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THE ROLES OF AGRICULTURE IN ECONOMIC DEVELOPMENT: THE KOREAN EXPERIENCE AND IMPLICATIONS FOR KOREAN POLICY

by

Glenn L. Johnson
and
Michael H. Abkin
Department of Agricultural Economics
Michigan State University

Introduction

Agriculture, land and rents are often given special treatment by economists. We need only recall the physiocrats, David Ricardo and John Stuart Mill to realize this. Mill analyzed economic progress under the assumption that the supply of land could not be augmented with capital investments and that labor-saving technological advance would not occur in agriculture [3]. His analysis led to the bleak conclusion that earnings to labor would fall to a near subsistence level as population increased, that returns to capital would fall, and that landowners would become the recipients of higher rents as the result of high prices for food.

At the end of World War II, T. W. Schultz, in his book Agriculture in an Unstable Economy [7], modified Mill's analysis to recognize the development of capital forms which substitute for land or are labor saving. He then concluded that the terms of exchange for agriculture under these new conditions should be expected to be unfavorable, that high farm birthrates would depress labor earnings in agriculture as surplus labor accumulates in it but that returns to capital would be high in agriculture in order to attract the new forms of capital. A difficulty with the Schultzian analysis when one looks at Korea and the United States or for that matter any market-controlled agricultural economy [1, 2] is that returns to capital are not high.

Missing ingredients in the Schultzian analysis are the roles played by acquisition cost/salvage price differentials and imperfect knowledge. Agricultural production harvests solar energy under appropriate and favorable soil and climatic conditions. It takes space to harvest solar energy. The fact that agriculture occupies so much space results in high transportation costs. High transportation costs, in turn, introduce large differentials between acquisition and salvage prices of durables and storables, even including farmers. These large differentials combine with imperfect knowledge of the biological production processes, of prices and demand, weather, human behavior, war, institutional changes and other variables to cause farmers to make substantial mistakes in their investments. Repeated imperfections in knowledge result in repeated mistakes. Underinvestment mistakes in durables are easily corrected. Overinvestment mistakes in durables are not. Once overinvestment mistakes are made, the services generated by overinvested durables are priced either on a shadow or opportunity cost basis. Neither shadow nor opportunity costs would be required if acquisition prices or costs for the durables could be covered by earnings. When shadow prices or opportunity costs must be used, losses occur on the original investment despite the fact that resource allocation proceeds on the basis of either shadow or opportunity costs. Both Korean and U.S. agriculture are characterized by low marginal returns to capital and by the pricing of durable assets and the allocation of the use of their services on the basis of shadow prices or opportunity costs. This

characteristic of the Korean and U.S. agricultural sector is typical of all agricultural systems guided by the price mechanism.

Korea's Agrarian History: -- Historically, what is now South Korea was the agricultural part of Korea. Prior to the Korean War, Korean industry was located mainly in the North. During the 35-year Japanese occupation, the Japanese used South Korea as a source of rice. They forced Koreans to export rice to Japan leaving barley in Korea for Korean consumption.

After the Korean War, South Korea possessed a relatively well-educated, highly motivated labor force. Many South Koreans were refugees from the more industrial North; thus, South Korea had considerable industrial as well as agricultural expertise. Further, military service and continued mobilization created and maintained additional technical and mechanical skills needed by both modern armies and industry. At the end of the Korean war, South Korea was very unlike the present-day less developed countries of Africa and South America. It was more like the Soviet Union at the end of the Russian Revolution. It had technical capacity and long traditions of academic competence and well established arts among its elitist groups. South Korea could proceed with substantial reconstruction after the very devastating Korean War without preliminary major training and motivation of its people. However, unlike the Soviet Union, the People's Republic of China and North Korea, which also built on a substantial amount of previous industrialization and advanced culture, the South Koreans did not have the problem of pressing their population into a new form of social organization.

