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Korea Agricultural Simulation Model and Livestock Quarterly Model

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PREFACE

In 1970s, staffs of the National Agricultural Economics Research Institute (NAERI), the former of the Korea Rural Economic Institute (KREI), and Michigan State University build a Korea Agricultural Sector Model (KASM). But the model did not work well due to the lack of sufficient time series data and computing capacity. However, the KASM was a foundation of KREI-ASMO (KREI-Agricultural Simulation Model) which was developed in 1995, and updated every year. The KREI-ASMO is a partial equilibrium econometric model to forecast the agricultural macro-variables, and to simulate the effects of policy alternatives and external shocks such as tariff cuts or exchange rate changes.

The structure of the KREI-ASMO has partly changed about every four years. KREI started a two-year project to version up the KREI-ASMO to cover more detailed environmental changes, domestically as well as internationally, in 2007. Two research teams developed the model separately with identical data base. One of the teams was staffs in KREI, and the other was in Food and Agricultural Policy Research Institute (FAPRI) at the University of Missouri.

In July 2007 FAPRI and KREI entered into an agreement that would result in the development and delivery of a New KREI-ASMO and expansion and updating of the KREI Quarterly Livestock Model to be estimated by FAPRI. This report is the result of FAPRI. The performance of the model will be compared with the model developed by the KREI team, and the final version will be launched at the end of 2008.

I would like to express my gratitude for the great efforts and devotion of the authors, Dr. Scott Brown, Suk-Ho Hahn and Daniel Madison, and for the partnership of the FAPRI. I know they have spent almost all night long for several months. I believe the new version of KREI-ASMO surely will explain and forecast the Korean agricultural sector very precisely.

May 2008
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Contents

Part 1

KOREA AGRICULTURAL SIMULATION MODEL

1. INTRODUCTION

In July 2007 the Food and Agricultural Policy Research Institute (FAPRI) at the University of Missouri and Korea Rural Economic Institute (KREI) entered into an agreement that would result in the development and delivery of a New KREI-COMO (KREI-Commodity Model) and expansion and updating of the KREI Quarterly Livestock Model to be estimated by FAPRI. In December 2007 this model's first version was used to make 2008 Korean agricultural outlook baseline and tested on model performance in some economic shocks. At the time on contract only 46 commodities were addressed to develop a New KREI-COMO(KREI-Commodity Model). However, in January 2008 FAPRI decided to establish a New KREI-ASMO (KREI-Agricultural Simulation Model) for entire Korean model system and more realistic prediction results.

The new KREI-ASMO 2008 contains 67 Commodities, macro indices and agricultural total value module modeled in this project, which covered 1,881 equations and formulas and used 2,225 variables. The model is econometrically estimated by OLS dynamic simultaneous equation model and produced in a user-friendly Excel spreadsheet. This paper will provide a summary of this process to provide insight into the final model delivered to KREI. In addition, appendices are added that summarize a procedure of using the Excel model. The steps followed in constructing the model are: 1) review of Korean agriculture 2) conceptual framework 3) elasticity 4) dynamic system performance.

Figure 1. Model Main Page

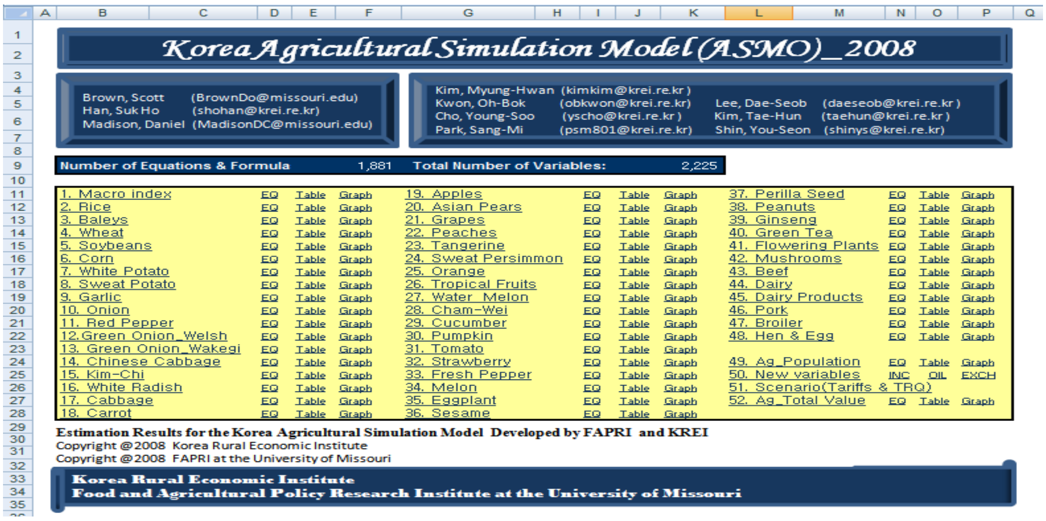


Table 1. Model Coverage

Sector	Commodity
Grains (9)	rice, barleys, wheat, soybeans, corn, sweet potato, potato produced in spring, summer and autumn
Vegetables (19)	chinese cabbage produced in spring, summer, autumn and winter, radish produced in spring, summer ,autumn and winter, onion, garlic, cabbage, red pepper, carrot, green onion (large type), green onion (medium type), kim-chi produced in spring, summer, autumn and winter
Fruits (8)	apple, pear, grape, persimmon , tangerine, peach, orange, tropical fruits
Fruit-bearing Vegetables (9)	watermelon , oriental melon , strawberry, tomato, cucumber, pumpkin squash, green pepper, melon , eggplant
Specialty Crops (3)	sesame, perilla seed, peanuts
Other Crops (7)	ginseng, flowering plants (3 types), mushrooms (2), green tea
Livestock (12)	cattle, dairy cattle, swine, hen, broiler, dairy products (7)
Macro Index	disposal income per capita input price index (machine price, materials price, fuel price, wage price, land rental price, seed price, fertilizer price, chemicals price etc.) exogenous variables (population, birth, GDP, GDP deflator, producer price index, consumer price index, exchange rate, interest rate, international crude oil price)
Agricultural Total Value	total production value, total value-added, total income, income per household (agricultural income, non-farm income, non-agbusiness income, transfer income, irregular income), population (agricultural population, economically active population, employment in agriculture, number of household), total farm price, total acreage (total utilized acreage, utilized acreage ratio, acreage per farm household, acreage per capita, acreage per farmer), total animal inventory, trade balance, self-sufficient ratio

Model Structure

New KREI-ASMO 2008 consists of five sectors and these sectors are simultaneously interact with each sector; 1) macro index' sector 2) input prices' sector 3) crops' sector 4) livestock's sector 5) agricultural total value sector. The system of the model is a simultaneous, non-spatial, partial equilibrium restricted on agricultural industry system designed for the purpose of policy analysis covering whole commodities in Korea. The reason for covering all commodities is that all commodities have an idiosyncrasy and commodities are all correlated with some information or signal in the market. This signal can be explained by expected price or expected income which determine farmer's planting or choosing the commodities in their farm land. Because this problem cannot be solved by low dimension but high dimension a simultaneous equation model tool is needed. For example, in case of production, rice can be production substitute to all commodities planted in paddy field such as green house products, soybeans and ginseng, etc.. Rice demand has been affected by changes to meat, dairy products and wheat demands. Hence, the method of estimating only a model for rice products can be lead to biased estimation results as regarding the spillover from all commodities.

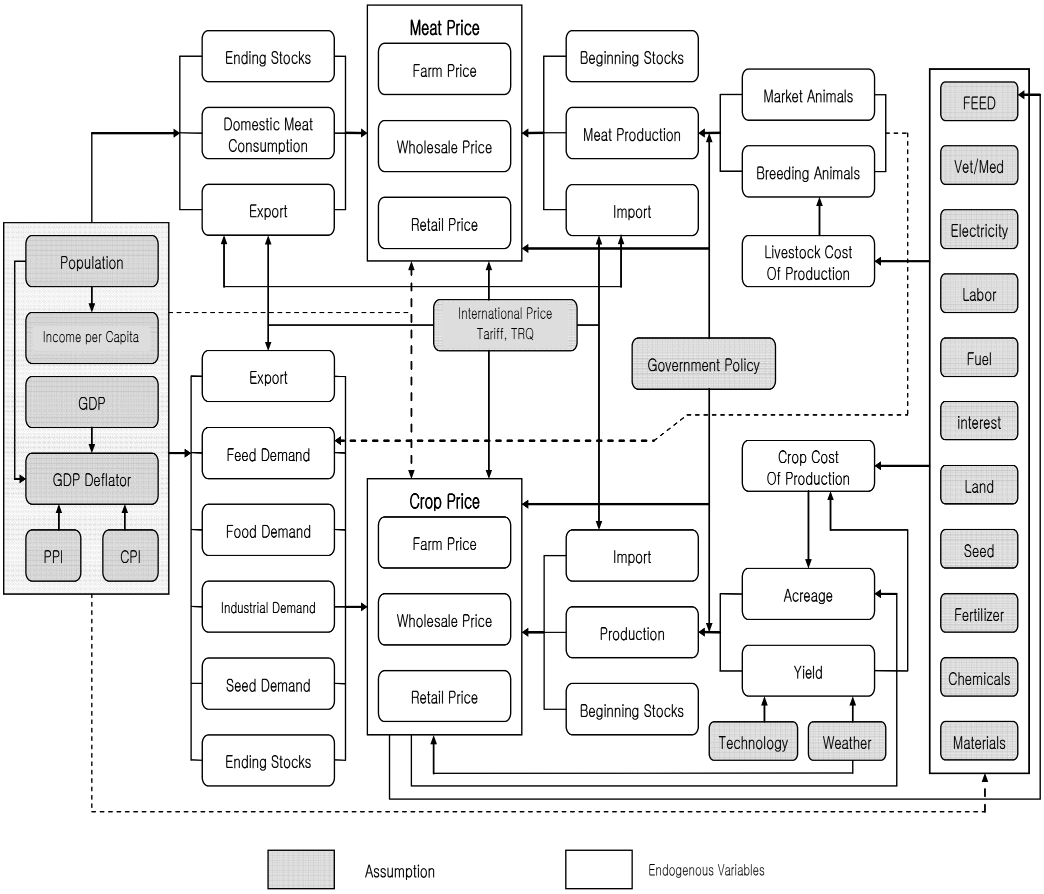
Figure 2 conceptualizes the basic structural of the KREI-ASMO 2008. The top half of the figure is a simplified representation of the livestock sector, while the bottom half reflects the crops sector. The left half of the figure represents demand variables and the right side of the diagram contains the supply variables. The macroeconomic variables driving this system include population, income growth, and input costs as well as technology and policy. For example, suppose an increase in income occurs. Positive income elasticities in the meat sector imply increased the demand for meat, which increases meat prices and provides additional production incentives. Increased meat production increases feed demand in the crops sector. Depending on the income elasticity for the crop in question, food demand may also increase in the crops sector. Strong demand for crop inputs increases crop prices and provides incentives to expand crop production. Analysis of the Korean farm policy use the traditional manner, a ten-year deterministic baseline[1] forecast is developed

[1] The second process is stochastic simulation. In simulation methods, there are two components to a probability forecast. First one is deterministic component which assume residuals are zero. In-sample prediction, we can calculate residuals ($e = Y - \hat{Y}$).

These residuals are stochastic component, which represent the variability in dependent variable that is not explained by the model. These two components lead to the complete model. Hence, deterministic models do not include risk, while the stochastic component and stochastic model is a deterministic model with risk added. Stochastic and Monte Carlo are names used to describe a random variable and Monte Carlo term used to describe stochastic simulation models. Model can be simple or complex. Model is an organized collection of data and equations to mathematically calculate the key output variables in a system, given changes in exogenous or management variables. Stochastic analysis, involves the simulation of the baseline under 500 alternatives forecasts of the random supply and demand factors by Monte Carlo and Bootstrap tool. Each of the forecasts represents a random draw from the distributions of the random supply and demand factors. Variance-covariance matrices are used to make a draw consistent within the random supply and demand factors. Implications of the stochastic analysis are particularly important for calculation of government cost. While government purchase programs operate during low price simulations, government payments are not made during periods of high prices. Therefore government payments are much higher on average from the stochastic runs than a single point estimate would suggest because the minimum activity is bound at zero.

Two examples of stochastic simulation are the Bootstrap and Monte Carlo nonparametric estimation methods. The purpose of stochastic simulating the system is that it covers the shortcomings present in a point estimate or deterministic outcome. The point estimate focuses on the tendency of the dependent variable based on the variation of explanatory variables. It provides information regarding the mean, median and mode of the estimated dependent. However, this point estimate has a certainty of error terms and estimation is just one point even though we can use of interval estimation using probability. This is not directly with the error term's uncertainty. For the stochastic estimation, the first step is the generation of the standard error in each single equation based on non-zero error term. Current econometric theory provides an indication that a rule of thumb is that 1,000 simulations should be conducted. In large samples, the Monte Carlo simulation method is better than the Bootstrap. However, in this Korean econometric model has a small sample size (1980~2006), either method can be used. The Important difference is the stochastic estimation mean and deterministic estimation. That means that deterministic estimation results incorporating the various agricultural policies, specific macro economic assumptions supplied by Global Insight, Inc., and assuming average weather.

Figure 2. KREI-ASMO 2008 Flow Diagrams



Source: Han & Brown (FAPRI), 2007.

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in error term's variation are small is almost same as the stochastic results. Because of stochastic estimation is based on the error term's variation. One cautionary comment is necessary regarding of stochastic estimation is that we first focus on deterministic estimation problem to help frame the stochastic estimation results. The bigger the distance of lower bound and upper bound of estimation, the more inefficient estimation results we have.

2. REVIEW OF KOREAN AGRICULTURE

Over the forty years to 2006, Korea's agriculture has developed with growth of the national economy. However, its importance in national economic growth has decreased as time goes on. The main policy changes have transformed it from an agriculturally-based sector to an industrialized economy sector. Agriculture's contribution of Korea's economy declined from 27 percent in 1970 to 3 percent in 2006 even though gross domestic product in Korea increased at an average rate of 8 percent a year due to rapid economic growth and industrialization. Since the Uruguay Round agreement (1994), the expansion of Korean agricultural public investment funds and sequential and revised agricultural policy reforms have led to attaining sustainable agricultural growth in terms of economic index, price stabilization, and improved aggregated agricultural productivity.

However, the current crisis of the agricultural economy came from the fact that the agricultural development policies have failed to reverse the trend of decreasing farm household incomes, caused by failure to adjust freer trade in agricultural products. The agricultural policy reforms and expanded government support were not able to reap the expected results[2].

Agricultural trade liberalization or Free Trade Agreements (FTAs) could bring about short-term and/or mid-term direct damage to farm households, agriculture and the rural economy. Conversely, the agricultural policy scheme taken as a response to agricultural trade liberalization could lead to long-term indirect effects on agriculture. Despite the fact that the agricultural structure has changed over the past decade, systematic and integrated plans to keep up with such structural changes were greatly lacking. This significant structural change not only stemmed from globalization but also food demand change. Significant economic growth in Korea has led to an increase in living standards and changes in food consumption patterns away from traditional foods such as rice and barley toward meat, dairy products, and wheat-based products. Agricultural production in Korea, however, has not been satisfying these changing consumption patterns, mainly because of the relatively limited availability of arable land and competitive pressure for resources from nonagricultural sectors. As a result, Korean food demand is being increasingly met by imports. Korea's government has

[2] Kim, Yong-Taek. 2003

been implementing reforms in the agriculture sector and reducing tariffs and non-tariff barriers on agricultural imports through multilateral and bilateral trade negotiations. Tariffs on agricultural imports have been gradually reduced and import quotas have been replaced by tariffs or tariff quotas to improve market access. Despite these efforts, protection of many agricultural commodities, including dairy products, grains and vegetables remains relatively high.

However, in recent time, globalization in trade is strongly knocking on agriculture in Korea to reduce tariffs further, and in some cases inducing zero tariffs. FTAs should give Korea benefit in terms of benefit and cost analysis, but free trade agreements impact will make the country's industrial structure change and kinds of economic distribution will be changed by increasing trade volumes and values. It is a true that Korea will be made better off from free trade agreement in term of economic index such as GDP or National growth. Macroeconomic theories explain that free trade or openness induces national growth or welfare improvement. However, we need to consider the free trade concept in detail. Economic growth depends on the economies of scale of each country and each industrial sector joined in this agreement. Any change can be a Pareto improvement if at least one party is made better off and no party is made worse off. However, our main concern is not efficiency or the optimality of welfare norm but equity and redistribution.

How will the FTA cause Korean agriculture to change and adjust in the future? What is the principal component that induces the Korean agricultural structure to change? What is an alternative policy agenda to reduce the speed in declining agricultural industry, farm income?

One of purposes of this model, therefore, is to objectively evaluate the FTA spillover on the Korean agricultural industry, by using a simultaneous equation model covering all major commodities in Korea.

3. CONCEPTUAL FRAMEWORK

3.1. Crops

Korea is one of the small countries in agricultural trade and agricultural economic scale. Therefore we can assume that Korea is just a price taker[3] in agricultural products. Demand stems from income growth that has induced agricultural structure change. However, all commodities are traded and can be either homogenous goods or heterogeneous goods on the demand side but not the supply side, which means that consumers can separate goods as identified by the nationality label put on the goods sold, even though farmers in each country produce the same commodities. We assume symmetric information exists in the Korean agricultural trade market. But if consumers can not clearly identify the nationality of goods to consume, these goods can be homogenous goods in the food market. This case can be applied in processing food market and the restaurant industry.

Imported goods are traded by two types, fresh and processing; and imported fresh type is also separated into fresh usage and processing, feed, and seed usage. This separation is based on not only consumption style but also heterogeneous goods. To analyze these demand behaviors, with the above assumption demand function can be separated by fresh food, processing, seed, feed, industrial and loss functions to avoid the aggregation bias and capture demand structural change. Demand function specifications[4] can be derived like below.

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[3] There is a limitation in this model assumption as some Korean commodities can affect world price. We expect this problem's solution through KREI-FAPRI's future study, the KREI-FAPRI linkage model.

[4] Thurman (1986) interpreted endogeneity test results in supply and demand systems using the U.S. annual model. While the possibility of simultaneous equations bias is generally acknowledged in the estimation of demand functions, references to it in empirical demand work often are perfunctory. The treatment often consists of an introduction to empirical results that argues for quantity or price being predetermined the consistency of ordinary least squares estimates. In the simultaneous equations model of demand and supply it matters little whether price or quantity is

Fresh Food Demand: $Demand_{i,t} = f(Price_{i,t}, Price_{i,t}, Income_t, Trend)$, j=1,....n (1)

Processing Demand: $Processing\_Demand_{i,t} = f(Price_{i,t}, Price_{i,t}, Income_t, Trend)$, j=1.n (2)

Feed Demand: $Feed\_Demand_{i,t} = f(Price_{i,t}, Price_{i,t}, Production\_Livestocks_t)$ (3)

Seed Demand: $Seed\_Demand_{i,t} = f(E(Price_{i,t+1}), E(Price_{j,t+1}, Production_{i,t})$ (4)

Loss: $Loss_{i,t} = f(Price_{i,t}, Production_{i,t})$ (5)

Import: $Import_{it} = f(Domestic\_Price_{i,t}, Exch \times Import\_Price_{it} \times (1.1 + Tariff)$ (6)

The food demand functional form can be derived from the Marshallian demand curve; an individual's demand depends on preferences, all prices, and income. We assume that demand curve is downward sloping if it is a normal good or if income effect is less than substitution effect. And we assume it is homogenous of degree zero as well. Sum of the own and cross price elasticities are equal to minus the income elasticity, inducing own price elasticity has to be greater than sum of cross price elasticities by Euler's Theorem.

To derive the Euler's theorem, we need Slutsky decomposition. The Marshallian and Hicksian (compensated) demand functions must give the same quantities.

$$x_i(p_i, p_j, e(p_i, p_j, u)) = x_i^h(p_i, p_j, u) \quad (7)$$

Differentiate equation (7) to get equation (8)

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placed on the left-hand side in the demand equation. Economic theory accommodates demand price shocks as easily as it does quantity shocks. The choice of dependent variable is crucial to estimation and to economic interpretation. This test for endogeneity proposed by Wu (1973) and later by Hausman (1978) has natural application to the issue of price or quantity endogeneity in demand functions. Thurman (1986) compared Wu-Hausman tests in price-dependent demand equations with those in quantity-dependent equations and concluded that power is not invariant to demand normalization. And he concluded that the test of the predeterminedness of quantity will be more powerful than the test for the predeterminedness of price. Hence presented predeterminedness of price model is more consistent and asymptotically efficient.

$$\frac{\partial x_i(p_i,p_j,e(p_i,p_j,u))}{\partial p_i}+\frac{\partial x_i(p_i,p_j,e(p_i,p_j,u))}{\partial e}\ \frac{\partial e(p_i,p_j,u)}{\partial p_i}=\frac{\partial x_i^h(p_i,p_j,u)}{\partial p_i}$$

$$\frac{\partial x_i(p_i,p_j,e(p_i,p_j,u))}{\partial p_i}=\frac{\partial x_i^h(p_i,p_j,u)}{\partial p_i}-\frac{\partial x_i(p_i,p_j,e(p_i,p_j,u))}{\partial e}\ \frac{\partial e(p_i,p_j,u)}{\partial p_i} \quad (8)$$

$$or \quad \frac{\partial x_i(p_i,p_j,m)}{\partial p_i}=\frac{\partial x_i^h(p_i,p_j,u)}{\partial p_i}-\frac{\partial x_i(p_i,p_j,e(p_i,p_j,u))}{\partial e}\ \frac{\partial e(p_i,p_j,u)}{\partial p_i}$$

With equation (8), we can decompose substitution effect and income effect. Substitution effect is negative as long as MRS is diminishing. The reasons come from two properties of the expenditure function. If expenditure function be differentiated by price, which is hicksian demand curve and concavity of the expenditure function of second differentiation's sign is negative.

$$\frac{\partial e(p_i,p_j,u)}{\partial p_i}=x_i^h(p_i,p_j,u)\,,\quad \frac{\partial^2 e(p_i,p_j,u)}{\partial p_i^2}=\frac{\partial x_i^h(p_i,p_j,u)}{\partial p_i}<0 \quad (9)$$

By using above equations, Euler's theorem is applied to demand function for good i $x_i(p_i,p_j,m)$

$$\frac{\partial x_i(p_i,p_j,m)}{\partial p_i}\frac{p_i}{x_i}+\frac{\partial x_i(p_i,p_j,m)}{\partial p_j}\frac{p_j}{x_i}+\frac{\partial x_i(p_i,p_j,m)}{\partial m}\frac{m}{x_i}=0 \quad (10)$$

$$E_{ii}+E_{ij}+E_{im}=0 \ \text{ or } \ \sum E_{ij}+E_m=0 \quad (11)$$

Basically, we assume that our target commodity is a normal good and homogenous of degree zero as well. So, sum of the own and across price elasticity are equal to negative the income elasticity. This means that own price elasticity has to be greater than across price elasticity because own price elasticity is negative and substitution price elasticity is positive and this sum has to be negative.

$$E_{ii}+E_{ij}=-E_m \ \text{ where, } E_{ii}<0,\ E_{ij}>0 \text{ and } \left(E_{ii}+E_{ij}\right)<0 \quad (12)$$

Acreage function can be derived from partial adjustment method and adaptive expectation based on naïve expectation.

$$q_t^* = b_o + b_1 p_t^* + b_2 z_t + e_t \tag{13}$$

where, q_t^* : desired supply, p_t^* : expected price, z_t : other factor, e_t : error term

Equation (13) can be expressed again by using the partial adjustment method below

$$(q_t - q_{t-1}) = \delta(q_t^* - q_{t-1}) \text{ , } 0 < \delta < 1 \tag{14}$$

where, q_t : actual supply at t, q_{t-1} : actual supply at t-1, δ : adjustment coefficient

Especially, adjustment coefficient has one restriction, which has to be less than one and greater than zero. If adjustment coefficient is greater than one, it means a random walk in terms of time series analysis, which cannot be analytic over a domain containing unit disk, so can be nonstationary series by unit root. Now, by using equation (14), we can derive the dynamic acreage responds function.

$$\begin{gathered}(q_t - q_{t-1}) = \delta q_t^* - \delta q_{t-1} \\ q_t^* = \frac{q_t - q_{t-1} + \delta q_{t-1}}{\delta} = \frac{q_t - (1-\delta)q_{t-1}}{\delta}\end{gathered} \tag{15}$$

If we substitute equation (15) to equation (13), we can get acreage response function

$$\frac{q_t - (1-\delta)q_{t-1}}{\delta} = b_o + b_1 p_t^* + b_2 z_t + e_t \tag{16}$$

$$q_t = \delta b_o + \delta b_1 p_t^* + \delta b_2 z_t + \delta e_t + (1-\delta)q_{t-1} \tag{17}$$

In this function form, we can get two important elaticities, short term elasticity for supply with respect to expected price is $E_p^q = \frac{\partial q_t}{\partial p_t^*} \times \frac{\bar{p}_t^*}{\bar{q}_t^*} = \delta b_1 \times \frac{\bar{p}_t^*}{\bar{q}_t^*}$ and long run elasticity is E_p^q / δ.

We left expected price to solve, we assume farmers have a naïve expectation based on Martingale theorem; if any stochastic process $\{X_t\}$ is martingale, which means expected X_t is X_{t-1} realized at time t-1 when information given until time t-1. So conditional expectation at all time period t is $E[X_t \mid F_{t-1}] = X_{t-1}$ as result, martingale process means rational expectation is equal to naïve expectation because future price's best prediction is current price. And we get same results even though adaptive expectation theorem.

$$(p_t^* - p_{t-1}^*) = \beta(p_{t-1} - p_{t-1}^*),\ 0 < \beta < 1 \tag{18}$$

where, p_t^* : expected price at time t, p_t : actual price at time t

Through the above equations, individual crop acreage equations are specified as a function of the expected net returns[5] for the crop and expected net returns of competing crops. Expected net returns are calculated using naive price expectations. More formally, these equations are specified as:

$$Area_{it} = f\left[Area_{i,t-1}, \frac{E(Net\_Returns_{it})}{E(Deflator_t)}, \frac{E(Net\_Returns_{jt})}{E(Deflator_t)}\right] \tag{19}$$

where,

$$E(Net\_Returns_{it}) = (Max(Farm\_Price_{i,t-1}, Gov\_Purchase_{i,t-1}) \times Trend\_Yield_{i,t} - Cost_{i,t})$$

Cost is one of important variables for producer to make decision. It affects crop acreage and animal inventory. Cost function model specifications depend on the weight ratio of inputs each commodity. We used the 3 years average ratio in recent years on cost functions.

$$Cost_t = f(\sum_{i=1}^{j}\sum_{k=1}^{j}\gamma_i input_k), \qquad \gamma_i = weight \tag{20}$$

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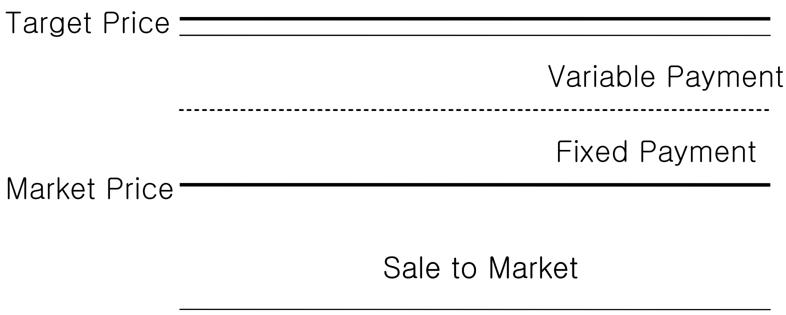
[5] In yield trend on net return formulas, we used post three year moving average with historical yield. When we compared the fitting performance on each equation, three year moving average method is more fittable than traditional yield trend usage. The main reason is that farmer's expected yield on next year is normal crop such as post three year averages. This result also can be checked in Korean monthly outlook survey. We also applied five year base moving average, however three year moving average method is more fittable. In net return formula, net return is calculated by subtracting cost on total revenue. However, some commodities' net return was negative. For solving this problem, we tried total revenue/cost form.

In Korean agricultural policy, the government purchase program for rice was replaced by direct payment program in 2005. Korean direct payment is categorized by two type payment such as fixed direct payment and variable direct payment. Fixed direct payment is paid to farmer without relating to planting, and program acreage is based on paddy field planted rice from 1998 to 2000 year. Payment amount is 70,000 won per hectare. Variable direct payment based on current production is only restricted on rice farmer on current time.

Direct Payment = (Target Price-Farm Gate Price in Harvesting) x 0.85

Variable Direct Payment = (Target Price-Farm Gate Price in Harvesting) x 0.85-Fixed Direct Payment

Figure 3. Korea Rice Payment



The intricacies of modeling the Korean farm policy change and evaluate government policy change, acreage function (19) can be modified as equation (21). Individual crop acreage equations are specified as a function of the expected net returns for the crop and expected net returns of competing crops. Expected net returns are calculated using naive price expectations.

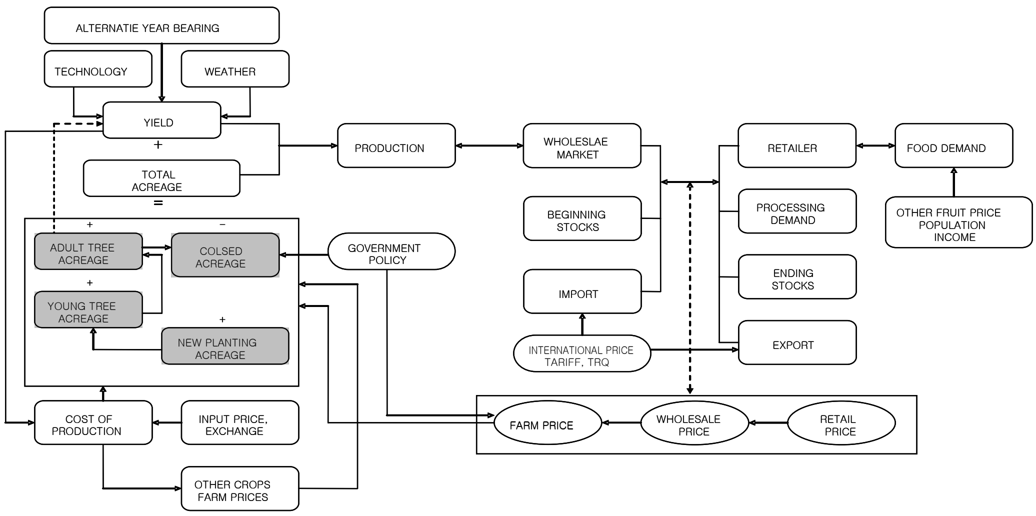
$$Area_{it} = f\left[Area_{i,t-1}, \frac{E(Net\_Returns_{it})}{E(Deflator_t)}, \frac{E(Net\_Returns_{jt})}{E(Deflator_t)} \right] \qquad (21)$$

where,

$$E(Net\_Returns_{it}) = ((Farm\_Price_{i,t-1} + Variable\_Purchase_{i,t-1}) \times Trend\_Yield_{i,t} - Cost_{i,t})$$

Fruits are some different acreage functions[6] needed due to perennial plant[7]. In some ways, modeling fruits is similar to modeling livestock. We need to consider investment behavior and biological constraints, which means supplies may respond differently in the short and long run. With our data constrains, we tried to estimate the young plant acreage as a function of some sort of a moving average of market prices or net returns. For example, this year's young plant acreage might be a function of returns for the past three years. Fruit-bearing tree acreage, then, might be a function of lagged values of fruit-bearing tree acreage and young plant acreage.

Figure 4. Orchards Model Flow Diagram



Source: Han & Brown (FAPRI), 2007.

[6] Han, Suk Ho; Brown, Scott ; Westhoff, Patrick (2007)

[7] We have just total acreage, young plant acreage, and fruit-bearing tree acreage data set. There are no new implant acreage data, and closing plant acreage data as well. Young plant acreage data contains new implant acreage and young plant acreage which planted one or two years ago. Fruit-bearing tree acreage is different, it depends on commodity, but almost we can justify this acreage which planted 3 or 4 years ago. Until this time, KREI has made fruit-bearing acreage function and young plant acreage function by using polynomial distribution lag function. Unfortunately, lags' coefficients did not make sense in some commodities, so we made new different method with data constraints.

Fruit-bearing tree: $Adult_t = f(Adult_{t-1}, Young_{t-j}, Net\_Returns_{t-1})$ (22)

New plant tree in this year: $New_t = f(New_{t-1}, Net\_Returns_{t-1})$ (23)

Young plant tree: $Young_t = \sum_{i=0}^{j} New_{t-i}$ (24)

$$Young_t = \sum_{k=1}^{j}\sum_{i=1}^{j}\alpha_k New_{t-i} + \sum_{l=1}^{j}\sum_{i=1}^{j}\beta_l Net\_Returns_{t-i} \; (\because \sum_{k=1}^{j}\sum_{i=1}^{j}\alpha_k New_{t-i} = Young_{t-1}) \quad (25)$$

$$Young_t = f(Young_{t-1}, \sum_{i=1}^{j} Net\_Returns_{t-i}), \; Young_t = f(Young_{t-1}, \frac{\sum_{i=1}^{j} Net\_Returns_{t-i}}{j}) \quad (26)$$

Yield functions in this model contain all exogenous variables such as weather, trend which is a proxy variable for technique growth. We assume yield is only determined by trend and weather. These yield functions do not affect entire model system. We use temperature, rainfall, sunshine hours, typhoon number affected Korea, and wind speed as weather variables. These variables were generated by average value with monthly data, based on each commodity's cropping type (seeding period, planting period, and harvesting period).

$$Yield_{it} = f(Weather_{it}, Trend) \quad (27)$$

Weather variable's prediction can be used by stochastic method. However, in this deterministic model prediction process just used past 5 years' moving average. 5 year's moving average was calculated by below method.

$$\text{5 year's moving average} = [\sum_{i=1}^{5} Yield_{t-i} - \underset{i=1}{\overset{5}{Max}}(Yield_{t-i}) - \underset{i=1}{\overset{5}{Min}}(Yield_{t-i})]/3 \quad (28)$$

3.2. Livestocks

Brown (1994) developed U.S. livestock flow diagram. The general approach of each sector was first to identify the primary supply point. The number of heads breeding or hatched drives the supply side. Each equation contains a lagged dependent variable to help capture the dynamics of the supply portions of the sectors. A ratio of output to input prices are also contained in the equations to drive the response of these equations to changing economics. The other sectors contain primary domestic consumption equations. The consumption of each meat product depends on its own price, the price of the other meats in the system and income. The demand side of this model estimated in a single equation approach. The other important portion of the model is the interaction with world markets. Trade equations are estimated that include comparisons of world to domestic prices, exchange rates and other trade barriers that limit trade to something less than the free trade solutions. We used this U.S. livestock flow diagram on Korean livestock modeling.

In beef model specification, we need to consider investment behavior and biological constraints, which mean supplies may respond differently in the short and long run. Any econometric model of beef industry that captures the underlying structure is fairly complex as indicated in the Figure 5.

This diagram replicates[8] the flow of product through the market channel from the cow-calf producer to the ultimate consumer of the beef product. The cow-calf sector provides an indication of the factors that influence supply. The decision made by cow-calf producers to expand or contract the breeding herd ultimately determines the number of animals that can be produced for a given time period. The number of breeding cows in the herd can be influenced by both the number of cows expected to be culled and the number of heifers retained to enter the cow herd. Calves that enter the feedlot are fed on a full ration of grain to finish them to an appropriate slaughter weight. Once cattle have been fed out in the feedlot, they are slaughtered.

Although Figure 5 shows the path that cattle can take from birth until slaughter, it does not associate the length of time necessary to travel each point of path. Two important factors differentiate the production of beef from that of other

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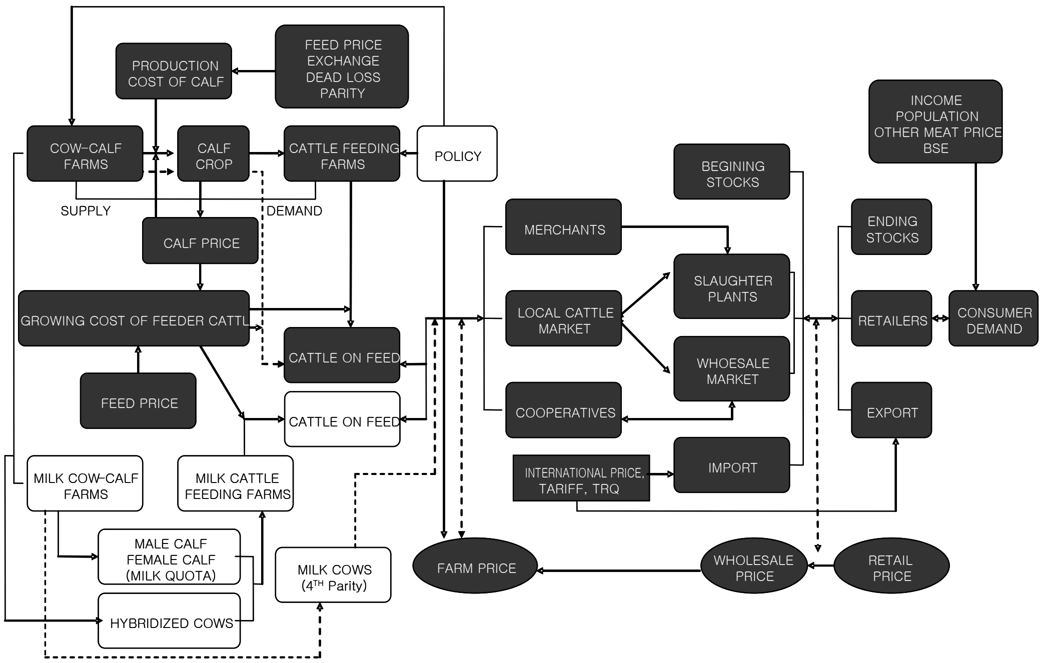
[8] Brown, Scott (1994)

meats. One is the offspring produced per animal per period and the other is the length of time needed to adjust production. Figure 6 shows the length of time necessary for each of the beef production stages to occur. From the time a cow-calf producer makes the decision to produce until that production reaches the consumer's table can take over two years.

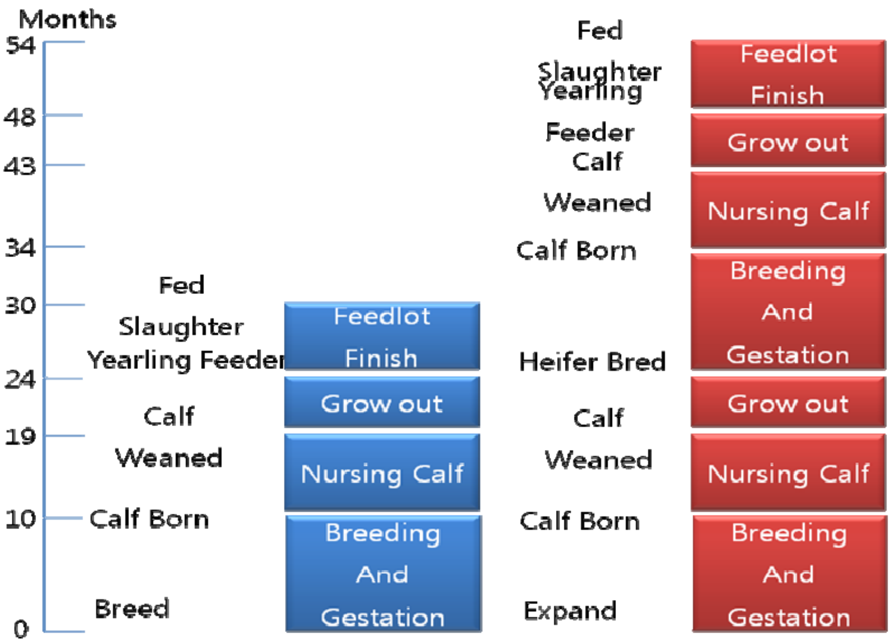
A decision to expand the breeding herd can ultimately delay the availability of the additional beef for more than four years. With above biological constrains, beef equations are specified as:

Figure 5. Korean Beef Model Flow Diagram



Source: Han & Brown (FAPRI), 2007.

Figure 6. Beef Production Schedule



Source: Brown, Scott (1994)

Number of Breeding

1) Female Beef Cattle over 2 years artificially inseminated

$$AI51F_t = f\{(\frac{NFP51MC_t + NFP51FC_t}{2})/COST51C_t, NB51FY_t\}$$

2) Female & Male Beef Cattle under 1 year

$$NB51FI_t = f(0.8 \times AI51F_{t-1} + 0.2 \times AI51F_t)$$
$$NB51FI_t = f[(0.8 \times AI51F_{t-1} + 0.2 \times AI51F_t), (0.8 \times AI52F_{t-1} + 0.2 \times AI52F_t)]$$

3) Female & Male Beef Cattle 1-2 years

$$NB51FI_t = f(NB51FI_{t-1}, SL51F_t)$$
$$NB51MT_t = f(NB51MI_{t-1}, SL51M_t + SL52M_t)$$

4) Female & Male Beef Cattle over 2 years

$$NB51FY_t = f(NB51FY_{t-1}, SL51FT_{t-1}, SL51F_t)$$
$$NB51MY_t = f(NB51MT_{t-1}, SL51M_t + SL52M_t)$$

5) Female Beef Inventory

$$NB51F = NB51FI + NB51FT + NB51FY$$

6) Male Beef Inventory

$$NB51M = NB51MI + NB51MT + NB51MY$$

7) Beef Inventory

$$NB51 = NB51F + NB51M$$

Number of Slaughter

8) $SL51F_t = f(NB51FY_t + NB51FT_t, NFP51F_t / COST51_t, NFP51FC_t / COST51C_t)$

9) $SL51M_t = f(NB51MT_t, NFP51M_t / COST51_t, NFP51MC_t / COST51C_t)$

10) Beef Cattle Slaughter $SL51_t = SL51F_t + SL51M_t$

Cost Functions

11) $$COST51_t = f((0.48*(0.5*NFP51C_t + 0.5*NFP51C_{t-1}) + 0.02*MACHP_t + 0.01*FUELP_t + 0.0*WAGE_t + 0.01*INTEREST_t + 0.48*FEED\_PRICE_t)$$

12) $$COST51C_t = f((0.07*MCHP_t + 0.06*MATRP + 0.02*FUELP_t + 0.01*WAGE_t + 0.03*INTEREST_t + 0.81*FEED\_PRICE_t)$$

Beef Supply

13) Slaughter Weight

$$SLW51F_t = f(SLW51F_{t-1}, Trend),\ SLW51M_t = f(SLW51M_{t-1}, Trend)$$

14) Beef Production

$$Q51_t = f(0.423 \times SLW51M_t \times SL51M_t + 0.381 \times SLW51F_t + 0.381 \times SLW51F_t \times SL52_t)$$

15) Beef Imports

$$M51_t = f\{[NCP51F_t, (MP51_t \times EXCH_t \times (1 + TE51_t / 100))] / CPI_t\}$$

16) Beginning Stock

$$EST51_t = f(EST51_{t-1}, Q51_t, M51_t, NCP51_t / CPI_t), \qquad EST51_{t-1} = BST51_t$$

Beef Demand

17) Per Capita Consumption

$$PERD51_t = f(NCP51_t, NCP\_SUB^j{}_t, DINC_t / CPI_t)$$

18) Ending Stock

$$EST51_t = f(EST51_{t-1}, Q51_t, M51_t, NCP51_t / CPI_t)$$

Market Clearing Condition

19) $SUP51_t = Q51_t + BST51_t + M51_t, \quad TD51_t = D51_t + EST51_t + X51_t$

20) $TD51_t = SUP51_t$

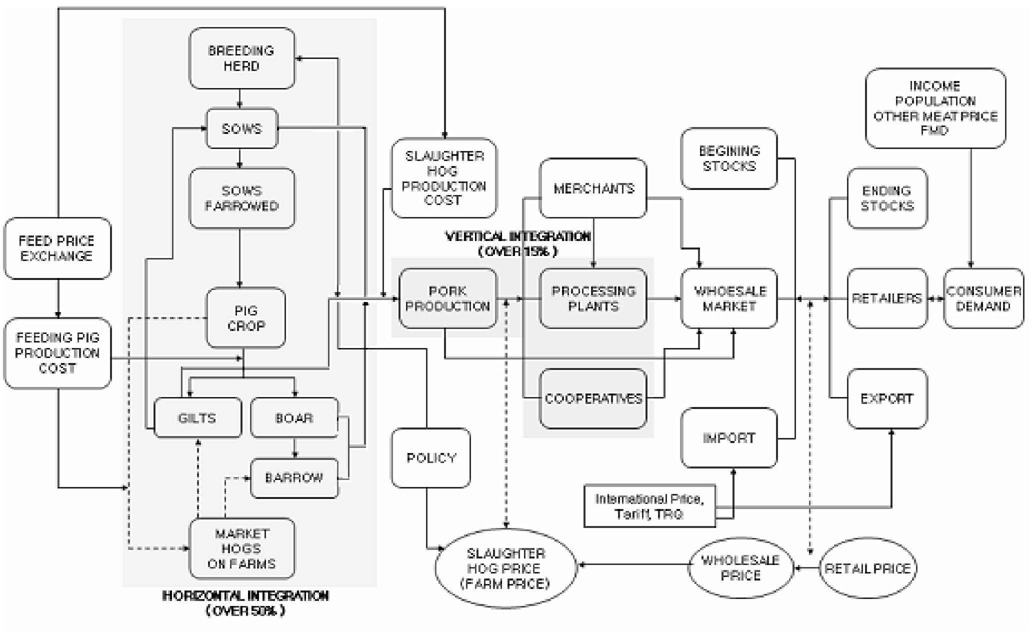
In pork modeling[9], the most important components are primary supply and demand decisions. On the supply side, the number of sows slaughtered or gilts retained determines the level of the pork breeding herd and pork production. These decisions depend on the expected economic profitability of producing pork. Once the breeding herd is determined, the next step is how often these animals are farrowed each year. In the past, it was not unusual to farrow each sow only once each year. This occurred as farmers staggered different enterprises on their farm, each of which took a significant amount of time. However, as pork production has moved toward

[9] Brown, Scott (1994)

confinement operations, the number of times a breeding animal is farrowed has increased dramatically. Some hog producers now farrow more than twice in a year.

Similar to the beef model, there exist biological lags in pork production. From the time a producer chooses to breed a sow, it takes 114 days before that sow produces offspring. It takes approximately another 6 months before that offspring can reach slaughter weight. Even though this time period is much shorter than beef, it remains important that the model deals with the biological lag so that production responds in a correct fashion.

Figure 7. Korean Pork Model Flow Diagram



Source: Han & Brown (FAPRI), 2007.

With the annual model, pork production also responds to changes in economic signals. However, there are still limitations to the extent of response. Once pigs are born and are not used for breeding purposes they are either slaughtered during the current year or remain as market hogs on farms at the end of year. For a given year, barrow and gilt slaughter occurs from market hogs on hand at the beginning of the year and from a portion of the pig crop born during the year. Supplies of barrows and gilts to be slaughtered and packers' demand for those animals determine the price to be paid for barrows and gilts. A similar interaction occurs for sows and boars. Like the beef model, there is no separation of pork into different products. A pound of pork is a pound of pork whether it comes from sows, boars or barrows and gilts.

Number of Breeding

1) Number of Pigs

$$NB53PIG_t = f(0.5 \times NB53SOW_{t-1} + 0.5 \times NB53SOW_t)$$

2) Number of Sows

$$NB53SOW_t = f\{NB53SOW_{t-1,} avr(\frac{NFP53_t}{COST53_t}, \frac{NFP53_{t-1}}{COST53_{t-1}})\}$$

3) Number of Hogs

$$NB53_t = f(NB53SOW_t + NB53PIG_t)$$

Number of Slaughter

4) Hog Slaughter

$$SL53_t = f(0.5 \times NB53PIG_{t-1} + 0.5 \times NB53PIG_t)$$

Cost Function

5)
$$COST53_t = f((0.35*(0.5*NFP53PIG_t + 0.5*NFP51PIG_{t-1}) + 0.02*MACHP_t + 0.03*MATRP_t + 0.01*FUELP_t + 0.02*WAGE_t + 0.01*INTEREST_t + 0.55*FEED\_PRICE_t)$$

Pork Supply

6) Slaughter Weight

$$SLW53F_t = f(SLW53F_{t-1}, Trend),\ SLW53M_t = f(SLW53M_{t-1}, Trend)$$

7) Pork Production

$$Q53_t = f(0.56 \times (SLW53F_t + SL53M_t)/2 \times SL53_t)$$

8) Imports

$$M53_t = f\{[NCP53_t, (MP53_t \times EXCH_t \times (1 + TE53_t / 100))] / CPI_t\}$$

9) Beginning Stock

$$EST51_t = f(EST53_{t-1}, Q53_t, M53_t, NCP53_t / CPI_t), \qquad EST53_{t-1} = BST53_t$$

Pork Demand

10) Per Capita Consumption

$$PERD53_t = f(NCP53_t, NCP\_SUB^j{}_t, DINC_t / CPI_t)$$

11) Ending Stock

$$EST53_t = f(EST53_{t-1}, Q53_t, M53_t, NCP53_t / CPI_t)$$

Market Clearing Condition

12) $SUP53_t = Q53_t + BST53_t + M53_t, \quad TD53_t = D53_t + EST53_t + X53_t$

13) $TD53_t = SUP53_t$

The broiler sector provides a different structure than other livestock sectors. The level of complexity is much less. The lack of complexity can be contributed to the small biological lag that exists in the broiler sector. Production levels can be changed very quickly in response to changes in current economic information. That means that no farm level exits within this developed framework of the broiler industry which is related to the degree of vertical integration[10] in broiler industry. The flow diagram of

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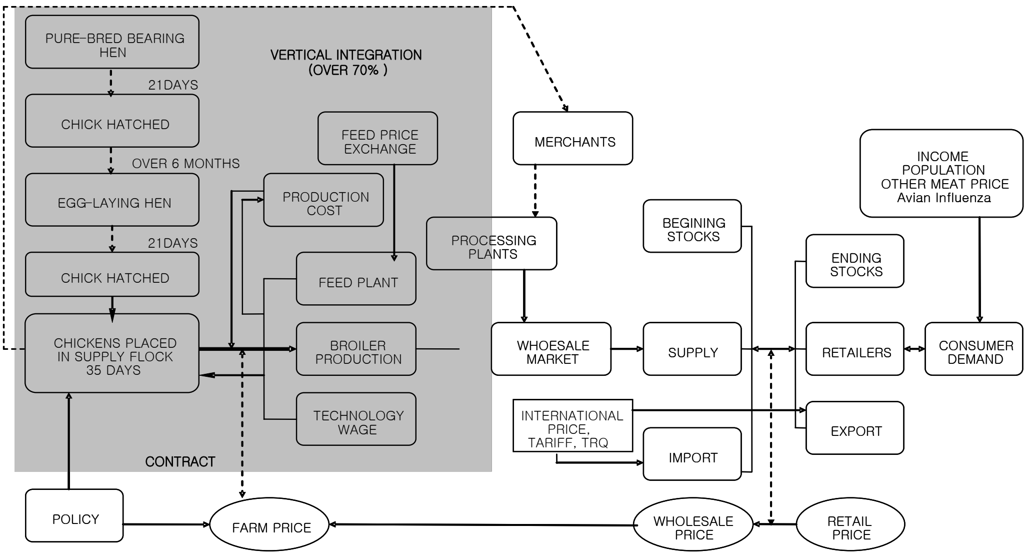
[10] That is, broilers are produced and marketed by companies that own or control breeder flocks, hatcheries, broiler flocks, feed mills, processing plants, and market arrangements. While there are some company-owned farms, typically, birds (both broiler and breeder flocks) are managed by farmers under contract and under supervision of the company. The farmer provides land, labor, houses, litter, equipment, taxes, utilities, and insurance. Contracts provide a base amount and reward efficiency and quality of product with bonuses. The company furnishes birds,

the broiler sector is shown in Figure 8. In the supply portion, each decision point can be influenced by changes in the current wholesale broiler price. It is very different than the other livestock models due to biological lag is very short. In the demand side of the broiler sector, retail demand is the main determinant of demand with exports and stocks which are less important than in other livestock. The supply decisions depend on feed costs and broiler costs. The primary investment decision is chicks placed in the broiler supply flock. The lagged dependent variable represents the large fixed costs that exist in broiler production. The interaction of production with a packer demand equation determines the wholesale broiler price. Wages are one of the determinants that affect the margin between the wholesale and retail price. The retail demand specification is that per capita consumption of broiler meat depends on income and prices of substitute meat products. This demand interacts with the total supply of broiler meat to determine the retail price of broilers.

Figure 8. Korean Broiler Model Flow Diagram



Source: Han & Brown (FAPRI), 2007.

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feed, vaccines, drugs, and supervision. Broiler chicks are derived from genetically selected male and female lines. The male and female lines are crossed to produce a hybrid offspring referred to as a broiler. The parent stock is referred to as broiler breeders. Integrated broiler companies typically have three types of contract farms - those raising broiler breeder replacement stock, those keeping the broiler breeder stock for production of fertile eggs, and those growing out the broiler chicks.

