica-related factor. The problem can probably be solved by some change

in the time or method of harvest or, better, by selection or back-cross breeding with a japonica variety. And, finally, there appears to be some lack of consumer preference for IR-667 because the rice grain is too long and not sticky enough. Similar taste problems faced the introduction of IR-8 in the Philippines, but these have largely been eliminated in more recent releases, IR-20 and IR-22, which have incorporated Philippine quality preferences into a high-yielding prototype.

There are a number of other problems associated with the introduction of a new rice type, and research on these factors is also required. For example, a strong research program is required on how best to fertilize the variety and how to determine the best fertilizer application rates in each area where the variety is to be grown. Also, the new variety will have an estimated 20 percent less straw than traditional varieties. Rice straw is an important byproduct of the rice crop for the Korean farmer. It is used for cattle feed and fuel in winter, for roofing on many farm homes, for compost, and for rope, baskets, and straw bags. The shorter length and the lesser amount of straw represent some of the secondary potential problems which may affect acceptance of a new variety.

The level of competence of the technicians working in the Korean rice breeding program is high. The work both at the central experiment station at Suwon and at provincial stations was well planned and appeared to be systematically followed through. The stations were well equipped with laboratory and field equipment.

What appeared to be lacking, however, was adequate guidance in the long-range crop breeding program. For example, in the case of the rice program, there are still very few research results on which to choose a dwarf-statured selection of IR-667 as the type scheduled for release to farmers in 1972. This summer will be the first growing season in which it will be tested in Korea in a comparative yield trial with other high-yielding varieties.

It is true that a knowledge of the good results that have been obtained with other short-strawed varieties, both in rice and wheat, would indicate that the same advantages will probably hold true in the present case. Good research procedures, however, would have required a series of conclusive results before the selection of any specific IR-667 line for seed propagation. In any case, IR-667 should be considered only as the first of a new series from which subsequent, more highly improved, superior-yielding varieties may be developed. Once the factors for high yield are fixed, other factors for quality can be added through the backcross method, as has been done in the case of IR-8 in the Philippines.

Another consequence of the choice of the dwarf-type IR-667 without adequate testing has been the need to carry along a whole series of other IR-667 selections on which to fall back in case the dwarf line does not live up to expectation. A general observation was that too much field material appears to be carried on from year to year in this manner. There is a general tendency to build up collections. Much time and labor might be saved if some procedures were followed for screening all genetic stocks, both locally bred and introduced, so that those of little promise might be discarded. A recommended scientific procedure would be to determine a series of priority crops and to work only on those. Within each crop the characteristics sought for a program of plant development should be outlined. Those plant lines which did not possess one or more of these characteristics can then be eliminated.

At the present time, seed production is entirely controlled by MAF. There is a danger that this control of all steps in the production and distribution of certified seed will prevent the formation of a strong seed producer's association and the development of private initiative in the seed industry. In those countries where improved seed programs have become strongest, private initiative has taken over large sectors of it, including the production, distribution, and sale of seed, the packaging and processing of seed, and even the breeding and testing of some new varieties. This is certainly true in Japan, the United States, and most European nations. In fact, either private initiative will have to assist in the government's seed improvement program or the expense of maintaining it likely will become so large that its development will need to be curtailed. It is highly recommended that the possibility of interesting private capital to enter the seed industry be investigated.

Secondary Crops Grown in Rotation Following Rice

In most of the four northern and central provinces of Korea, the growing season is too short to follow rice with a second crop, except for a few specialized vegetables. In the remaining provinces, however, a second crop following rice is a common practice. Barley is by far the most important second crop in the double-cropping pattern. More recently, considerable research has been conducted on wheat as a second crop. The possibility of a rice-rice double cropping pattern is also being investigated. On poorer lands, rye is sometimes grown in rotation with rice, while on Cheju Island and in parts of Chollanam Province, the production of rapeseed for oil has become fairly important. Average yields of polished barley are only about two tons per hectare, much less than yields in Japan. This fact indicates that, with proper research and even the application of known techniques, great advances might well be achieved in increasing barley yields. Both common and naked barley are produced, with the naked type being emphasized by the Korean government because of its generally higher yields.

In spite of barley's importance as Korea's second crop, the cultural practices employed for its production are very poor when compared to those utilized in rice production. There are several reasons for this, but it is primarily because barley is looked down upon as a poor man's food. It is a subsistence crop produced primarily for the farm family's food during the summer when rice is not readily available or when the price of last year's rice has risen on the market. Rice is the commercial crop and the one which earns the farm family its income.

The rotation cycle for barley in relation to rice is very tight. At the time of barley harvest, rice has to be transplanted while, at the time of the rice harvest, it is time to plant barley. At both times, there is a heavy demand on labor. As a consequence, barley is generally both poorly seeded on an inadequately prepared seedbed and hastily harvested. Rice is always given a high priority.

Perhaps the most important factor responsible for the poor yields of Korean barley, however, is high soil acidity. Rice research has repeatedly demonstrated the acid tolerance of rice, and lime has only a minor effect in increasing rice production. Barley, on the other hand, is poorly tolerant to production on acid soils, and its response in increased yields after liming is highly significant. It is also likely that much of the fertilizer now applied may not be utilized by the crop under the high acid conditions in which barley is usually grown. No doubt the national averages in barley production could be considerably improved if adequate quantities of lime were employed.

Professor Jin Hwan Park made the following significant comments concerning the present and likely future role of barley:

Barley is regarded as inferior to rice by domestic consumers, especially for urban families. Income effects for barley consumption will be zero or negative. However, if the relative price of rice goes up, the substitution of barley for rice will be rather elastic for farm and low income urban families. As urban population and consumer incomes increase, the per capita consumption of barley (for food) is likely to decline, and the economic incentives for barley production will be lowered further from the present level, which is already low.

In spite of the declining trend of incentives for barley production, the farmers in southern provinces will have to continue the barley production in the winter season, for the alternative use of crop lands in the off season is yet limited for most farmers. Thus, barley will be produced in spite of its low profitability, and this will contribute to supplementing

the shortage of rice for the economy as a whole. Because of these reasons, policy measures to encourage barley production will be needed equally as much as for increasing rice production in the Third Five Year Plan. 1/

A study prepared by the Institute of Agricultural Economics of the Office of Rural Development makes similar comments on the role of barley in the Korean cropping pattern:

Barley is a suitable winter crop to follow rice on well-drained paddy lands, and has a big potentiality of production increase by expansion of cultivation area or improvement of cultivation techniques ... In view of the national need for increased agricultural output, it is a very urgent problem to utilize the considerable amount of idle paddy area in the winter season. Further expansion for barley production offers an important possible way to do this.

The quality of barley as a food is relatively inferior, so that demand for barley is expected to decrease as the national level of living rises. Therefore, the creation of new demand is very desirable for expansion of barley production. For this reason, the possibilities of using barley for feeding livestock have been of great interest recently. But the production cost of barley in Korea has stayed high due to poor production techniques ... The usual practice among farmers is to limit the crop to what can be grown with self-supplied farm resources, especially labor, or to grow only enough to meet on-farm food consumption needs. Accordingly, creation of additional demand, development of improved production techniques, and more favorable price-cost relationships, are required to expand barley production. 2/

Despite these strong endorsements of barley as a valuable crop in rotation with rice, there appears to be some official tendency to deemphasize the role of this crop. Barley research

1/ Working draft of a paper by Professor Park, "Problems and Policy Programs in the Agricultural Sector for the 3rd Plan Period."

2/ "Feed Supply and Use for Livestock Production in Korea, Final Report," by the Institute of Agricultural Economics, Office of Rural Development, July 1968, p. 460-1.

is being curtailed, with emphasis shifting to seeking methods by which large areas now in barley may be replaced by wheat or possibly even a second crop of rice. As explained later in this section, wheat has an important production role, but it appears that, in rotation with rice, barley has a definite advantage. Probably with no crop is there a better chance for spectacular increases in yield than with barley. With a strong research program and the necessary government incentives, the chances of a breakthrough in barley production appear better than for rice. The reason is simply that barley production starts from such a low base, while rice production is already quite good as compared with other Asian nations.

Crop breeders feel that considerable improvement can be made in barley production by breeding alone. Varieties with a shorter growing season are needed to reduce competition for labor with rice. Also, most Korean barley is of long straw types, and the development of dwarf types would both reduce lodging and augment the potential of increasing yields by higher nitrogen application. Also, it may be possible to increase yields by integration of the more promising high production Japanese germ-plasm types into the better local varieties. An additional need is for a barley which is more tolerant of wet soil and thus suitable for planting quickly after rice has been harvested. Many of these improvements probably can be achieved quite rapidly.

Wheat is a minor crop in Korea, with only about 150,000 hectares now grown. Much of this is produced as an upland crop in the northern provinces and not in rotation with rice. The problem involved in growing wheat as a second crop following rice is that its growing season is about two weeks longer than barley. In most of Korea, the growing season is too short to produce wheat effectively in a rice rotation.

Research is now underway to develop wheat varieties with a shorter growing season to fit in a rice-wheat rotation. Such research ought to be continued, but it is recommended that research in wheat not be furthered in preference to barley or with funds that would otherwise be allocated for barley research. As indicated above, it now appears that the prospects for increasing food production by means of improvements developed through research are probably better in barley than with any other Korean crop.

Considerable effort is being expended at the Youngnam experiment station on the production of two rice crops a year. As in the case of wheat-rice rotation, however, it is unlikely that a rice-rice combination will ever produce as much total food under Korean conditions as can rice rotated with barley. The growing season is just too short. The normal maturation season must be substantially shortened (by setting out seedlings under vinyl hot beds) for both the first and the second rice

crops. In that process, yields of both rice crops are likely to be substantially curtailed. For this reason, it is recommended that rice-rice rotations be provided less research support than that for barley or wheat.

Only a small amount of rye is grown, generally produced on poor riceland after rice where the crop has either been harvested late or where the soil conditions are too poor for production of barley. Rye appears to have little potential in a rotation with rice except possibly as a forage crop for livestock feed.

Mechanization of Grain Production 1/

A program for modernizing Korean farming operations touches on a number of broad issues including (1) the possibilities of alleviating peak labor requirements, (2) the effects of introducing new practices on total output, and (3) the possibilities of improving operator returns in relation to costs. The 1970 Korean Government self-help program, prepared in connection with the U. S. PL 480 program, contains the following statement concerning farm mechanization:

In the interest of increased labor productivity, lower cost of food grain production, increased output of grains, and higher profits to farmers from grain production, the Government will develop and implement forward looking farm mechanization policies which will consider both economic returns and social impact and which will enhance the position of farmer-controlled enterprises. Mechanization of land preparation and certain other farming operations will remove a critical labor restraint and add materially to labor productivity in agriculture. Emphasis will also be given to organizational arrangements for utilizing equipment in a way that maximizes local farmer or farm group control over its use.

From an agronomic point of view, mechanization generally permits somewhat more effective and timely land cultivation. A better and deeper seedbed can be prepared so the plants can make better use of available water and increased fertilizer applications. Mechanization also permits more rapid seedbed preparation. This is an important factor in the double cropping areas in Korea, with its relatively short growing season and resultant pressure

1/ This section is based, in part, on material prepared by Troy Mullins, rice mechanization specialist and member of the Agricultural Sector Advisory Team during May and early June 1970.

for timely completion of field work. A planting date a few days earlier relieves some of this time strain, and the slightly longer growing season may have a yield increasing effect. Some increase in the amount of double cropping is possible through mechanization, thus increasing the rate of land utilization.

Power Tillers

Mechanization of the power source for Korean farm production has been proceeding along two major paths: (1) small, hand-operated power tillers (in the 5-8 horsepower range), and (2) large tractors (in the 30-50 horsepower range) used in paddy rearranged areas under some type of group operation. The Ministry of Agriculture has helped introduce power tillers through direct subsidy and low interest loans (advanced through the National Agricultural Cooperatives Federation (NACF)) equal to about 60 percent of the purchase price. Power tiller numbers have increased from about 1,100 in 1965 to 9,141 in 1968, with the purchasers of some 6,200 receiving subsidy and loan. The Third FYP projects an increase of about 70,000 tillers during the plan period. NACF also participates with machinery manufacturers in providing a local (gun) supply and service center for such equipment.

Table IV-1 provides some estimates of labor requirements for rice production using an 8 horsepower tiller, as compared with conventional practices, and with a tractor. Estimates of the number of man days of labor required for 60 hectares of rice grown under selected levels of mechanization are given in Table IV-2. In terms of total investment capital required to mechanize farm operations, the use of tillers is somewhat more expensive than is the case for larger tractors (Table IV-3). However, the disadvantage probably is more than offset by the greater total hours of use that can be made of tillers annually. Farmers located near urban-industrial centers where truck crops provide substantial crop income have been most interested in power tillers. The increased opportunities for use of these units (in farming and in nonfarming hire) is a major consideration.

Other favorable attributes of power tillers include: (1) they are relatively simple to operate, repair, and maintain; (2) they are better suited for use in small and irregular land areas; and (3) the horsepower capacity, on most jobs, is utilized at a relatively high degree of efficiency.

Tractors

To some agencies and numerous individuals concerned with modernizing Korean agriculture, mechanization primarily means the introduction and use of tractors and associated equipment rather than the smaller power tillers. A number of provincial officials and representatives of the Agricultural Development

Table IV-1. --Estimated labor requirements for rice production for selected levels of mechanization

	Levels of mechanization		
	Conventional : practices <u>1/</u>	8 hp tiller & attachments <u>2/</u>	35 hp tractor & attachments <u>3/</u>
	- - - - - man days per hectare - - - - -		
Nursery preparation and growing	21.1	13.7 (7.4) ^{4/}	9.1 (12.0)
Seeding preparation and transporting	22.0	9.1 (12.9)	2.2 (19.8)
Transplanting	25.6	25.6	25.6
Weeding	28.7	16.6 (12.1)	15.7 (13.0)
Pest control	28.0	15.0 (13.0)	9.1 (18.9)
Harvest and thresh	41.1	8.0 (33.1)	4.8 (36.3)
Transport, et.al.	31.4	31.4	31.4
Total	197.9	119.4 (78.5)	97.9 (100.0)

1/ Assumes conventional practices including draft animals, hand transplant and harvesting, and threshing with foot-pedal thresher.