Once sufficient stability and security from invasion from the North was established, South Korea proceeded with industrialization. Importantly, it also carried out a land reform early in the process. Its first development plan depended largely on food assistance from the United States while concentrating on industrialization to the neglect of agriculture. Later, with concerns over long-run food security and the need to exploit all of its meager natural resources to the fullest (including its limited supply of favorably endowed land), policies were changed to ones more favorable to agriculture.

South Korea's agriculture has responded significantly and now provides a much higher proportion of the food consumed by her greatly expanded population. The expansion of population in South Korea since the World War II period resulted from the influx of refugees from the North during and immediately after the Korean War and from the birthrates which continue to be high. The food produced and consumed by the increase in population in South Korea is now far greater than that previously delivered to the Japanese under forced exports and supplied to what is now North Korea.

Structure of Paper: -- With the above agricultural and historical perspective, we next discuss the contributions of Korea's agriculture to general national development, and then the implications of that growth and development for transformation of the agricultural sector. We conclude with a discussion of the consequent Korean policy implications for the 1980s. References to Korea in the remainder of this paper are references to South Korea.

Agriculture's Contribution to Korea's National Development

Korean agriculture has made and is making a considerable contribution to Korea's national development. Korea is short of resources. While she is not long on land, land is one of her important resources. Korea's major resource is labor and much of it was originally lodged in her agricultural sector. Her ability to use her labor and foreign

financing to develop her industry has resulted in substantial capital formation. Korea's agricultural labor has made a substantial contribution to that flow of capital. In this section, we look at the role which land, labor and capital from agriculture have played in the Korean economy. We also look at the role of agricultural products in the nutrition of and industrialization of Korea. Agriculture also saves substantial amounts of foreign exchange and provides an important market for the nonagricultural sector; still further, Korea's rural areas are important recreational resources for the her population.

Land: -- Koreans use their limited land resources intensively and effectively. Since the Korean War, there has also been a substantial expansion in the use of land-substitute capital such as fertilizer, pesticides and improved varieties. Korea has also expanded its use of capital forms which complement land with poor natural endowments. There has been a substantial expansion in the use of irrigation water to complement land with moisture deficiencies. Similarly, there has been an expanded use of drainage capital in order to remove excess water and accumulating mineral salts. Land has also been contributed by the agricultural sector to the nonfarm economy for use as roads, factory sites and housing developments though the Koreans have tried to minimize such inroads on its productive agricultural land. In total, Korea has made a substantial investment in its agricultural land with significant expansions in production.

Forestlands have been difficult to handle. Surface soil has been eroded off forestland to base rock in much of the mountainous regions as a result of deforestation by earlier generations of Koreans and the Japanese during the occupation. Reforestation of this land is expensive and difficult though progress is being made.

Labor: -- Probably Korea's greatest resource is her people. As previously noted, they are ambitious, motivated, and well trained in traditional agricultural technology with substantial industrial skills. The substitution of power equipment for labor in Korean agriculture has been relatively slow. Even as late as the early '70s, Korean agriculture was powered mainly with human and animal labor. As industrialization has proceeded and wage rates have increased, it is becoming increasingly necessary to shift from human and animal power to mechanical power. However, the energy shortages which materialized in the early '70s have further retarded this shift.

Some forms of capital, such as tractors, transplanters, and threshers, substitute for land. But, in turn, most of such capital is complementary to the skilled labor it takes to run it, even if it substitutes for the unskilled labor it replaces. Public investments in people to create these skills are crucial.

Capital: -- Fortunately, Korea has not had extensive programs designed to force the transfer of capital out of agriculture to develop the nonfarm sector. Instead, Korea has been able to draw heavily on foreign sources of capital to develop her industry. U.S. and Japanese investments have been substantial. Germany is now expanding her investments. The U.S. has granted favorable terms of trade and credit on raw materials to Korea, particularly for textiles, which has in turn facilitated Korean industrialization and, incidentally, U.S. cotton exports.

