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**Effects of Trade Liberalization on
Agriculture in the Republic of Korea:
Commodity Aspects**

Myung-Hwan Sung

The CGPRT Centre

The Regional Co-ordination Centre for Research and Development of Coarse Grains, Pulses, Roots and Tuber Crops in the Humid Tropics of Asia and the Pacific (CGPRT Centre) was established in 1981 as a subsidiary body of UN/ESCAP.

Objectives

In co-operation with ESCAP member countries, the Centre will initiate and promote research, training and dissemination of information on socio-economic and related aspects of CGPRT crops in Asia and the Pacific. In its activities, the Centre aims to serve the needs of institutions concerned with planning, research, extension and development in relation to CGPRT crop production, marketing and use.

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Abbreviations

AFMC	Agricultural & Fishery Marketing Cooperation
AMS	Aggregate measurement of support
BOP	Balance of payments
CGPRT	Coarse grains, pulses, roots and tubers
CMA	Current market access
GATT	General Agreement on Tariffs and Trade
IMF	International Monetary Fund
KATIC	Korea Agricultural Trade and Information Center
KGCF	Korean Ginseng Cooperative Federation
KT & GC	Korean Tobacco and Ginseng Cooperation
MMA	Minimum market access
NACF	National Agricultural Cooperation Federation
NTC	Non tariff concern
TE	Tariff equivalent
WTO	World Trade Organization

Foreword

Responding to the growing concern for the effects of trade liberalization on regional agriculture, the CGPRT Centre started a three-year research project “Effects of Trade Liberalization on Agriculture in Selected Asian Countries with Special Focus on CGPRT Crops (TradeLib)” in March 1997, in collaboration with partners from ten countries: China, India, Indonesia, Japan, Malaysia, Pakistan, the Philippines, the Republic of Korea, Thailand and Viet Nam. In all these countries, important issues regarding trade liberalization were investigated with an identical research framework by national experts.

The investigation covers major crops which might receive either favorable or unfavorable effects of trade liberalization both in export and import. I believe that readers of the reports can obtain broad and practical knowledge on institutional aspects of the effects of trade liberalization; moreover, the information will be useful for researchers and policy planners in other countries in the region. A volume which includes more commodity and location-oriented study on the same subject will follow. I would like to note that, since this project was conceived and started before the current currency and economic crisis began in the middle of 1997, the analysis handles basically the period before the crisis with available current information.

I am pleased to publish **Effects of Trade Liberalization on Agriculture in the Republic of Korea: Commodity Aspects** as the report of the second phase of the country study of the Republic of Korea. A report of the first phase of the country study, which includes institutional and structural aspects on the same subject, was published recently. I certainly hope these reports will be fully utilized for the improvement of agricultural trade and the encouragement of regional agriculture.

I thank Dr. Myung-Hwan Sung of the Republic of Korea for his intensive research and the Korea Rural Economic Institute (KREI) for allowing him to work with us and for providing continuous support. Dr. Boonjit Titapiwatanakun ably coordinated the various complex steps in the study. I would also like to express appreciation to the Government of Japan for funding the project.

Haruo Inagaki
Director
CGPRT Centre

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Executive Summary

This study is a part of a project initiated by the United Nations ESCAP CGPRT Centre, entitled “Effects of the Trade Liberalization on Agriculture in Selected Asian Countries with Special Focus on CGPRT Crops.” This is a three-year project consisting of three parts, an institutional study, a commodity study and a location-commodity specific study. The present study covers the commodity and location-commodity specific parts of the project. The study focuses on the effects of trade liberalization on agriculture in Korea with special focus on CGPRT crops. The main objective of this part is to analyze the effects of trade liberalization at the national level and farm level, and to examine impacts of the current financial crisis on domestic prices in Korea.

Korean agriculture has also progressed in line with general economic development. Attempts to develop the agricultural sector were made in the early 1960s. The objective of agricultural development was to increase food production as Korea had suffered from a chronic food deficiency. However, the importance of the agricultural sector in the Korean economy has been shrinking with the progress of industrialization.

The Uruguay Round launched in 1986 was the eighth round of multilateral trade negotiations conducted under the GATT (General Agreement on Tariffs and Trade). The Uruguay Round Agreement on agriculture has forced agricultural policy reform, which may remove all trade barriers and subsidies, on member countries. In the case of Korea, negotiations held in December 1993 settled the details for an open form of major agricultural product market and the size of reduction in subsidy due to the preferential trade arrangement for developing countries.

Since the beginning of the UR negotiation, Korea has opposed the tariff principle without exception, but has opened the market by the minimum market access (MMA) instead of deferring tariffication in the case of rice. Korea has decided upon the maintenance of a quota system for a fixed period, tariff increases in the case of other publicly noted items and the setting of a ceiling tariff in the case of non-concession items. The right to import these items through state trade, quota auction, recommendation of real demander and so forth are effectively distributed and managed. Profits created by state trade and quota auction are absorbed into a fund and invested in business to raise competitive power.

Korea was recognized as a developing country for tariff reduction and compliance with the fulfillment period. In particular, the calculation of tariff equivalents considers the base period of 1988-90 (1986-88 in the document of the UR agreement on agriculture) and the reduction rate and period are reduced to two-thirds of the level of developed countries. However, import liberalization by tariffication on all agricultural, fishery and livestock products with the exception of rice, which is major source of income for farmers, was inevitable.

Due to the conclusions of the UR negotiations on agricultural products, Korea has imported rice in accord with minimum market access from 1995. The MMA of 1-4% of domestic consumption has been granted. The quantities of import for barley, potato, and sweet potato among major agricultural products are 3-5% of total domestic consumption by MMA. The import quantities for soybean and maize increased above current import levels. Imports of red pepper, garlic, onions, and sesame, which were concession items before the UR agreement, are 3-5% the level of total domestic consumption due to their import liberalization.

Under the WTO, the stable supply of foodstuffs in Korea is related to food policies, because the self-sufficiency ratio is continuously decreasing and the import of foodstuffs shows a continuously increasing tendency. If complete liberalization of agricultural trade is realized,

the Korean self-sufficiency rate for foodstuffs will decrease markedly. Korea's capability to produce food, including the main food, rice, is weak and very unstable. Another problem is to overcome the financial crisis which started in November 1997. The rising exchange rate has also increased production costs in the agricultural sector. The income and expenditure of farm households became worse due to the increase in farming costs caused by the rapid currency depreciation, increase in the interest rate and constraint of loans by financial institutes, and decrease in consumption of agricultural products. For these reasons, some farm households have abandoned agriculture and the agricultural production structure has changed.

In this situation of flux in domestic and international environments, farmers' incomes in Korea are highly dependent on agriculture and the impacts of trade liberalization on agricultural products are very significant in Korea as well as in other countries in the Asian area. The greatest impact is the decrease in domestic prices of agricultural products.

To analyze the effect of trade liberalization on domestic agriculture at the national level, a baseline was set as the basis for comparison. Also, for each of the selected products, i.e., rice, soybean, onion, and ginseng, two scenarios were made. The baseline for the four commodities was the average of the domestic prices, production quantity, and consumption amount during the 1992-1994 period (three recent years before launching WTO). Scenario I for rice, soybean, and onion is the case where the import quota by MMA becomes 1% of total consumption after trade liberalization. Scenario II assumes that the import quota by MMA becomes 4% of total consumption after trade liberalization. In the case of ginseng, scenario I assumes that the import quota by MMA becomes 0.25% of total consumption after trade liberalization. On the other hand, scenario II uses the value 0.5%.

The effect of trade liberalization at the national level was calculated using the elasticities of demand, supply, and price transmission. Based on the effects on the consumption, production, and prices with trade liberalization, changes in the consumer and producer surplus are calculated. The results are expectations of how the producer and consumer welfare would be changed with further progress of trade liberalization. In the case of rice, scenario I shows that the consumer surplus, as a result of trade liberalization, would be increased by 261.3 billion won, whereas the producer surplus would be decreased by 192.0 billion won. Therefore, it can be expected that the social welfare gain will be 69.3 billion won. Scenario II indicates that the increase in the consumer surplus would be 1,060.7 billion won compared to the baseline, whereas the producer loss would be 759 billion won. Therefore, the social welfare gain will be 301.7 billion won.

In the case of soybean, scenario I shows that the consumer surplus, as a result of trade liberalization, would increase by 72.1 billion won, whereas the producer surplus would decrease by 5.7 billion won. Therefore, the social welfare gain will be 66.3 billion won. Scenario II indicates that, compared to the baseline, the increase in the consumer surplus would be 292.5 billion won, whereas the producer loss would be 22.6 billion won. Therefore, it can be calculated that the social welfare gain will be 269.9 billion won.

In the case of onion, scenario I shows that the consumer surplus, as a result of the trade liberalization, would increase by 13.8 billion won, whereas the producer surplus would decrease by 2.4 billion won. Therefore, the social welfare gain will be 11.4 billion won. Scenario II indicates that, compared to the baseline, the increase in the consumer surplus would be 56 billion won, whereas the producer loss would be 9.4 billion won. Therefore, the social welfare gain will be 46.6 billion won.

In the case of ginseng, scenario I shows that the consumer surplus, as a result of trade liberalization, would increase by 2.3 billion won, whereas the producer surplus would decrease by 1.2 billion won. Therefore, the social welfare gain will be 1.1 billion won. On the other hand, scenario II indicates that, compared to the baseline, the increase in the consumer surplus would be 4.6 billion won, whereas the producer loss would be 2.4 billion won. Therefore, the social welfare gain will be 2.3 billion won.

Thus, the effect of trade liberalization on consumer prices is greater than on producer prices. This means that the actual import quantities of the selected commodities would increase to the import quantities estimated to accompany further progress of trade liberalization of agricultural products. All of the selected commodities will have consumer gains due to the lower consumer price and producer loss due to the decrease in producer prices. As a result, the producer loss for a commodity which has high self-sufficiency, such as rice and ginseng, is larger than that for a commodity which has low self-sufficiency, such as soybean.

Partial budget analysis was used to evaluate the effects of trade liberalization at the farm level. For the partial budget analysis between with and without trade liberalization, the change in the net return is calculated according to the change in farm price at the farm level. It is assumed that the input quantity and costs are not changed. If there were no trade liberalization, the farm price of rice would be 1,847 won per kg, increased by 7% compared to 1,726 won with trade liberalization. Due to trade liberalization, although the seeding cost is reduced, annual farm returns would be reduced by 67,203 won per 10 a.^{*} In the case of soybean, the farm price of soybean would be 2,035 won per kg, increased by 5.4% compared to 1,931 won with trade liberalization. The trade liberalization of soybean would reduce annual farm returns by 20,691 won per 10 a.

Under the scenario without trade liberalization the farm price of onion per kg would be 304 won, increased by 7.5% compared to 283 won with trade liberalization. Due to trade liberalization, annual farm returns of onion would be reduced by 110,456 won per 10 a. If there is no trade liberalization, the farm price of ginseng would be 17,267 won per kg, increased by 0.5% compared to 17,181 won with trade liberalization. Due to trade liberalization, although the seeding cost is reduced, the annual returns of ginseng farming would be reduced by 34,791 won per 10 a.

From the above results, although the farm price of rice was only decreased by 7% at the national level, net returns of rice were reduced by 9.4% at the farm level. The negative effect of trade liberalization, on net returns of soybean at the farm level was much higher than that on the farm price. For onion, the farm price was reduced by 7.5%, however, net returns were decreased by 11.4%. These results mean that net returns of farming households decrease and the condition of farm management deteriorates due to trade liberalization. With trade liberalization of ginseng, there is little effect of price change on net returns at the farm level.

In order to capture the effects on domestic prices of exchange rate changes induced by the current financial crisis, price transmission and exchange rate pass-through elasticities were used. The transmission elasticity of soybean shows that given a 1% increase in the import price causes the domestic price of soybean to increase by 1.309%. The exchange rate pass-through elasticity of soybean shows that given a 1% increase in the exchange rate, the domestic price of soybean increases by 2.4884%. This seems an unusual case. The high figures mean that the domestic consumer price of soybean is very sensitive to changes in the import price and exchange rate.

The price transmission and exchange rate pass-through elasticity for wheat flour are 0.2756 and 1.3644, respectively. The domestic consumer price of wheat flour is more affected by a change in exchange rate than by a change in the import price. The price transmission and exchange rate pass-through elasticity of a feed mixture for beef cattle and swine are lower. Given a 1% increase in the import price of maize or exchange rate, the domestic feed price paid by farmers increases about 0.3%. This result corresponds to the fact that the increasing rate of price index paid by farmers is lower than that of the consumer price index for food and beverages for the period of 1997-98.

^{*} 10 a (are) = 0.1 hectare.

In summary, considering the overall results of this study, it seems that trade liberalization of agricultural products will increase consumer welfare. Nevertheless, it is expected that there would be a decrease in producer welfare and farm income. Also, due to trade liberalization, the price of agricultural products would decline, then this would lead to stagnation of growth in agriculture. Furthermore, the population and labor participation rate in rural areas would decline, so, the unemployment rate in agriculture will be a great issue in Korea.

If trade liberalization is completely allowed, agricultural production will decline on a large scale, then insecurity of farm households will be greatly increased in the agricultural sector. Prior to the import opening, growth of the agricultural sector was dependent on the conditions of domestic demand and supply. Furthermore, change in both inter and intra macro economic conditions (i.e., exchange rate and price change in domestic and world markets) will greatly affect the domestic agricultural sector.

Currently, it is important for agricultural policy to promote agricultural growth and rural development to increase the income of farm households. Accordingly, in order to alleviate the current agricultural situation in Korea, agricultural policy is focusing on the construction of agricultural infrastructure to promote productivity of paddy land and upland. In order to cope with trade liberalization, the Korean government needs to invest in agricultural infrastructure so the government can improve the structure of the agricultural industry.

For these purposes, policy implications to be considered by policy-makers are outlined briefly below. The government should increase investment in the construction of the agricultural infrastructure to improve production conditions, such as irrigation development, readjustment of arable land, and research and extension for grains. Also, the government needs to construct an integrated agricultural information system to improve production and the marketing system. For security of foodgrains, policy such as production support for the purpose of food security and consolidating competitiveness for self-sufficiency of foods, especially rice, is promoted. In order to reduce production costs, new varieties with high yield and high quality should be developed and efficient farm management should be accomplished by agricultural mechanization. Moreover, along with trade liberalization, the trade policy of import restriction should be changed to efficient import management of foodgrains.

1. Introduction

1.1 Background and objectives

The role of agriculture in Korea has decreased in spite of the achievement of self-sufficiency of rice and barley in the late 1970s, while a large proportion of the population is still employed in agriculture. Even though the share of the farm population decreased from 44.7% in 1970 to 9.7% in 1997, the farm population was 4.5 million in 1997. Of the total land area in Korea (9.9 million ha), the area of cultivated land amounted to about 1.9 million ha in 1997. Paddy fields and upland were about 1.16 million and 0.76 million ha, respectively. Average farm size in Korea is still merely 1.3 ha. This small farm structure has been a major constraint to development of the agricultural sector.

Faced with strong pressure to liberalize agricultural imports, Korean agriculture has been urged to achieve structural adjustment to compete in an internationally open market. The basic factor limiting agricultural productivity, small farm size, will not improve substantially in the near future in spite of the restructuring plan, as the land itself is so limited. Therefore, it is essential to compare production, prices, and export and import of major agricultural products to evaluate the effects of trade liberalization before and after trade liberalization in Korea. The decision-makers are limited in policy measures, since all agricultural policies are to be regulated under the disciplines of the WTO.

In this situation of flux in domestic and international environments, farmers' incomes in Korea are highly dependent on agriculture and impacts of trade liberalization on agricultural products are very significant in Korea as well as in other countries in the Asian area. The greatest impact is the decrease in domestic prices of agricultural products. Considering the current situation of Korean agriculture, it is believed that the present small farming size needs to be expanded to increase farm household income.

While analyzing the effect of trade liberalization on the agricultural products, the effect of trade liberalization on the domestic agricultural industry will be assessed, and the possible alternatives for agricultural policy will be presented, based on the results of this study. The study focuses on the effects of trade liberalization on agriculture in Korea with special focus on CGPRT crops. The main objectives of the study are:

- to identify the international trade of agricultural products in Korea under further liberalized market conditions,
- to characterize the situation and prospects of agriculture with special attention to the effects of trade liberalization,
- to specify policy options for improving farm income in the process of trade liberalization, and
- to provide concerned policy-makers and researchers with discussions and suggestions on the findings.

Given these objectives, the project consists of three parts, namely the effects of agricultural trade liberalization at the national level, the effects of trade liberalization on selected agricultural commodities at the farm level, and the effects of the current financial crisis on the agricultural sector.