2/ Power tiller with plow and rotary, hand transplant, hand-operated spray (weed and pest control), binder for cutting, and power operated thresher.

3/ Thirty-five hp tractor, 2-bottom plow, hand transplanting, power spray for insect control, and combine for direct harvesting.

4/ Data in parenthesis indicate days per hectare saved compared with conventional method.

Table IV-2.--Estimated man days of labor required for 60 hectares of rice grown under selected levels of mechanization and value of labor saved compared with conventional method

Level of mechanization	:	:
	: Total <u>1/</u>	: Value of <u>2/</u>
	: man days	: labor saved
Conventional practices @197.9 days per hectare	: 11,870	<u>Won</u> -
Eight hp tiller @119.4 days per hectare	: 7,160 : (4,710) <u>3/</u>	2,355,000
Thirty-five hp tractor @100.0 days per hectare	: 6,000 : (5,870)	2,935,000

1/ Assumes 10-hour work day.

2/ Assumes wage rate of 500 ₪ per day.

3/ Data in parenthesis indicate days per hectare saved compared with conventional method.

Table IV-3. --Estimated investment capital required and annual maintenance costs associated with two levels of mechanization ^{1/}

	:	:
Item	: 8 hp tiller :	: 35 hp tractor :
	:	:
	- - - - - <u>1,000 won</u> - - - - -	
Total capital investment in equipment per set of equipment	: : :	: : :
	: 810.5	: 2,456.9
Per hectare served <u>2/</u>	: 115.8	: 81.9
Capital required for 60 hectares	: 6,947.4	: 4,913.8
	: : :	: : :
Annual maintenance costs <u>3/</u>	: : :	: : :
Per set of equipment	: 240.1	: 700.7
Per hectare served	: 34.3	: 23.4
Per 60 hectares	: 2,058.0	: 1,401.4
	:	:

1/ Assume complement of equipment referred to in footnotes to Table 1.

2/ Assume 8 hp tiller serves 7 ha. and 30 hp tractor 30 ha.

3/ Includes depreciation, interest on investment capital, and annual repairs.

Corporation (ADC) expressed enthusiasm regarding this type of mechanization and were giving much less consideration to other alternatives. At the present time, there are 113 of these tractors, and the Third FYP calls for an additional 4,000 to 6,000 by the end of 1976.

Certainly with the paddy rearrangement program well under way and with considerable expansion planned for the Third FYP period, there will be a considerable number of areas where the larger tractors and attached equipment can operate at favorable levels of efficiency. (Approximately 135,000 hectares of paddy land had been rearranged by the end of 1969, and an additional 323,000 hectares are planned to be rearranged by the end of 1976. The ultimate goal is about 588,000 hectares of rearranged paddy land, or about one-half the total paddy area.) The larger tractors can cover a much larger area in land preparation in a limited time than can power tillers. They also have the capability for somewhat deeper seedbed preparation. A limited number of tractor units can be used in the off season for extending and servicing roadways, canals, and drainage structures. Other possibilities include handling of bulk supplies and numerous jobs in specialized livestock farms.

Under present conditions, the average Korean farms are far too small (less than one hectare) to be mechanized individually, and farmers lack experience in tractor operation and maintenance. Under these circumstances, the government plans to operate farm machinery stations under the ADC to provide mechanization services to farmers. These stations will also provide facilities for training farmers to operate and maintain the tractors and associated equipment. As the local Farmland Improvement Associations or other cooperative groups of farms become strong enough, it is proposed that the ownership and operation of the tractors will be turned over to these groups.

Mechanization of Other Farm Operations

As evidenced by numbers of thresher units, the rice threshing has become more mechanized in recent years. Between 1963 and 1968 the number of foot-press threshers increased by approximately 35 percent and the number of power threshers by slightly less than 200 percent (from 9,495 to 26,680). However, the bottleneck in harvesting operations remains the actual threshing and drying of the crop. Small binders have been perfected and are in general use in Japan. However, they are expensive (about 310,000 won compared with 284,000 won for the 8 horsepower tiller and attachments). Thus far they have not been subsidized, and the days of annual use (for rice, barley, and wheat) necessarily are quite limited. Furthermore, the output increasing effects of binders are limited, and progress toward mechanizing this operation is expected to be slow.

The use of chemicals for weed and pest control has increased rapidly in recent years. The fact that such operations have a definite, direct effect in producing higher yields probably is a major factor in this increase. Hand sprayers increased from 85,000 in 1963 to 271,300 in 1968, and power sprayers from 3,071 to 11,588 in the same period.

Comments and Recommendations

Modernization of Korean agriculture will be conditioned by and dependent upon a number of basic problems. First is the question of the degree to which the present subsistence type agriculture can be shifted to one which is primarily market oriented. Without such change, Korean farmers cannot make the capital savings required to purchase even limited machinery needed. Second is the question of an effective demand at prices which would cover the increased cost required to expand aggregate output. Third is the problem of sufficient job opportunities for employment of the rural working force which would be released through the modernization process.

In general, economic conditions in Korea are quite favorable for a spontaneous growth in the modernization of the agricultural sector. However, even though most government administrators recognize that the mechanization process can only occur gradually, care must be taken that rapid changes are not imposed from the top without a very careful evaluation of the benefits that would accrue to the individual producer. The team's preliminary analysis and appraisal of problems and prospects in mechanization during the Third FYP period suggest that possibly too much emphasis is being placed on the introduction and use of relatively large tractors as compared with the smaller power tillers. Moving too rapidly toward the larger units would be a mistake of major proportions and should be guarded against in every practical way.

However, even on a comparatively modest scale, a well-rounded modernization program will require considerable public investment in a number of community-oriented programs. Some of the more important ones which should receive priority include: (1) improvement of roads and communication facilities to major village centers; (2) for selected demonstrational communities, provision of adequate technical advisors and training personnel to train competent, local residents in the skills required to operate all types of mechanized equipment; (3) provision of adequate capital at favorable rates and effectively supervised to encourage farmers to purchase power equipment (primarily the 8-12 horsepower units with suitable attachments), even though the degree of financial risk is relatively high; and (4) establishment and supervision of an effective grading, processing, and marketing program for rice and possibly other major cash crops.

Some Researchable Problem Areas

A lack of time prevented as detailed an analysis and appraisal of problems and prospects in mechanization of Korean agriculture as would have been desirable. Several aspects of the problem are not well understood and need further study before a comprehensive program is initiated. The following questions relate to some of these problem areas.

(Labor Related Questions)

1. How serious is the labor shortage problem? For the spring and fall "turn around" operations (barley to rice and vice versa), what is the labor deficit for selected study areas in terms of completing peak operations in a sufficiently short period to eliminate timeliness as a yield restricting factor? If a measurable deficit is determined, is it of such nature that it can be compensated for by specific operations amenable to mechanization (for example, land preparation--probably yes; transplanting--questionable; cutting and threshing--yes)?
2. What are the employment alternatives of labor saved through mechanization: (a) within the farm unit in terms of more intensive attention to present enterprise, addition of new enterprise, etc.; or (b) off-farm employment within a practical distance?

(Income Related Questions)

1. How does the use of tillers or tractors change the cost structure for major crops, compared with conventional practices?
2. What are the yield effects?
3. Is the increased output marketable at nominal prices, or would any significant degree of mechanization result in a serious surplus problem (depressed prices, storage and holding, etc.) for farmers in the major rice areas?
4. To farmers in predominantly rural areas, how is the "income horizon" changed as a result of owning power tillers, i.e., is it limited primarily to (a) expanding output from his land base (more intensive practices, etc.); (b) hiring out to neighboring farmers at custom rate; or (c) enlarging his farm unit through lease or purchase of additional land?

(Institutional and Policy Related Questions)

1. To what extent does lack of farm and community roads or other facilities restrict modernization of agriculture, especially mechanization?
2. Is availability of credit a serious limitation, and what changes would be necessary to improve the economic feasibility of capital investment in equipment?
3. Would higher prices to farmers, even at substantial government costs, assist materially in changing food grain production from primarily a subsistence to a cash crop enterprise?

Problems of Price Policy

Background

In recent years, mainly during the 1960's, the Korean Government has made purchases and sales of rice designed to reduce sharp seasonal movements in the price, which rises from a low point during the November-December harvest period to a peak that occurs most frequently in July-August of the following year. The objectives of this program are to strengthen prices received by farmers at harvest time and to check the later seasonal price rise for the benefit of urban consumers. When acquisitions of rice from domestic supplies have been insufficient to prevent sharp price increases at the consumer level, government stocks have been augmented by imports.

This program was only partially successful in the earlier years, as the government purchase price (established by the National Assembly) was not always high enough to acquire amounts from farmers sufficiently large for effective stabilization later on. However, during the past two years, the program has been much more successful as a result of increases in the purchase price and willingness to acquire sizable additional stocks through imports. Since about the beginning of 1969, the real price of rice at wholesale has been remarkably steady.

The Stabilization Problem in Rice

The stated goals for rice under the Third FYP go well beyond the earlier program aimed primarily at seasonal price stabilization.

On the production side, these goals can be summarized as (1) self-sufficiency in rice, (2) stimulation of larger marketings for urban consumption, and (3) improvement of the income position

of rice farmers. On the consumption side, the goal is stability of consumer prices throughout the year. The production and consumption goals are closely connected, as adequate production will ensure the supplies needed to achieve price stability at the retail level. Attainment of self-sufficiency would help to increase farm income, reduce the need for foreign exchange to purchase imported rice, and ensure more effective operation of the seasonal price stabilization program. In addition, it is desirable in terms of military considerations.

However, the MAF presentation recognizes that there are certain difficulties in achieving all the foregoing goals, particularly in the short run. Price increases to farmers are subject to the constraint that they shall "not affect the increase of general prices annually." But the MAF notes that this dilemma could be resolved through the use of two-price systems, and recommends that study be made of the "possibility of introducing dual price systems step by step."

It is clear that continuation of present policies affecting the price of rice will not be adequate to achieve the multiple goals of self-sufficiency, higher farm income, and stable, non-inflationary prices.

If government cost were not a significant constraint, all the other goals could be achieved -- given normal growing conditions-- by a program that includes: (1) government purchase of the entire portion of the crop destined for urban consumption, making it the sole owner of the total marketable supply of domestically produced rice; (2) release of stocks back into the market at a price equal to that paid to farmers (also seasonally stabilized) plus a normal wholesale markup to cover necessary costs of processing and transportation; and (3) government absorption of all other costs, principally storage and interest charges.

Using this type of approach, two things stand out: (1) that government costs can become extremely high, and (2) that the magnitude of the cost is largely determined by the degree of price stabilization sought at the consumer and farm levels.

In this connection, it is interesting to note that the level of farm prices needed to achieve self-sufficiency on the output side is not by itself a major determinant of program costs. Rice production in Korea under normal weather conditions appears to have been at or fairly close to self-sufficiency levels during the 1960's. There has been an annual increase of at least 2 percent due to gains in productivity, aided by substantial progress on the input side in terms of such factors as water supply, paddy rearrangement, fertilizer use, application of pesticides, and greater use of machinery. This suggests that assurance of a moderate increase in the real price to farmers during the harvest period may be sufficient to achieve projected output goals.

The fact that complete seasonal price stabilization is likely to be prohibitive in terms of costs should not deter intensive study of alternative plans for government purchase and resale of rice. Acceptance of a lesser degree of stabilization could reduce costs considerably and yet go much further toward achieving the several goals for rice than continuation of the present system.

It should be emphasized that economic and statistical analysis in this field is very difficult. In order to develop an effective program, it is essential to have reliable estimates of the demand and supply elasticities for rice, and to form some idea of how the latter is likely to change over time. ^{1/} This is particularly important, as there is a tendency for the production response to increase as farmers become convinced of the permanence of the price incentive and are more willing to make investments to increase productive efficiency.

A thorough analysis and appraisal of alternate price programs for rice applicable to the Third FYP can hardly be made in less than six months. It is recommended that a team of highly qualified economists, with a good knowledge of statistical methods and the problems of Korean agriculture, be organized and charged with that assignment. This team would be composed of three to five Koreans with adequate statistical support.

The Position of Barley

The demand projections for the grains show the price of rice rising considerably faster than the price of barley. This means that barley becomes cheaper relative to rice, thereby increasing the demand for barley as food and dampening somewhat the demand for rice. Mention is also made of a two price plan for barley which would presumably serve to maintain or increase barley consumption on the one hand and stimulate its production on the other.

This is conceptually a good idea, particularly in view of the fact that a two price system for barley would be much less costly than for rice. However, increasing the demand for barley as food should not be viewed too optimistically. Though barley consumption as food is equal to about 40 to 50 percent of rice

^{1/} A comprehensive study sponsored by USAID/RDD is now in preparation. It covers all aspects of the price problems relating to rice (and barley), employing rigorous economic theory and extensive statistical computations. It should be of material aid in quantifying the consequences of alternative price policies for farm income, consumer welfare, inflation, self-sufficiency, the balance of payments, and government costs.

consumption, the proportion drops to about 20 to 25 percent when only non-farm consumption of the two grains is considered. In terms of value, the ratio is even lower. This does not leave a great deal of room for strengthening the demand for barley relative to rice via the market price mechanism. However, a low consumer price for barley could be important from the welfare point of view if the population shift results in increasingly large numbers of poor people in the cities.

Even though there may be significant limits on the expansion of the consumer demand for barley as food, it is the best second crop to combine with rice, from the agronomic point of view, and potential increases in output are quite large. This leads to the conclusion that greater emphasis should be given to expanding the use of barley for feed. This would contribute to the improvement of farm income and reduce the need for imports of other grains to support the large expansion planned for livestock.

V. EVALUATION OF MARKETING NEEDS

The team's evaluation of marketing (collection, storage, processing, and distribution) in Korea indicated the following:

1. A need for greater general recognition of marketing's crucial role in Korea's future economic development.
2. A need for more comprehensive thinking and planning on the role which the Korean Government should perform in marketing.
3. A need for estimating the flow of products through segments of the system and for considering alternative scales of proposed facilities.
4. A need for further evaluation of particular commodity marketing plans and problems and for considering other alternative actions.