Korean agriculture has been an important source of capital for the post-war development of Korea despite the absence of programs to force capital out of agriculture. While not making forced contributions to industrialization, it has contributed human capital as well as the financial resources which have gone to urban centers with or has been inherited by the large flow of off-farm migrants. Also, Korean agriculture and rural communities have contributed substantial amounts of capital for the creation of rural infrastructure and for the development of agriculture itself. The Saemaul Program has

been an important way of stimulating the simultaneous production, saving and utilization of capital in the form of local and village infrastructure. When Korean policies made prices and other conditions favorable for agriculture, many opportunities were created for highly motivated, efficient and productive traditional farmers simultaneously to produce, save and invest capital in agriculture. We refer here to construction of irrigation facilities, the building up of livestock herds and poultry flocks, the establishment of orchards and mulberry plantations and the construction of plastic greenhouses, etc., all of which have increased Korea's total stock of productive capital. This has reduced the need for urban and foreign capital to develop Korean agriculture.

Nutrition: -- Probably the most fundamental contribution Korean agriculture makes is to the supply of food energy to fuel the urban, industrial labor force (and its own labor force as well). Therefore, the efficiency of agricultural production in supplying low-cost food energy is of prime importance. Despite important gains in the productivity of Korean agriculture over the last ten years, the cost of producing major food grains in Korea, principally rice and barley, is still significantly higher than world price levels. These food costs are part of the price paid by Korean society to conserve foreign exchange and to enhance national security.

Nutrition involves more than energy, however. Physiologically, there is need for other categories of nutrients as well -- protein, vitamins, minerals, etc. Also, as per capita incomes rise "food aesthetics" become relatively more important. As we discuss below, Korean agriculture is adjusting and must further adjust to the changing effective demand for food of higher quality as well as quantity.

Raw Materials for Industry: -- In addition to providing energy input for labor production, agriculture also supplies raw materials to Korea's manufacturing sectors. Obviously, the principal intermediate input linkages are with the food processing sectors. Again, as food processing industries expand and adapt to changes in effective demand for processed products, the supply of agricultural raw products will also have to adjust to the concomitant changes in the derived demand for them. If the price system is allowed to operate effectively, prices will signal the necessary adjustments to farmers who will reallocate resources accordingly. Otherwise, if these signals and incentives are not there, Korea will pay the price of reduced food supplies or increased food imports.

Aside from food, Korean agriculture does produce, to a much lesser degree, raw materials for other industries as well: a small amount of cotton and wool for the textile industry; hides and skins for leather; and industrial starches and oils. In addition, crop residues and by-products, such as rice straw, find such varied uses as for animal feed, in construction, and for fuels (biomass combustion, methane generators, etc.).

With respect to the production of nonfood energy, Korea's shortage of arable land for food severely limits her ability to supply feedstocks for ethanol production or other such energy crops, as is currently in vogue in the United States and Brazil. With careful forestry management and fast-growing species of trees, an expansion of Korea's active reforestation program, however, could perhaps make better use of some of her uncultivable hillsides as wood-fuel producers than as improved pasture.

Foreign Exchange Savings: -- Unlike the United States, Thailand, Nigeria and other countries with major agricultural exports, Korea is a significant importer of foodstuffs and agricultural raw materials (primarily cotton). However, substantial investments in agricultural land and labor substitutes and complements have greatly expanded Korea's capacity to produce food to save foreign exchange through import substitution. This has been mainly in rice and barley. Recent crop improvement research investments have been

devoted to wheat. Though Korea has recognized that it does not enjoy much comparative advantage in beef production, there are problems in liquidating the draft herd in such a way as to continue to economically convert the use of the roughage it consumes to beef and milk production.

Market for Manufactures and Services: -- In addition to supplying land, labor, capital, food and raw materials for Korea's population and industry, Korean agriculture represents a growing market for goods and services produced in other sectors of the economy. Two such markets are involved: that for manufactured inputs to agricultural production, and that for consumer goods and services. The manufactured input market is very important from the point of view of the national economy. In its efforts to compensate for its scarce arable land and the transfer of large parts of the agricultural labor force to industry, Korean agriculture has made, and will continue to make, increasing use of such manufactured land and labor substitutes and complements as chemical fertilizers, power tillers, tractors, rice transplanters, threshers, irrigation and drainage systems, pesticides, commercially mixed feeds, etc. Initially, these markets were suplied by imports, but Korean industry has largely replaced such imports with domestic products. This is particularly so in the case of agricultural machinery. This trend will continue as Korean agriculture becomes more capital intensive.