For evaluating the effects of trade liberalization at the national level, welfare analysis will be applied. For evaluating the effects of trade liberalization at the farm level, the effects with and without trade liberalization, which affects domestic products and input prices, will be examined. The farm level study covers four commodities: rice, soybean, onion, and ginseng. For evaluating the effects of the current financial crisis on the agricultural sector, the law of one

Chapter 1

price will be applied to analyze the effects of import price on domestic price. This study covers four commodities: soybean, wheat flour, and feedstuffs for beef and pork.

1.2 Outline of the study

This report consists of five chapters. The first chapter presents the background, objectives, policy review related to trade liberalization, and current issues on institutions and policy. The second chapter overviews the theoretical concepts and selection of commodities. Then, crucial production, marketing, and trade-related policies on selected commodities are examined and the effects of trade liberalization are analyzed at the national level. The third chapter presents the methodology and the results using partial budget analysis in order to evaluate the effect of trade liberalization at the farm level. In the fourth chapter, the effects of exchange rate changes on domestic prices as in the current financial crisis in Korea are analyzed. Conclusions and policy implications are summarized in the last chapter.

1.3 Summary of institutional and policy review study

This section summarizes the institutional and trade policy review undertaken in the first phase study which was published (Sung 1998). Korean trade policy has its major emphasis on production of domestic industries, stabilization of prices, improvement of the balance of payments, increase in employment, and efficient usage of production factors. In Korea, exports have been important in economic growth from the 1960s. In the 1960s, Korea's trade policy had its main focus on promoting exports, while improving the balance of payments by controlling imports. Along with depreciation of the Korean won, a monetary policy and tax system were established to promote exports. Therefore, to achieve rapid economic growth, the foreign trade policy in the 1960s emphasized supply of foreign exchange and improvement of the balance of payments. To achieve such goals, the Korean government took steps to support the export sector, while reasonably controlling the import sector.

In the 1970s, to maintain continuous rapid growth, trade policy emphasized increase in exports and stability of domestic prices by simplifying import regulations. As a result, the five-year economic development plans, which were in effect throughout the 1960s, reached their goal of rapid economic growth. Furthermore, along with inflation, the rapid economic growth in Korea increased the income gap among people. Accordingly, while based on export promotion to reach rapid economic growth, the foreign trading policy in the 1970s partially allowed liberalization of imports for stabilization of domestic prices of consumer goods and to strengthen competitiveness in the international market.

In the 1980s, the main goal of the trade policy was correcting the balance of payments. To overcome the scarcity of national resources and the constraint of a small domestic market, it was necessary for the Korean government to strongly enhance the balance of payments to achieve continuous economic growth. However, this goal of balancing payments could not be reached because of political as well as social instabilities within the nation. At the end of the 1980s, due to rapid increases in wages and conflicts between employees and employers, the Korean economy weakened in terms of international competitiveness, and as a result, economic growth deteriorated. The deterioration of this situation was linked to deficits of the balance of payments in 1990s. Accordingly, strengthening competitiveness in the international market emerged as the government's major task in the 1990s. Also, easing regulations, self-control of money and banking, and liberalizing imports were promoted by the Korean government in the early 1990s.

Government fiscal policy functions to allocate resources, distribute income, and stabilize the economy. The major purpose of operating public finance lies in promoting potential

economic growth, supplying public goods in appropriate sectors to enhance social welfare, and maintaining stability of the economy. On the other hand, government fiscal policy has an important effect on economic fluctuation by changing total demand for currency. The objective of public finance is basically economic stability; however, proper income distribution, which is a main function of public finance, has not yet been accomplished in Korea. The fiscal scale in Korea increased in the 1960s and 1970s, when there was rapid economic growth. Although the scale of government expenditure has rapidly increased, the scale relative to the whole economy tended to decrease after reaching at a maximum level in the early 1980s. The scale in the late 1980s and early 1990s compared to the early 1980s decreased.

The monetary and credit policy fixed the goal of M2 (money supply including time and saving deposits and resident's foreign currency deposits at monetary institutions), at 11.5-15.5%, in order to ensure a stable monetary supply, so that the economy could run smoothly and aggregate money demand be maintained at the optimum level. Furthermore, the stable relation between total monetary supply and price levels has been weakened due to the progress of financial deregulation and openness. In this situation, throughout the year the monetary and credit policy stressed stability of the financial markets to increase flexibility of currency operations with stable management of mid and long run liquidity. In 1996, the pressure of price increases in the face of aggregate money demand did not appear.

In the case of Korea, the negotiations held in December 1993 settled the details for an open form of major agricultural product market and the size of reduction in subsidy due to the preferential trade arrangement for developing countries. However, application of many negotiation principles in the document for the country schedule for various items gave rise to technical problems and interpretation problems for negotiation principles. In addition, Korea and the USA in bilateral negotiation reached agreement on the key subjects within a short period. For the incomplete parts and omitted matter, which were not decided during the UR negotiation, Korea faithfully accomplished the principle of market openness in the UR agreement on agriculture and the content of bilateral negotiation and submitted the document for the country schedule.

Since the beginning of UR negotiations, Korea has opposed the tariff principle without exception, but has opened the market by the minimum market access (MMA) in the case of rice instead of deferring tariffication. In the case of publicly noted items other than rice, Korea has decided upon the maintenance of a quota system for a fixed time and increased tariffs. In the case of non-concession items, Korea has also decided upon the maintenance of a quota system for a fixed period with the setting of ceiling tariffs. In order to minimize the shock of liberalization, Korea decided upon a domestic managerial program for 67 groups of items (190 items) permitting market access by tariff quota on the document for the country schedule, accomplished the program from the first of January, 1995, and notified this process to the Committee of Agriculture in WTO. The right to import these items through state trade, quota auction, recommendation of real demander and so forth are effectively distributed and managed. Profits created by state trade and quota auction are absorbed into a fund and invested in business to raise competitive power.

To alter the domestic system to fulfill the obligations of the UR negotiation, Korea revised 11 laws such as the grain management law and the livestock law, which are related to management of imports of agricultural and livestock products, and newly legislated a special safeguard to prohibit a rapid increase in import of agricultural products. With regard to domestic subsidies in the agricultural sector, Korea annually reduced domestic subsidies at a fixed amount for items within the range of total aggregate measurement of support (total AMS). In addition, actual imports of some items were less than expected owing to decreases in domestic import demand or domestic price below international prices. Therefore, no rapid increase in imports was expected.

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Korea was recognized as a developing country for tariff reduction and compliance of the fulfillment period. In particular, the calculation of tariff equivalent considers the base period of 1988-90 (1986-88 in the UR agreement document on agriculture) and the reduction rate and period are reduced to two-thirds of the level of developed countries. However, import liberalization by tariffication on all agricultural, fishery and livestock products with the exception of rice, which is major source of income for farmers, was inevitable.

Due to the UR agreement on agricultural products, Korea imported rice by minimum market access from 1995. The MMA of 1-4% of domestic consumption has been granted for 10 years from 1995 to 2004. The quantities of import for barley, potato, and sweet potato among major agricultural products are 3-5% of total domestic consumption by MMA. The quantities of import for soybean and maize increased above current import levels. Imports of red pepper, garlic, onions, and sesame, which were concession items before the UR agreement, are 3-5% of the level of total domestic consumption due to their import liberalization.

In addition, Korea should reduce tariffs on agricultural products or the tariff equivalent by 24% on average for all items during 10 years. Protection of the domestic market by import limits becomes impossible and, therefore, a huge amount of some items of foreign agricultural produce can be imported. Korea should phase down agricultural subsidies that support agricultural production and prices. The AMS on agriculture, which should be reduced during 1995-2004, is 228.6 billion won.

1.4 Current issues on institutions and policy

According to the UR agreement on agriculture, the agricultural sector has to apply the principle of competition under the regulations of the World Trade Organization (WTO). Under the system of WTO, it seems that the demand for agricultural products in the world will increase due to increasing population and income. However, the agricultural production of importing countries would decrease due to the reduction of agricultural subsidies. On the other hand, the world agricultural market is a very unstable situation due to increasing prices and a slowdown in the growth of agricultural production caused by the consolidating of international environmental restrictions. In particular, the situation of demand and supply of foodstuffs in the world has experienced increasing uncertainty.

In Korea, the stable supply of foodstuffs is a matter of food policies, because the self-sufficiency ratio is continuously decreasing. The self-sufficiency ratio of foodstuffs was 31.7% in 1997. As production of rice has remarkably decreased since 1990, a deficiency in supply has occurred between in 1993 and 1996. The total stock at the end of 1997 was 250 thousand tons and a crisis of instability between supply and demand has emerged. Also, the self-sufficiency ratios of wheat and maize in 1997 are no more than 2.2% and 0.9%, respectively. The self-sufficient ratio of pulses has been decreasing continuously to the rate of 10.3% in 1997.

On the other hand, the importing of foodstuffs shows a continuous increasing tendency. In 1990, imports of wheat, which has been imported through the policy of liberalization of imports, increased considerably. In 1997, 3.2 million tons were imported. The total amount of maize has been increased from 6.2 million tons in 1990 to 8.6 million tons. During this period, the import of soybean increased from 1.1 million tons to 1.6 million tons. If complete liberalization of agricultural is realized, the Korean self-sufficiency rate of foodstuffs will markedly decrease. However, the capability of Korea to produce its food supply including the main food, rice, is weaken and very unstable. Accordingly, in order to alleviate this situation, food policy is focusing on the construction of agricultural infrastructure for promoting production on paddy land and upland.

The second current issue is to overcome the financial crisis which started in 1997. In November 1997, Korea had a foreign exchange crisis and requested IMF (International Monetary Fund) help to bail it out of the crisis. The high level of economic growth since the

1960s is now converted to minus economic growth. From a social point of view, the negative economic growth has resulted in increase in unemployment, rise in prices, decrease in income, rise in the interest rate, depreciation of exchange rate, etc.

The rising exchange rate has also increased production costs in the agricultural sector. The income and expenditure of farm households became worse with the increase in farming costs caused by rapid currency depreciation, increase in the interest rate and constraint of loans by financial institutes, and decrease in consumption of agricultural products. For this reason, some farm households have abandoned agriculture and the agricultural production structure has been changed. In particular, the livestock and horticultural industries were remarkably reduced due to the serious financial crisis. Therefore, important issues need to be addressed by agricultural policy to promote agricultural growth and rural development and increase the income of farm households suffering under the current financial crisis.

2. Effects of Trade Liberalization on Production, Marketing and Demand of Selected Commodities

2.1 Analytical methodology

The conventional theory of international trade is that exchange of goods and services benefits both trading countries. Such mutual benefits can be measured by increases in the income or social welfare of both countries. In the absence of transfer costs and tariffs, trade will equalize the foreign and domestic prices of the same product. A tariff increases the import price without direct limitation of import quantity. However, a tariff reduces directly the import quantity since the import demand depends on its price. On the other hand, an import quota restricts the import quantity without directly limiting the import price. However, an import quota will indirectly increase the import price. Therefore, tariffs and import quotas will have the same impact on trade. Every tariff has an equivalent quota in the sense that both ways result in the same price and quantity.

A tariff or import quota has some economic effects, because it not only protects the producers by maintaining the price of a particular product in the domestic market, but also it leads to a decrease in the consumer surplus. Since the imposition of the tariff on exported agricultural products maintains the domestic price of the agricultural products at a higher level than in the case of free trade, it could affect the production, consumption, allocation of income, and distribution of resources in the industry of the selected commodity. Tariffs and import quotas have some similar economic effects. Both tariffs and import quotas reduce the trade volume by raising import prices in the importing country. For this study, the economic effect of an import quota can be explained in Figure 2.1 in the partial equilibrium model. This framework assumes that the product is a final good.

If a country is viewed as a small nation, both the export supply and the import demand curves, which the nation faces, would be a horizontal line at the level of the world market price. If there were no trade barriers and the world market price were OP_2 , then the domestic production would be OQ_1 and the domestic consumption would be OQ_4 . And, if there were no quality differential between the domestic and the foreign agricultural products, the amount $OM_2=Q_1Q_4$ would be imported. This is the difference between domestic consumption and domestic production. However, if an import quota were imposed with magnitude OM_1 , then the domestic market price would be increased from P_2 to P_1 . As a result, domestic production will increase from OQ_1 to OQ_2 , whereas domestic consumption will decrease from OQ_4 to OQ_3 . Therefore, the import quantity will decrease from Q_1Q_4 to Q_2Q_3 .

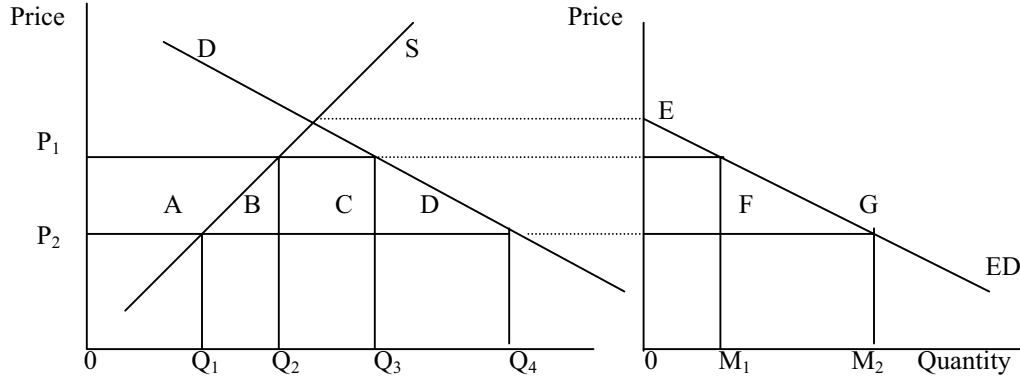
The excess demand curve is ED , which is the import demand curve with the import tariff. However, the import demand curve with the quota becomes EFM_1 which is kinked at the point of F . The reason is that an import quota greater than OM_1 cannot be permitted. Thus, import demand becomes vertical at the point of F . This means the elasticity of import demand is perfectly inelastic. However, quantities less than the quota are permitted, which implies that import demand depends on price to the left of F . The effects of the import quota of OM_1 on price and quantity are the same as the effects of a tariff P_1P_2 per unit.

As a result of the tariff imposition, the income of farm households that is derived from the increase in the domestic price as well as the increase in the production will be A . On the other hand, due to the increase in price and the decrease in consumption, consumers will have

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"surplus loss" as much as the sum of A, B, C, and D. Among the consumer surplus loss which is derived from the tariff imposition, A indicates the increase in the producer surplus, and C indicates the increase in government financial revenue. Both A and C could be returned in part, however both B and D would remain as a "social cost" that is derived as a result of the tariff imposition. After all, the welfare level in the whole country would be reduced. On the other hand, D is also considered as the consumer surplus loss, which would not be returned at all. Due to the tariff imposition, social costs will be determined by the level of the tariff as well as by the size of the price elasticities for demand and supply of the products.

Figure 2.1 Economic effects of import quota.



To measure the effect of the trade liberalization with tariff or import quota on consumers as well as producers according to the above framework, the demand and supply functions would be as defined in this section. In general, the demand function is derived from the maximization of utility function, subject to income and relative price of commodities. That is, the demand function for a particular product could be defined as follows:

$$Q_d = f(P_c, P_{sc}, I) \quad (\text{Equation 2.1})$$

where P_c and P_{sc} are own price for a specific product and substitute price purchased by consumers, respectively. I is consumer income.

The supply function could be defined as follows:

$$Q_s = f(P_f, P_{sf}, T) \quad (\text{Equation 2.2})$$

where P_f and P_{sf} are own price for a specific product and substitute price received by producers, respectively. T is time trend, which reflects change in production technique, etc.

With complete liberalization of international trade, the domestic import price will be equal to the foreign price expressed in terms of the trading country's currency. In the case of imposing a tariff, the domestic price will be equal to the sum of the import price based on C.I.F., tariff, and transfer cost. Equation 2.3 shows the relationship between domestic price and import price. The domestic price linkage equation between farm price and consumer price is defined in equation 2.4.

$$P_d = P_{c.i.f.} + \text{Tariff} + \text{Transfer cost} \quad (\text{Equation 2.3})$$

$$P_f = a + bP_d \quad (\text{Equation 2.4})$$

where P_d is the domestic price for a specific product and is assumed to be equal to the consumer price. P_f is the farm price.

From the above demand, supply and price linkage function, various elasticities could be calculated as follows:

$$\varepsilon_d = \frac{dQ_d}{Q_d} \frac{P_d}{dP_d} \quad (\text{Equation 2.5})$$

$$\varepsilon_s = \frac{dQ_s}{Q_s} \frac{P_f}{dP_f} \quad (\text{Equation 2.6})$$

$$\varepsilon_t = \frac{dP_f}{P_f} \frac{P_d}{dP_d} \quad (\text{Equation 2.7})$$

where ε_d , and ε_s are demand and supply elasticity for the specific product. ε_t is the transmission elasticity between prices in the two markets.