Commendable effort has gone into MAF's plans for marketing, even though crucial input information -- the supply, demand, and price projections -- were only tentative and still under revision. As these are firmed up, many of the marketing plans will have to be re-evaluated and revised.

Marketing's Crucial Role in Korea's Future Development

As Korea rapidly moves from subsistence farming to a commercial urbanized economy, the marketing system plays an increasingly crucial role. In brief, this role is to:

1. Anticipate, promote, and satisfy rapid increases and changes in commercial demand for agricultural products.
2. Provide increased incentives and commercial inputs to stimulate rapid expansion in domestic production to meet demand.
3. Effectively and economically move products from producer to consumer.

Failure of the system to expand and effectively perform the above could have political as well as economic consequences, since the system connects the farmers on one end with the urban consumers on the other, and can easily antagonize both.

Anticipate, Promote, and Satisfy Rapid Increases and Changes in Commercial Demand

Two factors indicate a rapidly increasing commercial demand. The first is the rapid growth in the urban population, expected

to be over 30 percent higher in 1976 than in 1969, compared with a decrease in rural population (Table V-1). By 1976, 58 percent of the population will be urban, compared with 50 percent in 1969.

The second factor is a rapidly increasing per capita income, particularly in urban areas which depend on the marketing system. Projections indicate over a 75 percent increase in urban per capita income by 1976. Higher rural per capita incomes will also be a factor in that, increasingly, rural people will be purchasing from the market economy.

The net result of these factors will be that nearly all of the increases in production will move through the marketing system (Table V-2). Initial projections indicate that total supply of agricultural and fishery products (excluding forest products) will expand by some 3.3 million metric tons (m.t.), between 1969 and 1976, of which 2.8 million m.t., or 85 percent will move through the marketing system into urban-commercial use. Looking at the percentage increases, total urban-commercial use will increase by a projected 39 percent, compared with a 27 percent increase in total supply of agricultural products.

Changes in the make-up of commercial demands will also present challenges to the Korean marketing system. Changes in demand make-up will result from higher per capita incomes, apartmentization (which means less storage space), some likely changes in methods of cooking, and greater mobility of the population (the latter resulting in part from an increase in the number of private automobiles).

Experience of other countries indicates that, with development, demands will increase or can be stimulated in Korea for improved quality of products, more canned and more packaged products, and a greater variety of product selection. With higher incomes, households will likely shop less frequently and in larger quantities.

Some rough projections have been made of the likely (if stimulated sufficiently) increased use of processed products (Table V-3). The use of canned products is projected to triple, compared with a 49-70 percent increase in commercial demand for fruits and vegetables (see Table V-2). Use of fats and oils could increase over four times.

Included in the increases in commercial use are expected exports. Increasing the exports of agricultural products will present some particular challenges. One challenge will be the identification of export opportunities. A second will be an analysis of the types, quality, and form of product that the export market needs. A third challenge will be the gearing up to actually provide that type of product, and a fourth will be sufficient promotion, merchandising, and public relations to obtain and maintain foreign customers.

Table V-1. --Changes in factors affecting future demand for agricultural products

Items	Unit	Urban		Rural		Total		Changes 1969-76 1/	
		1969	1976 1/	1969	1976 1/	1969	1976 1/	Urban: Rural: Total	-- -Percent -- -
Per household income	1000 won	334	562	219	335	280	474	68	53 69
Number of households	1000								
	households	2,869	3,960	2,546	2,534	5,415	6,494	38	-0.5 20
Ratio	Percent	53	61	47	39	100	100		
Total income	Billion won	957	2,226	557	850	1,514	3,076	133	53 103
Ratio	Percent	63	72	37	28	100	100		
Population	Million								
	persons	15.5	20.4	15.6	14.8	31.1	35.2	32	-5 13
Ratio	Percent	50	58	50	42	100	100		
Household size	Persons	5.42	5.15	6.12	5.86	5.76	5.50	-5	-4 -5
Per capita income	1000 won	62	109	36	57	49	87	76	58 78

1/ Preliminary projections subject to revision.

Sources: 1. Per household income data were taken from two reports: MAF, Report on Farm Household Economy Survey and EPB, Report on Urban Household Income and Expenditure Survey, and Projections for preparation of 3rd Five Year Economic Development Plan by both agencies

2. Population data were taken from EPB, Korea Statistical Yearbook 1969 and EPB projections.

3 Data on households were found in the Korea Statistical Yearbook and MAF, Yearbook of Agricultural and Forestry Statistics 1969. Projection for 1976 for rural was furnished by MAF but author projected figure for urban areas.

Table V-2. --Projected increases in total supply and urban-commercial use of agricultural products, 1969-76

Item	: : Increase : in total : supply :	: Increase : in urban- : commercial : use :	: Urban-com- : mercial por- : tion of total : supply change :	: : Change in : urban-com- : mercial use :
	: - - - - -	<u>1,000 m.t.</u>	- - - - -	<u>Percent</u>
Grains	: 1,300	1,094	84	24
Vegetables	: 818	596	73	49
Fruit	: 291	278	96	70
Meat	: 136	120	88	93
Beef	: 41	37	90	124
Pork	: 54	46	85	73
Poultry	: 41	37	90	103
Milk	: 73	68	93	194
Eggs: m.t. (million eggs)	: 95 : (1,789)	85 (1,610)	89	77
Marine products	: 454	445	98	70
Food Oil	: 84	68	81	200
Special crops ^{1/}	: 76	63	83	77
Total	: 3,327	2,817	85	39

^{1/} Includes fibers, oil crops, and medicinal crops.

Table V-3. --Projected changes in the processing
of agricultural products, 1969-76

Products	:	:	:	Increase
	: 1969	: 1976	:	
	: actual	: projected	:	
	: output	: output	:	
	<u>1,000 m.t.</u>			<u>Percent</u>
Canned products	8,597.0	26,298.0	17,701.0	206
Sweet potato starch	39.0	110.0	71.0	182
Glucose	8.0	120.0	112.0	1,400
Flour (1,000 bags)	39,403.0	80,276.0	40,873.0	104
Fats and oils	78.0	423.0	345.0	442
Agar-agar	.5	.9	.4	80
Soy sauce, soybean and red pepper paste	548.0	908.0	360.0	65
Rush and matrush	7.9	15.4	7.5	95

Source: MAF Storage Processing Industry for Farm Products, Third Five Year
Development Plan, draft of May 1970.

An even bigger challenge for the commercial marketing system than promoting export demand will be the promotion and satisfaction of the internal market with Korean-produced agricultural products. As noted earlier, the demands of Korea's consumers will increase and change. The challenge for Korean agri-business is whether or not these demands will be anticipated, will be stimulated, and then satisfied with internally produced, processed, and packaged products. This will require consumer research to identify needs and products desired, and much greater promotion and merchandising efforts. It will also require products of higher and more consistent quality, since consumers will become more discerning.

The ability of Korea's marketing system to take advantage of the expanding commercial use will have several desirable effects. One of these would be reduced under-employment in marketing. A second would be that markets would become more dependable and involve less risk. More dependable markets and larger ones would induce investment and GNP increases.

Provide Increased Incentives and Inputs to Stimulate Production

To meet increasing domestic demand without using foreign exchange, production must be increased rapidly. The marketing system can help do this as follows:

1. It must provide producers with enough information and incentives for appropriate farm production decisions. Specifically, it should indicate to producers what consumers want through the stimulus of expected prices and quality differentials which will compensate the producer for additional costs and efforts of increasing production.
2. The marketing system must provide commercial inputs and information needed to increase the quantity and quality of production. This will be not small task, as the projections in Table V-4 indicate. Most of the required production increases will depend upon commercial inputs because of Korea's rather fixed cultivated area. The projected increase in the use of commercial fertilizer will be over 30 percent. The use of lime should increase over 200 percent. Farm machinery will show tremendous increases in use. These projected changes likely hold for most other farm inputs as well. The marketing system must move these inputs from manufacturer to farmer. Also credit to finance these commercial inputs will need to expand at least in proportion to the inputs.

Table V-4. --Projected increases in commercial inputs to
agriculture

Item	Unit	Quantity in Use		Change 1969-76
		1969	Projected 1976	
				Percent
Commercial fertilizer	1,000 m.t.	1,380	1,860	35
Lime	1,000 m.t.	300	1,000	233
Farm chemicals	1,000 m.t.	17	NA	-
Sprayers (power)	each	12,000	25,000	108
Tractors	each	113	6,000	5200
Tillers (power)	each	9,000	79,000	800
Threshers (power)	each	27,000	87,000	220

Source: MAF projections.

3. The marketing system must be able to handle increased supplies without depressing prices and eliminating incentives to production. In other words, the marketing system must keep the process rolling. It must not only induce the farmer to produce in the first place, but it must then handle his product in such a way that a continued incentive exists for maintaining and further expanding production as market needs require.

Effectively and Economically Move Products from Producer to Consumer

Changes needed. A major challenge to the marketing system will be to expand and improve itself so as to efficiently and economically handle the much greater flows of product, the demands for greater convenience in both product and sale, and the greater concentration of consumption. Meeting this challenge will require various changes in the system which can be predicted from developments in other countries. Retail markets will need to become bigger, handle greater variety, and maintain refrigeration and storage facilities. Purchasing and distribution will need to increase in scale along with the retail markets. Less frequent, larger scale, and hopefully lower cost handling of products should occur. Transactions will need to be fewer and more easily made.

The demand for modern products creates the need for a more modern marketing system. To attempt to meet expanding demands with no increase in scale (volume per marketing unit) but, rather, just an increase in small-scale units would likely make, in the future, for a less efficient and higher cost marketing system.

How to handle small-scale units. The best way to handle small scale is to provide the proper environment and credit necessary for small-scale firms with potential to expand and take advantage of economies of scale as they normally turn up in a developing economy. This will require available credit at reasonable interest, perhaps guidance (extension) help, appropriate laws and regulations, better market information, tax advantages, etc. More will be said about the environment in the next section.

The existence of many middlemen and a fragmented distribution and collection system involving considerable handling of products is usually thought of as a sign of marketing inefficiency. However, one must be careful here, as efficiency is a relative term. A method is inefficient only if a cheaper or more effective method or system is known. This, of course, requires market research to discover or invent a better system. If the existence of many middlemen and small-scale marketing is caused by lack of alternative employment or because of the nature of the farm unit which they serve, then one must not be quick to condemn.

Attempts to quickly force marketing arrangements into the pattern of developed countries may lead to waste. Small-scale middlemen are a case in point. Compulsory elimination of intermediaries would increase the capital and skills required in distribution (which might be used more productively elsewhere) while setting labor free with little or no alternative employment. Also, lack of easy access to intermediaries could further discourage some small-scale out-of-the-way farmers.

Would compulsory reduction of intermediaries reduce costs? The answer is probably not. An intermediary is used only if the price he charges for his service is less than the value his customers place on his service (which would be the value of doing the service for themselves). Otherwise, he would be bypassed by the customer on one end or the other. An exception would be those cases where institutional arrangements (such as a regulation that the intermediary has to be present, as in Korea's livestock markets) prevent adoption of more direct methods. Compulsory reduction of intermediaries implies that the services must be performed at greater cost by one or the other of the parties between whom the intermediaries stand.

Careful analysis must be made before artificially restricting small-scale collection and distribution by licensing, government franchising, etc. Such restrictions may well increase the costs of assembly and distribution and reduce alternatives to producer and consumer. It could narrow markets, reduce specialization, and increase unemployment.

Need for marketing skills. Modernization of marketing will require substantially increased numbers of trained and skilled managers and technicians. When you begin talking about efficient scale of operation, technical operation of sophisticated machinery, product mix management, building product image, advertising copy, international standards of quality, corporate identity, etc., you need a much more qualified and trained individual. This will pertain not only to processing-packaging companies, but also increasingly to wholesalers, retailers, and other middlemen. From where will this needed talent come? Present schools are apparently not turning it out in sufficient numbers. Those that are receiving training are being attracted into heavy industry rather than agri-business. This could become a major bottleneck to marketing modernization.^{1/}

^{1/} The team is indebted for the above valuable insight to Herbert Fuchs, Marketing Management Consultant to AFDC, who has worked closely with many marketing-processing firms and has observed their needs.

The Korean Government's Role in Marketing

The Korean Government's role in marketing should be one of helping the marketing system expand, improve, and function properly. In performing this role, there are six major challenges:

1. Provide for expansion and improvement of physical infrastructure needed to efficiently handle rapidly increasing flows of product.
2. Establish an environment conducive to marketing improvement and modernization.
3. Provide capital or incentives for capital investment in marketing.
4. Organize, finance, and carry out much needed marketing research.
5. Provide for much more training in marketing and agribusiness.
6. Organize and provide broad-scale guidance for marketing firms.

Of the above, most MAF planning to date has concentrated on infrastructure, particularly storage and processing facilities as related to price stabilization goals. More consideration and planning needs to take place on other aspects of infrastructure, particularly rural roads and central markets, and on all of the other items above.

Improvement and modernization of marketing requires planning and coordinated development along various lines if bottlenecks are to be eliminated or avoided. Marketing in Korea does need more attention and understanding than it has been getting. This will require more personnel in MAF working on marketing research and evaluation, market information, and marketing program planning and administration.

Challenge 1: Provide for Expansion and Improvement of Physical Infrastructure

Transportation. Planning on transportation (road system, railroads, and transport vehicles) is being done mainly in the Ministry of Transportation. Time did not permit the team to evaluate the plans being made. Since these plans will have a crucial effect on the transformation of agriculture, they should be evaluated carefully by MAF to see that they reflect agriculture's needs.

Recent improvements in the inter-provincial road system are commendable and will have a major effect on transportation costs and patterns. However, increased attention must now be directed toward the rural roads: building passable truck roads to most villages; widening roads to permit trucks to pass; and road improvements to permit speedier, smoother, and year around travel.^{1/}

Roads, more than any other factor, will help transform agriculture into commercial production. Several studies have been made which indicate that improved road access substantially reduces transportation costs and brings about changes in the production pattern in the village area.^{2/} Better rural roads will mean not only increased economic opportunities for farmers but also better markets, more competition, more contacts with development forces, and lower-priced inputs.