Number of Breeding

1) Number of Broilers

$$NB541_t = f(SL541_t)$$

2) Inventory of Pure-bred Breeding Chicks for Broiler

$$NB542BROILER_t = f(NB542BROILER_{t-1}, \mathrm{NFP541_t/COST541_t})$$

Number of Slaughter

3) Broilers Slaughter

$$SL541_t = f(SL541_{t-1}, 0.5\times(NFP551_t / COST541_t) + 0.5\times(NFP541_{t-1} / COST541_{t-1}),$$
$$0.5\times NB542BROILER_{t-1} + 0.5\times NB542BROILER_{t-1}, SLW541_{t-1}, (TEMP\_7 + TEMP\_8)2))$$

Cost Function

4) $$COST541_t = f((0.31*(0.5*NFP541_t + 0.5*NFP541_{t-1}) + 0.03*MACHP_t + 0.02*MATRP_t)$$
$$+ 0.04*FUELP_t + 0.01*WAGE_t + 0.01*INTEREST_t + 0.58*FEED\_PRICE_t), SLW541_t$$

Supply

5) Broilers Slaughter Weight

$$SLW541_t = f(SLW541_{t-1}, Trend)$$

6) Production

$$Q541_t = SLW541_t \times SL541_t$$

7) Import

$$M541_t = f\{(NCP541_t / CPI_t), (MP541 * EXCH * (1.1 + TE541/100) / CPI_t)\}$$

Demand

8) Per Capita Consumption

$$PERD541_t = f(NCP541_t, NCP\_SUB^j{}_t, DINC_t / CPI_t)$$

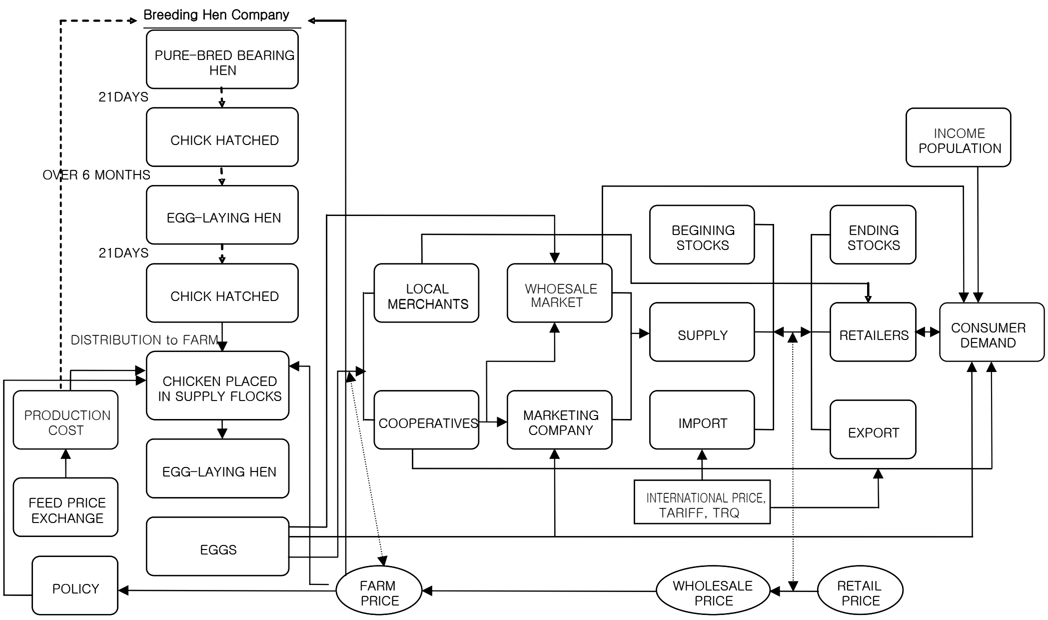
Market Clearing Condition

9) $SUP541_t = Q541_t + M541_t, \quad TD541_t = D541_t$

10) $TD541_t = SUP541_t$

The hen and eggs sector is similar to broiler sector. It provides a different structure than other livestock sectors. The level of complexity is much less. The lack of complexity can also be contributed to the small biological lag that exits in the sector. Production levels can be changed very quickly in response to changes in current economic information. Because biological lags are same with broiler sector except hen's life cycle.

Figure 9. Korean Hen & Eggs Model Flow Diagram



Source: Han & Brown (FAPRI), 2007.

Number of Breeding

1) Number of Hens

$$NB543_t = f\{NB543_{t-1}, NB542HEN_t, NB542HEN_{t-1}, \frac{NFP543EGG_t}{COST543_t}\}$$

2) Inventory of Pure-bred Breeding Chicks for Hen

$$NB542HEN_t = f\{NB543HEN_{t-1}, \frac{NFP543EGG_t}{COST543_t}\}$$

Cost Function

3) $$COST543EGG_t = f((0.33*(0.5*NFP543EGG_t + 0.5*NFP543EGG_{t-1}) + 0.03*MACHP_t + 0.03*MATRP_t) + 0.01*FUELP_t + 0.03*WAGE_t + 0.01*INTEREST_t + 0.55*FEED\_PRICE_t))$$

Supply

4) Production

$$Q541_t = f(0.5 \times NB543_t + 0.5 \times NB543_{t-1}, Temp_t)$$

5) Import

$$M543_t = f\{(NCP543_t / CPI_t), (MP543 * EXCH * (1.1 + TE543/100) / CPI_t)\}$$

Demand

6) Per Capita Consumption

$$PERD543_t = f(NCP543_t, NCP\_SUB^j{}_t, DINC_t / CPI_t)$$

Market Clearing Condition

7) $SUP543_t = Q543_t + M543_t, \quad TD543_t = D543_t$

8) $TD543_t = SUP543_t$

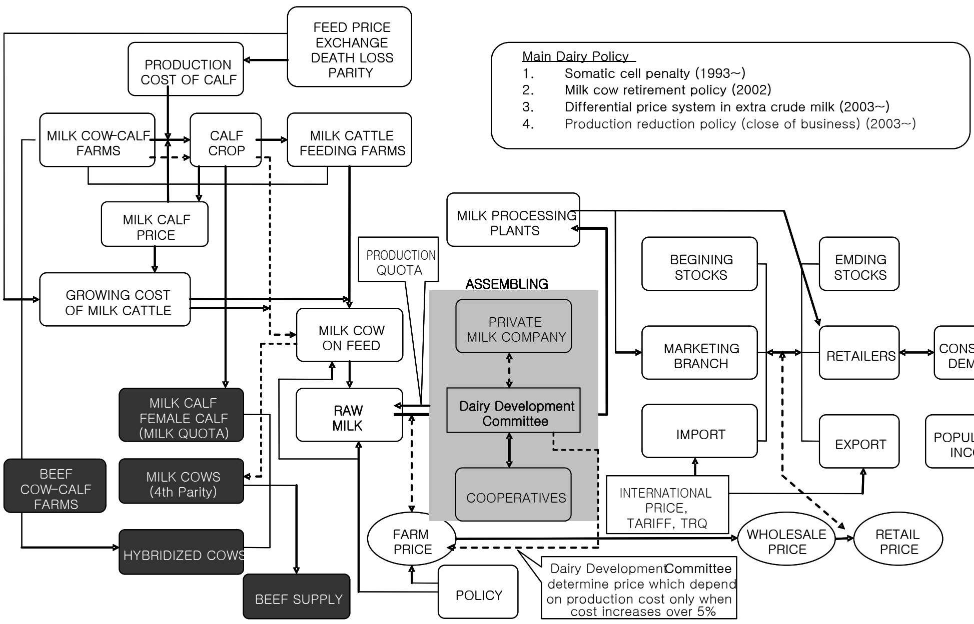
In terms of complexities that exist within the agriculture industry, the dairy sector is most complex. Factors which lead to this level of complexity include the numerous products that are produced from raw milk, Korean government or Dairy Development Committee intervention in terms of target price activity. Given all of these factors, an econometric model that retains this level of complexity will be difficult to develop. Figure 10 and Figure 11 lay out the structure that makes up the dairy sector and develops an econometric model that attempts to replicate the important decision points that occur within the sector.

The most important issue involved in this dairy sector modeling is how we estimate and specify the future milk price and target price. According to historical data, all milk prices just followed the target price made by the government. The government guaranteed fluid milk price has been unchanged for the last 5 years. Over the last 15 years, the government has changed the target price 4 times to increase the price when production cost increased over 5% compared to previous years. We can assume that current raw milk price would continue into the near future or we can change the government target price based on cost increases. This method is not realistic in policy analysis. We made new target price deterministic method in this model with using government deterministic method. The First step is predicting the production cost induced from management cost prediction to make dummy variable. If production cost growth exceeds the 5% compared to last year, dummy variable is one, others are zero. The Next step is to forecast the target price. Target price is determined by exchange ratio on production cost and dummy variable's joint product variable because the government increase target price by using exchange ratio for production cost when production cost exceeded 5%.

We can skip a detailed explanation of the supply side model specification because milk cow's biological lags are same to beef sector. Figure 10 reviews the model flow diagram and model specifications. In milk cow policy modeling, we tried to include these policies to the model however, data was not available. We tried to include these policy changes by using structural dummy variables or dummy variables.

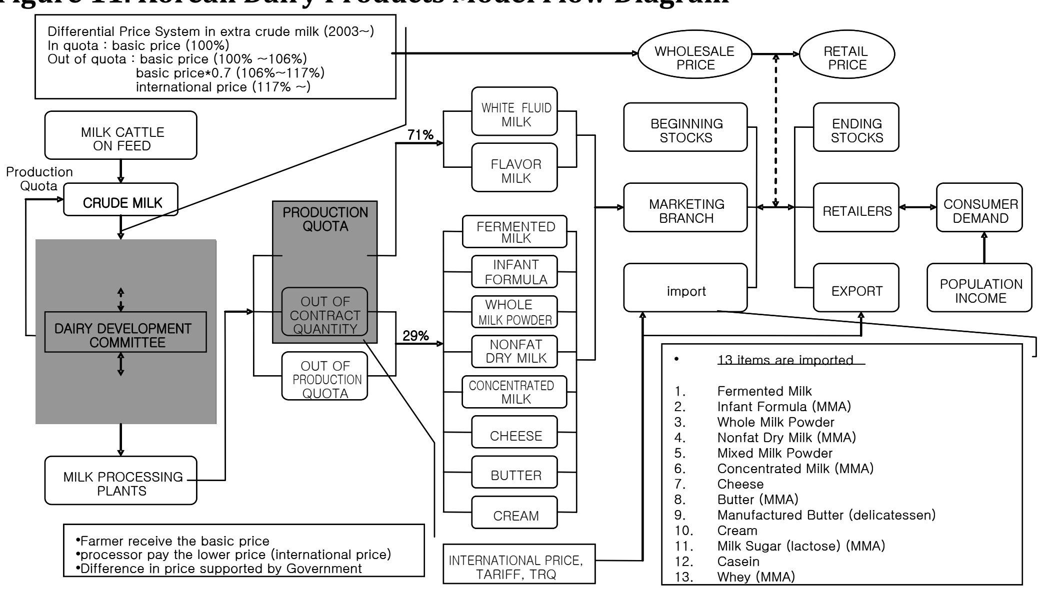
In dairy products modeling, we only covered milk powder (whole milk powder, skim milk powder, and infant formula), cheese, butter, concentrated milk and fermented milk. We have to cover 13 items. However, data was not available in Korea. The other 6 items' marketing proportion was also small. We treated these six items as residuals.

Figure 10. Korean Milk Cow Model Flow Diagram



Source: Han & Brown (FAPRI), 2007.

Figure 11. Korean Dairy Products Model Flow Diagram



Source: Han & Brown (FAPRI), 2007.

Number of Breeding

1) Female Beef Cattle over 2 years artificially inseminated

$AI52F_t = f\{(NFP52MILK_t)/COST51C_t, NB52FY_t\}$

2) Female under 1 year

$NB51F2_t = f(0.8\times \mathrm{AI52F_{t-1}} + 0.2\times \mathrm{AI52F_t})$

3) Female 1-2 years

$NB52FT_t = f(NB52FT_{t-1}, SL52F_t)$

4) Female over 2 years

$NB52FY_t = f(NB52FY_{t-1}, NB52FT_{t-1}, SL52F_t)$

5) Female Inventory

$NB52F_t = NB52FI + NB52FT + NB52FY)$

6) Milk Cow Inventory

$NBMC52F_t = f(NBMC52F_{t-1}, NB52FY_t, NFP52MILK_t / NFP51F_t)$

Number of Slaughter

7) $SL52_t = f(DIFFERNCE(NB52FY_t), NFP52MILK_t' PPI_t, NFP51F_t' PPI_t)$

Cost Functions

8) $$COST52MILK_t = f(0.06*MACHP_t + 0.04*MATRP_t + 0.02*FUELP_t + 0.02*WAGE_t + 0.02*INTEREST_t + 0.83*FEED\_PRICE_t))$$

9) $PCOST52_t = -COST52_t = f(WAGE_t, +INTEREST_t)$

Meat Supply

10) Slaughter Weight

$$SLW52F_t = f(SLW52F_{t-1}, Trend)$$

11) Meat Production

$$Q52_t = f(0.381 \times \mathrm{SLW52F_t} \times \mathrm{SL52_t})$$

Fluid Milk Supply

12) Milk Yield Per Head

$$YD52MILK_t = f(YD52MILK_{t-1}, Trend)$$

13) Milk Production

$$Q52MILK_t = NBMC52F_t \times YD52MILK_t$$

Fluid Milk Demand

14) Per Capita Consumption

$$PERD52MILK_t = f(NCP52MILK_t, NCP\_SUB^j{}_t, NINC_t / CPI_t)$$

Price

15) Target Price

$$T\arg 52MILK_t = f\{(PCOST52_t / PCOST52_{t-1} - 1) \times DUMMY\_COST, CPI_t\}$$

Dairy Products' Supply

16) Dairy Products' Production

$$Q52DAIRY_t = f(NCP52DAIRY_t^j / NCP52MILK_t, BST52DAIRY_t)$$

17) Dairy Products' Import

$$M52DAIRY_t^j = f\{(NCP52DAIRY_t^j / CPI_t),(MP52DAIRY_t^j * EXCH * (1.1 + TE52DAIRY_t^j / 100 / CPI_t)\}$$

18) Dairy Products' Beginning Stock

$$EST52DAIRY_t^j = f(EST52DAIRY_{t-1}^j, Q52DAIRY_t^j, M52DAIRY_t^j, NCP52DAIRY_t^j / CPI_t),$$
$$EST52DAIRY_{t-1}^j = BST52DAIRY_t^j$$

Dairy Products' Demand

19) Per Capita Consumption

$$PERD52DAIRY_t^j = f(NCP52DAIRY_t^j / NCP\_SUB^k{}_t, DINC_t / CPI_t)$$

20) Export (assumption)

$$X52DAIRY_t^j = f(X52DAIRY_{t-1}^j, TREND$$

21) Ending Stock

$$EST52DAIRY_t^j = f(EST52DAIRY_{t-1}^j, Q52DAIRY_t^j, M52DAIRY_t^j, NCP52DAIRY_t^j / CPI_t)$$

Dairy Products' Market Cearing Condition

22) $$SUP52DAIRY_t^j = Q52DAIRY_t^j + BST52DAIRY_t^j + M52DAIRY_t^j$$
$$TD52DAIRY_t^j = D52DAIRY_t^j + EAT52DAIRY_t^j + X5sDAIRY_t^j$$

23) $TD52DAIRY_t^j = SUP52DAIRY_t^j$

3.3. Macro Index & Cost Price Index

We used specific macro economic assumptions supplied by Global Insight, Inc. except per capita disposable income. Especially, we assumed current exchange rate[11] and current International oil price continue constantly in the future prediction because all international institutes' prediction performance was not good to apply this model assumption.

LOG(DINC) = -5.3926 + 0.9458**LOG(GDP)* - 0.0332**SD*95 - 0.0408**SD*98 - 0.0186**DUM*97
(-6.52) (157.42) (-4.558) (-9.438) (-8.333)

Adjusted R-squared: 0.999889, *D.W.*: 1.485534, *Theil Inequality Coefficient*: 0.003454

INPUT PRICES

CHEMP = 28.92897258 + 0.04687969455**EXCH* + 0.08391439667**GDPDEF* + 0.05444908273**FUELP* + 3.765360287*(*DUM*99+*DUM00)* - 3.66436186*(*DUM*85+*DUM*86)

FERTP = 7.808767617 + 0.2764432947**FUELP* + 0.4615072008**FUELP*(-1) + 0.203321318**PPI*

FUELP = 42.21698286 + 0.002033756634**EXCH***INTERP*_FUELP2 + 22.55643028**DUM*98

MACHP = 25.77566832 - 0.04959976261*FUELP + 0.7972116935**PPI* + 18.80347371**SD*9397 - 0.5054603716**SD*9397**PPI* - 4.286055776**DUM0*4

MATRP = 32.35575683 + 0.01798864235**EXCH* + 0.1586619075**PPI* + 0.2665927259**FUELP* + 12.64150368*SD88 - 9.004596217**SD*99 + 15.88348526**SD*04

[11] Exchange rate was updated until April, 2008 in this model. And in case of international oil price, we updated on May 2nd 2008 and used all countries spot FOB price weighted by estimated export volume (dollars per barrel) supported by http://tonto.eia.doe.gov/dnav/pet/pet_pri_wco_k_w.htm

LOG(RENT) = -1.823437983 + 0.4492565208**LOG(RENT*(-1)*)* +
0.6269156658**LOG(NFP11*(-1)*)* - 0.057792831**LOG(WAGE*(-1)*)* +
0.1314028925**(DUM*88+*DUM*89*)* - 0.1155225955**SD*92

SEEDP = 1.581189981 + 1.071722299**SEEDP*(-1) - 8.251936839**SD*94

WAGE = -15.47441196 + 1.186423061**CPI*(-1) + 10.1189688*SD90 -
5.84234583**SD*97 + 16.1732692**SD*00

3.4. Agricultural Total Value

Agricultural total values are calculated by aggregation with each commodity or estimated by economic model. Aggregation method is used on total production value, total value-added, total income, total utilized acreage, total animal inventory, trade balance and self-sufficient ratio. In case of total farm price, we calculated by aggregating total commodities with quantities' weights.

Table 2. Aggregated Total Value

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Agricultural Total Income							(one billion won)					
Total Production Value	26,602	28,643	29,375	29,760	31,973	31,968	32,383	32,164	31,809	36,156	35,089	35,232
Total Value-Added	19,637	20,540	20,203	18,672	21,082	21,244	21,055	21,056	20,436	22,651	21,098	21,027
Total Income	15,714	16,038	14,694	12,654	14,602	15,082	15,255	14,431	13,367	14,942	15,041	15,054
Total Income (real)	18,889	18,671	16,480	12,648	14,903	15,083	15,327	14,543	13,181	13,893	13,690	13,392
							(one thousand won)					
Total Income per ag_capita	3,239	3,418	3,289	2,876	3,468	3,741	3,879	4,019	3,787	4,375	4,380	4,556
Income per Household							(one thousand won)					
Total Income per household	21,803	23,298	23,488	20,494	22,323	23,072	23,907	24,475	26,878	29,001	30,503	32,303
Agricultural Income	10,469	10,837	10,204	8,955	10,566	10,897	11,267	11,274	10,572	12,050	11,815	12,092
Non-Farm Income	1,526	1,522	1,823	1,213	1,484	1,435	1,491	1,454	2,266	2,342	2,531	2,690
Non-Agbusiness Income	5,404	5,965	6,854	5,763	5,550	5,997	6,338	6,686	7,131	7,201	7,353	7,347
Transfer Income	4,403	4,974	4,607	4,563	4,723	4,743	4,811	5,060	2,031	3,006	4,078	4,886
Irregular Income	-	-	-	-	-	-	-	-	4,878	4,401	4,725	5,289
Population							(one thousand person)					
Agricultural Population	4,851	4,692	4,468	4,400	4,210	4,031	3,933	3,591	3,530	3,415	3,434	3,304
Economically Active Pop	2,702	2,629	2,589	2,656	2,569	2,535	2,478	2,422	2,293	2,152	2,126	2,097
Employed in Agriculture	2,289	2,218	2,177	2,318	2,219	2,162	2,065	1,999	1,877	1,749	1,747	1,721
							(one thousand household)					
Number of Household	1,501	1,480	1,440	1,413	1,382	1,384	1,354	1,280	1,264	1,240	1,273	1,245
Total Farm Price (Normal)							(index 2000=100)					
Total Farm Price	91	96	93	93	99	100	105	111	120	116	112	114
-Crops	89	95	96	99	100	100	102	105	114	108	99	104
-Livestocks	98	98	88	79	96	100	117	132	141	144	154	150
							(Thousand hectares)					
Total Acreage	1,985	1,945	1,924	1,910	1,899	1,889	1,876	1,863	1,846	1,836	1,824	1,800
Total Utilized Acreage	2,197	2,142	2,097	2,118	2,116	2,098	2,089	2,020	1,936	1,941	1,921	1,860
-Grains	1,346	1,340	1,314	1,331	1,325	1,316	1,333	1,297	1,234	1,231	1,232	1,178
-Vegetables	322	311	285	278	289	296	280	251	245	255	240	234
-Special crops	122	101	108	115	104	92	94	96	85	76	77	76
-Orchards	172	171	174	173	171	169	163	162	159	153	150	147
Utilized Acreage ratio (%)	108.1	107.9	107.8	110.1	110.8	110.5	110.6	107.6	103.9	105.2	104.7	102.0
Acreage per Farm household (unit: ha)	1.32	1.31	1.34	1.35	1.37	1.36	1.39	1.46	1.46	1.48	1.43	1.45
Acreage per capita (unit: a)	4.4	4.3	4.2	4.1	4.1	4.0	4.0	3.9	3.9	3.8	3.8	3.7
Acreage per Farmer (unit: a)	40.9	41.5	43.1	43.4	45.1	46.9	47.7	51.9	52.3	53.8	53.1	54.5
Total Animal Invetory							(Million heads)					
Cattle+Milkcow+Hog+Broiler+Hen	90.1	93.1	95.7	91.8	102.0	107.7	111.4	115.2	110.4	110.6	129.0	132.3
Trade Balance												
Quantities							(Thousand Tons)					
-Trade deficits	19,706	22,361	21,030	19,973	21,711	22,756	22,665	23,956	23,849	23,685	24,264	24,856
-Exports	852	999	1,104	1,217	1,150	1,129	1,288	1,322	1,335	1,345	1,389	1,351
-Imports	20,558	23,360	22,134	21,191	22,861	23,886	23,953	25,278	25,185	25,029	25,654	26,207
Values							(one hundred million dollars)					
-Trade deficits	56.4	67.3	60.9	40.3	45.2	55.1	54.3	61.8	66.5	72.9	76.9	86.9
-Imports	68.9	81.5	76.0	54.2	59.3	67.8	68.0	76.5	83.3	92.1	97.6	108.7
-Exports	12.5	14.2	15.1	13.9	14.1	12.7	13.7	14.7	16.8	19.2	20.7	21.8
Self-sufficient Ratio												
Total (Demand+Processing)	80.4	82.5	81.9	82.4	83.8	83.7	85.1	83.2	79.4	82.2	82.4	80.9
Grains (Demand+Processing)	56.5	62.7	63.1	59.6	62.1	63.1	65.5	60.4	54.9	60.9	62.1	59.4
-Rice	89.9	105.0	104.5	96.6	102.9	102.7	99.2	90.3	94.3	96.0	95.2	92.5
Meats	85.9	87.7	89.2	95.0	81.5	78.8	75.4	76.7	75.8	78.6	76.4	72.3
-Beef	51.4	53.8	65.4	76.5	57.8	53.2	42.4	36.6	36.3	44.2	48.1	47.8
Spice & Culinary	98.7	95.5	94.5	92.5	96.5	95.7	97.4	94.0	86.3	90.0	92.5	88.3
-Red Pepper	94.6	107.5	91.6	78.4	94.3	88.2	82.7	89.5	63.1	70.1	72.9	61.2

Other sectors were estimated by using economic equations or formulas; total acreage (utilized acreage ratio, acreage per farm household, acreage per capita, acreage per farmer) income per household (agricultural income, non-farm income, non-agbusiness income, transfer income, and irregular income), and population (agricultural population, economically active population, employment in agriculture, number of household).

$ACL\_TOINC = \sum_{i-1}^{n} INCOME_i$

PER_TOINC= ACL_TOINC/ AG_POP

H_INC=FARM_INC+NF_INC+NB_INC+TR_INC+IR_INC

FARM_INC= ACL_TOINC/ AG_FARM

LOG(NF_INC) = -0.1384922181 + 0.5674062641**LOG(NF_INC*(-1)) + 0.7825806105**LOG(WAGE)* - 0.3631846792**SD*98 + 0.1597437523*SD03 + 0.256368056*(*DUM*99+*DUM*03)

LOG(NB_INC) = -2.209369692 + 1.373966431**LOG(WAGE)* + 0.7632729044**LOG(NEPA)* + 0.3480522275**SD*93 - 0.3686219875**SD*00

TR_INC = *Q*11**VGP/AG_FARM**1000/80 + *ACR*11*700000/*AG_FARM* +*PR_INC*+*ALHF*

IR_INC = *IR_INC*(-1)*1.0273142508861013

PR_INC =*PR_INC*(-1)*(1+0.05)

ALHF = *ALHF*(-1)*(1+0.0944499844506923)

AG_POP: Dynamic Cohort Model

LOG(H_AG_POP) = 1.259081661-0.01755841325*@*TREND*

AG_FARM = AG_POP / H_AG_POP

LOG(EPA) = 2.539032419 + 0.6449514071**LOG(EPA*(-1)) - 0.3199787054**LOG(T_WAGE*(-1)/*PPI*(-1)) - 0.1080195298*(*DUM*91-*DUM*98) + 0.1288601273**LOG(PER_TOINC*(-1))

LOG(EPA_POP) = 1.130121752 + 0.1934625273**LOG(EPA_POP*(-1)) + 0.6763049873**LOG(EPA)*

NEPA = 1*(*EPA_POP-EPA*)

LOG(T_WAGE) = -1.091810017 + 0.6371342524**LOG(T_WAGE*(-1)*)* + 0.8841219854**LOG(CPI)* - 0.06828115837**SD*97 - 0.0737646157**SD*04 + 0.07560329827**(DUM*89+*DUM*90-*DUM*98-*DUM*01

LOG(TOTAL_ACR) = 2.60870869978 + 0.655536878344**LOG(TOTAL_ACR*(-1)*)* + 0.0130610652669**LOG(TNFP_INDEX_CROPS*(-1)*)* - 0.0117754524974**LOG(CURTP*(-1)*)* - 0.0265825397452**LOG(WAGE*(-1)/*PPI*(-1)*100) + 0.0144169061362**LOG(AG_POP*(-1)*)* - 0.00851375689592**SD*06 + 0.00497747414313**(DUM*87-*DUM*96*)* - 0.00728699443453**LOG(@TREND)***SD*95

3.5. Converting Price from Crop Year to Calendar Year

We considered the commodity data period as the biological concept such as crop year. For example, rice farmers plant on paddy field in May and harvest on Oct. So marketing period is that from November to October in the next year. This period is called as marketing year or crop year. This concept is important in modeling and data mining. The reason is that if we just use price data on the calendar year or fiscal year basis, measurement error arises and this error makes the coefficients in model bias and inconsistent estimator. Jeffery (2002) explained basic measurement error problem in model.

$$y = \beta_0 + \beta_1 x_1^* + u \qquad (29)$$

$$x_1 = x_1^* + e \qquad (30)$$

$$y = \beta_0 + \beta_1 x_1 + (u - \beta_1 e) \qquad (31)$$

$$E(u, x) = \text{cov}(u, x) = 0 \qquad (32)$$

$$E(e, x) = \text{cov}(e, x) = 0 \qquad (33)$$

Where, x_1^*: Actual Value, x_1: Observed Value, e : Measurement Error

We can think this measurement error problem by two types. The first case is there is no correlation between measurement error term and explanatory variables ($\text{cov}(e, x_1) = 0$). In this case, β 's values are all unbiased, consistent estimator. Because we already assume that $E(u, x) = \text{cov}(u, x) = 0$, $E(e, x) = \text{cov}(e, x) = 0$. However, problem is that variance *u-β₁e* of (31) is basically bigger than original variance, inducing inefficiency.

$$\mathrm{var}(u-\beta_1 e)=\sigma_u^2+\beta_1^2\sigma_e^2>\sigma_u^2 \tag{34}$$

The second case is there is correlation between measurement error term and explanatory variables ($\mathrm{cov}(e,x_1)\neq 0$), we call this problem classical errors-in-variable (EIV). This problem raise biased and inconsistent estimator in equation even though in large sample size.

$$\mathrm{cov}(x_1,e)=\mathrm{cov}(x_1^*+e,e)=\sigma_e^2\neq 0 \text{ where, } \mathrm{cov}(x_1^*,e)=0, \quad \mathrm{cov}(e^2)=\sigma_e^2 \tag{35}$$

$$\mathrm{cov}(x_1,u-\beta_1 e)=-\beta_1\sigma_e^2\neq 0 \text{ Where, } \mathrm{cov}(x_{1,}u)=0,\mathrm{cov}(x_1,-\beta_1 e)=-\beta_1\sigma_e^2 \tag{36}$$

$$p\lim(\hat{\beta}_1)=\beta_1+\frac{\mathrm{cov}(x_1,u-\beta_1 e)}{\mathrm{var}(x_1)} \tag{37}$$

$$=\beta_1+\frac{-\beta_1\sigma_e^2}{\sigma_{x_1^*}^2+\sigma_e^2} \quad \because \mathrm{var}(x_1)=\mathrm{var}(x_1^*+e)=\sigma_{x_1^*}^2+\sigma_e^2 \tag{38}$$

$$=\beta_1\left(1-\frac{\sigma_e^2}{\sigma_{x_1^*}^2+\sigma_e^2}\right)=\beta_1\left(\frac{\sigma_{x_1^*}^2}{\sigma_{x_1^*}^2+\sigma_e^2}\right) \qquad \therefore \hat{\beta}_1\xrightarrow{p}\beta_1\left(\frac{\sigma_{x_1^*}^2}{\sigma_{x_1^*}^2+\sigma_e^2}\right) \tag{39}$$

Unfortunately, macro variable data are published with calendar year base. Because we used this macro data, this model can contain some measurement error in real price data series. However, we expect it should be not the problem because PPI and CPI data series did not much change in historical data and their pattern was so smooth. In using crop year we met another problem in this model. Because Korean agricultural statistic index such as total agricultural income, production value and total price index were published by calendar year base. We needed a new method in converting from crop year's price to calendar year's price. In converting price methods, we considered several methods[12]. One of them was selected for the smallest error. According to our survey, we found that Korean farm gate price index used the marketing weight[13] made

[12] We applied price index model, and tried regression on each period.

[13] Even though this marketing weight is fixed and does not change over time, basically we have to use this weight in our prediction because formal statistic use this fixed weight over time.

by Korean Agricultural Cooperative Federation. This method also use marketing weights made by Korean Agricultural Cooperative Federation on crop year data. Converting method is like below. If we assume crop year price start September and end August. by using marketing period we calculate marketing weight such as R_1 and R_2. And then we can apply this weight on crop year to get calendar year price. However, this method also has limitation. There has to exist clear seasonality. If there does not exist clear seasonality, calculation error should be large.

$$Period\_A : \frac{P_{t\_4/4}}{P_t} = R_1,\ Period\_B : \frac{P_{t\_1/4 \sim 3/4}}{P_t} = R_2 \tag{40}$$

$$P\_calendar = R_2 \times P_{t-1}\_crop + R_1 \times P_t\_crop \tag{41}$$

Table 3. Monthly Marketing Weight

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Sum
Rice	2.9	3.8	3.8	2.3	2.6	2.6	2.6	3.1	4.7	27.8	30.0	13.8	100
Corn	2.9	0.6	1.0	-	0.2	16.6	38.8	17.5	1.9	9.3	2.1	9.1	100
Soybean	6.6	4.9	2.1	1.6	0.9	1.5	1.1	1.1	2.5	10.6	41.5	25.6	100
Red Pepper	2.0	2.6	2.1	1.4	2.0	0.8	1.1	13.5	33.7	23.5	11.8	5.5	100
Garlic	0.9	1.2	1.2	4.8	3.5	42.8	27.2	7.4	3.0	1.2	3.2	3.6	100
Onion	0.1	0.1	1.9	2.4	3.8	44.2	35.9	9.6	1.0	0.7	0.1	0.2	100
Apple	16.2	5.7	5.3	4.3	8.2	2.0	2.0	8.2	13.9	9.7	13.9	10.6	100
Pear	14.0	4.5	3.4	1.9	2.6	2.0	1.4	3.0	18.9	16.9	14.0	17.4	100
Peach	-	-	-	-	-	0.7	38.9	48.7	10.2	1.1	0.4	-	100
Grape	-	-	-	-	2.3	1.7	2.8	28.3	39.8	21.5	3.1	0.5	100
Tangerine	18.7	11.7	5.7	1.8	1.5	0.9	0.4	1.4	3.0	7.3	13.1	34.5	100
Persimmon	7.3	3.4	3.0	0.9	0.1	-	0.1	0.1	2.7	24.4	48.1	9.9	100

Source: Korean Agricultural Cooperative Federation.

4. ELASTICITY

We summarized commodities' elasticity on coefficients sheet in excel model (KREI-ASMO 2008). In demand, price elasticities are estimated from -0.24 to -0.95 in this model. Grains' price elasticity is lowest estimated by -0.24 and dairy products' price elasticity highest estimated by -0.95. In case of income elasticity, oil crops' elasticity is lowest estimated by 0.14 and dairy products' elasticity highest estimated by 0.96.

According to Euler's theorem, magnitude of own elasticity depends on the magnitude of substitution's elasticity. If there exists no substitute goods in demand equation, basically, own price elasticity has to equal to income elasticity. There are no principles in ordering the magnitude of elasticity due to substitution's elasticity. However, if we consider own price elasticity has to be greater than substitute elasticity, price own elasticity's magnitude order in each commodity group has to be similar to Income elasticity's.

Table 4. Food Demand Elasticity Each Sector

	Price Elasticity	Income Elasticity
Grains	(0.24)	0.16
Vegetables	(0.32)	0.28
Fruits	(0.53)	0.30
Meats	(0.31)	0.62
Oil Crops	(0.47)	0.14
Dairy Products	(0.95)	0.96
Flowering Plants	(0.41)	0.61

Table 5. Food Demand Cross Elasticity

	Rice	Barleys	Wheat	Beef	Pork	Chicken	Eggs	Dairy	Income
Rice	(0.280)	0.031	0.085	0.009	0.036	0.014	0.000	0.013	0.234
Barleys	0.008	(0.336)	0.002	0.015	0.058	0.022	0.000	0.016	0.102
Wheat	0.175	0.009	(0.312)	0.017	0.069	0.026	0.000	0.008	0.124
Beef	0.006	0.000	0.001	(0.523)	0.332	0.017			0.943
Pork	0.009	0.001	0.002	0.118	(0.329)	0.089			0.556
Chicken	0.015	0.001	0.004	0.092	0.120	(0.234)			0.536
Eggs	0.083	0.006	0.020				(0.156)		0.435

	Apples	Asian Pears	Grapes	Peaches	Tangerine	S.Persimmon	F.Vegetables	Orange etc	Income
Apples	(0.689)	0.051	0.060	0.032	0.119	0.026	0.016	0.006	0.103
Asian Pears	0.172	(0.654)	0.085	0.045	0.166	0.037	0.038	0.021	0.103
Grapes	0.075	0.031	(0.493)	0.020	0.072	0.016	0.033	0.032	0.338
Peaches	0.005	0.002	0.003	(0.490)	0.005	0.001	0.049		0.294
Tangerine	0.120	0.050	0.059	0.031	(0.508)	0.026	0.029	0.037	0.252
S.Persimmon	0.077	0.039	0.047	0.022	0.087	(0.471)	0.024	0.027	0.300

	Water Melon	Cham-wei	Tomato	StrawBerry	Fruits	Orange etc			Income
Water Melon	(0.661)	0.122	0.106	0.078	0.197	0.005			0.383
Cham-wei	0.362	(0.685)	0.098	0.069	0.016	0.050			0.373
Tomato	0.102	0.033	(0.366)	0.020	0.002	0.024			0.341
StrawBerry	0.106	0.033	0.027	(0.222)	0.022	0.018			0.191

	Soybeans	Corn	Garlic	Onion	Red Pepper	Welsh	WaKegi	Fresh Pepper	Income
Soybeans	(0.151)								0.178
Corn		(0.117)							0.152
Garlic			(0.344)						0.334
Onion				(0.393)					0.393
Red Pepper					(0.105)				0.103
Welsh						(0.206)			0.188
WaKegi							(0.227)		0.194
Fresh Pepper								(0.527)	0.502

	W.P.(spirng)	W.P.(summer)	W.P.(fall)	S. Potato	Cabbage	Carrot	Cucumber	Pumpkin	Income
W.Potatoes(spirng)	(0.301)								0.099
W.Potatoes(summer)		(0.286)							0.103
W.Potatoes(fall)			(0.360)						0.274
Sweet Potato				(0.235)					0.092
Cabbage					(0.332)				0.291
Carrot						(0.131)			0.104
Cucumber							(0.246)		0.468
Pumpkin								(0.609)	0.530

	Seasam	Perilla Seed	Peanuts	Eggplant	Melon	Ginseng			Income
Seasam	(0.498)	0.268							0.120
Perilla Seed	0.482	(0.543)							0.109
Peanuts			(0.372)						0.179
Eggplant				(0.359)					0.543
Melon					(0.545)				0.676
Ginseng						(1.345)			1.016

	C.C.(spring)	C.C.(summer)	C.C.(fall)	C.C.(winter)	W.R.(spring)	W.R.(summer)	W.R.(fall)	W.R.(winter)	Income
C.Cabbage(spring)	(0.741)			0.089					0.214
C.Cabbage(summer)		(0.185)							0.265
C.Cabbage(fall)			(0.407)						0.141
C.Cabbage(winter)	0.134			(0.223)					0.160
W.Radish (spring)					(0.241)			0.093	0.122
W.Radish (summer)						(0.195)			0.258
W.Radish (fall)							(0.272)		0.302
W.Radish (winter)					0.023			(0.243)	0.288

	Cut Flower	Potting Flower	Others	Income
Cut Flower	(0.644)	0.010	0.002	0.757
Potting Flower	0.015	(0.303)	0.009	0.569
Others	0.026	0.071	(0.281)	0.507

	Mush_Ag	Mush_Forest	Green Tea	Income
Mushrooms_Ag	(0.143)			0.764
Mushromms_Forest		(0.446)		1.088
Green Tea			(0.514)	0.784

Table 6. Acreage Cross Elasticity

	Barleys	Garlic	Onion	Rice	Soybeans	Red Pepper	Corn	Sweat Potato	Ginseng	F.vegetables
Barleys	0.484	(0.241)	(0.243)							
Garlic	(0.204)	0.284	(0.078)							
Onion	(0.217)	(0.081)	0.302							
Rice				0.070	(0.017)				(0.013)	(0.027)
Soybeans				(0.270)	0.292	(0.009)	(0.004)	(0.005)		
Red Pepper					(0.158)	0.349	(0.082)	(0.108)		
Corn					(0.081)	(0.089)	0.225	(0.054)		
Sweat Potato					(0.014)	(0.014)	(0.007)	0.036		
Ginseng				(0.030)					0.185	(0.150)

	Apples	Asian Pears	Grapes	Peaches	Tangerines	S.Persimmons
Apples	0.493	(0.162)	(0.304)	(0.023)		
Asian Pears	(0.244)	0.381	(0.129)			
Grapes	(0.204)	(0.154)	0.364			
Peaches	(0.315)			0.320		
Tangerines					0.330	
Sweat Persimmons						0.347

	Water Melon	Cham Wei	Cucumber	Pumpkin	Tomato	Strawberry	Rice	Ginseng
Water Melon	0.122	(0.018)	(0.026)	(0.015)	(0.016)	(0.011)		(0.033)
Cham Wei	(0.135)	0.256					(0.118)	
Cucumber	(0.060)		0.141	(0.015)	(0.017)	(0.012)	(0.033)	
Pumpkin	(0.147)		(0.062)	0.474	(0.039)	(0.028)	(0.195)	
Tomato	(0.034)		(0.015)	(0.009)	0.241	(0.007)	(0.175)	
Strawberry	(0.071)		(0.029)	(0.016)	(0.018)	0.136		

	Cut Flower	Potting Flower	Others
Cut Flower	0.246	(0.015)	
Potting Flower	(0.085)	0.316	
Others			0.191

5. DYNAMIC SYSTEM PERFORMANCE

The next step in building the model system is to evaluate how the entire system of equation performs. This was accomplished by simulating the model over the 1980 to 2006 period. The model was simulated in a dynamic mode to determine how well it replicates history. Table 7 shows RMSE (Root Mean Squared Error), MAE (Mean Absolute Error), MAPE (Mean Absolute Percentage Error) and Theil Inequality Coefficient. RMSE and MAE depend on variables' units. They are not percentage. These two forecast error statistics depend on the scale of the dependent variable. These should be used as relative measures to compare forecasts for the same series across different models.

Table 7. Dynamic Model Performance

Variable	RMSE	MAE	MAPE	Theil's Coefficient	Bias Proportion	Variance Proportion	Covariance Proportion
CHEMP	1.30908	1.049437	1.31754	0.00778	0.00009	0.00195	0.99796
DINC	58.62533	48.02935	0.84236	0.00313	0.00117	0.00303	0.99581
FERTP	3.500051	2.902449	3.50269	0.02040	0.00000	0.00642	0.99358
FUELP	2.174665	1.582858	1.58005	0.00961	0.00000	0.00198	0.99802
MACHP	0.739269	0.566959	0.71001	0.00433	0.00000	0.00063	0.99937
MATRP	3.03267	2.10066	2.28762	0.01638	0.00000	0.00852	0.99148
WAGE	1.895375	1.607233	2.75777	0.01233	0.00000	0.00084	0.99916
SEEDP	2.453198	2.043855	2.94563	0.01489	0.00422	0.00010	0.99568
RENT	1.974204	1.57455	1.94176	0.01232	0.00273	0.00640	0.99087
EPA_POP	24.89504	21.21266	0.72747	0.00426	0.00004	0.00000	0.99996
T_WAGE	28.72746	22.30306	1.91950	0.01005	0.00292	0.01130	0.98578
EPA	24.91176	18.41873	0.70429	0.00499	0.00001	0.00325	0.99675
AG_POP	67.79682	50.68825	1.00909	0.00640	0.00000	0.00040	0.99960
AG_FARM	6.478867	5.003	0.33174	0.00217	0.00000	0.00029	0.99971
NF_INC	59.85885	49.33993	3.51381	0.01893	0.00426	0.00006	0.99568
TOTAL_ACR	4.242956	3.462661	0.17634	0.00108	0.00000	0.00035	0.99965
ACR125	8.769528	7.031549	7.45879	0.02869	0.00003	0.00727	0.99270
COST125	5241.597	4367.361	3.42161	0.01904	0.00000	0.01202	0.98798
DPRO125	25.45812	17.44506	4.36382	0.03282	0.00123	0.06688	0.93189
M125	13.07767	10.85074	9.86438	0.04966	0.00000	0.02522	0.97478
RESIDUALD125	5.953215	4.74683	9.41095	0.03916	0.00079	0.00212	0.99710
EST125	16.71448	12.42308	4.10827	0.02764	0.00145	0.02965	0.96890
YD125	12.56888	10.46996	3.84305	0.02274	0.00000	0.05186	0.94814
NFP125	0.481755	0.415463	0.37130	0.00216	0.00000	0.00122	0.99878
ACR212	0.931646	0.777091	6.52959	0.03416	0.00028	0.02799	0.97173
COST212	24608.3	20543.28	5.63623	0.03071	0.00000	0.00597	0.99404
D212	46.16287	37.98087	4.75386	0.02761	0.00060	0.00564	0.99376
M212	4.195171	3.213961	22.86176	0.04259	0.00000	0.00566	0.99434
NWP212	31.51218	20.42607	4.49373	0.03540	0.00000	0.00672	0.99329
NFP212	26.91773	20.71498	11.58734	0.06385	0.00000	0.03804	0.96196
YD212	129.2655	108.9435	2.36947	0.01232	0.00000	0.00405	0.99595
ACR211	1.315673	1.121131	3.14285	0.01801	0.01002	0.00063	0.98935
COST211	17258.29	15356.82	2.55649	0.01316	0.00000	0.00624	0.99376
D211	16.78577	13.09714	3.39254	0.02094	0.01329	0.00327	0.98344
EST211	0.990666	0.769261	10.67881	0.04168	0.00000	0.00032	0.99968
M211	8.434116	6.639945	28.63343	0.11047	0.00000	0.07380	0.92620
YD211	19.87703	15.46221	1.56847	0.00956	0.00000	0.00471	0.99529
NFP211	250.3502	160.8637	9.94736	0.07281	0.00103	0.01855	0.98042
NWP211	71.31512	51.76823	3.55229	0.02108	0.00311	0.00564	0.99125

Variable	RMSE	MAE	MAPE	Theil's Coefficient	Bias Proportion	Variance Proportion	Covariance Proportion
D124	25.1357	20.08937	1.71504	0.01101	0.00013	0.00976	0.99012
PRO124	25.89962	22.57387	2.43133	0.01368	0.00031	0.02684	0.97285
EST124	51.26906	33.4094	7.04447	0.04616	0.00000	0.02751	0.97249
NCP124	1.546223	1.231319	2.37377	0.01288	0.00037	0.00552	0.99411
FEED124	0.38145	0.304362	4.42483	0.02819	0.00000	0.01127	0.98873
LOSS124	5.179393	2.684379	7.61943	0.08037	0.00312	0.08760	0.90928
MP124	0.007392	0.005622	3.69055	0.02236	0.00000	0.01145	0.98855
ACR11	11.57886	9.309251	0.87675	0.00527	0.00782	0.00455	0.98763
COST11	5744.317	4732.155	2.11907	0.01211	0.00000	0.00180	0.99821
EST11	53.62768	43.50857	6.83348	0.02672	0.00123	0.03979	0.95898
SEED11	0.421067	0.26264	0.59824	0.00498	0.00002	0.00516	0.99482
LOSS11	0.310121	0.264284	4.58026	0.02628	0.00000	0.07294	0.92706
NFP11	16.40091	13.44231	0.70641	0.00441	0.00000	0.00497	0.99504
NWP11	18.92802	12.2809	0.84315	0.00635	0.00000	0.00038	0.99962
YD11	7.635728	6.360362	1.37605	0.00819	0.00000	0.01953	0.98047
D11	52.17839	43.20903	0.91592	0.00554	0.00004	0.00526	0.99470
PRO11	18.78449	14.75818	6.30037	0.03615	0.00167	0.01312	0.98521
ACR222	0.212894	0.169824	3.46950	0.02062	0.00003	0.00655	0.99342
COST222	11614.36	7867.168	2.30723	0.01615	0.00025	0.00325	0.99650
D222	18.64269	14.44351	6.98622	0.04348	0.00242	0.02696	0.97061
M222	0.336996	0.241603	47.24616	0.08836	0.00000	0.01347	0.98653
NFP222	18.58154	13.92752	8.92318	0.04621	0.00000	0.01945	0.98055
NWP222	24.55751	21.40383	7.99220	0.03948	0.00000	0.01091	0.98909
YD222	132.7082	111.3301	2.87149	0.01568	0.00000	0.00765	0.99235
ACR232	0.111492	0.077756	1.48294	0.01113	0.00011	0.00210	0.99779
COST232	38250.4	30206.32	8.07319	0.03819	0.00000	0.00830	0.99170
D232	7.239905	6.091123	3.94867	0.02259	0.00109	0.03975	0.95915
M232	2.408231	1.902698	12.94341	0.03212	0.00000	0.00188	0.99812
NFP232	55.86998	48.17875	12.79878	0.05585	0.00000	0.02953	0.97048
NWP232	24.81034	19.95359	2.99635	0.01760	0.00000	0.00925	0.99075
YD232	108.8536	81.3623	3.27659	0.02057	0.00000	0.00505	0.99495
ACR214	0.912223	0.745925	5.65138	0.03372	0.00013	0.11540	0.88448
COST214	26213.33	21211.89	4.59618	0.02093	0.00000	0.00440	0.99560
D214	21.99961	17.66681	4.33623	0.02696	0.00079	0.10032	0.89890
M214	1.675013	1.334283	1426.75	0.02137	0.00000	0.00485	0.99514
NWP214	42.2663	29.59966	4.54235	0.03051	0.00000	0.00445	0.99555
YD214	16.5798	12.33985	0.45588	0.00301	0.00000	0.00323	0.99677
ACR215	0.591165	0.485013	6.24996	0.03587	0.00032	0.10190	0.89778
COST215	62784.33	48815.31	9.32324	0.05093	0.00131	0.00672	0.99197
D215	14.16991	11.04946	5.77571	0.03688	0.00128	0.05259	0.94614
M215	0.170935	0.117545	1001.25	0.07978	0.00000	0.00869	0.99132
YD215	75.80218	52.10468	2.26515	0.01635	0.00000	0.04035	0.95965
NWP215	241.2662	161.4507	15.52529	0.09647	0.00225	0.02273	0.97502
ACR151_1	1.126846	0.914997	5.59423	0.03436	0.00000	0.06617	0.93383
ACR151_2	0.083901	0.0697	1.58365	0.00928	0.00002	0.00450	0.99548
ACR151_3	0.431217	0.329479	8.19366	0.04570	0.00000	0.01401	0.98599
COST151	12980.19	10490.81	2.23220	0.01364	0.01958	0.03507	0.94536
COST151_3	135639.5	45241.8	5.13373	0.17331	0.03617	0.00076	0.96307
D151_1	37.34187	28.1456	7.39900	0.04819	0.00205	0.04848	0.94946
D151_2	10.78272	8.22342	5.45330	0.03584	0.00058	0.00821	0.99121
D151_3	18.44119	15.54439	13.79478	0.07235	0.00335	0.00861	0.98804
M151	1.348112	1.118732	4.62889	0.02087	0.00000	0.00422	0.99578
M151_1	1.081312	0.750859	8.84088	0.06417	0.00000	0.00888	0.99112
M151_2	0.189961	0.140345	2.73153	0.00967	0.00000	0.00059	0.99941

Variable	RMSE	MAE	MAPE	Theil's Coefficient	Bias Proportion	Variance Proportion	Covariance Proportion
NFP151_1	44.65916	38.38054	7.92444	0.03860	0.00023	0.00164	0.99813
NFP151_2	68.27107	53.2163	10.02969	0.06099	0.00131	0.00203	0.99666
NFP151_3	56.20465	46.0519	8.22485	0.03899	0.00013	0.05837	0.94151
YD151_1	55.1975	44.36411	2.34457	0.01297	0.00000	0.00346	0.99654
YD151_2	140.6113	119.32	4.44641	0.02395	0.00000	0.01592	0.98408
YD151_3	51.5646	36.4526	2.37145	0.01542	0.00000	0.00736	0.99264
ACR221_1	0.479166	0.402725	2.52722	0.01452	0.00004	0.01748	0.98248
ACR221_2	0.589919	0.492985	8.55526	0.03850	0.00004	0.02256	0.97740
ACR221_3	1.099416	0.84971	5.06078	0.03200	0.00011	0.00777	0.99212
ACR221_4	0.247452	0.191401	4.29295	0.02648	0.00001	0.01983	0.98017
COST221_1	28199.08	21062.91	5.58024	0.03906	0.00078	0.00977	0.98945
COST221_2	16889.07	13584.8	3.73196	0.02160	0.00046	0.00856	0.99098
COST221_3	15345.59	10548.18	3.96758	0.02711	0.00080	0.00591	0.99329
COST221_4	82444.3	72291.32	8.46324	0.04905	0.00000	0.14951	0.85050
D221_1	39.24544	33.50924	4.79481	0.02577	0.00004	0.01840	0.98156
D221_4	16.20196	13.19095	6.63561	0.03880	0.00145	0.02791	0.97064
D221_2	15.75658	13.02001	3.97062	0.02372	0.00060	0.03956	0.95984
D221_3	107.4059	87.9449	5.34134	0.03229	0.00135	0.06283	0.93582
M221_1	0.354311	0.213033	59.75268	0.15883	0.00000	0.03298	0.96702
M221_2	0.719592	0.529384	70.75328	0.14583	0.00000	0.04305	0.95695
M221_3	0.148583	0.111017	20.00501	0.09221	0.00000	0.01351	0.98649
M221_4	2.18393	1.417453	13.92580	0.36335	0.00000	0.17608	0.82392
NFP221_1	16.42182	14.8287	12.80605	0.05039	0.00000	0.01651	0.98349
NFP221_2	64.07649	47.59894	30.08242	0.12364	0.00000	0.08841	0.91159
NFP221_3	36.23858	28.14405	17.87639	0.08212	0.01057	0.04114	0.94829
NFP221_4	54.82161	41.05604	38.14459	0.14370	0.07923	0.04700	0.87377
NWP221_1	24.77632	19.85842	7.15261	0.04350	0.00000	0.01270	0.98731
NWP221_2	34.83804	28.71854	6.94752	0.03293	0.00000	0.00675	0.99325
NWP221_3	29.95986	19.03025	7.56789	0.04672	0.00000	0.01061	0.98939
NWP221_4	40.31309	31.52307	10.90247	0.05036	0.00000	0.01248	0.98752
X221_1	0.196759	0.162719	76.17015	0.16006	0.00000	0.05448	0.94552
X221_2	0.162253	0.133615	87.26952	0.14561	0.00000	0.02973	0.97027
X221_3	0.655857	0.52554	1412.795	0.12290	0.00000	0.01944	0.98057
X221_4	0.181158	0.147191	32.694810	0.18408	0.00000	0.05508	0.94493
XP221_1	0.073899	0.045527	6.76614	0.04157	0.00000	0.01178	0.98822
XP221_2	0.090115	0.047318	5.72940	0.03241	0.00000	0.00554	0.99446
XP221_3	0.081567	0.05556	7.76159	0.04131	0.00000	0.01515	0.98485
XP221_4	0.061701	0.047917	7.39286	0.03975	0.00000	0.01570	0.98430
YD221_1	85.2549	66.1477	1.71908	0.01049	0.00000	0.00389	0.99612
YD221_2	157.9322	120.3819	3.39402	0.02123	0.00000	0.04601	0.95399
YD221_3	1222.926	445.7662	7.02502	0.05946	0.04362	0.24377	0.71262
YD221_4	90.29738	68.38683	1.75288	0.01109	0.00000	0.00848	0.99152
M228_1	0.69305	0.553184	5.23569	0.01241	0.00000	0.00022	0.99978
M228_2	4.460438	3.586699	1.19098	0.08624	0.03106	0.13962	0.82932
M228_4	0.095812	0.092665	1317.846	0.00355	0.00000	0.00002	0.99998
M228_3	0.220627	0.171592	38.55360	0.00461	0.00000	0.00029	0.99971
X228_1	0.924064	0.712324	17.49668	0.07291	0.00000	0.02013	0.97987
X228_2	0.705679	0.558742	14.55037	0.06818	0.00000	0.01864	0.98137
X228_3	0.837744	0.564449	10.45021	0.07090	0.00000	0.03999	0.96001
X228_4	0.582377	0.465341	16.06047	0.08192	0.00000	0.02836	0.97164
XP228_1	0.168047	0.084259	2.89430	0.02590	0.07401	0.01078	0.91521
XP228_2	0.079085	0.061936	2.09197	0.01237	0.00000	0.00868	0.99132
XP228_3	0.114592	0.081756	2.62481	0.01871	0.00000	0.03296	0.96704
XP228_4	0.141824	0.112697	3.58309	0.02237	0.00000	0.02588	0.97412