2.2 Selection of commodities

Recently, there have been increases in household income, changes in lifestyle, changes in family structure, aging population, change in structure of the labor market, and drastic increase in women's labor force participation. Along with these changes, the food consumption patterns in Korea have changed as well. In particular, there have been some transitions in food consumption patterns, that is from cereals to high quality agricultural products. Considering the change of food consumption patterns in Korea, commodities such as rice, soybean, onion, and ginseng were selected to evaluate the effect of trade liberalization on each of the four product categories.

As the main foodgrain for Korean people, rice was selected because it takes not only a great portion of the farm households' total income, but also a high weight in the consumption expenditures for urban households. With the trend in consumption of high quality food in Korea, consumption of meat has increased. Imports of soybean, wheat, bean, maize, which are usually used as feed for livestock, have increased every year. We selected soybean to represent imported feed.

Along with the trend of increase in per capita vegetable consumption, there has been a trend of increase in the consumption of onion and garlic in Korea. Therefore, onion was selected for our study. Under the present circumstances in Korean agriculture, rice, soybean, and onion must be imported from other countries, whereas ginseng has been one of the major export products in Korea. Accordingly, by focusing on rice, soybean, onion, and ginseng, this research will measure the effect of the trade liberalization on production and consumption of both imported and exported agricultural products.

2.3 Production, marketing, and trade-related policy on selected commodities

2.3.1 Rice

Korea is located in the area of the temperate monsoon climate in which rice grows very well due to the abundant rainfall. Accordingly, rice has been a major foodgrain for Korean people. The variety of rice cultivated in Korea is Japonica. Rice production reached 6,053 thousand tons in 1988. Since then, the production of rice declined. However, production soared again in 1996, and it reached 5,450 thousand tons in 1997 in terms of the milled rice. The planted area was at a peak of 1,260 thousand ha in 1988 and has continuously declined. The

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planted area was 1,052 thousand ha in 1997. The yield has increased continuously and passed 5 tons in both 1996 and 1997. Overall, the average harvested quantity was about 4.6 tons per ha for milled rice, during the 1985-1997 period (Table 2.1).

The cultivation area of rice showed an increasing rate during the 1986-1987 period, but it has declined since 1989. During the 1987-90 period due to new urban development, there was an increase in demand for land for non-agricultural purposes. Also, in the 1990s, coarse grains, pulses, and potatoes, that are usually cultivated in uplands, moved to paddy land. Furthermore, vegetables for spices, vegetables planted in greenhouses, and fruits were cultivated on paddy land. Therefore, there is a shortage in cultivation area for rice in Korea.

Table 2.1 Planted area, yield, and production of rice in Korea.

Year	Planted Area ('000 ha)	Yield (ton/ha)	Production ('000 tons)
1985	1,237	4.56	5,626
1986	1,236	4.54	5,607
1987	1,262	4.36	5,493
1988	1,260	4.81	6,053
1989	1,257	4.70	5,898
1990	1,244	4.51	5,606
1991	1,208	4.46	5,384
1992	1,157	4.61	5,331
1993	1,136	4.18	4,750
1994	1,103	4.59	5,060
1995	1,056	4.45	4,695
1996	1,050	5.07	5,327
1997	1,052	5.18	5,450

Source: Ministry of Agriculture and Forestry, Statistical Yearbook of Agriculture & Forestry, 1998.

Table 2.2 shows the utilization of rice. Total utilization of the rice continuously increased until the mid of 1980s, and peaked at 5,805 thousand tons in 1986. However, since then it has decreased continuously. In 1997, the total utilization of rice was 5,225 thousand tons. More specifically, consumption for food purposes decreased from 5,308 thousand tons in 1986 to 4,688 thousand tons in 1997. Rice consumption for processing purposes rapidly increased from 43 thousand tons in 1985 to 351 thousand tons in 1994. However, by 1995, rice for processing had started to decrease.

During the 1988-1994 period, rice consumption for processing purposes continuously increased. This increase could have happened because the government stock increased due to repeated huge harvests. Therefore, the Korean government released lots of old rice at lower price for processing (e.g., making alcoholic beverages). During the 1980-1990 period, per capita rice consumption for meal dropped at about 2% per year. Rice consumption per capita has decreased since 1985 and stood at 102.4kg in 1997.

Table 2.3 shows the rice balance sheet. Due to the continuous huge harvests of rice, the stock quantity increased from 1,428 thousand tons in 1985 to 2,141 thousand tons in 1991. Accordingly, the Korean government released the rice for processing purposes (like alcoholic drinks) to a great extent. However, in 1993, there was a poor harvest because of cold weather, thus the stock (carry-out) of rice decreased to 659 thousand tons in 1993, and to 244 thousand tons in 1996. In 1996, 115 thousand tons of rice was imported by minimum market access (MMA) from other countries.

As reviewed in the above section, consumption of rice in Korea has continuously decreased since the 1980s, and the production of rice has decreased as well. Recently, the decreasing rate of production for rice has been faster than that of consumption for the rice. Accordingly, the self-sufficiency rate of rice in Korea dropped from 108.3% in 1990 to 89.9% in 1996. The average self-sufficiency rate of rice was about 99% during the 1985-1997 period.

Table 2.2 Rice utilization ('000 tons).

Year	Food	Processing	Seed	Others	Total	Per capita (kg)
1985	5,259	43	45	154	5,501	128.1
1986	5,308	44	45	408	5,805	127.7
1987	5,247	56	46	268	5,617	126.2
1988	5,129	70	45	367	5,611	122.2
1989	5,145	72	45	340	5,602	121.4
1990	5,127	80	45	192	5,445	119.6
1991	5,032	148	43	255	5,490	116.3
1992	4,930	285	42	267	5,526	112.9
1993	4,855	347	41	266	5,510	110.2
1994	4,514	351	40	208	5,414	108.3
1995	4,777	222	38	349	5,536	106.5
1996	4,747	210	38	250	5,245	104.9
1997	4,688	101	38	213	5,225	102.4

Source: Ministry of Agriculture and Forestry.

Note: Based on the crop year from November to October.

Table 2.3 Rice balance sheet.

Year	Supply ('000 tons)				Demand ('000 tons)			Self-sufficiency (%)
	Carry-in	Production	Import	Total	Consumption	Export	Carry-out	
1985	1,247	5,682	-	6,929	5,501	-	1,428	103.3
1986	1,428	5,626	-	7,054	5,805	-	1,249	96.9
1987	1,249	5,607	-	6,856	5,617	-	1,239	99.8
1988	1,239	5,493	-	6,732	5,611	-	1,121	97.9
1989	1,121	6,053	-	7,174	5,602	1	1,572	108.1
1990	1,572	5,898	-	7,470	5,444	12	2,025	108.3
1991	2,025	5,606	-	7,631	5,478	2	2,141	102.3
1992	2,141	5,384	-	7,525	5,524	1	1,999	97.5
1993	1,999	5,331	-	7,330	5,509	-	1,820	96.8
1994	1,820	4,750	-	6,570	5,414	-	1,156	87.8
1995	1,156	5,060	-	6,216	5,557	-	659	91.4
1996	659	4,695	115	5,469	5,225	-	244	89.9
1997	244	5,323	-	5,567	5,070	-	497	105.0

Source: Ministry of Agriculture and Forestry, Statistical Yearbook of Agriculture & Forestry, 1998.

Note: Based on the crop year from November to October.

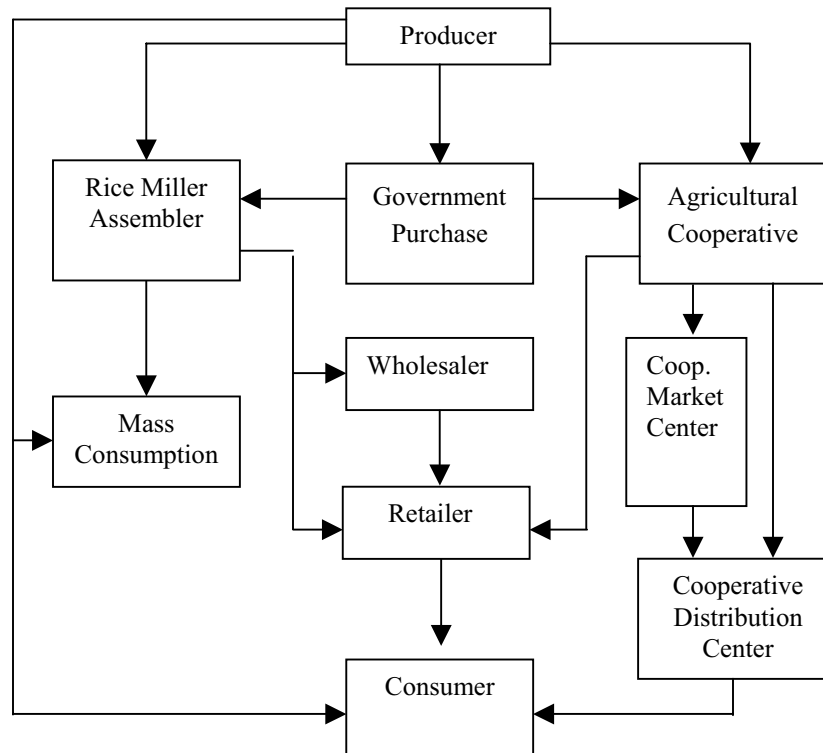
Currently, the marketing structure of rice is divided into two types, according to the administration system: one is administrated by the government sector in which the government purchases and releases the rice, whereas the other is administrated by the private sector. The private market organization consists of traditional merchant cooperatives and the National Agricultural Cooperation Federation (NACF). Therefore, rice marketing is handled by three institutions, the government, merchants, and the NACF (Figure 2.2).

Regarding the steps in rice marketing, rice is marketed through the producing location market organization and the consumer side market organization. In the producing place market organization, the rice produced by farm households is mainly purchased and is released through either the government or the NACF, except for farmers' own consumption and seed. The rice produced by farm households is also sold to private rice millers and assemblers. The government, the NACF, the private rice millers, and the assemblers process the unmilled rice, into milled rice, and then release it to the market.

In the consumer side market organization, rice is handed over to consumers after going through some merchants, or the grain wholesale market and the NACF market. Currently, the share of the private marketing system, which is based on the traditional dealer organization, tends to be declining. That is, the quantity of the rice marketed through the merchant organization has decreased from 66.0% in 1990 to 30.4% in 1996 out of the total production quantity. This might be due to the lack of difference between the government purchasing price and the farm price. It could also be considered that the demand for rice through the private

marketing system has decreased, because there is not much difference in prices over the seasons. Furthermore, the rice management policy has changed, so the NACF has taken charge of part of the government's rice purchase and release. Also, the function of selling rice by the NACF has been strengthened, therefore, the quantity of rice marketing through the merchant organization could be decreased during that period. In addition, there are direct transactions between the producers and consumers, and this type of the transaction is more likely to increase at present. Thus, in the near future, the direct transaction type of marketing system is expected to increase, whereas the function of the wholesale marketing system would be weakened.

Figure 2.2 Marketing channels of rice.



The rice policy in Korea has transformed from a closed economic system to an open economic system since the WTO system was launched in 1995. According to the results of the UR agreement, Korea should import rice by MMA during the 1995-2004 period. That is, the MMA quantity of the rice will increase from 1% of average domestic consumption (during 1988-90) in 1995 to 4% in 2004, and the tariff rate for this will be 5%. However, since the tariff for import quantity by MMA is only reached at 5%, the company which imports this product would have great profits by selling it in the domestic market. Therefore, the Korean Procurement Agency (KPA) will import rice in the form of "state trade." Also, regarding the issue of additional concessions for rice import by MMA or of import allowance by tariff before the year 2004, a re-settlement will be made. At that time, if rice import is allowed by tariffication, the tariffication will be enacted at the level of 90% of the base year tariff equivalent (TE).

For several years, the Korean government has practiced a dual price system and a production promotion policy such as supplying high yielding varieties. The dual price system of

rice was enacted in order to protect both producers and consumers and to reach the goal of rice self-sufficiency. Each year, the purchase and release prices of rice by the government were determined by the production costs and the inflation rate. However, the purchase and release prices of rice were frozen in 1994. Following the UR rules, the budget for purchase and release of rice, which is equal to the domestic subsidy, ought to be reduced from the year 1995. Therefore, if the purchase and release prices were increased, the purchase and release quantities should be reduced. According to this situation farmers would have more interest in the purchase and release quantity than the increase in the purchase and release price, which is set higher than the market price.

2.3.2 Soybean

Total production of soybean was 234 thousand tons in 1985, and peaked at 252 thousand tons in 1989. However it decreased to 156 thousand tons in 1997. The reason for the declining trend in the production of soybean was that farmers did not want to cultivate soybean because income from soybean cultivation was lower than that from other agricultural products. The cultivation area of soybean in 1985 was 156 thousand ha; however, it decreased to 100 thousand ha in 1997. This decrease might be due to the lower profits from soybean production, compared to the production of other competitive products. Nevertheless, the yield increased because of the development of cultivation techniques and the distribution of higher quality of production materials, ie. superior quality seed and composite fertilizer since the mid 1980s (Table 2.4).

The utilization of the soybean is divided into several purposes as follows: i) direct food purposes; ii) processed food-tofu, tofu milk, and soybean oil; and iii) feed and fertilizer. The total utilization of soybean is shown in Table 2.5.

Although consumption of soybean showed some fluctuations at the point of 1,130 thousand tons in 1985, it started to increase in 1997. Processed soybean increased from 282 thousand tons in 1985 to 331 thousand tons in 1997. Feed soybean increased from 725 thousand tons to 1,413 thousand tons, increasing 1.9 times during the period 1985-1997. The consumption of soybean for food is stagnant.

Table 2.6 shows the balance sheet of soybean based on the crop year. The increase in soybean consumption for feed purposes was due to the enhanced income level of Korean households, the demand for oil products as well as the increased consumption of feed. While the demand of soybean products has rapidly increased, the production of soybean has stagnated. The import of soybean increased from 885 thousand tons in 1985 to 1,628 thousand tons in 1997, an increase by 1.8 times during that period. As a result, the self-sufficiency rate of soybean has continuously declined. The self-sufficiency rate of soybean decreased from 22.5% in 1985 to 8.6% in 1997. Along with the increase in soybean consumption, the import of soybean will increase and the self-sufficiency rate will decrease in Korea.

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Table 2.4 Planted area, yield, and production of soybean.

Year	Planted Area (‘000 ha)	Yield (ton/ha)	Production (‘000 tons)
1985	156	1.50	234
1986	133	1.49	199
1987	154	1.32	203
1988	145	1.65	239
1989	157	1.60	252
1990	152	1.53	233
1991	119	1.54	183
1992	105	1.68	176
1993	117	1.46	170
1994	122	1.27	154
1995	105	1.52	160
1996	98	1.63	160
1997	100	1.57	156

Source: Ministry of Agriculture and Forestry, Statistical Yearbook of Agriculture & Forestry, 1998.

Table 2.5 Soybean utilization (‘000 tons).

Year	Food	Processing	Feed	Others	Total
1985	99	282	725	24	1,130
1986	96	264	860	17	1,247
1987	76	251	861	37	1,225
1988	72	275	918	33	1,298
1989	102	265	830	35	1,232
1990	84	271	866	33	1,254
1991	91	269	805	37	1,202
1992	92	255	1,141	15	1,503
1993	88	256	914	16	1,274
1994	89	308	934	16	1,347
1995	81	321	1,142	14	1,558
1996	87	336	1,180	15	1,618
1997	97	331	1,413	14	1,855

Source: Ministry of Agriculture and Forestry.

Note: Based on the crop year (from November to October).

The import quantity of soybean increased. Most of the soybean was imported from the US. For the case of soybean meal, the import was mainly made from the US prior to 1987. However, imports from the US rapidly decreased since 1988, and import of soybean meal has come from other countries such as China, India, and Brazil. In particular, China has become a major source country for the import of soybean meal in Korea.

The majority of the soybean produced in Korea is consumed for food. The marketing channels of soybean are shown in Figure 2.3. The NACF purchases 20% of the total domestic soybean and distributes it to the Agricultural & Fishery Marketing Cooperation (AFMC). The AFMC pools the domestic and imported soybean products together and supplies all of them to processing companies, or releases soybeans to adjust the market price. For the case of the imported soybean, the soybean for food purpose is supplied for processing firms through the AFMC, and bean sprouts are sold through the wholesale market. Also, imported soybean grain for oil is processed by oil firms, and the soybean meal produced is sold to soy-sauce firms.