Recreation: -- Finally, we can also mention the aesthetic and recreational value of rural Korea. This is reflected in a number of ways, including the government policy of establishing and maintaining green belts around urban centers.

Implications of Economic Growth for Agricultural Change in Korea

The implications of economic growth for Korean agriculture are more similar to the implications of Japan's post-war recovery period than to the implications of economic growth for United States agriculture. Both Korea and Japan are long on labor and short on land. However, Japan, Korea and the United States are all experiencing increased per capita incomes, rising wage rates and adverse pressure on marginal earnings of labor and capital in agriculture even though total earnings of many U.S. farmers now compare more favorably than formerly with typical incomes of nonfarmers.

Both Japan and Korea have land tenure systems reflecting U.S. inspired post-war land reforms which make it difficult to develop large-scale farming operations to utilize labor effectively as it gets more expensive and to produce total per capita earnings in addition to marginal value products for individual farms comparable to those of the nonfarm population. The farms are too small for parity earnings at the margin to produce parity earnings in toto.

Both Korea and Japan depend upon the importation of energy and raw materials for their industry while the U.S. is less dependent. All three are trading nations, but the U.S. is relatively more self-sufficient in energy.

Increased Market Integration: -- As Korea's economy grows and develops, agriculture will have to become more closely integrated with the national economy. This kind of increased integration is required in all economies whether managed by the market or by governmental decree. The Korean economy is a mixed economy with the government taking substantial initiatives in many areas while relying on the price mechanism to allocate resources and production in many other areas. The rapid rate of growth in Korea's nonfarm economy draws labor from the farm economy thereby forcing a closer integration of the farm and nonfarm labor markets. As this occurs, it becomes

increasingly necessary to substitute inputs produced in the nonfarm sector for those produced in the farm sector; again, market integration is required. Similarly, the demands of the nonfarm economy on the farm economy expand and change with economic growth, requiring the farm economy to integrate its output more closely with nonfarm demands. In a mixed economy such as Korea's, more and more of the agricultural sector will be integrated with the nonfarm sector via both market and governmental direction. Even the integration which occurs as the result of governmental initiatives will give the farm sector a greater orientation to urban markets for farm products and to urban markets for inputs. In mixed economies such as those of Korea, Japan and the U.S., it is important that government interactions not interfere with the allocative efficiency of prices outside of the immediate intervention. Perhaps Japan is a better model to follow when intervening in the non-farm economy than the U.S. -- Korea cannot afford many of the inefficiencies resulting from the unwise governmental intervention increasingly characteristic of the U.S. non-farm economy.

This paper started out by noting the important roles played by differentials between acquisition and salvage prices as well as imperfect knowledge in market-oriented agricultural economies. It was noted that the roles of these two factors combine with the impacts of economic growth on the land, labor and capital markets to produce low returns at the margin for all three factors of production. It should be pointed out that low returns to factors of production does not mean that capital cannot accumulate in agriculture and that per capita incomes cannot be fairly large. If the farm population owns enough land and capital, it can have higher incomes than large segments of the nonfarm population despite lower returns at the margin and be able to make substantial savings. This is amply demonstrated in many parts of the U.S. agricultural economy at the present time. Korean farmers, however, now face the consequence of the earlier land reform which means that their ability to command ownership of large amounts of land and, hence, capital is severely limited. Full integration between the farm and nonfarm markets in Korea may require that this land constraint be relaxed. One possible consequence of not relaxing it will be a demand for high farm prices such as those prevailing in Japan and Europe in order to keep total farm incomes at more adequate levels. The alternative consequence is a disadvantaged peasant class of Korean farmers. Interventions to increase ownership of productive resources on a per capita basis in Korean agriculture will probably be needed in order to avoid these two alternatives. Again, it will be extremely important to carry out these interventions in such a way as to not destroy the efficiency of prices as resource allocators. Neither Japan nor Western Europe are particularly good patterns for Korea to follow in carrying out such difficult adjustments in the farm economy. Perhaps the U.S. is a better example to follow.