Variable	RMSE	MAE	MAPE	Theil's Coefficient	Bias Proportion	Variance Proportion	Covariance Proportion
ACR231_1	0.400796	0.323734	2.33366	0.01442	0.00034	0.00509	0.99457
ACR231_2	0.161591	0.143439	4.92843	0.02617	0.00017	0.05898	0.94085
ACR231_3	1.057466	0.836834	6.34208	0.03788	0.15177	0.00229	0.84594
ACR231_4	0.304885	0.248005	4.65381	0.02832	0.00116	0.02713	0.97171
COST231_1	31324.56	21036.61	5.20981	0.04079	0.00064	0.00376	0.99561
COST231_2	16189.64	12356.6	5.01632	0.02432	0.00125	0.10015	0.89860
COST231_3	10732.86	7186.81	3.82668	0.02085	0.00086	0.03794	0.96120
COST231_4	39317.64	26889.67	3.29784	0.02528	0.00054	0.05197	0.94749
D231_1	25.19648	19.35284	4.21086	0.02724	0.00107	0.09341	0.90552
D231_2	5.67868	4.286624	4.63991	0.03018	0.00093	0.03775	0.96132
D231_3	56.38242	46.52251	5.10715	0.03012	0.00065	0.00474	0.99461
D231_4	15.7885	12.24804	7.53801	0.04549	0.00114	0.00523	0.99363
NWP231_1	22.45523	16.49665	7.96046	0.04393	0.00000	0.01674	0.98326
NWP231_2	60.66694	52.0719	17.85185	0.07576	0.00000	0.02877	0.97123
NWP231_3	46.39316	37.29914	17.89348	0.08152	0.00000	0.03087	0.96913
NWP231_4	43.219	34.07609	18.42283	0.07427	0.00000	0.01640	0.98360
YD231_1	71.3411	56.41251	1.83210	0.01115	0.00000	0.00842	0.99158
YD231_2	71.55226	57.78012	1.88048	0.01138	0.00000	0.02658	0.97342
YD231_3	174.1907	149.1204	2.54760	0.01494	0.00000	0.02719	0.97281
YD231_4	62.98615	50.84199	1.40616	0.00877	0.00000	0.00658	0.99343
ACR2401	0.962349	0.739336	2.35194	0.01538	0.05161	0.03995	0.90844
COST2401	15363.28	13165.24	0.99897	0.00577	0.00000	0.00250	0.99750
D2401	34.64955	26.29995	3.06533	0.02117	0.00033	0.01826	0.98141
NFP2401	35.40082	25.86637	4.26285	0.02837	0.00015	0.00474	0.99512
NWP2401	22.49381	18.81557	2.97079	0.01144	0.00027	0.00939	0.99034
YD2401	98.26787	72.91515	2.73638	0.01804	0.00034	0.04092	0.95874
ACR2402	0.2479	0.219849	2.48014	0.01360	0.00290	0.02842	0.96868
COST2402	41733.23	30351.6	1.98212	0.01332	0.00000	0.00429	0.99571
D2402	6.415072	4.534104	1.95185	0.01229	0.00030	0.00986	0.98984
NWP2402	78.92383	64.93278	3.49657	0.02052	0.00000	0.02278	0.97722
YD2402	92.11471	62.53261	2.42888	0.01828	0.00000	0.00700	0.99300
CR2403	0.154806	0.132113	1.86220	0.01058	0.00012	0.00299	0.99689
COST2403	148173.7	96010.51	2.68976	0.01741	0.00000	0.00193	0.99807
D2403	11.03691	8.875465	2.99548	0.01628	0.00063	0.00929	0.99008
M2403	1.014375	0.873875	8.37211	0.03194	0.00000	0.00434	0.99567
NWP2403	15.90701	11.97477	1.09732	0.00709	0.00067	0.00001	0.99999
YD2403	117.5517	90.7731	2.58726	0.01289	0.00000	0.00126	0.99874
ACR2404	0.132722	0.122442	1.61382	0.00837	0.00019	0.01092	0.98889
COST2404	294771.6	110706.2	4.01038	0.06270	0.05226	0.25392	0.69383
D2404	9.417074	7.256669	4.09045	0.02413	0.00050	0.00182	0.99768
M2404	0.328488	0.271488	11.538480	0.02971	0.00000	0.00147	0.99853
NWP2404	33.9904	25.53181	1.61139	0.01115	0.00000	0.00831	0.99169
YD2404	75.42557	60.52117	2.34623	0.01436	0.00000	0.00466	0.99534
ACR2405	0.140474	0.121873	2.94430	0.01495	0.00010	0.00438	0.99552
COST2405	118118.4	95370.76	10.78150	0.02430	0.00000	0.00161	0.99839
D2405	20.46227	14.91226	6.68347	0.04082	0.00185	0.01161	0.98654
M2405	9.00716	3.036911	8.20972	0.08675	0.05807	0.00189	0.94003
NWP2405	56.90114	41.38911	4.14810	0.02420	0.00000	0.00415	0.99585
X2405	0.634511	0.531489	5.59777	0.02742	0.00000	0.01048	0.98952
YD2405	189.3377	153.2747	3.77731	0.01993	0.00006	0.01258	0.98737
ACR2406	0.130884	0.106972	1.53465	0.00932	0.00000	0.01433	0.98567
COST2406	160568.4	140556.7	5.10603	0.02497	0.00000	0.00634	0.99366
D2406	7.632336	6.568605	4.48432	0.02508	0.00038	0.00178	0.99784
M2406	0.142749	0.112091	9.29098	0.05093	0.00000	0.01122	0.98878
NWP2406	150.6654	124.0295	5.04556	0.02491	0.00000	0.00455	0.99545
YD2406	29.78704	25.16739	1.45605	0.00723	0.00574	0.03685	0.95742

Variable	RMSE	MAE	MAPE	Theil's Coefficient	Bias Proportion	Variance Proportion	Covariance Proportion
ACR2408	0.051142	0.039722	7.14576	0.03366	0.00022	0.00219	0.99759
D2408	1.080084	0.823995	5.13056	0.02871	0.00026	0.00018	0.99956
X2408	0.146588	0.132334	12.607540	0.08659	0.00000	0.01967	0.98033
YD2408	72.55296	58.35055	2.10543	0.01324	0.00000	0.02108	0.97892
ACR2409	0.049577	0.037289	4.01289	0.02468	0.00018	0.06447	0.93535
D2409	0.347105	0.273353	0.90169	0.00532	0.00104	0.00340	0.99556
NWP2409	67.71039	46.21894	3.68323	0.02773	0.00000	0.01253	0.98747
X2409	0.074561	0.05649	57.04828	0.03278	0.00000	0.00278	0.99722
YD2409	127.6246	108.1274	4.97424	0.02413	0.00000	0.00533	0.99467
ACR31	1.995171	1.64522	3.65698	0.02199	0.00025	0.02417	0.97558
COST31	6844.072	5283.22	4.40940	0.02863	0.00000	0.03267	0.96733
D31	2.787305	1.928962	2.37482	0.01588	0.00033	0.01042	0.98925
M31	9.626689	7.149798	14.03126	0.07586	0.03363	0.00401	0.96236
NFP31	347.0862	287.9452	3.62734	0.02077	0.00000	0.01357	0.98643
NWP31	825.9231	685.4336	6.62661	0.03728	0.00000	0.02774	0.97227
YD31	4.105875	3.375112	6.14996	0.03457	0.00000	0.03750	0.96250
ACR32	2.733765	2.174895	6.34303	0.04014	0.00034	0.08210	0.91756
COST32	2577.738	1711.47	2.94181	0.01511	0.00000	0.00121	0.99879
D32	2.069067	1.524105	4.13212	0.02789	0.00064	0.04440	0.95497
M32	1.645153	1.371405	12.21186	0.04917	0.00000	0.01292	0.98708
NFP32	71.50158	60.80954	2.49767	0.01316	0.00000	0.00242	0.99758
NWP32	89.89596	76.89092	2.17477	0.01185	0.00000	0.00269	0.99731
YD32	4.163626	1.343187	1.53894	0.02748	0.06616	0.25825	0.67559
ACR33	0.883954	0.629302	10.99956	0.06074	0.00003	0.01677	0.98319
COST33	3528.687	2180.36	1.16695	0.00645	0.00000	0.00047	0.99953
D33	3.372515	2.889942	8.85398	0.04695	0.00111	0.00076	0.99813
M33	2.236977	1.596954	6.76788	0.03671	0.00000	0.04334	0.95666
NFP33	49.64895	43.8816	2.00124	0.01120	0.00000	0.00955	0.99046
NWP33	280.9101	209.7624	5.66395	0.03805	0.00000	0.02296	0.97704
YD33	5.951919	4.626972	2.37942	0.01557	0.00000	0.02523	0.97477
M720	5.152972	4.707381	5.43384	0.02075	0.00000	0.00267	0.99733
M723	11.22187	7.937979	4.18837	0.02465	0.00000	0.00635	0.99365
ADULT701	0.413731	0.310106	1.24201	0.00838	0.00004	0.01055	0.98941
YOUNG701	0.330892	0.273098	2.16198	0.01047	0.00055	0.00587	0.99358
COST701	32572.9	25597.73	2.49745	0.01498	0.00000	0.00281	0.99719
D701	19.06701	15.88665	2.84568	0.01707	0.00009	0.00171	0.99820
M701	5.291801	4.034279	25.27826	0.06716	0.00000	0.00994	0.99006
NFP701	51.56789	38.655	4.23514	0.02337	0.00000	0.00934	0.99066
NWP701	133.3379	109.259	7.84221	0.03237	0.00000	0.00527	0.99473
YD701	38.56615	31.43956	1.43434	0.00869	0.00000	0.01019	0.98981
ADULT702	0.355981	0.255032	2.21863	0.01463	0.00212	0.00005	0.99784
YOUNG702	0.235153	0.177411	2.93190	0.01416	0.00081	0.00104	0.99815
COST702	33768.53	24529.89	1.68907	0.01182	0.00011	0.00804	0.99186
D702	19.89264	13.06175	4.64327	0.03561	0.00138	0.02374	0.97488
M702	0.01178	0.009775	82.51227	0.11216	0.00000	0.03615	0.96385
NFP702	87.45382	60.65063	5.46519	0.03425	0.00000	0.01084	0.98916
NWP702	164.5449	104.602	5.94773	0.04398	0.00392	0.00033	0.99575
YD702	54.81171	43.16807	1.79967	0.01124	0.00001	0.01395	0.98604
ADULT703	0.479763	0.400804	2.46404	0.01317	0.00161	0.00202	0.99636
YOUNG703	0.225073	0.175809	4.47781	0.01895	0.00171	0.02460	0.97369
COST703	38417.81	29459.34	3.58318	0.02166	0.00000	0.00680	0.99320
D703	18.70957	14.01011	4.99047	0.02648	0.00042	0.00194	0.99765
M703	8.35457	7.475193	33.93307	0.07916	0.00007	0.01270	0.98724
NFP703	94.95573	80.13618	6.62656	0.03451	0.00000	0.00892	0.99108
NWP703	184.1645	129.1758	5.26171	0.03442	0.00000	0.02238	0.97762
YD703	44.51316	35.58686	2.28066	0.01271	0.00000	0.00351	0.99649

Variable	RMSE	MAE	MAPE	Theil's Coefficient	Bias Proportion	Variance Proportion	Covariance Proportion
ADULT704	0.055836	0.04209	0.52052	0.00334	0.00092	0.00001	0.99908
YOUNG704	0.133379	0.098274	2.28305	0.01534	0.00020	0.00033	0.99947
COST704	23334.93	19330.38	2.20456	0.01331	0.00000	0.00548	0.99452
D704	8.451224	7.143596	5.31835	0.02852	0.00131	0.01076	0.98793
M704	0.629846	0.530799	6.21119	0.03101	0.00000	0.01033	0.98967
NFP704	51.71986	40.48287	4.01957	0.02412	0.00000	0.02487	0.97513
NWP704	148.0446	119.2733	4.99806	0.02817	0.00003	0.00030	0.99967
YD704	67.89857	52.98358	2.94379	0.01821	0.00000	0.00844	0.99156
ADULT705	0.124244	0.100844	0.44087	0.00286	0.01382	0.00070	0.98549
YOUNG705	0.022645	0.017141	0.55279	0.00367	0.00004	0.02129	0.97867
COST705	25167.7	18496.54	2.79418	0.01839	0.00036	0.03109	0.96855
D705	23.89556	17.38199	3.38261	0.02237	0.00029	0.00092	0.99879
NFP705	66.22171	53.71089	6.35666	0.03371	0.00021	0.00429	0.99550
NWP705	120.4222	98.84092	8.04023	0.04828	0.00001	0.00208	0.99792
X705	1.609408	1.313401	19.01967	0.04936	0.00000	0.00867	0.99133
XP705	0.160388	0.128957	7.36484	0.03745	0.00000	0.01720	0.98280
YD705	95.95011	82.25428	3.12536	0.01779	0.00000	0.02767	0.97233
ADULT7061	0.162166	0.127623	0.89664	0.00570	0.00003	0.00609	0.99389
YOUNG7061	0.133719	0.114654	1.73573	0.00874	0.00061	0.00001	0.99939
COST7061	23709.07	18117.92	3.52746	0.02094	0.00000	0.00642	0.99358
D7061	15.70879	14.14798	9.71225	0.04695	0.01605	0.01474	0.96921
NFP7061	82.04569	66.2088	4.84752	0.02823	0.00058	0.00040	0.99902
NWP7061	257.8747	196.3263	10.05471	0.06038	0.00058	0.00030	0.99912
YD7061	94.84872	69.3905	4.84822	0.03245	0.00000	0.04154	0.95846
PLANT41	0.088109	0.071257	1.96522	0.01210	0.00073	0.00347	0.99580
YOUNG41	0.027061	0.020811	1.26717	0.00846	0.04582	0.04504	0.90914
HARV41	0.151484	0.120225	3.86418	0.02494	0.00042	0.02710	0.97247
COST41	154944.9	130291.5	4.26117	0.02254	0.00000	0.00612	0.99388
D41	1.015688	0.808522	6.78916	0.04193	0.00107	0.01722	0.98171
M411	0.015646	0.012229	26.82888	0.17104	0.00000	0.06234	0.93767
M412	0.045706	0.037695	69.95355	0.03847	0.00000	0.00377	0.99623
X411	0.136409	0.10707	8.34074	0.04772	0.00000	0.01616	0.98384
X412	0.068765	0.056447	4.94625	0.02631	0.00000	0.00643	0.99357
XP411	1.106367	0.856205	3.27290	0.02110	0.00000	0.01601	0.98399
XP412	0.39825	0.332146	1.09028	0.00667	0.00000	0.00204	0.99796
NFP41	1080.713	916.0504	3.23752	0.01959	0.00000	0.02721	0.97279
YD41	9.059542	7.493508	1.69804	0.00997	0.00000	0.00598	0.99402
NB541	1293.201	1009.162	2.27061	0.01405	0.00000	0.00256	0.99744
NB542BROILER	106.3722	85.40199	2.04466	0.01255	0.00236	0.02300	0.97464
SL541	5720092	5034531	1.43767	0.00717	0.00013	0.00174	0.99813
SLW541	0.002241	0.001742	0.31339	0.00196	0.00019	0.00526	0.99455
D541	8363.406	6324.972	2.68417	0.01585	0.00019	0.00067	0.99914
M541_US	7400.212	6424.07	46.74396	0.10136	0.00000	0.04133	0.95867
M541_RE	778.0213	602.2142	1.58957	0.01060	0.00000	0.00508	0.99492
NFP541	40.78042	34.26789	3.05524	0.01805	0.00000	0.00089	0.99910
NWP541	68.04683	54.55151	2.73805	0.01667	0.00074	0.09586	0.90340
COST541	18949.4	15317.42	1.06072	0.00634	0.00005	0.00785	0.99210
PCOST541	18163.58	15436.15	0.92237	0.00548	0.00000	0.00377	0.99623
COST543EGG	786715.1	627373.2	3.45186	0.02292	0.00882	0.01968	0.97150
PCOST543EGG	169912.7	128297.5	0.79008	0.00490	0.00005	0.00005	0.99990
NB543	392.3731	338.063	0.70458	0.00405	0.00235	0.03339	0.96426
NB542HEN	16.59169	12.03596	2.46441	0.01623	0.04815	0.03511	0.91674
Q543EGG	9808.124	8386.638	1.83566	0.01036	0.00000	0.01119	0.98881
D543EGG	6686.131	5494.06	1.21664	0.00722	0.00002	0.00063	0.99935
NFP543EGG	25.81605	20.1695	2.80396	0.01852	0.00000	0.00481	0.99520
NWP543EGG	43.10138	30.47748	3.78823	0.02709	0.00000	0.00798	0.99202

Variable	RMSE	MAE	MAPE	Theil's Coefficient	Bias Proportion	Variance Proportion	Covariance Proportion
COST53	2050.446	1783.959	1.18832	0.00684	0.00003	0.00070	0.99927
PCOST53	1557.702	1185.928	0.92483	0.00542	0.00116	0.00152	0.99732
NB53	2404.468	2113.099	0.02817	0.00015	0.00000	0.00000	1.00000
NB53PIG	132521.7	94915.04	2.36579	0.01113	0.00153	0.00066	0.99781
NB53SOW	9406.563	8930.558	1.00827	0.00527	0.00000	0.00293	0.99707
SL53	332988.1	285608.1	3.05056	0.01501	0.00298	0.00004	0.99699
SLW53F	0.873385	0.751977	0.71084	0.00415	0.00026	0.01062	0.98912
SLW53M	0.995666	0.833126	0.84192	0.00503	0.00235	0.00013	0.99752
EST53	3121.964	2156.386	17.51299	0.06737	0.00000	0.00881	0.99119
Q53	17574.48	12783.05	2.39750	0.01396	0.00000	0.00402	0.99598
M53_US	3326.27	2931.514	35.95501	0.05063	0.00000	0.00491	0.99509
M53_CH	3261.051	2699.285	26.71614	0.07864	0.00000	0.03139	0.96861
M53_RE	4626.037	3672.093	5.12051	0.02682	0.00001	0.00817	0.99183
D53	22784.94	16492.24	2.71499	0.01771	0.01447	0.01548	0.97005
NFP53	5934.946	3420.453	1.91827	0.01709	0.00199	0.08784	0.91017
NFP53PIG	3058.172	2293.918	5.60315	0.02933	0.00000	0.00729	0.99271
NWP53	106.9055	87.81001	3.17316	0.01844	0.00000	0.01486	0.98514
COST51	119555.7	94460.86	4.13485	0.02375	0.00000	0.01101	0.98899
COST51C	11542.06	8821.338	1.83137	0.01104	0.00029	0.00717	0.99254
PCOST51	43563.01	35405.11	1.78949	0.00753	0.00000	0.00032	0.99968
AI51F	39639.19	22833.82	2.49058	0.02041	0.04214	0.00865	0.94922
NB51FI	6242.809	5483.545	1.88631	0.00930	0.00000	0.00126	0.99874
NB51FT	3197.397	1953.417	1.25944	0.00777	0.00000	0.00110	0.99890
NB51FY	9048.324	7653.388	1.05161	0.00548	0.00030	0.03705	0.96265
NB51MI	16684.74	14248.96	3.13434	0.01770	0.00000	0.00547	0.99453
NB51MT	3588.907	2719.565	1.49855	0.00856	0.00000	0.00129	0.99871
NB51MY	1259.308	969.9701	4.95826	0.02358	0.00000	0.01087	0.98913
SL51F	18778.3	15156.82	6.60483	0.03037	0.00000	0.00461	0.99539
SL51M	10724.81	8679.189	3.31267	0.01709	0.00000	0.00361	0.99639
SLW51F	9.003793	7.580791	1.72660	0.01024	0.00578	0.00058	0.99364
SLW51M	2.992553	2.282659	0.39825	0.00261	0.00005	0.00012	0.99983
Q51	7976.858	3842.252	2.38149	0.02468	0.03732	0.01799	0.94470
EST51	11569.53	8065.145	72.81784	0.17842	0.00000	0.06137	0.93863
M51_US	14445.96	10912.94	6.97192	0.03855	0.00004	0.02065	0.97932
M51_AU	5070.769	4445.009	5.95832	0.02652	0.00000	0.00711	0.99289
M51_RE	3856.195	3165.862	19.55602	0.05800	0.00000	0.02645	0.97355
NFP51F	115268.3	93981.61	3.84783	0.01744	0.00019	0.01768	0.98213
NFP51FC	105118	84074.51	9.02592	0.03420	0.00003	0.00610	0.99388
NFP51M	97176.12	84321.18	3.30348	0.01538	0.00007	0.00391	0.99601
NFP51MC	76739.79	60961.88	5.84708	0.02712	0.00586	0.03039	0.96375
NWP51	379.6238	338.4982	5.06371	0.02473	0.00000	0.01059	0.98942
D51	4762.62	3681.097	1.26252	0.00772	0.00005	0.00020	0.99975
COST52MILK	811.3434	657.9774	2.11767	0.01379	0.00000	0.00331	0.99669
PCOST52MILK	492.3505	396.0884	0.84718	0.00533	0.00000	0.06611	0.93389
AI52F	8233.114	6489.525	2.15492	0.01362	0.00000	0.00237	0.99764
NB52FI	1424.02	1099.918	0.99385	0.00652	0.00000	0.00553	0.99447
NB52FT	1636.4	1339.453	1.21995	0.00744	0.00000	0.00731	0.99269
NB52FY	3058.84	2486.304	0.81641	0.00505	0.00125	0.15518	0.84356
NBMC52F	6486.858	4773.883	1.98073	0.01274	0.00011	0.00273	0.99715
SL52	4914.242	3797.053	4.71064	0.02868	0.00000	0.01917	0.98083
SLW52F	12.41692	10.82499	2.02740	0.01144	0.00113	0.05835	0.94052
YD52MILK	0.094007	0.074536	1.10102	0.00665	0.00000	0.00172	0.99828
TARGET52MILK	3.529447	2.877485	0.63569	0.00385	0.00000	0.00066	0.99934
NFP52MILK	2.182349	1.412243	0.29186	0.00222	0.00000	0.00008	0.99992

Variable	RMSE	MAE	MAPE	Theil's Coefficient	Bias Proportion	Variance Proportion	Covariance Proportion
ACR131	3.452596	2.558748	2.39230	0.01593	0.00113	0.00853	0.99034
COST131	7797.467	5802.034	4.59962	0.02997	0.00000	0.00704	0.99296
DPRO131	11.51568	9.715368	2.35889	0.01430	0.00017	0.02738	0.97245
EST131	29.35297	20.80542	20.26131	0.11306	0.00001	0.15783	0.84216
M131	93.9184	71.76336	5.66549	0.03507	0.00000	0.05852	0.94148
NFP131	75.14559	60.23584	4.14709	0.02165	0.00000	0.00248	0.99752
NWP131	188.9788	130.9182	6.40421	0.04358	0.00000	0.00737	0.99263
ESIDUALD131	0.068733	0.057647	0.82171	0.00488	0.00000	0.10410	0.89590
YD131	3.877652	3.065626	2.10382	0.01320	0.00000	0.01499	0.98501
ACR141	0.54114	0.374967	2.03886	0.01427	0.00792	0.01125	0.98083
COST141	26332.38	22439.25	8.41637	0.04654	0.00000	0.03792	0.96208
DPRO141_1	27.00042	25.00007	1.38046	0.00723	0.00007	0.00121	0.99873
DPRO141_2	0.09204	0.079918	0.59815	0.00345	0.00000	0.12185	0.87815
EST141	88.3009	76.05817	13.81828	0.06252	0.00002	0.03073	0.96925
RESIDUALD141	203.04	156.5332	2.94575	0.01718	0.00024	0.00001	0.99975
YD141	5.431616	4.500473	1.09055	0.00645	0.00000	0.01156	0.98844
ACR152	0.401143	0.348598	2.00049	0.01131	0.00025	0.00035	0.99940
COST152	18934.51	16085.6	6.67531	0.02848	0.00000	0.00439	0.99561
D152	5.157262	4.596448	4.92823	0.02630	0.00047	0.00104	0.99849
YD152	12.99626	9.265157	1.52260	0.01051	0.00000	0.01550	0.98450
NFP152	62.5396	41.60419	7.96727	0.06543	0.00000	0.04574	0.95426
COST2407	346582.1	232286.4	9.22891	0.03495	0.00000	0.00378	0.99622
D2407	7.851824	4.499284	3.60040	0.02668	0.00272	0.03792	0.95936
NWP2407	173.8055	123.6434	6.53042	0.03882	0.00139	0.04032	0.95829
YD2407	147.9531	118.0333	5.80668	0.02664	0.00000	0.00497	0.99503
ACR2407	0.121412	0.099966	2.32740	0.01268	0.00068	0.00103	0.99830
ACR213	2.165168	1.63643	2.21492	0.01451	0.00574	0.03161	0.96264
COST213	14233.39	12293.94	3.19127	0.01674	0.00000	0.00363	0.99637
D213	6.579948	5.289197	2.54969	0.01649	0.00027	0.01427	0.98546
M213	3.452974	3.105638	10.91394	0.03615	0.00000	0.00497	0.99503
NFP213	237.9811	185.9671	3.62593	0.02293	0.00264	0.06682	0.93054
NWP213	120.0718	103.0537	2.10254	0.01036	0.00000	0.00082	0.99918
X213	0.430096	0.347654	9.53531	0.04508	0.00000	0.01007	0.98993
XP213	0.045543	0.034508	1.21480	0.00795	0.00000	0.02837	0.97163
YD213	8.982902	8.025056	4.16624	0.02075	0.00000	0.00955	0.99045
D52DRINK	25112.06	20104.44	1.39281	0.00851	0.00008	0.01111	0.98881
Q52POWDER	697.6037	350.8763	9.56983	0.07202	0.05967	0.00046	0.93987
D52POWDER	269.3909	193.6057	3.46951	0.02188	0.00061	0.00391	0.99548
EST52POWDER	284.8559	195.4452	39.68331	0.07754	0.00002	0.00875	0.99123
M52POWDER	183.1819	133.5188	20.43441	0.07500	0.04395	0.00374	0.95231
X52POWDER	8.966821	6.802228	88.37351	0.05520	0.00005	0.01977	0.98018
Q52NONFAT	2994.181	2536.714	14.69681	0.06714	0.00000	0.03749	0.96252
D52NONFAT	2239.587	1799.744	7.64627	0.04454	0.00248	0.04554	0.95198
EST52NONFAT	1045.788	795.0666	19.93676	0.09909	0.00081	0.02287	0.97632
M52NONFAT	506.2479	387.8341	11.84904	0.04854	0.02742	0.00007	0.97251
X52NONFAT	34.44753	28.52237	64.45308	0.12583	0.00002	0.03860	0.96138
Q52INFANT	879.2956	753.0067	3.65705	0.01964	0.00680	0.00868	0.98452
D52INFANT	755.4874	621.4659	2.99940	0.01708	0.02977	0.00567	0.96456
M52INFANT	113.7155	93.1602	30.68753	0.04157	0.00288	0.00028	0.99684
X52INFANT	40.83326	32.80365	7.20483	0.02139	0.00005	0.00587	0.99407
Q52CHEESE	705.1565	520.2459	2.88779	0.01640	0.00000	0.00650	0.99350
D52CHEESE	1953.993	1337.022	3.42227	0.02169	0.00045	0.00007	0.99949
M52CHEESE	1577.492	1442.299	4.30271	0.02183	0.00071	0.00972	0.98957
Q52BUTTER	130.4444	92.46898	2.18813	0.01618	0.00000	0.00370	0.99631
D52BUTTER	497.9996	361.7741	5.35805	0.03963	0.00116	0.01916	0.97968
M52BUTTER	126.5538	81.45445	4.38098	0.02405	0.00000	0.00167	0.99833

Variable	RMSE	MAE	MAPE	Theil's Coefficient	Bias Proportion	Variance Proportion	Covariance Proportion
Q52FERM	5628.071	3672.93	0.68695	0.00525	0.00000	0.00411	0.99589
D52FERM	11193.48	8974.783	1.68182	0.01044	0.00006	0.03654	0.96340
M52FERM	18.49404	14.10303	29.28355	0.04729	0.00000	0.00346	0.99654
X52FERM	331.8586	231.9573	25.747150	0.05189	0.04771	0.01884	0.93345
Q52CONCENT	161.2182	131.5454	3.83313	0.02348	0.00000	0.01616	0.98384
D52CONCENT	373.5252	282.2033	8.82342	0.05605	0.00288	0.04975	0.94737
M52CONCENT	25.28089	20.37406	13.061320	0.12432	0.00850	0.10737	0.88413

APPENDIX 1.

USING THE SPREADSHEET MODEL

Turning off the Equilibrators

The model file consists of nine worksheets:

1) Main Page
2) Data
3) Equations
4) Equilibrators
5) Tables
6) Graphs
7) Coefficients
8) Pop
9) Analysis

To perform an update for this file, one should first to go to Equilibrators sheet and turn off the equilibrators. This will keep the model from possibly erroring out as new data is introduced. Equilibrators, shown in below Figure 12, consist of a line that reflects the price that is currently being used by the model ("Old Price"). A line that computes the difference in supply and demand that results at the price currently used by the model ("Supply-Demand"), and two line that contain formulas to adjust the model to a new price that more closely aligns supply and demand ("New Price"). This new price is what the Data sheet of the model will access. When a model is in equilibrium, as is the case in Figure 1, the difference in supply and demand is zero. To turn off the equilibrators: 1) Go to the new price lines located in the equilibrators. 2) Perform an Edit-Copy, Edit-Paste Special-Values beginning in the first year of the forecast until the last year of the forecast (Do not overwrite the formulas in historical observations; this will keep the formulas needed to turn the equilibrators back on later).

Figure 12. The Equilibrators

	A	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1		2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
2	**Barley**																
3	Old Price	100	100	102	99	97	97	97	97	97	97	96	96	95	95	94	94
4	Supply - Demand	-	-	-	-	0	(0)	(0)	0	(0)	0	(0)	0	(0)	0	(0)	(0)
5	-0.01	-	-	-	-	(0.00)	0.00	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)	0.00	0.00
6	New Price	100	100	102	99	97	97	97	97	97	97	96	96	95	95	94	94
7																	
8	**Onion**																
9	Old Price	858	951	1,119	623	1,041	921	978	1,005	1,030	1,059	1,087	1,115	1,139	1,167	1,194	1,221
10	Supply - Demand	-	-	-	-	-	-	0	(0)	(0)	0	(0)	0	(0)	0	(0)	0
11	-0.1	-	-	-	-	-	-	(0.00)	0.00	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)
12	New Price	858	951	1,119	623	1,041	921	978	1,005	1,030	1,059	1,087	1,115	1,139	1,167	1,194	1,221
13																	
14	**Garlic**																
15	Old Price	4,720	4,523	4,073	3,641	4,017	4,118	3,967	3,827	3,711	3,603	3,487	3,479	3,467	3,441	3,407	3,368
16	Supply - Demand	-	-	-	-	-	0	(0)	(0)	0	(0)	0	(0)	0	(0)	0	0
17	-0.5	-	-	-	-	-	(0.00)	0.00	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)	(0.00)
18	New Price	4,720	4,523	4,073	3,641	4,017	4,118	3,967	3,827	3,711	3,603	3,487	3,479	3,467	3,441	3,407	3,368
19																	
20	**Wheat**																
21	Old Price	100	103	112	111	121	130	135	139	144	147	151	154	157	160	163	166
22	Supply - Demand	-	-	-	-	-	-	-	-	(0)	-	-	-	-	(0)	-	-
23	-0.05	-	-	-	-	-	-	-	-	0.00	-	-	-	-	0.00	-	-
24	New Price	100	103	112	111	121	130	135	139	144	147	151	154	157	160	163	166
25																	
26	**Rice**																
27	Old Price	2,321	2,151	2,175	2,122	2,137	2,072	1,986	1,902	1,821	1,743	1,682	1,638	1,605	1,583	1,574	1,572
28	Supply - Demand	-	-	-	-	-	-	(0)	0	(0)	0	(0)	0	(0)	0	(0)	-
29	-0.5	-	-	-	-	-	-	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)	0.00	-
30	New Price	2,321	2,151	2,175	2,122	2,137	2,072	1,986	1,902	1,821	1,743	1,682	1,638	1,605	1,583	1,574	1,572
31																	
32	**Cabbage**																
33	Old Price	930	687	737	685	602	643	657	663	671	681	690	699	708	717	725	733
34	Supply - Demand	-	-	-	-	0	-	0	-	-	(0)	(0)	-	0	-	-	0
35	-0.5	-	-	-	-	(0.00)	-	(0.00)	-	-	0.00	0.00	-	(0.00)	-	-	(0.00)
36	New Price	930	687	737	685	602	643	657	663	671	681	690	699	708	717	725	733
37																	

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Updating Historical Data

Once the equilibrators have been turned off, the next step is to update historical data in the Data sheet. In order to update data that was already available historically and has just been revised (this data will appear as a typed in number in the Data sheet), simply type over the old historical data with the revised number. In order to update data that has previously been forecasted by the model, note the formula that resides in the cell before typing in the new historical data number. This is important so that you can see which equation (or calculated data) now has an additional observation. How to deal with this fact will be discussed later. The endogenous data calculated by the model section is different from the other data sections. All of the data that exists historically has been computed by formulas referencing other available data. In the forecast period, some of these data lines reference the Equations sheet, while others continue to run with formulas. The most important thing to remember when updating this section is when one should copy formulas to the right as more data becomes available, allowing more historical calculated data to be available.

Forecasting Exogenous Data

The next step after updating the historical data in the Data sheet involves forecasting the exogenous data. The exogenous data resides in the macro index section, weather and scenario section of the Data sheet. We used specific macro economic assumptions supplied by Global Insight, Inc., and assuming average weather.

Figure 13. The Data

	A	Z	AA	AB	AC	AD	AE	AF	AG	AH
1	YEAR	2,004	2,005	2,006	2,007	2,008	2,009	2,010	2,011	2,0
496	YD231_4	3,978	4,212	4,373	4,060	4,078	4,097	4,115	4,134	4,1
497										
498	19. Water Melon									
499	ACR2401	22	23	21	19	18	17	17	17	1
500	COST2401	1,492,720	1,533,494	1,577,728	1,611,469	1,708,219	1,764,236	1,775,677	1,784,821	1,793,3
501	D2401	824	905	778	709	675	665	669	663	66
502	EST2401	-	-	-	-	-	-	-	-	-
503	INTERP2401									
504	M2401	-	-	-	-	-	-	-	-	-
505	MP2401	-	-	-	-	-	-	-	-	-
506	NCP2401	1,877	1,770	1,882	2,043	2,234	2,371	2,180	2,191	2,1
507	NFP2401	506	498	529	582	611	666	559	555	51
508	NWP2401	1,299	1,289	1,360	1,466	1,606	1,705	1,560	1,566	1,51
509	PERD2401	17	19	16	15	14	13	13	13	
510	Q2401	824	905	778	709	675	665	669	663	66
511	SELF2401	100	100	100	100	100	100	100	100	1
512	SUP2401	824	905	778	709	675	665	669	663	6
513	TD2401	824	905	778	709	675	665	669	663	6
514	TE2401	45	45	45	45	45	45	40	35	
515	X2401	0	0	0	0	0	0	0	0	
516	XP2401	2	2	2	2	2	2	2	2	
517	YD2401	3,804	3,904	3,787	3,727	3,738	3,805	3,870	3,931	3,9
518										
519	20. Cham-Wei									
520	ACR2402	7	7	7	6	6	6	6	5	
521	COST2402	1,882,801	1,919,899	2,097,450	2,009,096	2,150,623	2,201,485	2,216,893	2,230,302	2,243,21
522	D2402	243	200	220	192	199	191	183	176	1
523	EST2402	-	-	-	-	-	-	-	-	-
524	INTERP2402									
525	M2402	-	-	-	-	-	-	-	-	-
526	MP2402	-	-	-	-	-	-	-	-	-
527	NCP2402	3,790	3,679	3,746	4,022	3,773	3,822	3,647	3,691	3,6
528	NFP2402	954	1,022	1,061	1,139	1,069	1,082	1,033	1,045	1,0
529	NWP2402	2,334	2,057	2,010	2,258	2,080	2,092	1,973	1,991	1,9
530	PERD2402	5	4	5	4	4	4	4	4	

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Lining up the Equations

The Equations sheet contains equations for all endogenous variables, other than those generated by a simple calculation process. A typical equation, as shown in Figure 14, contains a description of the independent variable and parameter estimates for the dependent variables in Column A, and lists dependent variables in Column B. In addition, SUM, ADJUSTMENT, ESTIMATE, and ACTUAL lines are denoted in Column B. the rows corresponding to the parameter estimates and dependent variable descriptions contain formulas of the product of the parameter estimate and the dependent variable as it resides in the Data sheet. The SUM row merely adds together the contributions of each dependent variable. The ADJUSTMENT line is the error term of the equation, and historically is simply actual level of the variables less the SUM line. In the forecast period, analysts use the ADJUSTMENT line to alter error terms as deemed appropriate due to market knowledge, identification of trends, etc. The ADJUSTMENT line often begins as a formula setting future error terms equal to the ESTIMATE line purely adds the SUM and ADJUSTMENT lines, and this is the ACTURAL line references the Data sheet to show the current value of the independent variable as it resides in the Data sheet.

When additional historical data observations become available, an analysts must copy the (ACTUAL-SUM) formula in the ADJUSTMENT line forward in order to account for the fact that new data now exists for the equation. This allows the analyst to incorporate the additional observed error term into the decision process for setting the path of future error terms.

Figure 14. The Equations

	A	B	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ
1			2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
428		2. Rice													
429															
430	Dependent Variable: ACR11 (coupled Payment)														
431															
432	207.4017	C	207.40	207.40	207.40	207.40	207.40	207.40	207.40	207.40	207.40	207.40	207.40	207.40	207.40
433	0.762458	ACR11(-1)	728.32	724.53	719.13	712.60	704.44	694.48	684.77	675.06	661.08	648.73	637.43	622.27	609.06
434	25.27879	(NFP11(-1)+VPAY11(-1)/80)*@MOVAV	69.43	67.21	65.46	63.30	60.75	60.25	59.38	52.72	51.97	51.22	44.19	43.53	42.89
435	-4.664633	(NFP131(-1)*@MOVAV(YD131(-1),3)/C	-8.46	-11.69	-10.58	-9.21	-9.15	-9.45	-9.73	-10.15	-10.31	-10.17	-9.96	-9.72	-9.38
436	-7.379165	(NFP41(-1)*@MOVAV(YD41(-1),3)/COS	-26.29	-25.98	-24.48	-24.63	-25.41	-26.12	-27.20	-28.40	-29.37	-30.64	-31.78	-32.81	-33.74
437	-15.91364	(FRUIT_VEGE(-1))*SD91	-30.72	-28.86	-27.62	-28.20	-28.51	-29.12	-29.58	-29.77	-30.01	-30.57	-31.18	-31.87	-32.60
438		SUM	939.68	932.61	929.32	921.27	909.53	897.45	885.04	866.87	850.76	835.98	816.11	798.80	783.64
439		ADJUSTMENT	10.57	**10.57**	**5.29**	**2.64**	**1.32**	**0.66**	**0.33**	**0.17**	**0.08**	**0.04**	**0.02**	**0.01**	**0.01**
440		ESTIMATE	950.25	943.18	934.61	923.91	910.85	898.11	885.37	867.04	850.84	836.02	816.13	798.81	783.64
441		ACTUAL	950.25	943.18	934.61	923.91	910.85	898.11	885.37	867.04	850.84	836.02	816.13	798.81	783.64
442															
443															
444	Dependent Variable: OOST11														
445															
446	-81851.31	C	-81851	-81851	-81851	-81851	-81851	-81851	-81851	-81851	-81851	-81851	-81851	-81851	-81851
447	2654.457	0.02*MACHP+0.02*MATRP+0.001*FUELP	307578	318007	330051	334912	339194	343401	347744	352274	357105	362295	367832	373728	379988
448	197.3623	YD11	91547	95444	97530	97753	98122	98561	98842	99059	99192	99296	99345	99327	99249
449	-15790.53	SD92	-15791	-15791	-15791	-15791	-15791	-15791	-15791	-15791	-15791	-15791	-15791	-15791	-15791
450	21629.21	SD98	21629	21629	21629	21629	21629	21629	21629	21629	21629	21629	21629	21629	21629
451	18183.59	SD03	18184	18184	18184	18184	18184	18184	18184	18184	18184	18184	18184	18184	18184
452		SUM	341296	355622	369752	374837	379487	384133	388757	393504	398468	403761	409348	415227	421408
453		ADJUSTMENT	**9729**	**4865**	**2432**	**1216**	**608**	**304**	**152**	**76**	**38**	**19**	**10**	**5**	**2**
454		ESTIMATE	351025	360487	372185	376053	380095	384437	388909	393580	398506	403780	409358	415231	421411
455		ACTUAL	351025	360487	372185	376053	380095	384437	388909	393580	398506	403780	409358	415231	421411
456															
457															
458	Dependent Variable: LOG(D11/POP)														
459															
460	-10.51664	C	-10.52	-10.52	-10.52	-10.52	-10.52	-10.52	-10.52	-10.52	-10.52	-10.52	-10.52	-10.52	-10.52
461	-0.115693	LOG(NCP11/CPI*100)	-0.88	-0.88	-0.87	-0.86	-0.85	-0.85	-0.84	-0.83	-0.82	-0.82	-0.81	-0.81	-0.81
462	0.079812	LOG((D124*(NCP124/CPI*100)+Q125*(N	0.37	0.37	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
463	0.025771	LOG((Q51(1)*(NCP51(1)/CPI(1)*100)+Q5	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24

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Turning up the Equilibrators Back on

In order for the model to be in equilibrium, the equilibrators must be turned back on at some point. The timing of this depends on the preference of the analyst as well as the level of disparity between supply and demand. When the equilibrators are turned off, as occurred in the first step, market clearing prices are not allowed to move with changes in supply and demand. Instead, non-zero values appear in the supply-demand line of Equilibrators sheet.

Once the equilibrators are turned back on, the market clearing prices will adjust in order to balance supply and demand. Through experience, an analyst can often have a feel for how much price adjustment must take place in order for the model to be in equilibrium from a non-equilibrated state. If the level of price adjustment seems to be in reason, the analyst will turn the equilibrators on. If the level of price adjustment appears to be too radical, the analyst may re-examine the error terms in the Equations sheet to better align supply and demand before turning on the equilibrator.

The process of turning on the equilibrator is simply undoing what was done in the first step.

- Go to the formula residing historically in the New Price line.
- Copy it forward into the forecast period.
- Calculate each cell containing the just copied formula (F2-ENTER) before calculating the entire spreadsheet by simply hitting F9.

Tables and Graphs

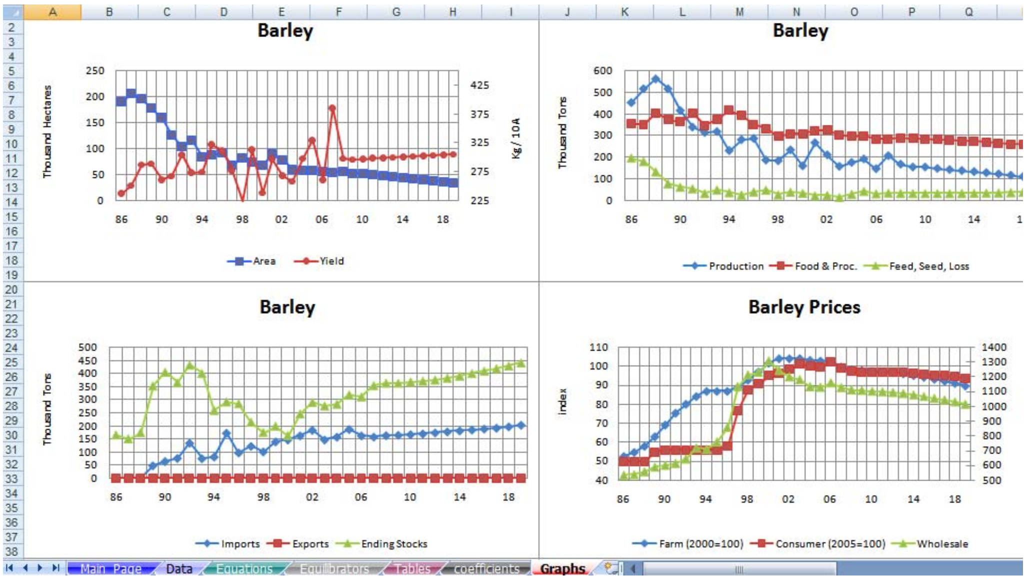
The Tables' sheet contains the output tables for the model. The Graphs sheet contains selected graphics from the model output. Feel free to make any modifications to these sheets, in order to provide the output desired by the modelers.

Figure 15. The Tables

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
								Barley						
Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
									(Thousand Hectares)					
Area	117	84	87	92	68	82	75	68	91	79	61	59	58	57
									(Kilograms / 10A)					
Yield	273	275	322	312	278	225	313	239	297	268	258	298	330	262
Supply									(Thousand Tons)					
Beginning Stocks	401	259	292	285	214	175	199	163	246	290	276	283	319	311
Production	319	232	282	288	188	184	235	161	268	212	159	177	193	148
Imports	75	81	172	97	122	101	139	146	162	183	146	157	186	162
Utilization														
Food and Processing	375	416	393	350	331	296	309	308	323	325	303	296	298	285
Feed, Seed, and Loss	51	39	28	42	50	28	41	35	24	26	16	31	44	33
Exports	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Stocks	401	259	292	285	214	175	199	163	246	290	276	283	319	311
Prices									(Won / Kilogram)					
Farm (index, 2000=100)	84.1	86.8	86.8	86.8	88.8	92.8	97.1	101.7	104.0	104.0	104.0	103.1	102.8	102.4
Wholesale	719	710	761	858	1,134	1,213	1,231	1,308	1,244	1,200	1,182	1,133	1,130	1,160
Consumer (index, 2005=100)	55.9	55.9	55.9	58.2	76.6	87.7	90.7	95.0	96.1	98.3	101.3	100.1	99.6	102.2
International	88.5	92.6	124.1	80.9	92.0	110.3	88.2	98.1	132.2	137.0	115.5	98.7	93.0	139.0
								Onion						
Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006

Main Page | Data | Equations | Equilibrators | Tables | coefficients | Graphs

Figure 16. The Graphs



APPENDIX 2. VARIABLES

Number of Commodities

Name of Variables

Number of Commodities

1. CROPS

Food Crops	**1**	**Root**	23	Others	708
Rice	11	White Radishes	231	Orange	720
Paddy Rice	111	Carrots	232	Orange_navel	721
Upland Rice	112	Burdock	233	Orange_valencia	722
Barley & Wheat	12	Lotus root	234	Tropical Fruit	723
Common Barley	121	Taro	235	HS code 0801	7231
Naked Barley	122	Other(233+234+235)	236	HS code 0802	7232
Beer Barley	123	**Fruit-bearing**	24	HS code 0803	7233
Wheat	124	Watermelons	2401	HS code 0804	7234
121+122+123	125	Melons(Chamwei)	2402	Mandarines	724
Pulses	13	Cucumbers	2403	Lemon	725
Soybeans	131	Pumpkins	2404	Flowering Plants	43
Red Beans	132	Tomatoes	2405	**Other Crops**	**10**
Green Beans	133	Strawberries	2406	Mulberry	101
Other	134	Fresh Peppers	2407	Other Tree Crops	102
Miscellaneous Grains	14	Melons	2408	Fodder Crops	103
Corn	141	EggPlant	2409	Green Manure	104
Buck Wheat	142	Other	2410	Seedbed	105
Millet	143	**Western Vegetables**	25	Other	106
Sorghum	144	**Other**	26	Green Tea	42
Other	145	**Specialty Crops**	**3**	Mushrooms	44
Potatoes	15	Sesame	31		
White Potatoes	151	Perilla Seeds	32		
Sweet Potatoes	152	Peanuts	33		
Vegetables	**2**	Rapeseeds	34		
Spice & Culinary	21	Other	35		
Garlic	211	**Monopoly Crops**	**4**		
Onions	212	Ginseng	41		
Red Peppers	213	Red Ginseng	411		
Green Onion(Welsh)	214	White Ginseng	412		
Green Onino(Wakegi)	215	Tobacco	45		
Ginger	216	**Medicinal Herbs**	**6**		
Leafy and Stem	22	**Orchards**	**7**		
Chinese Cabbage	221	Apples	701		
Cabbage	222	Asian Pears	702		
Spinach	223	Grapes	703		
Lettuce	224	Peaches	704		
Dropwort	225	Tangerine	705		
Crown Daisy	226	Persimmon	706		
Leek	227	Sweet Persimmon	7061		
Kim Chi	228	Bitter Persimmon	7062		
Other(225+226+227)	229	Plums	707		

2. LIVESTOCKS

Cattle	**51**
Female Cattle	51F
Male Cattle	51M
Calf	51C
Female Calf	51FC
Male Calf	51MC
Female Beef Cattle Under 1 year	51FI
Male Beef Cattle Under 1 year	51MI
Female Beef Cattle 1-2 years Head	51FT
Male Beef Cattle 1 - 2 years Head	51MT
Female Beef Cattle Over 2 years Head	51FY
Male Beef Cattle Over 2 years Head	51MY
Dairy Cattle	**52**
Female Cattle	52F
Male Cattle	52M
Calf	52C
Female Calf	52FC
Male Calf	52MC
Female Cattle Under 1 year	52FI
Male Cattle Under 1 year	52MI
Female Cattle Under 1-2 years Head	52FT
Male Cattle 1 - 2 years Head	52MT
Female Cattle Over 2 years Head	52FY
Male Cattle Over 2 years Head	52MY
First Pregnant Female Milking Cattle	52FY_PREG
Raw Milk	52Milk
White Fluid Milk	52WHITE
Flavor Milk	52FLAVOR
Fermented Milk	52FERM
Cheese	52CHEESE
Concentrated Milk	52CONCENT
Butter	52BUTTER
Infant Formula	52INFANT
Whole Milk Powder	52POWDER
Nonfat Dry Milk	52NONFAT
Hogs	**53**
Sow (Female Swine over 8 months)	53SOW
Pig	53pig
Poultry	**54**
Broiler	541
Pure-bred Breeding	542
Inventory of Pure-bred Breeding Chicks for Broiler	542BROILER
Inventory of Pure-bred Breeding Chicks for Hen	542HEN
Hen	543
Egg	543EGG

Name of Variables

COMMON	VARIABLE	Description	UNIT	SOURCE
Macro Data	POP	POPULATION	PERSON	http://kosis.nso.go.kr/
	Birth	BIRTH	PERSON	http://kosis.nso.go.kr/
	GDP	GDP	BILLION WON	http://kosis.nso.go.kr/
	GDPDEF	GDP DEFLATOR	INDEX	http://kosis.nso.go.kr/
	RGDP	REAL GDP	BILLION WON	http://kosis.nso.go.kr/
	DINC	DISPOSAL INCOME PER CAPITA	1,000WON	http://kosis.nso.go.kr/
	PPI	PRODUCER PRICE INDEX	INDEX	http://kosis.nso.go.kr/
	CPI	CONSUMER PRICE INDEX	INDEX	http://kosis.nso.go.kr/
	EXCH	EXCHANGE RATE	WON/$	http://kosis.nso.go.kr/
Input Price Data	INPUTP	AVERAGE INPUT PRICE	INDEX	Weighted AVERAGE(curtp,machp)
	CURTP	REGULAR INPUT PRICE	INDEX	AVERAGE(seedp,fertp,chemp,fuelp,matrp)
	MACHP	MACHIN PRICE	INDEX	http://kosis.nso.go.kr/
	FEED_PRICE	WEITHED AVERAGE FEED PRICE	WON/TON	http://www.fapri.iastate.edu/Outlook2008/
	MATRP	MATERIALS PRICE	INDEX	http://kosis.nso.go.kr/
	FUELP	FUEL PRICE	INDEX	http://kosis.nso.go.kr/
	WAGE	WAGE PRICE	INDEX	http://kosis.nso.go.kr/
	INTEREST	INTEREST RATIO	%	Global Insight
	RENT	LAND RENTAL PRICE	INDEX	http://kosis.nso.go.kr/
	SEEDP	SEED PRICE	INDEX	http://kosis.nso.go.kr/
	FERTP	FERTILIZER PRICE	INDEX	http://kosis.nso.go.kr/
	CHEMP	CHEMICALS PRICE	INDEX	http://kosis.nso.go.kr/
IMPORT & EXPORT	M	IMPORT	1000TON	http://www.kati.net/
	FoodM	FRESH FOOD IMPORT	1000TON	http://www.maf.go.kr/
	FeedM	FEED IMPORT	1000TON	http://www.maf.go.kr/
	X	EXPORT	1000TON	http://www.kati.net/
	TRQ	TRQ(MMA,CMA)	1000TON	DDA,FTA Trade Agreement
	TE	TARIFF	%	DDA,FTA Trade Agreement

COMMON	VARIABLE	Description	UNIT	SOURCE
MANAGEMENT	TRV	TOTAL REVENUE	WON/10A,HEAD	http://kosis.nso.go.kr/
	NRV	NET REVENUE	WON/10A,HEAD	http://kosis.nso.go.kr/
EXPENSES	INC	INCOME	WON/10A,HEAD	http://www.maf.go.kr/
	ADD	VALUE_ADDED	WON/10A,HEAD	http://www.rda.go.kr/
	PCOST	PRODUCTION COST	WON/10A,HEAD	TRV-NRV
	ICOST	INTERMEDIATE METERIAL EXPENSE	WON/10A,HEAD	TRV-ADD
	COST	TOTAL EXPENSES	WON/10A,HEAD	TRV-INC
OTHER	DUM#	DUMMY VARIABLE		FAPRI CALCULATION
	SD#	STRUCTURAL(SHIFT) DUMMY		FAPRI CALCULATION
	TREND	TREND VARIABLE		FAPRI CALCULATION
Weather	Typhoon	NUMBER OF EFFECTIVE TYPHOON TO KOREA	UNIT	http://web.kma.go.kr/edu/young/typ/kortp/typ_02.html
	wind	AVERAGE MAXIMUM WIND SPEED	0.1 M/S	http://www.kma.go.kr/intro.html
	TEMP	TEMPERATURE (MONTHLY)	℃	http://www.kma.go.kr/intro.html
	mintemp	MINIMUM TEMPERATURE(MONTHLY)	℃	http://www.kma.go.kr/intro.html
	RAIN	PRECIPITATION (MONTHLY)	MM	http://www.kma.go.kr/intro.html
	SUN	SUNSHINE HOUR (MONTHLY)	HOUR	http://www.kma.go.kr/intro.html
PRICE	NFP	NORMAL FARM PRICE	WON/KG	http://kosis.nso.go.kr/
	NWP	NORMAL WHLOESALE PRICE	WON/KG	http://kosis.nso.go.kr/
	NCP	NORMAL CONSUMER PRICE	WON/KG	http://kosis.nso.go.kr/
	INTERP	INTERNATIONAL PRICE	$/KG	http://www.fapri.iastate.edu/Outlook2008/
			$/KG	http://nfapp.poly.asu.edu/Outlook07/TOC.htm
			$/KG	http://faostat.fao.org/site/352/default.aspx
	MP	IMPORT PRICE	$/KG	http://www.kati.net/
	FoodMp	FRESH FOOD IMPORT PRICE	$/KG	http://www.kati.net/
	FeedMp	FEED IMPORT PRICE	$/KG	http://www.kati.net/
	XP	EXPORT PRICE	$/KG	http://www.kati.net/

COMMON	VARIABLE	Description	UNIT	SOURCE
POLICY	NKOREA	SUPPORTING N.KOERA	TON	http://www.maf.go.kr/
	GOVP	GOVERNMENT PURCHASING PRICE	WON/KG	http://www.maf.go.kr/
	GOVQ	GOVERNMENT PURCHASING QUANTITY	TON	http://www.maf.go.kr/
	GOVCLOSE	GOVERNMENT CONTROL TO REDUCE ACREAGE	1000 HA	http://www.maf.go.kr/
	Target	TARGET PRICE (DIRECT PAYMENT POLICY)	WON/80KG	http://www.maf.go.kr/
	VPAY	VARIABLE PAYMENT (DIRECT PAYMENT)	WON/80KG	http://www.maf.go.kr/
	FPAY	FIXED PAYMENT (DIRECT PAYMENT POLICY)	WON/80KG	http://www.maf.go.kr/
	Quota	DIFFERENTIAL PRICE SYSTEM (DAIRY)	TON	http://www.maf.go.kr/
	SP	FARM-GATE PRICE IN HARVESTING TIME	WON/80KG	http://www.maf.go.kr/
	AP	THREE YEARS MOVING AVERAGE OF SP	WON/80KG	http://www.maf.go.kr/
Agricultural Total Index	ACL_TOINC	TOTAL INCOME	BILLION WON	http://www.maf.go.kr/
	PER_TOINC	TOTAL INCOME PER AG_CAPITA	1,000 WON	http://www.maf.go.kr/
	H_INC	TOTAL INCOME PER HOUSEHOLD	1,000 WON	http://www.maf.go.kr/
	FARM_INC	TOTAL FARM INCOME PER HOUSEHOLD	1,000 WON	http://www.maf.go.kr/
	NF_INC	NON-FARM INCOME	1,000 WON	http://www.maf.go.kr/
	NB_INC	NON-AGBUSINESS INCOME	1,000 WON	http://www.maf.go.kr/
	TR_INC	TRANSFER INCOME	1,000 WON	http://www.maf.go.kr/
	IR_INC	IRREGULAR INCOME	1,000 WON	http://www.maf.go.kr/
	PR_INC	AID OF PRIVATE	1,000 WON	http://www.maf.go.kr/
	ALHF	AID OF LEAVING HOME FAMILY	1,000 WON	http://www.maf.go.kr/
	AG_POP	AGRICULTURAL POPULATION	1,000 PERSON	http://www.maf.go.kr/
	AG_FARM	NUMBER OF HOUSEHOLD	1,000 PERSON	http://www.maf.go.kr/
	EPA_POP	ECONOMICALLY ACTIVE POPULATION	1,000 PERSON	http://www.maf.go.kr/
	EPA	EMPLOYMENT IN AGRICULTURE	1,000 PERSON	http://www.maf.go.kr/
	T_WAGE	AVERAGE WAGE IN ENTIRE INDUSTRY	1,000 WON	http://www.maf.go.kr/
	NEPA	EMPLOYMENT IN NON-AGRICULTURE	1,000 PERSON	http://www.maf.go.kr/
	CURQ	TOTAL PRODUCTION VALUE	BILLION WON	http://www.maf.go.kr/
	CUCST	TOTAL MANAGEMENT COST	MILLION WON	http://www.maf.go.kr/
	CUGST	OTHER PRODUCTION COST	MILLION WON	http://www.maf.go.kr/
	CUWST	TOTAL WAGE COST	MILLION WON	http://www.maf.go.kr/
	CUADD	TOTAL ADDED VALUE	BILLION WON	http://www.maf.go.kr/
	INC	TOTAL INCOME	BILLION WON	http://www.maf.go.kr/
	SELF	SUFFICIENCY RATIO	%	http://www.maf.go.kr/

CROP	VARIABLE	Description	UNIT	SOURCE
PRODUCTION	ACR	ACREAGE	1000HA	http://www.maf.go.kr/
	HAR	HARVESTING ACREAGE	1000HA	http://www.maf.go.kr/
	ADULT	ADULT TREE ACREAGE	1000HA	http://kosis.nso.go.kr/
	YOUNG	YOUNG TREE ACREAGE	1000HA	http://kosis.nso.go.kr/
	CLOSE	CLOSE ACREAGE	1000HA	http://kosis.nso.go.kr/
	PLANT	NEW PLANTING ACREAGE	1000HA	d(adult)+d(young)+close
	YD	YIELD	KG/10A	Q/(ACR*100)
	Q	PRODUCTION	1000TON	http://kosis.nso.go.kr/
	SUP	TOTAL SUPPLY	1000TON	Q+M+ST(-1)
	LOSS	LOSS	1000TON	http://www.maf.go.kr/
	BST	Beginning STOCK=ST(-1)	1000TON	http://www.maf.go.kr/
	EST	Ending STOCK=ST	1000TON	http://kosis.nso.go.kr/
DEMAND	TD	TOTAL DEMAND	1000TON	D+PROFOOD+INDUS+SEED+FEED+ST+X
	PERD	CONSUMPTION PER CAPITA	KG	D/POP
	D	FRESH FOOD DEMAND	1000TON	SUP-PROFOOD-ST-INDUS-SEED-FEED-LOSS-X
	PRO	TOTAL PROCESSING DEMAND	1000TON	PROFOOD+INDUS
	DPRO	FOOD DEMAND+PROCESSING DEMAND	1000TON	http://www.maf.go.kr/
	RESIDUALD	FEED+SEED+LOSS	1000TON	http://www.maf.go.kr/
	SEED	SEED DEMAND	1000TON	http://www.maf.go.kr/
	FEED	FEED DEMAND	1000TON	http://www.maf.go.kr/

LIVESTOCKS	VARIABLE	Description	UNIT	SOURCE
PRODUCTION	NB	TOTAL BREEDING OR INVENTORY	HEAD	http://www.maf.go.kr/
	SL	SLAUGHTER	HEAD	http://www.maf.go.kr/
	SLW	SLAUGHTER WEIGHT	KG	http://www.maf.go.kr/
	NBMC	MILKING COW	HEAD	http://www.maf.go.kr/
	CH	CROP HEAD	HEAD	http://www.maf.go.kr/
	BH	CHICK HATCHED	HEAD	http://www.maf.go.kr/
	AI	ARTIFICIALLY INSEMINATION	HEAD	http://www.maf.go.kr/
	Q	PRODUCTION	1000TON	http://www.maf.go.kr/
	SUP	TOTAL SUPPLY	1000TON	Q+M+ST(-1)
	LOSS	LOSS	1000TON	http://www.maf.go.kr/
DEMAND	TD	TOTAL DEMAND	1000TON	D+ST+X+INDUS
	PERD	CONSUMPTION PER CAPITA	KG	D/POP
	D	FOOD CONSUMPTION	1000TON	SUP-ST-LOSS-X-INDUS
	PRO	TOTAL PROCESSING DEMAND	1000TON	PROFOOD+INDUS
	PROFOOD	PROCESSING FOOD DEMAND	1000TON	http://www.maf.go.kr/
	INDUS	INDUSTRIAL DEMAND	1000TON	http://www.maf.go.kr/

APPENDIX 3.