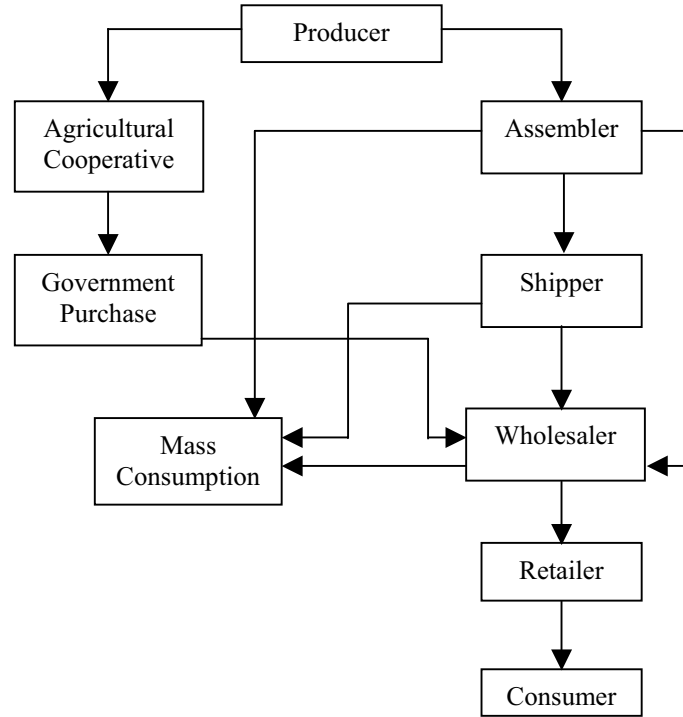
Table 2.6 Soybean balance sheet.

Year	Supply ('000 tons)				Demand ('000 tons)			Self-Sufficiency (%)
	Carry-in	Production	Imports	Total	Consumption	Carry-out	Total	
1985	87	254	885	1,226	1,130	96	1,130	22.5
1986	96	234	944	1,274	1,247	27	1,247	18.8
1987	27	199	1,131	1,357	1,225	132	1,225	16.2
1988	132	203	1,130	1,465	1,298	167	1,298	15.6
1989	167	239	932	1,338	1,232	106	1,232	19.4
1990	106	252	1,092	1,450	1,254	196	1,254	20.1
1991	196	233	883	1,312	1,202	110	1,202	19.4
1992	110	183	1,304	1,597	1,503	94	1,503	12.2
1993	94	176	1,113	1,383	1,274	109	1,274	13.8
1994	109	170	1,299	1,578	1,347	231	1,347	12.6
1995	231	154	1,435	1,820	1,558	262	1,558	9.9
1996	262	160	1,467	1,889	1,618	271	1,618	9.9
1997	271	160	1,628	2,059	1,855	204	1,855	8.6

Source: Ministry of Agriculture and Forestry.

Note: Based on the crop year from November to October.

Figure 2.3 Marketing channel of domestic soybean.



After the UR settlement, the import of soybean adapted the tariffication method by CMA. For the case of soybean, the tariff equivalent (TE) will be reduced (up to) 10% over 10 years, based on the difference between domestic and foreign prices. TE is allowed at the level of average CMA during the 1988-1990 period.

The total amount of the subsidy for the domestic agricultural industry was 1,718.6 billion won and it will be decreased to 1,490.0 billion won by the year 2004. For 10 years, the decreasing rate of the subsidy will be 13.3%. More than 90% of the total reduction in the subsidy is related to rice, and the remaining 10% consists of wheat, soybean, maize, and rape.

2.3.3 Onion

Compared to the 1960-1970s period, the production of onion has greatly increased since the 1980s because of increased cultivation area, the development of new seed, and the development of cultivation technology. Also, due to the change in food consumption patterns among Koreans, onion has become one of the products in Korea that has dramatically increased in terms of its consumption quantity. The production of onion has increased from 440 thousand tons in 1985 to 740 thousand tons in 1997, increasing about 68%. The quantity of onion cultivated per ha is greatly affected by the amount of rainfall as well as the temperature. As mulching cultivation technology diffused in farm households at the end of the 1980s, the yield of onion increased greatly (Table 2.7).

Table 2.7 Planted area, yield, and production of onion.

Year	Planted Area (ha)	Yield (ton/ha)	Production ('000 tons)
1985	10,749	40.92	440
1986	9,791	38.70	379
1987	11,819	44.45	525
1988	11,097	47.46	527
1989	10,327	54.03	558
1990	7,602	53.58	407
1991	10,288	51.51	530
1992	14,066	57.57	810
1993	9,716	57.23	556
1994	9,674	55.94	541
1995	15,817	61.62	975
1996	9,661	59.89	579
1997	12,539	59.03	740

Source: Ministry of Agriculture & Forestry, Statistical Yearbook of Agriculture & Forestry, 1998.

The onion balance sheet indicates that onion has maintained its balance in terms of supply and demand (Table 2.8). Onion is largely for domestic consumption as the major spicy vegetable. From a long-term perspective, there has been no big difference between the supply and demand of onion. The Korean government has restricted the import of onion in order to protect domestic producers. However, recently the quantity of imported onion has been a little higher than that of exported onion. As a result, a shortage of onion could occur in Korea. Also, the per capita consumption of onion has rapidly increased, so the surplus in domestic production was used for domestic consumption rather than for export.

Table 2.8 Onion balance sheet ('000 tons).

Year	Demand			Supply			Per capita (kg)
	Consumption	Export	Total	Production	Import	Total	
1985	440	-	440	440	-	440	7.8
1986	377	2	379	379	-	379	6.4
1987	524	1	525	525	-	525	9.8
1988	517	10	527	527	-	527	9.4
1989	552	6	558	558	-	558	10.0
1990	425	-	425	408	17	425	7.4
1991	530	-	530	530	-	530	9.4
1992	787	2	810	810	-	810	14.1
1993	586	4	594	556	17	594	10.0
1994	602	-	602	541	57	602	10.3
1995	956	19	975	975	-	975	16.3
1996	631	-	631	579	52	631	10.6
1997	746	-	746	740	6	746	12.4

Source: Ministry of Agriculture & Forestry, Statistical Yearbook of Agriculture & Forestry, 1998.

Among the vegetables, spicy vegetables show the most fluctuation in prices as well as on the supply and demand sides. The price change in onion per year was more than 40%. The major reasons for the change in onion price are considered to be: i) the supply of onion in the market fluctuated a lot because of change in cultivation area as well as in the yield, which caused fluctuation of the production quantity; ii) onion spoils easier than other vegetables; iii) onion is produced at one time per year; iv) since onion is classified as an import-restricted product, the minimum quantity of onion was imported through the AFMC. Therefore, the import of onion was not flexible in response to the price change, and v) merchants, who own large storage or cold storage, collect a great amount of onion for the purpose of speculation when production is low. The price of onion fluctuated a lot each year, therefore, and from a short-term perspective this price fluctuation was due to production quantity fluctuation.

The main marketing route of onion has five steps: producer → collecting merchant → wholesale merchant → middle wholesale merchant → retailer → consumer. However, after the shipping season, the route, via storage firms rather than the collecting merchant, is common. More than 90% of the total production is released to the Seoul area and some is distributed to local markets such as Kwangju, Pusan, and Daegu. The collecting merchants obtain (preserve) onion through transactions at farmyards, then release the onion to markets later. Or, after storing onion for some period and monitoring the onion price in the market, the collecting merchants release onion little by little. Onion collected through middleman or farm collecting merchants is preserved by storage firms.

About 70-80% of the quantity of onion in the consumer wholesale market passes through the wholesalers and is sold to the middle wholesalers, and the rest (20%) is sold to truck peddlers or small merchants. The small store types vary from a food store, supermarket, department store, stall keeper, to truck peddler. Also, the packaging of onion varies from small pack and net style pack, to peeled onion pack. The retailer directly purchases onion in the wholesale market, or onion is supplied by some wholesalers.

Spicy vegetables, such as onion and garlic, have been self-sufficient from domestic production because the Korean government has restricted their import for several years. In order to support the income of farm households, the government tried to assist the price through several projects: "system for the price stability" and "the system for purchasing and releasing," and "producing agreement system." The producing agreement system was a sales contract between farmers and the agricultural cooperatives before planting, in which farmers should ship onion to the agricultural cooperative at a fixed price after harvest. Accordingly, compared to the prices in foreign countries, the price of onion in Korea remains relatively high.

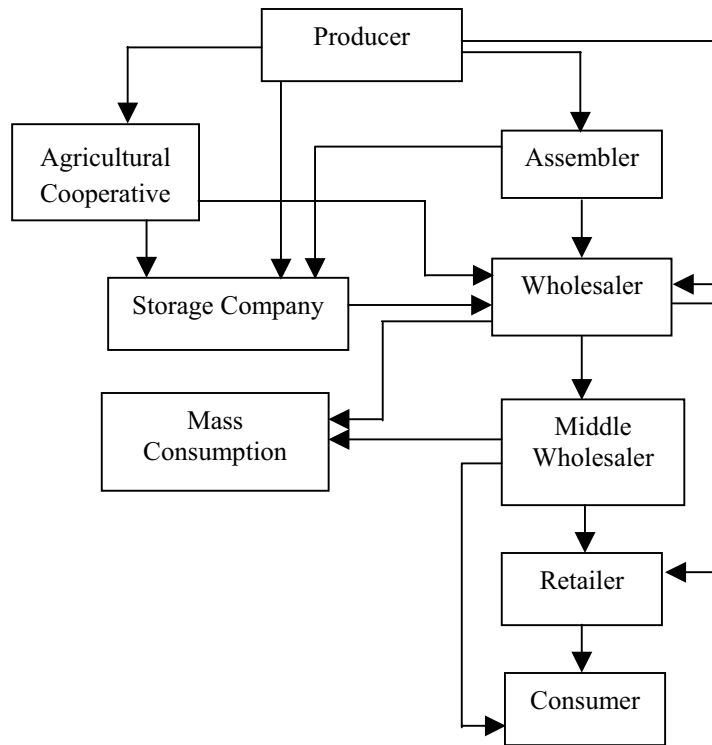
As the policy of opening agricultural product markets has been practiced since 1995, the Korean government allowed the import of pepper, garlic, and onion in accord with MMA. In the case of onion, the import quota is set from 12,369 tons (1995) to 20,645 tons (2004), and tariff of quota is set as 50%.

2.3.4 Ginseng

Ginseng is difficult to maintain in the fresh state. Because it contains 70% water it will last about one week at normal temperature. If ginseng is refrigerated, it will remain fresh for 3-4 months. Therefore, techniques of the processing and drying ginseng have been developed. The traditional ginseng products are of two kinds, red ginseng and white ginseng.

Red ginseng (as the first processed product which keeps the original shape of ginseng) is made by steaming, and then drying it. Ginseng products, made from the red ginseng as raw material, are called secondary processed red ginseng products. For the secondary processed red ginseng, both miscellaneous red ginseng and small root red ginseng are used to make essence or powder. These types of ginseng products are easy to consume: they include red ginseng extract, red ginseng tea, red ginseng powder, red ginseng extract-tea, red ginseng tablet, red ginseng capsule, and powder for medical usage.

Figure 2.4 Marketing channels of onion.



White ginseng means dried ginseng. If the ginseng is boiled in hot water and then dried, that type of ginseng is called Taegeuk ginseng. Thus, Taegeuk ginseng is classified in the category of the white ginseng. Generally, the secondary processed white ginseng products are classified as ginseng tea, ginseng extract, ginseng powder, ginseng tablet, and ginseng capsule. The processing method of white ginseng for each product is similar to that of the red ginseng. Fresh ginseng means the non-processed ginseng, compared to both red ginseng and white ginseng which are processed products. In the following section, the focus is on the non-processed ginseng (i.e., the fresh ginseng).

Ginseng farms are divided into two types, the red ginseng farm and the white ginseng farm. Although the red ginseng farm has more restrictions by the Korean Ginseng Cooperative Federation (KGCF) than the white ginseng farm, the red ginseng farm has more benefits such as loans and other kinds of KGCF assistance than the white ginseng farm. Red ginseng is produced as six-year root under the control of the Korean Tobacco and Ginseng Cooperation (KT & GC). The red ginseng farms supply all the red ginseng produced to the KT & GC. The KT & GC produces the secondary processed products and sells them monopolistically. The white ginseng farm households freely cultivate white ginseng and sell it in the markets. Most of the white ginseng is dug out as four-year root. The ginseng produced from the white ginseng farms is processed into types of white ginseng, Taegeuk ginseng, dried ginseng, and then is circulated in the market.

The production quantity of ginseng increased from 11,362 tons in 1985 to 14,874 tons in 1993, but decreased to 11,259 ton in 1997. The production quantity has dramatically increased since the mid 1980s. The number of farm households that cultivate ginseng was stable in the late 1980s without much fluctuation. However, the number declined to 20,399 households in

1997, indicating about 60% reduction in the total number of households compared to the late 1980s. The cultivation area of ginseng was maintained at 11,000 ha from the mid 1980s to 1993, but it has started to decrease since 1994. However, due to the increase in new cultivating area, the planted area of ginseng started to increase from 1997.

Table 2.9 Production, planted area, and farm households of ginseng.

Year	Designated Area*		Reported Area		Total	
	Production (tons)	Planted area (ha)	Production (tons)	Planted area (ha)	Production (tons)	Planted area (ha)
1985	2,214	3,369	9,148	7,748	11,362	11,117
1986	2,621	3,480	12,205	8,361	14,826	11,841
1987	2,242	3,444	12,182	8,588	14,424	12,032
1988	2,108	3,182	12,726	8,516	14,834	11,698
1989	2,604	3,073	11,335	8,804	13,939	11,877
1990	2,270	3,229	11,619	8,955	13,889	12,184
1991	1,927	3,133	13,205	8,561	15,132	11,694
1992	2,049	3,290	11,459	8,074	13,508	11,364
1993	2,787	3,610	12,087	7,376	14,874	10,986
1994	3,016	3,750	11,276	6,373	14,292	10,123
1995	2,251	3,733	9,720	5,642	11,971	9,375
1996	2,672	3,434	7,475	5,506	10,147	8,940
1997	3,503	3,188	7,756	6,715	11,259	9,903

Source: Ministry of Agriculture & Forestry, Statistical Yearbook of Agriculture & Forestry, 1998.

* The designated area is managed by the Korean Tobacco and Ginseng Corporation and produces six-year ginseng roots. The reported area is managed by farmers and produces mainly four-year ginseng roots.

The consumption of ginseng including domestic consumption and exports increased from 1985 to the early part of 1990s, but has shown a decreasing trend since that time. In the case of red ginseng, it increased from 1,866 tons in 1985 to 2,636 tons in 1993, but decreased up to 981 tons in 1996. In the case of fresh ginseng, it increased from 3,324 tons in 1985 to 4,671 tons in 1991, but decreased to 3,208 tons in 1996. Regarding white ginseng, it peaked at 8,674 tons in 1991, then decreased to 5,958 tons in 1996. Total consumption peaked at 15,132 tons in 1991, but decreased to 10,147 tons in 1996.

Table 2.10 Ginseng domestic consumption (tons).

Year	Red Ginseng	Fresh Ginseng	White Ginseng	Total
1985	1,866	3,324	6,172	11,362
1986	2,103	4,453	8,270	14,826
1987	1,702	4,453	8,269	14,424
1988	1,672	4,607	8,555	14,834
1989	2,047	4,162	7,730	13,939
1990	1,919	4,190	7,780	13,889
1991	1,787	4,671	8,674	15,132
1992	1,937	4,050	7,521	13,508
1993	2,636	4,283	7,955	14,874
1994	2,815	4,017	7,460	14,292
1995	2,039	3,476	6,456	11,971
1996	981	3,208	5,958	10,147

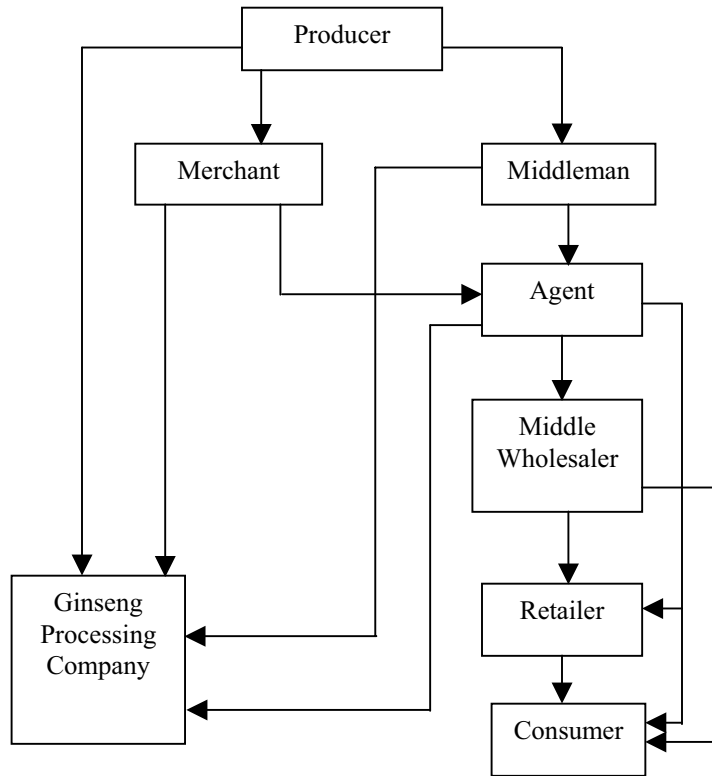
Source: Korean Tobacco and Ginseng Cooperation; Korean Ginseng Cooperative Federation.