Railway transportation is apparently used less than roads as a means of transporting agricultural goods. Reasons given are the limited capacity of the railroads, especially during harvest periods, and the time involved in getting products to market. In the future, railroads may even be used less proportionately, especially with the opening of the new Seoul-Pusan super highway. However, many bulky agricultural items (such as grains) and agricultural inputs (fertilizer, lime, and machinery) which do not require rapid handling will still likely find railroads the most efficient means of movement.

Getting agricultural goods to markets and inputs to farmers requires not only roads and rails, but also transport vehicles. The 40 percent increase in movement of product through the marketing system indicates roughly a similar increase in capacity of transport vehicles between now and 1976. Both larger, more efficient vehicles will be needed and also insulated refrigerated trucks and railroad cars for perishable agricultural products.

^{1/} Suh, Joong Il. "Present Status and Problems of Agricultural Marketing in Korea." ORD, Institute of Agricultural Economics, August 1969.

^{2/} Lee, Kyung Won. "Some Effects of Roads on Agricultural Production and Rural Life, A Case Study." Dept. of Agric. Econ., Seoul National University, May 1969. Park, Jin Hwan. "A Study of Effects of Road Development Between Seoul and Kangnung on Agricultural Resource Uses." College of Agriculture, Seoul National University, 1969.

Central markets. Providing central markets will largely continue to be a governmental, either federal or local, function. There should be concern about what expansion and changes in central markets will be needed to handle the 40 percent increase in movement to the system, including a 50 to 70 percent increase in movement of fruits and vegetables and over a 100 percent increase in cattle and beef, all heavy users of central markets. Increased movement of this nature will require larger scale, more efficient markets. Crucial will be the transportation access, both incoming and outgoing, of these markets. Very limited observation by the team indicated tremendous congestion in and around markets, hampering transportation. If changes are not made, small scale, poor access, and slow handling will increasingly lead in the future to inefficient movement of products through central markets and the tendency to use other means, even though it might mean a lower price to producers.

Storage and processing facilities. Some storage and processing facilities, especially for grains, may require government ownership and operation. However, most other storage and processing facilities should be able to be operated profitably by private enterprise. Incentives must be allowed to exist and, in some cases, capital provided, as will be discussed later. In any case, there will have to be a sizable increase in the total capacity of storage, processing, and packaging facilities to smooth out the flow of products from farms to consumers.

Challenge 2: Establish an Environment Conducive to Marketing Improvement and Modernization

A substantial challenge to the Korean Government will be to provide an environment in which private enterprise in the marketing system will expand in scale, improve in efficiency, and modernize. This environment must include these crucial factors:

1. Incentives (opportunities and probabilities) for economic gain on investment and managerial effort in marketing.
2. Rules of the game (regulations and enforcement) which keep competitive activities within bounds of fair play and public interest.
3. Adequate market information to facilitate price setting and marketing decision making.

Incentives. In cases where demands are expanding and changing, prices of particular products will rapidly increase and profit margins may be high. Both of these are needed as incentives to pull capital, managerial know-how, and labor into new lines of production and marketing activity. Eventually, supply of the demanded goods and connected services will expand

sufficiently and competition will increase to lower prices and margins. However, for the government to become an alarmist at the onset and attempt to hold down prices and margins will remove incentives for shifts in resources and only perpetuate unsatisfied demand pressures.

Rules of the game. Koreans have traditionally been suspicious of all merchants and looked down on their activity. Some of this is warranted, mainly because rules of the game and adequate enforcement have been lacking. If one competitor takes unfair advantage, the others are all placed at a disadvantage unless they follow suit. It will be crucial for the Korean Government to recognize the importance of adequately setting and enforcing rules of the game and to not let traditional attitudes move government policy and programs toward either removing the competition or eliminating incentives to play. This tendency does exist and must be recognized and combatted.

Adequate regulations and enforcement. Sanitation and consumer protection are essential in food marketing and can result in catastrophes if found lacking. Unfortunately, too often strong measures are not undertaken until many people die and the issues become political. This has occurred in the United States and could well occur in Korea. The team has not had time to look into the adequacy of the regulations and enforcements regarding sanitation, food additives, processing standards, etc. However, the observation of several articles in the newspapers suggests that all may not be well here. If problems exist now, what will happen when 40 to 100 percent more products are moving through the marketing system? Probably there is a jurisdictional problem among the various ministries, but agriculture's stake in this area is great.

Government inspection and grading. Inspection and grading of agricultural products is a second crucial area for government action. This activity, if done meaningfully and early in the marketing process, can facilitate and speed movement through the whole system. Plans by the National Agricultural Products Inspection Station to expand and improve inspection and grading of agricultural products are justified and needed. These plans should be reviewed carefully after finalization of the supply and demand projections and estimation of the flows of product through the marketing system to determine if they are adequate and if perhaps even further strengthening should be undertaken. Care must be taken to make sure that grades set are meaningful and objective in order to obtain the confidence of users. Further, inspection and grading must be so performed as to not delay product movement or create undue burdens on producers or middlemen. The government might well consider subsidizing the entire cost of inspection and grading; it well could have multiple returns to both consumers and farmers.

Standardization of weights and measures. Movement to a weight system and a standardization of weights and measures will benefit the marketing of most agricultural products. For some, of course, it is not practical. A weight system is less subject to discrepancies in measurement of product than is the volume system because it is easier and faster to check and enforce. Standardization of scales and enforcement measures will be needed and will require funds, but here again the benefits will be high from improved marketing and reduced marketing costs. Before regulations are set or changed for bag weights, sizes, etc., a careful study should be made.

Central market regulations. These are needed to facilitate handling the products and making transactions. There needs to be planning and funding for such regulations. From comments picked up from others and from research findings, there seems to be considerable incentive in many cases to avoid moving products through the central markets. This seems to be because taxes and charges, and perhaps delays, are such that there is a definite economic advantage to avoiding the market. This suggests that something must be wrong. The central market should facilitate movement of product, exchange, and price setting, and result in economic benefits to the users. This might be an area for priority research to really understand what is happening.

Associated with the central markets are the auctioneers. Auctioning is an efficient method of setting price, but the auctioneer can greatly influence the results. Auctioneers thus require not only training but regulation and scrutiny of their activities.

Regulations of business and practices. Included here are such things as monopoly, collusive price setting, and misrepresentation. Much of the regulation is probably outside of the jurisdiction of the Ministry of Agriculture but, still, it is of crucial importance to the marketing of products and MAF should make sure it is adequate.

Adequate marketing information. Such information facilitates price setting and marketing decision making. Types of information needed include flows of product to the system, stocks on hand, latest prices in different areas for specific grades of product, and supply-demand-price outlook information. Informed buyers and sellers will reach agreement on a price nearer the true supply and demand situation. If prices are higher in one part of the country or in one central market than another, then products can flow into these markets if this information is known. Average price in a given area frequently does not mean much unless it is for a specific grade. Another area may have lower grade products and thus not be able to command the same price. Plans should cover future needs and requirements for market information to smooth and facilitate the greater flow of product.

Challenge 3: Provide Capital or Incentives for Capital Investment in Marketing

Expansion and modernization of a marketing system cannot be made, of course, without capital; capital to collect, grade, process, store, and distribute the vast increases in goods. This will mean capital development programs with precedent conditions spelled out in terms of specific marketing regulations and procedure changes which will make capital investment efficient and less risky.

Apparently private merchants and middlemen receive little consideration from commercial banks and must depend on their own resources or the curb money market with its ultrahigh interest rates (4-5 percent per month compared to 2 percent bank rates). A substantial increase in capital at reasonable interest rates will be needed by merchants and middlemen to increase scale and modernize operations, thus reducing costs and margins to the benefit of both producers and consumers.

When capital needs are such that private sources are insufficient, unavailable, or too costly, institutional arrangements must be developed to make flows of capital available for the required projects. Alternative means of doing this include the following:

1. Direct government investment.
2. Government loans at subsidized interest rates.
3. Financial regulations in which banks are directed to loan a certain proportion of their funds to agri-business firms or to deposit a like amount as an extra reserve requirement. (Often banks need to be pushed into such lending; then they find it an attractive activity.)
4. Central Bank underwriting of private bank lending to agriculture by rediscounting such loans. (This has worked well in Mexico and Brazil; reserve requirements have usually been reduced for those banks that increase lending to the agri-business sector.)
5. A loan insurance program in which the government guarantees repayment of bank loans directed to approved marketing firms.

Direct government investment will be needed in some cases. However, it should not be the only alternative considered. Perhaps the other alternatives above, along with certain marketing regulations which reduce investment risk, may stimulate inflows of private investment and initiative at less cost to the government, freeing public funds for other uses.

Challenge 4: Organize, Finance, and Carry Out Much Needed Marketing Research

One must understand how marketing works in order to improve it. Korea has just started agricultural marketing research. The lack of research makes the preparation and evaluation of marketing plans difficult. Further research activity and emphasis cannot be put off or the problems and inefficiencies will get out of hand.

Research must be of two types: problem oriented and basic. The former has to do with analysis of particular problem situations and possible remedies. The latter delves more into how the system functions at different levels, what crucial factors affect it, what the relationships are within marketing and with other sectors of the political economy, and what the broad evolving issues and problems are. Some suggested topics for marketing research are discussed in a later section.

Research will largely be a direct government activity, or a government-financed activity. Within government, research among differing ministries and agencies should be coordinated to avoid unnecessary duplication. Within the Ministry of Agriculture, marketing research should be concentrated in an economic research bureau, as opposed to an administrative or production bureau. This is necessary to preserve needed objectivity and to assure that basic research does not get pushed aside for immediate administrative matters.

Market research performed by nongovernmental institutions, such as universities, will be essential. Frequently, the university research environment is more conducive to deeper and more critical analysis. Also market research in the university is a teaching-training activity preparing research technicians for government and industry roles. University research in agricultural marketing will require increased government funding.

Challenge 5: Provide for More Training in Marketing

As noted previously, expansion and modernization of marketing will require many more individuals trained in marketing, management, and economics. The government must take a role in providing for such training and for incentives for young men to receive the training. This may require more availability of funds to universities for instruction and training. It may also require incentives in terms of financial support or perhaps slightly lower entrance qualifications to induce young men, particularly young men from farming areas, to enter into this type of training.

A successful United States program has been a two-year course in agricultural business conducted at universities which accept students not fully qualified for regular university entrance. Also successful have been trade schools in which students have received specialized training in particular marketing and business skills. In most cases, students have gone out of these specialized agri-business or marketing courses to perform vital functions in the agri-business development. Some have passed university entrance examinations and gone on to complete university training. Similar programs might well be considered for Korea to meet the future needs for these types of people.

Challenge 6: Organize and Provide Broad-Scale Guidance for Marketing Firms

Providing marketing consultation to marketing firms has already begun to a small extent through the activities of the Agricultural and Fisheries Development Corporation (AFDC). So far, however, these have been firms with deep problems in which AFDC has had to enter with both financial and management resources. There is a need for guidance work on a much broader basis.

A vital United States program has been the placing of guidance (extension) people in the various states to work exclusively on marketing. This involves taking market research findings, making contacts with the whole range of marketing firms, from small firms to retail supermarkets, and then offering advice ranging from purchasing, firm management, and training through advertising and sale management. This has been done free of charge and there have been waiting lists of firms seeking help. This program has played a vital role in modernizing U. S. marketing. Korea should seriously consider this as a needed program in the Third FYP. A good possibility would be to provide sufficient funding for AFDC to broaden its program of consultation and guidance to marketing firms in general.

Determination of Marketing Flows

A crucial problem in planning and evaluating marketing needs is determining the magnitude of flows through the system and through segments or sectors of the system. This information is needed on a monthly as well as yearly basis to properly assess pricing plans and physical infrastructure requirements. An even monthly flow of product through the marketing system is ideal, because this permits us to build the scale of facilities needed to handle the flow and operate these facilities at near capacity the year round. However, the flow of many products bunches up at harvest time. This requires programming the flows of different products and adding up the flows to determine total marketing needs.

Many facilities have multiple uses, the processing and handling of several different raw products. This is also true for storage facilities, transportation, and central marketing facilities. Thus, by programming the flows of each product for each month of the year and then adding up these flows, we can determine the full monthly requirements for selected facilities.

More of this type of work needs to be done by MAF to produce an internally consistent and efficient marketing plan. This is most crucial for planning of physical infrastructure, but also permits better planning of marketing services such as inspection and grading. Proper evaluation of some of the marketing plans was difficult because this had not been done.

Basic Data Needed for Planning Flows

1. Yearly and monthly marketing rates. These are the rates at which production moves into the marketing system. This information appears adequate for grains but somewhat lacking for most other crops. Estimates may need to be made by surveying all available data and perhaps a sample of marketing firms.
2. Seasonal price fluctuations. These refer to the fluctuation between the low and high price months of the year, rather than between these months and the yearly average price. This is essential since storage is usually undertaken during the low-priced month and held until the months of high price.
3. Monthly consumption rates. These are the proportion of product moving into consumption during each month of the year.
4. Costs of production of various sized farms in various areas.
5. Costs of storage. This information should include both the cost of storage in existing facilities and the cost of storage in new facilities which might be built. It is essential to consider the cost in both cases, since storage in existing facilities may take place even if fixed costs are not met, while both fixed and variable costs plus return on capital and management would be needed as incentive for investment in new storage facilities.
6. Relationships between seasonal prices and the monthly marketing and consumption rates.

Projecting Flows

1. Specify assumptions or targets regarding extent of price stabilization and price support.
2. Project the yearly quantity of production marketed. This can be done in several ways.
 - a. Project urban-commercial consumption directly, and subtract out likely imports.
 - b. Project rural use and subtract from total production.
 - c. Project yearly marketing rate and multiply this times production (the rate will nearly always increase because of urbanization and rising urban incomes).
3. Project monthly marketing rate. This can be done by adjusting recent marketing rates for the expected effect of the stabilization target on farmers' decisions as to when to market.
4. Project the monthly consumption rate. Here again historic monthly rates would be adjusted for expected influence of the specific stabilization target or pricing assumptions.
5. Project the monthly consumption quantity by multiplying yearly marketed quantity by the monthly consumption rate.