EQUATIONS

Macro Index & Agricultural Total Value Model Specifications

Macro Index & Input Price

@ Disposal Income Per Capita

LOG(DINC) = -5.392656 + 0.945824*LOG(GDP) -0.03324* SD95-0.040838*SD98 - 0.018627*DUM97

@ GNI

GNI=-19289.1+1.005538*GDP+-22279.54*SD96+-56507.57*DUM98+DUM99

@ Chemical Price

CHEMP = 16.43936+ 0.049468*EXCH + 0.235516*GDPDEF + 0.04008*FUELP - 5.140122*SD97 +
4.621114*(DUM99+DUM00)

@ Fertilizer Price

FERTP = 7.013204+ 0.266257*FUELP + 0.487158*FUELP(-1) + 0.200059*PPI

@ Fuel Price

FUELP = 45.68073+ 0.001914*EXCH*INTERP_FUELP + 21.06616*DUM98

@ Machinery Price

MACHP = 25.7756683188 - 0.0495997626132*FUELP + 0.797211693548*PPI + 18.8034737127*SD9397 - 0.50546037161*SD9397*PPI - 4.28605577566*DUM04

@ Material Price

MATRP = 32.33015+0.015048*EXCH+0.13066*PPI+0.32385*FUELP-8.647509*DUM06+13.80036*SD88-9.461992*SD99+15.12631*SD04

@ Land Rent

LOG(RENT) = -1.676073+0.75481*LOG(RENT(-1))+0.253396*LOG(NFP11(-1))+-0.191948*LOG(WAGE(-1))+0.388457*LOG(PPI)+0.123902*DUM88+DUM89-DUM05

@ Seed Price

SEEDP = 8.970608+0.875145*SEEDP(-1)+0.037908*(PPI)*SD88+7.560287*DUM91+DUM92+DUM93+0*SD06

@ Wage

WAGE = -6.61978+0.313821*WAGE(-1)+0.730721*CPI(-1)+9.450978*SD90+-3.046658*SD97+12.82381*SD00

@ Regular Input Price (weighted average)

CURTP=CURTP(-1)*(1+(SEEDP/SEEP(-1)-1)*(19.6/156.9)+(FERTP/FERTP(-1)-1)*(34.2/156.9)+(CHEMP/CHEMP(-1)-1)*(39.8/156.9)+(FUELP/FUELP(-1)-1)*(28/156.9)+(MATRP/MATRP(-1)-1)*(35.3/156.9))

@ Input Price (weighted average)

INPUTP=INPUT(-1)*(1+(CURTP/CURTP(-1)-1)*(156.9/250.2)+(MACHP/MACHP(-1)-1)*(93.3/250.2))

@Feed Price: beef & milk cow= feed_price, others= feed_price1

Feed_price=(0.73*(mp141*exch*(1.1+te141/100))+0.13*(mp131*exch*(1.1+te131/100))+0.14*(mp124*exch*(1.1+te124/100)))

Feed_price1=(0.73*(mp141*exch*(1.1+te141/100))+0.13*(mp131*exch*(1.1+te131/100))+0.14*(interp125/1000*exch*(1.1+te125/100)))

@#Exogenous Variables

@POP: GLOBAL INSIGHT
@BIRTH: GLOBAL INSIGHT
@GDP: GLOBAL INSIGHT
@GDPDEF: GLOBAL INSIGHT
@RGDP=GDP/GDPDEF*100
@PPI: GLOBAL INSIGHT
@CPI: GLOBAL INSIGHT
@EXCH: http://www.bok.or.kr/index.jsp
@INTEREST: GLOBAL INSIGHT
@TE, TRQ: WTO
@INTERP: FAPRI
@INTERP_FUELP: http://tonto.eia.doe.gov/dnav/pet/pet_pri_wco_k_w.htm

New Variables

@Fruit Price

fruit_price=(q701*(ncp701/cpi*100)+q702*(ncp702/cpi*100)+q703*(ncp703/cpi*100)+q704*(ncp704/cpi*100)+q705*(ncp705/cpi*100)+q7061*(ncp7061/cpi*100))/(q701+q702+q703+q704+q705+q7061)

@Fruit Bearing Vegetable Net Return

fruit_vege=(((nwp2402*@movav(yd2402,3)/cost2402)*q2402+(nwp2403*@movav(yd2403,3)/cost2403)*q2403+(nwp2404*@movav(yd2404,3)/cost2404)*q2404+(nwp2405*@movav(yd2405,3)/cost2405)*q2405+(nwp2407*@movav(yd2407,3)/cost2407)*q2407)/(q2402+q2403+q2404+q2405+q2407))

fruit_vege1=(((nwp2402*@movav(yd2402,3)/cost2402)*q2402+(nwp2403*@movav(yd2403,3)/cost2403)*q2403+(nwp2404*@movav(yd2404,3)/cost2404)*q2404+(nwp2405*@movav(yd2405,3)/cost2405)*q2405+(nwp2406*@movav(yd2406,3)/cost2406)*q2406)/(q2402+q2403+q2404+q2405+q2406))

fruit_vege3=(((nfp2401*@movav(yd2401,3)/cost2401)*q2401+(nwp2404*@movav(yd2404,3)/cost2404)*q2404+(nwp2405*@movav(yd2405,3)/cost2405)*q2405+(nwp2406*@movav(yd2406,3)/cost2406)*q2406)/(q2401+q2404+q2405+q2406))

fruit_vege4=(((nfp2401*@movav(yd2401,3)/cost2401)*q2401+(nwp2403*@movav(yd2403,3)/cost2403)*q2403+(nwp2405*@movav(yd2405,3)/cost2405)*q2405+(nwp2406*@movav(yd2406,3)/cost2406)*q2406)/(q2401+q2403+q2405+q2406))

fruit_vege5=(((nfp2401*@movav(yd2401,3)/cost2401)*q2401+(nwp2403*@movav(yd2403,3)/cost2403)*q2403+(nwp2404*@movav(yd2404,3)/cost2404)*q2404+(nwp2406*@movav(yd2406,3)/cost2406)*q2406)/(q2401+q2403+q2404+q2406))

fruit_vege6=(((nfp2401*@movav(yd2401,3)/cost2401)*q2401+(nwp2403*@movav(yd2403,3)/cost2403)*q2403+(nwp2404*@movav(yd2404,3)/cost2404)*q2404+(nwp2405*@movav(yd2405,3)/cost2405)*q2405)/(q2401+q2403+q2404+q2405))

@Fruit bearing vegetable price for using for Fruit

fruit_vege_price=(q2401*(ncp2401/cpi*100)+q2402*(ncp2402/cpi*100)+q2405*(ncp2405/cpi*100)+q2406*(ncp2406/cpi*100))/(q2401+q2402+q2405+q2406)

@Orange Price

Orange_price=(exch*mp720*(1.1+te720/100))/cpi*100

@Tropical Fruit Price

Tropic_price=(exch*mp723*(1.1+te723/100))/cpi*100

@Dairy Price Index

NCP_DAIRY = -13.17223522 + 0.4238301258*NCP52WHITE + 0.2287552088*NCP52POWDER + 0.06595455879*NCP52CHEESE + 0.008093675296*NCP543EGG + 0.233601195*NCP52FERM

Agricultural Total Value

@Agricultural Total Production Value

ACL_TOPV= $\sum_{i=1}^{n} PV_i, \quad PV = NFP \times Q$

@Agricultural Total Add-Value

ACL_TOAV= $\sum_{i=1}^{n} AV_i, \quad AV = PV \mid COST$ (COST: Management Cost)

@Agricultural Total Income

ACL_TOINC= $\sum_{i=1}^{n} INC_i, \quad INC = PV \mid PCOST$ (PCOST: Production Cost)

@ Agricultural Total Income Per Agricultural Capita

PER_TOINC= ACL_TOINC/ AG_POP

@ Agricultural Total Income Per Agricultural Household

FARM_INC= ACL_TOINC/ AG_FARM

@Total Income Per Agricultural Household Including All Sources

H_INC=FARM_INC+NF_INC+NB_INC+TR_INC+IR_INC

@Non-Farm Income

LOG(NF_INC) = -0.1384922181 + 0.5674062641*LOG(NF_INC(-1)) + 0.7825806105*LOG(WAGE) - 0.3631846792*SD98 + 0.1597437523*SD03 + 0.256368056*(DUM99+DUM03)

@Non-Agbusiness Income (agricultural wage, other wage, milling fee, and rent for agricultural machine etc.)

LOG(NB_INC) = -2.209369692 + 1.373966431*LOG(WAGE) + 0.7632729044*LOG(NEPA) + 0.3480522275*SD93 - 0.3686219875*SD00

@Transfer Income (Variable direct payment + fixed direct payment + PR_INC+ALHF)

TR_INC = Q11*VPAY11/AG_FARM*1000/80 + ACR11*FPAY11/AG_FARM +PR_INC+ALHF

@Irregular Income

IR_INC = IR_INC(-1)*1.0273142508861013

@Other private aid (2003-2006 Average increasing ratio: 5%)

PR_INC =PR_INC(-1)*(1+0.05)

@ Aid of Leaving Home Family (2003-2006 Average increasing ratio: 9.44499844506923%)

ALHF = ALHF(-1)*(1+0.0944499844506923)

@Agricultural Population: Dynamic Cohort Model

@Agricultural Population (Age Specific Giving up Farming Rate)

* In this study, SUR method was tried, however, Statistic Results were same with OLS results because explainable variables were same for each equation. In case of over 65 age G.F equations, we assumed these generations will not be effected by economic change.

Dependent Variable: (GF04)

= 1.924936+-0.050556*(@TREND)+-0.658821*(@MOVAV(H_INC(-1)/T_WAGE(-1),5))+-0.02474*SD99+0.033432*SD04+-0.013452*DUM00

Dependent Variable: GF59

= 4.165388+-1.564053*LOG(@TREND)+-3.067058*LOG(@MOVAV(H_INC(-1)/T_WAGE(-1),5))+-0.176111*SD00+0.135317*SD04+-0.071463*DUM99+DUM04

Dependent Variable: GF1014

= 4.143566+-0.917971*LOG(@TREND)+-1.526662*@MOVAV(H_INC(-1)/T_WAGE(-1),5)+-0.080474*SD00+0.058473*SD04+-0.032321*DUM99+DUM04

Dependent Variable: GF1519
= 1.828729+-0.422279*LOG(@TREND)+-0.305845*@MOVAV(H_INC(-1)/T_WAGE(-1),5)+-0.025442*SD00+-0.012546*DUM99

Dependent Variable: GF2024
= 0.978824+-0.014725*LOG(@TREND)+-0.219666*@MOVAV(H_INC(-1)/T_WAGE(-1),5)+-0.016108*SD00+-0.008314*DUM99

Dependent Variable: GF2529
= 1.159104+-0.240639*LOG(@TREND)+-0.041047*@MOVAV(H_INC(-1)/T_WAGE(-1),5)+-0.005767*SD00+-0.00289*DUM99

Dependent Variable: GF3034
= 1.549792+-0.217939*LOG(@TREND)+-0.578959*@MOVAV(H_INC(-1)/T_WAGE(-1),5)+-0.029155*SD00+0.02272*SD04+-0.012049*DUM99

Dependent Variable: GF3539
= 5.211043+-0.955404*LOG(@TREND)+-2.524852*@MOVAV(H_INC(-1)/T_WAGE(-1),5)+-0.127151*SD00+0.09912*SD04+-0.052554*DUM99

Dependent Variable: GF4044
= 3.238114+-0.641585*LOG(@TREND)+-1.432404*@MOVAV(H_INC(-1)/T_WAGE(-1),5)+-0.073209*SD00+0.055785*SD04+-0.02997*DUM99

Dependent Variable: GF4549
= 1.439514+-0.366291*LOG(@TREND)+-0.353191*@MOVAV(H_INC(-1)/T_WAGE(-1),5)+-0.024699*SD00+0.007082*SD04+-0.012215*DUM99

Dependent Variable: GF5054
= 1.726191+-0.45769*LOG(@TREND)+-0.400415*@MOVAV(H_INC(-1)/T_WAGE(-1),5)+-0.023419*SD00+0.014463*SD04+-0.008862*DUM99+DUM04

Dependent Variable: GF5559
= 1.606369+-0.429871*LOG(@TREND)+-0.35455*@MOVAV(H_INC(-1)/T_WAGE(-1),5)+-0.020958*SD00+0.012654*SD04+-0.007848*DUM99+DUM04+*

Dependent Variable: GF6064
= 1.028211+-0.243405*LOG(@TREND)+-0.301805*@MOVAV(H_INC(-1)/T_WAGE(-1),5)+-0.015903*SD00+0.014209*SD04+-0.007015*DUM99+DUM04

@Number of Agricultural Household

LOG(H_AG_POP)=1.259081661+-0.01755841325*@TREND

@Number of Agricultural Household

AG_FARM = AG_POP/H_AG_POP

@Economically Active Population

LOG(EPA) = 2.539032419 + 0.6449514071*LOG(EPA(-1)) - 0.3199787054*LOG(T_WAGE(-1)/PPI(-1)) - 0.1080195298*(DUM91-DUM98) + 0.1288601273*LOG(PER_TOINC(-1))

@Employment in Agriculture

LOG(EPA_POP) = 1.130121752 + 0.1934625273*LOG(EPA_POP(-1)) + 0.6763049873*LOG(EPA)

@Net Economically Active Population in Agriculture

NEPA = 1*(EPA_POP-EPA)

@Average Monthly wage in Total industry

LOG(T_WAGE) = -2.282083+0.050988*LOG(T_WAGE(-1))+0.626428*LOG(GDP)+0.504747*LOG(CPI)+0.117263*SD89+0.043391*SD91+-0.124727*SD98+-0.017637*DUM97

@Total Acreage

TOTAL_ACR = 2.54546600975322+0.655537*LOG(TOTAL_ACR(-1))+0.026122*LOG(TNFP_INDEX_CROPS(-1))+-0.0058875*LOG(CURTP(-1))+-0.008861*LOG(WAGE(-1)/PPI(-1)*100)+0.014417*LOG(AG_POP(-1))+-0.008514*SD06+0.004977*DUM87-DUM96+-0.043722*LOG(@TREND)*SD95

@@Utilized Total Acreage (Medicinal Herbs and Flowering Plants are not included; these are treated by just residuals)

TOTAL_UTILIZED= $\sum_{i=1}^{n} AGR_i$,

@Pulses Total Acreage
ACR13 = -8.84285072336 + 0.0715560260468*ACR13(-1) + 1.24092443907*ACR131 - 7.23705464811*SD03 + 12.3862491035*(DUM86+DUM87+DUM88-DUM84)

@Miscellaneous Total Acreage
ACR14 = 0.62151018126 + 0.0950658356412*ACR14(-1) + 1.35682205651*ACR141 + 13.4480218886*DUM82 + 3.63691547196*(DUM86+DUM87-(DUM89+DUM90+DUM93)) + 2.68388710786*SD05

@Total Leafy And Stem
ACR22 = -15.6508979455 + 0.179468567438*ACR22(-1) + 1.20176911363*(ACR221_1+ACR221_2+ACR221_3+ACR221_4+ACR222) + 7.96353454565*SD88 + 2.15184063704*(DUM95-DUM96-DUM90)

@Total Special Crops Acreage
ACR3 = 0.0481906814306 + 0.00689450308322*ACR3(-1) + 1.00729965099*(ACR31+ACR32+ACR33)

@Total Orchards Acreage
ACR7 = -10.6577503557 + 0.551747322215*ACR7(-1) + 0.649753019531*(ACR701+ACR702+ACR703+ACR704+ACR705+ACR7061) - 6.27407641329*SD96 + 4.77802190067*SD05 - 3.27267734169*(DUM98+DUM99+DUM00+DUM01)

@Utilized Ratio

TOTAL_UTILIZED_RATIO= TOTAL_UTILIZED/ TOTAL_ACR*100

@Total animal inventory (Cattle+Milkcow+Hog+Broiler+Hen)

TOTAL_NB5=NB51+NB52+NB541+NB542+NB543

@Total Farm Price Index (2000=100)

TNFP_index=0.2252* TNFP_livestocks_index+0.7748* TNFP_crops_index

TNFP_crops_index= $\sum_{i=1}^{n} \beta_i \times NFP_{i_{index}}, \quad \beta_i =_{quant\ \mathrm{int}\ iy\ \ weig|t}$

TNFP_livestocks_index=0.872557726465364* TNFP_lives+0.127442273534636* TNFP_EGGS_index

TNFP_lives= $\sum_{i=1}^{n} \delta_i \times NFP_{i_{index}}, \quad \delta_i =_{quant\ \mathrm{int}\ iy\ \ weig|t}$

TNFP_EGGS_index=NFP543EGG_index

@#Trade Balance

Total Import= $\sum_{i=1}^{n} M_i$

Total Import Value=

Total export_livestocks= $\sum_{i=1}^{n} X_i$ _livestocks

Total export Value_livestocks= $\sum_{i=1}^{n} X_i$ _livestocks

@# Korea has exported mainly grains' processing products (So-ju, Ramen, snacks, wheat powder products etc) . However, there does not exist exports in Government static. To predict exports, we used trade statistic made by http://www.kati.net/

@Total export_crops
X_CROPS = 342.9112429 - 171.0384664*XP_CROPS + 47.32543867*@TREND - 85.42731763*(DUM91+DUM92+DUM93+DUM94)

@ Total export price_crops
XP_CROPS = -0.131292132 + 0.05906017127*@TREND + 0.1548519449*SD04

@ Total export Value_crops= X_CROPS* XP_CROPS

Crops Model Specifications

Rice

'@Acreage (variable direct payment)

ACR11 = 253.132561537614+0.744457*ACR11(-1)+22.90407*(NFP11(-1)+VPAY11(-1)/80)*@MOVAV(YD11(-1),3)/COST11(-1)+-9.8209689*(NFP131(-1)*@MOVAV(YD131(-1),3)/COST131(-1))*SD92+-14.2735087*(NFP41(-1)*@MOVAV(YD41(-1),3)/COST41(-1))*SD02+-16.31646*(FRUIT_VEGE(-1))*SD91

'@ Yield

YD11 = 266.9224+8.330842*(TEMP_6+TEMP_7+TEMP_8+TEMP_9)/4+-0.000628*RAIN_6+RAIN_7+RAIN_8+RAIN_9+0.00019*SUN_6+SUN_7+SUN_8+SUN_9+-1.654031*TYPHOON+34.21383*SD84+40.91664*SD96+0.345936*@TREND*SD95+-21.10128*DUM93+DUM94+DUM95+-27.19152*DUM02+DUM03+DUM05

'@Cost

COST11= -61565.18+3358.088*(0.135*MACHP+0.029*MATRP+0.011*FUELP+0.296*WAGE+0.328*RENT+0.035*SEEDP+0.086*FERTP+0.08*CHEMP)+8.803421*YD11+15286.69*SD92-13538.59*SD98+28743.56*SD03

'@Production

Q11 = ACR11 * YD11 / 100

'@Fresh Food Demand

LOG(D11 / POP) -9.70330143174835+-0.280244*LOG(NCP11/CPI*100)+0.116134*LOG((D124*(NCP124/CPI*100)+Q125*(NCP125/CPI*100))/(Q125+D124))+0.059213*LOG((Q51(1)*(NCP51(1)/CPI(1)*100)+Q541(1)*(NCP541(1)/CPI(1)*100)+Q53(1)*(NCP53(1)/CPI(1)*100))/(Q51(1)+Q541(1)+Q53(1)))+0.013245*LOG(NCP_DAIRY(1)/CPI(1)*100)*SD85+0.233712*LOG(DINC/CPI*100)+-0.0362*@TREND+-0.033968*SD02+-0.030187*SD04+0.043118*DUM95+DUM96+DUM98+DUM99

'@Processing Demand

LOG(PRO11 / POP) = 3.390941+-2.48001*LOG(NCP11/CPI*100)+1.997039*SD01*LOG(NCP11/CPI*100)+0.323276*LOG(DINC/CPI*100)+-15.25153*SD01+0.677*SD90+0.544958*DUM91+DUM92+DUM93

'@DPRO Demand

DPRO11 = 1 * (D11 + PRO11)

'@Ending stock

EST11 -2218.86501228195+0.564721428571429*EST11(-1)+Q11+M11+-0.225939*NCP11/CPI*100+10.7145682*@TREND+-261.9047*DUM94+209.667*DUM99+DUM00+DUM03

'@Residual Demand

RESIDUALD11 = 1 * (SEED11 + LOSS11 + FEED11)

'@Loss

LOG(LOSS11) = -2.02131164295826+1.072539*LOG(Q11)+-0.2208805*LOG(NFP11/CPI*100)+0.781194*SD98+0.312177*SD93+-0.540404*DUM96-DUM02

'@Seed Demand

LOG(SEED11) = -1.672649+0.545829*LOG(ACR11)+0.050059*LOG(YD11)+0.1654*LOG(NFP11/CPI*100)+-0.040039*SD90+-0.040777*SD94+0.164854*SD99+0.036405*DUM00

'@Feed Demand

FEED11 = 0

'@Exports

X11 = 0

'@Price Linkage

NFP11 = - -178.2404+1.066764*NWP11+-26.86747*SD01+61.99671*SD05+119.9241*DUM04

NWP11 = -19.35592+0.940745*NCP11+-79.40055*SD91+-74.1899*SD01+-120.5233*DUM04

'@Market Clearing Conditions

SUP11 = Q11 + M11 + EST11(-1)

TD11 = DPRO11 + RESIDUALD11 + X11 + EST11

(sup11 - td11)

'

'@Korean Direct Payment System@

'

'@ Regional average farm price on harvesting period. (unit: won/80kg), We assume that SP11's changing rate equals to NFP11's due to SP11 can not be estimated in this model.

SP11 = (@YEAR<=2006) * 146000 + (@YEAR>2006) * (SP11(-1) * (NFP11 / NFP11(-1)))

'@ 3 years moving average on SP11, according to Current Principal on determining Target Price, Target Price is changed by every three years based on historical 3 years moving average on SP11.

AP11 = (YEAR<=2006) * 157981 + (YEAR>=2007 AND YEAR<=2009) * 149219 + (YEAR>=2010 AND YEAR>=2012) * ((SP11(-1) + SP11(-2) + SP11(-3)) / 3) + (YEAR>=2013 AND YEAR>=2015) * ((SP11(-1) + SP11(-2) + SP11(-3)) / 3) + (YEAR>=2016 AND YEAR>=2018) * ((SP11(-1) + SP11(-2) + SP11(-3)) / 3) + (YEAR>=2019 AND YEAR>=2021) * ((SP11(-1) + SP11(-2) + SP11(-3)) / 3)

'@Target Price (Target Price is changed by every three years based on historical 3 years moving average on SP11)

TP11 = (YEAR<=2007) * 170083 + (YEAR>2007 AND YEAR<=2009) * 170083 + (YEAR = 2010) * (TP11(-3) * (1 + (AP11 / AP11(-3) - 1))) + (YEAR>=2011 AND YEAR<=2012) * TP11(-1) + (YEAR = 2013) * (TP11(-3) * (1 + (AP11 / AP11(-3) - 1))) + (YEAR>=2014 AND YEAR<=2015) * TP11(-1) + (YEAR = 2016) * (TP11(-3) * (1 + (AP11 / AP11(-3) - 1))) + (YEAR>=2017 AND YEAR<=2018) * TP11(-1) + (YEAR = 2019) * (TP11(-3) * (1 + (AP11 / AP11(-3) - 1))) + (YEAR>=2020 AND YEAR<=2021) * TP11(-1)

'

@Fixed direct payment (Unit: won/80kg), after 2006, 700,000won /ha=11,475won/80kg

```
FPAY11  = (YEAR<2006)  * 9836  + (YEAR>=2006)  * 11475

'@Variable Direct Payment (Unit: won/80kg):
'
'@checking the negative sign in VPAY11

TEST_SIGN  = (TP11  - SP11)  * 0.85  - FPAY11

VPAY11  = (TEST_SIGN>0)  * ((TP11  - SP11)  * 0.85  - FPAY11)  + (TEST_SIGN<=0)
* 0
```

Barleys

```
'@Acreage

ACR125  128.122625172918+0.596061*ACR125(-1)+309.704740740741*NFP125(-
1)*@MOVAV(YD125(-1),3)/(COST125(-1))+-10.2497824*NFP211(-
1)*@MOVAV(YD211(-1),3)/COST211(-1)+-12.7537146*(NFP212(-
1)*@MOVAV(YD212(-1),3)/COST212(-1))*SD90+-90.51703*SD85+27.45582*DUM86

'@Yield

YD125  = 260.1577+7.905685*TEMP_1(1)+TEMP_2(1)-
4.811539*TEMP_3(1)+TEMP_4(1)+TEMP_5(1)-
0.010072*RAIN_1(1)+0.00219*RAIN_2(1)+RAIN_3(1)-
0.001208*RAIN_4(1)+RAIN_5(1)+0.000171*SUN_1(1)+SUN_2(1)+SUN_3(1)+0.00605*
SUN_4(1)+SUN_5(1)+0.871084*@TREND

'@Production

Q125  = ACR125  * YD125  / 100

'@COST

COST125  =
12155.87+1390.472*0.099*machp+0.01*matrp+0.017*fuelp+0.246*wage+0.349*rent+0.
105*seedp+0.137*fertp+0.037*chemp+9253.005*SD02*@TREND+-191981.3*SD02+-
18773.77*SD98+12541.09*DUM01
```

'@Demand

LOG(DPRO125 / POP) = -10.6411930105105+-0.3364135*LOG(NCP125/CPI*100)+0.009677*LOG((Q11*(NCP11/CPI*100)+D124*(NCP124/CPI*100))/(Q11+D124))*SD85+0.094985*LOG((Q51(1)*(NCP51(1)/CPI(1)*100)+Q53(1)*(NCP53(1)/CPI(1)*100)+Q541(1)*(NCP541(1)/CPI(1)*100))/(Q51(1)+Q53(1)+Q541(1)))*SD94+0.016618*LOG(NCP_DAIRY(1)/CPI(1)*100)*SD00+0.10229*LOG(DINC/CPI*100)*SD99+0.116367*SD99+-0.0244935*@TREND

PRO125 = @MOVAV(PRO125(-1) , 3) / @MOVAV(DPRO125(-1) , 3) * DPRO125

D125 = DPRO125 - PRO125

LOG(RESIDUALD125) = 16.88335+-3.238242*LOG(NFP125)+0.222773*LOG((M131*NFP131+M141*NFP141+M124*NCP124)/(M131+M141+M124))+-0.292153*SD88+0.349029*SD92+-0.476441*DUM94+DUM97+DUM02-DUM04

SEED125 = SEED125(-1) * ACR125 / ACR125(-1)

LOSS125 = LOSS125(-1) * RESIDUALD125 / RESIDUALD125(-1)

FEED125 = RESIDUALD125 - SEED125 - LOSS125

'@Ending Stock

EST125 = -109.419645699484+0.733245*EST125(-1)+-1.278684*(NFP125)/PPI*100+0.777498*M125+Q125+39.62322*SD01+0*DUM92+DUM93

'@Import

M125 = 27.83304+258265.7*(NFP125)/((INTERP125*EXCH*(1.1+TE125/100)))+59.21878*DUM92+DUM95+DUM02+40.05615*SD95+32.08896*SD00+25.37949*SD05

'@Export

X125 = 0

'@Market Clearing Condition

SUP125 = Q125 + M125 + EST125(-1)

TD125 = DPRO125 + RESIDUALD125 + X125 + EST125
(SUP125=TD125)

'@Price linkage

NFP125 / CPI * 100 - 8.07514079651063+1.12033666666667*NCP125/CPI*100+2.474269*DUM01-DUM03+DUM05

Wheat

@Acreage (unit: 1,000ha)

ACR124-0.232131+0.4112*ACR124(-1)+2.822496*NCP124(-1)*@MOVAV(YD124(-1),3)/COST125(-1)+0.012777*@TREND*SD07+1.563763*DUM95+DUM96+1.359093*DUM02+DUM03+DUM04+0.201282*SD93+0.488844*SD03

@Yield

YD214 = 269.979193009957+4.83481636363636*@TREND+-16.22278*DUM03+DUM05+-53.28628*DUM00+-57.9065*SD00

@Production

Q124=ACR124*YD124/100

@Demand

LOG(D124/POP) -12.9629078015622+-0.312159*LOG(NCP124/CPI*100)+0.1835595*LOG(((Q11*NCP11+Q125*NCP125+Q141*NFP141)/(Q11+Q125+Q141))/CPI*100)+0.112093*LOG((Q51(1)*(NCP51(1)/CPI(1)*100)+Q541(1)*(NCP541(1)/CPI(1)*100)+Q53(1)*(NCP53(1)/CPI(1)*100))/(Q51(1)+Q541(1)+Q53(1)))+0.0082465*LOG(NCP_DAIRY(1)/CPI(1)*100)*SD91+0.123767*LOG(DINC/CPI*100)+0.008062*@TREND*SD97+-0.126809*DUM93+DUM98+DUM03

LOG(PRO124/POP) = -11.8712144568855+-0.017694*LOG(NCP124/CPI*100)*SD82+0.149999*LOG(DINC/CPI*100)+-0.00700566666666667*@TREND+-0.087009*SD00+-0.134352*SD9194+0.146605*DUM97+DUM98+-0.040635*DUM04+DUM05+DUM06

DPRO124 = 1*(D124+PRO124)

LOG(FEED124) = -23.8978+-0.091989*LOG(EXCH*INTERP124)*(1.1+TE124/100)+1.021853*LOG(Q51)+1.180619*LOG(Q52MILK)+3.828277*SD84+-1.07773*SD95+-2.777346*DUM90+*SUM+*ADJUSTMENT+*ESTIMATE+*ACTUAL

LOG(LOSS124) = -5.899414+-0.043347*LOG((NCP124))+1.097249*LOG(M124+EST124(-1))+0.057862*@TREND*SD00+-0.946066*DUM00+DUM02+DUM03+-0.448906*DUM04

SEED124 = 0

RESIDUALD124 = 1*(FEED124+SEED124+LOSS124)

@Ending Stock

EST124 = 572.09+0.0970*EST124(-1)+M124+Q124-5.6665*NCP124/CPI*100+245.488*DUM93+DUM97-118.90*DUM99+DUM02+DUM03+106.8109*SD02

@Import

M124 = DPRO124+RESIDUALD124+X124+EST124-Q124-EST124(-1)

@Export

X124 = 0

@MARKET CLEARING CONDITION

SUP124=Q124+M124+EST124(-1)
TD124=DPRO124+RESIDUALD124+X124+EST124

SUP124=TD124

SOYBEANS

@Acreage

ACR131 = 78.6669450119405+0.277813*ACR131(-1)+12.84062*NFP131(-1)*@MOVAV(YD131(-1),3)/COST131(-1)+-11.1958095238095*((Q11(-1)*(NFP11(-1)*@MOVAV(YD11(-1),3)/COST11(-1))+Q213(-1)*(NFP213(-1)*@MOVAV(YD213(-1),3)/COST213(-1))+Q141(-1)*(NFP141(-1)*@MOVAV(YD141(-1),3)/COST141(-1))+Q152(-1)*(NFP152(-1)*@MOVAV(YD152(-1),3)/COST152(-1)))/(Q213(-1)+Q141(-1)+Q152(-1)+Q11(-1)))*SD91+-18.47878*SD99+14.48884*SD02+15.45054*DUM93+DUM94+-11.28818*DUM03+DUM04

@Yield

YD131 = 166.149555 + 1.358974199*(TEMP_6+TEMP_7+TEMP_8+TEMP_9)/4 - 0.0001518168833*(RAIN_6+RAIN_7+RAIN_8+RAIN_9) + 0.0001382549429*(SUN_6+SUN_7+SUN_8+SUN_9) - 0.9717284421*TYPHOON - 0.4874964191*WIND + 0.9433155962*@TREND*(@YEAR>=2004) - 5.820996252e-005*COST131 + 31.82694653*SD85 - 33.10653025*DUM94

@Production

Q131=ACR131*YD131/100

@Cost

COST131 = -77907.76047 + 1342.792651*(0.25*MACHP+0.06*MATRP+0.04*FUELP+0.24*WAGE+0.08*RENT+0.1*SEEDP+0.17*FERTP+0.06*CHEMP) + 365.8999019*YD131 + 21643.09101*SD93 + 37193.26872*SD01

@Demand

LOG(DPRO131/POP) = -12.17179- 0.1510858056*LOG(NCP131/CPI*100) + 0.177618*LOG(DINC/CPI*100) + 0.06929816196*(DUM88+DUM98+DUM05) - 0.08373217329*(DUM00+DUM01+DUM02) + 0.1696791147*SD93

PRO131=@MOVAV(PRO131(-1),3)/@MOVAV(DPRO131(-1),3)*DPRO131

D131=DPRO131-PRO131

LOG(RESIDUALD131) = -9.751799+-0.219832*LOG(NFP131)+1.290525*LOG(Q51(1)+Q53(1)+Q541(1)+Q543EGG(1))+0.167275*DUM99+DUM04+-0.068064*SD04+0.166263*DUM96

SEED131=SEED131(-1)*ACR131/ACR131(-1)

LOSS131=LOSS131(-1)*RESIDUALD131/RESIDUALD131(-1)

FEED131=RESIDUALD131-SEED131-LOSS131

@Ending Stock

EST131 = -225.0983927 + 0.2341847436*(EST131(-1)+Q131+M131) - 0.005609581445*NCP131/CPI*100 - 66.56105376*(DUM97+DUM98+DUM99+DUM00+DUM01)

@Import

M131 = 845.7237+-0.272443*EXCH*MP131*(1.1+TE131/100)+0.127745*NCP131+0.000426*Q51(1)+Q53(1)+Q541(1)+Q543EGG(1)+10.82601*@TREND+-256.2714*SD00+-205.0722*DUM90+DUM92-DUM96+138.5566*DUM01+DUM02+-389.3879*DUM04+DUM05+*SUM+*ADJUSTMENT

MP131 = 0.1146352197 + 0.7353451907*INTERP131/1000 - 0.03765122905*(DUM99+DUM00+DUM01) + 0.03142830657*SD03

@Export

X131 = 0

@Market Clearing Condition

SUP131=Q131+M131+EST131(-1)
TD131=DPRO131+RESIDUALD131+X131+EST131

SUP131=TD131

@Price Linkage

NFP131 -499.583533524275+1.0003899*NWP131+565.8875*SD96+-215.213*DUM96+DUM97+DUM98+-137.9392*DUM02+DUM03+DUM05

NWP131 = -25.84067+0.87441*NCP131+-1643.721*SD04+-334.1682*DUM96+DUM97+-929.1875*DUM00+DUM01+-594.345*DUM02+DUM05

CORN

@Acreage

ACR141 = 5.94442315987775+0.813639*ACR141(-1)+6.31474*NFP141(-1)*@MOVAV(YD141(-1),3)/COST141(-1)+-1.7370306*(Q131(-1)*(NFP131(-1)*@MOVAV(YD131(-1),3)/COST131(-1))+Q213(-1)*(NFP213(-1)*@MOVAV(YD213(-1),3)/COST213(-1))+Q152(-1)*(NFP152(-1)*@MOVAV(YD152(-1),3)/COST152(-1)))/(Q131(-1)+Q213(-1)+Q152(-1))+-3.111681*DUM91+DUM95-DUM94-DUM97+4.310403*DUM02+DUM04+-2.882718*SD00+-0.128178*@TREND

@Yield

YD141 = 611.891899228571+-3.525616*TEMP_4+TEMP_5+TEMP_6+TEMP_7+-0.0005*RAIN_4+RAIN_5+RAIN_6+RAIN_7+0.000751*SUN_4+SUN_5+SUN_6+SUN_7+3.38426666666667*@TREND+52.81946*SD05+-32.01143*SD99+-23.8419*DUM96

@Production

Q141=ACR141*YD141

@Cost

COST141 = -70645.85+3388.239*0.174*MACHP+0.126*MATRP+0.023*FUELP+0.189*WAGE+0.045*RENT+0.064*SEEDP+0.337*FERTP+0.041*CHEMP+103832*SD9099

@Demand (DPRO141_1: DPRO OF IMPORTS, DPRO141_2: DOMESTIC DPRO, Korean corn production is almost used for fresh sweet corn)

DPRI141=DPRO141_1+DPRO141_2

LOG(DPRO141_1/POP) = -10.8828815961805+-0.11748*LOG((EXCH*MP141*(1.1+TE141/100))/CPI*100)+0.025092*LOG(NFP141/CPI*100)+0.152294666666667*LOG(DINC/CPI*100)+-0.068911*SD9295+-0.082238*SD00+0.068962*DUM04-DUM05

LOG(DPRO141_2/POP) = -10.7108130035937+-0.62112*LOG(NFP141/CPI*100)+0.12042192*LOG(DINC/CPI*100)+0.104432*LOG((EXCH*MP141*(1.1+TE141/100))/CPI*100)+-0.025238*@TREND

PRO141=@MOVAV(PRO141(-1),3)/@MOVAV(DPRO141(-1),3)*DPRO141

D141=DPRO141-PRO141

LOG(RESIDUALD141) = 1.22981-0.12649*LOG((EXCH*MP141*(1.1+TE141/100))/CPI*100) + 0.6285337747*LOG(0.4*Q51(1)+0.4*Q53(1)+0.2*Q541(1)) - 0.2273225027*SD97 + 0.09542127966*SD99 - 0.3780836505*DUM93 - 0.146327082*(DUM90+DUM91+DUM92-DUM95) + 0.01875627726*@TREND

SEED141=SEED141(-1)*ACR141/ACR141(-1)

LOSS141=LOSS141(-1)*RESIDUALD141/RESIDUALD141(-1)

FEED141=RESIDUALD141-SEED141-LOSS141

@Ending Stock

EST141 = 379.1858135 + 0.04707598419*(EST141(-1)+Q141+M141) - 0.204315137*(EXCH*MP141*(1.1+TE141/100))/CPI*100 + 550.8518496*(DUM87+DUM94) + 244.7964069*SD9903

@Import

M141=DPRO141+X141+EST141-Q141-EST141(-1)

MP141 = 0.0237499923 + 0.9611580408*INTERP141/1000 + 0.02716975895*SD03 - 0.023881445*(DUM87+DUM88)

@Export
X141=0

@MARKET CLEARING CONDITION ON KOERAN SWEET CORN USAGE (corn price data only exists farm price, this farm price represents only Korean sweet corn)

Q141=DPRO141_2

WHITE POTATO

@Acreage

ACR151_1 = 2.71041+ 0.42110*ACR151_1(-1) + 1.96226*(NFP151_1(-1)*@MOVAV(YD151_1(-1),3))/COST151(-1) - 9.296059115*(DUM97+DUM98) - 2.358412624*(DUM91+DUM94+DUM99) + 3.456769632*SD92

ACR151_2 = 3.39604+ 0.2082137778*ACR151_2(-1) + 0.164708*NFP151_2(-1)*@MOVAV(YD151_2(-1),3)/COST151(-1) + 0.2167670453*NFP151_1*@MOVAV(YD151_1,1)/COST151 - 0.1328507068*TYPHOON - 0.8013071144*(DUM97+DUM98-DUM00) - 0.2976376485*SD03 - 0.4660355592*SD94

ACR151_3 = -0.5163751943 + 0.1710028726*ACR151_3(-1) + 0.848905612*(NFP151_3(-1)*@MOVAV(YD151_3(-1),3))/COST151_3(-1) +

2.954452226*SD92 + 2.982822789*DUM05 -
1.812977514*(DUM93+DUM94+DUM97+DUM98-DUM92)

ACR151 = 1*(ACR151_1+ACR151_2+ACR151_3)

@Yield
YD151_1 = 2569.157578 + 15.44455463*TEMP_4 - 106.2290246*TEMP_5 -
0.01303656626*RAIN_4 + 0.01672223162*RAIN_5 - 0.013488607*SUN_4 +
0.02208430035*SUN_5 + 105.1870598*@TREND + 587.5552088*SD99 -
430.5940827*SD90 - 50.163149*SD99*(@TREND)

YD151_2 = 3208.874676 - 27.88714865*TEMP_KW_7 - 122.5952778*TEMP_KW_8 -
0.05688140431*RAIN_KW_7 + 0.203664941*RAIN_KW_8 + 1.148044991*SUN_KW_7
+ 0.3909136417*SUN_KW_8 + 164.3676245*@TREND -
91.54370025*SD90*(@TREND)

YD151_3 = 5260.820881 - 54.95492859*(TEMP_JEJU_9+TEMP_JEJU_10) +
41.54296552*TEMP_JEJU_11 - 44.0495751*TEMP_JEJU_12 +
0.1346023207*(RAIN_JEJU_9+RAIN_JEJU_10) -
0.1940183801*(RAIN_JEJU_11+RAIN_JEJU_12) - 0.9668469954*SUN_JEJU_9 -
0.03327079316*(SUN_JEJU_10+SUN_JEJU_11) - 1.507599364*SUN_JEJU_12 -
25.59937901*TYPHOON - 9.430144672*WIND + 32.02319383*@TREND +
547.6131427*SD87

YD151 = 1*Q151/ACR151*100

@Production

Q151_1=ACR151_1*YD151_1/100
Q151_2=ACR151_2*YD151_2/100
Q151_3=ACR151_3*YD151_3/100

Q151=Q151_1+ Q151_2+ Q151_3

@Cost

COST151 = -215765.3577 +
6201.860481*(0.11*MACHP+0.18*MATRP+0.02*FUELP+0.21*WAGE+0.02*RENT+0.2
5*SEEDP+0.19*FERTP+0.03*CHEMP) + 50091.01123*SD91 + 55131.78262*SD94 +
30052.98862*(DUM99+DUM01) + 8.865152958*YD151

LOG(COST151_3) = 1.8496939 +
2.475217082*LOG(0.1*MACHP+0.12*MATRP+0.01*FUELP+0.2*WAGE+0.07*RENT+0
.27*SEEDP+0.17*FERTP+0.07*CHEMP) -
1.509028627*SD95*LOG(0.1*MACHP+0.12*MATRP+0.01*FUELP+0.2*WAGE+0.07*R
ENT+0.27*SEEDP+0.17*FERTP+0.07*CHEMP) + 0.1525125993*SD01 +
6.799441551*SD95

@Demand

LOG(D151_1/POP) = -11.34465 -0.27951*LOG(NWP151_1/CPI*100) + 0.1619600208*LOG(DINC/CPI*100) + 0.3010653311*(DUM95+DUM96+DUM05)

LOG(D151_2/POP) = -11.78155 -0.28412*LOG(NWP151_2/CPI*100) + 0.1135870452*LOG(DINC/CPI*100) - 0.3531542175*DUM88 + 0.3062070947*DUM04 - 0.2484570948*SD04

LOG(D151_3/POP) = -10.72041 - 0.6645055264*LOG(NWP151_3/CPI*100) + 0.27728*LOG(DINC/CPI*100)

@Ending Stock

EST151_1 = 0
EST151_2 = 0
EST151_3 = 0

@Import

M151 = 123.1290261 + 0.0120223272*NWP151/CPI*100 - 0.0264964255*(EXCH*MP151*(1.1+TE151/100))/CPI*100 + 27.95624847*(DUM98+DUM99+DUM00+DUM01+DUM02+DUM03)

M151_1 = 1.149130854 + 0.1932877922*M151 - 0.006495267791*DUM00
M151_2 = 0.1359906848 + 0.1994959481*M151 - 1.053575419*DUM03
M151_3 = 1*(M151-M151_1-M151_2)

@Export

X151_1 = (YEAR>=2006)*0.0092
X151_2 = (YEAR>=2007)*0.0052
X151_3 = (YEAR>=2007)*0.066

X151= X151_1+ X151_2+ X151_3

@Market Clearing Condition

SUP151_1=Q151_1+M151_1+EST151_1(-1)
TD151_1=D151_1+X151_1+EST151_1
SUP151_1=TD151_1

SUP151_2=Q151_2+M151_2+EST151_2(-1)
TD151_2=D151_2+X151_2+EST151_2
SUP151_2=TD151_2

SUP151_3=Q151_3+M151_3+EST151_3(-1)
TD151_3=D151_3+X151_3+EST151_3
SUP151_3=TD151_3

@Price Linkage

NFP151_1/CPI*100 = -24.77108498 + 0.8405512482*NWP151_1/CPI*100 - 209.7377319*SD04 + 261.6585683*(DUM96+DUM97-DUM02-DUM03)

NFP151_2/CPI*100 = 21.5069 + 0.763904*NWP151_2/CPI*100 - 85.6730515*(DUM94+DUM95+DUM02+DUM03) + 303.8812967*SD96 - 388.6064024*SD00

NFP151_3/CPI*100 = -309.7918 + 0.78705*NWP151_3/CPI*100 + 294.9286238*(DUM95+DUM97+DUM98+DUM99) + 709.8358223*DUM96 - 297.087109*DUM06

SWEET POTATO

@Acreage

ACR152 = 13.0055976133934+0.515426*ACR152(-1)+0.5043385*NFP152(-1)*@MOVAV(YD152(-1),3)/COST152(-1)+-0.4288374*((Q213(-1)*(NFP213(-1)*@MOVAV(YD213(-1),3)/COST213(-1))+Q141(-1)*(NFP141(-1)*@MOVAV(YD141(-1),3)/COST141(-1))+Q131(-1)*(NFP131(-1)*@MOVAV(YD131(-1),3)/COST131(-1)))/(Q213(-1)+Q141(-1)+Q131(-1)))*SD94+-6.102415*SD90+1.552815*SD04+-2.392674*DUM01+5.018463*DUM99+-1.456769*DUM93

@Yield

YD152 = 449.265+69.69046*LOG(@TREND)+-80.89136*DUM94+DUM97+DUM03+-220.0316*SD05

@Production

Q152=ACR151*YD152/100

@Cost

COST152 = -180240.3115 + 3687.854156*(0.09*MACHP+0.2*MATRP+0.02*FUELP+0.3*WAGE+0.1*RENT+0.18*S

EEDP+0.09*FERTP+0.02*CHEMP) + 10792.24114*@TREND -
32410.06189*(DUM89+DUM90+DUM91+DUM92)

@Demand

LOG(D152/POP) = -12.1545877353436+-
0.2350862*LOG(NCP152/CPI*100)+0.091776*LOG(DINC/CPI*100)+-
0.230164*SD05+0.284452*DUM02+DUM03

@Ending Stock

EST152 = 0

@Import

M152 = 0

@Export

X152 = 0

@Marketing Condition

SUP152=Q152+M152+EST152(-1)
TD152=D152+X152+EST152

SUP152=TD152

@Price Linkage

NFP152 = -48.5137916 + 0.2745379*NCP152 + 79.95506466*DUM94 +
181.4075861*(DUM96+DUM97-(DUM01+DUM02))

GARLIC

@Acreage

ACR211 = 2.81215442516307+0.776833*ACR211(-1)+2.52206385*(NFP211(-
1)*@MOVAV(YD211(-1),3))/COST211(-1)+-0.697032*(NFP212(-1)*@MOVAV(YD212(-
1),3))/COST212(-1)+-42.6275865*((NFP125(-1)*@MOVAV(YD125(-1),3))/(COST125(-
1)))*SD97+8.869305*DUM99+DUM00+3.987617*DUM03+DUM05

@Yield

YD211 = -87614.52944 + 22.47438419*(TEMP_1+TEMP_2+TEMP_3)/3 - 27.11938209*(TEMP_4+TEMP_5)/2 + 0.002646175768*(RAIN_1+RAIN_2+RAIN_3+RAIN_4+RAIN_5) + 0.006613971797*(SUN_1+SUN_2+SUN_3+SUN_4+SUN_5) + 44.42938633*@YEAR + 83378.80153*SD93 - 41.84121656*@YEAR*SD93