Thirty percent of the total ginseng production is consumed as fresh ginseng in the domestic market, whereas the rest is processed and consumed as red ginseng (15%) and white ginseng (55%) types. The consumption of red ginseng is not popular in the domestic market. Most consumers purchase ginseng in the fresh state. Thus, only a small amount of red ginseng is purchased in the domestic market and it is purchased for use as a gift. The reason for this is that, traditionally, ginseng is viewed as a kind of medicine for strengthening the body.

Table 2.11 Trade of ginseng and its products ('000 US dollars).

Year	Red Ginseng and Products	White Ginseng and Products	Total
1985	28,841	44,144	72,985
1986	44,392	51,949	96,341
1987	54,565	60,063	114,628
1988	62,289	61,083	123,323
1989	74,252	72,111	146,362
1990	79,030	85,219	164,249
1991	60,321	81,157	141,478
1992	56,698	88,329	145,027
1993	50,934	66,918	117,852
1994	51,488	62,092	113,580
1995	77,103	63,650	140,753
1996	62,549	50,107	112,656
1997	39,246	49,963	89,210

Source: Korean Tobacco and Ginseng Cooperation; Korean Ginseng Cooperative Federation.

Figure 2.5 Marketing channels of fresh ginseng.

The 4-5 year root of the ginseng is marketed as fresh ginseng or dried white ginseng (including Taegeuk ginseng). In the marketing route of fresh ginseng, transaction merchants, middlemen, and commission middlemen collect ginseng in the producing places. Although fresh ginseng transactions are made in the wholesale market all-year-around, most of the transactions are made in September and October. The fresh ginseng is sold to middle level wholesale merchants, to retailers, to consumers who purchase a great amount, and to the ginseng processing firms (Figure 2.5).

The main market, which is the middle level of wholesale or directly sales to consumers, is Kyung-dong market in Seoul. There are two marketing routes for white ginseng; one type, in which the merchants directly purchase the ginseng from producers and process it, is popular,

whereas the other type, in which the producers process and sell the ginseng by themselves, is not popular.

The export of ginseng as well as ginseng products from Korea continuously increased until the end of the 1980s and recorded the highest export at \$164 million US dollars in 1990. After that, it sharply decreased to 89 million US dollars in 1997. However, the export of ginseng, in terms of its quantity, has shown a declining trend since 1990, although it peaked at 2,789 tons of export that year. Along with the decrease in both the cultivation area and the production quantity, ginseng exports have shown a declining trend since 1990. Ginseng has been imported in accord the MMA, and a total 37 tons of ginseng were imported in 1996.

2.4 Effects of trade liberalization on selected commodities at the national level

As discussed above, among the selected commodities, the import quotas of rice, onion, and ginseng are determined by the MMA, whereas that of soybean is determined by the current market access (Table 2.12). The tariff rates of imports through either the MMA or the CMA are relatively low, and domestic consumer prices of those products are very high. Accordingly, a decrease in the tariff will not directly affect the domestic consumer prices for those selected products, but will affect more the domestic agricultural production, because the increase in the import quantity will expand the domestic supply. If the demand of an agricultural product is constant, an increase in the import quantity will expand the domestic supply, and therefore will lead to a decrease in the domestic consumer price. The decline in the consumer price will be accompanied by a decrease in both the domestic producer price and the production of the agricultural product.

In Korea, it is considered that the effects of a drastic increase in import quantity would be greater than the effects of decrease in the tariff. Therefore, to evaluate the effects of trade liberalization, first of all, the amount of decrease in the domestic consumer price was calculated from Equation 2.5, the demand elasticity, as the import quota increased. The magnitude of the decrease in the domestic producer prices was also calculated from Equation 2.6 and the price linkage Equation 2.4. Then, using both Equations 2.5 and 2.6, the increased amount in the domestic demand and the decreased amount in domestic production were calculated, and then the consumer and producer surpluses were estimated.

In order to analyze the effect of following the market access provision on domestic agriculture, the baseline was set as the basis for comparisons. Also, for each of the selected products (i.e., rice, soybean, onion, and ginseng), two scenarios were studied. The baseline for the four commodities was the average of domestic prices, production quantity, and consumption quantity during the 1992-1994 period (recent three years before launching the WTO). Concerning the scenarios for rice, soybean, and onion, it was supposed that the import quotas, by the MMA, would be 1% and 4% of the total consumption amounts. Of these values, 1% was for the quantity imported in 1995, whereas about 4% will be for the quantity imported in 2004. Therefore, scenario I is the case that the import quota by MMA becomes 1% of total consumption after trade liberalization. Scenario II assumes that the import quota by MMA becomes 4% of total consumption after trade liberalization. In the case of ginseng, 37 tons, which was the import quota in the early period, is 0.25% of the total consumption amount at the baseline, so this is considered scenario I for this case. On the other hand, scenario II uses the value 0.5%, which will be the import quota in 2004.

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Table 2.12 Schedules of trade liberalization for selected commodities.

		1995	1996	1997	1998	1999
Rice	Quota (tons)	51,000	64,000	77,000	90,000	103,000
	Tariff rate (%)	5	5	5	5	5
Soybean	Quota (tons)	1,032,152	1,032,152	1,032,152	1,032,152	1,032,152
	Tariff rate (%)	5	5	5	5	5
Onion	Quota (tons)	12,369	13,289	14,208	15,128	16,047
	Tariff rate (%)	50	50	50	50	50
Ginseng	Quota (tons)	34.1	36.6	39.1	41.7	44.2
	Tariff rate (%)	20	20	20	20	20
		2000	2001	2002	2003	2004
Rice	Quota (tons)	103,000	128,000	154,000	180,000	205,000
	Tariff rate (%)	5	5	5	5	5
Soybean	Quota (tons)	1,032,152	1,032,152	1,032,152	1,032,152	1,032,152
	Tariff rate (%)	5	5	5	5	5
Onion	Quota (tons)	16,967	17,886	18,806	19,725	20,645
	Tariff rate (%)	50	50	50	50	50
Ginseng	Quota (tons)	46.7	49.2	51.7	54.3	56.8
	Tariff rate (%)	20	20	20	20	20

Sources: WTO, Summary of the Results of the Uruguay Round, 1995.

Using past time series data, the demand, supply, and price linkage functions were estimated and listed in the Annex. Typical variables included in general demand and production functions were used for the variables in those equations. That is, the demand function included variables such as price and income, whereas the supply function contained variables such as lagged price (as expected price) and time trend. The last two numbers of the particular year were substituted as the time variable. Table 2.13 presents the coefficients estimated by the OLS method.

The own price, cross price, and income elasticities of demand for rice were -0.3094, 0.1104, and -0.1565, respectively. The own price elasticity of rice supply was 0.2558 and price transmission elasticity between the farm price and consumer price was 0.9305. In the case of soybean, the own price and income elasticities of demand were -0.397 and 0.3466, respectively. The price elasticity of soybean supply was 0.313 and the price transmission elasticity between farm price and consumer price was 0.8609. In the case of onion, the own price and income elasticities of demand were -0.2828 and 0.6261, respectively. The own price elasticity of onion supply was 0.2309 and price transmission elasticity between farm price and consumer price was 0.8421. In the case of ginseng, the own price and income elasticities of demand rice were -0.4175 and 0.2329, respectively. The price elasticity of ginseng supply was 0.4309 and price transmission elasticity between farm price and consumer price was 0.5761.

Table 2.13 Various elasticities estimated.

Commodity	Demand		Income Elasticity	Supply		Price Transmission
	Own Price Elasticity	Cross Price Elasticity		Own Price Elasticity	Cross Price Elasticity	
Rice	-0.3094	0.1104	-0.1565	0.2558	-	0.9305
Soybean	-0.3970	1.1248	0.3466	0.3130	-	0.8609
Onion	-0.2828	-	0.6261	0.2309	-0.2782	0.8421
Ginseng	-0.4175	0.5531	0.2329	0.4309	-	0.5761

Table 2.14 presents the estimated effects of trade liberalization. In the case of rice, the baseline values for consumption amount, production amount, consumer price, and producer price were 5,482 thousand tons, 5,047 thousand tons, 117,387 won per 80kg, and 101,573 won per 80kg, respectively. As a result of the analyses for scenario I, domestic consumption was 5,537 thousand tons (55 thousand ton increase), whereas domestic production was 5,008 thousand tons (39 thousand ton decrease). It was also found that the consumer price per 80kg decreased to 113,593 won from 117,387 won (3,794 won decrease). The decrease was 3.3%. The producer price was 98,518 won per 80kg, indicating a 3,055 won decrease from the baseline. The decrease of producer price was 3.0%.

Scenario II was made under the assumption that 4% of the baseline consumption amount would be imported. According to the result, the consumption quantity was 5,701 thousand tons, increased by 219 thousand tons from the baseline. On the other hand, the amount of production was 4,892 thousand tons, decreased by 155 thousand tons from the baseline. The consumer price was 102,211 won, 15,176 won lower than the baseline (117,387 won). The decrease of consumer price was 12.9%. The producer price was 89,354 won, 12,219 won lower than the baseline (101,573 won). The decrease was 12.0%.

Table 2.14 Scenarios for measuring the effects of trade liberalization at national level on selected commodities.

Commodity		Baseline	Scenario I	Scenario II
Rice	Consumption ('000 tons)	5,482	5,537	5,701
	Production ('000 tons)	5,047	5,008	4,892
	Consumer price (won/80kg)	117,387	113,593	102,211
	Producer price (won/80kg)	101,573	98,518	89,354
Soybean	Consumption ('000 tons)	1,375	1,389	1,430
	Production ('000 tons)	167	166	162
	Consumer price (won/kg)	2,070	2,018	1,861
	Producer price (won/kg)	1,584	1,550	1,447
Onion	Consumption ('000 tons)	658	665	684
	Production ('000 tons)	636	632	619
	Consumer price (won/kg)	590	569	507
	Producer (won/20kg)	2522	2,447	2,222
Ginseng	Consumption (tons)	14,227	14,263	14,298
	Production (tons)	14,225	14,204	14,183
	Consumer price (won/750g)	20,353	20,231	20,109
	Producer price (won/750g)	18,113	18,051	17,988

Notes: 1) Scenario I assumes that the import quotas for rice, soybean, and onion are 1% of total consumption for 1992-1994 period. For ginseng the quota is 0.25%.

2) Scenario II assumes that the import quotas for rice, soybean, and onion are 4% of total consumption for 1992-1994 period. For ginseng the quota is 0.5%.

3) Computed by author.

In the case of soybean, the baseline values for consumption amount, production amount, consumer price, and producer price were 1,375 thousand tons, 167 thousand tons, 2,070 won per kg, and 1,584 won per kg, respectively. Scenario I was made under the assumption that 1% of the baseline consumption amount would be imported. As a result of the analyses for scenario I, the domestic consumption amount was 1,389 thousand tons (14 thousand increase), whereas the domestic production amount was 166 tons (one thousand decrease). It was also found that

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the consumer price was 2,018 won per kg, decreased from 2,070 won according to the decrease in the domestic quantity of supply. The producer price was 1,550 won per kg, a 34 won decrease from the baseline.

Scenario II was made under the assumption that 4% of the baseline consumption amount would be imported. According to the result, the consumption amount was 1,430 thousand tons, increased by 55 thousand tons from the baseline. On the other hand, the amount of production was 162 thousand tons, decreased by 5 thousand tons from the baseline. The consumer price was 1,861 won, 209 won lower than the baseline. The decrease was 10.1%. However, the producer price was 1,447 won, 137 won lower than the baseline. The decrease of producer price was 8.6%.

In the case of onion, the baseline values for consumption amount, production amount, consumer price, and producer price were 658 thousand tons, 636 thousand tons, 590 won per kg, and 2,522 won per 20kg, respectively. Scenario I was made under the assumption that 1% of the baseline consumption amount would be imported. As a result of the analyses for scenario I, the domestic consumption amount increased to 665 thousand tons from 658 thousand tons, whereas the domestic production amount decreased to 632 thousand tons from 636 thousand tons. The consumer price per kg decreased to 569 won from 590 won. The decrease of onion consumer price was 3.6%. The producer price per 20kg was 2,447 won, 75 won decrease from the baseline. The decrease of producer price was 3.0%.

Scenario II was made under the assumption that 4% of the baseline consumption amount would be imported. According to the results, the consumption amount was 684 thousand tons, increased by 26 thousand tons from the baseline. On the other hand, the amount of production was 619 thousand tons, decreased by 17 thousand tons from the baseline. The consumer price per kg was 507 won, 83 won lower than the baseline. The decrease of consumer price was 14.1%. However, the producer price per 20kg was 2,222 won, 300 won lower than the baseline. The decrease was 11.9%.

In the case of ginseng, the baseline values for consumption amount, production amount, consumer price, and producer price were 14,227 tons, 14,225 thousand tons, 20,353 won per 750g, and 18,113 won per kg, respectively. Scenario I was made under the assumption that 0.25% of the baseline consumption amount would be imported. As a result of the analyses for scenario I, domestic consumption amount increased to 14,263 tons, whereas domestic production amount decreased to 14,204 tons. It was also found that the consumer price of ginseng per 750g was 20,231won. The decrease was 0.6%. The producer price was 18,051 won, a 62 won decrease from the baseline. The decrease of producer price was 0.3%.

Scenario II was made under the assumption that 0.5% of the baseline consumption amount would be imported. According to the result, the consumption amount was 14,298 tons, increased by 71 tons from the baseline. The amount of production decreased to 14,183 tons from the baseline. The consumer price of ginseng per 750g was 20,109 won, 244 won lower than the baseline. The decrease was 1.2%. However, the producer price of ginseng was 17,988 won, 125 won lower than the baseline. The decrease of ginseng producer price was 0.7%.

The analysis indicates that the effects of trade liberalization on consumer prices are greater the effects of trade liberalization on producer prices. That is, the decrease in consumer price is higher compared to that of the producer price. The reason is that the price elasticity of demand is higher than that of supply in the cases of rice, soybean, and onion. On the other hand, in the case of ginseng, the supply elasticity is higher than the demand elasticity, but the price transmission elasticity is very low compared to the other commodities. This means that the import quantities of selected commodities would be increased more than estimated here with further progress of trade liberalization of agricultural products.

Based on the effects on consumption, production, and prices with trade liberalization, the changes in consumer and producer surplus are calculated and presented in Table 2.15. The results are not real, but they anticipate how producer and consumer welfare would be changed

along with further progress of trade liberalization. Therefore, the consumer or producer surplus estimated by the current methodology does not indicate the actual social welfare gain or loss, but the changes in the expected social welfare gain or loss.

In the case of rice, scenario I shows that the consumer surplus, as a result of trade liberalization, would be increased by 261.3 billion, whereas the producer surplus would be decreased by 192.0 billion. Therefore, it can be expected that the social welfare gain will be 69.3 billion won. Scenario II indicates that the increase in consumer surplus would be 1,060.7 billion won compared to the baseline, whereas the producer loss would be 759 billion won. Therefore, the social welfare gain will be 301.7 billion won.

Table 2.15 Effects of trade liberalization on selected commodities (billion won).

		Rice	Soybean	Onion	Ginseng
Scenario I	Consumer gain	261.3	72.1	13.8	2.3
	Producer loss	192.0	5.7	2.4	1.2
	Total surplus	69.3	66.3	11.4	1.1
Scenario II	Consumer gain	1,060.7	292.5	56.0	4.6
	Producer loss	759.0	22.6	9.4	2.4
	Total surplus	301.7	269.9	46.6	2.3

Source: Computed by author.

In the case of soybean, scenario I shows that the consumer surplus, as a result of trade liberalization, would increase by 72.1 billion won, whereas the producer surplus would decrease by 5.7 billion won. Therefore, it can be expected that the social welfare gain will be 66.3 billion won. Scenario II indicates that compared to the baseline, the increase in consumer surplus would be 292.5 billion won, whereas the producer loss would be 22.6 billion won. Therefore, the social welfare gain will be 269.9 billion won.

In the case of onion, scenario I shows that the consumer surplus, as a result of trade liberalization, would increase by 13.8 billion won, whereas the producer surplus would decrease by 2.4 billion won. Therefore, it can be expected that the social welfare gain will be 11.4 billion won. Scenario II indicates that compared to the baseline, the increase in consumer surplus would be 56 billion won, whereas the producer loss would be 9.4 billion won. Therefore, the social welfare gain will be 46.6 billion won.