Projecting Storage and Other Marketing Needs

1. Calculate the indicated monthly storage needs by accumulating the difference between the monthly commercialized quantity and the consumed quantity. An example of this is shown in Table V-5.
2. Project the quantity of private commercial storage. This would be done considering the cost of such storage in relation to the stabilization target. If the stabilization target is less than the cost of new storage facilities, then only existing storage facilities would be used. If the stabilization target is even lower than the cost of using existing storage facilities, then little or no commercial storage would likely take place.
3. Determine the required government storage by subtracting commercial storage from total storage requirements (see Table V-6).

Table V-5. --Example: projection of required rice storage capacity
under assumption of nearly complete price stabilization
1975-76

Month	Marketing		Urban-commercial consumption		Required storage
	Rate	Quantity	Rate	Quantity	
	Percent	1,000 m.t.	Percent	-----1,000 m.t.-----	
Carry in					300 ^{1/}
1975 October	10	273	8	218	355
November	25	684	9	246	793
December	40	1,094	9	246	1,641
1976 January	6	164	9	246	1,559
February	4	109	9	246	1,422
March	4	109	8	218	1,313
April	3	82	8	218	1,177
May	3	82	8	218	1,041
June	2	54	8	218	877
July	1	27	8	218	686
August	1	27	8	218	495
September	1	27	8	218	304
Total	100	2,737 ^{2/}	100	2,737	

^{1/} Reserve stocks.

^{2/} This represents a yearly commercialization of 61 percent of a projected production of 4,487,000 m.t.

Table V-6. --Example: allocation of required storage among
commercial and government accounts, rice

Month of crop year	:	Total required storage	:	Estimated com- mercial storage	:	Residual to be met by government storage
Carry in:	:					
	:					
November	:					
	:					
December	:					
	:					
January	:					
	:					
February	:					
	:					
March	:					
	:					
April	:					
	:					
May	:					
	:					
June	:					
	:					
July	:					
	:					
August	:					
	:					
September	:					
	:					

Note: This is an example of the appropriate
format.

4. Evaluate the cost to the government of actually undertaking the indicated storage. This should involve evaluation of costs under several alternatives: (1) storage in government-owned facilities, (2) storage in commercial facilities built with subsidized interest rate loans, (3) storage in commercial facilities with government paying an adequate rental.
5. If costs and benefits to the stabilization program are out of line with funds available or political acceptance, then return to step one of projecting flows and rework at a lower level of stabilization.
6. If storage facilities are suitable for more than one crop, an aggregation should be made by months of storage needs for each crop (see Table V-7 as an example).
7. After determining aggregate needs by months, allocation should be made among the various types of storage available (Table V-7). A procedure similar to that above for storage can be worked out for various other marketing needs, such as transport, central markets, and inspection and grading.

Consideration of Economies of Scale

There seems to have been little consideration given to economies of scale of the various marketing facilities proposed in the Third FYP. Analysis of different alternatives to those proposed is not shown. It may be that fewer and larger scale facilities than those in the plan would reduce total expenditure by the government and reduce operating costs of the facilities after construction.

The new Seoul-Pusan super highway will reduce transportation costs and time. Economies of scale in many processing plants are frequently such that they can offset a considerable amount of additional transportation expense to collect and transport products from other areas to the larger plant. Thus, location of the plant also enters into the consideration. A decision on location and scale should be made on the basis of total cost per unit of placing a product into the hands of the final consumer under the various alternatives.

Evaluation of Grain Marketing

Price Stabilization - Storage

Problem. High seasonal variation exists in grain prices, particularly rice (average 37 percent between low and high months for rice and 24 percent for barley between 1964 and 1969).

Table V-7. --Example: aggregation of grain storage requirements and allocation of capacity

Month	Required storage of:				Storage allocation			
	Rice	Barley	Wheat	Other grains	Total	Low Temp.	Insulated	Bulk silo
Carry in:								
October								
November								
December								
January								
February								
March								
April								
May								
June								
July								
August								
September								

Note: This is an example of the appropriate format.

Causes.

1. High commercialization after harvest because of the farmers' need for funds and their risk of high loss with farm-stored grain (estimated annual 13 percent, mostly to rodents but some weevil).
2. High grain losses in commercial storage - about 10 percent over 8 months because of:
 - a. High moisture content of grain (around 16 percent moisture because of no artificial drying) and warm humid weather which, together, cause high weevil damage.
 - b. Some loss due to rodents.
3. High interest rate or opportunity cost of capital investment in stored grain and facilities (possibly 3 to 5 percent per month, which would bring total storage cost to around 20 to 25 percent minimum).

Planned Action in Third FYP (as of July 31, 1970). Stabilize seasonal price variation - limits not set yet, but very possibly below 15 percent through:

1. Government purchase during low price months, storage, and sale during high price months.
2. Construction of 45 low temperature warehouses for polished rice storage.

Capacity of each = 10,000 m.t. polished rice
Total capacity = 450,000 m.t. polished rice
Cost per m.t. of capacity = 10,637 won
Total cost = 4,787 million won

Location: Taejon, near railroad and highway interchange

Ownership: Presumably Korean Government

Management: Not specified

3. Construction of 20 country elevators with milling and grain drying equipment for storage of brown rice.

Capacity of each = 2,000 m.t. brown rice

Total capacity = 40,000 m.t. (equivalent of 37,200 m.t. polished rice)

Total cost = 1,913 million won

Foreign exchange = 932 million won for equipment purchase

Cost per m.t. of polished rice equivalent of stored brown rice = 51,400 won

Location: At cooperative paddy farming areas which grow IR 667

Ownership: Presumably Korean Government

Management: Not specified

4. Continued use of private warehouses for paddy rice and barley, using class A warehouses to the extent available.

Note: See Table V-8. -- Present and Projected Grain Storage Capacity.

Comments and recommendations.

1. Analysis and quantification should be made of the effects of planned stabilization levels on the monthly rates of marketing and consumption to more accurately calculate monthly purchase and storage requirements. This is needed because under greater stabilization:
 - a. Those farmers (usually larger ones) who still hold on to rice until later in the season, anticipating that the rise in price will more than offset storage cost, interest, and grain loss, will have less or no incentive to do so.
 - b. Consumers will purchase proportionately less rice in fall months and proportionately more rice in summer months.
2. The effect of different levels of price stabilization on quantity of private commercial storage should be estimated and incorporated into planning. Sizable reductions in seasonal price variation will quickly reduce or remove any incentive for private commercial storage unless sources

Table V-8. --Present (1970) and planned (1976) capacity of grain storage facilities available for government grain

Type	: Available : January 1, : 1970	: Planned : construction : 1970-72	: Construc- : tion : 1972-76	: Avail- : able : 1976
	: - - - - - 1,000 m.t. - - - - -			
Grain management special account warehouses: .	:	:	:	:
Low temperature (refrigerated)	: 48	: -	: 450	: 498
Insulated	: 15	: 60	: -	: 75
Sub-total	: 63	: 60	: 450	: 573
Bulk silos	: 70	: 400	: 40	: 510
Regular warehouses: 1/	:	:	:	:
Grade A	: 141	:	:	: 141
B	: 384	:	:	: 384
C	: 483	:	:	: 483
Sub-total	: 1,008	:	:	: 1,008
Total storage	: 1,141	: 460	: 490	: 2,091
Total excluding grades B&C	: 274	: 460	: 490	: 1,224

1/ Ownership of available regular warehouse capacity is as follows
(in 1,000 m.t.):

NACF 510

Korea Express Co. 243

Private 255

Total 1,008

Source: MAF, Food Adm. Bureau

of low interest capital are made available and reduction in storage loss occurs. Thus the government could quickly become the only purchaser of grain for storage.

3. The proposed expansion in storage capacity should be reevaluated after firming up stabilization plans and examining the results of recommendations 1 and 2 above (see Table V-5 for a trial projection of required rice storage in 1976 under assumption of nearly complete price stabilization). Government storage needs for each month of the year for each grain should be aggregated and then programmed among the available or contemplated types of storage (Table V-7). This will also help determine requirements for particular types of storage, i.e., low temperature or drying for preservation through warm weather months.
4. The unit cost of the low temperature storage, as estimated in the draft plan, is surprisingly lower than the cost estimate of bulk storage in country elevators. The Kansas State/USAID study suggested just the opposite. The costs and benefits of the two types should be reexamined carefully, including related grain loss and consumer acceptance. If the difference turns out as initially estimated, why not concentrate investment in the lowest cost of storage?
5. Alternative scales of the respective types of storage should be examined to see if total costs can be reduced further by constructing fewer but larger warehouses or elevators. As planned, the country elevator would only be handling a small proportion of the rice available in a grain area. If government purchases are going to be much greater than this, perhaps a larger structure would be more efficient.
6. Are there other storage alternatives which should be considered? For example, Korea produces the types of steel required, and could likely get the stamping equipment necessary through a licensing arrangement, to make quite acceptable steel silos. These would have the advantage over the proposed country elevator cement-type structures in that they could be moved as conditions change. These steel structures would be used for the storage of grain which would be moved out before the hot summer months. There might also be some commercial demand for this type of storage facility.

7. Are there alternative means of satisfying storage requirements without so much direct government investment? In the United States, for example, much of the CCC storage is contracted out to commercial firms. Should this possibility be considered? Also, is there a way in which the farmer himself could benefit by participating in the storage program? One possibility would be a program in which the farmer would either sell his rice to the government after harvest or receive a loan based on government price and then receive from the government a fee for holding the grain on the farm until the government calls it in. Adjustments in value for grade, etc., could be worked out at the time of turnover of the rice by the farmer to the government. Such a program might require some guidance work with farmers for improvement of farm storage, but the farmers would be receiving an additional source of income, at no extra cost to the government. A question for research would be the amount of rice which could be stored easily and safely on the farm without much investment in special facilities.
8. No mention is made in the plan about inspection and grading of storage facilities, or of improving grain storage management. These would certainly pay dividends in prevention of storage losses and deterioration. Also, there is no mention of any budget for costs of insect and rat control, etc. Differential rates paid for commercial storage should be large enough to provide incentive for storage improvement. Also, classification should consider rodent entry and insect infestation (see Kansas State/USAID study for more detail on these points).

Erratic Price Variation

Problem and cause. Erratic variations occur in wholesale and retail prices largely because merchants keep only a one to three day supply on hand on the average. ^{1/} Thus any disruption in movement of grain from rural to urban areas due to rain or snow has immediate effect on price. Ill effects are greatest on low income people who must buy grain daily or several times a week.

Planned action. None specified.

^{1/} Shim, Young Kun, "Marketing of Rice and Other Grains in Suwon," report of a field survey, 1965-67, Dept. of Agr'l Economics, Seoul National University, 1968.

Comments. There is no apparent analysis of just how serious this is, and whether it is decreasing with improved transportation and communication. Immediate solution would be for some government storage, which could be released as necessary, in or near consumption centers. Presence of stocks might have a psychological effect too, toning down variation even without any release.

Government Sale of Rice

Problem. Market price of rice at retail is frequently above government selling price plus allowed margin. Thus a strong incentive exists for wholesalers and retailers to sell government rice, in one way or another, at market price. The government in turn has cut out wholesalers and sells rice directly to licensed retailers who are heavily policed. Also some distribution and sale is made to government employees.

Causes. Principal cause is lack of sufficient government stockpiles to strongly influence market price. Also government rice has been of lower quality, less polished, or of less preferred type.

Planned action. No new plans have been made, except the following:

Package 25 percent of market control rice in paper bags (20 kg) for release in metropolitan areas.

Coverage: Beginning with Seoul, Pusan, and Taegu in 1972 and extending to 10 cities by 1976.

Government cost: 85.5 million won for paper bags.

Comments and recommendations.

1. With sufficient rice to back up the stabilization program, the government should distribute through regular channels (wholesalers to retailers) and not attempt to directly control prices or margins. If margins or prices get out of line, the government increases flow into the system until the price pressures decline. This will save many administration headaches.
2. The bagging project sounds like a good way to introduce a method of sale which will eventually need to be the general practice. However, government should allow retail price of bagged grain to at least cover additional costs of bagging.

Volume Measurement - Quantity Margins

Problems.

1. Farmer usually delivers 1-3 percent more grain than he is paid for.
2. Consumer may be receiving less grain than he pays for.
3. Volume of grain is frequently remeasured in marketing process, adding to handling costs.

Causes ,

1. Volume measurement is easy to defraud.
2. Taking quantity margins permits hiding of margin and likely taking some extra margin over what would otherwise exist.
3. Straw bags do not consistently hold the same volume, and they are easy to open.

Planned action.

1. Change completely from volume to a weight system of measurement by 1976 by:
 - a. revising measurement law or separate legislation.
 - b. guidance and promotion.
 - c. control measures (not specified).

Cost to government: 10 million won/year, mostly for guidance and promotional effort.

Private cost: 362 million won for purchase of scales.
2. Standardize weight of grain in straw bags to 50 kg with some 20 kg cotton bags for certain items.

Coverage: Government management grain in 1972-73 and free market grain starting in 1974 if the 1972-73 program is effective.

Legislation: Revise Agriculture Products Standards Regulation.

Revise Agriculture Products Inspection Law.

Comments and recommendations.

1. Control measures will be crucial. These should include:
 - a. periodic inspection of scales by official inspector.
 - b. penalties for faulty weighing.
2. Determine who will do inspection and enforcement, federal or provincial.
3. Estimate cost of control and include in Third FYP.
4. Continue using straw bags. However, will the introduction of IR-667 in 1972 and the resultant lower quantity and shorter length of straw affect the construction and supply of straw bags?
5. The proposed standardization of the weight of bagged grain at 20 or 50 kilograms would certainly be a simplification over the present multiple weights system, but it would require that the standard straw bags be filled to different levels of fullness. Has any research been done on the practicalities of making this change? Would it result in considerable confusion during the introduction period; that is, if government uses the standardized system and others do not? There may be some good but not readily discernible reasons for the current system of using various weights of bags. Some research and analysis here might avoid considerable problems later.

Uncertain Quality

Problems.

1. Quality of farmers' grain is frequently downgraded by buyers.
2. Farmers are suspicious of official grading and inspection.
3. Quality is apparently appraised at each transaction, causing much unpacking and repacking.
4. Consumers prefer good quality rice, but find it hard to judge the quality.

Causes.