Food Demand Changes: -- As urban and rural incomes increase in Korea, not only will more food in general be demanded and consumed but there will also be shifts in the mix of foods to higher-quality commodities. These shifts are a consequence of the observed income elasticities of food demand in Korea and elsewhere, where the elasticities for meat and dairy products, fruits, and wheat products are substantially higher than those of the more traditional staples such as rice and barley. Vegetables and pulses are on the border of the two groups because of the importance of kimchi and soybean products in the traditional Korean diet [8]. An added factor influencing such demand shifts will be the increasing levels of nutritional knowledge in the Korean population. This comes with increasing educational levels and exposures to new medical and dietary information.

These demand changes will have implications for all components of the food supply system: agricultural production, food processing, and food transportation and marketing. Agriculture will be facing higher prices for the more preferred commodities and relatively

lower prices for the staples. Korea can be expected to follow the Japanese pattern of declining rice consumption as per capita incomes increase. Need for expansion and modernization of livestock production, particularly dairy, pork and poultry, can therefore be expected. There will be, and already has been, price pressures to divert some paddy land to fruit, vegetable and soybean production, particularly near urban areas.

Along the same path, food processing, transportation and marketing activities and facilities will need to make similar adjustments [6]. As the urban population and its per capita income grow and as the rural population declines, the volume of food passing through marketing channels from rural-producing to urban-consuming areas will increase dramatically. Furthermore, that volume will tend to be composed of more highly processed and perishable commodities -- processed fruits and vegetables, meat and dairy products, baked goods, etc. These adjustments need to be recognized in public policy -- in terms of production incentives and controls, infrastructure investments, price policies and controls, etc. -- if the private sector is to be able to anticipate them and respond in an appropriate manner.

Losses of Land and Labor and the Rising Costs of Land and Labor for Korean Agriculture: -- While Korea and her agriculture are relatively long on labor, she is short on land. Furthermore, Korean agriculture is faced with a very large out-migration of labor and with rising wage rates. This need to economize on the use of labor in agriculture can be expected to continue. Land is being lost for infrastructure, housing and industrialization though some of these losses are offset by land development projects, including irrigation and dryland farming in the less level areas of Korea, and the use of land substitutes and complements.

The postwar land reform in Korea was an important contributor to agricultural production and to social stability, at least into the early '70s. It was noted above that farm sizes are now so small that few farmers own farms large enough to permit them to earn incomes comparable with those now starting to be earned by the industrial labor force. There have been significant projects on land consolidation in Korea in which individuals maintain ownership of land but merge their holdings into large fields and operations to take advantage of mechanical farming. This, however, does not permit per capita farm incomes to keep up with nonfarm incomes. As industrialization is dispersed into smaller communities, an alternative to a land reform permitting the development of larger farms and larger land holdings is off-farm employment in association with part-time farming of small holdings.

Korea is making substantial educational investments in its farm population. These investments are needed to create the kind of skilled agriculturalists to complement mechanization, the use of improved varieties, and particularly the use of herbicides, pesticides and disease controls.

Korea has also invested heavily in the generation of new varieties of rice and barley and is making some efforts with respect to forage crops for winter paddies and soybeans. It is important that the maturity dates for barley and rice be shortened to permit double cropping of rice in the extreme south and double cropping of rice and barley in the middle area. In the northern part of South Korea, double cropping of paddies may involve the production of winter roughage for ruminants.

The rising cost of energy has affected all of the Korean economy. Perhaps because mechanization has not proceeded as far in Korea as in Japan and the western countries, Korean agriculture is less affected by the increased price of fuels. However, this simply means that the rate at which incomes increase and economic progress occurs in Korea is

being slowed and that it will be more difficult for Korean farmers to catch up with their Japanese counterparts.