In the case of ginseng, scenario I shows that the consumer surplus, as a result of trade liberalization, would be increased by 2.3 billion won, whereas the producer surplus would decrease by 1.2 billion won. Therefore, it can be expected that the social welfare gain will be 1.1 billion won. On the other hand, scenario II indicates that compared to the baseline, the increase in the consumer surplus would be 4.6 billion won, whereas the producer loss would be 2.4 billion won. Therefore, the social welfare gain will be 2.3 billion won.

From these results, four commodities have consumer gain due to the low consumer price and producer loss due to the decrease in producer price. The percentages of producer loss/consumer gain for scenario I were 73.5% for rice, 7.9% for soybean, 17.4% for onion, and 52.2% for ginseng, respectively. This means that the higher figure, the greater the producer loss. Although the estimated consumer gain of rice is very great, the estimated producer welfare loss will also be greater than that of any other commodity. The next commodity is ginseng, for which the producer loss is relatively large compared to soybean and onion. Rice and ginseng in Korea are almost self-sufficient. Accordingly, the results indicate that the producer loss of a commodity which has high self-sufficiency is larger than for a commodity with low self-sufficiency.

3. Effects of Trade Liberalization at the Farm Level

3.1 Analysis methodology and selection of location

3.1.1 Analysis methodology

In order to analyze effects of trade liberalization at the farm level, partial budget analysis is used. Partial budget analysis is generally used by farm managers for planning and decision making. A partial budget calculates the expected change in profit or net return for proposed changes in the farming environment, such as changes in farm price, input prices, variable inputs, etc. Therefore, a partial budget includes the changes in expense and income. The final result is an estimate of the increase or decrease in profit or net return. That is, partial budgets are used to evaluate the effects on farm profits of a proposed change in the way of farming, for example, a different method of weed control, purchase of equipment for farm operation and doing contract work for other farms. A positive value indicates the proposed change in the farming environment will be profitable.

Basically, the partial budget analysis deals with a comparison between with and without the changes. Therefore, the items, which remain constant with and without changes such as fixed cost, are not considered in the analysis. In general, partial budget analysis involves estimating the costs and returns which are due to the changes.

All variable inputs should be identified and the magnitude of each input used should also be known. Normally, inputs can be divided into purchased inputs such as seed, pesticide, fertilizer, and irrigation water, etc. and non-purchased inputs such as home-grown seeds and family labor. In principle, the cost of inputs is the cost at the farm gate or field. Cost of purchased inputs includes the price of input and transportation cost from the local market to the farm field.

Hired labor cost or wage rate is the on-going labor wage in the locality. Normally, the hired labor cost is the wage rate per day plus any non-monetary payment such as offered meals, drinks and transportation. Although, family labor is not an out-of-pocket cost (non-cash cost) of the farmer, the opportunity cost of the family labor should be considered in calculating the total labor cost. The general rule is to treat the opportunity cost of family labor the same as hired labor cost.

The cost of equipment and machinery can be calculated by using the concept of investment analysis.

In addition, the revenue from by-products should be considered.

In this chapter, the effects of trade liberalization at the farm level will be examined by comparing the effects with and without trade liberalization, which affects domestic product and input prices.

3.1.2 Selection of location

Of the total land area in Korea (about 9,937 thousand ha), only a small proportion of (about 19.4%) is suitable for cultivation. Administrative districts of Korea consisted of 6 cities (megapolis) and 9 provinces in 1997. The six cities are Seoul, Pusan, Daegu, Incheon, Kwangju, and Daejeon, and the 9 provinces are Kyunggi, Kangwon, Chungbuk, Chungnam, Chonbuk, Chonnam, Kyungbuk, Kyungnam, and Cheju (Figure 4.1).

Figure 3.1 Map of Korea.



Rice is cultivated all over the country, but the main production area is centered on the plains region. In 1997, the cultivation area and the production quantity of rice were 1,052 thousand ha and 5,450 thousand ton, respectively. Looking at the cultivation area and the production quantity, based on city and province, the first is Chonnam province at 202 thousand ha (19.2% of total planted area) and 1,087 thousand tons (19.2% of total rice production). The second is Chungnam province at 174 thousand ha (16.5%) and 946 thousand tons (16.5%). The third is Chonbuk province at 154 thousand ha (14.6%) and 825 thousand tons (14.6%). In order to analyze the effect of trade liberalization on the rice, Chungnam province was selected from among these three regions.

Table 3.1 Rice production by region in 1997.

Region	Planted Area (ha)	Production (tons)	Region	Planted Area (ha)	Production (tons)
Seoul	658	2,819	Chungbuk	59,892	307,458
Pusan	5,419	26,622	Chungnam	173,936	945,632
Daegu	6,101	29,401	Chonbuk	153,705	825,351
Inchon	17,701	89,032	Chonnam	202,375	1,086,684
Kwangju	8,606	43,843	Kyungbuk	136,713	690,848
Daejeon	2,909	14,983	Kyungnam	113,734	551,403
Kyunggi	123,617	613,954	Cheju	129	573
Kangwon	46,900	220,958	Total	1,052,395	5,449,561

Source: Ministry of Agriculture & Forestry, Statistical Yearbook of Agriculture & Forestry, 1998.

Soybean is cultivated all over the country, but, Haenam, Shinan, and Koheung in Chonnam province, and Yungyang, Euhsung, and Sangjoo in Kyungbuk province are considered the main producing places. Thus, Chonnam and Kyungbuk provinces together took 44.9% of the total planted area, 44,482 ha out of the total 99,862 ha. In 1997, out of the total production quantity (i.e., 156 thousand tons), Chungnam and the Kyungbuk provinces produced 48 thousand tons (30.8%) and 23 thousand tons (14.6%) of soybeans, respectively. In order to analyzing the effects of trade liberalization on soybean, Chonnam province, which is the greatest production area in Korea, was selected.

Table 3.2 Soybean production by region in 1997.

Region	Planted Area (ha)	Production (tons)	Region	Planted Area (ha)	Production (tons)
Seoul	42	69	Chungbuk	7,902	13,591
Pusan	123	180	Chungnam	8,134	12,364
Daegu	429	674	Chonbuk	5,932	9,551
Inchon	818	1,006	Chonnam	30,527	48,233
Kwangju	383	613	Kyungbuk	14,315	22,904
Daejon	282	443	Kyungnam	9,082	13,260
Kyunggi	7,536	12,359	Cheju	7,720	9,959
Kangwon	6,637	11,283	Total	99,862	156,489

Source: Ministry of Agriculture & Forestry, Statistical Yearbook of Agriculture & Forestry, 1998.

The main producing areas of onion are Chonnam, Kyungnam, Kyungbuk, and Chungnam. These four provinces produced 70-80% of the total production quantity of onion in Korea. Since onion is a winter crop, it has been a substitution crop of wheat, barley, and rape. However, along with the decrease in the relative income of farm households, farmers have no incentive for cultivating onion. That is, as farmer's incentive for cultivating onion has disappeared, onion is no longer viewed as a substitution product of wheat and oilseed. Looking at the cultivation area and the production quantity, the first is Chonnam province with 6,166 ha (49.2% of total planted area) and 349 thousand tons (47.1% of total rice production). In order to analyze the effect of the trade liberalization on the onion, Cheju province, which is an island, was selected.

Table 3.3 Onion production by region in 1997.

Region	Planted Area (ha)	Production (tons)	Region	Planted Area (ha)	Production (tons)
Seoul	0	0	Chungbuk	0	0
Pusan	19	1,134	Chungnam	189	7,823
Daegu	100	5,714	Chonbuk	249	12,629
Inchon	12	497	Chonnam	6,166	348,934
Kwangju	0	0	Kyungbuk	2,238	145,716
Daejon	1	41	Kyungnam	2,328	138,935
Kyunggi	17	704	Cheju	1,097	75,002
Kangwon	123	3,058	Total	12,539	740,187

Source: Ministry of Agriculture & Forestry, Statistical Yearbook of Agriculture & Forestry, 1998.

Ginseng takes 3-5 years after planting before harvest. Thus, the production quantity depends on the harvest region rather than the cultivation region. The production quantity of ginseng was more than 14 thousand tons in the middle of the 1980s and it peaked at 15 thousand tons in 1991. However, it has decreased since 1991 and only 11,259 tons were produced in 1997. The main producing places of ginseng are Chungbuk, Chungnam, Chonbuk, and Kyunggi provinces. For red ginseng, Kyunggi region produced half of the total production of the red ginseng in Korea. Thus, to analyze the effect of the trade liberalization on ginseng, Chungbuk province, which is the highest producing place in Korea, was selected.

Table 3.4 Planted area of ginseng by region in 1997.

Region	Planted Area (ha)	Farmers (no.)	Region	Planted Area (ha)	Farmers (no.)
Seoul	0	0	Chungbuk	2,245	3,407
Pusan	0	0	Chungnam	2,058	7,543
Daegu	0	0	Chonbuk	2,193	3,098
Inchon	103	328	Chonnam	154	130
Kwangju	4	5	Kyungbuk	812	1,230
Daejon	33	324	Kyungnam	37	110
Kyunggi	1,771	3,655	Cheju	0	0
Kangwon	492	569	Total	9,903	20,399

Source: Ministry of Agriculture & Forestry, Statistical Yearbook of Agriculture & Forestry, 1998.

3.2 Effects of trade liberalization at the farm level

Table 3.5 shows the national average returns and costs of rice, soybean, onion, and ginseng at the farm level reported by the Rural Development Authority (RDA). The average production cost of rice per 10 are (a indicates are), which is equivalent to 0.1 ha, was 335,555 won and the gross return was 927,879 won. Therefore, the net return of rice cultivation at the farm level was 592,324 won in 1997. In the case of soybean, the average production cost was 341,274 won and the gross return was 345,152 won. The net return of soybean at the farm level was only 3,878 won. The average production cost of onion was 769,822 won, the gross return was 1,591,196 won, and the net return was 821,374 won. For ginseng, which grows for 4 years, the average production cost was 5,570,493 won and the gross return was 8,698,450 won. The net return of ginseng cultivation at the farm level was 3,127,957 won in 1997.

For the partial budget analysis between the scenarios with and without trade liberalization, changes in the net return are calculated according to the change in farm prices at the farm level. It is assumed that the input quantity, variable cost and fixed cost are not changed. The reasons are as follows. First, the government subsidized half the purchasing price to farmers who bought small machinery until 1997, but, after that time, did not provide any funds to buy it in Korea. Second, there are no subsidies for pesticides and fertilizer. In the case of fertilizer, the subsidy was suspended from 1988. Third, the government exempts farmers from fuel taxation without regard to trade liberalization. Therefore, the assumption is that the final farm price is only changed due to trade liberalization.

Changes in farm price lead to changes in the net returns. The average decrease of farm prices estimated by the FAO and the scenarios in the previous chapter are applied to calculate the effects at the farm level. For example, the increase in international price for rice suggested by the FAO under the Uruguay Round is 7%. Accordingly, this rate is applied for the change in rice price compared to with and without trade liberalization. The decrease of soybean prices were 2.1% and 8.6% in scenario I and scenario II according to the imports of soybean by the quota, respectively. Therefore, 5.4%, which was the average decrease of the two scenarios with trade liberalization, was used to calculate the effects of changes in farm price on the net return of soybean. The decreases in prices of onion and ginseng were 7.5% and 0.5%, respectively.

Table 3.5 Returns and costs for selected commodity production at the national level (per 10 a).

Item	Rice	Soybean	Onion	Ginseng
Returns				
Yield (kg)	518	162	5,903	445
Price (won/kg)	1,745	2,114	269	19,316
By-products (won)	23,752	2,684	510	102,830
Gross returns	927,879	345,152	1,591,196	8,698,450
Variable costs				
Seed and seeding	8,016	15,488	96,648	452,325
Amount (kg or dl)	6.1	7.0	6.3	8.5
Unit price (won)	1,314	2,213	15,341	53,215
Fertilizer	17,017	24,048	87,855	217,101
Pesticides	19,680	9,288	14,621	141,242
Electric power and fuels	1,732	3,675	1,285	28,854
Repairs	45,857	3,503	20,740	19,474
Irrigation	3,624	0	84	519
Hired labor cost	14,814	18,098	169,543	1,156,725
Own labor cost	100,208	227,935	280,258	1,572,732
Miscellaneous	5,038	4,339	23,880	669,397
Sub-total costs	215,986	306,374	694,914	4,258,369
Cost of working capital	7,200	8,936	28,955	780,701
Interest rate (%/year)	5	5	5	5
Crop growing duration (month)	8	7	10	44
Total variable cost	223,186	315,310	723,869	5,039,070
Fixed cost				
Land charge	91,768	3,996	39,249	285,441
Depreciation	20,601	21,968	6,704	245,982
Total fixed cost	112,369	25,964	45,953	531,423
Net return	592,324	3,878	821,374	3,127,957

Source: Rural Development Authority, Standard Income of Agricultural and Livestock Products, 1998.

Note: 10 a is equivalent to 0.1 ha.

Remark: A figure such as cost of working capital is modified by author for the partial budget analysis.

3.2.1 Rice

Before presenting the results of partial budget analysis, the rice production costs will be compared between the whole country and Chungnam region, which is the selected region for the analysis (Tables 3.5 and 3.6). The average production cost of rice per 10 a in the whole country was 335,555 won in 1997. On the other hand, the production cost per 10 a in the Chungnam region was 342,493 won. This indicates that the production cost of rice in Chungnam region is a little higher than the country average. However, when comparison is made in terms of the production quantity per 10 a; while the average quantity in the whole country was 518 kg, the quantity in Chungnam region was 561 kg. Along with this result, it could be noted that the rice yield per 10 a in the selected region is a little higher than that in the whole country. When a comparison of the selected region and the whole country is made in terms of the production cost per kg, the average production cost in Chungnam shows 611 won per kg, indicating that this cost in Chungnam region is a little lower than the average production cost in the whole country.

Table 3.6 presents the results of partial budget analysis for rice production. All values in the budget analysis are average annual costs and the net return is net change between without and with trade liberalization. If there were no trade liberalization, the farm price of rice per kg would be 1,847 won, increased by 7% compared to 1,726 won with trade liberalization. Due to trade liberalization, although the seeding cost was reduced, farm returns would be reduced annually by 67,203 won per 10 a because the farm price of rice decreases by 7%.

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Table 3.6 Partial budget for rice production (per 10 a).

Item	Without Trade Liberalization	With Trade Liberalization	Difference
Returns			
Yield (kg)	561	561	0
Price (won/kg)	1,847	1,726	-121
By-products (won)	28,673	28,673	0
Gross returns	1,064,840	997,065	-67,775
Variable costs			
Seed and seeding	8,461	7,907	-554
Amount (kg or dl)	6.1	6.1	0
Unit price (won)	1,387	1,296	-141
Fertilizer	18,146	18,146	0
Pesticides	19,505	19,505	0
Electric power and fuels	1,846	1,846	0
Repairs	43,449	43,449	0
Irrigation	3,976	3,976	0
Hired labor cost	18,650	18,650	0
Own labor cost	104,060	104,060	0
Miscellaneous	6,497	6,497	0
Sub-total costs	224,590	224,036	-554
Cost of working capital	7,486	7,468	-18
Interest rate (%/year)	5	5	0
Crop growing duration (month)	8	8	0
Total variable cost	232,076	231,504	-572
Fixed cost			
Land charge	100,391	100,391	0
Depreciation	18,066	18,066	0
Total fixed cost	118,457	118,457	0
Net return	714,307	647,104	-67,203

Source: Rural Development Authority, Standard Income of Agricultural and Livestock Products, 1998.

Note: Recomputed by author.

3.2.2 Soybean

The average production cost of soybean per 10 a in the whole country was 341,274 won. On the other hand, the production cost per 10 a in Chonnam region, which was selected for the analysis, was 315,507 won. This result indicates that the production cost of soybean in Chonnam region is a little lower than the country average.

Table 3.7 presents the results of partial budget analysis for soybean production at the farm level. All values in the budget analysis are average annual costs and the net return is net change between without and with trade liberalization. If there were no trade liberalization, the farm price of soybean per kg would be 2,035 won, increased by 5.4% compared to 1,931 won with trade liberalization. Due to trade liberalization of soybean, although the seeding cost is reduced, annual farm returns would be reduced by 20,691 won per 10 a because the farm price of soybean decreases by 5.4%.

Table 3.7 Partial budget for soybean production (per 10 a).

Item	Without Trade Liberalization	With Trade Liberalization	Difference
Returns			
Yield (kg)	206	206	0
Price (won/kg)	2,035	1,931	-104
By-products (won)	1,111	1,111	0
Gross returns	420,321	398,897	-21,424
Variable costs			
Seed and seeding	13,867	13,155	-712
Amount (kg)	8.1	8.1	0
Unit price (won)	1,712	1,624	-88
Fertilizer	28,088	28,088	0
Pesticides	12,013	12,013	0
Electric power and fuels	3,278	3,278	0
Repairs	1,828	1,828	0
Irrigation	0	0	0
Hired labor cost	16,803	16,803	0
Own labor cost	203,133	203,133	0
Miscellaneous	5,192	5,192	0
Sub-total costs	284,202	283,490	-712
Cost of working capital	8,289	8,268	-21
Interest rate (percent/year)	5	5	0
Crop growing duration (month)	7	7	0
Total variable cost	292,491	291,758	-733
Fixed cost			
Land charge	10,126	10,126	0
Depreciation	13,623	13,623	0
Total fixed cost	23,749	23,749	0
Net return	104,081	83,390	-20,691

Source: Rural Development Authority, Standard Income of Agricultural and Livestock Products, 1998.