@Produciton

Q211=ACR211*YD211/100

@Cost

COST211 = -597460.6+12810.07*(0.035*machp+0.043*matrp+0.005*fuelp+0.179*wage+0.054*rent+0.455*seedp+0.176*fertp+0.053*chemp)+105862.7*DUM95+DUM99+-56017.5*SD0104

@Demand

LOG(D211/POP) = -11.5882585331215+-0.344165*LOG(NCP211/CPI*100)+0.334499*LOG(DINC/CPI*100)+-0.024248*@TREND+0.198987*SD85+-0.147464*SD01+0.148778*SD8990+0.090272*SD0305+0.108387*DUM91+DUM94+DUM98+DUM99

@Ending Stock

EST211 -18.27133+0.106499*EST211(-1)+Q211+M211+-0.003032*NWP211+-17.54075*SD94+-9.858832*DUM99-DUM02+-2.163199*DUM04

@Import

M211_F = 0.00809+7.79992*NCP211/(MP211_F*EXCH*(1.1+TE211/100))+20.95267*DUM94+DUM98+-13.37059*DUM99+DUM00+-5.163811*DUM05+0.258287*TRQ211+0*@TREND

M211_P= -22.0361930976695+18.83097*NCP211/(MP211_P*EXCH*(1.1+TE211_P/100))+1.530658*@TREND+10.40952*SD06+8.96032*DUM99+DUM00+9.405465*SD00

@Export

X211 = (YEAR>=2006)*0.49175

@Market Clearing Condition

SUP211=Q211+M211+EST211(-1)
TD211=D211+X211+EST211

SUP211=TD211

@Price Linkage

NFP211/CPI*100 = 1087.253+0.887007*NWP211/CPI*100+-764.6593*DUM89+1227.496*DUM90+DUM91+DUM92+DUM94+DUM95+257.8466*DUM01+-353.1693*SD05+-9.934285*WAGE/CPI*100

NWP211/CPI*100 = -40.01698+0.52074*NCP211/CPI*100+-19.18544*DUM89+-437.688*DUM05+-489.0427*(DUM91+DUM95)-(DUM94+DUM98)

ONION

@Acreage

ACR212 = 8.21611982886506+0.267785*ACR212(-1)+1.156784*(NFP212(-1)*@MOVAV(YD212(-1),3))/COST212(-1)+-0.32697863*(NFP211(-1)*@MOVAV(YD211(-1),3))/COST211(-1)+-13.98699803*(NFP125(-1)*@MOVAV(YD125(-1),3))/(COST125(-1))+3.733935*SD98+6.156474*DUM95+-2.720128*DUM90+DUM02+DUM03+DUM04

@Yield

YD212 = 1220.493077 + 101.5800569*(((TEMP_1+TEMP_2)/2)-((TEMP_3+TEMP_4)/2)) + 0.0511442674*(RAIN_1+RAIN_2+RAIN_3+RAIN_4) + 0.04193553448*(SUN_1+SUN_2+SUN_3+SUN_4) + 191.3576959*@TREND - 169.1373666*(@TREND)*SD92 + 2298.672417*SD92 - 443.2032914*SD00 - 389.8261931*DUM99

@Production

Q212=ACR212*YD212/100

@Cost

COST212 = - -230871.1+6937.009*0.029*machp+0.061*matrp+0.005*fuelp+0.322*wage+0.078*rent+0.227*seedp+0.2*fertp+0.078*chemp+15.26978*YD212+-67408.38*SD9802

@Demand

LOG(D212/POP) = -11.9284953794612+-0.392728*LOG(NCP212/CPI*100)+0.392673*LOG(DINC/CPI*100)+0.183498*DUM98

@Ending Stock

EST212=(YEAR>=2006)*0

@Import

M212_F = -59.83291+0.116344*NCP212+-0.010825*MP212_F*EXCH*(1.1+TE212/100)+0.579246*TRQ212+-25.96146*SD97+12.21941*SD01+-33.27808*DUM05

M212_P= 43.41377+0.005286*NCP212+-0.116105*MP212_P*EXCH*(1.1+TE212/100)+14.10431*SD04+-7.187571*DUM97+12.90619*DUM98

@Export

X212=(YEAR>=2006)*0.416555555555556

@Market Clearing Condition

SUP212=Q212+M212+EST212(-1)
TD212=D212+X212+EST212

SUP212=TD212

@Price Linkage

NFP212 = 133.1669+0.427901*NWP212+-87.01237*SD89+85.91835*SD01+-115.7053*SD05+-140.9462*DUM93+DUM94+-99.67211*DUM87-DUM00

NWP212 = -20.79072+0.667429*NCP212+-131.9322*DUM05

RED PEPPER

@Acreage

ACR213 = 45.9683644849394+0.555157*ACR213(-1)+8.534764*NFP213(-1)*@MOVAV(YD213(-1),3)/COST213(-1)+-16.08662619*(Q131(-1)*(NFP131(-1)*@MOVAV(YD131(-1),3)/COST131(-1))+Q141(-1)*(NFP141(-1)*@MOVAV(YD141(-1),3)/COST141(-1))+Q152(-1)*(NFP152(-1)*@MOVAV(YD152(-1),3)/COST152(-1)))/(Q131(-1)+Q141(-1)+Q152(-1))+-7.99983*DUM97+DUM98+DUM01+DUM03+16.90181*DUM88+-0.7880264*@TREND

@Yield

YD213 = -38.14145775 + 5.047540596*(TEMP_4+TEMP_5+TEMP_6+TEMP_7+TEMP_8)/5 + 0.00143629757*(RAIN_4+RAIN_5+RAIN_6) - 0.001022832911*(RAIN_7+RAIN_8) + 0.004432742372*(SUN_4+SUN_5+SUN_6) - 0.004012519213*(SUN_7+SUN_8) + 5.821583137*@TREND - 29.01907492*(DUM03+DUM91) + 57.92579789*SD88 - 0.000192756717*COST213

@Production

Q213=ACR213*YD213/100

@Cost

COST213 = -92831.65+5786.077*0.059*machp+0.143*matrp+0.069*fuelp+0.228*wage+0.101*rent+0.117*seedp+0.126*fertp+0.158*chemp+-45996.76*SD9702+85426.37*SD05

@Demand

LOG(D213/POP) = -12.3553618088736+-0.10467425*LOG(NCP213/CPI*100)+0.103228913043478*LOG(DINC/CPI*100)+-0.134585*SD05+0.130359*DUM92+DUM94+DUM95-DUM02

@Ending Stock

EST213=(YEAR>=2006)*4

@Import

M213_F = -19.87595+0.002343*NCP213+-0.00036*((MP213_F*EXCH*(1.1+TE213/100)))*SD99+4.365228*SD97+0.954291*TRQ213+-6.305176*DUM06

M213_P= 27.88327+0.001935*NCP213+-0.009026*MP213_P*EXCH*(1.1+TE213_P/100)+8.321681*SD01+12.29375*SD04+14.11025*SD06

@Export

X213 = -1.280471+-0.242136*XP213+0.000398*EXCH*SD00+0.044057*(X228_3+X228_1(1)+X228_2(1)+X228_4(1))*SD99+0.331676*@TREND+-0.625836*DUM98+DUM01+-0.758557*SD01+1.004076*SD05

@Market Clearing Condition

SUP213=Q213+M213+EST213(-1)
TD213=D213+X213+EST213

SUP213=TD213

@Price Linkage

NWP213 = 141.6692+0.881929*NCP213+-9.753412*WAGE+385.6658*DUM99+DUM00+DUM03+-781.2213*DUM96+DUM97+-427.2055*SD01

NFP213/CPI*100 = 124.2878140392+0.8552479*NWP213+-1.471257*WAGE+992.4932*DUM96+DUM97+-796.8182*DUM88+DUM89+-640.4483*DUM02+DUM03+DUM04+DUM05

Green Onion (Welsh)

@Acrage

ACR214 = 8.38340342430608+0.24743*ACR214(-1)+0.3021975*NWP214(-1)*@MOVAV(YD214(-1),3)/COST214(-1)+2.064255*DUM86+DUM92+DUM99+DUM04-DUM05-DUM97+1.443491*SD00

@Yield

YD214 = 4030.447295 - 15.73558947*TEMP + 0.001397062261*RAIN - 0.004259953098*SUN - 5.432500532*WIND + 352.7295274*SD99 + 93.39191905*(DUM97+DUM04-DUM05)

@Production

Q214=ACR214*YD214/100

@Cost

COST214 = -1027005+4006.596*(0.097*MACHP+0.06*MATRP+0.027*FUELP+0.414*WAGE+0.065*RENT+0.044*SEEDP+0.227*FERTP+0.065*CHEMP)+431.7215*YD214+90160.13*SD01+42318.78*SD95+155671.3*DUM03

@Demand

LOG(D214/POP) = 5.77565386186456+-0.206016*LOG(NCP214/CPI*100)+0.1879892*LOG(DINC/CPI*100)+-0.167062*DUM90+DUM93+DUM96+DUM97+DUM01+DUM03+DUM05+-0.228134*DUM02+0.161*SD01+-0.161967*SD05

@Ending Stock

EST214 = 0

@Import

M214_F = -2.664702+3.467162*(NCP214)/((EXCH*MP214_F*(1.1+TE214_F/100)))+-2.443423*DUM02+DUM03+DUM04+-3.340718*DUM00+-6.818665*DUM05

M214_P = 4.063508+14.0667*(NCP214)/((EXCH*MP214_P*(1.1+TE214/100)))+8.467739*DUM95+DUM97+DUM98+DUM04+DUM01+0.82779*@TREND+-6.232449*DUM06+12.80491*SD94

@Export

X214=(YEAR>=2006)* 0.097766

@Market Clearing Condition

SUP214=Q214+M214+EST214(-1)
TD214=D214+X214+EST214

SUP214=TD214

@Price Linkage

NWP214 = -36.67607+0.698316*NCP214

Green Onion (Wakegi)

@Acreage

ACR215 = 3.091173+0.541672*ACR215(-1)+0.338048*NWP215(-1)*@MOVAV(YD215(-1),3)/COST215(-1)+-0.047646*@TREND+-2.085541*DUM90+DUM94+DUM98-DUM00-DUM04+1.365528*SD98+-1.995584*SD02

@Yield

YD215 = 3368.357234 + 4.996766349*TEMP - 0.003039483425*RAIN - 0.003225333631*SUN + 96.60268194*SD99 - 615.1571741*SD94 + 254.6461157*SD96 - 312.709916*(DUM92+DUM05)

@Production

Q215=ACR215*YD215/100

@Cost

LOG(COST215) = 0.217427+2.569103*LOG(0.064*MACHP+0.089*MATRP+0.016*FUELP+0.238*WAGE+0.037*RENT+0.366*SEEDP+0.161*FERTP+0.029*CHEMP)+-1.637356*SD94*LOG(0.064*MACHP+0.089*MATRP+0.016*FUELP+0.238*WAGE+0.037*RENT+0.366*SEEDP+0.161*FERTP+0.029*CHEMP)+7.342707*SD94+0.219126*LOG(YD215)+0.346966*DUM98+DUM99

@Demand

LOG(D215/POP) = -12.0299225303589+-0.226650666666667*LOG(NCP215/CPI*100)+0.19426675*LOG(DINC/CPI*100)+-0.0253835*@TREND+0.323934*SD9901+0.275486*DUM93+DUM04

@Ending Stock

EST215 = 0

@Import

M215 = -0.031461+0.124916*(NCP215)/((EXCH*MP215*(1.1+TE215/100)))+0.955274*SD03+1.138129*DUM03+DUM04

@Export

X215=(YEAR>=2006)* 0.00613

@Market Clearing Condition

SUP215=Q215+M215+EST215(-1)
TD215=D215+X215+EST215

SUP215=TD215

@Price Linkage

NWP215 = -7.653973+0.593773*NCP215+228.2904*SD02+-241.4706*DUM04

Chinese cabbage

@Acreage

ACR221_1 = -4.45816535527502+0.51347*ACR221_1(-1)+0.694178*NWP221_3(-
1)*@MOVAV(YD221_3(-1),3)/COST221_3(-1)+2.714481*NWP221_1(-
1)*@MOVAV(YD221_1(-1),3)/COST221_1(-1)+4.251962*DUM01+DUM03+-
2.682589*DUM04-DUM05+-2.442576*SD06

ACR221_2 = -1.3993192866367+0.632712*ACR221_2(-1)+0.38087*NWP221_2(-
1)*@MOVAV(YD221_2(-1),3)/COST221_2(-
1)+0.179926333333333*NWP221_1*@MOVAV(YD221_1,1)/COST221_1+-
0.0376875*@TREND*SD03+3.525533*SD91+-1.304656*SD02

ACR221_3 16.2160762583852+0.289442*ACR221_3(-1)+0.406641*NWP221_3(-
1)*@MOVAV(YD221_3(-1),3)/COST221_3(-1)+-0.1793675*@TREND+-
6.625155*SD87+1.592645*SD98+4.572044*DUM90+DUM93+-
3.112811*DUM92+DUM99

ACR221_4 = 1.385837+0.391358*ACR221_4(-1)+0.145028*NWP221_3(-
1)*@MOVAV(YD221_3(-1),1)/COST221_3(-1)+-
0.019395*@TREND+0.886495*SD91+-1.024107*SD02+-
1.003144*DUM89+DUM92+1.083542*DUM95+DUM98+DUM03

ACR221 = 1*(ACR221_1+ACR221_2+ACR221_3+ACR221_4)

@Yield

YD221_1 = -837072.2829 + 247.2698106*(TEMP_2+TEMP_3+TEMP_4+TEMP_5)/4 - 227.4858293*(MINTEMP_2+MINTEMP_3+MINTEMP_4+MINTEMP_5)/4 - 0.01079567546*(RAIN_2+RAIN_3+RAIN_4+RAIN_5) - 0.004046424678*(SUN_2+SUN_3+SUN_4+SUN_5) + 110504.0236*LOG(@YEAR) + 152299.9641*SD93*LOG(@YEAR) - 1156973.687*SD93 + 486.7489709*DUM93

YD221_2 = 1801.268647 + 50.63036276*(TEMP_5+TEMP_6+TEMP_7)/3 + 0.009014586694*(RAIN_5+RAIN_6+RAIN_7) + 0.01687620487*(SUN_5+SUN_6+SUN_7) + 47.02674261*SD92*(@TREND) - 16.27205105*@TREND - 834.6448771*SD92 + 250.6963216*(DUM90+DUM00)

YD221_3 = 17046.63948 - 174.3455438*(TEMP_8+TEMP_9+TEMP_10)/3 - 0.04060430985*(RAIN_8+RAIN_9+RAIN_10+RAIN_11) - 0.03590362427*(SUN_8+SUN_9+SUN_10+SUN_11) - 6.464431277*WIND + 38.93002554*@TREND + 992.5280314*SD89 - 1095.361639*SD99 - 1123.545119*DUM88

YD221_4 = 2105.420413 + 26.51159977*TEMP_10 - 16.64001319*(TEMP_11+TEMP_12) + 0.03713403704*(RAIN_11+RAIN_12) + 0.02797606971*(SUN_10+SUN_11+SUN_12) + 14.08087176*@TREND + 722.0312358*SD98

@Production

Q221_1=ACR221_1*YD221_1/100
Q221_2=ACR221_2*YD221_2/100
Q221_3=ACR221_3*YD221_3/100
Q221_4=ACR221_4*YD221_4/100

@Cost

LOG(COST221_1) = 5.959799+0.976329*LOG(0.126*MACHP+0.113*MATRP+0.025*FUELP+0.231*WAGE+0.043*RENT+0.088*SEEDP+0.289*FERTP+0.086*CHEMP)+0.247978*LOG(YD221_1)+0.497601*SD89+0.182571*DUM87+DUM88+DUM97

LOG(COST221_2) = -1.754054+3.341462*LOG(0.11*MACHP+0.061*MATRP+0.023*FUELP+0.208*WAGE+0.048*RENT+0.099*SEEDP+0.326*FERTP+0.125*CHEMP)+-2.620883*SD95*LOG(0.11*MACHP+0.061*MATRP+0.023*FUELP+0.208*WAGE+0.048*RENT+0.099*SEEDP+0.326*FERTP+0.125*CHEMP)+11.53632*SD95+0.239611*DUM94+-0.167122*DUM01

LOG(COST221_3) = 6.545708+0.91167*LOG(0.179*MACHP+0.084*MATRP+0.031*FUELP+0.219*WAGE+

0.038*RENT+0.107*SEEDP+0.271*FERTP+0.071*CHEMP)+0.157841*LOG(@TREND +1)+0.124953*LOG(YD221_3)+0.295885*SD93+0.214245*SD87

LOG(COST221_4) = 10.38373+0.709793*LOG(0.1*MACHP+0.27*MATRP+0.04*FUELP+0.22*WAGE+0.02*RENT+0.1*SEEDP+0.19*FERTP+0.06*CHEMP)

@Demand

LOG(D221_1/POP) = -8.66770322589894+-0.740755*LOG(NCP221_1/CPI*100)+0.0892626666666667*LOG(NCP221_4/CPI*100)+0.213662*LOG(DINC/CPI*100)+-0.03015*@TREND*SD92+0.145149*SD96+-0.268873*SD06+0.33438*DUM93+DUM01+DUM06

LOG(D221_2/POP) = -12.4618704236484+-0.184727*LOG(NCP221_2/CPI*100)+0.264786*LOG(DINC/CPI*100)+-0.036916*@TREND+0.211894*SD99+-0.160938*SD02+-0.140203*SD04+0.17528*DUM04+DUM06

LOG(D221_3/POP) = -8.47117125895265+-0.4074255*LOG(NCP221_3/CPI*100)+0.140514*LOG(DINC/CPI*100)+-0.035578*@TREND+0.170457*SD03+-0.141918*DUM92

LOG(D221_4/POP) = -13.0000066837792+-0.22323*LOG(NCP221_4/CPI*100)+0.133621*LOG(NCP221_1/CPI*100)+0.15974175*LOG(DINC/CPI*100)+-0.01256*@TREND+-0.236728*SD04+0.355001*DUM95+DUM98+DUM00-DUM02-DUM05

@Ending Stock

EST221_1 = 0
EST221_2 = 0
EST221_3 = 0
EST221_4 = 0

@Import

M221_1 = -0.846182+0.003528*NWP221_1+2.03733*DUM03

M221_2 = -15.79758+0.028234*NWP221_2+1.665207*DUM02

M221_3 = -0.197493+0.001305*NWP221_3+1.692634*DUM03

M221_4 = -2.397658+0.009204*NWP221_4

@Export

X221_1 = 0.812924+0.048133*X228_1+-
0.86181*XP221_1+0.000395*EXCH*SD02+0.546249*DUM99+-
0.943232*DUM02+DUM03+DUM04

X221_2 = 0.425316582191587+0.174332*X228_2+-
0.379895*XP221_2+0.000389*EXCH*SD99+-1.707961*SD00+0.525673*SD05+-
0.34513*DUM03

X221_3 = -3.93231284317689+2.733354*X228_3+-
4.128714*XP221_3+0.0057315*EXCH*SD99+-18.24039*SD99+-
3.779195*SD02+6.264227*SD04

X221_4 = 0.371645+0.014873*X228_4+-
0.301986*XP221_4+0.0000889*EXCH*SD04+0.76293*DUM98+DUM99+DUM01

XP221_1 = 2.299618+0.001297*NWP221_1+-0.000985*EXCH+-0.207613*SD04+-
0.883874*SD91

XP221_2 = 0.988246+0.0029*NWP221_2+-0.000134*EXCH+-1.160811*SD95+-
0.585865*SD01

XP221_3 = 2.175487+0.001156*NWP221_3+-0.00146*EXCH+-0.259882*SD02+-
0.643938*DUM91+-0.262662*DUM02

XP221_4 = 0.779016+0.001001*NWP221_4+-0.0004*EXCH+-0.368869*DUM00

@Market Clearing Condition

SUP221_1=Q221_1+M221_1+EST221_1(-1)
TD221_1=D221_1+X221_1+EST221_1
SUP221_1=TD221_1

SUP221_2=Q221_2+M221_2+EST221_2(-1)
TD221_2=D221_2+X221_2+EST221_2
SUP221_2=TD221_2

SUP221_3=Q221_3+M221_3+EST221_3(-1)
TD221_3=D221_3+X221_3+EST221_3
SUP221_3=TD221_3

SUP221_4=Q221_4+M221_4+EST221_4(-1)
TD221_4=D221_4+X221_4+EST221_4
SUP221_4=TD221_4

@Price Linkage

NFP221_1 = -94.0206362057583+0.583018*NWP221_1+68.38245*SD95+-51.71481*DUM01+76.12363*SD0104

NFP221_2 = -103.11795544941+0.441794*NWP221_2+235.697*DUM02+115.991*DUM99+DUM01+DUM03+DUM04+90.60621*SD96

NFP221_3 = -87.374946819004+0.613041*NWP221_3+255.1723*DUM03+56.2323*DUM98+-44.89903*DUM95+65.88833*SD96

NFP221_4 = -13.8491152918386+0.5450659*NWP221_4+137.8831*DUM88+DUM04+-81.80804*DUM91+DUM92+DUM93+DUM94

NWP221_1 = -45.28368+0.754056*NCP221_1+50.45806*SD96+-67.15851*SD04+-102.3986*DUM94

NWP221_2 = -123.458437703433+0.695301*NCP221_2+67.449*SD90+104.8481*SD96+100.4165*SD03+129.8992*DUM98

NWP221_3 = -52.97538+0.735168*NCP221_3+58.50081*SD94+20.81142*DUM92+DUM95

NWP221_4 = -56.99209+0.884346*NCP221_4+-182.5511*DUM02+DUM05

KIM-CHI

@Prodcution

Q228_1 = 1*((Q221_1*0.65*0.92*0.45)/0.75)/0.7
Q228_2 = 1*((Q221_2*0.65*0.92*0.4)/0.75)/0.7
Q228_3 = 1*((Q221_3*0.65*0.92*0.52)/0.75)/0.7
Q228_4 = 1*((Q221_4*0.65*0.92*0.45)/0.75)/0.7

@Demand

D228_1 = 1*(Q228_1+M228_1-X228_1)

D228_2 = 1*(Q228_2+M228_2-X228_2)
D228_3 = 1*(Q228_3+M228_3-X228_3)
D228_4 = 1*(Q228_4+M228_4-X228_4)

@Import

M228_1 = -329.1828+0.028823*NWP221_1/CPI*100+-0.033457*((EXCH*MP228_1*(1.1+TE228/100))/CPI*100)*SD03+14.89841*@TREND

M228_2 = -7.650755+11.4261*NWP221_2/(EXCH*MP228_2*(1.1+TE228/100))+15.59628*DUM04-DUM05+45.22032*SD05

M228_3 = -232.641+-0.010109*(EXCH*MP228_3*(1.1+TE228/100))/CPI*100+-22.7702*SD02+11.97635*@TREND+-11.17088*DUM05

M228_4 = -1.127699+0.00721*NWP221_4/CPI*100+-0.001956*(EXCH*MP228_4*(1.1+TE228/100))/CPI*100+26.82524*SD05+8.351661*DUM04

@Export

X228_1 = -1.127123+-0.389634*XP228_1+0.001989*EXCH*SD98+-3.383624*DUM98+0.401559*@TREND

X228_2 = 0.50651995661451+-0.178497*XP228_2+0.000786333333333333*EXCH*SD99+0.244042*@TREND

X228_3 = 5.74708310854978+-0.721779*XP228_3+0.000703666666666667*EXCH+2.346507*SD99+1.484902*DUM02+DUM03+3.45204*DUM04

X228_4 = 1.59559497251157+-0.221187*XP228_4+0.000201*EXCH+0.110925*@TREND

XP228_1 = 5.521247+0.001088*NFP221_1+-0.001671*EXCH+-1.016406*SD96+-0.523306*SD02+0.004811*0.5*WAGE+0.5*FUELP

XP228_2 = 6.004353+0.000964*NFP221_2+-0.001541*EXCH+-0.073402*@TREND+0.417551*DUM00

XP228_3 = 4.91221+0.00044*NFP221_3+-0.001071*EXCH+-0.386762*SD05+-0.032883*@TREND+-0.299261*DUM02+DUM97

XP228_4 = 5.978927+0.000252*NFP221_4+-0.001045*EXCH+-0.092842*@TREND+0.46425*DUM00+0.225662*SD04

White Radish

@Acreage

ACR231_1 = 3.01274228164306+0.6045875*ACR231_1(-1)+0.716959*(NWP231_1(-1)*@MOVAV(YD231_1(-1),3))/COST231_1(-1)+0.232331666666667*(NWP231_3(-1)*@MOVAV(YD231_3(-1),3))/COST231_3(-1)+-1.75851*DUM92-DUM94+DUM95+DUM97+-1.480042*SD05

ACR231_2 = 1.56044852480852+0.225372*ACR231_2(-1)+0.18688*(NWP231_2(-1)*@MOVAV(YD231_2(-1),3))/COST231_2(-1)+0.075025*(NWP231_1*@MOVAV(YD231_1,3))/COST231_1+-0.046664*@TREND+1.069105*SD94+0.872772*DUM92+DUM99+DUM01

ACR231_3 = -0.91587213583077+0.841862*ACR231_3(-1)+0.3476185*(NWP231_3(-1)*@MOVAV(YD231_3(-1),3))/COST231_3(-1)+0.1206825*(NWP231_2*@MOVAV(YD231_2,3))/COST231_2+-2.75867*DUM92-DUM98

ACR231_4 = -0.761268178268917+0.88107*ACR231_4(-1)+0.3881*(NWP231_4(-1)*@MOVAV(YD231_4(-1),3))/COST231_4(-1)+0.0783985*(NWP231_3(-1)*@MOVAV(YD231_3(-1),3))/COST231_3(-1)+0.772743*SD97+-0.606555*SD04

@Yield

YD231_1 = -223271.3+-52.1085*TEMP_4+101.1359*TEMP_5+0.014942*RAIN_4+RAIN_5+0.012306*SUN_4+SUN_5+29560.87*LOG(@YEAR)+170550.7*SD96*LOG(@YEAR)+-1296070*SD96

YD231_2 = 2452.667+23.7264*TEMP_KW_6+TEMP_KW_7+-2.417959*TEMP_KW_8+0.005607*RAIN_KW_7+RAIN_KW_8+-0.010067*SUN_KW_7+SUN_KW_8+-432.98*SD94+328.0165*SD02+-138.3687*DUM96+DUM00+DUM05+-0.0004*COST231_2+3.185468*@TREND*SD96

YD231_3 = -3458405+19.9456*TEMP_9+TEMP_10+TEMP_11+-0.001419*RAIN_9+RAIN_10+RAIN_11+0.001194*SUN_9+SUN_10+SUN_11+456156.3*LOG(@YEAR)+-962.8427*SD94+-79.64853*TYPHOON+-0.00687*COST231_3+-855.8765*DUM88+DUM03

YD231_4 = -99804.96+28.39939*TEMP_10+TEMP_11+TEMP_12+TEMP_1+-0.014819*RAIN_10+RAIN_11+RAIN_12+RAIN_1+0.013696*SUN_10+SUN_11+SUN_12+SUN_1+51.2944*@YEAR+-441.1183*SD93+365.175*SD96+-380.8883*DUM90+DUM91+DUM04

@Production

Q231_1=ACR231_1*YD231_1/100
Q231_2=ACR231_2*YD231_2/100
Q231_3=ACR231_3*YD231_3/100
Q231_4=ACR231_4*YD231_4/100

@Cost

LOG(COST231_1) =
7.485853+1.069258*LOG(0.132*MACHP+0.071*MATRP+0.029*FUELP+0.215*WAGE+0.052*RENT+0.185*SEEDP+0.242*FERTP+0.075*CHEMP)+0.171721*SD89+-0.164462*SD98+0.025969*@TREND

LOG(COST231_2) = 8.040917405 +
0.9053165646*LOG(0.18*MACHP+0.04*MATRP+0.02*FUELP+0.2*WAGE+0.03*RENT+0.17*SEEDP+0.27*FERTP+0.09*CHEMP) + 0.1032131795*SD95 - 0.05931996268*DUM02 + 0.0344877447*@TREND

LOG(COST231_3) =
7.154965+1.034572*LOG(0.196*MACHP+0.053*MATRP+0.028*FUELP+0.257*WAGE+0.056*RENT+0.123*SEEDP+0.222*FERTP+0.065*CHEMP)+0.033281*@TREND+0.15547*SD90

LOG(COST231_4) =
11.42781+0.443432*LOG(0.097*MACHP+0.319*MATRP+0.03*FUELP+0.17*WAGE+0.028*RENT+0.17*SEEDP+0.166*FERTP+0.021*CHEMP)+-0.15766*DUM98+DUM99+0.136807*SD96

@Demand

LOG(D231_1/POP) = -11.4522121493418+-0.241252*LOG(NCP231_1/CPI*100)+0.0932985*LOG(NCP231_4/CPI*100)+0.121815*LOG(DINC/CPI*100)+-0.015726*@TREND+-0.18496*DUM92+DUM95+-0.187946*DUM02+DUM05+0.179417*SD00

LOG(D231_2/POP) = -13.4143508086702+-0.195452*LOG(NCP231_2/CPI*100)+0.2581005*LOG(DINC/CPI*100)+-0.044482*@TREND+-0.205629*DUM93+0.211846*SD99+-0.297139*SD02+0.183255*DUM03

LOG(D231_3/POP) = -10.86735193139+-0.2717208*LOG(NCP231_3/CPI*100)+0.301546923076923*LOG(DINC/CPI*100)+-0.0545226*@TREND+-0.156109*SD91+0.136152*DUM98

LOG(D231_4/POP) = -13.3522140989863+-
0.2429*LOG(NCP231_4/CPI*100)+0.0232074*LOG(NCP231_1/CPI*100)+0.28829777
7777778*LOG(DINC/CPI*100)+0.568222*SD98+-0.0491845*@TREND

@Ending Stock

EST231_1 = 0
EST231_2 = 0
EST231_3 = 0
EST231_4 = 0

@Import

M231_1 = 0
M231_2 = 0
M231_3 = 0
M231_4 = 0

@Export

X231_1=(YEAR>=2007)*3.122655
X231_2=(YEAR>=2007)*0.00289
X231_3=(YEAR>=2007)*0.078193
X231_4=(YEAR>=2007)*0.350315

@Market Clearing Condition

SUP231_1=Q231_1+M231_1+EST231_1(-1)
TD231_1=D231_1+X231_1+EST231_1
SUP231_1=TD231_1

SUP231_2=Q231_2+M231_2+EST231_2(-1)
TD231_2=D231_2+X231_2+EST231_2
SUP231_2=TD231_2

SUP231_3=Q231_3+M231_3+EST231_3(-1)
TD231_3=D231_3+X231_3+EST231_3
SUP231_3=TD231_3

SUP231_4=Q231_4+M231_4+EST231_4(-1)
TD231_4=D231_4+X231_4+EST231_4
SUP231_4=TD231_4

@Price Linkage

NWP231_1 = 7.987143+0.537943*NCP231_1+108.8296*DUM00+-
103.6458*DUM94+DUM95+-83.38029*DUM04+DUM05+29.96457*SD06+-
40.78998*SD97

NWP231_2 = -7.825457+0.550994*NCP231_2+-114.6088*DUM94+DUM95+DUM02+DUM03

NWP231_3 = -25.8146+0.562755*NCP231_3+-116.3507*DUM94+DUM95

NWP231_4 = -28.53366+0.594506*NCP231_4+-135.0823*DUM94+DUM95+99.89593*DUM92+DUM00+DUM03-DUM04

Cabbage

@Acreage

ACR222 = 0.562710140274229+0.542499*ACR222(-1)+0.677484*NFP222(-1)*@MOVAV(YD222(-1),3)/COST222(-1)+-1.175124*DUM97+DUM98+DUM99+DUM00+-1.15971*DUM02+DUM03+DUM04+DUM05+-0.954404*SD04+0.0374652*@TREND

@Yield

YD222 = -1812396+-79.72774*TEMP+0.002049*RAIN+0.008509*SUN+-22.43553*TYPHOON+239051.3*LOG(@YEAR)+-367.3148*SD91+471.7704*DUM96+DUM01

@Production

Q222=ACR222*YD222/100

@Cost

LOG(COST222) = 2.982116+0.888201*LOG(0.114*MACHP+0.12*MATRP+0.022*FUELP+0.306*WAGE+0.029*RENT+0.09*SEEDP+0.227*FERTP+0.091*CHEMP)+0.686887*LOG(YD222)+0.173152*SD03+0.177881*DUM97+-0.138395*DUM01

@Demand

LOG(D222/POP) = -12.7143562254336+-0.332245*LOG(NCP222/CPI*100)+0.291464333333333*LOG(DINC/CPI*100)+-0.31518*DUM87+DUM93+-0.263191*DUM97+DUM98+-0.173579*DUM02+DUM05

@Ending Stock

EST222 = 0

@Import

M222 = -0.22688795998398+0.009746*NCP222+-0.01584*EXCH*MP222*(1.1+TE222/100)+1.20686*SD99+-2.611942*SD04+-1.192448*DUM00

@Export

X222=(YEAR>=2007)*1.568031

@Market Clearing Condition

SUP222=Q222+M222+EST222(-1)
TD222=D222+X222+EST222
SUP222=TD222

@Price Linkage

NFP222 = -17.5503216433782+0.6165132*NWP222+50.1265*SD98+-48.41858*SD05+-52.13731*DUM00+DUM05

NWP222 = 18.62742+0.560924*NCP222+-59.27543*SD01+-12.93626*DUM85

Carrot

@Acreage

LOG(ACR232) = 0.056032840091043+0.721774*LOG(ACR232(-1))+0.306386*LOG(NFP232(-1)*@MOVAV(YD232(-1),3)/COST232(-1))+-0.1617*DUM92+DUM96+DUM03+-0.13216*DUM02+-0.719054*DUM04+0.215394*DUM06

@Yield

YD232 = 2353.125+-42.71199*(TEMP_4+TEMP_5+TEMP_6+TEMP_7+TEMP_8+TEMP_9+TEMP_10)/7+-0.009445*(RAIN_4+RAIN_5+RAIN_6+RAIN_7+RAIN_8+RAIN_9+RAIN_10)/7+0.003288*(SUN_4+SUN_5+SUN_6+SUN_7+SUN_8+SUN_9+SUN_10)/7+218.9329*SD95+599.4517*SD00+58.48437*@TREND+698.5729*DUM96+DUM97

@Production

Q232=ACR232*YD232/100

@Cost

COST232 = -477382.5+8370.22*0.1*MACHP+0.2*MATRP+0.02*FUELP+0.24*WAGE+0.07*RENT+0.11*SEEDP+0.21*FERTP+0.05*CHEMP+48.4335*YD232+12061.51*SD93+50947.27*SD98+99420.72*DUM02

@Demand

LOG(D232/POP) = -12.61006+-0.130582*LOG(NCP232/CPI*100)+0.104381*LOG(DINC/CPI*100)+0.353345*DUM97+0.203647*DUM05+DUM06+-0.066144*SD0104

@Ending Stock

EST232 = 0

@Import

M232 = -6.5824+4.910052*(NCP232)/((EXCH*MP232*(1.1+TE232/100)))+-802.9335*SD02+9.863947*SD04+14.03779*DUM01+265.3663*LOG(@TREND)*SD02

@Export

X232 =(YEAR>=2007)*0.012503

@Market Clearing Condition

SUP232=Q232+M232+EST232(-1)
TD232=D232+X232+EST232
SUP232=TD232

@Price Linkage

NFP232 = -79.562496712151+0.922172*NWP232+-261.5701*SD04+177.3637*DUM00+DUM02+DUM03+DUM04+229.8926*SD07

NWP232 = -42.13763+0.591061*NCP232+-82.5961*DUM99+DUM00+351.625*DUM01+-261.8379*DUM04+DUM05+-96.20206*DUM93+DUM94+DUM95

Water Melon

@Acreage

LOG(ACR2401) = 0.629554065139279+0.821089*LOG(ACR2401(-1))+0.121689*LOG(NFP2401(-1)*@MOVAV(YD2401(-1),3)/COST2401(-1))+-0.08572275*LOG(FRUIT_VEGE1(-1))+-0.03317025*LOG(NFP41(-1)*@MOVAV(YD41(-1),3)/COST41(-1))*SD96+0.178154*DUM97+DUM99+DUM95+DUM05

@Yield

YD2401 = -916.9354983 + 0.823997646*YD2401(-1) + 94.27806833*(TEMP-MINTEMP) - 0.0001217164498*RAIN + 0.006032838222*SUN + 1.480795481*@TREND + 240.064119*SD97 - 286.9028962*(DUM96+DUM02)

@Production

Q2401=ACR2401*YD2401/100

@Cost

COST2401 = 328735.2+9696.07*0.087*MACHP+0.277*MATRP+0.03*FUELP+0.156*WAGE+0.058*RENT+0.164*SEEDP+0.183*FERTP+0.046*CHEMP+-157980.1*DUM98+63491.17*SD96

@Demand

LOG(D2401/POP) = -13.4213816083254+-0.661004*LOG(NCP2401/CPI*100)+0.30562*LOG(((NCP2402/CPI*100)*Q2402+(NCP2405/CPI*100)*Q2405+(NCP2406/CPI*100)*Q2406)/(Q2402+Q2405+Q2406))+0.197067*LOG(FRUIT_PRICE(-1))+0.004726*LOG((ORANGE_PRICE*M720+TROPIC_PRICE*M723)/(M720+M723))+0.383463666666667*LOG(DINC/CPI*100)+-0.0228861538461538*@TREND+-0.301127*SD02+0.17207*SD91+-0.069282*DUM87

@Ending Stock

EST2401 = 0

@Import

M2401 = 0

@Export

X2401=(YEAR>=2006)*0.046308

@Market Clearing Condition

SUP2401=Q2401+M2401+EST2401(-1)
TD2401=D2401+X2401+EST2401
SUP2401=TD2401

@Price Linkage

NFP2401/CPI*100 = 131.045657989196+0.7950254*NWP2401/CPI*100+-460.8693*SD97+-150.1744*SD00+-105.568*DUM03-DUM97+-240.4812*DUM89+DUM94

NWP2401/CPI*100 = 93.21249+0.781669*NCP2401/CPI*100+-1.913251*WAGE/CPI*100+28.2888*SD90+-7.837458*SD95

CHAM WEI

@Acreage

ACR2402 = 5.72446005516348+0.430964*ACR2402(-1)+0.743964*NWP2402(-1)*@MOVAV(YD2402(-1),3)/COST2402(-1)+-0.701148*NFP2401(-1)*@MOVAV(YD2401(-1),3)/COST2401(-1)+-0.401209*NFP11(-1)*@MOVAV(YD11(-1),3)/COST11(-1)+-0.06182*@TREND+1.143389*SD93+-1.589573*SD01+-0.827272*SD04+1.435127*DUM95+DUM91

@Yield

YD2402 = 242.7280459 + 301.3593701*(TEMP-MINTEMP) + 46.55677197*@TREND + 529.859576*SD89 + 305.1538771*SD95 + 195.9589708*SD00 - 0.0003081205368*COST2402

@Production

Q2402=ACR2402*YD2402/100

@Demand

LOG(D2402/POP) = -13.7913682243375+-0.684858*LOG(NCP2402/CPI*100)+0.530134*LOG(((NCP2401/CPI*100)*Q2401+(NCP2405/CPI*100)*Q2405)/(Q2401+Q2405))+0.01586*LOG(FRUIT_PRICE(-

1))*SD00+0.050355*LOG((ORANGE_PRICE*M720+TROPIC_PRICE*M723)/(M720+M723))+0.373329*LOG(DINC/CPI*100)+-0.148906*SD01+0.213107*SD94+0.163447*SD98+0.215427*DUM91+DUM95+-0.0408926666666667*@TREND

@Ending Stock

EST2402=0

@Import

M2402=0

@Exprot

X2402=0

@Market Clearing Condition

SUP2402=Q2402+M2402+EST2402(-1)
TD2402=D2402+X2402+EST2402
SUP2402=TD2402

@Price Linkage

NWP2402 = -121.826896283187+0.5826691*NCP2402+226.788*DUM99+DUM03+DUM04+DUM05+445.5734*SD07

Cucumber

@Acreage

ACR2403 = 1.51340961376066+0.735762*ACR2403(-1)+0.675807*NWP2403(-1)*@MOVAV(YD2403(-1),3)/COST2403(-1)+-0.5883806*(FRUIT_VEGE3(-1))*SD96+-0.306888*(NFP11(-1)*@MOVAV(YD11(-1),3)/COST11(-1))*SD03+0.515482*DUM02+DUM03+DUM05+DUM06+1.591175*DUM98

@Yield

YD2403 = 44.81504+233.4991*TEMP-MINTEMP+0.004135*RAIN+0.005174*SUN+91.07265*@TREND+959.3084*SD00+1220.656*SD96+563.2643*DUM93

@Production

Q2403=ACR2403*YD2403/100

@Cost

COST2403 = -1545092+37610.66*0.091*MACHP+0.225*MATRP+0.288*FUELP+0.095*WAGE+0.022*RENT+0.118*SEEDP+0.12*FERTP+0.041*CHEMP+164.418*YD2403+1030981*SD94+1028583*SD01

@Demand

LOG(D2403/POP) = -13.9695061994705+-0.245588*LOG(NCP2403/CPI*100)+0.467523*LOG(DINC/CPI*100)+-0.0334945454545455*@TREND+0.309373*SD98+0.188356*SD91+0.15604*DUM93

@Ending Stock

EST2403 = 0

@Import

M2403 = -21.86358+2.79089*(NCP2403)/((EXCH*MP2403_P*(1.1+TE2403_P/100)))+-5.899596*SD05+1.430549*@TREND

@Export

X2403=(YEAR>=2007)* 0.304474

@Market Clearing Condition

SUP2403=Q2403+M2403+EST2403(-1)
TD2403=D2403+X2403+EST2403
SUP2403=TD2403

@Price Linkage

NWP2403/CPI*100 = -13.75013743581+0.5018208*NCP2403/CPI*100+166.7065*DUM98+DUM00+DUM01+-178.5528*DUM97+DUM04+DUM05+-164.5362*SD94+175.2021*SD07

Pumpkin

@Acreage

ACR2404 = 0.765290018485612+0.734187*ACR2404(-1)+1.961586*NWP2404(-1)*@MOVAV(YD2404(-1),3)/COST2404(-1)+-1.23136589147287*FRUIT_VEGE4(-1)+-0.696413178294574*(NFP11(-1)*@MOVAV(YD11(-1),3)/COST11(-1))*SD96+-1.134604*DUM94+DUM95+DUM03+1.865075*SD91

@Yield

YD2404 = 3544.585+-673.3841*TEMP+663.8913*MINTEMP+-0.005887*RAIN+0.008036*SUN+90.9899*@TREND+-240.2118*DUM94+DUM96

@Production

Q2404=ACR2404*YD2404/100

@Cost

COST2404 = -1077663+16200.31*0.083*MACHP+0.34*MATRP+0.229*FUELP+0.09*WAGE+0.039*RENT+0.054*SEEDP+0.134*FERTP+0.031*CHEMP+285.0115*YD2404+338748.4*SD94+333241*SD01+254406.9*DUM97+DUM03+30197.03*@TREND

@Demand

LOG(D2404/POP) = -12.7157645565129+-0.608973*LOG(NCP2404/CPI*100)+0.530291333333333*LOG(DINC/CPI*100)+0.172923*SD01+0.300844*SD91+0.144284*SD98+0*DUM90

@Ending Stock

EST2404 = 0

@Import

M2404 = -15.9034+0.000634*NCP2404+-0.002146*EXCH*MP2404*(1.1+TE2404/100)+-2.343572*SD99+7.338922*SD04+-4.438726*DUM04+DUM05+0.955238*@TREND

@Export

X2404=(YEAR>=2007)*0.220098

@Market Clearing Condition

SUP2404=Q2404+M2404+EST2404(-1)
TD2404=D2404+X2404+EST2404
SUP2404=TD2404

@Price Linkage

NWP2404 = 218.0833+0.383842*NCP2404+134.6421*SD93+101.9694*SD96+-50.24097*SD04+-191.9111*DUM99+DUM01+DUM04-DUM07

Tomato

@Acreage

ACR2405 = 2.32447935204372+0.30793*ACR2405(-1)+0.444908048780488*NWP2405(-1)*@MOVAV(YD2405(-1),3)/COST2405(-1)+-0.179041333333333*FRUIT_VEGE5(-1)+-0.239068666666667*NFP11(-1)*@MOVAV(YD11(-1),3)/COST11(-1)+1.121756*SD95+-0.718422*SD01+1.188028*SD04

@Yield

YD2405 = -1097.306+0.465536*YD2405(-1)+251.188*TEMP-MINTEMP+0.003828*RAIN+0.006641*SUN+61.40558*@TREND+492.2271*SD97+1058.245*DUM96

@Production

Q2405=ACR2405*YD2405/100

@Cost

COST2405 = -2164970+12395.67*0.094*MACHP+0.305*MATRP+0.194*FUELP+0.118*WAGE+0.018*RENT+0.144*SEEDP+0.103*FERTP+0.024*CHEMP+545.2945*YD2405+252032.2*DUM95+DUM87+712387.2*SD89+665463.5*SD01

@Ending Stock

EST2405 = 0

@Import

M2405 =
21.50246+1.744158*(NCP2405)/((EXCH*MP2405_P*(1.1+TE2405_P/100)))+6.853127*SD95+8.69008*SD99+7.89174*SD04+16.12343*DUM97+0.620898*@TREND

@Export

X2405_F = 17.63798+0.002648*EXCH*SD03+-0.005866*NWP2405/CPI*100+-0.078939*FUELP/CPI*100+9.85623*SD00+-5.937061*SD02+5.410982*DUM98+DUM99

X2405_P=12.14572+0.002613*EXCH*SD01+-0.00415*NWP2405/CPI*100+-0.031465*FUELP/CPI*100+7.729559*SD95+-5.347744*SD98+4.332895*DUM96

@Market Clearing Condition

SUP2405=Q2405+M2405+EST2405(-1)
TD2405=D2405+X2405+EST2405
SUP2405=TD2405

@Price Linkage

NWP2405 = 39.42063+0.603325*NCP2405+67.1672*DUM92+DUM90-DUM88+-66.09127*SD01

Strawberry

@Acreage

ACR2406 = 4.40710090486076+0.599336*ACR2406(-1)+0.531042*(NWP2406(-1)*@MOVAV(YD2406(-1),3)/COST2406(-1))*SD93+-0.4839516*FRUIT_VEGE6(-1)+-0.12965625*@TREND+1.767714*SD00+-0.45003*DUM97-DUM98+DUM00+-0.406432*DUM03+DUM04+DUM05+DUM06

@Yield

YD2406 = 213.9085389 + 0.7592267677*YD2406(-1) + 66.44901565*(TEMP-MINTEMP) - 0.001789335672*RAIN - 0.001437382742*SUN + 31.11267296*@TREND - 78.47209674*SD97

@Production

Q2406=ACR2406*YD2406/100

@Cost

COST2406 = -2915897+34678.15*0.045*MACHP+0.321*MATRP+0.057*FUELP+0.205*WAGE+0.027*RENT+0.232*SEEDP+0.091*FERTP+0.024*CHEMP+1152.989*YD2406

@Demand

LOG(D2406/POP) = -14.01381+-0.222351*LOG(NCP2406/CPI*100)+0.16579*LOG(((NCP2401/CPI*100)*Q2401+(NCP2402/CPI*100)*Q2402+(NCP2405/CPI*100)*Q2405)/(Q2401+Q2402+Q2405))+0.021954*LOG(FRUIT_PRICE(-1)*2/3+FRUIT_PRICE*1/3)*SD01+0.01843*LOG((ORANGE_PRICE*M720+TROPIC_PRICE*M723)/(M720+M723))+0.190947*LOG(DINC/CPI*100)+0.151571*SD95

@Ending Stock

EST2406 = 0

@Import

M2406 = -2.133108+1.042836*(NCP2406)/((EXCH*MP2406*(1.1+TE2406/100)))+0.07208*@TREND+1.519488*DUM97-DUM03+0.914646*SD04+1.611876*SD06

@Export

X2406=(YEAR>=2007)*0.0184478039215686

@Market Clearing Condition

SUP2406=Q2406+M2406+EST2406(-1)
TD2406=D2406+X2406+EST2406
SUP2406=TD2406

@Price Linkage

NWP2406 = -141.5512+0.691847*NCP2406+290.6797*SD03+568.3284*SD06+424.8535*DUM99

Melon

@Acreage

ACR2408 = 0.046388+0.815736*ACR2408(-1)+0.0000241*(NWP2408(-1))+0.164856*SD00+0.10962*SD03+0.131237*DUM95-DUM96+DUM97-DUM05+*0

@Yield

YD2408 = -1281.397 + 195.0218403*(TEMP-MINTEMP) + 0.007074530044*RAIN + 0.01207533499*SUN + 30.65464*@TREND + 484.1264146*(DUM96+DUM93) - 344.2130339*SD02

@Production

Q2408=ACR2408*YD2408/100

@Cost (Data Is Not Available)

@Demand

LOG(D2408/POP) = -17.4295954245245+-0.544976*LOG(NWP2408/CPI*100)+0.014538*LOG(((NCP2401/CPI*100)*Q2401+(NCP2402/CPI*100)*Q2402+(NCP2405/CPI*100)*Q2405+(NCP2406/CPI*100)*Q2406)/(Q2401+Q2402+Q2405+Q2406))*SD91+0.019711*LOG(FRUIT_PRICE(1))*SD01+0.011569*LOG((EXCH*MP720*(1.1+TE720/100))/CPI*100)+0.67569775*LOG(DINC/CPI*100)+0.167318*SD03+0.089612*DUM95

@Ending Stock

EST2408 = 0

@Import

M2408=(YEAR>=2006)*0.162037

@Export

X2408 = -1.951496+0.141866*@TREND+-0.000461*NWP2408+0.000253*EXCH+0.484932*SD04

@Market Clearing Condition

SUP2408=Q2408+M2408+EST2408(-1)
TD2408=D2408+X2408+EST2408
SUP2408=TD2408

Eggplant

@Acreage

ACR2409 = 0.709574605667407+0.297616*ACR2409(-1)+0.00023*0.5*NWP2409(-1)+0.5*NWP2409+-0.010795*@TREND+-0.166997*DUM92+DUM95+DUM96+DUM01-DUM99

@Yield

YD2409 = 3257.927533 - 773.0169784*(TEMP-MINTEMP) - 0.002215865169*RAIN + 0.01524624815*SUN + 72.55087624*@TREND - 653.988561*SD86 + 720.0357387*SD04 - 343.8044798*(DUM96-DUM00+DUM94) + 307.9189056*SD99

@Production

Q2409=ACR2409*YD2409/100

@COST (DATA IS NOT AVAILABLE)

@Demand

LOG(D2409/POP) = -16.4903904565435+-0.359115*LOG(NCP2409/CPI*100)+0.54258525*LOG(DINC/CPI*100)+-0.190533*DUM01

@Ending Stock

EST2409 = 0

@Import

M2408=(YEAR>=2006)*0

@Export

X2409 = -1.331943+-0.000268*NWP2409+0.002068*EXCH+0.801823*SD99+-0.620644*SD03+0.477408*DUM00

@Market Clearing Condition

SUP2409=Q2409+M2409+EST2409(-1)
TD2409=D2409+X2409+EST2409
SUP2409=TD2409

@Price Linkage

NWP2409 = 403.8196+0.287079*NCP2409+-148.5887*SD98+-160.0086*DUM94+DUM97+DUM98+DUM02+DUM04+DUM05

Fresh Red Pepper

@Acreage

ACR2407 = -1.91658644251669+0.531617*ACR2407(-1)+0.427048*NWP2407(-1)*@MOVAV(YD2407(-1),3)/COST2407(-1)+-0.021661*NFP11(-1)*@MOVAV(YD11(-1),3)/COST11(-1)+1.1324285*LOG(@TREND)+0.311413*SD91+-0.971609*DUM02+DUM05+DUM06+0.706139*DUM94

@Yield

YD2407 = -676.8466096 + 121.9021931*TEMP - 0.001175027588*RAIN + 0.003618269323*SUN + 84.64336133*@TREND + 1541.965755*DUM99 + 781.5004235*SD00 - 16.31534526*TYPHOON

@Production

Q2407=ACR2407*YD2407/100

@Cost

COST2407 = -3500213+41624.03*0.067*MACHP+0.318*MATRP+0.332*FUELP+0.127*WAGE+0.009*RENT+0.043*SEEDP+0.076*FERTP+0.028*CHEMP+753.3614*YD2407+536428*SD89+2509363*SD95+618078.7*DUM93+DUM94

LOG(D2407/POP) = -13.2844424500653+-0.526909*LOG(NCP2407/CPI*100)+0.501777222222222*LOG(DINC/CPI*100)+0.25418*SD94+0.421665*SD99

@Ending Stock

EST2407 = 0

@Import

M2407 = 0

@Export

X2407 = 0

@Market Clearing Condition

SUP2407=Q2407+M2407+EST2407(-1)
TD2407=D2407+X2407+EST2407

SUP2407=TD2407

@Price Linkage

NWP2407/CPI*100 = -79.89107+0.681205*NCP2407/CPI*100+-828.807*SD02+82.1677*SD91+642.7371*SD06+205.5571*DUM88-DUM00

Sesame

@Acreage

ACR31 = 25.97951+0.449369*ACR31(-1)+0.687621*NFP31(-1)*@MOVAV(YD31(-1),3)/COST31(-1)+-8.076452*DUM92+DUM94+DUM96-DUM05+-5.306462*SD00+-9.072552*SD03

@Yield

YD31 = -113.7799835 + 9.952318098*(TEMP_4+TEMP_5+TEMP_6+TEMP_7+TEMP_8)/5 - 0.0005309303324*(RAIN_4+RAIN_5+RAIN_6+RAIN_7+RAIN_8) + 1.052104427e-005*(SUN_4+SUN_5+SUN_6+SUN_7+SUN_8) + 0.6772212214*@TREND + 6.705828245*DUM90 - 11.9235392*(DUM94+DUM99)

@Production

Q31=ACR31*YD31/100

@Cost

COST31 = -58038.91+1553.524*0.094*MACHP+0.136*MATRP+0.016*FUELP+0.227*WAGE+0.236*RENT+0.09*SEEDP+0.085*FERTP+0.116*CHEMP+-7622.589*DUM04+14555.77*SD06+407.0872*YD31

@Demand

LOG(D31/POP) = -11.6492+-0.497591*LOG(NCP31/CPI*100)+0.120179*LOG(DINC/CPI*100)+0.268201*LOG(NWP32/CPI*100)+-0.129352*DUM98-DUM00+-0.191048*SD06