National Food Security: -- If the present international political and military situation persists indefinitely, Korea will continue to consider food security (self-sufficiency) a prime objective. Because of this, and because self-sufficiency essentially refers to the major staple grains, the latitude for policy adjustments to allow for productive shifts to higher-quality foods will be limited. The costs of food security, therefore, will be subsidies (inflationary, if financed with deficit financing or monetary expansion) to farmers to maintain rice and barley production, high consumer prices for and/or larger foreign exchange costs due to importation of the higher-quality foods, and possibly decreased competitiveness in export markets for industrial products due to higher labor costs.

Spatial Patterns of Population and Economic Activity: -- A final consequence of economic growth to be mentioned here, which has implications for Korean agriculture, is shifts in the geographic distribution of population and economic activity. As for the other areas already discussed, these shifts can be promoted, hindered and/or guided by governmental interventions and policy manipulation.

Korea has good and expanding networks of roads and rails which promote the efficient movement of people and goods between rural and urban areas, between urban areas, and to and from seaports. These networks are a necessary, though not sufficient, condition for success in the government's efforts to disperse, for social, economic and military reasons, Korea's highly concentrated population away from the Seoul and Pusan centers. They are also necessary to service the expanding seaport capacity around the country and the industrial centers being established at new seaport sites. Another means of stemming the tide of rural-urban migration, establishing more dispersed and lower-density population centers and supporting rural income is the promotion of rural industrialization. This can take the form of new industrial parks in rural areas and assistance and incentives to establish on-farm cottage industries. Heretofore, such efforts have not proved very economic or otherwise attractive because of the more difficult access to input and product markets and infrastructure services (communications, utilities, etc.). As the transportation and communication networks are expanded and improved, however, and as additional port facilities are opened, such industrial dispersal will become more feasible.

These changing spatial patterns imply that Korean agriculture will become more regionally diversified. With new population and industrial centers growing up around the country, the potential for shortening food market channels can be exploited by local production of food to service nearby communities. This trend can be further promoted if food processing industries, such as dairy and meat-packing plants, are among those dispersed. Although an improved transportation system may tend to promote regional specialization in the short to medium run, higher fuel costs will eventually offset this gain, thus further reducing the advantage of regional specialization.

Implications of Further Korean Development for Her Agricultural Policies in the 1980s

In the sections above we have seen that Korea's rapid rate of development has been furthered by her success in managing her agriculture. Korea's general development creates, in turn, other problems which will have to be handled with policy changes. In this section we look at policy issues associated with Korea's rapid development in terms of the interdependencies between her agricultural and nonagricultural sectors in view of her place in world trade. We then look at implications of these developments for policies

governing the process and structures whereby the Korean government makes decisions concerning its agricultural sector.

Implications of General Development for the Interdependencies Among Korea's Agricultural and Nonagricultural Sectors and the World Economy: -- Among the important topics to be discussed under this rubric are (a) policies involving technological change, research, extension activities and the allocation of manufactured inputs, (b) land development and land use policies, (c) labor and human development policies, (d) price trade and income policies with particular emphasis on foreign trade and exchange earnings, (e) policies influencing production other than those covered in "a" through "d" above, and (f) infrastructure policies with respect transportation, communications and food marketing and processing facilities.

As populations grow, demands for food expand in Korea, nonfarm incomes rise and the pressure for off-farm migration increases. This, in turn, creates the need for new technologies to furnish both land and labor substitutes to the agricultural economy. Agricultural research to produce such new technologies can be financed by either the public or by private industry. In the case of Korea, substantial reliance will have to be placed on the public sector until the industries supplying inputs to agriculture become better developed and develop more capacity to finance such research. Even in a country as developed as the United States, much of the basic research underlying technological advance is supported in the public sector. The farm machinery companies, the feed manufacturers and the producers of improved seeds and planting materials tend to carry out the development phase of the research and development process which creates these new technologies. The same is true for the agrochemicals and the biological inputs so important in modern agriculture. By and large, the Korean business environment appears to be one which will permit private companies to develop; however, they will need a research base on which to develop. Once new technologies are developed, the materials carrying these new technologies, whether they be new machines, new chemicals, improved varieties or better breeding stock, have to be produced and made available to farmers. Still further, farmers have to be educated as to their availability and productivity. This calls for publicly supported education and extension programs as well as private advertising and promotion campaigns by companies. Still further, good research, the ready availability of modern equipment and materials and effective extension programs do not do the job unless the economic environment is favorable for the use of the materials and equipment carrying the new technology. Price policies were discussed earlier. Tax policies are also important. If a government taxes away the profits accruing to farmers from using new technologies, one can be assured they will not be used.