Note: Recomputed by author.

3.2.3 Onion

The average production cost of onion per 10 a in the whole country was 769,822 won. On the other hand, the production cost of onion in the selected region, Cheju province, was 870,755 won. Thus, the production cost of onion in Cheju is much higher than the average production cost in the whole country. However, when compared in terms of the production quantity per 10 a, the average production quantity of onion in the whole country was 5,903kg, whereas the production quantity of onion in Cheju was 6,097 kg. The result indicates that the production quantity per 10 a in Cheju is higher than the average in the whole country. When a comparison is made in terms of the production cost of onion per kg, the Cheju region was 146 won, and the average in the whole country was 131 won. Thus, it is noted that the production cost of onion per kg in Cheju region is higher than the average production cost of onion in the whole country, at 111% of the average production cost of the whole country. Specifically, since Cheju region is an island, the cost of water utilization in Cheju was much higher than the average cost for that category in the whole country.

Table 3.8 presents the results of partial budget analysis for onion production. All values in the budget analysis are average annual costs and the net return is net change between without and with trade liberalization. If there were no trade liberalization, the farm price of onion per kg would be 304 won, which would be increased by 7.5% compared to 283 won with trade liberalization. Although the seeding cost is reduced with trade liberalization, trade liberalization of onion would reduce annual farm return by 110,456 won per 10 a because farm price of onion decreases by 7.5%.

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Table 3.8 Partial budget for onion production (per 10 a).

Item	Without Trade Liberalization	With Trade Liberalization	Difference
Returns			
Yield (kg)	6,097	6,097	0
Price (won/kg)	304	283	-21
By-products (won)	0	0	0
Gross returns	1,853,488	1,725,451	-128,037
Variable costs			
Seed and seeding	241,878	225,000	-16,878
Amount (dl)	6	6	0
Unit price (won)	40,313	37,500	-2,813
Fertilizer	43,394	43,394	0
Pesticides	35,913	35,913	0
Electric power and fuels	3,569	3,569	0
Repairs	0	0	0
Irrigation	51,667	51,667	0
Hired labor cost	143,750	143,750	0
Own labor cost	237,400	237,400	0
Miscellaneous	57,684	57,684	0
Sub-total costs	815,255	798,377	-16,878
Cost of working capital	33,969	33,266	-703
Interest rate (percent/year)	5	5	0
Crop growing duration (month)	10	10	0
Total variable cost	849,224	831,643	-17,581
Fixed cost			
Land charge	27,000	27,000	0
Depreciation	12,112	12,112	0
Total fixed cost	39,112	39,112	0
Net return	965,152	854,696	-110,456

Source: Rural Development Authority, Standard Income of Agricultural and Livestock Products, 1998.

Note: Recomputed by author.

3.2.4 Ginseng

The average production cost of ginseng per 10 a in the whole country was 5,570,493 won. On the other hand, the production cost per 10 a in Chungbuk region, which was selected for the analysis, was 5,200,276 won. This result indicates that the production cost of ginseng in Chungbuk region is a little lower than the national average.

Table 3.9 presents the results of partial budget analysis for ginseng production at the farm level. All values in the budget analysis are average annual costs and the net return is net change between without and with trade liberalization. If there were no trade liberalization, the farm price of ginseng per kg would be 17,267 won increased by 0.5% compared to 17,181 won with trade liberalization. Although the seeding cost reduced due to trade liberalization, trade liberalization of ginseng would reduce annual farm return by 34,791 won per 10 a.

Table 3.10 shows the summary of the calculated effects of trade liberalization on farm prices at the national level and on net returns at the farm level. The effects in scenario I and II are taken from Table 2.14 in Chapter 2 and Table 3.6-3.9 in Chapter 3, respectively. Although the farm price of rice only decreased by 7% at the national level, the net return of rice farming was reduced by 9.4% at the farm level. The negative effects of trade liberalization on net return of soybean at the farm level was much higher than that of farm price. For onion, farm price decreased by 7.5%, however, net return decreased by 11.4%. These results mean that net returns of farming households decrease and the condition of farm management deteriorates due to trade liberalization. With trade liberalization of ginseng, there was little effect of price change on net return at the farm level.

Effects of Trade Liberalization at the Farm Level

Table 3.9 Partial budget for ginseng production (per 10 a).

Item	Without Trade Liberalization	With Trade Liberalization	Difference
Returns			
Yield (kg)	415	415	0
Price (won/kg)	17,336	17,181	-155
By-products (won)	0	0	0
Gross returns	7,194,440	7,130,115	-64,325
Variable costs			
Seed and seeding	153,720	152,350	-1,370
Amount (dl)	6.1	6.1	0
Unit price (won)	25,200	24,975	-225
Fertilizer	207,927	207,927	0
Pesticides	122,523	122,523	0
Electric power and fuels	30,697	30,697	0
Repairs	26,569	26,569	0
Irrigation	2,593	2,593	0
Hired labor cost	1,211,753	1,211,753	0
Own labor cost	1,789,760	1,789,760	0
Miscellaneous	453,795	453,795	0
Sub-total costs	3,999,337	3,997,967	-1,370
Cost of working capital	733,212	732,961	-251
Interest rate (%/year)	5	5	0
Crop growing duration (month)	44	44	0
Total variable cost	4,732,549	4,730,928	-1,621
Fixed cost			
Land charge	134,409	134,409	0
Depreciation	334,939	334,939	0
Total fixed cost	469,348	469,348	0
Net return	1,992,543	1,929,839	-62,704

Source: Rural Development Authority, Standard Income of Agricultural and Livestock Products, 1998.

Table 3.10 Comparison of trade liberalization effects at the national level and the farm level.

Commodity	Effects on Domestic Farm Price at National Level		Effects on Net Return at Farm Level
	Scenario I	Scenario II	
Rice	-3.0	-12.0	-9.4
Soybean	-2.1	-8.6	-19.9
Onion	-3.0	-11.9	-11.4
Ginseng	-0.3	-0.7	-1.8

4. Effects of the Financial Crisis on the Agricultural Sector

4.1 The financial crisis in Korea

The Korean government officially asked the IMF for support on November 21, 1997, and announced the negotiation results on December 3, 1997. The main points of the mutual agreement with the IMF include the negative economic growth rate in 1998, maintenance of a deficit trade balance, structural adjustment in the financial sector, acceleration of capital liberalization, reform of the labor market, etc. Since the mutual agreement with the IMF was announced, the exchange rate and interest rate increased rapidly.

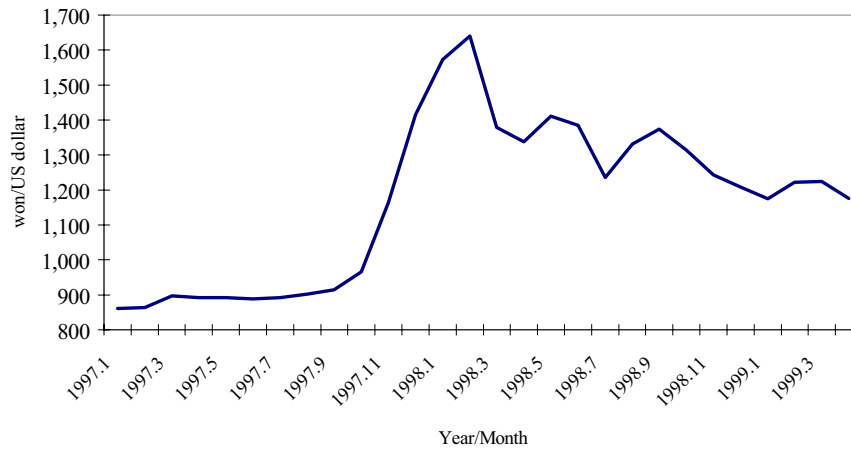
The direct cause of the Korean financial crisis was the restricted mobility of foreign currency derived from the deficit trade balance. Since the beginning of 1990, the trade balance recorded a deficit every year except 1993, and it exceeded \$ 14 billion dollars in 1996. The Korean economic structure could not help increasing imports for capital, industrial raw materials, crude oil, etc. However, the trade balance in 1998 was 41,165 million dollars due to the sharp decrease in imports. Together with this, imports of agricultural products also increased from \$ 6.9 billion dollars in 1991 to \$ 11.2 billion dollars in 1997.

Table 4.1 Balance of payments in Korea (million US dollars).

Year	Trade Balance			Current Account
	Exports	Imports	Balance	
1985	26,633	26,653	-20	-795
1986	34,128	29,829	4,299	4,709
1987	46,560	39,031	7,529	10,058
1988	59,973	48,690	11,283	14,505
1989	61,832	57,471	4,361	5,360
1990	63,124	66,109	-2,450	-2,003
1991	70,541	77,344	-6,803	-8,317
1992	76,199	77,954	-1,755	-3,943
1993	82,089	79,771	2,319	990
1994	94,964	97,824	-2,860	-3,867
1995	124,632	129,076	-4,444	-8,508
1996	129,968	144,933	-14,965	-23,005
1997	138,619	141,798	-3,179	-8,167
1998	131,808	90,643	41,165	40,039

Source: Korea Statistical Yearbook, National Statistical Office, various issues.

The movement of monthly Korean won/US dollar exchange rates after January, 1997 are shown in Figure 4.1. The Korean won per US dollar increased from a low of won 861.3 in January 1997 to won 1,163.8 in November 1997, when the Korean currency crisis hit. After November of 1997 it rose to won 1,415.2 in December 1997 and to high of won 1,640.1 in February 1998. After February of 1998 it declined to won 1,313.8 in September and to won 1,207.8 in December of 1998. For 3 months (from November of 1997 to February of 1998) the Korean currency to US dollar depreciated by 41%. At present, it is around won 1,180 per US dollar and is relatively stable.

Figure 4.1 Trend of the Korean won/US dollar exchange rate.

4.2 Effects of the crisis on the agricultural sector

By the beginning of the IMF bail out, the producer price index increased by 3.6% between December 1997 and December 1998, but the index for agricultural products was increased by 15.7%. During this period, the consumer price index increased by 4.0%. Among them, the prices of food and beverages were increased 7.3%. In other words, producer prices of agricultural products increased rapidly. During this period, both price indices of received and paid by farm households increased 4.6%. Therefore, terms of trade (between price index received and paid by farmers) showed no change.

Table 4.2 Main price index (1995=100).

	1997. 12	1998.12	Increase (%)
Producer price index	114.4	118.5	3.6
Agricultural products	98.7	114.2	15.7
Manufacturing industrial products	114.9	118.4	3.0
Consumer price index	113.5	118.0	4.0
Food and beverages	110.3	118.4	7.3
Excluding food and beverages	114.9	117.8	2.5
Price index received by farmers	99.3	103.9	4.6
Price index paid by farmers	111.9	117.0	4.6
Terms of trade	88.7	88.8	-

Source: Monthly Review, NACF.

The cost of agricultural products has increased due to the high prices of agricultural raw materials caused by the rapid increase in the exchange rate. Feed mixture is an example. The portion of raw material costs in manufacturing cost of feed is 77% and 96% of the raw material of feed mixture, which is mainly maize, is imported. Therefore, it will increase the price of feed mixture by 74% just because of the exchange rate. Along with this rising price of feed, production costs of livestock breeding increased rapidly.

Due to the tight money policy and reduction of real income, the consumption of agricultural products with high income elasticity, such as products of the livestock industry, fresh vegetables, etc., has decreased. In this regard, the producer, who is engaged in livestock

breeding and horticulture, is suffering increasing production costs and shrinking demand. Furthermore, rising exchange rates increase the price of fertilizer and agricultural chemicals, which further increase agricultural production cost.

By the beginning of the IMF managing system, the budget of the agricultural sector was reduced by the tight money policy. The budget for agriculture in 1998 was reduced 9.3% in comparison with the regular schedule. With the reduction in the agricultural budget, investment and support for agriculture and rural areas were reduced and agricultural growth decreased. The rural economy also became stagnant. The rate of agricultural growth in 1998 is expected to be between -3.5% and -3.9%.

Another problem is the high rate of interest caused by contraction of the money supply. In other words, industries such as livestock breeding and horticulture used to borrow funds from outside because this type of management usually needs high investment. With the higher rate of interest, the interest burden becomes too great. Accordingly, farmers were suffering from high interest and high prices of raw materials from the increased exchange rate, and this has caused farm incomes to decrease.

Since the financial crisis, damage to the grain sector was less than to other agricultural sectors including livestock breeding, horticulture, etc. The demand for grains also decreased, but reduction of income from grains was slight because the import portion of raw materials among managing costs was low. Furthermore, due to the high exchange rate, the price of imported grain increased. However, demand for grain produced domestically increased. The price of grain processed products, which are composed mainly of imported grain, was remarkably increased by the high exchange rate. In 1998, consumption amount of the major products processed from grain decreased.

The reduction of the agricultural budget came under the tight money policy and it affected the agricultural sector. For this reason, agricultural growth was reduced and the rural economy is expected to be stagnant. A domestic depression and reduction of demand for agricultural products reduced the prices of agricultural products. The low prices of agricultural products caused low investment to the agricultural sector. Accordingly, agricultural investment is continuously needed in order to maintain agricultural productivity. Government must strengthen investment such as technical agricultural development.

4.3 Effects of the financial crisis on the price of agricultural products

4.3.1 Analysis methodology

The price effects on import demand can be divided into changes in import prices imported from an exporting country and changes in exchange rates. Exchange rates among currencies are simply the prices of a country's money in terms of other currencies. Domestic prices of goods are translated by exchange rates. Like other prices, exchange rates are subject to change. When a country's currency rises in value relative to those of other countries, exports tend to decrease and imports tend to increase. When a country's currency falls in relative value, exports tend to be increased and import decreased. When a currency's value is rising internationally, domestic prices of imported goods tend to decrease and foreign prices of the same goods tend to increase. When a currency's value is falling, domestic prices of imported goods tend to increase, while international prices tend to decrease.

Such a relationship between exchange rate and price can be explained by the law of one price (LOP). The LOP maintains that the domestic price of a commodity will be equal to the foreign price of the same commodity through the exchange rate. The specification of the price equation begins with identity, which links the domestic price of a commodity to the import price:

$$P_d = E \cdot P_m \quad (\text{Equation 4.1})$$

where P_d is the domestic price in importing country, P_m is the import price of the commodity imported from a country, and E is the exchange rate expressed in units of domestic currency per unit of the exporting country's currency. Thus, Equation 4.2 becomes basically a statement of the law of one price. In international trade, transactions are mainly dealt with in US dollars. The price Equation 4.2 can be rewritten in terms of percentage changes:

$$\frac{dP_d}{P_d} = \frac{dE}{E} + \frac{dP_m}{P_m} \quad (\text{Equation 4.2})$$

The price equation (4.2) can be also rewritten in terms of percentage changes in import price and exchange rates under the assumption that domestic goods and imported goods are homogeneous:

$$\begin{aligned} \varepsilon_m &= \frac{dP_d}{P_d} \frac{P_m}{dP_m} \\ \varepsilon_e &= \frac{dP_d}{P_d} \frac{E}{dE} \end{aligned} \quad (\text{Equation 4.3})$$

Equation (4.3) means the percentage change in domestic price in expressed units of domestic currency to the percentage change in imported price in expressed units of US dollar. It can be defined as price transmission elasticity. Equation (4.4) means the percentage change in domestic price in expressed units of domestic currency to the percentage change in exchange rate in expressed Korean won/US dollar. It can be defined as exchange rate pass-through elasticity. To analyze those effects, the following equation will be applied:

$$\ln P_d = \beta_0 + \beta_1 \ln P_m + \beta_2 \ln E \quad (\text{Equation 4.4})$$

β_1 implies the level of how much import prices transmit to domestic price. β_2 implies the level of how much exchange rates pass to domestic price through international financial markets.

4.3.2 Selection of commodities

In order to analyze the effect of exchange rate changes on domestic prices by the recent financial crisis in Korea, soybean, maize, and wheat were selected. Korea imports a lot of these commodities, because domestic production is not sufficient. Table 4.3 shows the quantity and value of soybean, maize, and wheat imported during the period of 1987-1997.

Soybean, which is imported by three major oil companies and the Agricultural and Fishing Marketing Cooperation, is used for processing into oil and fats and feeds. Maize is imported for feed. The amounts of imported soybean and maize have been increasing since 1987, especially after launching the WTO system. The total quantities of imported soybean and maize were 1,628 thousand tons and 8,634 thousand tons in 1997, respectively. However, there is a large annual fluctuation in the total quantity of wheat imported.