@Ending Stock

EST31 = 0

@Import

M31 = 62.93062+-0.002216*EXCH*MP31*(1.1+TE31/100)+0.001391*NCP31+-38.62497*DUM90+DUM91+DUM92

@Export

X31=(YEAR>=2006)*0.000104

@Market Clearing Condition

SUP31=Q31+M31+EST31(-1)
TD31=D31+X31+EST31

SUP31=TD31

@Price Linkage

NFP31 = 2991.245+0.495696*NWP31+-297.3397*DUM98+659.2602*SD04

NWP31 = 7029.756+0.292557*NCP31+-529.8554*SD01+4095.502*SD03+-2904.349*SD05+-2245.129*DUM06

Perilla Seed

@Acreage

ACR32 = 11.399591977185+0.553192*ACR32(-1)+3.357358*NFP32(-1)*@MOVAV(YD32(-1),3)/COST32(-1)+6.623231*DUM92+DUM01+DUM03+-6.047544*DUM94+DUM96+DUM97+-9.750419*SD99

@Yield

YD32 = 50.66619103 + 0.9395110167*(TEMP_4+TEMP_5+TEMP_6+TEMP_7+TEMP_8)/5 - 3.571919737e-005*(RAIN_4+RAIN_5+RAIN_6+RAIN_7+RAIN_8) + 1.871183823e-005*(SUN_4+SUN_5+SUN_6+SUN_7+SUN_8) + 0.4445629616*@TREND - 3.191378276*SD93 + 4.447480545*SD96 - 5.220812909*SD03 - 4.16699316*DUM01

@Production

Q32=ACR32*YD32/100

@Cost

COST32 = -32549.96+1348.078*0.094*machp+0.136*matrp+0.016*fuelp+0.227*wage+0.236*rent+0.09*seedp+0.085*fertp+0.116*chemp+26798.03*DUM87+20786.14*SD99+-29786.38*DUM98

@Demand

LOG(D32/POP) = -15.2361586887804+-0.5426395*LOG(NWP32/CPI*100)+0.109275*LOG(DINC/CPI*100)+0.482186*LOG(NCP31/CPI*100)+-0.292433*DUM99+DUM00+0.141227*DUM95+DUM96+DUM02+DUM03

@Ending Stock

EST32 = 0

@Import

M32 = 0.764135+-0.005241*EXCH*MP32*(1.1+TE32/100)+0.00254*NWP32+0.714271*@TREND+-4.171898*SD97+-7.038591*SD00+14.16911*SD02+-2.1038*DUM03+-10.4592*DUM05

@Export

X31=(YEAR>=2006)*0.00109

@Market Clearing Condition

SUP32=Q32+M32+EST32(-1)
TD32=D32+X32+EST32

SUP32=TD32

@Price Linkage

NFP32 = -959.02006265844+1.12935*NWP32+241.6276*SD91+-193.6115*DUM91+DUM02+DUM90

Peanuts

@Acreage

ACR33 = -1.385158+0.315836*ACR33(-1)+3.147722*NFP33(-1)*@MOVAV(YD33(-1),3)/COST33(-1)+-2.01181*DUM96+DUM97+1.491129*DUM01+DUM02+-0.661236*SD05

@Yeild

YD33 = 211.7694044 - 19.35897788*TEMP_5 + 8.116468351*(TEMP_6+TEMP_7) - 8.303482529*TEMP_8 - 0.0004147633221*(RAIN_5+RAIN_7+RAIN_8) + 0.0005922682944*(SUN_5+SUN_7+SUN_8) + 9.028919391*@TREND - 41.60231962*SD99 - 53.60346829*DUM05

@Production

Q33=ACR33*YD33/100

@Cost

COST33 = -71796.58+3211.211*0.094*MACHP+0.136*MATRP+0.016*FUELP+0.227*WAGE+0.236*RENT+0.09*SEEDP+0.085*FERTP+0.116*CHEMP+58252.51*SD01+27809.11*DUM95+33069.23*SD92

@Demand

LOG(D33/POP) = -12.5419168713572+-0.37249*LOG(NCP33/CPI*100)+0.17864975*LOG(DINC/CPI*100)+0.168441*SD01+-0.225676*SD05+0.284023*DUM93-DUM97+DUM98+DUM99+-0.110382*DUM02+DUM03

@Ending Stock

EST33 = 0

@Import

M33 = 2.45346451511252+-0.002074*EXCH*MP33*(1.1+TE33/100)+0.002393*NCP33+7.939123*SD98+7.274051*DUM96+DUM01+2.986307*DUM03-DUM05+0.662482*@TREND

@Export

X33=0

@Market Clearing Condition

SUP33=Q33+M33+EST33(-1)
TD33=D33+X33+EST33

SUP33=TD33

@Price Linkage

NFP33 = 16.54804426899+0.762832*NWP33+-242.0182*DUM98+-211.5136*SD96+-629.863*SD99+168.0702*SD03+-346.71*SD06

NWP33 = -549.344+0.88501*NCP33+-791.0135*SD98+472.7354*SD00+-702.8433*DUM03+DUM05

Apples

@Acreage

ACR701 = 1*(ADULT701+YOUNG701)

LOG(ADULT701) = 1.799431+0.280435*LOG(ADULT701(-1))+0.207587*LOG(@MOVAV(YOUNG701(-3),2))+-0.146957*SD98+-0.054742*DUM04+DUM05-DUM95

LOG(YOUNG701) = 0.745866886631526+0.710374*LOG(YOUNG701(-1))+0.493427*LOG(@MOVAV(NFP701(-1)*YD701(-1)/COST701(-1),4))+-0.162207305*LOG(@MOVAV(NFP702(-1)*YD702(-1)/COST702(-1),4))+-0.304465615*LOG(@MOVAV(NFP703(-1)*YD703(-1)/COST703(-1),4))+-0.02304542*LOG(@MOVAV(NFP704(-1)*YD704(-1)/COST704(-1),4))+-0.083627*DUM96+DUM01

@Yield

YD701 = 5750.995205 + 97.58349261*TEMP_3 - 95.71548924*MINTEMP_3 - 273.8305674*(TEMP_4+TEMP_5+TEMP_6+TEMP_7+TEMP_8)/5 + 0.002258723279*(RAIN_6+RAIN_7+RAIN_8) + 0.04220957201*(SUN_6+SUN_7+SUN_8) - 71.38654211*TYPHOON + 268.4866732*SD8990 + 442.4479616*DUM00 - 418.1554563*DUM01 - 5.11442661*@TREND*(@YEAR>=1987)

@Production

Q701=ADULT701*YD701/100

@Cost

COST701 = -586007.2052 + 14432.7315*(0.15*MACHP+0.29*MATRP+0.04*FUELP+0.21*WAGE+0.01*RENT+0*SEEDP+0.13*FERTP+0.17*CHEMP) + 70.07799102*YD701 + 226168.6707*SD93 + 60598.77682*DUM92 - 97628.94638*DUM98

@Demand

LOG(D701/POP) = -7.55639362726772+-0.688509*LOG(NCP701/CPI*100)+0.2889855*LOG(((NCP702/CPI*100)*Q702+(NCP703/CPI*100)*Q703+(NCP704/CPI*100)*Q704+(NCP705/CPI*100)*Q705+(NCP7061/CPI*100)*Q7061)/(Q702+Q703+Q704+Q705+Q7061))+0.016152*LOG(FRUIT_VEGE_PRICE(1))*SD89+0.005946*LOG((ORANGE_PRICE(1)*M720(1)+TROPIC_PRICE(1)*M723(1))/(M720(1)+M723(1)))+0.102516*LOG(DINC/CPI*100)*SD04+-0.04141*@TREND+-0.307594*SD98+0.143284*DUM99+DUM00-DUM03-DUM91-DUM96

@Ending Stock

EST701 = 0

@Import

M701 = -26.12582+-0.013817*EXCH*MP701*(1.1+TE701/100)+0.006036*NCP701+52.7407*SD05+-11.05792*SD99+-22.99593*DUM05+2.535079*@TREND

@Export

X701=(YEAR>=2006)*3.82887311111111

@Market Clearing Condition

SUP701=Q701+M701+EST701(-1)
TD701=D701+X701+EST701

SUP701=TD701

@Price Linkage

NFP701 = 345.0775+0.49888*NWP701+191.6823*DUM99+DUM03+-518.8488*DUM04+-185.25*SD89+-195.3052*SD96+-633.02*SD03

NWP701 = 109.0713+0.698086*NCP701+241.1148*DUM90+DUM91+-628.2551*DUM99+DUM00+811.3611*DUM03

Asian Pears

@Acreage

ACR702 = 1*(ADULT702+YOUNG702)

LOG(ADULT702) = 0.070736+0.960612*LOG(ADULT702(-1))+0.032524*LOG(@MOVAV(YOUNG702(-3),2))+0.069913*SD96+-0.095477*SD03

LOG(YOUNG702) = 0.86894593439761+0.3988265*LOG(YOUNG702(-1))+0.381256*LOG(@MOVAV(NFP702(-1)*YD702(-1)/COST702(-1),4))+-0.24414*LOG(@MOVAV(NFP701(-1)*YD701(-1)/COST701(-1),4))+-0.128685*LOG(@MOVAV(NFP703(-1)*YD703(-1)/COST703(-1),4))+-0.26296*SD99+0.317856*SD94+0.207236*SD03

@Yield

YD702 = 3149.326743 - 502.5039352*MINTEMP_3 + 415.0266859*TEMP_3 - 60.23830668*(TEMP_4+TEMP_5+TEMP_6+TEMP_7+TEMP_8)/5 - 0.001551508754*(RAIN_6+RAIN_7+RAIN_8) + 0.01042363555*(SUN_6+SUN_7+SUN_8) - 35.70309191*TYPHOON - 12.32336224*WIND - 40.99528684*@TREND*SD97 + 735.7596426*SD97 - 439.004522*(DUM93+DUM94)

@Produciton

Q702=ADULT702*YD702/100

@Cost

LOG(COST702) = 11.21356176 + 0.6223805218*LOG(0.14*MACHP+0.35*MATRP+0.04*FUELP+0.22*WAGE+0.02*RENT+0*SEEDP+0.14*FERTP+0.09*CHEMP) + 0.06762491646*DUM99 + 0.04822662711*DUM02 + 0.08504521641*SD96

@Demand

LOG(D702/POP) = -12.466304856668+-0.654347272727273*LOG(NCP702/CPI*100)+0.505219090909091*LOG(((NCP701/CPI*100)*Q701+(NCP703/CPI*100)*Q703+(NCP704/CPI*100)*Q704+(NCP705/CPI*100)*Q705+(NCP7061/CPI*100)*Q7061)/(Q701+Q703+Q704+Q705+Q7061))+0.03751525*LOG(FRUIT_VEGE_PRICE(1))+0.020536*LOG((ORANGE_PRICE(1)*M720(1)+TROPIC_PRICE(1)*M723(1))/(M720(1)+M723(1)))+0.103204666666667*LOG(DINC/CPI*100)+-0.013785*@TREND*SD02+0.168832*SD00+0.341703*SD96

@Ending Stock

EST702 = 0

@Import

M702 = 21.14244+-0.02048*EXCH*MP702*(1.1+TE702/100)+0.001192*NCP702+5.177129*SD98+17.32311*SD00+-5.95263*SD05+-9.45203*DUM00

@Export

X702=-8.23192905000578+-5.411773*XP702+0.003538*EXCH+1.3316095*@TREND+-5.318987*SD97+6.314589*SD01+5.21226*SD04+*SUM+*ADJUSTMENT+*ESTIMATE+*ACTUAL

XP702=1.166262+0.000291*NWP702+0.407935*SD04+0.533118*SD06+-0.28603*DUM00+DUM01

@Market Clearing Condition

SUP702=Q702+M702+EST702(-1)
TD702=D702+X702+EST702

SUP702=TD702

@Price Linkage

NFP702 = -148.185893339782+0.5585058*NWP702+-324.3543*DUM00+DUM01-DUM97+-740.08*SD02+425.5036*SD94

NWP702 = -62.94734+0.769288*NCP702+-362.1248*SD04+-313.8634*DUM00+DUM01+943.7819*DUM90+DUM91+-487.7896*DUM99+DUM02+DUM05

Grapes

@Acreage

ACR703 = 1*(ADULT703+YOUNG703)

LOG(ADULT703) = 1.36834168479337+0.417014*LOG(ADULT703(-1))+0.186459*LOG(@MOVAV(YOUNG703(-2),2))+0.080153*DUM95+-0.006*@TREND*SD98+0.104634*SD97

LOG(YOUNG703) = 0.237601031534775+0.851754*LOG(YOUNG703(-1))+0.363787*LOG(@MOVAV(NFP703(-1)*YD703(-1)/COST703(-1),3))+-0.2043072*LOG(@MOVAV(NFP701(-1)*YD701(-1)/COST701(-1),3))+-0.1537752*LOG(@MOVAV(NFP702(-1)*YD702(-1)/COST702(-1),3))+0.384706*SD9196+-0.513429*SD96+0.253929*DUM98+DUM99+DUM00+-0.483061*DUM06

@Yield

YD703 = 6734.896854 - 267.77185*(TEMP_4+TEMP_5+TEMP_6+TEMP_7+TEMP_8)/5 - 0.006646192738*(RAIN_4+RAIN_5+RAIN_6+RAIN_7+RAIN_8) + 0.001390678931*(SUN_4+SUN_5+SUN_6+SUN_7+SUN_8) - 11.23889774*TYPHOON + 8.038301144*@TREND + 848.960611*SD94 - 205.93521*(DUM03+DUM92)

@Production

Q703=ADULT703*YD703/100

@Cost

COST703 = -395020.7+9636.129*0.103*MACHP+0.466*MATRP+0.029*FUELP+0.166*WAGE+0.02

6*RENT+0*SEEDP+0.148*FERTP+0.062*CHEMP+133.6543*YD703+115072.5*SD93 +82543.19*SD01+-82753.33*SD04

@Demand

LOG(D703/POP) = -12.880567174425+-0.492844*LOG(NCP703/CPI*100)+0.214585*LOG(((NCP702/CPI*100)*Q702+(NCP701/CPI*100)*Q701+(NCP704/CPI*100)*Q704+(NCP705/CPI*100)*Q705+(NCP7061/CPI*100)*Q7061)/(Q702+Q701+Q704+Q705+Q7061))+0.031721*LOG((ORANGE_PRICE*M720+TROPIC_PRICE*M723)/(M720+M723))+0.03314*LOG(FRUIT_VEGE_PRICE)*SD99+0.338152941176471*LOG(DINC/CPI*100)+-0.0314853333333333*@TREND+0.63057*SD95+0.178914*DUM94+DUM97+DUM99+DUM05

@Ending Stock

EST703 = 0

@Import

M703 = -6.3572488440345+-0.00233*EXCH*MP703*(1.1+TE703/100)+0.001604*NCP703+0.551201*@TREND+-4.825526*DUM06+17.05367*SD06

@Export

X703=0.205192+-0.390228*XP703+0.002428*EXCH+-1.448559*SD99+0.986709*SD05

XP703=-0.453552+0.000573*NWP703+0.879922*SD05+2.15861*SD00

@Market Clearing Condition

SUP703=Q703+M703+EST703(-1)
TD703=D703+X703+EST703

SUP703=TD703

@Price Linkage

NFP703 = -18.131164799228+0.565104*NWP703+-403.2065*DUM90+DUM91+DUM92+DUM93+451.8656*DUM00-DUM01-DUM05

NWP703 = -238.7329+0.815355*NCP703+-798.9711*DUM95+DUM05+318.2328*DUM98+-433.9025*SD99

Peaches

@Acreage

ACR704 = 1*(ADULT704+YOUNG704)

LOG(ADULT704) = 0.296418+0.802879*LOG(ADULT704(-1))+0.113535*LOG(@MOVAV(YOUNG704(-3),1))+-0.055356*GOVCLOSE704+-0.037937*DUM96+DUM99

LOG(YOUNG704) = 0.789583986465115+0.392322*LOG(YOUNG704(-1))+0.320057*LOG(@MOVAV(NFP704(-1)*YD704(-1)/COST704(-1),3))+-0.315480588235294*LOG(@MOVAV(NFP701(-1)*YD701(-1)/COST701(-1),3))+-0.0561258*GOVCLOSE704(-1)+-0.264883*DUM92+-0.08529*DUM96

@Yield

YD704 = 4841.850373 - 91.14938264*MINTEMP_3 + 78.83231513*TEMP_3 - 172.9938662*(TEMP_4+TEMP_5+TEMP_6+TEMP_7+TEMP_8)/5 - 0.005337797487*(RAIN_4+RAIN_5+RAIN_6+RAIN_7+RAIN_8) - 0.003103598295*(SUN_4+SUN_5+SUN_6+SUN_7+SUN_8) - 17.19189952*TYPHOON + 440.7723924*SD94 + 523.8547635*SD97

@Production

Q704=ADULT704*YD704/100

@Cost

COST704 = 77144.16131 + 7413.28164*(0.14*MACHP+0.3*MATRP+0.03*FUELP+0.21*WAGE+0.02*RENT+0*SEEDP+0.17*FERTP+0.12*CHEMP) + 80240.28044*SD97 + 106515.6449*(DUM01+DUM02-DUM98)

@Demand

LOG(D704/POP) = -11.5607435692584+-0.490472*LOG(NCP704/CPI*100)+0.016582*LOG(((NCP702/CPI*100)*Q702+(NCP701/CPI*100)*Q701+(NCP703/CPI*100)*Q703+(NCP705/CPI*100)*Q705+(NCP7061/CPI*100)*Q7061)/(Q702+Q701+Q703+Q705+Q7061))+0.049102*LOG(FRUIT_VEGE_PRICE)*SD97+0.294419*LOG(DINC/CPI*100)+-0.200709*DUM94-DUM05+0.068383*DUM03+DUM04+DUM96+0.078391*SD01

@Ending Stock

EST704 = 0

@Import

M704 = 28.7128655496599+0.001563*NCP704+-0.007323*EXCH*MP704*(1.1+TE704/100)+9.819289*DUM00+DUM01+DUM02

@Export

X704=0.883103+-0.889336*XP704+0.000338*EXCH+-0.462601*SD01+0.667251*SD05

XP704=0.583633+0.0000762*NWP704+-0.3036*DUM01+DUM03+DUM06+0.205443*DUM00+DUM04+DUM05

@Market Clearing Condition

SUP704=Q704+M704+EST704(-1)
TD704=D704+X704+EST704

SUP704=TD704

@Price Linkage

NFP704 = 351.1183+0.210888*NWP704+73.08323*SD04+-156.374*DUM03+DUM04+DUM07+-316.0782*DUM01+DUM05

NWP704/CPI*100 = 1180.85+0.357715*NCP704/CPI*100+1646.486*SD98+-1467.248*SD02+-458.9063*SD05+1024.234*DUM98+DUM99+DUM93

Tangerine

@Acreage

ACR705 = 1*(ADULT705+YOUNG705)

LOG(ADULT705) = 0.41402+0.848802*LOG(ADULT705(-1))+0.028412*LOG(@MOVAV(YOUNG705(-3),2))+-0.044053*GOVCLOSE705+0.055497*SD94+0.044275*DUM96-DUM05

LOG(YOUNG705) = -0.653167+0.952029*LOG(YOUNG705(-1))+0.329863*LOG(@MOVAV(NFP705(-1)*YD705(-1)/COST705(-1),4))+-0.119183*DUM98+0.239439*DUM01+0.255541*DUM03

@Yield

YD705 = -8270.311188 + 343.3758983*(TEMP_5+TEMP_6+TEMP_7+TEMP_8+TEMP_9)/5 + 0.01163838512*(RAIN_5+RAIN_6+RAIN_7+RAIN_8+RAIN_9) + 0.02036024302*(SUN_5+SUN_6+SUN_7+SUN_8+SUN_9) + 91.27338648*@TREND - 776.5416677*SD98 + 731.2798517*DUM95

@Produciton

Q705=ADULT705*YD705/100

@Cost

LOG(COST705) = 9.253126+0.912262*LOG(0.046*MACHP+0.193*MATRP+0.019*FUELP+0.303*WAGE+0.024*RENT+0*SEEDP+0.15*FERTP+0.264*CHEMP)+0.173661*DUM01+-0.126812*SD03

@Demand

LOG(D705/POP) = -11.7978442817908+-0.507958*LOG(NCP705/CPI*100)+0.2849*LOG(((NCP702/CPI*100)*Q702+(NCP703/CPI*100)*Q703+(NCP704/CPI*100)*Q704+(NCP701/CPI*100)*Q701+(NCP7061/CPI*100)*Q7061)/(Q702+Q703+Q704+Q701+Q7061))+0.036904*LOG((ORANGE_PRICE(1)*M720(1)+TROPIC_PRICE(1)*M723(1))/(M720(1)+M723(1)))*SD92+0.251678*LOG(DINC/CPI*100)+0.029169*LOG(FRUIT_VEGE_PRICE(1))*SD89+-0.019307*@TREND+-0.228714*SD93+0.08335*DUM01

@Ending Stock

EST705 = 0

@Import

M705=2.73811696344069+-0.000472*EXCH*MP705*(1.1+TE705/100)+0.00106*NCP705*SD04+0.145084*@TREND+-1.282573*DUM06+-0.376784*SD06

@Export

X705 = -7.158131+-1.616441*XP705+0.008273*EXCH+0.363509*@TREND+-2.438921*DUM00+DUM01+-2.188571*DUM05+DUM06

XP705 = -0.182326+0.001832*NFP705+1.092121*SD01+0.992474*SD06+0.713302*DUM00+DUM01

@Market Clearing Condition

SUP705=Q705+M705+EST705(-1)
TD705=D705+X705+EST705

SUP705=TD705

@Price Linkage

NFP705/CPI*100 = -125.271104213465+0.701615*NWP705/CPI*100+366.4221*DUM04+DUM98+DUM99+218.2084*SD94+-408.4816*SD01

NWP705/CPI*100 = 832.64+0.388919*NCP705/CPI*100+-3.162641*WAGE/CPI*100+-535.7865*SD99+566.0485*DUM03+276.235*SD05

Sweat Persimmon

@Acreage

ACR7061 = 1*(ADULT7061+YOUNG7061)

LOG(ADULT7061) = 0.974278+0.563722*LOG(ADULT7061(-1))+0.112988*SD96*LOG(@MOVAV(YOUNG7061(-3),2))+-0.075895*DUM97+DUM05+0.065711*SD05

LOG(YOUNG7061) = -0.203713+0.820366*LOG(YOUNG7061(-1))+0.34696*LOG(@MOVAV(NFP7061(-1)*YD7061(-1)/COST7061(-1),4))+-0.100169*DUM96+-0.10031*DUM03

@Yield

YD7061 = -58.96074869 + 110.1280385*(TEMP_4+TEMP_5+TEMP_6+TEMP_7+TEMP_8)/5 - 0.006774306258*(RAIN_4+RAIN_5+RAIN_6+RAIN_7+RAIN_8) + 0.0006379124414*(SUN_4+SUN_5+SUN_6+SUN_7+SUN_8) - 43.38723456*TYPHOON - 389.9799239*(DUM90+DUM01) + 248.8807046*DUM95 - 180.652755*SD00

@Production

Q7061=ADULT7061*YD7061/100

@Cost

COST7061 = -
40420.1+5154.712*0.115*MACHP+0.276*MATRP+0.037*FUELP+0.254*WAGE+0.009
*RENT+0*SEEDP+0.199*FERTP+0.11*CHEMP+-
21.91311*YD7061+91653.47*SD05+155245.2*SD93+74794.59*DUM96+DUM92

@Demand

LOG(D7061/POP) = -14.0677395036408+-
0.470818*LOG(NCP7061/CPI*100)+0.273273*LOG(((NCP702/CPI*100)*Q702+(NCP7
03/CPI*100)*Q703+(NCP704/CPI*100)*Q704+(NCP701/CPI*100)*Q701+(NCP705/CPI
*100)*Q705)/(Q702+Q703+Q704+Q701+Q705))+0.027008*LOG((ORANGE_PRICE(1)
*M720(1)+TROPIC_PRICE(1)*M723(1))/(M720(1)+M723(1)))+0.024499*LOG(FRUIT_V
EGE_PRICE(1))*SD95+0.300029090909091*LOG(DINC/CPI*100)+0.232975*DUM05-
DUM93

@Ending Stock

EST7061 = 0

@Import

M7061 = -0.00535103471545372+-
0.0000884*(EXCH*MP7061*(1.1+TE7061/100))*SD96+0.00000641*NCP7061+0.00117
6*@TREND*SD02+0.014989*SD01+-0.017345*SD04+-0.019052*DUM03+DUM05

@Export

X7061=-
6.13848985716222+0.244544*XP7061+0.4147355*@TREND+2.612803*DUM00+DU
M01+DUM02+-1.668077*DUM06+-2.701768*SD02

@Market Clearing Condition

SUP7061=Q7061+M7061+EST7061(-1)
TD7061=D7061+X7061+EST7061

SUP7061=TD7061

@Price Linkage

NFP7061 = -366.8043+0.623535*NWP7061+-364.7507*SD02+860.1327*SD89+-
656.2765*SD92+229.3431*DUM98+DUM99-DUM04
NWP7061/CPI*100 = -90.83403+0.812916*NCP7061/CPI*100+-526.3631*SD06+-
393.3351*DUM02+-1145.057*DUM03+DUM04+DUM05

Orange

@Import

M720 = 27.96089+-0.053174*ORANGE_PRICE+0.009056*DINC/CPI*100+0.035376*FRUIT_VEGE_PRICE+0.004466*FRUIT_PRICE*SD98+-34.47062*SD05

Tropical Fruits

@Import

M723 = 29.47885+-0.152376*TROPIC_PRICE+0.018056*DINC/CPI*100+0.033779*FRUIT_VEGE_PRICE+0.011724*FRUIT_PRICE*SD97+102.3922*SD05+-50.13414*DUM05

@M723=M7231+ M7232+ M7233+ M7234

@M7231: HS code 0801: coconut, brazil nut, cashew nut
@M7232: HS code 0802: other nuts & kernels
@M7233: HS code 0803: banana
@M7234: HS code 0804: datepalm, fig, pineapple, mango, mangosteen, guavas, avocados

Ginseng

@Acreage

ACR41 = 1*(PLANT41+YOUNG41+HARV41)

LOG(PLANT41) = 0.304007727231615+0.50749*LOG(PLANT41(-1))+0.185008*LOG(NFP41(-2)*@MOVAV(YD41(-2),3)/COST41(-2))+-0.0300456*LOG(NFP11(-3)*@MOVAV(YD11(-3),3)/COST11(-3))+-0.1495104*LOG(NFP2401(-2)*@MOVAV(YD2401(-2),3)/COST2401(-2))*SD95+0.339303*SD97+-0.348555*DUM98+-0.143886*DUM01-DUM92+-0.148546*DUM04+DUM05

LOG(YOUNG41) = -0.011384+0.997499*LOG(YOUNG41(-1)+PLANT41(-1)-HARV41)+-0.323387*DUM02+DUM03+-0.003392*LOG(NFP41/COST41

LOG(HARV41) = 0.337228+0.816157*LOG(YOUNG41(-1))+0.089977*LOG(NFP41/COST41)+-0.201023*SD01+0.114059*DUM04+-0.1397*DUM05

@Yield

YD41 = 1471.78+-77.52121*@MOVAV(TEMP,2)+-0.000115*@MOVAV(RAIN,2)*SD96+-0.001544*@MOVAV(SUN,2)+10.44555*@TREND+-82.29549*DUM96+45.20785*SD03

@Production

Q41=HARV41*YD41/100

@Cost

COST41 = -602460+34323.26*(0.132*machp+0.236*matrp+0.089*fuelp+0.221*wage+0.135*rent+0.117*seedp+0.089*fertp+0.053*chemp)+476520.4*SD95+631629.7*SD02

@Demand

LOG(D41/POP) = -10.28732+-1.34539*LOG(NWP41/CPI*100)+1.015743*LOG(DINC/CPI*100)+0.174146*DUM02+DUM03+0.253142*DUM99

@Ending Stock

EST41 = 0

@Import (M411: red ginseng, M412: white ginseng)

M41 = 1*(M411+M412)

M411 = 0.014121197638683+0.00000214*NWP41+-0.000000395*MP411*EXCH*(1.1+TE411/100)+0.036446*SD04+0.071523*DUM02-DUM05

M412 = -1.62384073663419+0.50416*(NWP41)/((MP412*EXCH*(1.1+TE412/100)))+0.05407*@TREND+-0.132114*SD96+0.157879*SD00+0.099407*SD05+-0.158732*DUM98+DUM99+DUM00

@Export

X41 = 1*(X411+X412)

X411 = -0.449506+-0.004247*XP411+0.00032*EXCH*SD02+0.106398*@TREND+-0.896788*DUM02+DUM03+DUM05

X412 = 0.795363603555556+-0.0033696*XP412+0.000104*EXCH+0.006345*@TREND+-0.113056*DUM03+DUM04

XP411 = -65.82891+0.00192*NWP41+2.916754*DUM04

XP412 = -21.88358+0.000607*NWP41+0.196343*WAGE+3.686473*SD04

@Market Clearing Condition

SUP41=Q41+M41+EST41(-1)
TD41=D41+X41+EST41

SUP41=TD41

@Price Linkage

NFP41= 3769.624+0.501797*NWP41+2280.192*SD02+2400.927*SD04+-4191.081*DUM99+DUM04+*SUM+*ADJUSTMENT+*ESTIMATE+*ACTUAL+*+*

Flowering Plants

@Acreage

ACR43=ACR431+ACR432+ACR433

ACR431= 1.024052+0.503606*ACR432(-1)+0.34523*NFP431(-1)/COST43(-1)+-0.002767*NFP432(-1)/COST43(-1)+0.29232*SD95+0.166724*SD99+-0.114718*SD04+-0.072717*DUM05-DUM01

ACR432= 0.409719345737452+0.356691*ACR432(-1)+0.0265*NFP432(-1)/COST43(-1)+-0.050947*NFP431(-1)/COST43(-1)+0.162018*SD03+0.039159*DUM04+DUM05+-0.048072*DUM00+DUM01-DUM99

ACR433= 0.56441698770431+0.336902*ACR433(-1)+0.157595*NFP433(-1)/CURTP(-1)*SD97+0.0381075*@TREND+-0.314669*SD97+0.326284*SD01+0.555922*SD04+-0.371893*SD06+-0.222578*DUM96+DUM97-DUM99

@Yield

YD43=Q43/ACR43

YD431 = 47164.6896753634+809.0042*@TREND+12637.75*DUM98+DUM02

YD432=111.786680684098+0.100634*YD432(-1)+7768.746*@TREND+8130.197*SD96+6311.139*SD05+17623.13*DUM87+DUM97+DUM02+8066.03*DUM00+DUM01

YD433=-564.672137764062+3241.457*@TREND+15284.98*DUM92+7544.722*DUM01

@Production

Q43=Q431+Q432+Q433

Q431=ACR431*YD431/100
Q432=ACR432*YD432/100
Q433=ACR433*YD433/100

@Cost

COST431=0.5*FUELP+0.3*MATRP+0.2*WAGE

COST432=0.5*FUELP+0.3*MATRP+0.2*WAGE

COST433=CURTP

@Demand

LOG(PERD431)= -0.111454+-0.64439*LOG(NFP431/CPI*100)+0.010342*LOG(NFP432/CPI*100)*SD94+0.002236*LOG(NFP433/CPI*100)+0.756602*LOG(DINC/CPI*100)+-0.094889*SD99+-0.272797*SD06

LOG(PERD432)= -1.73405693124599+-0.303001*LOG(NFP432/CPI*100)+0.014903*LOG(NFP431/CPI*100)*SD94+0.008798*LOG(NFP433/CPI*100)*SD93+0.5687567*LOG(DINC/CPI*100)+0.300905*SD04+-0.369031*DUM99+DUM01

LOG(PERD433)= -1.403958+-0.280617*LOG(NFP433/CPI*100)+0.026236*LOG(NFP431/CPI*100)*SD99+0.070761*LOG(NFP432/CPI*100)*SD01+0.507033*LOG(DINC/GDPDEF*100)+0.124127*DUM96+-0.37112*DUM02+DUM03+DUM04+-0.190449*DUM05+DUM06

@Ending Stock

EST43=EST431+EST432+EST433=0

@Import

M43=M431+M432+M433

M431=0.254079+-0.0000249*MP431*EXCH*(1+TE43/100)+0.000853*NFP431+-0.025692*SD99+0.298306*SD06+-0.189357*DUM06

M432=0.410534+-0.000181*MP432*EXCH*(1+TE43/100)+0.001225*NFP432+0.813129*SD01+1.490471*SD05+-0.722573*DUM03+0.75005*DUM97

M433=1.02928442640072+-0.000076*MP433*EXCH*(1+TE43/100)+0.001433*NFP433+1.188375*SD00+0.451953*DUM95+DUM96+0.988266*DUM97

@Export

X43=X431+X432+X433

X431=-3.602248+-0.049203*XP431*SD97+0.000892*EXCH+0.206176*@TREND+3.164677*SD99+0.964962*DUM01+DUM04

X432=-4.212862+-0.113571*XP432*SD97+0.001715*EXCH+0.205732*@TREND+1.732031*SD99+-1.343052*DUM01+DUM04+DUM02

X433=-0.161434+-0.003086*XP433*SD97+0.0000109*EXCH+0.009988*@TREND+-0.029594*SD02+-0.035351*SD04+0.016873*DUM97

@Market Clearing Condition

SUP431=Q431+M431+EST431(-1)
SUP432=Q432+M432+EST432(-1)
SUP433=Q433+M433+EST433(-1)

TD431=D431+X431+EST431
TD432=D432+X432+EST432
TD433=D433+X433+EST433

SUP431=TD431
SUP432=TD432
SUP433=TD433

Livestock's Model Specifications

Beef

@Number of Breeding

@Female Beef Cattle Over 2 Years Artificially Inseminated (Coupled Payment)

*Government income support system for stabilizing Calf production.
*From 2008, Korean government supports coupled payment to calf farmers for stabilizing production.
Maximum Payment is limited by 300 thousand won per calf if farm gate price goes down below 1650 thousand won per calf.

PAY51FC=MAX(0,1650000-NFP51FC)

PAY51MC=MAX(0,1650000-NFP51MC)

AI51F = -111718.8+51783.69*(0.5*(NFP51MC+MIN(300000,PAY51MC))+0.5*(NFP51FC+MIN(300000,PAY51FC)))/COST51C+1.154707*NB51FY+-69286.5*SD97+75539.38*SD04

@Female & Male Beef Cattle Under 1 Year

NB51FI = -8668.671663 + 0.3555624561*(0.8*AI51F(-1)+0.2*AI51F) - 15884.97368*(DUM97-DUM04)

NB51MI = -6550.663452 + 0.3852006761*(0.8*AI51F(-1)+0.2*AI51F) + 0.3075442035*(0.8*AI52F(-1)+0.2*AI52F) + 24299.80251*SD02

@Female & Male Beef Cattle 1-2 Years

NB51FT = -85246.52564 + 0.9337325386*NB51FI(-1) - 0.2174855952*SL51F + 90652.71012*SD98 + 12999.81759*(DUM91+DUM92) + 19257.44653*DUM97 - 38892.77911*DUM98

NB51MT = -191.7599766 + 0.4292753928*NB51MI(-1) + 1.156026964*SD04*NB51MI(-1) - 0.1888484815*(SL51M+SL52M) + 25136.50314*(DUM95+DUM97) - 374980.7034*(DUM04+DUM05) - 379143.1608*SD06 + 55504.8685*SD96 + 53355.82668*SD98

@Female & Male Beef Cattle Over 2 Years

NB51FY = 56390.48+0.667208*NB51FY(-1)+3.073851*NB51FT(-1)+-1.481868*SL51F+58031.79*SD93+-122997*SD99+61708.92*DUM97+-49813*DUM04+DUM05+DUM06

NB51MY = 4639.338778 + 0.169232682*NB51MT(-1) - 0.04536852524*(SL51M+SL52M) - 7729.463286*(DUM99+DUM00+DUM01+DUM06) + 29134.6259*SD06

@Female Beef Inventory
NB51F = 1*(NB51FY+NB51FT+NB51FI)

@Male Beef Inventory

NB51M = 1*(NB51MY+NB51MT+NB51MI)

@Beef Inventory

NB51 = 1*(NB51F+NB51M)

@Number of Slaughter

@Female Cattle Slaughter

SL51F = 174490.9+0.041317*NB51FY(-1)+0.983204*NB51FT(-1)+0.00798*NB51FI(-1)+-64430.91*NFP51FC/COST51C+87501.64*SD97+-95508.38*SD04

@Male Cattle Slaughter

SL51M = -74468.86+0.873362*NB51MY(-1)+0.932821*NB51MT(-1)+0.467152*NB51MI(-1)+-368.7795*NFP51M/COST51+-21361.99*SD94+-68569.53*DUM03+DUM04+DUM05+DUM06

@Beef Cattle Slaughter

SL51 = 1*(SL51F+SL51M)

@*Cost*

@Cow Management Cost

LOG(COST51) = 9.916668+1.008365*LOG((0.627*(0.5*NFP51C_INDEX+0.5*NFP51C_INDEX(-1))+0.021*MACHP+0.017*MATRP+0.005*FUELP+0.003*WAGE+0.008*INTEREST_INDEX+0.32*FEED_PRICE_INDEX))+-0.195296*DUM88+DUM89+DUM03+0.155323*SD97+-0.202482*SD01

@Calf Management Cost

LOG(COST51C) = 2.759919+0.360899*LOG(0.068*MACHP+0.058*MATRP+0.016*FUELP+0.012*WAGE+0.032*INTEREST_INDEX+0.813*FEED_PRICE_INDEX)+0.114188*DUM93+DUM94+1.947266*LOG(PPI

@Production Cost

PCOST51 = -14204.73+1.376109*0.85*COST51+0.15*(0.34*WAGE+0.66*INTEREST)+101052.1*SD05+195048.1*SD87

@Beef Supply

@Slaughter Weight

SLW51F = -1706.276+350.1386*LOG(SLW51F(-1))+30.34797*LOG(@TREND)+-3.088294*LOG(COST51)*SD84+-39.46214*DUM86+DUM06+-24.33884*DUM97+DUM98

SLW51M = -1736.9+341.5431*LOG(SLW51M(-1))+55.64205*LOG(@TREND)+-1.435247*LOG(COST51)+9.25403*SD03+14.45884*DUM96+DUM04+-14.52322*DUM98

@Beef Production

Q51 = 14676.68618 + 0.001006079262*(0.423*SLW51M*SL51M+0.381*SLW51F*SL51F+0.381*SLW52F*SL52) + 6613.05343*SD90 + 5554.019828*SD97 + 10606.65737*SD03

@Import (U.S., Australia and Residuals)

M51_US = 19325.63+5.492015*NCP51-(EXCH*MP51_US*(1.1+TE51_US/100))/1000+-206940.2*BSE_(SD0406)+-176146.1*SD07

M51_AU = 38797.54+-8.811976*EXCH*MP51_AU*(1.1+TE51_AU/100)+2.477963*NCP51+26396.77*DUM99+DUM00+31474.64*SD04

M51_RE = -2636.873+-1.782731*EXCH*MP51_RE*(1.1+TE51_RE/100)+1.410246*NCP51+16691.25*DUM99+DUM00+DUM04

@Beginning Stock

BST51=EST51(-1)

@Beef Demand

@Demand

LOG(D51/POP) = -11.7026700842477+-0.522643*LOG(NCP51/CPI*100)+0.33198*LOG(NCP53/CPI*100)+0.017334*LOG(NCP541/CPI*100)*SD91+0.007261*LOG(((D11(-1)*NCP11(-1)+DPRO125(-1)*NCP125(-1)+D124(-1)*NCP124(-1))/(D11(-1)+DPRO125(-1)+D124(-1)))/CPI*100)+0.942987272727273*LOG(DINC/CPI*100)+-0.258807*SD04+-0.066268*DUM88+DUM01-DUM02-DUM03+DUM06

@Export

X51=(YEAR>=2007)*MOVAV(X51(-1),3)

@Ending Stock

EST51 = -16717.92+0.191902*Q51+M51+-0.772502*NWP51+-25139.13*DUM93+DUM94+DUM95+DUM96

@Market Clearing Condition

SUP51=Q51+M51+EST51(-1)

TD51=D51+X51+EST51

SUP51=TD51

@Price Linkage

NWP51 = 331.536328571429+0.4538508*NCP51+-3960.922*SD02+-1257.091*DUM97+DUM98-DUM02

NFP51F = -1017940+590.4884*NWP51+-1.14291*SL51F+733897*DUM86+DUM03+DUM04+506467.3*SD97+-434876.3*SD05

NFP51M=-158981.3+500.0968*NWP51+-0.343465*SL51M+-1093401*SD05+-300627.8*SD99+474061.6*SD02+364566.5*DUM05

NFP51FC/PPI*100 = -862910.4+0.5974863*NFP51F/PPI*100+758127.8*SD03+312754.4*DUM97

NFP51MC = -572142.7+0.608886*NFP51M+-126979.6*SD97+345495.7*SD03

NFP51C = 1*(0.5*NFP51FC+0.5*NFP51MC)

Pork

@Number of Breeding

@Number of Sows

NB53SOW = -62427+0.892148*NB53SOW(-1)+122546.5*0.5*(NFP53/COST53)+0.5*(NFP53(-1)/COST53(-1))+37952.32*DUM95+DUM98+51338.14*SD00+-44562.78*SD04+29530.84*DUM06

@Number of Pigs

NB53PIG = -1531869.8394348+7.367458*(2/3)*NB53SOW+(1/3)*NB53SOW(-1)+4.024975*((2/3)*NB53SOW+(1/3)*NB53SOW(-1))*SD98+66206.86*@TREND+-2740969*SD98+-216201.5*DUM88+DUM89-DUM97

@Number of Hogs

NB53 = 100247.5899 + 0.9943398164*(NB53SOW+NB53PIG) - 10585.27977*SD03

@Number of Slaughter

SL53 = 151254.7+2.031142*0.25*NB53PIG(-1)+0.75*NB53PIG+-985238.9*SD95+-2184589*SD04+852321*DUM98+DUM04

@Cost

@Hog Management Cost

LOG(COST53) = 6.60311040129146+1.079885*LOG((0.333*(0.5*NFP53PIG_INDEX+0.5*NFP53PIG_INDEX(-1))+0.018*MACHP+0.032*MATRP+0.012*FUELP+0.025*WAGE+0.011*INTEREST_INDEX+0.568*(FEED_PRICE1_INDEX)))+0.128693*SD96+0.166575*SD97+0.091733*SD04+0.057083*DUM93-DUM97+DUM04

@Hog Production Cost

PCOST53 = 14620.63+1.140607*0.93*COST53+0.07*(0.37*WAGE+0.63*INTEREST)+-9193.836*SD82+9071.584*SD90+-12098.13*SD98

@Pork Supply

@Slaughter Weight

SLW53F = -40.46338+23.05995*LOG(SLW53F(-1))+12.30523*LOG(@TREND)+2.398274*SD97

SLW53M = -169.2751+54.41196*LOG(SLW53M(-1))+6.61929*LOG(@TREND)+1.738892*SD95

@Pork Production

Q53 = 182430.9+0.000665*0.56*((SLW53F+SLW53M)/2)*SL53+-28633.25*SD04+89562.13*SD9298+0*SD90

@Beginning Stock

BST53=EST53(-1)

@Import (U.S., Chile and Residuals)

M53_US = -54582.91+-1.642309*EXCH*MP53_US*(1.1+TE53_US/100)+26.63794*NWP53+-12647.98*DUM01+DUM04+-4755.064*SD02+42295.12*SD06

M53_CH = -7543.335+-17.92349*EXCH*MP53_CH*(1.1+TE53_CH/100)+25.65815*NWP53+14260.8*DUM03

M53_RE = 589.046+-18.56707*EXCH*MP53_RE*(1.1+TE53_RE/100)+56.04696*NWP53+13745.26*DUM01-DUM04+-43064.22*SD02

@Pork Demand

@Demand

LOG(D53/POP) = -8.470995+-0.328735*LOG(NCP53/CPI*100)+0.118404*LOG(NCP51/CPI*100)+0.089274*LOG(NCP541/CPI*100)+0.01138*LOG(((D11(-1)*NCP11(-1)+DPRO125(-1)*NCP125(-1)+D124(-1)*NCP124(-1))/(D11(-1)+DPRO125(-1)+D124(-1)))/CPI*100)*SD90+0.556069*LOG(DINC/CPI*100)+0.097955*DUM85+0.09398*SD06+0.152703*SD99

@Ending Stock

EST53 = -11201.05+0.016333*EST53(-1)+Q53+M53+0.636038*NCP53/CPI*100+24581.36*SD00+10198.69*SD97+-17539.39*DUM01+DUM04+8616.491*DUM02+DUM92+DUM99

@Export

X53 = (YEAR>=2007)*MOVAV(X53(-1),3)

@Market Clearing Condition

SUP53=Q53+M53+EST53(-1)

TD53=D53+X53+EST53

SUP53=TD53

@Price Linkage

NWP53 = 334.7266444+0.2857488*NCP53+-425.7418*SD00+538.4895*DUM04+DUM05

NFP53PIG = -23746.04+0.39561*NFP53+3664.883*DUM95-DUM96+-5490.847*DUM98+DUM99+-14188.92*DUM04+8966.535*SD92+9902.619*SD05

NFP53/CPI*100 = 14345.87+71.73915*NWP53/CPI*100+-234.5099*WAGE/CPI*100+-24950.6*DUM90+DUM91+DUM84

Broilers

@Number of Breeding

@Number of Broiler

NB541 = 15867.37+0.069896*SL541+-2553.761*SD93+4806.332*SD00+4836.877*SD05

@ Inventory of Pure-Bred Breeding Chicks for Broiler

NB542BROILER = 481.1424+0.705915*NB542BROILER(-1)+871299.9*NFP541/COST541+-578.5777*DUM98-DUM01-DUM02+DUM03+550.5677*SD05

@Number of Slaughter

SL541 = 94095.46+0.34977*SL541(-1)+153000000*0.5*(NFP541/COST541)+0.5*(NFP541(-1)/COST541(-1))+59.26996*0.5*NB542BROILER+0.5*NB542BROILER(-1)+-155775.7*SLW541+-4190.698*(TEMP_7+TEMP_8)/2+44018.53*SD99

@Cost

@Broiler Management Cost

LOG(COST541) = 12.75274+0.33498*LOG((0.31*(0.5*NFP541_INDEX+0.5*NFP541_INDEX(-1))+0.03*MACHP+0.02*MATRP+0.04*FUELP+0.01*WAGE+0.01*INTEREST_INDEX+0.58*FEED_PRICE1_INDEX))+0.174336*LOG(PPI)*SD00+-0.925482*SD00+-0.165731*SD03+-0.044377*DUM94+DUM95-DUM04

@Production Cost

PCOST541 = 44177.27+1.146556*0.93*COST541+0.06*(0.83*WAGE+0.17*INTEREST)+100885.2*SD89+-22667.38*SD94+-128187.9*SD98+-37569.83*DUM84-DUM88+DUM90

@Supply

@Slaughter Weight

LOG(SLW541) = 0.180824+0.097508*LOG(SLW541(-1))+-0.183356*LOG(@TREND)+-0.085879*SD05+-0.095993*SD01

@Production

Q541= SL541*SLW541

@Beginning Stock

BST541=EST541(-1)

@Import (U.S. and Residuals)

M541_US = -53465.6854664201+36865.74*NWP541/(EXCH*MP541_US*(1.1+TE541_US/100))+2927.581*@TREND+-55890.36*SD04+18344.79*DUM05+DUM06

M541_RE = 49477.3906216256+12.60045*NCP541+-14.19806*EXCH*MP541_RE*(1.1+TE541_RE/100)+-9446.445*DUM04+DUM06+0*@TREND

@Demand

@Demand

LOG(D541/POP) = -10.36589+-0.233874*LOG(NCP541/CPI*100)+0.092326*LOG(NCP51/CPI*100)+0.119645*LOG(NCP53/CPI*100)+0.020147*LOG(((D11(-1)*NCP11(-1)+DPRO125(-1)*NCP125(-1)+D124(-1)*NCP124(-1))/(D11(-1)+DPRO125(-1)+D124(-1)))/CPI*100)*SD92+0.535536*LOG(DINC/CPI*100)+0.046954*SD90+0.098665*DUM01+-0.166421*DUM04

@Ending Stock

EST541 = 0

@Export

X541 = (YEAR>=2007)*MOVAV(X541(-1),3)

@Market Clearing Condition

SUP541=Q541+M541+EST541(-1)

TD541=D541+X541+EST541

SUP541=TD541

@Price Linkage

NWP541/CPI*100 = 423.692552708333+0.783185*NCP541+-144.0986*SD90+-306.548*SD93+-880.4855*SD05+-209.309*DUM95+DUM96-DUM05

NFP541/CPI*100 = 172.025480735786+0.509555384615385*NWP541+103.0714*DUM93+DUM94+DUM95+-131.3034*DUM97+DUM98+DUM99+DUM00+-106.263*SD90

Hen & Eggs

@Number of Breeding

@Number of Hen

NB543 = 12991.13+0.579816*NB543(-1)+6.622304*0.5*NB542HEN+0.5*NB542HEN(-1)+36451354*NFP543EGG/COST543EGG+-2749.705*DUM98-DUM99+2608.18*SD95+4605.552*SD05

@ Inventory of Pure-Bred Breeding Chicks for Hen

NB542HEN = 354.2749+0.03513*NB542HEN(-1)+4679283*NFP543EGG/COST543EGG+75.62089*DUM99-DUM00+-52.04018*DUM02+DUM05+-123.799*SD03

@Cost

@Management Cost

LOG(COST543EGG) = 10.847830923663+0.711885833333333*LOG((0.328*(0.5*NFP543EGG_INDEX+0.5*NFP543EGG_INDEX(-1))+0.033*MACHP+0.033*MATRP+0.009*FUELP+0.035*WAGE+0.012*INTEREST_INDEX+0.549*FEED_PRICE1_INDEX))+0.5623512*LOG(PPI)+-0.072947*SD03+-0.112768*DUM95+DUM96+DUM03

@Production Cost

PCOST543EGG = 765831.2+1.08338*0.94*COST543EGG+0.06*(0.57*WAGE+0.43*INTEREST)+878137*SD89+-775080.9*SD99+-387981.1*DUM89+-743379*DUM98

@Eggs' Supply

@Production

Q543EGG = 14464.91+7.805308*0.5*NB543+0.5*NB543(-1)+64143.36*@TREND+-78580.45*SD89+-32660.16*SD98+15991.65*DUM03+DUM04+45148.75*DUM02

@Beginning Stock

BST543EGG=EST543EGG(-1)

@IMPORT (import data series are so short that we used synthetic method in this equation)

M543EGG= 4411.99448903297+2.428732*NCP543EGG+-1.151604*EXCH*MP543EGG*(1.1+TE543EGG/100

@Eggs' Demand

@Demand

LOG(D543EGG/POP) = -8.082242+-0.155988*LOG(NCP543EGG/CPI*100)+0.109078*LOG(((D11(-1)*NCP11(-1)+DPRO125(-1)*NCP125(-1)+D124(-1)*NCP124(-1))/(D11(-1)+DPRO125(-1)+D124(-1)))/CPI*100)+0.434536*LOG(DINC/CPI*100)+-0.062837*DUM99+DUM00+DUM01+DUM03+DUM04+-0.191717*SD89+-0.081023*SD94

@Ending Stock

EST543EGG = 0

@Export

X543EGG = 0

@Market Clearing Condition

SUP543egg=Q543egg+M543egg+EST543egg(-1)

TD543egg=D543egg+X543egg+EST543egg

SUP543egg=TD543egg

@Price Linkage

NWP543EGG = 66.79343415449+0.853288333333333*NCP543EGG+-178.318*SD05+-90.90303*SD9198

NFP543EGG = 35.92466+0.859714*NWP543EGG+0*NWP543EGG*SD04+-92.58726*SD04

Dairy

@Number of Breeding

@Female Beef Cattle Over 2 Years Artificially Inseminated

LOG (AI52F) = 5.599122+0.771198*LOG(NFP52MILK2/COST51C)+0.997044*LOG(NB52FY)+-0.27673*SD98+-0.192468*SD00+-0.144518*DUM97+0.129866*DUM03+DUM04+DUM05

@Female Under 1 Years

NB52FI = 89582.8771290909+0.0774136*0.8*AI52F(-1)+0.2*AI52F+0.3746413*SD03*(0.8*AI52F(-1)+0.2*AI52F)+-86622.05*SD03

@Female 1-2 Years

NB52FT = 66912.61+0.352215*NB52FI(-1)+-0.129583*SL52+14279.1*SD93+9349.027*SD98+-6926.784*SD05

@Female Over 2 Years

NB52FY = -8704.074+0.776512*NB52FY(-1)+NB52FT(-1)+-15964.61*SD02+-0.117219*SL52

@Female Inventory

NB52 = 1*(NB52FY+NB52FT+NB52FI)

@Milling Cow Inventory

NBMC52F = -6521.892+0.323071*NBMC52F(-1)+0.59844*NB52FY+27558.7*DUM99+DUM02-DUM01+-14656.61*SD90+24386.77*SD87

@Number of Slaughter

SL52 = 158869.5+-0.942394*D(NB52F)+-140.382*NFP52MILK3/PPI*100+0.003438*NFP51F/PPI*100+-20917.74*SD03+32714.03*DUM98+DUM93+-7471.92*DUM95+DUM07

@Cost

@Management Cost

COST52MILK = -3931.1061356731+279.64021*0.064*MACHP+0.041*MATRP+0.021*FUELP+0.021*WAGE+0.021*INTEREST+0.831*FEED_PRICE_INDEX+6836.713*SD96+4935.196*SD04+2259.227*DUM92+DUM98-DUM96-DUM05

@Production Cost

(PCOST52MILK)-(COST52MILK) = 2295.456+97.82044*WAGE+697.8209*INTEREST+-5885.557*SD98+-2335.43*DUM94+DUM95

@Meat Supply

@Slaughter Weight

SLW52F = -2282.867+441.7237*LOG(SLW52F(-1))+19.70799*LOG(@TREND

@Meat Production

Q52=0.381*SLW52F*SL52

@Fluid Milk Supply

@ Milk Yield Per Head

LOG(YD52MILK) = 0.219452+0.858029*LOG(YD52MILK(-1))+0.027934*LOG(@TREND)+0.108126*DUM01

@Milk Production

Q52MILK = NBMC52F*YD52MILK

@Fluid Milk Demand

@ In this model, instead of this equation's being not used, we used the identity like this; Fluid Milk demand=Fluid Milk production=Total milk production-Total dairy products' production because Fluid Milk does not be imported or exported.