Currently, much attention is being given in the international commodity research centers to development of varieties and technologies appropriate to constraints faced by farmers. While commendable in many respects, there is also a danger in this strategy. A rapidly developing, vigorous economy like Korea's may find it more advantageous to overcome resource ownership, infrastructural, educational, water and drainage constraints through governmental (both central and local) policies, programs and projects than to settle for second-rate, constrained technologies.

Land development and land use policy are important and are going to become more important in the future. Land holdings in Korea are now too small to permit Korean farmers to keep up with the incomes now being received in the nonfarm sector. In the 1980s, Korean agricultural policy makers will have to face up to policy issues involving farm enlargement, land consolidation, cooperative farming, and part-time farming which implies a wide dispersal of industry throughout the countryside. There will also be a continual need to protect Korea's meager agricultural land resources from encroachment

by cities, roads and various public facilities. Reforestation policies and programs will also be important.

Korea has invested rather heavily in education of its people. As economic development occurs and as the farm sector becomes increasingly mechanized, it will be necessary to educate farm people to handle the modernized factors of production. Farmers using modern inputs are no longer laborers who can be replaced by a simple machine or mechanism; instead, they are skilled technicians. In addition, as farming operations become large enough to use modern equipment, individual farm businesses will have to get bigger or various forms of cooperative farming will have to be developed. The farmers who manage larger farms and farming co-ops have to be skilled businessmen. There will be important policy decisions to be made in the '80s concerning the upgrading of Korea's farm people.

Price, trade and income policies will be important for Korean agriculture in the '80s. South Korea is not a large country; however, it extends a considerable distance from the north to the south and there are considerable advantages in trade in agricultural products among the regions. Korea needs to examine its rice procurement and release policies very carefully to be sure that governmental operations do not interfere with the development of efficient patterns of production and trade within the country. Even more important are the trading relationships with the other countries of the world. Self-sufficiency with respect to agricultural products is important in Korea and is a matter of national security. However, as the country gets richer and as its population increases, the demand for food will tend to expand considerably. As this happens, the cost of producing more and more food on Korea's limited land resources will increase, particularly if an attempt is made to keep farm incomes on a par with nonfarm incomes. If such an attempt is not made, much of Korea's less productive land may be abandoned as farm people turn to urban employment for higher standards of living. The policy issue will be: what is the appropriate level of self-sufficiency to be maintained in Korea in view of rising nonfarm standards of living and national security? The degree of self-sufficiency required for military security does not require total self-sufficiency with respect to semi-luxury foods consumed by the middle and upper income classes in peacetime.

There are policies which influence production other than those mentioned above and other than those having to do with rural infrastructure. The Korean government has made direct investments in productive capacity of Korean agriculture by supporting the development of irrigation and drainage systems. Undoubtedly, as the need to mechanize and modernize agriculture becomes more pronounced, questions will be raised about the use of government funds, including subsidies and the granting of favored treatment to various input manufacturers in the nonfarm economy. Many proposals will involve government production or procurement and distribution of the modern factors of production. Some of these proposals will be advantageous and should be acted on. Others will be unimportant or will tend to displace private industry which could develop capacity to do these things better than governmental agencies. The '80s will see many questions involving projects, programs and policies to further the productive capacity of Korean agriculture.