Annual import prices of soybean, maize, and wheat for the past several years are presented in Appendix Table 8. The highest import price of soybean, maize, and wheat per ton was US\$ 330.45 in 1997, US\$ 172.58 in 1996, and US\$ 225.45 in 1996, respectively.

Table 4.3 Import quantity and value of soybean, maize, and wheat.

Year	Soybean		Maize		Wheat	
	Quantity (’000 ton)	Value (mil. dollar)	Quantity (’000 ton)	Value (mil. dollar)	Quantity (’000 ton)	Value (mil. dollar)
1987	1,131	244.5	4,792	428.3	4,223	733.9
1988	1,137	312.8	5,236	585.4	4,243	583.4
1989	932	298.7	5,528	779.0	2,292	433.3
1990	1,092	288.7	6,189	837.5	2,239	395.4
1991	912	242.2	5,438	682.3	4,524	551.6
1992	1,304	329.2	6,386	821.1	3,926	580.3
1993	1,113	285.5	6,418	733.0	4,470	625.3
1994	1,299	354.1	5,322	634.6	6,124	794.6
1995	1,435	382.3	8,879	1,168.8	2,860	507.4
1996	1,467	455.3	8,428	1,454.5	3,107	700.5
1997	1,628	538.0	8,634	1,367.8	3,400	633.1

Source: Statistical Yearbook of Foreign Trade, Korea Customs Service, Min. of Agriculture and Forestry.

4.2.3. Effects of exchange rate changes on domestic prices

The price transmission and exchange rate pass-through elasticities obtained from equation (4.5) are shown in Table 4.4. The transmission elasticity of soybean shows that given a 1% increase in the import price, domestic price of soybean increases by 1.309%. The exchange rate pass-through elasticity of soybean shows that given a 1% increase in the exchange rate, the domestic price of soybean increases by 2.4884%. This seems an unusual case. The high figures mean that the domestic consumer price of soybean is a very sensitive to changes in import price and exchange rate.

The price transmission and exchange rate pass-through elasticity for wheat flour are 0.2756 and 1.3644, respectively. The domestic consumer price of wheat flour is more affected by the change in exchange rate than the change in import price. The price transmission and exchange rate pass-through elasticity of feed for beef cattle and swine are lower. Given a 1% increase in the import price of maize or exchange rate, the domestic feed price paid by farmers increases about 0.3%. This result corresponds to the fact that the increasing rate of price index paid by farmers is lower than that of consumer price index for food and beverages for the period of 1997-98 (Table 4.2).

Table 4.4 The effects of import price and exchange rate changes on domestic price.

Commodity	Price Transmission Elasticity	Exchange Rate Pass-through Elasticity
Soybean	1.3090	2.4884
Wheat flour	0.2756	1.3644
Feed for beef	0.2531	0.3560
Feed for pork	0.3341	0.3359

5. Conclusions and Policy Implications

5.1 Conclusions

5.1.1 Effects of trade liberalization at the national level

In order to analyze the effects of trade liberalization on domestic agriculture, baselines were set as the basis for comparisons. Also, for each of the selected products, i.e., rice, soybean, onion, and ginseng, two scenarios were considered. The baseline for the four commodities was the average of the domestic prices, production quantity, and consumption amount during the 1992-1994 period (recent three years before launching the WTO). Scenario I for rice, soybean, and onion is the case that the import quota by MMA becomes 1% of total consumption after trade liberalization. Scenario II assumes that the import quota by MMA becomes 4% of total consumption after trade liberalization. In the case of ginseng, scenario I assumed that the import quota by MMA becomes 0.25% of total consumption after trade liberalization. On the other hand, 0.5% was used for this value in scenario II.

The baseline of rice was 5,482 thousand tons for consumption amount, 5,047 thousand tons for production amount, 117,387 won per 80 kg for consumer price, and 101,573 won per 80 kg for producer price, respectively. As a result of the analyses for scenario I, the domestic consumption amount was 5,537 thousand tons (55 thousand ton increase), whereas the domestic production amount was 5,008 thousand tons (39 thousand ton decrease). It was also found that the consumer price per 80 kg decreased to 113,593 won from 117,387 won (4,881 won decrease). The decrease was 3.2%. The producer price was 97,643 won per 80 kg, a 3,055 won decrease from the baseline. The decrease of producer price was 3.0%. Scenario II was made under the assumption that 4% of the baseline consumption amount would be imported. According to the results, the consumption amount was 5,701 thousand tons, increased by 219 thousand tons from the baseline. On the other hand, the amount of production was 4,892 thousand tons, decreased by 155 thousand tons from the baseline. The consumer price was 102,211 won, 15,176 won lower than the baseline (117,387 won). The decrease of consumer price was 12.9%. The producer price was 89,354 won, 12,219 won lower than the baseline (101,573 won). The decrease was 12.0%.

In the case of soybean, the baseline values for consumption amount, production amount, consumer price, and producer price were 1,375 thousand tons, 167 thousand tons, 2,070 won per kg, and 1,584 won per kg, respectively. As a result of the analyses for scenario I, the domestic consumption amount was 1,389 thousand tons (14 thousand increase), whereas the domestic production amount was 166 tons (one thousand decrease). It was also found that the consumer price was 2,018 won per kg, decreased from 2,070 won (52 won decrease) caused by the decrease in the domestic quantity of supply. The producer price was 1,550 won per kg, a 34 won decrease from the baseline. Scenario II was made under the assumption that 4% of the baseline consumption amount would be imported. According to the result, the consumption amount was 1,430 thousand tons, increased by 55 thousand tons from the baseline. On the other hand, the amount of production was 162 thousand tons, decreased by 5 thousand tons from the baseline. The consumer price was 1,861 won, 209 won lower than the baseline (2,070 won). The decrease was 10.1%. The producer price was 1,447 won, 137 won lower than the baseline (1,584 won). The decrease of producer price was 8.6%.

In the case of onion, the baseline values for consumption amount, production amount, consumer price, and producer price were 658 thousand tons, 636 thousand tons, 590 won per kg, and 2,522 won per 20 kg, respectively. Scenario I was made under the assumption that 1% of the baseline consumption amount would be imported. As a result of the analyses for scenario

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I, the domestic consumption amount increased to 665 thousand tons from 658 thousand tons, whereas the domestic production amount decreased to 632 thousand tons from 636 thousand tons. The consumer price per kg decreased to 569 won from 590 won. The decrease of onion consumer price was 3.6%. The producer price per 20 kg was 2,447 won, a 75 won decrease from the baseline. The decrease of producer price was 3.0%. Scenario II was made under the assumption that 4% of the baseline consumption amount would be imported. According to the results, the consumption amount was 684 thousand tons, increased by 26 thousand tons from the baseline. On the other hand, the amount of production was 619 thousand tons, decreased by 17 thousand tons from the baseline. The consumer price per kg was 507 won, 83 won lower than the baseline. The decrease of consumer price was 14.1%. The producer price per 20 kg was 2,222 won, 300 won lower than the baseline. The decrease was 11.9%.

In the case of ginseng, the baseline values for consumption amount, production amount, consumer price, and producer price were 14,227 tons, 14,225 thousand tons, 20,353 won per 750g, and 18,113 won per kg, respectively. Scenario I was made under the assumption that 0.25% of the baseline consumption amount would be imported. As the result of the analyses for scenario I, the domestic consumption amount increased to 14,263 tons, whereas the domestic production amount decreased to 14,204 tons. It was also found that the consumer price of ginseng per 750g was 20,231 won. A decrease of 0.6%. The producer price was 18,051 won, a 62 won decrease from the baseline. The decrease of producer price was 0.3%. Scenario II was made under the assumption that 0.5% of the baseline consumption amount would be imported. According to the result, the consumption amount was 14,298 tons, increased by 71 tons from the baseline. The amount of production decreased to 14,183 tons from the baseline. The consumer price of ginseng per 750g was 20,109 won, 244 won lower than the baseline (20,353 won). The decrease was 1.2%. The producer price of ginseng was 17,988 won, 125 won lower than the baseline. The decrease of ginseng producer price was 0.7%.

Based on the above effects on consumption, production, and prices with trade liberalization, the changes in the consumer and producer surplus were calculated. The results are not real, but are expectations of how the producer and consumer welfare would be changed according to the further progress of trade liberalization. In the case of rice, Scenario I shows that the consumer surplus, as result of the trade liberalization, would be increased by 261.3 billion, whereas the producer surplus would be decreased by 192.0 billion. Therefore, it can be expected that the social welfare gain will be 69.3 billion won. Scenario II indicates that the increase in the consumer surplus would be 1,060.7 billion won compared to the baseline, whereas the producer loss would be 759 billion won. Therefore, the social welfare gain will be 301.7 billion won.

In the case of soybean, scenario I shows that the consumer surplus, as a results of trade liberalization, would be increased by 72.1 billion won, whereas the producer surplus would be decreased by 5.7 billion won. Therefore, it can be expected that the social welfare gain will be 66.3 billion won. Scenario II indicates that, compared to the baseline, the increase in consumer surplus would be 292.5 billion won, whereas the producer loss would be 22.6 billion won. Therefore, the social welfare gain will be 269.9 billion won.

In the case of onion, scenario I shows that the consumer surplus, as a result of trade liberalization, would be increased by 13.8 billion won, whereas the producer surplus would decrease by 2.4 billion won. Therefore, it can be expected that the social welfare gain will be 11.4 billion won. Scenario II indicates that, compared to the baseline, the increase in consumer surplus would be 56 billion won, whereas the producer loss would be 9.4 billion won. Therefore, the social welfare gain will be 46.6 billion won.

In the case of ginseng, scenario I shows that the consumer surplus, as a result of trade liberalization, would increase by 2.3 billion won, whereas the producer surplus would be decreased by 1.2 billion won. Therefore, it can be expected that the social welfare gain will be 1.1 billion won. On the other hand, scenario II indicates that, compared to the baseline, the

increase in the consumer surplus would be 4.6 billion won, whereas the producer loss would be 2.4 billion won. Therefore, the social welfare gain will be 2.3 billion won.

According to the analysis, the effects of trade liberalization on consumer prices are greater than those of trade liberalization on producer prices. This means that the actual import quantities of selected commodities would be increased more than the import quantities estimated according to the further progress of trade liberalization of agricultural products. All of the selected commodities will have consumer gain due to the low consumer price and producer loss due to the decrease in producer price. The results indicate that the producer loss of a commodity, which has high self-sufficiency such as rice and ginseng, is larger than that of a commodity, which has low self-sufficiency such as soybean.

5.1.2 Effects of trade liberalization at the farm level

Partial budget analysis was used to evaluate the effects of trade liberalization at the farm level. For the partial budget analysis between the scenarios with and without trade liberalization, the changes in the net return are calculated according to the change in farm price at the farm level. It is assumed that the input quantity and costs are not changed. If there were no trade liberalization, the farm price of rice per kg would be 1,847 won, increased by 7% compared to 1,726 won with trade liberalization. Although the seeding cost is reduced, trade liberalization of rice would reduce annual farm return by 67,203 won per 10 *a*. In the case of soybean, the farm price of soybean per kg would be 2,035 won, increased by 5.4% compared to 1,931 won with trade liberalization. Due to trade liberalization, the trade liberalization of soybean would reduce annual farm return by 20,691 won per 10 *a*.

Under the scenario without trade liberalization the farm price of onion per kg would be 304 won, increased by 7.5% compared to 283 won with trade liberalization. The trade liberalization of onion would reduce annual farm return by 110,456 won per 10 *a*. If there is no trade liberalization, the farm price of ginseng per kg would be 17,267 won, increased by 0.5% compared to 17,181 won with trade liberalization. Although the seeding cost is reduced due to trade liberalization, the liberalization of ginseng would reduce annual farm returns by 34,791 won per 10 *a*.

From the above results, although the farm price of rice was only decreased by 7% at the national level, net returns of rice farming were reduced by 9.4% at the farm level. The negative effect of trade liberalization, on net returns of soybean at the farm level was much higher than that of farm price. For onion, the farm price was decreased by 7.5%; however, net return was decreased by 11.4%. These results mean that net returns of farming households decrease and the condition of farm management deteriorates due to trade liberalization. With trade liberalization ginseng, there was little effect of price change on net return at the farm level.

5.1.3 Effects on domestic prices of exchange rate changes caused by the financial crisis

In order to capture the effects of exchange rate changes by the current financial crisis on domestic prices, the price transmission and exchange rate pass-through elasticities were used. The transmission elasticity of soybean shows that given a 1% increase in the import price, domestic price of soybean increases by 1.309%. The exchange rate pass-through elasticity of soybean shows that given a 1% increase in the exchange rate, the domestic price of soybean increases by 2.4884%, which seems an unusual case. The high figures mean that the domestic consumer price of soybean is very sensitive to changes in import price and exchange rate.

The price transmission and exchange rate pass-through elasticity for wheat flour are 0.2756 and 1.3644, respectively. The domestic consumer price of wheat flour is affected more by change in exchange rate than change in the import price. The price transmission and exchange rate pass-through elasticity of feed mixture for beef cattle and swine are lower. Given

a 1% increase in the import price of maize or exchange rate, the domestic feed price paid by farmers increases about 0.3%. This result corresponds to the fact that the increasing rate of price index paid by farmers is lower than that of the consumer price index for food and beverages for the period of 1997-98.

5.2 Policy implications

Under the WTO system, it seems that the demand for agricultural products in the world will increase due to the reasons of increasing population and income. However, the agricultural production of importing countries would decrease due to the reduction of agricultural subsidies. On the other hand, the world agricultural market is a very unstable situation due to increasing prices and slowdown in the growth of agricultural production.

In Korea, the stable supply of foodstuffs as a current outstanding question rises to one of food policies, because the self-sufficiently ratio is continuously decreasing and the importing of foodstuffs shows a continuous increasing tendency. If the complete liberalization of agricultural trade is realized, the Korean self-sufficient rate of foodstuffs will markedly decrease. Moreover, the capability of Korea to supply food including its main food, rice, is weak and very unstable.

Another problem is to overcome the financial crisis which occurred in November 1997. Due to the rising exchange rate, production costs also increased in the agricultural sector. The income and expenditure of farm households became worse as increasing farming costs caused by rapid currency depreciation, increase in the interest rate and constraint of loans by financial institutes, and decrease in consumption for agricultural products. Therefore, some farm households have abandoned agriculture and agricultural production structure has been changed.

It seems that trade liberalization of agricultural products will increase consumer welfare. Nevertheless, it is expected that there would be a decrease in producer welfare and farm income. Also, due to trade liberalization, the price of agricultural products would decline, and this would lead to stagnation of growth in the agricultural industry. Furthermore, the total population and the labor participation rate in rural areas would decline, and the unemployment rate in agriculture will be a great issue in Korea.

If trade liberalization is completely allowed, and agricultural production declines on a large scale, then insecurity of farm households will be greatly expanded in the agricultural sector. Prior to import opening, the growth of the agricultural sector was dependent on the condition of domestic demand and supply as well as changes in both inter and intra macro economic conditions.

Currently, it is important that agricultural policy promote agricultural growth and rural development that will increase the low income of farm households. Accordingly, in order to alleviate the current agricultural situation in Korea, agricultural policy is focusing on the construction of agricultural infrastructure for promoting production in paddy land and upland. That is, in order to cope with trade liberalization, the Korean government needs to invest in the agriculture “infra” in which the government can improve the structure of the agricultural industry and elevate the management ability of producers. For these purposes, policy implications to be considered by policy makers are outlined briefly below.

For investment in construction of the agricultural infrastructure to improve production conditions, the government should:

- Increase continuous investment in irrigation development, readjustment of arable land, and research and extension for grains,
- Improve technological research and control of plant diseases,
- Increase the adjustment of upland for the major upland crops such as fresh fruits, vegetables, and ginseng,
- Develop high agricultural technology and construct the distribution system.

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For investment in the construction of an integrated agricultural information system to improve production and marketing, the government should:

- Establish an integrated agricultural information network to improve producing areas, marketing regions, specific technology, and regional information system,
- Develop and distribute agricultural databases and software for applying agricultural information to producers,
- Strengthen education to producers for utilizing the agricultural information.

For security of foodstuffs, the government, researchers, producers, and processors should:

- Promote policies such as production support for the purpose of food security and consolidating competitiveness for self-sufficiency of foods, especially, rice,
- Reduce production costs by investment in agricultural infrastructure, development of new varieties with high yield and high quality, and efficient farm management by agricultural mechanization,
- Establish marketing information systems in producing areas and marketing regions,
- Improve the methods of processing, storage, and preservation,
- Establish a food reservoir system,
- Diversify the trading countries, including oversea development to secure foodgrains,
- Transfer the trade policy of foodgrains from import restriction to efficient import management.

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