LOG(D52DRINK/POP) = -4.41416979238799+-0.221856*LOG(NCP52WHITE/CPI*100)+0.231592666666667*LOG(DINC/CPI*100)+-0.0098484*@TREND+-0.142694*DUM98+DUM99+-0.075144*DUM02+0*SD03

@Target Price deterministic method

@Ratio Of Production Cost Change

RPCOST52MILK=PCOST52MILK/PCOST52MILK(-1)-1

@Dummy Variable

DUMPCOST52MILK= IF(RPCOST52MILK>=0.05,1,0)

@Target Price

TARGET52MILK = 246.2538531 + 59.11243515*RPCOST52MILK*DUMPCOST52MILK + 2.225201555*CPI + 70.17991356*SD98 - 19.48847429*SD01 + 45.08683035*SD05

NFP52MILK = -4.384629+1.012626*TARGET52MILK+35.52941*SD93+75.00976*SD03

NFP52MILK2/1.03 (낙농진흥회)=
45.00111+0.871499*TARGET52MILK+1.325981*NCP52MILK+24.51526*SD01+12.46839*DUM00

NCP52WHITE = -37.62199165 + 0.2301127864*NFP52MILK + 0.1573929364*SD03*NFP52MILK - 10.17491303*SD98 - 111.8312657*SD03 - 3.798220063*DUM05

@ Quarter System (Differential Price System In Extra Raw Milk)

	2003	2004	2005	2006	2007	2008	2009	2010
Q52milk	236.6	225.5	222.9	217.6	218.8	216.9	215.2	214.8
Quarter (unit: 10 ton)	197.2	213.4	213.4	213.4	213.4	215.4	215.4	215.4
In Quarter	197.2	213.4	213.4	213.4	213.4	215.4	215.2	214.8
Out of Quarter	39.4	12.1	9.4	4.2	5.3	1.5	-	-
-Buffer Quantity	11.8	12.1	9.4	4.2	5.3	1.5	-	-
-Differential price Quantity	21.7	-	-	-	-	-	-	-
-Extra Quantity	5.9	-	-	-	-	-	-	-
Price (unit: won / liter)								
In Quarter	634.7	662.2	716.8	722.4	728.5	837.6	843.0	848.7
Out of Quarter								
-Buffer Quantity	634.7	662.2	716.8	722.4	728.5	837.6	843.0	848.7
-Differential price Quantity	444.3	463.6	501.8	505.7	509.9	586.3	590.1	594.1
-Extra Quantity	339.7	419.3	353.3	281.2	405.3	449.9	456.8	457.1
NFPMILK3 (Real farmgate price)	609.9	662.2	716.8	722.4	728.5	837.6	843.0	848.7

@ Quantity (unit:10 ton)

In Quarter= MIN(Q52MILK,Quarter)
Out of Quarter =MAX(Q52MILK – In Quarter,0)
-Buffer Quantity =MIN(In Quarter*0.06,Out of Quarter)
-Differential price Quantity =MIN(in quarter*0.11,(out of quarter-buffer quantity))
-Extra Quantity =out of quarter-(buffer quantity+ differential price quantity)

@ Price (unit: won / liter)

In Quarter= NFP52MILK2/1.03*1.03
-Buffer Quantity= NFP52MILK2/1.03*1.03

-Differential price Quantity=Buffer Quantity price *0.7
-Extra Quantity=international price

NFPMILK3 (Real farmgate price)= =(in quarter price*(in quarter + buffer quantity)+differential price*differential price quantity + extra price*extra price quantity)/Q52MILK

Dairy Products

@ Whole Milk Powder

@Production

Q52POWDER = -4903.517+36980.04*NCP52POWDER/NFP52MILK3+-1.723562*EST52POWDER(-1)+4282.218*SD96+-1294.365*DUM99+4042.5*DUM02+DUM03+1183.721*DUM04+DUM05

@Demand

LOG(D52POWDER/POP) = 33.20515+-0.958663*LOG(NCP52POWDER/CPI*100)+1.239295*LOG(DINC/CPI*100)+-0.293304*DUM99+0.243558*DUM01+0.397513*DUM02+DUM03+-0.02469*@YEAR

@Stock

EST52POWDER = 1094.539993 - 8.82592798*NCP52POWDER/CPI*100 + 0.08842238549*(EST52POWDER(-1)+Q52POWDER+M52POWDER) + 6385.967185*DUM89 + 1300.492232*DUM02

@Import

M52POWDER = 1026.18+0.833803*NCP52POWDER+-0.114316*EXCH*MP52POWDER*(1.1+TE52POWDER/100)+57.61748*@TREND+-958.1213*DUM95+DUM96+DUM97+DUM98+DUM99+DUM00+-623.2307*DUM02

@Export

X52POWDER = -713.0358261 + 0.109224704*X52POWDER(-1) + 0.3596623039*@YEAR + 38.02716587*DUM88 + 328.5604627*DUM95 + 137.3722511*DUM98

@Market Clearing Condition

SUP52POWDER=Q52POWDER+M52POWDER+EST52POWDER(-1)
TD52POWDER=D52POWDER+XPOWDER+EST52POWDER

SUP52POWDER = TD52POWDER

@Skim Milk Powder & Butter

@Production

Q52NONFAT = 5886.777+33615.56*NCP52NONFAT/NFP52MILK3+-0.970805*EST52NONFAT(-1)+18801.61*SD96+-4751.947*SD06+-11715.67*DUM98+DUM99+7382.337*DUM02+DUM03

Q52BUTTER = 2442.749+0.06678*Q52NONFAT+-1050.185*DUM97+-1862.944*DUM99+970.1821*DUM01+DUM02+DUM03

@Demand

LOG(D52NONFAT/POP) = -7.013347+-0.421598*LOG(NCP52NONFAT/CPI*100)+0.159382*LOG(DINC/CPI*100)+0.278979*DUM96+DUM97-(DUM98+DUM99)+0.332312*DUM01+DUM02+DUM03

LOG(D52BUTTER/POP) = -25.00563+-0.350959*LOG(NCP52NONFAT/CPI*100)+1.874992*LOG(DINC/CPI*100)+-0.838786*DUM99

@Stock

EST52NONFAT = -893.177+-11.65765*NCP52NONFAT/CPI*100+0.259978*EST52NONFAT(-1)+Q52NONFAT+M52NONFAT+2680.426*DUM89-DUM90+3539.53*DUM98+DUM00

EST52BUTTER=0

@Import

M52NONFAT = 8395.87+35.50015*NCP52NONFAT+-0.75921*EXCH*MP52NONFAT*(1.1+TE52NONFAT/100)+-5679.146*SD96+3050.996*SD05+1691.695*SD01+2562.127*DUM01

M52BUTTER = -136.1795+19.47871*NCP52NONFAT+-0.012218*EXCH*MP52BUTTER*(1.1+TE52DELIBUTTER/100)+-238.4116*SD00+1979.126*SD04+1935.119*DUM05

@Export

X52NONFAT = -46855.62+0.23582*X52NONFAT(-1)+23.40077*@YEAR+224.4465*DUM96+DUM97+DUM98+421.2391*DUM00

X52BUTTER =0

@Market Clearing Condition

SUP52NONFAT=Q52NONFAT+M52NONFAT+EST52NONFAT(-1)
TD52NONFAT=D52NONFAT+XNONFAT+EST52NONFAT

SUP52BUTTER=Q52BUTTER+M52BUTTER+EST52BUTTER(-1)
TD52BUTTER=D52BUTTER+XBUTTER+EST52BUTTER

SUP52NONFAT+SUP52BUTTER = TD52NONFAT+TD52BUTTER

@Infant Milk Powder

@Production

Q52INFANT = -6479.481+216.198*NCP52INFANT/CPI*100+-43.44716*NFP52MILK3/CPI*100+0.045379*0.5*BIRTH(-1)+0.5*BIRTH+4102.204*SD89+7089.981*SD00+-2628.688*SD03+3069.379*DUM96+DUM97+DUM98+-1629.113*DUM04-DUM05

@Demand

LOG(D52INFANT) = -6.310467+1.221691*LOG(0.5*BIRTH+0.5*BIRTH(-1))+0.238387*DUM00+DUM01-DUM99+0.147178*DUM02+DUM03

@Stock

EST52INFANT=0

@Import

M52INFANT = -2904.398+39.02333*NCP52INFANT+-0.006797*EXCH*MP52INFANT*(1.1+TE52POWDER/100)+285.4055*DUM97-DUM98+573.1995*DUM01+DUM02-DUM03+1544.455*SD03

@Export

X52INFANT = -29768.07+0.701291*X52INFANT(-1)+15.00478*@YEAR+296.0015*SD02+223.5428*DUM93-DUM94+DUM95

@Market Clearing Condition

SUP52INFANT=Q52INFANT+M52INFANT+EST52INFANT(-1)
TD52INFANT=D52INFANT+XINFANT+EST52INFANT

SUP52INFANT = TD52INFANT

@Cheese

@Production

Q52CHEESE = -41684.93+377384.7*NCP52CHEESE/NFP52MILK3+7241.846*SD01+4676.014*SD99+3718.43*DUM04+DUM06

@Demand

LOG(D52CHEESE/POP) = -7.837088+-3.022086*LOG(NCP52CHEESE/CPI*100)+1.284061*LOG(DINC/CPI*100)+0.801086*LOG(@TREND)+-0.138222*DUM94+DUM95+0.247436*DUM99+DUM00+DUM01+0.100894*DUM04+DUM05+0.222291*SD05

@Stock

EST52CHEESE=0

@Import

M52CHEESE = -39380.2984077229+1180.848*NCP52CHEESE+-6.97215*EXCH*MP52CHEESE*(1.1+TE52CHEESE/100)+7293.911*DUM01+DUM02+DUM03+DUM04

@Export

X52CHEESE =0

@Market Clearing Condition

SUP52CHEESE=Q52CHEESE+M52CHEESE+EST52CHEESE(-1)
TD52CHEESE=D52CHEESE+XCHEESE+EST52CHEESE

SUP52CHEESE = TD52CHEESE

@Fermented Milk

@Production

Q52FERM = 450403+615436.4*NCP52FERM/NFP52MILK3+105856.6*DUM97+-44435.25*DUM98+18647.29*DUM03+DUM06+-52103.23*SD05

@Demand

LOG(D52FERM/POP) = 66.8426901843271+-1.058345*LOG(NCP52FERM/CPI*100)+1.54328*LOG(DINC/CPI*100)+-0.0404506666666667*@YEAR+-0.196437*SD02+-0.102539*DUM96+DUM00+DUM01-DUM06

@Stock

EST52FERM=0

@Import

M52FERM = -126.0103+2.09469*NCP52FERM+-0.001997*EXCH*MP52FERM*(1.1+TE52FERM/100)+259.6246*DUM95+486.6727*DUM96+DUM97+42.49871*SD04

@Export

X52FERM = -112251.7+0.842332*X52FERM(-1)+56.43755*@YEAR+772.9432*DUM93+1042.59*DUM01+DUM02+DUM03

@Market Clearing Condition

SUP52FERM=Q52FERM+M52FERM+EST52FERM(-1)
TD52FERM=D52FERM+XFERM+EST52FERM

SUP52FERM = TD52FERM

@Concentrated Milk

@Production

Q52CONCENT = -123764.6+6.486068*NCP52WHITE/CPI*100+-
2.484804*NFP52MILK3/CPI*100+-
509.7339*DUM88+895.6422*DUM90+DUM91+DUM95+-
662.7064*SD06+396.8042*SD00+64.18514*@YEAR

@Demand

LOG(D52CONCENT/POP) = -10.29108+-
0.626777*LOG(NCP52WHITE/CPI*100)+0.388335*LOG(DINC/CPI*100

@Stock

EST52CONCENT=0

@Import

M52CONCENT = -32.27147+0.825903*NCP52WHITE+-
0.000249*EXCH*MP52CONCENT*(1.1+TE52CONCENT/100)+177.7178*SD04

@Export

X52CONCENT=0

@Market Clearing Condition

SUP52CONCENT=Q52CONCENT+M52CONCENT+EST52CONCENT(-1)
TD52CONCENT=D52CONCENT+XCONCENT+EST52CONCENT

SUP52CONCENT = TD52CONCENT

APPENDIX 4.

DYNAMIC SIMULATION RESULTS

Scenario

Tables

Graphics

Scenario

DDA (Develop country status) +U.S. FTA

YEAR	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
TE124	–	–	–	–	–	–	–	–	–	–	–	–
TE125	378.9	353.6	328.4	303.1	277.9	252.6	227.3	202.1	176.8	151.6	126.3	101.0
TE131	485.1	485.1	440.1	395.0	350.0	305.0	260.0	260.0	260.0	260.0	260.0	260.0
TE141	329.0	329.0	283.3	237.6	191.8	146.1	100.4	100.4	100.4	100.4	100.4	100.4
TE151	304.0	304.0	261.7	219.5	177.2	135.0	92.7	92.7	92.7	92.7	92.7	92.7
TE152	385.0	385.0	331.5	278.0	224.5	170.9	117.4	117.4	117.4	117.4	117.4	117.4
TE211	360.0	360.0	326.6	293.2	259.8	226.4	193.0	193.0	193.0	193.0	193.0	193.0
TE212	135.0	135.0	122.5	109.9	97.4	84.9	72.4	72.4	72.4	72.4	72.4	72.4
TE213	270.0	270.0	244.9	219.9	194.8	169.8	144.7	144.7	144.7	144.7	144.7	144.7
TE214	27.0	27.0	23.9	20.8	17.7	14.6	11.5	11.5	11.5	11.5	11.5	11.5
TE215	27.0	27.0	23.9	20.8	17.7	14.6	11.5	11.5	11.5	11.5	11.5	11.5
TE221	27.0	27.0	23.9	20.8	17.7	14.6	11.5	11.5	11.5	11.5	11.5	11.5
TE222	27.0	27.0	23.9	20.8	17.7	14.6	11.5	11.5	11.5	11.5	11.5	11.5
TE228	22.7	22.7	21.8	20.8	19.9	18.9	18.0	17.0	16.1	15.1	15.1	15.1
TE231	45.0	45.0	39.8	34.7	29.5	24.3	19.1	19.1	19.1	19.1	19.1	19.1
TE232	30.0	30.0	26.6	23.1	19.7	16.2	12.8	12.8	12.8	12.8	12.8	12.8
TE2401	45.0	45.0	39.8	34.7	29.5	24.3	19.1	19.1	19.1	19.1	19.1	19.1
TE2402	–	–	–	–	–	–	–	–	–	–	–	–
TE2403	27.0	27.0	23.9	20.8	17.7	14.6	11.5	11.5	11.5	11.5	11.5	11.5
TE2404	27.0	27.0	23.9	20.8	17.7	14.6	11.5	11.5	11.5	11.5	11.5	11.5
TE2405	45.0	45.0	39.8	34.7	29.5	24.3	19.1	19.1	19.1	19.1	19.1	19.1
TE2406	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0
TE2407	–	–	–	–	–	–	–	–	–	–	–	–
TE2408	45.0	45.0	39.8	34.7	29.5	24.3	19.1	19.1	19.1	19.1	19.1	19.1
TE2409	27.0	27.0	23.9	20.8	17.7	14.6	11.5	11.5	11.5	11.5	11.5	11.5
TE31	630.0	630.0	542.4	454.9	367.3	279.7	192.2	192.2	192.2	192.2	192.2	192.2
TE32	54.0	54.0	46.5	39.0	31.5	24.0	16.5	16.5	16.5	16.5	16.5	16.5
TE33	230.5	230.5	198.5	166.4	134.4	102.3	70.3	70.3	70.3	70.3	70.3	70.3
TE411	222.8	222.8	191.8	160.9	129.9	98.9	68.0	68.0	68.0	68.0	68.0	68.0
TE412	754.3	754.3	649.2	544.4	439.6	334.8	230.0	230.0	230.0	230.0	230.0	230.0
TE51	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
TE53	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
TE541	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
TE52CHEESE	30.0	30.0	29.2	28.3	27.5	26.7	25.8	25.0	24.2	23.3	22.5	21.9
TE52POWDER	36.0	32.7	29.5	26.2	22.9	19.6	16.4	13.1	9.8	6.5	–	–
TE52NONFAT	36.0	32.7	29.5	26.2	22.9	19.6	16.4	13.1	9.8	6.5	–	–
TE52BUTTER	176.0	160.0	144.0	128.0	112.0	96.0	80.0	64.0	48.0	32.0	–	–
TE52DELIBUTTER	89.0	80.9	72.8	64.7	56.6	48.5	40.5	32.4	24.3	16.2	–	–
TE52CONCENT	8.0	7.3	6.5	5.8	5.1	4.4	3.6	2.9	2.2	1.5	–	–
TE52FERM	89.0	80.9	72.8	64.7	56.6	48.5	40.5	32.4	24.3	16.2	–	–
	36.0	32.4	28.8	25.2	21.6	18.0	14.4	10.8	7.2	3.6	–	–
TE701	45.0	42.0	39.0	36.0	33.0	30.0	27.0	24.0	21.0	18.0	15.0	12.0
TE702	45.0	42.0	39.0	36.0	33.0	30.0	27.0	24.0	21.0	18.0	15.0	12.0
TE703	24.8	20.7	16.5	12.4	8.2	4.1	–	–	–	–	–	–
TE704	34.9	42.0	39.0	36.0	33.0	30.0	27.0	24.0	21.0	18.0	15.0	12.0
TE705	144.0	134.4	124.8	115.2	105.6	96.0	86.4	76.8	67.2	57.6	48.0	38.4
TE7061	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
TE720	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
TE723	53.2	53.2	53.2	53.2	53.2	53.2	53.2	53.2	53.2	53.2	53.2	53.2
TE7231	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8
TE7232	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
TE7233	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0
TE7234	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
TE724	144.0	144.0	144.0	144.0	144.0	144.0	144.0	144.0	144.0	144.0	144.0	144.0
TE725	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
TE51_US	40.0	37.3	34.7	32.0	29.3	26.7	24.0	21.3	18.7	16.0	13.3	10.7
TE51_AU	40.0	40.0	36.9	33.9	30.8	27.7	24.6	24.6	24.6	24.6	24.6	24.6
TE51_RE	40.0	40.0	36.9	33.9	30.8	27.7	24.6	24.6	24.6	24.6	24.6	24.6
TE53_US	25.0	21.4	17.9	14.3	10.7	7.1	3.6	–	–	–	–	–
TE53_CH	15.0	12.5	10.0	7.5	5.0	2.5	–	–	–	–	–	–
TE53_RE	25.0	25.0	23.1	21.2	19.2	17.3	15.4	15.4	15.4	15.4	15.4	15.4
TE541_US	20.0	18.0	16.0	14.0	12.0	10.0	8.0	6.0	4.0	2.0	–	–
TE541_RE	20.0	20.0	18.7	17.3	16.0	14.7	13.3	13.3	13.3	13.3	13.3	13.3

Tables of Prediction

Barleys

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	54	54	45	46	45	43	42	42	42	41	41	40	40
							(Kilograms / 10A)						
Yield	443	448	447	447	449	449	450	451	452	453	454	455	456
Supply							(Thousand Tons)						
Beginning Stocks	311	363	398	398	404	407	408	410	418	426	435	446	458
Production	238	241	202	208	201	195	191	190	190	187	185	183	182
Imports	158	147	152	153	155	156	158	162	162	165	168	172	176
Utilization													
Food and Processing	311	315	314	313	311	308	304	301	298	295	291	288	285
Feed, Seed, and Loss	33	38	40	41	42	42	43	44	46	48	51	53	57
Exports	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Stocks	363	398	398	404	407	408	410	418	426	435	446	458	474
Prices							(Won / Kilogram)						
Farm (index, 2000=100)	103	98	96	95	94	93	93	92	90	89	88	87	85
Wholesale	1,169	1,110	1,084	1,071	1,062	1,056	1,048	1,037	1,025	1,011	997	980	961
Consumer (index, 2005=100)	103	97	95	93	93	92	92	91	91	90	89	88	87
International	157	232	217	224	223	226	224	226	224	225	221	221	222

Onions

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	17.8	15.4	15.9	15.6	15.8	16.0	16.1	16.3	16.4	16.6	16.8	16.9	17.1
							(Kilograms / 10A)						
Yield	6,836	6,725	6,743	6,760	6,778	6,795	6,813	6,830	6,848	6,865	6,883	6,900	6,918
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	1,213	1,035	1,072	1,058	1,070	1,084	1,098	1,112	1,126	1,141	1,155	1,169	1,181
Imports	32	66	53	60	66	73	81	89	92	94	97	101	104
-TRQ	21	21	21	28	35	42	49	56	56	56	56	56	56
-Fresh	8	44	31	36	40	45	51	56	59	61	63	65	67
-Processing	25	22	22	23	25	28	30	33	33	33	34	36	38
Utilization													
Food	1,246	1,100	1,124	1,117	1,135	1,157	1,179	1,201	1,217	1,234	1,252	1,269	1,285
Exports	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Farm	166	258	239	250	252	255	258	260	266	271	276	280	284
Wholesale	407	622	549	559	558	561	566	571	585	596	606	616	627
Consumer	706	1,027	886	885	876	876	881	888	908	925	939	954	970

Garlic

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	27.0	28.4	27.5	26.2	25.4	24.7	24.2	23.6	23.1	22.7	22.3	22.0	21.6
							(Kilograms / 10A)						
Yield	1,288	1,321	1,323	1,324	1,327	1,330	1,333	1,335	1,338	1,340	1,343	1,346	1,348
Supply							(Thousand Tons)						
Beginning Stocks	0	2	6	5	3	2	2	2	1	1	0	0	0
Production	348	375	364	347	337	329	322	315	309	304	300	296	292
Imports	56	60	59	63	67	71	76	80	82	83	85	87	90
-TRQ	14	14	14	17	20	23	26	29	29	29	29	29	29
-Fresh	12	14	14	17	20	23	26	29	29	29	29	30	32
-Processing	44	45	45	46	47	48	49	51	52	54	55	57	58
Utilization													
Food	402	431	425	412	405	401	398	396	391	387	384	383	382
Exports	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Stocks	2	6	5	3	2	2	2	1	1	0	0	0	0
Prices							(Won / Kilogram)						
Farm	1,239	976	1,017	1,044	1,038	1,005	968	929	919	899	871	831	777
Wholesale	1,990	1,691	1,724	1,755	1,754	1,727	1,697	1,667	1,670	1,662	1,646	1,616	1,572
Consumer	3,729	3,152	3,306	3,411	3,437	3,401	3,353	3,301	3,311	3,302	3,275	3,221	3,140

Wheat

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	1.9	2.5	2.7	2.7	2.7	2.8	2.8	2.8	2.8	2.8	2.9	2.9	2.9
							(Kilograms / 10A)						
Yield	381	367	370	373	376	379	383	387	390	394	398	402	407
Supply							(Thousand Tons)						
Beginning Stocks	462	393	393	393	393	393	393	393	393	393	393	393	393
Production	6	9	10	10	10	10	11	11	11	11	11	12	12
Imports	3,237	3,489	4,000	4,353	4,330	4,314	4,259	4,188	4,154	4,107	4,009	3,906	3,796
Utilization													
Food and Processing	2,057	2,100	2,194	2,243	2,278	2,293	2,298	2,301	2,300	2,298	2,299	2,298	2,296
Feed, Seed, and Loss	1,255	1,398	1,817	2,120	2,062	2,032	1,971	1,898	1,865	1,821	1,721	1,620	1,511
Exports	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Stocks	393	393	393	393	393	393	393	393	393	393	393	393	393
Prices							(Won / Kilogram)						
Consumer (INDEX)	163	151	154	161	163	166	170	174	179	184	188	191	195
Farm	477	536	531	538	542	543	544	543	543	540	537	534	535
International	285	320	322	326	328	329	330	329	329	327	325	324	324

Rice

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	(Thousand Hectares)												
Area	950	936	926	915	905	895	884	870	858	846	830	816	805
	(Kilograms / 10A)												
Yield	464	488	495	496	497	498	498	499	499	500	500	500	501
Supply	(Thousand Tons)												
Beginning Stocks	695	648	616	662	719	780	841	901	933	950	959	949	935
Production	4,408	4,566	4,584	4,543	4,499	4,455	4,408	4,341	4,282	4,225	4,148	4,085	4,033
Imports	553	307	327	348	368	388	409	409	409	409	409	409	409
Utilization													
Food	3,824	3,726	3,686	3,651	3,611	3,570	3,526	3,473	3,415	3,354	3,286	3,216	3,147
Processing	444	452	464	477	492	508	526	542	557	572	586	600	615
Seed	41	40	39	39	38	37	37	36	35	35	34	33	33
Loss	699	687	676	668	666	666	669	667	666	665	660	657	657
Exports	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Stocks	648	616	662	719	780	841	901	933	950	959	949	935	925
Prices	(Won / Kilogram)												
Farm	1,905	1,873	1,827	1,772	1,709	1,645	1,576	1,521	1,480	1,442	1,411	1,382	1,351
Wholesale	1,930	1,895	1,849	1,797	1,737	1,677	1,612	1,560	1,521	1,486	1,457	1,430	1,401
Consumer	2,237	2,199	2,150	2,094	2,031	1,966	1,897	1,843	1,801	1,764	1,732	1,704	1,673
International	645	857	808	800	817	815	828	819	829	820	825	817	817

Cabbage

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	(Thousand Hectares)												
Area	6.1	6.4	6.3	6.2	6.2	6.2	6.3	6.3	6.3	6.3	6.4	6.4	6.4
	(Kilograms / 10A)												
Yield	5,518	5,608	5,637	5,667	5,696	5,725	5,754	5,783	5,812	5,842	5,871	5,900	5,929
Supply	(Thousand Tons)												
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	334	359	352	350	354	357	361	364	367	370	374	376	379
Imports	5	3	5	5	5	5	5	6	6	6	6	6	6
Utilization													
Food	338	360	356	354	358	361	364	368	371	374	378	380	383
Exports	2	2	2	2	2	2	2	2	2	2	2	2	2
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices	(Won / Kilogram)												
Farm	252	220	238	251	254	257	259	261	263	264	265	267	270
Wholesale	451	399	429	449	455	460	463	466	468	470	472	475	480
Consumer	729	637	690	726	736	745	751	756	761	764	767	773	781

Carrot

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	2.3	2.5	2.3	2.2	2.2	2.1	2.1	2.0	2.0	1.9	1.9	1.9	1.9
							(Kilograms / 10A)						
Yield	3,606	3,934	3,975	4,006	4,038	4,073	4,108	4,143	4,177	4,211	4,246	4,280	4,315
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	82	97	90	88	87	86	84	83	82	82	81	81	80
Imports	87	87	93	97	101	105	108	111	114	116	118	120	122
Utilization													
Food	168	184	183	185	188	190	192	194	196	198	199	201	202
Exports	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Farm	539	377	459	437	414	404	389	389	379	371	365	362	362
Wholesale	742	548	633	607	579	566	549	547	535	526	519	515	515
Consumer	1,342	987	1,137	1,095	1,050	1,028	999	997	976	962	949	943	942

Green Onion (Welsh)

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	12.6	13.1	13.5	13.8	14.0	14.1	14.1	14.2	14.2	14.2	14.2	14.3	14.3
							(Kilograms / 10A)						
Yield	2,830	2,951	2,963	2,976	2,988	3,001	3,013	3,025	3,038	3,050	3,063	3,075	3,088
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	356	387	400	410	417	422	426	429	431	434	436	438	440
Imports	43	42	44	45	47	48	49	51	52	53	54	55	56
-Fresh	2	1	2	3	3	3	4	4	4	4	5	5	5
-Processing	40	41	42	43	44	45	46	47	48	49	50	51	51
Utilization													
Food	399	429	444	456	464	470	475	480	484	487	490	494	497
Exports	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Wholesale	961	914	936	933	938	953	968	984	1,000	1,020	1,039	1,058	1,078
Consumer	1,476	1,409	1,441	1,435	1,443	1,464	1,487	1,509	1,533	1,561	1,587	1,614	1,643

Green Onion (Wakegi)

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	5.6	5.4	5.4	5.3	5.2	5.1	5.0	5.0	4.9	4.8	4.7	4.6	4.5
							(Kilograms / 10A)						
Yield	2,381	2,350	2,360	2,370	2,380	2,390	2,400	2,410	2,420	2,430	2,440	2,450	2,460
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	133	127	128	125	124	122	121	119	118	116	114	112	110
Imports	2	2	2	2	2	2	2	2	2	2	2	2	2
Utilization													
Food	134	128	129	126	126	124	123	121	119	118	116	114	112
Exports	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Wholesale	1,596	1,806	1,691	1,784	1,767	1,786	1,785	1,794	1,801	1,808	1,817	1,835	1,861
Consumer	2,275	2,629	2,439	2,600	2,573	2,610	2,611	2,628	2,642	2,655	2,672	2,704	2,749

White Potato (Spring)

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	13.0	13.4	12.8	13.0	12.9	13.0	12.9	12.9	12.8	12.8	12.7	12.6	12.5
							(Kilograms / 10A)						
Yield	2,818	2,836	2,842	2,854	2,866	2,878	2,890	2,902	2,914	2,926	2,938	2,950	2,962
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	367	380	365	372	370	373	372	373	372	373	373	372	371
Imports	13	13	16	17	19	20	22	23	23	24	24	24	24
Utilization													
Food	380	394	381	390	389	393	394	396	396	397	396	396	395
Exports	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Farm	388	310	379	327	329	299	289	268	261	243	232	219	207
Wholesale	803	726	816	767	778	755	755	742	746	738	739	738	740

White Potato (Summer)

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	3.2	3.3	3.5	3.3	3.3	3.3	3.2	3.2	3.2	3.2	3.2	3.1	3.1
							(Kilograms / 10A)						
Yield	3,516	3,460	3,549	3,566	3,583	3,600	3,616	3,633	3,650	3,667	3,683	3,700	3,717
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	113	113	123	119	118	117	117	117	117	116	117	116	116
Imports	13	12	15	16	18	19	21	22	23	23	23	23	24
Utilization													
Food	126	126	138	135	136	137	138	139	139	139	140	140	140
Exports	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Farm	429	649	405	422	387	370	344	326	321	315	308	302	294
Wholesale	877	911	661	711	687	681	659	648	651	653	653	657	656

White Potato (Fall)

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	4.2	4.1	4.4	3.9	4.2	3.9	3.9	3.7	3.7	3.7	3.6	3.6	3.5
							(Kilograms / 10A)						
Yield	1,974	2,100	2,133	2,152	2,170	2,189	2,207	2,226	2,244	2,263	2,281	2,300	2,319
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	83	86	93	84	90	85	86	83	82	83	82	82	81
Imports	43	40	48	50	55	60	64	69	69	69	70	70	71
Utilization													
Food	126	126	140	135	146	145	150	152	151	152	152	152	153
Exports	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Farm	697	699	422	522	348	353	286	258	261	242	231	217	193
Wholesale	2,164	2,197	1,640	1,877	1,538	1,577	1,464	1,434	1,472	1,463	1,474	1,478	1,463

Chinese cabbage (Spring)

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	12.9	12.8	11.7	11.7	11.0	11.0	10.8	10.7	10.6	10.5	10.4	10.2	10.0
							(Kilograms / 10A)						
Yield	5,418	5,479	5,493	5,507	5,521	5,535	5,549	5,563	5,577	5,591	5,605	5,600	5,614
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	698	701	645	642	606	607	598	596	591	588	583	573	563
Imports	0	0	0	0	0	0	0	0	0	0	0	0	0
Utilization													
Food	698	700	644	641	605	606	596	595	590	587	582	572	562
Exports	1	1	1	1	1	1	1	1	1	1	2	2	2
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Farm	158	167	169	152	161	154	155	151	150	148	147	148	150
Wholesale	224	239	289	283	309	303	307	302	301	298	296	297	301
Consumer	386	407	468	459	493	485	489	483	482	477	475	476	481

Chinese cabbage (Summer)

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	6.3	6.3	6.1	5.8	5.6	5.5	5.3	5.2	5.0	4.9	4.7	4.6	4.4
							(Kilograms / 10A)						
Yield	4,011	4,019	4,027	4,035	4,043	4,051	4,060	4,068	4,076	4,084	4,092	4,100	4,108
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	253	255	245	233	228	221	216	210	205	199	193	188	182
Imports	1	0	0	0	0	1	1	1	1	2	2	2	3
Utilization													
Food	254	254	244	233	228	221	216	211	205	200	194	189	183
Exports	0	1	1	1	1	1	1	1	1	1	1	1	1
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Farm	337	272	259	272	265	268	267	270	271	273	276	279	284
Wholesale	643	570	578	625	618	629	631	637	641	646	652	660	670
Consumer	787	681	654	704	684	695	696	703	709	715	723	734	749

Chinese cabbage (Fall)

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	12	14	13	13	13	12	12	12	12	12	11	11	11
							(Kilograms / 10A)						
Yield	9,351	9,360	9,374	9,388	9,402	9,416	9,430	9,444	9,458	9,472	9,486	9,500	9,514
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	1,139	1,289	1,196	1,204	1,189	1,173	1,154	1,134	1,112	1,090	1,068	1,043	1,017
Imports	1	1	1	1	1	1	1	1	1	1	1	1	1
Utilization													
Food	1,140	1,287	1,194	1,201	1,186	1,170	1,151	1,131	1,109	1,087	1,064	1,040	1,014
Exports	0	3	3	3	3	3	3	4	4	4	4	4	4
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Farm	244	206	297	299	307	310	311	313	314	315	316	319	323
Wholesale	662	486	576	551	550	547	547	547	548	549	551	555	562
Consumer	953	684	791	750	744	739	737	737	738	740	742	748	758

Chinese cabbage (Winter)

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	2.9	3.4	3.1	3.1	3.1	3.0	3.0	3.0	2.9	2.9	2.9	2.8	2.8
							(Kilograms / 10A)						
Yield	4,974	4,800	4,814	4,828	4,842	4,856	4,870	4,884	4,898	4,912	4,926	5,000	5,014
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	143	165	150	151	149	148	147	145	144	143	142	142	140
Imports	0	2	3	3	3	3	3	3	3	3	3	3	3
Utilization													
Food	143	166	153	153	152	151	149	148	147	146	145	144	143
Exports	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Farm	148	243	344	311	327	325	329	328	330	329	330	319	328
Wholesale	221	395	588	535	569	572	584	587	594	597	601	584	603
Consumer	331	520	733	671	709	711	725	729	736	739	744	724	746

White Radish (Spring)

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	11.8	11.9	11.0	10.7	10.4	10.1	9.9	9.7	9.6	9.4	9.3	9.2	9.0
							(Kilograms / 10A)						
Yield	3,921	3,946	3,972	3,997	4,022	4,048	4,073	4,099	4,124	4,149	4,175	4,200	4,225
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	462	469	438	430	417	408	402	398	394	391	388	384	382
Imports	0	0	0	0	0	0	0	0	0	0	0	0	0
Utilization													
Food	459	467	437	428	416	407	401	397	393	390	387	383	381
Exports	3	1	1	1	1	1	1	1	1	1	1	1	1
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Wholesale	282	284	345	319	333	347	352	355	355	354	353	359	349
Consumer	487	491	625	588	619	648	659	664	665	663	661	672	654

White Radish (Summer)

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	2.6	2.5	2.3	2.1	2.0	2.0	1.9	1.8	1.7	1.7	1.6	1.5	1.5
							(Kilograms / 10A)						
Yield	2,828	2,934	2,946	2,959	2,972	2,986	2,999	3,012	3,025	3,038	3,051	3,063	3,076
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	73	73	68	63	61	58	57	55	53	51	49	47	45
Imports	0	0	0	0	0	0	0	0	0	0	0	0	0
Utilization													
Food	73	73	68	63	61	59	57	55	53	51	49	47	45
Exports	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Wholesale	505	454	392	421	393	399	397	402	407	414	424	435	459
Consumer	936	844	728	779	728	738	735	743	753	766	784	804	848

White Radish (Fall)

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	(Thousand Hectares)												
Area	7.2	7.5	7.0	6.9	6.8	6.6	6.4	6.1	5.9	5.7	5.4	5.2	5.0
	(Kilograms / 10A)												
Yield	6,409	6,567	6,550	6,556	6,559	6,562	6,565	6,566	6,567	6,565	6,562	6,520	6,510
Supply	(Thousand Tons)												
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	459	492	457	452	445	432	418	403	387	371	355	337	323
Imports	0	0	0	0	0	0	0	0	0	0	0	0	0
Utilization													
Food	459	492	457	452	445	432	418	403	387	371	355	337	323
Exports	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices	(Won / Kilogram)												
Wholesale	672	473	589	562	542	535	534	536	542	549	559	585	592
Consumer	1,096	742	1,020	1,008	990	988	990	996	1,008	1,021	1,038	1,085	1,097

White Radish (Winter)

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	(Thousand Hectares)												
Area	4.3	3.7	3.4	3.4	3.3	3.2	3.1	2.9	2.8	2.7	2.6	2.5	2.4
	(Kilograms / 10A)												
Yield	4,060	4,215	4,229	4,243	4,257	4,271	4,284	4,298	4,312	4,326	4,340	4,315	4,329
Supply	(Thousand Tons)												
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	175	158	143	143	140	135	131	126	122	117	113	107	104
Imports	0	0	0	0	0	0	0	0	0	0	0	0	0
Utilization													
Food	174	157	143	142	139	135	131	126	121	117	112	107	104
Exports	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices	(Won / Kilogram)												
Wholesale	236	315	405	334	311	301	292	286	283	279	276	287	274
Consumer	412	546	714	602	567	552	538	529	523	517	513	532	509

Water Melon

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	(Thousand Hectares)												
Area	19.0	17.8	17.5	16.9	16.3	15.9	15.5	15.2	15.0	14.7	14.5	14.3	14.0
	(Kilograms / 10A)												
Yield	3,899	3,914	3,948	3,969	3,984	3,999	4,012	4,026	4,038	4,049	4,060	4,070	4,081
Supply	(Thousand Tons)												
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	742	697	689	670	649	634	623	613	604	597	589	581	573
Imports	0	0	0	0	0	0	0	0	0	0	0	0	0
Utilization													
Food	742	697	689	670	649	634	623	613	604	597	589	581	573
Exports	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices	(Won / Kilogram)												
Farm	623	778	642	564	544	521	494	468	448	426	402	385	365
Wholesale	1,589	1,716	1,562	1,483	1,479	1,471	1,459	1,451	1,449	1,447	1,444	1,451	1,456
Consumer	2,059	2,216	2,033	1,946	1,952	1,955	1,951	1,952	1,960	1,969	1,975	1,994	2,010

Cham-Wei

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	(Thousand Hectares)												
Area	6.5	6.1	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.9	5.9	5.8	5.7
	(Kilograms / 10A)												
Yield	3,174	3,194	3,208	3,223	3,239	3,255	3,272	3,288	3,304	3,320	3,336	3,352	3,367
Supply	(Thousand Tons)												
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	205	196	192	195	195	196	197	197	197	197	196	195	194
Imports	0	0	0	0	0	0	0	0	0	0	0	0	0
Utilization													
Food	205	196	192	195	195	196	197	197	197	197	196	195	194
Exports	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices	(Won / Kilogram)												
Wholesale	2,216	2,599	2,608	2,538	2,554	2,536	2,498	2,458	2,427	2,390	2,348	2,320	2,289
Consumer	3,188	3,846	3,867	3,753	3,785	3,757	3,696	3,632	3,581	3,521	3,452	3,405	3,355

Cucumber

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	4.9	4.6	4.5	4.4	4.3	4.3	4.2	4.1	4.1	4.0	3.9	3.9	3.8
							(Kilograms / 10A)						
Yield	6,749	6,770	6,783	6,796	6,809	6,822	6,835	6,848	6,861	6,874	6,887	6,900	6,913
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	330	313	302	300	296	291	287	284	280	276	271	266	261
Imports	27	29	36	36	38	39	40	42	43	44	45	46	47
Utilization													
Food	357	341	337	336	333	330	328	325	323	319	316	312	308
Exports	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Wholesale	1,366	1,552	1,595	1,580	1,586	1,597	1,585	1,556	1,529	1,502	1,474	1,445	1,425
Consumer	2,478	2,838	2,943	2,930	2,956	2,994	2,984	2,939	2,897	2,854	2,808	2,762	2,731

Pumpkin

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	10.4	10.4	9.7	9.7	9.8	10.0	10.1	10.4	10.6	10.7	10.9	11.1	11.2
							(Kilograms / 10A)						
Yield	3,181	3,300	3,350	3,400	3,450	3,500	3,550	3,600	3,650	3,700	3,750	3,800	3,850
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	330	345	327	330	339	349	360	373	385	397	409	421	431
Imports	20	20	22	23	24	25	26	27	28	29	30	31	32
Utilization													
Food	350	365	348	352	363	374	386	400	413	426	439	451	462
Exports	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Wholesale	1,810	1,600	1,778	1,834	1,859	1,877	1,884	1,881	1,879	1,877	1,877	1,879	1,887
Consumer	3,069	3,021	3,490	3,640	3,708	3,761	3,782	3,779	3,775	3,774	3,778	3,785	3,808

Tomato

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	7.4	7.7	7.7	7.7	7.8	7.9	7.9	8.0	8.0	8.1	8.1	8.1	8.2
							(Kilograms / 10A)						
Yield	6,526	6,536	6,608	6,671	6,738	6,812	6,887	6,964	7,041	7,118	7,196	7,273	7,351
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	480	500	507	517	525	536	546	555	565	574	583	591	599
Imports	71	75	76	77	78	79	80	81	82	83	83	84	85
Utilization													
Food	546	571	574	581	588	597	606	615	624	632	641	650	658
Exports	5	4	9	12	15	18	20	21	23	24	25	25	26
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Wholesale	1,879	1,849	1,871	1,887	1,931	1,948	1,954	1,958	1,966	1,971	1,970	1,979	1,983
Consumer	2,657	2,608	2,645	2,672	2,745	2,773	2,783	2,790	2,802	2,811	2,809	2,823	2,831

Strawberry

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	6.7	6.6	6.6	6.4	6.3	6.2	6.1	6.0	5.9	5.8	5.6	5.5	5.3
							(Kilograms / 10A)						
Yield	3,049	3,042	3,102	3,171	3,244	3,319	3,398	3,479	3,562	3,645	3,730	3,815	3,901
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	203	200	204	204	205	207	208	209	209	210	210	209	209
Imports	7	7	7	7	8	8	8	9	9	9	10	10	10
Utilization													
Food	210	207	211	212	213	215	216	217	218	219	219	219	219
Exports	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Wholesale	6,227	6,954	6,468	6,495	6,549	6,538	6,531	6,559	6,612	6,662	6,729	6,901	7,037
Consumer	7,255	8,307	7,753	7,868	7,982	7,986	7,984	8,029	8,108	8,182	8,279	8,528	8,725

Melon

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	1.7	1.8	1.8	1.8	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0
							(Kilograms / 10A)						
Yield	2,747	2,848	2,912	2,920	2,942	2,973	3,000	3,029	3,057	3,086	3,115	3,144	3,173
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	48	51	53	54	55	57	58	59	60	62	63	64	65
Imports	0	0	0	0	0	0	0	0	0	0	0	0	0
Utilization													
Food	46	49	51	52	53	55	56	57	58	59	60	61	62
Exports	2	2	2	2	2	2	2	2	3	3	3	3	3
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Wholesale	2,244	2,153	2,157	2,228	2,300	2,363	2,429	2,491	2,560	2,623	2,686	2,749	2,814

Eggplant

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	0.9	0.9	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
							(Kilograms / 10A)						
Yield	4,970	4,560	4,647	4,705	4,775	4,855	4,927	5,000	5,072	5,145	5,217	5,290	5,362
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	46	43	44	44	45	45	46	46	46	46	47	47	47
Imports	0	0	0	0	0	0	0	0	0	0	0	0	0
Utilization													
Food	46	42	44	44	44	44	45	45	45	46	46	46	46
Exports	0	1	1	1	1	1	1	1	1	1	1	1	1
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Wholesale	1,367	1,579	1,492	1,491	1,491	1,489	1,493	1,497	1,505	1,513	1,524	1,536	1,550
Consumer	2,958	3,694	3,482	3,561	3,635	3,695	3,770	3,840	3,916	3,988	4,063	4,141	4,224

Sesame

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	31	32	30	28	27	26	26	25	25	25	25	25	25
							(Kilograms / 10A)						
Yield	56	58	63	63	63	64	65	66	66	67	68	68	69
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	18	18	19	17	17	17	17	17	17	17	17	17	17
Imports	65	64	66	68	70	71	73	74	74	75	75	76	77
Utilization													
Food	83	82	85	86	87	88	89	91	91	92	92	93	94
Exports	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Farm	10,698	10,132	9,942	9,907	9,870	9,809	9,755	9,699	9,727	9,745	9,722	9,689	9,664
Wholesale	14,180	12,833	12,572	12,562	12,516	12,409	12,307	12,199	12,257	12,295	12,248	12,182	12,132
Consumer	20,829	17,575	16,684	16,649	16,492	16,126	15,779	15,409	15,608	15,736	15,575	15,350	15,179

Perilla Seed

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	29	29	28	26	25	24	23	22	21	20	19	19	18
							(Kilograms / 10A)						
Yield	77	77	77	77	78	78	78	78	78	79	79	79	79
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	22	22	21	20	19	19	18	17	16	16	15	15	14
Imports	30	29	29	30	31	31	32	33	34	34	35	36	36
Utilization													
Food	52	51	51	50	50	50	50	50	50	50	50	51	50
Exports	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Farm	3,680	3,572	3,538	3,601	3,558	3,451	3,338	3,216	3,206	3,160	3,063	2,963	2,901
Wholesale	4,653	4,178	3,958	3,918	3,833	3,714	3,603	3,489	3,477	3,435	3,348	3,260	3,204
Consumer (Index)	-	-	-	-	-	-	-	-	-	-	-	-	-

Peanuts

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	(Thousand Hectares)												
Area	3.3	3.4	3.4	3.3	3.2	3.1	3.0	2.9	2.7	2.8	2.8	2.8	2.8
	(Kilograms / 10A)												
Yield	217	218	219	219	220	221	222	223	223	224	225	225	226
Supply	(Thousand Tons)												
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	7	7	7	7	7	7	7	6	6	6	6	6	6
Imports	41	41	42	43	44	46	47	48	49	50	51	52	52
Utilization													
Food	48	48	49	50	51	52	54	55	55	56	57	58	59
Exports	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices	(Won / Kilogram)												
Farm	2,195	2,337	2,364	2,406	2,364	2,347	2,319	2,289	2,364	2,384	2,412	2,444	2,474
Wholesale	5,835	6,022	6,057	6,111	6,057	6,034	5,998	5,959	6,056	6,083	6,119	6,162	6,201
Consumer	7,756	7,966	8,007	8,068	8,006	7,981	7,939	7,895	8,006	8,036	8,076	8,125	8,169

Apples

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	(Thousand Hectares)												
Area	29.4	30.0	30.8	30.9	30.6	30.2	29.7	28.9	27.8	26.7	25.6	24.5	23.5
Young	10.6	11.5	11.9	11.7	11.0	10.3	9.6	8.8	8.0	7.3	6.6	6.0	5.4
Adult	18.8	18.5	18.9	19.2	19.6	20.0	20.2	20.1	19.8	19.4	19.0	18.6	18.1
	(Kilograms / 10A)												
Yield	2,318	2,274	2,290	2,297	2,303	2,310	2,317	2,323	2,330	2,337	2,343	2,350	2,357
Supply	(Thousand Tons)												
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	436	421	433	441	451	462	467	466	461	453	445	436	426
Imports	84	85	86	88	91	93	96	98	102	105	108	111	114
Utilization													
Food	518	504	517	527	540	552	560	562	560	556	551	545	537
Exports	1.9	2.2	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.5	2.5	2.5	2.5
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices	(Won / Kilogram)												
Farm	1,024	1,136	1,153	1,148	1,107	1,042	985	948	925	904	882	861	846
Wholesale	3,341	3,566	3,604	3,598	3,522	3,394	3,284	3,213	3,170	3,129	3,087	3,048	3,021
Consumer	4,523	4,847	4,912	4,913	4,812	4,637	4,486	4,390	4,335	4,280	4,226	4,173	4,138

Asian Pears

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	19.9	18.4	17.8	17.3	16.8	16.4	16.0	15.7	15.5	15.4	15.3	15.3	15.3
Young	2.4	1.8	1.9	2.0	2.2	2.4	2.5	2.7	2.8	3.0	3.2	3.4	3.6
Adult	17.5	16.6	15.9	15.3	14.6	14.0	13.5	13.1	12.7	12.3	12.1	11.8	11.6
							(Kilograms / 10A)						
Yield	2,668	2,788	2,791	2,794	2,798	2,801	2,804	2,807	2,810	2,814	2,817	2,820	2,823
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	467	463	445	428	410	393	379	366	356	347	340	334	328
Imports	6	4	4	3	4	4	4	5	5	5	5	6	6
Utilization													
Food	452	445	421	401	381	363	347	334	322	313	304	297	290
Exports	21	22	27	30	33	34	36	37	39	40	41	42	44
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Farm	613	773	764	769	785	801	817	841	871	898	923	945	968
Wholesale	1,743	2,031	2,015	2,024	2,053	2,080	2,110	2,152	2,206	2,254	2,299	2,338	2,379
Consumer	3,085	3,178	3,157	3,168	3,206	3,242	3,281	3,336	3,406	3,468	3,526	3,578	3,631

Grapes

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	18.8	18.1	17.8	17.5	17.2	16.9	16.5	16.1	15.7	15.3	15.0	14.6	14.3
Young	2.9	3.0	3.0	3.0	2.9	2.9	2.8	2.7	2.6	2.5	2.5	2.4	2.4
Adult	15.9	15.2	14.8	14.5	14.2	14.0	13.7	13.4	13.1	12.8	12.5	12.2	11.9
							(Kilograms / 10A)						
Yield	1,929	2,011	2,025	2,039	2,053	2,067	2,081	2,094	2,108	2,122	2,136	2,150	2,164
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	307	305	299	296	292	289	286	281	277	271	266	262	257
Imports	31	31	32	32	33	34	34	35	36	36	37	38	38
Utilization													
Food	338	336	330	327	325	322	320	316	312	307	303	299	295
Exports	0.3	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Farm	1,936	2,144	2,168	2,161	2,156	2,135	2,114	2,111	2,129	2,139	2,143	2,141	2,133
Wholesale	3,665	4,034	4,076	4,064	4,056	4,019	3,980	3,976	4,007	4,026	4,033	4,028	4,014
Consumer	5,431	5,762	5,814	5,799	5,790	5,744	5,697	5,692	5,730	5,753	5,761	5,756	5,739

Peaches

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	13.2	13.7	14.0	14.2	14.3	14.4	14.6	14.9	15.1	15.4	15.6	15.8	16.1
Young	3.8	3.9	4.2	4.4	4.5	4.5	4.6	4.7	4.9	5.0	5.1	5.2	5.3
Adult	9.4	9.8	9.8	9.8	9.8	9.9	10.0	10.1	10.3	10.4	10.5	10.6	10.8
							(Kilograms / 10A)						
Yield	2,228	2,237	2,247	2,257	2,267	2,277	2,287	2,297	2,307	2,317	2,327	2,337	2,347
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	209	219	219	220	222	225	229	233	237	240	244	248	253
Imports	18	16	18	20	21	22	22	23	23	23	24	24	24
Utilization													
Food	227	234	237	239	242	246	251	255	259	263	267	272	276
Exports	0.2	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Farm	917	1,078	1,101	1,122	1,143	1,156	1,166	1,176	1,190	1,201	1,212	1,222	1,231
Wholesale	3,009	3,030	3,172	3,290	3,400	3,467	3,516	3,565	3,629	3,685	3,735	3,782	3,826
Consumer	6,133	6,097	6,214	6,348	6,505	6,560	6,573	6,589	6,646	6,681	6,694	6,695	6,684

Tangerines

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	21.5	21.4	21.2	21.0	20.7	20.5	20.2	19.8	19.4	19.0	18.5	18.0	17.4
Young	0.6	0.5	0.4	0.4	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1
Adult	20.9	20.9	20.8	20.6	20.4	20.2	20.0	19.7	19.3	18.9	18.4	17.9	17.4
							(Kilograms / 10A)						
Yield	3,378	3,100	3,120	3,140	3,160	3,180	3,200	3,220	3,240	3,260	3,280	3,300	3,320
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	706	647	648	646	645	643	639	634	626	616	604	591	577
Imports	0.1	0.2	0.1	0.2	0.4	0.8	1.2	1.6	1.8	2.1	2.5	3.0	3.4
Utilization													
Food	702	642	642	640	639	637	633	627	619	609	597	584	570
Exports	4	5	6	7	7	8	8	8	9	9	10	10	10
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Farm	716	984	889	832	791	755	727	709	700	694	693	696	704
Wholesale	1,095	1,481	1,391	1,353	1,338	1,328	1,330	1,345	1,371	1,402	1,439	1,481	1,530
Consumer	2,208	3,155	2,907	2,792	2,731	2,685	2,665	2,678	2,720	2,773	2,839	2,917	3,010

Sweet Persimmons

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	16.3	16.0	15.5	15.1	14.9	14.8	14.7	14.6	14.5	14.5	14.5	14.5	14.5
Young	2.1	2.1	2.0	1.9	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.9	1.9
Adult	14.2	13.9	13.5	13.2	13.1	13.0	12.9	12.9	12.8	12.7	12.6	12.6	12.6
							(Kilograms / 10A)						
Yield	1,764	1,700	1,705	1,710	1,715	1,720	1,725	1,730	1,735	1,740	1,745	1,750	1,755
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	251	236	230	225	224	224	223	222	222	221	221	221	221
Imports	0.02	0.01	0.01	0.02	0.03	0.03	0.04	0.05	0.06	0.07	0.08	0.08	0.09
Utilization													
Food	246	231	224	219	218	217	216	214	213	212	212	211	211
Exports	5	5	6	6	7	7	8	8	8	9	9	10	10
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Farm	776	1,194	1,226	1,273	1,290	1,298	1,327	1,381	1,450	1,516	1,583	1,647	1,707
Wholesale	1,974	2,643	2,694	2,770	2,797	2,810	2,857	2,944	3,055	3,161	3,268	3,369	3,465
Consumer	3,197	4,020	4,083	4,177	4,210	4,226	4,284	4,391	4,527	4,657	4,789	4,914	5,032