1. Buyers are in a better bargaining position than farmers.

2. Free market rice is not officially inspected and graded. Thus, no grade goes with rice through the market system.
3. Official inspection procedures need improvement.

Planned action,

1. Expand grading program (gradually) to include all free market rice and barley by 1976.
2. Improve inspection reliability by use of new equipment and training of inspectors.
3. Improve convenience to farmer by increasing inspection stations, inspectors, and mobility of inspectors (by use of motorcycles and jeeps).
4. Review inspection standards for improvement.
5. Total cost (including fruit plus vegetables) = 757 million won.

Comments and recommendations,

1. Planned action appears completely warranted and should have priority.
2. Implementation of the service between farmer and buyer will be easy if the government is the major buyer, but difficult if the present system of assemblers continues as is. In the latter case, inspection would have to take place at major collecting or shipping points and thus not be of direct benefit to the farmer. From the standpoint of facilitating transactions, the earlier in the marketing process the inspection occurs, the better.

High Marketing Costs - Margins

Problem. Price margins between farmer and consumer average 8-14 percent with higher margins on private channel rice than on cooperative channel. When quantity margins of, say, 3 percent at producer level and 1 percent at retail level and a quality margin of 2-3 percent at producer level are added, the total private channel margin reaches about 20 percent.

Causes.

1. Small-scale marketing throughout the system, from producer through consumer.

2. Numerous transactions, rehandling, and frequent remeasurement and quality determination.

Planned action,

1. Change to weight system of measurement, standardization of bag weight, and require official inspection and grading.
2. No plans regarding scale of marketing firms.

Comments and recommendations,

1. Weight measurement, standard bag weights, and expanded inspection and grading will definitely help reduce costs and speed transactions.
2. Enlarging scale of marketing will be a difficult task. The recommendations here are the same as those in a previous section.

Other Plans

1. Expand flour milling capacity so as to remain within safe operating limits.

Demand in 1976 = 1,680,000 m.t.(wheat equiv.)

Present safe capacity = 1,366,000 m.t.(wheat equiv.)

Needed expansion = 314,000 m.t.(wheat equiv.)

Cost: 3,064,400 won

Note: Without expansion, mills would have to operate in 1976 at nearly 100 percent of maximum (24 hours?) capacity.

2. No expansion needed in rice and barley milling since facilities will operate at below 50 percent capacity even in 1976.
3. Move toward bulk transport system to facilitate grain transportation and reduce cost:

Coverage: 2 systems at seaports (bulk handling from ship to storage or mill).

20 systems at country elevators (bulk handling from farm to elevator).

Cost: At seaports, 64 million won (2x32 million won),

At elevators, 600 million won (20x30 million won).

Evaluation of Milk Marketing

Pricing - Price Stabilization

Situation. Variation in producer price or prices of bottled milk and milk products to consumers has not been a problem in Korea. Producer prices in recent years have only increased, moving steadily, from 27 ₩/kg in 1964 up to 55 ₩/kg in 1970. Production has been increasing so rapidly that no seasonality of production and prices has developed.

Prices of milk at the producer level and of bottled milk and processed milk products are very high compared with world prices. There appears to be no problem with incentives for increased production in the future. Production limitations have to do with number of cows and solving technical production problems (see earlier chapter).

Clearly, many more dairy products would be consumed at lower consumer prices with improvements in distribution methods and product quality.

Raw milk is purchased on a single price system, irrespective of quality above certain minimums and of end usage.

Plans.

1. No formal plans have been made for changing the milk pricing system.
2. Milk prices and purchases from producers would be stabilized by government purchases of processed milk products ranging from 13,000 m.t. in 1972 up to nearly 24,000 m.t. in 1976. Annual cost would range from 131 million won up to 326 million won in 1976, supposedly for storage and administration, since products would be sold.

Comments and recommendations.

1. A two-price policy on producer milk should be seriously considered. In this, the price of milk for bottling would be increased while that for processed products would be lowered. This would serve two purposes:
 - a. Provide incentives for farmers to produce the quality of milk desirable for high quality bottled milk.

- b. Permit the prices of processed milk products to be lowered as a stimulant to consumption. With the present lack of refrigeration facilities both in distribution and in homes, this would appear the best means of improving nutrition.
2. We question the need or priority for the proposed stabilization plan. Developed countries have stabilization plans because of seasonality of production and stable or declining demand. Neither appears to be a prospective serious problem in Korea for the period of the Third FYP. Hopefully, for sake of nutrition, consumer prices of milk products will decrease as production expands and plants become more efficient. Plants themselves should be able to have sufficient working stocks or storage to handle short-run fluctuations in supply and demand.

Expansion of Milk Bottling and Processing

Problem. Demand projections indicate a need for expanding capacity of milk bottling plants by 16,000 m.t. and milk processing plants by 35,000 m.t. during the Third FYP.

Plans.

1. Construct 16 fluid milk plants.

Capacity of each: 1,000 m.t./year

Total capacity: 16,000 m.t./year

Finance:	<u>1 Million Won</u>	<u>Percent</u>
Government investment	235.2	60
Private investment	<u>156.8</u>	<u>40</u>
Total	392.0	100

Foreign exchange: \$817,000 (235.2 million won at 288 ₩/\$)

2. Construct five milk processing plants.

Capacity of each: 7,000 m.t./year

Total capacity: 35,000 m.t./year

Finance:	<u>1 Million Won</u>	<u>Percent</u>
Loan	516.5	50
Private investment	<u>516.5</u>	<u>50</u>
Total	1,033.0	100

Foreign exchange: \$1,735,000 (500 million won at
288 ₩/\$)

Comments and recommendations

1. Consideration should be given to possible savings from enlarging scale and reducing number of proposed plants. Economies of scale are significant, especially in plants producing dry milk and condensed milk. With the new Seoul-Pusan Highway, the cost savings per unit may more than offset transportation cost of collecting milk, even from large distances away.
2. The report by the Japanese survey team on dairy development in Korea suggested a plant capacity of 30,000 m.t. was the efficient minimum.^{1/} If so, construction of one milk processing plant would nearly fulfill the projected need for additional capacity during the Third FYP. However, construction of such a plant in, say, 1972, would mean it would operate several years at somewhat less than full capacity, which would mean higher costs. Thus the alternatives need careful study.
3. Most existing milk processing plants have small capacity. Perhaps these can be enlarged to increase efficiency, rather than construct new ones. Again, careful study of alternatives will provide an answer.
4. At some point in future, it will likely reduce costs to close down small plants and construct new larger scale ones. This should be considered in planning for future expansion.

Milk Collection - Storage

Problem. One to 2 percent of total milk received from farmers is rejected because of failure to meet minimum standards. ^{2/} Rejection rate is above 2 percent during hot summer months and below in other months. One-half to two-thirds of the rejected milk is due to high acidity or sourness, while one-fourth to one-third is due to fat content below minimum of 3 percent.

^{1/} Overseas Technical Cooperation Agency. "Report on Survey for Dairy Market Development Project in Republic of Korea," Government of Japan, February 1970.

^{2/} Institute of Agricultural Economics. "Milk and Dairy Products Marketing Study Report," AER-21.

Causes. Mostly poor storage conditions on the farm, but also lack of insulated transport.

Plans.

1. No formal plan for improvement of farm storage. However, farmers are receiving guidance help at present.
2. Collection to be improved by purchasing 42 trucks with insulated vans for milk collection:

Use: Two large size for each new milk processing plant.

Two small size for each new fluid milk plant.

Cost: Ten at \$8,000 = \$80,000 or 23 million won.

32 at \$4,000 = \$128,000 or 36.8 million won.

Total \$208,000 or 59.8 million won.

Finance:

	<u>1 Million Won</u>	<u>Percent</u>
Government investment	29.9	50
Private investment	29.9	50
Total	59.8	100

Foreign exchange: \$208,000 (59.8 million won at 288 ₩/\$)

Comments and recommendations.

1. The insulated trucks appear desirable, but could the entire cost be paid for by milk plants? They do charge the farmer for at least part of the collection costs.
2. If scale of plant is changed, and processing more concentrated, then collection needs would change. Collection depots would be used, where milk would be tested, measured, then loaded into bulk trucks for long distance hauling.
3. Loans to farmers for improvement of milk storage facilities could be made by NACF.

Product Quality

Problem. Bottled milk and processed milk products at retail-consumer level tend to be lower in quality than international standards.

Causes. The following contribute to lower quality bottled milk:

- Inadequate production facilities and inadequate cooling of milk on farm and during transport.
- Improper technical operation and cleanliness of plant equipment.
- Lack of refrigeration during distribution and at consumers' homes.

Factors contributing to lower quality processed milk products are:

- Inadequate standardization of raw milk prior to processing.
- Inadequate and inconsistent processing standards and technical operation of equipment.
- Possible lack of concern by plants about presenting a top-quality product to consumers.

Plans.

1. Improvement in collection of milk (see previous section)
2. Purchase 18,000 refrigerated dairy cases for sale to retail stores:

Unit cost: 150,000 won

Finance:	<u>1 Million Won</u>	<u>Percent</u>
Loan	1,350	50
Private investment	<u>1,350</u>	<u>50</u>
Total	<u>2,700</u>	<u>100</u>

Comments and recommendations.

1. Raise the sanitary requirements for milk destined for bottling, as compared with milk for processing, and pay higher price for such milk to provide incentive for farmer to improve production facilities and sanitation.
2. Inspection of processing facilities should be made increasingly strict and penalties higher. This will entail expansion in number of inspectors and an increase in training. A completely federal inspection service would be easier to control. Achievement of international inspection and quality standards should be sought.

3. The dairy cases will contribute to higher retail sales of bottled milk and a better product. However, how will milk be distributed to retail stores with dairy cases? A dairy case would mean much larger delivery loads than present. Bicycle delivery would be inadequate. Small van trucks would be desirable. It may be that, in the future, milk plants will have to invest in delivery trucks.

School Milk Program

Plans. Expand program from 234,000 students in 1972 to 362,000 in 1976.

Finance:	<u>1 Thousand Won</u>	<u>Percent</u>
Government subsidy	2,518.7	55
Collections from children	<u>2,049.0</u>	<u>45</u>
Total	4,567.7	100

Note: Government subsidy would begin at 65 percent in 1972 and then drop to 50 percent in 1976.

Comments and recommendations.

1. Planned program differs from present program in that students would actually be getting bottled milk; now most of the milk is consumed in the form of bread and bakery goods.
2. Planned program would benefit only a small percent of Korea's student population. What criteria will be used to allocate program?

Evaluation of Livestock and Meat Marketing

Cattle Marketing and Pricing

Problems and causes.

1. Transactions and pricing usually are on per head basis rather than on a weight basis, making the total value per head more subjective than otherwise. This has not been a serious problem in the past since most animals were bought and sold for draft purposes, and weight was less important than size, form, or age. However, weight is crucial for livestock moving to slaughter or fattening, which is increasingly the case. Here transactions on a per head basis are costly to the farmer since he is less knowledgeable or in a less favorable bargaining position than the professional buyers. Presently, most markets are without adequate scales to weigh cattle.

2. Price or value is arrived at through face to face negotiation between one seller and buyer; no auctioning is done in any livestock markets. Principal reason for this appears to be tradition. To help assure that a fair transaction is made in established markets, an authorized agent is present in each negotiation, and he frequently has an assistant. The agent receives a set fee plus (usually) tips from both buyer and seller. However, many transactions are made outside market areas to avoid cost of agent and market place usage fee. Value of the service given by assistant agents is especially questionable. 1/
3. Marketing margin can be reduced and producer returns increased by marketing through livestock cooperatives. 2/ However, cooperatives have been little used to date because of insufficient finance and services, and low level of confidence by farmers.
4. Transportation of cattle has been slow and inadequate, causing high weight loss (frequently from 6 to 12 per cent on cattle moved from distant local markets to Seoul). Losses are generally higher for rail transport than truck. A shortage of specialized railroad cars and trucks apparently exists.

Plans. No plans have been formalized yet for improvement of cattle marketing and pricing during the Third FYP period.

Comments and recommendations.

1. Plans should be worked out to move towards a weight system for cattle moving to slaughter or for fattening so as to provide increased incentives for cattle feeding. One possibility would be to separate in some way the slaughter-feeder cattle market from the draft animal market. (However, the feasibility of this should be studied carefully.) Pricing on a per kilo basis would make intermarket price information more meaningful, and facilitate price analysis and decision making.
2. Movement toward an auction system, but not a compulsory one, would put price setting more into the open, and would probably reduce collusion between buyers and

1/ Agricultural Economics Research Institute, "A Study on Cattle Marketing," AER-22. MAF, March 1970, p. 33.

2/ Ibid, p. 34.

increase returns to farmers. Several studies have suggested such a system. ^{1/} Auctioning of draft cattle could possibly continue on a per head basis, but that of slaughter or feeder cattle would be on a per unit of weight basis.

3. Strengthening of local livestock cooperatives will likely require additional financing from NACF, management training, promotion to make farmers aware of advantages, and perhaps some incentives such as lower cost feed and supplies and operational loans to producers.
4. The Seoul-Pusan Highway should speed up truck transportation of livestock and make it more feasible than railroads. Consideration should be given to need for making financing available for private purchase of large trucks and specialized trailers to further facilitate livestock movement and reduce weight loss. Also, it may be more economical to transport meat rather than cattle. This would require that future slaughter plants be located in production areas, and the purchase of special refrigerated trucks (or perhaps more extensive use of the trucks to be purchased for the cold-storage fish distribution operation).

Livestock Slaughter - Meat Quality

Problems and causes.

1. The projected doubling of meat consumption by 1976 (over 1969) will require considerable expansion and improvement in slaughtering and meat storage facilities, even though many facilities at present are operating at less than capacity.
2. Considerable illegal slaughter and black marketing of beef and pork occurs which avoid payment of market-slaughter-inspection fees, commissions, and taxes. Also, it is used to get around the minimum age limitation on slaughter of female cattle. Much of the illegal slaughter and the resultant meat distribution is likely done under unsanitary conditions, and is thus a health hazard.

^{1/} For example, see FAO Seminar on Korean Livestock Marketing, p. 16; and IMI-NACF, "Preliminary Agricultural Marketing Survey in Korea," NISM-1, p. 371.