Finally, Korea's continued development in the '80s and '90s will require public investment in the infrastructure to support them. Included will be investments in transportation and communication systems, and food marketing and processing facilities. As discussed above, improvements and extensions of Korea's already fairly well developed transportation and communication networks will be necessary for the succesful dispersion of industry and population away from the Seoul and Pusan concentrations. These expanded networks will also be necessary to service the new seaport facilities which are

being established and will continue to be constructed in the '80s, thus contributing to an expanded foreign trade capacity for Korea. The changing effective demand for foods in increasing quantities and of higher quality, discussed above, will also have implications for Korea's transportation system as well as for her food marketing and processing facilities. Thus, government policies regarding investment in and management of infrastructure development cannot be designed in isolation from policies concerning industrialization, trade promotion, population, rural development and food and agriculture. Implications of the interdependence of policy areas is a topic we take up in the next section.

Implications for Decisionmaking Processes and Structures: -- As Korea's society and economy continue to progress to higher levels of development, they will become increasingly complex and diverse in terms of geographic distribution, economic activity and social needs, as we have indicated above. These considerations will have implications for the way in which government policy is made in Korea. As pointed out at the end of the last section, infrastructure policy must be well coordinated with policy in several other areas, and this will be increasingly true of other policy areas as well. This implies a need for a comprehensive approach to public policymaking in Korea and for a comprehensive, consistent and readily accessible information system to service it.

Korea's series of successful Five-Year Plans is one means of interrelating the various policy areas in a comprehensive, consistent framework. However, the rapid changes taking place in Korea and the relative inattention given to the Five-Year Plan in day-to-day decisionmaking and even in annual planning and budgeting attest to the rather short relevant life of such plans and to the need for a more regular approach to comprehensive and consistent planning and policymaking.

Agricultural planning in Korea has made significant progress in this area in the form of the earlier [4, 5] and on-going agricultural sector policy analysis simulation work at KREI. Further development of this capacity and its linkages to similar capacities in other Korean public and private organizations is necessary, however, to better consider the interdependencies between agriculture and input markets, food distribution systems, rural industrialization and other sectors of socioeconomic activity. These capacities for subject-matter analysis also need to be linked to capacities for problem-solving analysis located within the decisionmaking units of MAF, EPB and elsewhere in the public and private sectors - a linkage begun under the Korean Agricultural Planning Project but which needs to be further strengthened and expanded.

Korean development will have implications not only for the process of government policy making but also for the institutional structures which carry out that process. The increased complexity, diversity and interdependencies of Korea's society and economy will require large amounts of information and energy to maintain, particularly for a highly centralized decision structure. The costs of acquiring the quantity and quality of information necessary for centralized management of such a system and of implementing and enforcing management decisions will become increasingly prohibitive, reducing management effectiveness to the detriment of stable and orderly development. Thus, while centralized decisionmaking has aided the early stages of Korean development, and perhaps has even been essential for it, that very development has created the pressures for decentralization Korea has experienced and will continue to experience.

Decentralization of decisionmaking does not mean uncoordinated decisionmaking, however. While complex and diverse, the various segments of Korean society and the economy will also be increasingly interdependent, so that decisions cannot be taken in isolation but must be coordinated and mutually consistent. This implies a great degree of

communication and mutual cooperation among government ministries and other decision-making units at the national level and between national, provincial and local decision-making units in both the public and private sectors.

Such "coordinated decentralization" is by no means an easy task and there are no general formulas which Korea can follow. Indeed, the path taken depends heavily on each country's own history, cultural values and resource endowments. The United States, which began its historical development as a very decentralized system, has become much more centralized in the last half century in response to unprecedented social and economic pressures, and is now entering another difficult era which includes pressures for coordinated decentralization. The nations of the European Community, as decentralized nation-states, have seen the need for some form of coordination to deal with the strong interdependencies among them and their vulnerability as individual nations to outside pressures. The accession of additional nations to the Community -- from six to nine to, in a few years, 12 -- testifies to the strong advantages of coordination. Full political union, however, because of the prohibitive management costs of centralization discussed above, is probably unlikely, despite the lip service currently paid to that goal. The path Korea takes will have to be uniquely Korean, but that path must be taken if social and economic development is to continue in an orderly and stable manner.

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