3. Sanitary regulations and enforcement need strengthening as volume of slaughter, processing, and distribution expands. Lack of inspectors and objective sanitary measures are major problems. Also the divided responsibility for watching over sanitation creates coordination problems. (MAF supervises inspection of livestock prior to slaughter and of slaughtering-processing facilities, while sanitation of meat and handling facilities between plant and consumer is the responsibility of the Ministry of Public Health.)
4. Meat is not graded in Korea. All sales are on the basis of sight judgment only. This has not been a problem in the past since most beef came from retired draft cattle and was of universal low quality compared with international standards.

Plans,

1. Construct five slaughter meat-processing plants.

Investment: 291.3 million won, of which 50 percent is private and 50 percent government loan.

Foreign exchange: \$415,000 (119.5 million won at 288 ₩/\$).

2. Construct five poultry processing plants.

Investment: 243.3 million won of which 50 percent is private and 50 percent government loan.

Foreign exchange: \$140,000 (40.3 million won at 288 ₩/\$).

3. Construct five meat quick-freezing cold-storage plants (these will be distinct from the five slaughter processing plants).

Purpose: meat storage up to six months for price stabilization.

Finance:	<u>1 Thousand Won</u>	<u>Percent</u>
Government investment	213,750	30
Loan	213,750	30
Private investment	285,000	40
Total	<u>712,500</u>	<u>100</u>

Foreign exchange: \$330,000 (95.0 million at 288 ₩/\$)

4. No plans have been formalized for improvement of present slaughter-processing plants; for introducing a meat

grading system; for expansion and improvement of sanitary regulations, inspection and enforcement; or for coping with the illegal slaughter black marketing problem.

Comments and recommendations.

1. Alternative scales of slaughtering and processing facilities should be considered to see if fewer but larger facilities might be more efficient. One possibility would be facilities designed and planned so that scale could be easily increased as needed, rather than building separate new facilities. The new Seoul-Pusan Highway makes possible larger scale of facilities than previously. However, the effect on competition of concentrating slaughter-processing among fewer firms might be a negative point, depending on government regulations.
2. The extent of black market operations suggests that the legal marketing fees, commissions, and taxes may be too high. The advisability of using central cattle markets and slaughterhouses as tax collection points should be analyzed carefully. Perhaps there are better ways of raising government revenue without the side effects.
3. Sanitation and healthfulness of meat and poultry will become more crucial as volume (and thus the inherent danger) goes up. To avoid future problems, stiffer regulations and improved enforcement should be planned.
4. Movement toward a federal meat grading system should begin, starting in Seoul. Higher quality animals and meat are now capable of being produced, if incentives are sufficient to do so. Meat grading, along with a price per unit of weight system of sale, would provide such incentives.
5. Meat grading may also provide the best means of reducing black marketing. Regulations requiring retailers to sell only inspected and graded meat, along with adequate enforcement and penalties against sale of noninspected and nongraded meat, would likely eliminate the black market.

Meat Marketing and Pricing

Problems and causes.

1. As an inflation control measure, government policy has been to keep retail beef prices at a level below the supply-demand equilibrium price. This artificially lower price level has reduced retailers' margins and stimulated underhanded practices of short weighing and adding fat

in order to increase margin. Also, it has provided additional incentive for the retailer to participate in black market operations, since he can obtain meat at lower prices.

2. After slaughter in the Seoul municipal slaughterhouse, beef is auctioned off to retailers and distributors. This is good practice, except that the artificial ceiling on retail beef prices may negate to a large extent the auction as a price establishing mechanism.
3. The lack of official meat grading, along with the price ceiling, makes it difficult for consumers who desire higher quality meat and can afford to pay for it to correctly differentiate and purchase such. Lack of grading has not been a major problem in the past since only draft animals have been available for slaughter, and these have been of a rather universal low quality.

Plans.

1. MAF proposes that government restraints on retail beef prices be removed.
2. No formalized plans have been made regarding adoption of meat grading and sale of graded meat at retail.

Comments and recommendations.

1. Restraints on retail beef prices should be removed as soon as possible and price allowed to rise to supply-demand equilibrium level. This will provide incentives for beef production, as well as stimulate consumption of pork and poultry. Also, it will remove any negating influence on the pricing of slaughtered beef, and reduce incentives for black marketing.
2. Consideration should be given to inclusion of an official meat grading program in the Third FYP, perhaps starting only in Seoul. An enforcement program would also be needed to assure that meat was sold within grade at wholesale and retail. Consumers would thus be assured of getting the quality they pay for. Incentives would be passed back through marketing system to stimulate breeding and feeding for quality meat production.

Price Stabilization - Storage

Problems and causes. High seasonal price fluctuations occur for most fruits and vegetables. Underlying causes are inadequate storage facilities, low processing demand, and operational losses due at harvest time which necessitate sale of product by producers. Also, loss during storage is frequently high, adding to both costs and risk.

Plans. A government purchase and storage program to stabilize price and improve returns to producers is planned for apples, pepper, onions, garlic, and sesame. All of these are storable at reasonable costs. Storage requirements for apples, pepper, and garlic are projected in the plans at one-half the difference between marketings during the harvest season and marketings during the season of shortest supply.

Comments and recommendations.

1. The feasibility of the proposed government purchase and storage programs needs careful analysis. The plan as is would involve the government moving into marketing activities which private enterprise could probably handle if incentives and regulations were adequate and sources of capital made available. Cooperatives could play a larger role also, if programs to strengthen management, capital resources, and services were instituted.
2. Movement of government into purchase and storage of fruits and vegetables could cause disincentives to future expansion by private enterprise, or even to a reduction from present activity, especially at high levels of stabilization.
3. Determination of storage requirements can best be done on monthly basis using monthly rates of marketing and consumption, as suggested earlier in the section on "Determination of Marketing Flows." Table V-9 also presents one example projection of storage requirements for apples, under the assumption of highly stabilized prices.
4. Most of the credit advanced to producers is from commercial buyers and shippers. Sources of credit which do not require repayment at harvest would make it

1/ Due to time limitations, only a few key problems are discussed.

possible for growers to hold storable items for several months and benefit from higher prices. Cooperatives could provide this service, or perhaps some specialized institution is needed.

Table V-9. --Example: projection of storage requirements for apples in 1975-76, assuming highly stabilized price

Month	Marketing <u>1/</u>		Fresh apple consumption <u>2/</u>		Required storage <u>3/</u>
	Rate	Quantity	Rate	Quantity	
	Percent	1,000 m.t.	Percent	- - -1,000 m.t. - - -	
August 1975	5	15.2	5	15.2	--
September	15	45.6	10	30.4	15.2
October	40	121.6	15	45.6	91.2
November	25	76.0	15	45.6	121.6
December	15	45.6	12	36.5	130.7
January 1976	--	--	8	24.3	106.4
February	--	--	7	21.3	85.1
March	--	--	6	18.2	66.9
April	--	--	6	18.2	48.7
May	--	--	6	18.2	30.5
June	--	--	5	15.2	15.3
July	--	--	5	15.2	0.1
Total	100	304	100	304	

1/ Assumes price stabilization would provide no incentive for growers to hold apples off market.

2/ Includes processing demand during harvest months and some slightly higher demand for apples for direct fresh use.

3/ Under highly stabilized prices, most of this would have to be governmental storage.

Processing - Canning

Problems and causes.

1. Many facilities are operating at low levels of capacity and are having difficulties selling end products. Underlying problems have to do primarily with overall quality, consistency of quality, promotion, and high prices. Managerial problems also exist.
2. Initial projections indicate a large potential increase in demand for canned goods, nearly triple the 1969 level.

Plans. Plans call for expanding facilities for processing and canning fruits and vegetables. No breakdown of processing quantities among various products has yet been made, however.

Comments and recommendations. Rapid expansion of processing and canning in the future will depend upon developing both domestic and foreign markets to obtain as much scale and efficiency as possible. Increased effort will be essential on product development, technical quality control, and product promotion. The government will have to play a guiding-helping role in this. Programs to consider are improvements in sanitation inspection and enforcement, management training, marketing guidance, and supervised credit. Efforts of AFDC are commendable.

Inspection and Grading

Plans call for expansion and improvement of inspection and grading. Time limitations did not permit adequate evaluation by the author, but the proposed improvements generally appear justified, perhaps even urgently needed.

Framework for Marketing Evaluation and Planning

A procedural framework useful for evaluating Korea's marketing system and possible action programs is the following:

1. Performance evaluation
2. Problem analysis
3. Action determination

Performance Evaluation

Korea's marketing system should perform the functions of satisfying demands of consumers, providing incentives and direction to production, and efficiently and economically serving as a connecting link between production and consumption. In general, the system is doing this, but there are performance problems,

some already referred to in previous sections. These problems fall within two groups. The first includes market situations which lower consumption and demand satisfaction. These are summarized in Table V-10. The second group includes market situations which reduce incentives for commercial production. These are summarized in Table V-11. Not all of these exist for each commodity, of course.

Problem Analysis

Problem analysis involves analytical study of why poor performance situations exist and what causes them. Frequently the causes are multiple and interrelated. Also, there are what might be called subproblems which appear to be the major causes but which are in themselves the result of other more underlying causes. Analysis which fails to look deeply may not identify the real trouble spots that need corrective action. Unfortunately, shallow-type analysis occurs too often. As a result, actions are aimed at the performance situations rather than at correcting the underlying causes of the situation. Although such actions may yield temporary success, the causes still remain and eventually become even more troublesome.

The subproblems connected with many performance situations in Korea are also summarized in Tables V-10 and V-11. This list was not meant to be a complete listing but, hopefully, includes the major items.

The association between the performance situations and the subproblems is largely self-explanatory. For example, the performance situation of large daily or weekly price fluctuations at retail level is associated with the subproblems of low level of working stocks and/or inadequate market information. The situation of a low quality product at retail results from one or more of the following subproblems: low quality production, quality deterioration in marketing, inadequate inspection and grading, or inadequate quality control in processing.

A quick perusal of the list in Tables V-10 and V-11 indicates that many subproblems are connected with more than one of the performance situations. For example, lack of accurate market information on supply and demand, quantities marketed, etc., may cause unfavorable price situations at both the producer and retail levels. High marketing margins could also have the same effect.

One subproblem listed in Table V-10 perhaps needs some explanation. This is the one listing institutional factors which are possible causes of quantity or weight deception by merchants and unsatisfactory product presentation. Institutional factors include such things as common ways of doing things, political connections, and legal-regulatory-tax requirements.

Table V-10. --Marketing problems which lower consumption
and demand satisfaction

Performance problems	Sub-problems
<p>Large price fluctuations</p> <ul style="list-style-type: none"> - Daily or weekly - Seasonally (These discourage consumers and delay consumption) 	<p><u>Daily or weekly fluctuations</u></p> <p>Low level of working stocks at retail or wholesale Inadequate market information</p> <p><u>Seasonal fluctuations</u></p> <p>Uneven commercialization No alternative use of product (i.e. processing) Inadequate storage</p>
<p>Low quality products Unsanitary products</p>	<p>Low quality production Quality deterioration from inadequate storage, handling, or transport Inadequate inspection and grading Inadequate quality control in processing</p>
<p>Quantity or weight deception by merchants (faulty weighing or measuring; added fill, such as water or fat)</p>	<p>High costs or insufficient margin Uninformed consumers Inadequate regulation or enforcement</p>
<p>High prices because of high marketing margin</p>	<p>Small unit of sale Product loss or deterioration from inadequate storage, handling, or transport High transport cost Below capacity operation High cost operations Lack of competition Unfair competition Many middlemen; fragmented collec- tion and distribution Excessive handling of products</p>

continued-----

(Table V-10, continued)

Short domestic supply of products in demand (demands remains unsatisfied and a potential economic activity is lost)	Lack of product and consumer research Inadequate market information Lack of processing-packaging facilities Inadequate storage Insufficient production Insufficient sales to justify investment
Inadequate merchandizing - Inconvenient location - Limited selection - Unsatisfactory packaging	Inadequate knowledge of consumers' desires Institutional factors (zoning, taxes) Small-scale operation

Table V-11. --Marketing problems which reduce
incentive for commercial production

Performance problems	Sub-problems
<p>Low producer prices (or high probability of a low price)</p> <p>Quantity or weight deception by buyer (farmer delivers more than he is paid for)</p>	<p>Lack of competition among buyers</p> <p>Buyer takes unfair advantage</p> <p>Farmers uninformed of prices or buyers' practices</p> <p>Uneven commercialization</p> <p>High marketing margins</p>
<p>No quality differential (or high probability of no differential)</p> <p>Buyers won't recognize quality</p>	<p>Quality of no economic importance</p> <p>Lack of competition among buyers</p> <p>Buyer takes unfair advantage</p> <p>Farmer not knowledgeable of quality</p> <p>Quality deterioration in marketing or high risk of such</p>
<p>High product loss or deterioration before initial sale (or high risk of such)</p>	<p>Poor farm management</p> <p>Inadequate storage</p> <p>Unfavorable weather</p> <p>Inadequate roads or transport</p>
<p>Unavailable or high priced inputs</p> <p>Unavailable or high interest rate credit for purchase of inputs</p>	<p>Inadequate information on farmers' needs</p> <p>Inadequate distribution of inputs</p> <p>Lack of competition among suppliers</p> <p>Lack of government funds or programs</p>

For example, an institutional factor which could be associated with quantity or weight deception by merchants at the retail level might be a fixed government price at which he must sell but which does not provide sufficient price margin to make operations profitable unless some deception is undertaken. An institutional factor associated with inconvenient location or product sale might be zoning regulations or high property taxation which prohibit the use of certain sites as markets.

A point of importance is that each performance problem may only have one subproblem connected with it or it may have several. Of course, competent research looks for all possible subproblems and then continues probing for the underlying causes.

The underlying causes are the real problem makers which need recognition and analysis. These are the causes that a capable researcher eventually arrives at if he keeps asking "why." Why does the performance problem exist? Why do the connected subproblems exist, etc.? Conceivably a subproblem could be the underlying cause itself, but usually probing will yield further valuable insight.

The possible underlying causes of the various subproblems in Korean marketing are summarized in Table V-12. Again, this was not meant to be all-inclusive, but hopefully it includes most of the important factors. Usually, marketing problems will have multiple causes, but not always. If so, then analysis must proceed to judge the relative importance of each. For example, product loss or deterioration in marketing could be caused by inadequate storage, unavailability of capital or high interest, poor roads, shortage of transport vehicles, improper handling, poor initial quality, or poor management. Analysis may show poor roads and improper packing to be the major causes, with perhaps some poor management also involved. Or it may find inadequate storage facilities and lack of low interest capital to expand storage as the major cause.

Action Determination

In determining the most feasible actions to take in eliminating or reducing the causes of marketing problems, several points or questions need consideration.

1. What are the possible alternative actions? Usually there are several, as can be seen from the partial list in Table V-13. Also, since marketing improvement is a coordinated activity, a combination of actions usually provides better results than a single individual action. Planning which fails to consider more than one alternative action or combination of actions for each problem is highly subjective (yet this has happened in most

Table V-12.--Underlying causes of marketing problems

Sub-problems	Underlying causes
Product loss or deterioration (or high risk of such)	Inadequate storage facilities Unavailable capital or high interest Poor roads Shortage of transport vehicles Improper handling Poor initial quality Poor management
High transport cost	Distance or geographical location Poor roads Shortage of transport vehicles Small-scale operations Unavailable capital & high interest Poor management
Uneven collection and distribution	Lack of storage Poor roads and weather Lack of market information Lack of market coordination-integration
High costs or insufficient margin Many middlemen Numerous handling of products	Lack of funds for expansion of scale Lack of marketing-management expertise Institutional factors (laws, regulations, taxes, etc.) Lack of alternative employment Nature of farm unit (small and scattered) Limited market or market share
Lack of competition or unfair competition	Lack of market information Lack of funds on part of seller: - credit advances by buyer - seller needs immediate cash Collusion among buyers or sellers Poor roads which limit accessibility Institutional factors

continued-----

(Table V-12 continued)

Inadequate inspection and grading Inadequate regulation and enforcement	Untrained inspectors or officials Insufficient funding (for equipment, inspectors, etc.) No program; uncoordinated program
Uneven commercialization (high commercialization at harvest)	Inadequate farm storage facilities No economic gain from storage Farmer needs funds Repayment of debts
Low level of working stocks	Lack of storage facilities No economic gain from storage Unavailable capital or high interest
No alternative market for product	No economic alternative uses available Lack of processing or drying facilities Unavailable capital or high interest Lack of market research and development
Inadequate quality control in processing	Lack of competition Inadequate regulation or enforcement Poor management Inadequate market research and development
Inadequate market information on: - Prices by grades - Product movement - Stocks on hand - Supply, demand, and price outlook Uninformed consumers Lack of product and consumer research	Uncoordinated information gathering and distribution; untimely distribution Lack of sufficient funding Uncoordinated marketing research Failure by officials and management to understand need and value of research
Below capacity operation Insufficient sales to justify investment	Inadequate planning Inadequate market development and promotion Insufficient supplies of raw product Poor quality control Lack of management-marketing expertise

Table V-13.--Alternative actions for marketing problems

Cause of problem	Possible action
Poor or no roads	Public investment Community action
Lack of storage	<u>On farm</u> : Credit, guidance, subsidies <u>Commercial</u> : Credit, incentives, government contracts <u>Government</u> : Public investment
Improper or poor storage	Same as for lack of storage Government inspection & incentives or penalties
Lack of funds for expansion Unavailable capital or high interest	Government loans Directives or incentives to banks Subsidized interest rate loans Regulations to reduce risk
Lack of processing	Public investment (AFDC?) Joint ventures Foreign investment Incentives to private investment
Lack of market information on: - Prices by grades - Product movement - Supply, demand, and price outlook - Stocks on hand - Costs and margins	Public investment in: - Research - More and better reporting - Product grading (so that price information is meaningful) - Marketing guidance
Lack of marketing - management expertise	Public investment in: - Marketing guidance - Special training courses - Foreign training Incentives to universities and trade schools
Collusion or unfair competition	New laws or regulations Public investment in: - Research-investigation - Enforcement
Institutional factors: - Laws and regulations - Tax assessment and collections - Social High risk	Change laws, regulations, or enforcement

of MAF's planning in marketing on the Third FYP to date). In particular, alternatives should be considered which:

- a. Require minimum direct government investment and involvement in marketing activities which private enterprise can handle (such as buying, selling, processing, storing) when proper conditions (regulations and enforcement) and incentives exist.
 - b. Require a minimum use of capital by emphasizing better marketing techniques and organization forms, rather than innovations requiring capital outlays (especially if capital scarcity is serious).
 - c. Involve different scales of facilities, since larger scale facilities than in the past become feasible with improved transportation (such as with the new Seoul-Pusan Highway).
2. What will be the direct benefits and costs of the more feasible alternatives? In particular, how will each affect the marketing margin (costs and profits)? How will the benefits and costs likely be allocated among producers, middlemen, and consumers? ^{1/} How much will volume of product movement be changed? What will be the total effect on consumer demand satisfaction and on incentives or returns to producers?
3. What will be the extent of the following secondary or associated effects?
- a. Effect on employment? Will earnings of unskilled labor employed in marketing increase or decrease because of the action?
 - b. Effect on private enterprise? Will marketing activity by private enterprise be stimulated or will it be depressed or reduced by the action? If depressed, then the government may have to step in to a larger extent than planned, and increasingly so in the future. (Takeover by government of marketing

^{1/} This is difficult to determine with any preciseness, since the allocation depends upon elasticities of supply and demand in the short and long run, and these can usually only be grossly estimated. Even so, some estimates of direction and relative magnitude can be made.

activities from private enterprise, although often expedient in the short run, often results in a dis-service to long run development.)^{1/}

- c. Effect on foreign exchange? What will be the net result on foreign exchange earnings?
 - d. Effect on infrastructure and government support? How will the action affect the need for public roads, public offices and officials, and other public facilities and services?
 - e. Effect on economic activity in other sectors? Will it stimulate activity or depress it?
4. Which alternative action is best in light of both the direct and secondary benefits and costs? Which is best in light of resources (particularly capital) available for marketing improvement?

Priority Areas for Marketing Research

- 1. Operation of Central Markets. Why are some dealers using and others avoiding central markets? How can efficiency be increased and cost reduced? Should there be more or less regulation? How would changes in commissions and taxes affect magnitude of flow through the market?
- 2. Marketing Efficiency. To what extent can marketing costs per unit be reduced by use of improved methods and increased scale of operation? More research on this question needs to be done for various commodities and all marketing levels: assembling, storage, processing, shipping, wholesaling, and retailing; and for various commodities. Some particularly crucial areas for research would be into the economies to be gained from:
 - a. Use of weight (rather than volume) measurement and standardized container sizes.
 - b. Expanded government inspection and grading, and other services.

^{1/} Experience in most countries indicates that governmental or quasi-governmental marketing institutions generally become, over time, less efficient economically, less responsive to farmer and consumer needs, and more entangled in politics than regulated private enterprise.

- c. Enlarging scale of marketing facilities and operations, particularly grain storage, milk and meat processing, and food wholesaling and retailing.

Any economies of scale, of course, should also be evaluated in terms of possible negative effects, such as undesirable concentration of market power (leading to higher profits instead of lower prices) and reduced employment.

3. Factors Affecting Innovation and Growth in Scale. When innovations or larger scale would improve efficiency, as indicated by research in item 2 above, then what factors determine whether changes are made? Careful analysis should be made of the relative importance of availability and sources of capital, terms of credit, risk, tax structure, and management expertise. Some case studies of facilities and firms that have increased efficiency might give some insight.
4. Marketing Margins. Although considerable analysis has already been done, few attempts have been made to determine total margin by placing a value on quantity and quality margins and adding these to the price margin. Also, in calculating price margins, no consideration has been given to the fact that commercialization over a year's period is usually more skewed than consumption, thus casting doubt on the meaningfulness of margins calculated as the difference between simple averages of monthly prices. Some weighting procedure should be used. Also, the above only provides "average" margin. What is the margin during different times of the year? In analyzing this, consideration needs to be given to the lag between the product's initial sale by the farmer and final sale to end consumer.
5. Pricing. How are prices established? Who are the price leaders? On what information is price setting based? What is the geographical distribution of prices? How does this distribution compare with costs of transporting goods from one area to another? What services are included in a given price? More information on these questions would aid the analysis of margins and costs in search for improvements in efficiency.

VI. PROPOSED REORGANIZATION FOR ECONOMIC RESEARCH

In connection with the MAF statement on grain price policies, reference is made to a system of forward pricing, supported by an improved agricultural outlook service. Considerable progress has already been made in the outlook work for internal use, but more stress should be laid on the importance of providing reliable information on current trends in prices, markets, and general economic conditions to farmers. A flow of economic intelligence is essential to the effective functioning of a private enterprise economy, and is just as important for farmers as for industries and financial institutions.

In addition, there is a need for improving the accuracy of agricultural statistics and the quality of basic research in agricultural economics. When this need is combined with the need for an effective outlook service, the importance of substantial resource commitments and some reorganization of the economics and statistical work of MAF is clearly evident.

As indicated in the preceding sections of this report, considerable progress has been made in the preparation of the components of the five year plan for agriculture, and much careful statistical and analytical work has been done. At the same time, much remains to be done in terms of consistency cross-checks, tests for feasibility, and integration of the components into an overall plan which contains reasonable production targets, an analytical base clearly defining the policy measures, inputs and incentives needed to achieve the targets, and a realistic estimate of the investment needed to underwrite each proposed program. The recommendations given in the following paragraphs would provide a strong statistical and economic research organization within which this type of basic planning effort, and the continuing yearly planning for the Overall Resources Budget, could be centralized. 1/

It is recommended that a Bureau of Agricultural Economics and Statistics be established within the MAF with two deputy chiefs, one responsible for the statistical operation and the other guiding the economic research.

1/ These comments, in part, are in support of the recommendations by Norman V. Strand in his report to USAID and MAF on "Review and Recommendations on Collection and Handling of Farm Statistics in the Ministry of Agriculture and Forestry, Republic of Korea," February 1969.

Quoting from the Strand Report:

The rationale for consolidating economics and statistics in one Bureau lies in the nature of relationships between the two fields. The economists will necessarily have to determine the kinds of data to be collected so that economic studies may be pursued by use of the data obtained by the statisticians. A single director should thus coordinate the activities of the two parts. It is recommended that the economists would not normally undertake on their own, studies involving field work and certain types of data processing but would utilize the services of statisticians to perform this kind of work. On the other hand, the statisticians would not normally be responsible for economic analysis.

The Strand report recommends that the proposed bureau have seven sections -- Economic Policy and Planning, Agricultural Price and Income, Marketing and Processing, Agricultural Estimates, Field Operations, Data Processing, and Standards and Research. The Deputy Chief for Economic Analysis would supervise the first three sections and the Deputy Chief for Statistics the other four sections. In addition to these seven sections, it is recommended that the agricultural outlook function be transferred from the National Agricultural Cooperative Federation (NACF) to the new proposed bureau, either as a separate Agricultural Outlook Section under the Deputy Chief for Economic Analysis or as one of the functions of the Agricultural Price and Income Section.

Obviously, the proposed new organization can operate efficiently only if it is adequately staffed with competent economists and statisticians who are provided with the necessary logistical support. In addition, the two deputy chiefs must exert strong guidance in controlling and coordinating the work of the sections under their control, and must work together closely to prevent duplication and overlapping of functions and to provide an output from the bureau which incorporates sound economic analysis based on solid statistical data.

The Economic Policy and Planning Section of the proposed new bureau would have primary responsibility for the economic analysis involved in the annual and long-range planning activities. In this sense, this section would perform many of the analytical functions of the planning process which are now done in the Office of the Planning Coordinator. The Planning Coordinator, however, would still have a vital role in the planning activities in directing and coordinating the stages of the planning process which must be done in the other bureaus within the MAF.

APPENDIX A - LIST OF DRAFT PLAN MATERIALS

1. "World Data for 3rd Five Year Economic Development Plan," May 1970, by Bureau of Agricultural Administration.
2. "Basic Data on Price Adjustment," undated, by Agricultural Production Bureau.
3. "Pricing Policy for Farm Products," May 1970, by MAF.
4. "Estimation Data for Demand of Agricultural and Marine Products," May 1970, by MAF.
5. "Demand Projections of Agricultural Products," draft, May 1970, by MAF.
6. "Estimation of Grain Demand," 6 April 1970, by Food Administration Group.
7. "Agricultural Products Increase Plan," draft, undated, by Agricultural Production Bureau.
8. "Food Production Increase Plan," draft, undated (received 24 July 1970).
9. "Production Plan for Special Crops and Horticultural Crops," drafts, June and July 1970, by Agricultural Production Bureau.
10. "Third Five Year Economic Development Project Plan," 19 June 1970, by Farmland Bureau.
11. "Experimentation and Extension Program," 1 June 1970, by Office of Rural Development.
12. "Data for Farmland Utilization Plan," 24 June 1970, by Agricultural Production Bureau.
13. "Data for the Estimation of Vegetable, Fruit and Food Oil Demand," undated, by Special Crops Section.
14. "Livestock Development Program," June 1970, by Livestock Bureau.
15. "Demand Projections for Livestock Products," draft, 31 March 1970, by Livestock Development Work Team.
16. "Data for 3rd Five Year Plan," (livestock increase plan), 20 April 1970, by Livestock Bureau.
17. "Long Range Export Programs of Agricultural and Marine Products," June 1970, by MAF.

18. "Promotion of Sericulture in 3rd Five Year Plan," undated, by Agricultural Production Bureau.
19. "Preliminary Estimate of Grain Supply and Demand," (supply-utilization table), 29 July 1970, by Food Administration Bureau.
20. Computer runs on: (undated but received in late July - early August)
 - 1) Agricultural Production Index
 - 2) Per Capita Food Consumption
21. Plan of Standardized Grade of Agricultural Products for Modernized Marketing, May 1970, by National Agricultural Products Inspection Station.
22. Analysis of Agricultural and Fishery Products Storage and Processing Industry and Demand Forecast, May 1970, by Office of Agricultural Development Officer, MAF, in cooperation with Agricultural and Fishery Development Corporation.

APPENDIX B - BIBLIOGRAPHY

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