Ginseng

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	17.8	19.3	20.7	21.5	22.0	22.5	22.9	23.4	24.0	24.5	25.2	25.9	26.6
Young	9.2	10.3	11.2	11.9	12.1	12.4	12.6	12.9	13.2	13.6	13.9	14.3	14.8
New Planted	4.9	5.0	5.1	4.9	4.9	5.1	5.2	5.3	5.4	5.6	5.7	5.9	6.0
Harvested	3.8	4.0	4.4	4.7	4.9	5.0	5.1	5.2	5.3	5.4	5.5	5.7	5.8
							(Kilograms / 10A)						
Yield	574	581	588	595	602	609	615	622	629	636	643	650	657
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	22	23	26	28	30	31	31	32	33	35	36	37	38
Imports	2	2	2	2	2	3	3	3	4	4	4	4	4
Utilization													
Food	19	21	23	26	27	29	30	31	32	33	34	35	37
Exports	4	4	4	5	5	5	5	5	5	5	5	5	5
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Farm	30,097	29,968	29,357	29,047	29,169	29,694	30,211	30,632	31,188	31,698	32,186	32,629	32,975
Wholesale	42,926	42,774	41,610	41,019	41,275	42,329	43,361	44,201	45,310	46,327	47,299	48,184	48,873
Consumer (Index)	97	97	94	93	93	96	98	100	103	105	107	109	111

Broiler

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Million Head)						
Slaughter	638	660	675	687	700	716	725	730	738	744	749	754	758
Broiler Inventory	67	68	69	70	71	72	73	74	74	75	75	75	76
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	337	347	354	361	368	376	381	384	388	391	394	396	398
Imports	60	52	50	50	53	54	58	62	64	67	70	74	77
US	*19*	*18*	*20*	*21*	*24*	*26*	*29*	*32*	*35*	*38*	*41*	*45*	*48*
RE	*40*	*34*	*31*	*29*	*29*	*28*	*29*	*29*	*29*	*29*	*29*	*29*	*29*
Utilization													
Food	391	393	397	401	409	419	426	432	438	443	449	455	460
Exports	6	6	8	10	11	12	12	13	14	14	15	15	16
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Farm	1,118	1,211	1,232	1,225	1,265	1,269	1,266	1,265	1,268	1,269	1,274	1,278	1,279
Wholesale	2,030	2,212	2,258	2,247	2,328	2,338	2,335	2,335	2,343	2,347	2,357	2,366	2,371
Consumer	3,621	3,804	3,880	3,882	4,001	4,027	4,034	4,045	4,065	4,078	4,099	4,118	4,129

Hen & Eggs

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Million Head)						
Hen Inventory	56	56	57	57	57	58	58	59	59	59	59	59	59
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	554	560	564	569	574	579	585	591	595	598	601	603	605
Imports	3	2	2	2	3	3	3	3	3	3	3	4	4
Utilization													
Food	556	562	566	571	576	582	588	594	598	602	604	607	609
Exports	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Farm	787	811	809	840	879	900	903	899	908	923	941	958	978
Wholesale	995	1,023	1,020	1,057	1,102	1,126	1,130	1,125	1,136	1,154	1,174	1,194	1,217
Consumer	1,289	1,322	1,318	1,361	1,414	1,443	1,447	1,441	1,454	1,475	1,498	1,522	1,550

Pigs & Pork

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Million Head)						
Total Inventory	9.52	9.22	9.17	9.02	8.89	8.83	8.82	8.81	8.75	8.66	8.54	8.42	8.31
Sows	1.01	0.97	0.93	0.91	0.89	0.88	0.88	0.87	0.85	0.84	0.82	0.81	0.79
Pigs	8.47	8.21	8.20	8.07	7.96	7.91	7.91	7.90	7.86	7.78	7.68	7.57	7.47
Slaughter	13.60	13.35	13.33	13.23	13.06	12.96	12.97	12.99	12.93	12.80	12.61	12.40	12.20
MSY (Head)	13.6	13.2	13.7	14.2	14.4	14.6	14.7	14.8	14.9	15.0	15.0	15.1	15.1
Supply							(Thousand Tons)						
Beginning Stocks	48	55	55	52	50	50	49	49	49	49	49	49	49
Production	708	705	706	704	700	698	700	703	703	699	693	686	679
Imports	248	227	225	232	248	262	275	288	302	314	326	338	352
US	*70*	*75*	*78*	*81*	*87*	*91*	*93*	*94*	*96*	*99*	*103*	*107*	*110*
CH	*32*	*27*	*24*	*24*	*25*	*27*	*32*	*38*	*43*	*46*	*48*	*50*	*53*
RE	*146*	*125*	*124*	*127*	*136*	*143*	*149*	*156*	*163*	*169*	*176*	*182*	*189*
Utilization													
Food	937	919	922	925	935	947	963	979	992	1,000	1,007	1,011	1,018
Exports	13	13	13	13	13	13	13	13	13	13	13	13	13
Ending Stocks	55	55	52	50	50	49	49	49	49	49	49	49	49
Prices							(Thousand Won / Head)						
Farm (Hog)	221.0	243.3	252.1	258.4	275.4	287.5	291.8	293.0	296.3	303.3	313.4	324.6	333.2
Farm (Pig)	85.0	93.8	97.3	99.8	106.5	111.3	113.0	113.5	114.8	117.5	121.6	126.0	129.4
							(Won / Kilogram)						
Wholesale	3,255	3,565	3,693	3,786	4,028	4,202	4,267	4,287	4,339	4,441	4,588	4,749	4,875
Consumer	14,246	15,332	15,780	16,105	16,952	17,559	17,786	17,859	18,039	18,397	18,912	19,475	19,915

Cattle & Beef

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Million Head)						
Total Inventory	2.20	2.37	2.42	2.33	2.22	2.12	2.02	1.93	1.82	1.69	1.55	1.40	1.24
Females Under 1 Year	0.33	0.37	0.36	0.34	0.33	0.31	0.30	0.28	0.27	0.25	0.23	0.21	0.18
Females 1-2 Years	0.24	0.26	0.29	0.25	0.25	0.24	0.22	0.21	0.20	0.19	0.18	0.16	0.14
Females Over 2 Years	0.82	0.87	0.86	0.85	0.80	0.77	0.75	0.71	0.66	0.62	0.57	0.51	0.45
Males Under 1 Year	0.42	0.47	0.46	0.44	0.43	0.41	0.40	0.38	0.36	0.34	0.32	0.29	0.26
Males 1-2 Years	0.32	0.33	0.39	0.35	0.34	0.32	0.29	0.28	0.26	0.23	0.21	0.18	0.14
Males Over 2 Years	0.07	0.07	0.07	0.08	0.07	0.07	0.07	0.06	0.06	0.06	0.06	0.06	0.05
Slaughter	0.62	0.71	0.83	0.94	0.87	0.83	0.78	0.73	0.71	0.67	0.62	0.56	0.50
Females	0.24	0.28	0.35	0.40	0.36	0.35	0.33	0.32	0.31	0.30	0.28	0.27	0.25
Males	0.38	0.43	0.48	0.54	0.50	0.48	0.45	0.42	0.40	0.37	0.33	0.29	0.25
Supply							(Thousand Tons)						
Beginning Stocks	35	44	54	64	73	76	79	82	84	87	90	92	94
Production	172	195	241	277	266	260	250	239	233	226	212	197	182
Imports	203	223	218	220	246	271	295	318	339	362	387	413	438
US	*15*	*50*	*56*	*66*	*90*	*113*	*136*	*158*	*180*	*201*	*225*	*248*	*272*
AU	*147*	*137*	*130*	*125*	*127*	*127*	*128*	*129*	*129*	*129*	*130*	*132*	*133*
RE	*41*	*36*	*32*	*29*	*30*	*30*	*31*	*31*	*31*	*31*	*32*	*33*	*34*
Utilization													
Food	366	407	450	488	509	527	542	555	570	585	597	608	619
Exports	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Stocks	44	54	64	73	76	79	82	84	87	90	92	94	96
Prices							(Thousand Won / Head)						
Farm (Female Calf)	2,306	1,801	1,513	1,252	1,430	1,559	1,651	1,727	1,763	1,799	1,892	1,991	2,082
Farm (Male Calf)	2,136	1,624	1,299	1,013	1,097	1,163	1,207	1,250	1,268	1,290	1,363	1,444	1,522
Farm (Female)	4,972	4,163	3,402	2,778	2,946	3,073	3,164	3,249	3,281	3,323	3,467	3,626	3,777
Farm (Male)	4,768	3,927	3,054	2,415	2,467	2,534	2,585	2,644	2,668	2,702	2,821	2,954	3,080
							(Won / Kilogram)						
Wholesale	11,870	10,307	8,593	7,356	7,437	7,554	7,638	7,733	7,765	7,816	8,028	8,265	8,489
Consumer	31,222	27,778	25,173	23,150	23,751	24,262	24,597	24,898	25,024	25,170	25,656	26,190	26,690

Dairy

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Head)						
Total Inventory	453	444	427	418	411	405	401	398	391	383	376	369	362
Females Under 1 Year	92	89	79	75	73	72	72	72	70	66	63	60	57
Females 1-2 Years	104	105	105	103	102	102	102	102	101	100	99	98	97
Females Over 2 Years	258	250	243	239	235	231	227	224	221	217	214	211	208
Milk Cow	237	229	223	218	214	210	207	204	201	198	195	193	190
		-7.57	-6.31	-4.40	-4.15	-3.86	-3.46	-3.06	-2.90	-2.92	-2.87	-2.72	-2.75
Milk Production per Cow	9.25	9.46	9.65	9.83	10.00	10.15	10.29	10.42	10.54	10.66	10.76	10.87	10.96
Production							(Thousand Tons)						
Milk	2,188	2,169	2,152	2,148	2,142	2,136	2,130	2,125	2,120	2,111	2,102	2,092	2,080
Drinking	1,582	1,576	1,555	1,544	1,532	1,520	1,510	1,502	1,493	1,481	1,468	1,455	1,440
Processing	605	593	597	604	610	615	619	623	627	630	634	637	641
Whole Milk Powder	4	4	4	4	5	5	5	5	5	5	5	5	5
Nonfat Dry Milk	22	19	17	19	20	21	21	20	20	20	20	20	20
Infant Formula	15	14	13	13	13	13	12	12	12	12	12	12	12
Concentrated Milk	4	4	4	4	4	4	4	4	4	4	5	5	5
Butter	4	4	4	4	4	4	4	4	4	4	4	4	4
Cheese	24	22	24	25	27	28	29	30	32	33	35	37	38
Fermented Milk	486	479	484	487	491	495	498	500	502	504	506	508	510
Imports													
Infant Formula	2	3	3	3	3	3	3	3	3	3	3	3	3
Whole Milk Powder	1	0	1	1	2	2	2	2	2	2	2	3	3
Nonfat Dry Milk	5	6	6	6	7	8	8	9	9	9	9	10	10
Butter	4	4	4	4	4	4	4	4	4	5	5	5	5
Concentrated Milk	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheese	49	46	47	51	57	63	69	75	81	87	93	99	105
Fermented Milk	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Farm (Milk)	728	838	843	849	855	860	865	869	874	878	881	884	887
							(Index)						
Consumer (Infant Formula)	102	119	121	121	121	122	121	121	121	121	120	120	119
Consumer (Whole Milk Powder)	158	160	151	147	147	149	150	152	155	158	161	163	166
Consumer (Nonfat Dry Milk)	162	178	177	171	171	173	176	178	182	185	188	191	194
Consumer (Cheese)	104	113	118	122	125	129	133	136	141	145	149	153	158
Consumer (Fermented Milk)	104	112	118	123	129	134	139	143	146	150	152	155	158

Red Pepper

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	54.9	48.8	45.7	44.3	41.8	41.4	40.9	40.8	40.3	40.2	40.0	39.7	39.3
							(Kilograms / 10A)						
Yield	292	277	277	278	279	280	281	283	284	285	286	287	288
Supply							(Thousand Tons)						
Beginning Stocks	4	4	4	4	4	4	4	4	4	4	4	4	4
Production	160	135	126	123	117	116	115	115	114	115	114	114	113
Imports	88	92	92	92	96	96	98	99	100	101	102	103	105
-TRQ	7	7	7	9	10	12	13	15	15	15	15	15	15
-Powder & Dry	10	14	15	16	18	19	21	22	22	23	23	24	24
-Processing	78	78	77	76	77	77	77	78	78	78	79	80	81
Utilization													
Food	239	217	209	205	202	202	202	203	203	203	204	204	205
Exports	9	9	10	10	10	11	11	11	12	12	12	13	13
Ending Stocks	4	4	4	4	4	4	4	4	4	4	4	4	4
Prices							(Won / Kilogram)						
Farm	6,060	7,401	7,154	6,625	6,795	6,431	6,237	5,976	6,148	6,213	6,290	6,407	6,534
Wholesale	7,000	8,573	8,369	7,798	8,023	7,615	7,400	7,105	7,316	7,400	7,501	7,646	7,803
Consumer	9,579	11,394	11,244	10,660	10,972	10,562	10,370	10,088	10,379	10,530	10,700	10,922	11,161

Soybean

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	76	74	82	85	86	87	87	88	87	88	89	90	91
							(Kilograms / 10A)						
Yield	150	164	168	169	170	172	173	174	174	175	176	177	178
Supply							(Thousand Tons)						
Beginning Stocks	170	173	164	182	197	211	226	240	255	260	262	263	264
Production	114	122	138	145	147	149	151	152	153	155	157	160	162
Imports	1,495	1,475	1,546	1,579	1,617	1,656	1,693	1,734	1,735	1,733	1,731	1,726	1,718
Utilization													
Food and Processing	431	455	478	497	512	525	536	547	554	561	567	573	579
Feed, Seed, and Loss	1,176	1,151	1,188	1,211	1,237	1,266	1,293	1,324	1,328	1,325	1,319	1,312	1,302
Exports	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Stocks	173	164	182	197	211	226	240	255	260	262	263	264	263
Prices							(Won / Kilogram)						
Farm	2,307	3,083	3,067	2,776	2,567	2,343	2,126	1,924	1,868	1,803	1,744	1,688	1,638
Wholesale	2,360	3,136	3,119	2,828	2,619	2,395	2,179	1,977	1,921	1,856	1,797	1,741	1,691
Consumer	4,690	5,577	5,558	5,226	4,987	4,731	4,483	4,252	4,188	4,114	4,046	3,983	3,925
International	294.4	404.3	356.5	341.5	338.9	331.7	325.7	317.6	311.5	301.0	292.9	287.9	288.2

Corn

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	17.0	16.4	14.9	13.6	13.1	12.7	12.4	11.9	11.8	11.6	11.4	11.1	10.8
							(Kilograms / 10A)						
Yield	488	489	492	494	497	499	502	505	508	510	513	516	519
Supply							(Thousand Tons)						
Beginning Stocks	512	465	412	489	549	615	685	767	780	793	804	814	822
Production	83	80	73	67	65	64	62	60	60	59	58	57	56
Imports	9,114	9,180	9,861	10,216	10,727	11,359	12,260	12,430	12,644	12,806	12,971	13,094	13,203
Utilization													
Food and Processing	2,007	1,950	2,002	2,058	2,132	2,227	2,367	2,387	2,407	2,426	2,446	2,459	2,472
Feed, Seed, and Loss	7,236	7,363	7,856	8,165	8,594	9,125	9,875	10,089	10,284	10,429	10,573	10,684	10,781
Exports	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Stocks	465	412	489	549	615	685	767	780	793	804	814	822	829
Prices							(Won / Kilogram)						
Farm (domestic sweat corn)	593	658	734	818	823	813	776	817	813	822	829	843	863
International	194	267	263	267	268	270	268	267	263	259	253	253	253

Sweet Potato

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	16	16	17	17	17	17	17	17	17	17	17	17	17
							(Kilograms / 10A)						
Yield	563	567	572	576	580	584	589	593	597	601	605	608	612
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	92	93	94	96	97	98	99	100	101	101	102	103	103
Imports	0	0	0	0	0	0	0	0	0	0	0	0	0
Utilization													
Food	92	93	94	96	97	98	99	100	101	101	102	103	103
Exports	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Farm	910	918	906	892	885	886	888	891	896	905	916	925	935
Wholesale	1,356	1,385	1,384	1,378	1,380	1,393	1,407	1,421	1,436	1,458	1,480	1,501	1,520
Consumer	2,440	2,494	2,492	2,480	2,484	2,509	2,533	2,559	2,587	2,625	2,666	2,703	2,739

Fresh Pepper

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	6.0	6.2	6.2	6.1	6.2	6.2	6.3	6.4	6.5	6.5	6.6	6.7	6.8
							(Kilograms / 10A)						
Yield	4,253	4,335	4,402	4,468	4,535	4,601	4,668	4,734	4,801	4,867	4,934	5,000	5,066
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	254	268	271	275	280	287	294	302	310	319	327	335	342
Imports	0	0	0	0	0	0	0	0	0	0	0	0	0
Utilization													
Food	254	268	271	275	280	287	294	302	310	319	327	335	342
Exports	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Wholesale	3,343	3,193	3,045	3,011	3,039	3,068	3,084	3,093	3,100	3,099	3,096	3,100	3,109
Consumer	5,012	4,795	4,678	4,686	4,762	4,828	4,871	4,899	4,924	4,936	4,946	4,965	4,993

Kim Chi

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Supply							(Thousand Tons)						
Production	1,213	1,323	1,227	1,225	1,195	1,183	1,164	1,148	1,129	1,111	1,092	1,070	1,046
Spring	352	359	330	329	311	311	306	306	303	301	299	294	289
Summer	115	116	112	106	104	101	98	96	93	91	88	86	83
Fall	674	763	709	713	704	695	684	672	659	646	632	618	602
Winter	71	84	77	77	76	76	75	75	74	73	73	73	72
Imports	219	241	264	289	317	345	373	400	428	455	482	509	537
Spring	60	73	90	106	123	138	154	169	185	200	215	230	245
Summer	51	48	47	48	48	49	49	49	49	50	50	50	50
Fall	77	88	93	102	112	124	135	147	159	171	184	196	208
Winter	32	33	34	34	34	34	34	34	34	34	34	34	34
Utilization							(Thousand Tons)						
Food	1,405	1,537	1,462	1,483	1,479	1,494	1,502	1,513	1,520	1,529	1,536	1,541	1,543
Spring	403	423	410	424	421	437	448	462	474	487	499	509	518
Summer	160	157	151	146	144	141	139	136	133	130	128	125	122
Fall	744	844	794	807	809	811	811	811	811	810	808	806	802
Winter	98	112	106	106	106	105	104	104	103	102	101	101	100
Exports	26.5	27.9	30.1	31.6	32.8	33.7	34.6	35.5	36.4	37.2	38.0	38.8	39.7
Spring	8	9	10	11	12	13	13	13	14	14	15	15	15
Summer	6	7	8	8	8	9	9	9	10	10	10	10	11
Fall	7	7	7	8	8	8	8	8	8	8	8	8	8
Winter	4	5	5	5	5	5	5	5	5	5	6	6	6
Prices							($ / Kilogram)						
Export Price	3	3	3	3	3	3	3	3	3	3	3	3	3

Orange & Tropical Fruits

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Orange							(Thousand Tons)						
Imports	168	171	169	174	182	189	195	200	203	205	207	210	212
Tropical Fruits													
Imports	371	370	399	421	441	456	468	476	483	490	496	502	508

Flowering Plants

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	7.5	7.8	7.8	7.9	8.0	8.1	8.2	8.4	8.5	8.6	8.7	8.8	8.8
Cut Flower	2.4	2.4	2.6	2.6	2.7	2.7	2.8	2.8	2.9	2.9	2.9	3.0	3.0
Potting Flower	1.3	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Others	3.9	4.1	4.0	4.0	4.1	4.2	4.2	4.3	4.3	4.4	4.4	4.5	4.5
							(Ten millions/ 10A)						
Yield	27.9	28.0	29.0	29.6	30.0	30.4	30.8	31.2	31.5	31.9	32.2	32.6	32.8
Cut Flower	54.5	55.3	56.1	56.9	57.8	58.6	59.4	60.2	61.0	61.8	62.6	63.4	64.2
Potting Flower	25.1	24.6	25.6	26.2	26.6	26.8	26.9	27.0	27.1	27.2	27.3	27.3	27.4
Others	12.6	12.7	12.8	12.9	13.0	13.1	13.2	13.3	13.4	13.5	13.6	13.7	13.7
Supply							(Million Buds)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	2,095	2,172	2,265	2,340	2,402	2,469	2,537	2,605	2,671	2,737	2,803	2,855	2,902
Cut Flower	1,292	1,352	1,437	1,494	1,540	1,589	1,640	1,691	1,740	1,790	1,840	1,878	1,912
Potting Flower	316	304	315	324	330	335	341	346	351	357	362	366	369
Others	487	516	512	522	533	545	557	568	579	590	601	611	620
Imports	84	86	88	90	92	94	96	98	99	100	101	103	104
Cut Flower	9	9	9	9	9	9	9	9	9	9	9	10	10
Potting Flower	43	46	47	47	48	50	51	53	54	55	56	57	58
Others	32	31	33	34	35	35	36	36	36	36	36	37	37
Utilization													
Demand	2,039	2,105	2,194	2,266	2,325	2,388	2,453	2,517	2,578	2,640	2,701	2,749	2,791
Cut Flower	1,223	1,276	1,359	1,413	1,456	1,502	1,550	1,598	1,645	1,692	1,739	1,775	1,806
Potting Flower	297	282	290	297	302	307	311	315	319	323	326	328	331
Others	519	547	545	555	567	579	591	603	614	625	636	646	655
Exports	140	153	159	164	170	175	181	186	192	197	203	209	215
Cut Flower	77	84	87	90	93	96	99	102	104	107	110	113	116
Potting Flower	63	68	71	74	76	79	81	83	86	89	91	94	97
Others	0	0	0	0	1	1	1	1	1	1	1	2	2
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Bud)						
Farm_Total	441	477	491	499	519	535	547	558	570	579	587	601	617
Farm_cut flower	290	309	304	307	316	324	330	335	341	346	350	357	366
Farm_potting flower	1,008	1,275	1,296	1,316	1,383	1,451	1,513	1,573	1,637	1,693	1,748	1,817	1,892
Farm_others	474	445	521	545	569	586	596	603	611	614	616	622	629

Mushrooms

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area													
Ag_Mushrooms	1.0	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.3
Forest_Mushrooms	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
							(Ton / 10A)						
Yield													
Ag_Mushrooms	14.3	14.1	14.1	14.1	14.2	14.3	14.4	14.5	14.6	14.7	14.8	14.9	15.0
Forest_Mushrooms	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
Supply							(Thousand Tons)						
Beginning Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Production	194	200	203	207	210	213	216	219	221	223	224	226	227
Ag_Mushrooms	150	154	157	162	165	169	172	176	178	181	184	186	188
Forest_Mushrooms	43	46	46	45	45	44	44	43	42	42	41	40	39
Imports	30	30	32	34	36	38	40	42	44	46	49	51	53
Ag_Mushrooms	12	13	14	15	16	17	19	20	21	22	23	25	26
Forest_Mushrooms	18	18	18	19	20	21	22	23	23	24	25	26	27
Utilization													
Demand	220	227	232	238	243	248	253	258	263	267	271	274	278
Ag_Mushrooms	161	166	169	175	180	185	189	194	198	202	206	209	213
Forest_Mushrooms	59	62	62	63	63	63	64	64	65	65	65	65	65
Exports	3	3	3	3	3	3	3	3	3	2	2	2	2
Ag_Mushrooms	1	1	1	1	1	1	1	1	1	1	1	1	1
Forest_Mushrooms	2	2	2	2	1	1	1	1	1	1	1	1	1
Ending Stocks	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices							(Won / Kilogram)						
Ag_Mushrooms	2,830	3,014	3,391	3,271	3,485	3,464	3,545	3,526	3,556	3,517	3,497	3,471	3,484
Forest_Mushrooms	6,087	6,311	6,142	6,184	6,244	6,290	6,313	6,323	6,320	6,297	6,278	6,280	6,515

Green Tea

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
							(Thousand Hectares)						
Area	3.9	4.4	4.6	5.0	5.0	5.4	5.6	6.0	6.3	6.5	6.6	6.6	6.7
							(Kg / 10A)						
Yield	283	267	255	246	241	238	236	235	234	234	233	233	233
Supply							(Thousand Tons)						
Beginning Stocks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Production	4.2	4.5	4.3	4.7	4.3	5.1	5.2	5.8	6.3	6.6	6.9	7.1	7.4
Imports	1.4	1.5	1.6	1.8	1.9	2.2	2.5	2.7	2.9	3.0	3.4	4.0	4.7
Utilization													
Demand	4.4	4.6	4.5	4.9	4.7	5.4	5.8	6.3	6.7	7.0	7.4	7.9	8.4
Exports	1.2	1.4	1.4	1.6	1.5	1.8	1.9	2.2	2.5	2.6	2.9	3.2	3.6
Ending Stocks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prices							(Won / Kilogram)						
Farm	5,756	5,792	6,658	6,062	7,031	5,772	5,579	5,065	4,769	4,694	4,439	4,209	3,895
Wholesale													
Consumer (index, 2005=100)	99	98	98	97	97	96	95	93	92	91	90	88	87

Macro Index & Input Price

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Population							(million person)						
Population	48.5	48.6	48.7	48.9	49.0	49.1	49.2	49.2	49.3	49.3	49.3	49.3	49.3
Birth	0.50	0.45	0.44	0.43	0.43	0.42	0.41	0.41	0.40	0.39	0.39	0.38	0.38
Economic Growth							(one hundred million dollar)						
GDP	9,699	9,121	9,634	10,161	10,880	11,653	12,422	13,184	13,962	14,730	15,523	16,341	17,197
GNI	9,713	9,137	9,651	10,180	10,902	11,680	12,452	13,219	14,001	14,774	15,571	16,393	17,254
GNI per capita ($)	20,045	18,798	19,798	20,828	22,255	23,796	25,328	26,853	28,412	29,960	31,563	33,225	34,971
Economic Growth (RGDP %)	5.0	3.6	2.4	2.7	3.4	3.4	3.0	2.7	2.4	2.0	1.9	1.9	1.8
Disposal income	17	16	17	18	19	20	22	23	24	25	27	28	29
Exchange Rate (won / $)	929	1,044	1,064	1,078	1,081	1,081	1,082	1,083	1,085	1,088	1,090	1,091	1,092
Inflation							(Index)						
GDP deflator (2000=100)	113	115	121	126	131	136	140	145	151	156	162	167	173
PPI (2000=100)	115	119	120	121	124	127	130	134	137	141	145	149	153
CPI (2005=100)	105	109	113	117	121	125	130	134	139	144	149	154	159
Input Price							(Index, 2000=100)						
Machine Price	111	110	111	113	115	118	121	124	127	130	134	137	140
Material Price	131	163	161	160	159	156	154	152	150	149	149	151	152
Fuel Price	163	255	243	238	230	222	214	206	199	192	192	195	197
Wage	125	128	132	137	141	145	150	155	159	164	169	174	180
Rent	101	104	106	107	107	107	106	104	103	101	100	99	99
Seed Price	101	101	102	103	103	104	105	106	107	108	109	110	111
Fertilizer Price	154	181	222	216	211	206	200	195	190	186	183	185	187
Chemical Price	91	101	103	104	105	106	107	108	109	110	111	113	114

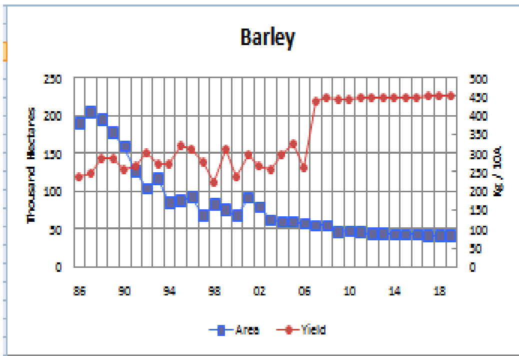
Agricultural Total Value

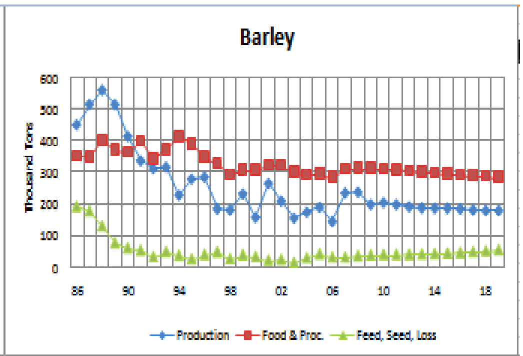
Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Agricultural Total Income							(one billion won)						
Total Production Value	36,272	38,563	39,037	38,658	38,696	38,575	38,200	37,763	37,663	37,608	37,533	37,555	37,526
Total Value-Added	21,733	21,739	21,889	21,787	22,318	22,493	22,335	21,992	21,816	21,731	21,599	21,482	21,341
Total Income	15,283	15,090	15,035	14,779	15,017	14,983	14,723	14,352	14,151	14,014	13,823	13,643	13,443
Total Income (real)	13,243	12,672	12,579	12,182	12,122	11,809	11,312	10,747	10,318	9,940	9,535	9,150	8,766
							(one thousand won)						
Total Value-Added per ag_capita	6,638	6,829	7,077	7,257	7,627	7,893	8,053	8,154	8,324	8,521	8,710	8,917	9,126
Total Income per ag_capita	4,668	4,740	4,861	4,923	5,132	5,258	5,309	5,321	5,399	5,495	5,575	5,663	5,749
Real Total Income per ag_capita	4,045	3,981	4,067	4,058	4,143	4,144	4,079	3,985	3,937	3,897	3,845	3,798	3,749
Total Production Value / GDP (%)	4.0	4.1	3.8	3.5	3.3	3.1	2.8	2.6	2.5	2.3	2.2	2.1	2.0
Total Value-Added / GNI (%)	2.4	2.3	2.1	2.0	1.9	1.8	1.7	1.5	1.4	1.4	1.3	1.2	1.1
Income per Household							(one thousand won)						
Total Income per household	32,870	33,660	34,633	35,470	36,779	37,913	38,360	39,287	40,362	40,872	42,009	43,205	44,076
Farm Income	12,415	12,387	12,398	12,256	12,477	12,484	12,313	12,059	11,957	11,894	11,797	11,718	11,632
Non-Farm Income	2,838	2,931	3,038	3,167	3,316	3,483	3,665	3,863	4,075	4,301	4,541	4,795	5,065
Non-Agbusiness Income	7,646	7,913	8,258	8,612	8,967	9,323	9,687	10,063	10,441	10,824	11,221	11,625	12,044
Transfer Income	4,538	4,847	5,203	5,543	5,967	6,406	6,308	6,740	7,149	6,928	7,337	7,759	7,827
Irregular Income	5,433	5,582	5,734	5,891	6,052	6,217	6,387	6,561	6,740	6,925	7,114	7,308	7,508
Population							(one thousand person)						
Agricultural Population	3,274	3,183	3,093	3,002	2,926	2,850	2,773	2,697	2,621	2,550	2,480	2,409	2,338
Economically Active Population	2,050	2,003	1,963	1,924	1,885	1,846	1,806	1,765	1,723	1,683	1,644	1,605	1,569
Employment in Agriculture	1,670	1,621	1,582	1,544	1,506	1,468	1,430	1,391	1,352	1,315	1,277	1,242	1,209
							(one thousand household)						
Number of Household	1,231	1,218	1,213	1,206	1,204	1,200	1,196	1,190	1,183	1,178	1,172	1,164	1,156
Population per Household (person)	2.7	2.6	2.6	2.5	2.4	2.4	2.3	2.3	2.2	2.2	2.1	2.1	2.0
Total Farm Price (Normal)							(index 2000=100)						
Total Farm Price	117	123	124	123	122	121	120	118	118	117	117	118	118
-Crops	110	113	115	113	112	110	108	106	105	104	104	103	103
-Livestocks	142	156	155	155	158	160	160	161	161	162	164	166	168
							(Thousand hectares)						
Total Acreage	1,782	1,769	1,747	1,725	1,705	1,687	1,671	1,657	1,644	1,632	1,622	1,613	1,604
Total Utilized Acreage	1,856	1,819	1,799	1,780	1,760	1,741	1,723	1,702	1,684	1,667	1,646	1,628	1,612
-Grains	1,154	1,136	1,125	1,117	1,107	1,095	1,083	1,068	1,055	1,043	1,028	1,015	1,004
-Vegetables	227	210	206	199	194	191	189	186	184	182	180	178	176
-Special crops	80	82	80	78	76	75	74	73	72	72	72	72	72
-Orchards	144	142	140	138	137	135	133	131	128	126	123	121	118
Utilized Acreage ratio (%)	104.2	102.8	103.0	103.1	103.2	103.2	103.1	102.8	102.4	102.1	101.5	100.9	100.5
Acreage per Farm household (unit: ha)	1.45	1.45	1.44	1.43	1.42	1.41	1.40	1.39	1.39	1.39	1.38	1.39	1.39
Acreage per capita (unit: a)	3.7	3.6	3.6	3.5	3.5	3.4	3.4	3.4	3.3	3.3	3.3	3.3	3.3
Acreage per Farmer (unit: a)	54.4	55.6	56.5	57.5	58.3	59.2	60.2	61.4	62.7	64.0	65.4	66.9	68.6

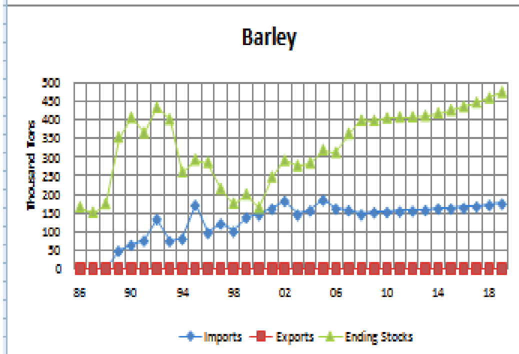
Agricultural Total Value (Con't)

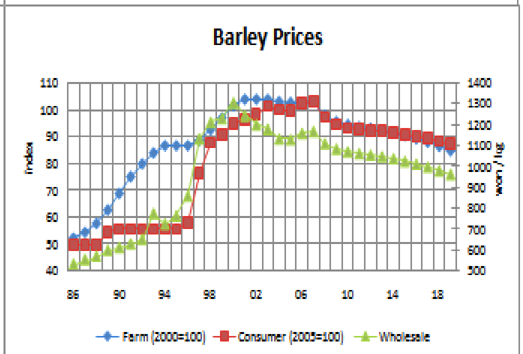
Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total Animal Invetory						(Million heads)							
Cattle+Milkcow+Hog+Broiler+Hen	135.0	136.7	138.0	139.0	140.1	141.6	142.8	143.5	144.1	144.5	144.7	144.8	144.8
Trade Balance													
Quantities						(Thousand Tons)							
-Trade deficits	25,637	25,397	27,360	28,597	29,626	30,860	32,460	32,847	33,258	33,561	33,799	33,964	34,096
-Exports	1,430	1,482	1,527	1,571	1,611	1,652	1,692	1,731	1,771	1,810	1,848	1,887	1,926
-Imports	27,066	26,879	28,887	30,168	31,238	32,512	34,151	34,578	35,029	35,371	35,647	35,851	36,022
Values						(one hundred million dollars)							
-Trade deficits	109.2	121.7	128.5	134.7	144.3	154.4	164.0	168.4	171.5	173.8	176.2	180.2	184.1
-Imports	133.2	147.2	155.6	163.5	174.7	186.5	197.8	203.9	208.8	213.0	217.3	223.1	229.0
-Exports	24.0	25.4	27.1	28.7	30.4	32.1	33.8	35.6	37.4	39.2	41.0	42.9	44.9
Self-sufficient Ratio													
Total (Demand+Processing)	79.1	79.9	79.2	78.6	77.8	77.1	76.2	75.7	75.4	75.0	74.5	74.1	73.7
Grains (Demand+Processing)	56.2	58.5	57.4	56.5	55.4	54.4	53.2	52.5	52.0	51.6	51.0	50.6	50.2
-Rice	88.0	93.1	94.2	94.0	93.6	93.2	92.7	92.0	91.6	91.3	90.8	90.6	90.6
Meats	71.8	72.5	73.6	74.0	71.9	70.5	69.0	67.5	66.2	64.9	63.3	61.7	60.1
-Beef	46.9	47.9	53.7	56.7	52.2	49.2	46.1	43.1	41.0	38.7	35.5	32.5	29.4
Spice & Culinary	91.3	89.3	89.7	89.1	88.5	88.1	87.6	87.1	86.9	86.8	86.6	86.4	86.1
-Red Pepper	67.0	62.2	60.5	60.0	57.7	57.5	56.9	56.8	56.3	56.3	56.1	55.7	55.2

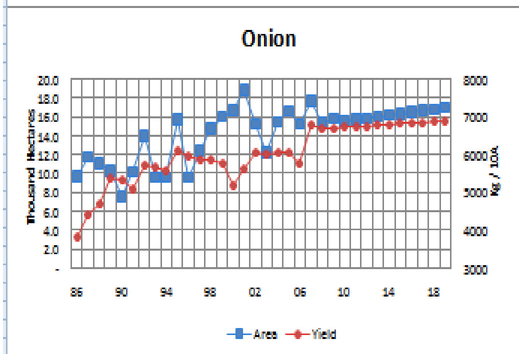
Graphs of Prediction

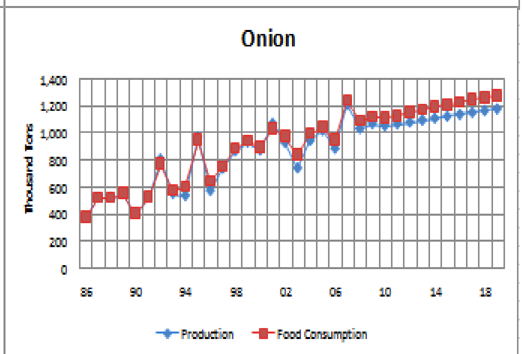


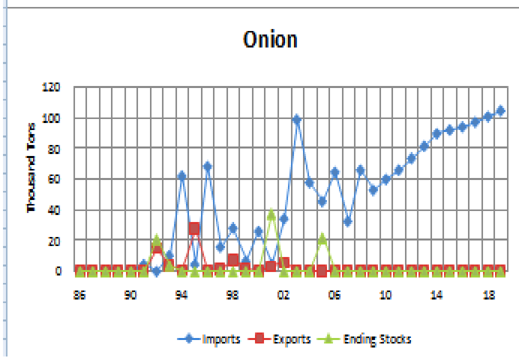


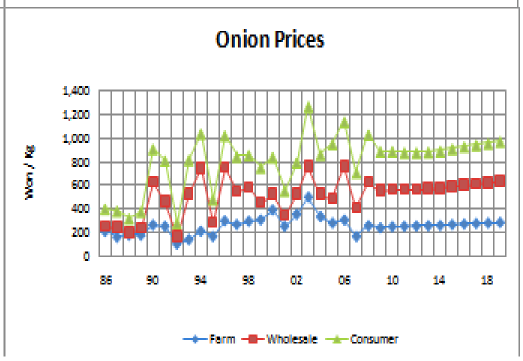


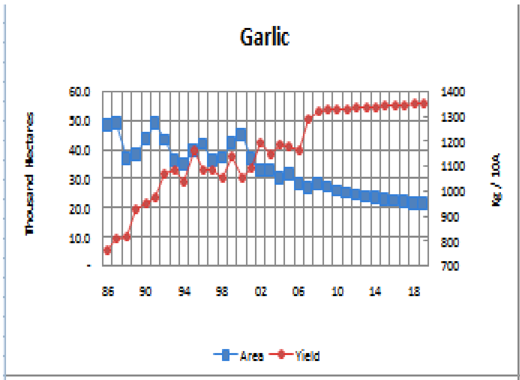


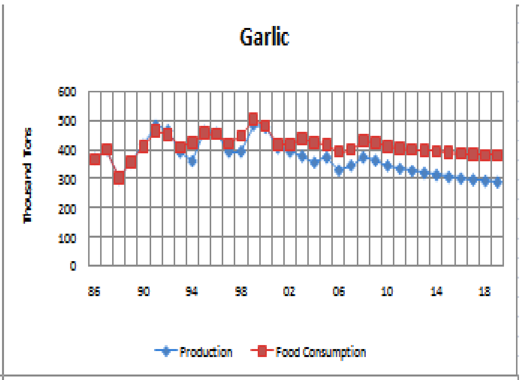


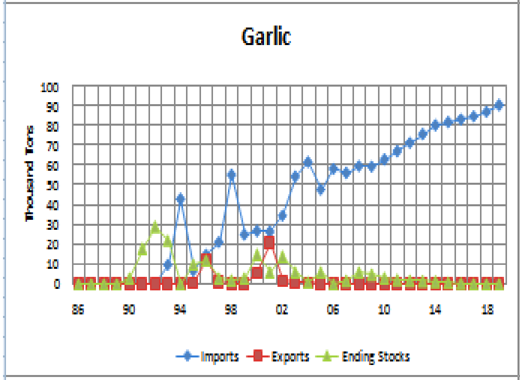


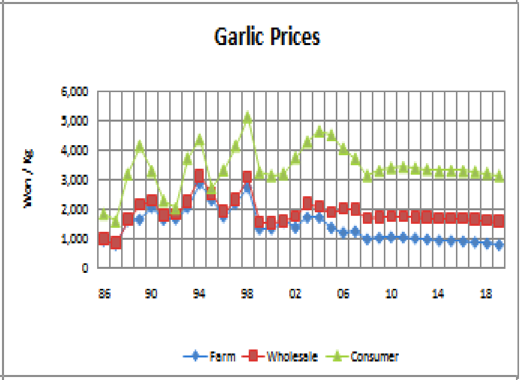


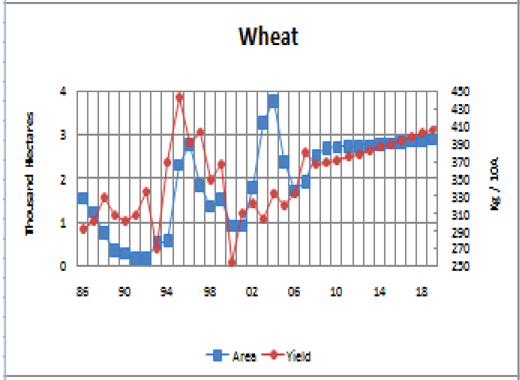


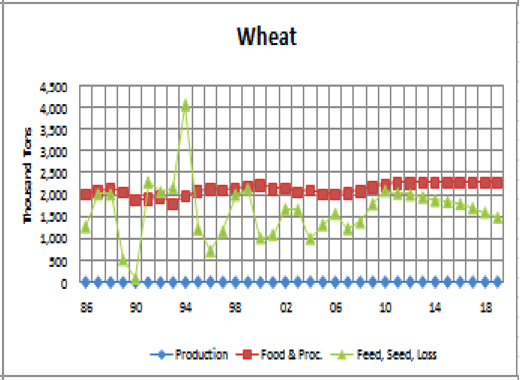

Garlic
Thousand Hectares
Kg / 10A
Area
Yield

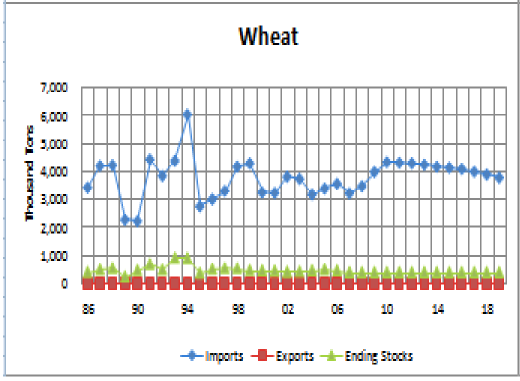

Garlic
Thousand Tons
Production
Food Consumption

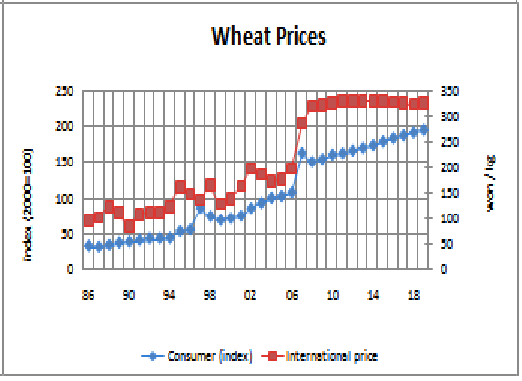

Garlic
Thousand Tons
Imports
Exports
Ending Stocks

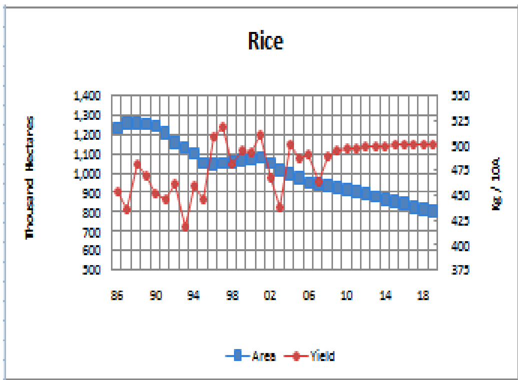

Garlic Prices
Won / kg
Farm
Wholesale
Consumer

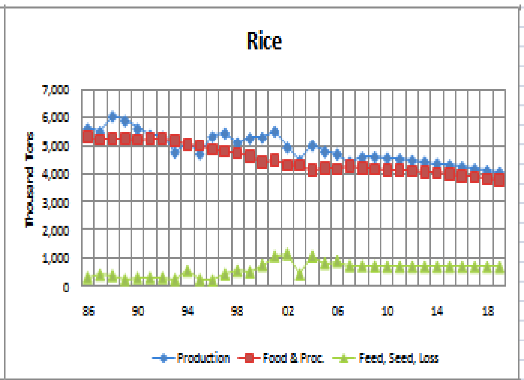

Wheat
Thousand Hectares
Kg / 10A
Area
Yield

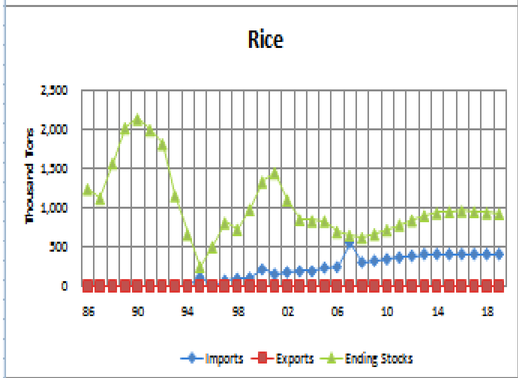

Wheat
Thousand Tons
Production
Food & Proc.
Feed, Seed, Loss

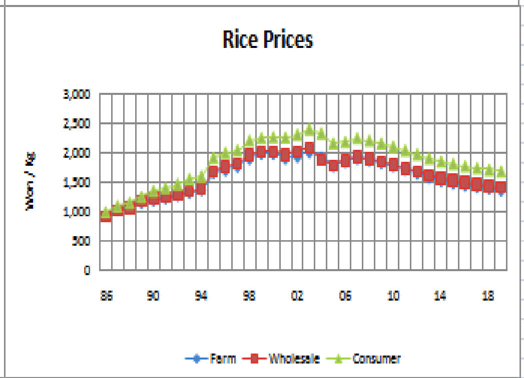

Wheat
Thousand Tons
Imports
Exports
Ending Stocks

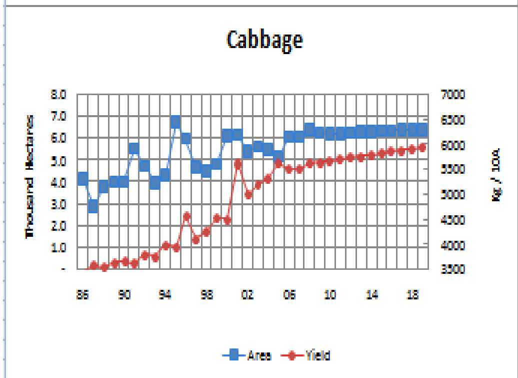

Wheat Prices
Index (2000=100)
won / kg
Consumer (index)
International price

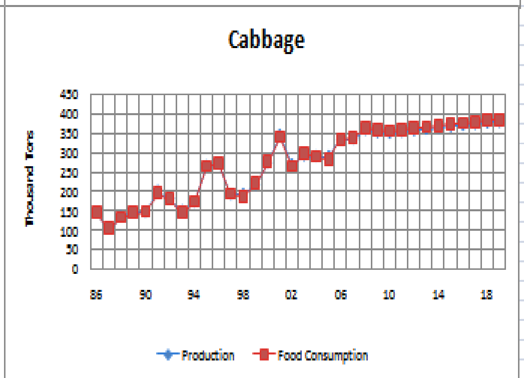

Rice
Thousand Hectares
Kg / 10A
Area
Yield

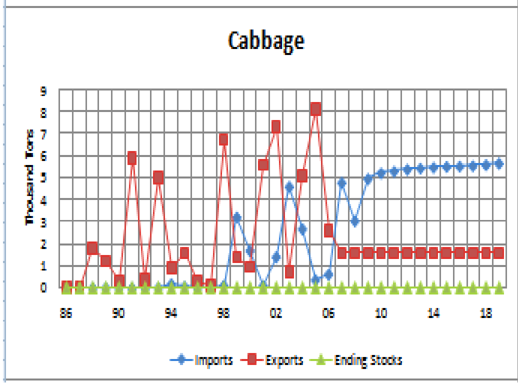

Rice
Thousand Tons
Production
Food & Proc.
Feed, Seed, Loss

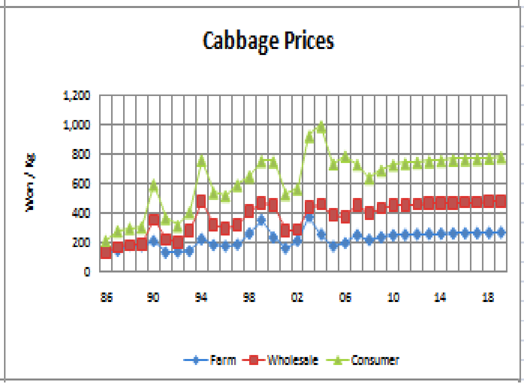

Rice
Thousand Tons
Imports
Exports
Ending Stocks

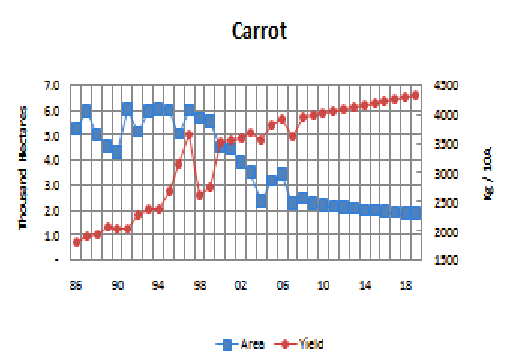

Rice Prices
Won / Kg
Farm
Wholesale
Consumer

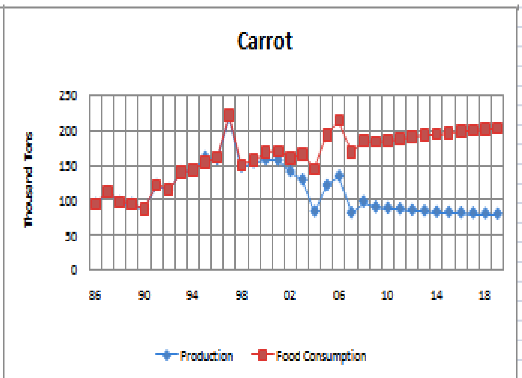

Cabbage
Thousand Hectares
Kg / 10A
Area
Yield

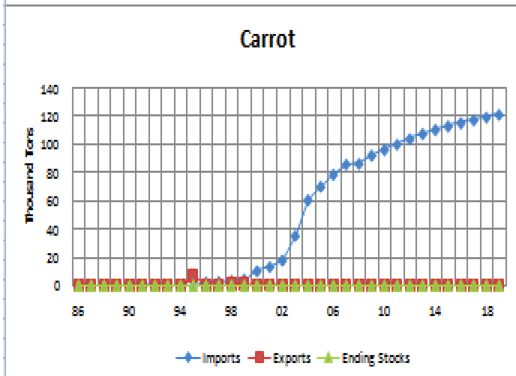

Cabbage
Thousand Tons
Production
Food Consumption

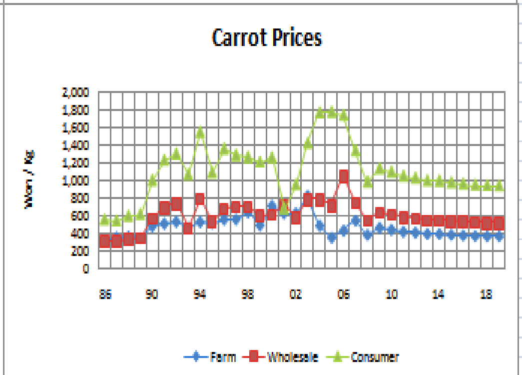

Cabbage
Thousand Tons
Imports
Exports
Ending Stocks

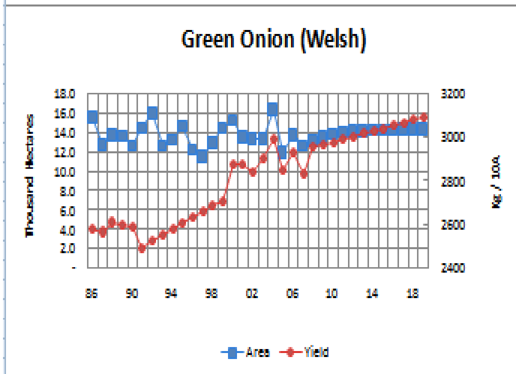

Cabbage Prices
Won / Kg
Farm
Wholesale
Consumer

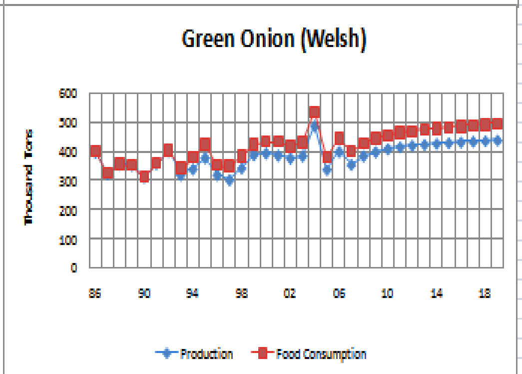

Carrot
Thousand Hectares
7.0
6.0
5.0
4.0
3.0
2.0
1.0
-
4500
4000
3500
3000
2500
2000
1500
Kg / 10A
86
90
94
98
02
06
10
14
18
Area
Yield

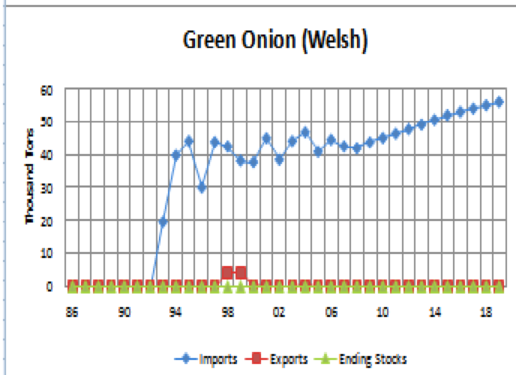

Carrot
Thousand Tons
250
200
150
100
50
0
86
90
94
98
02
06
10
14
18
Production
Food Consumption

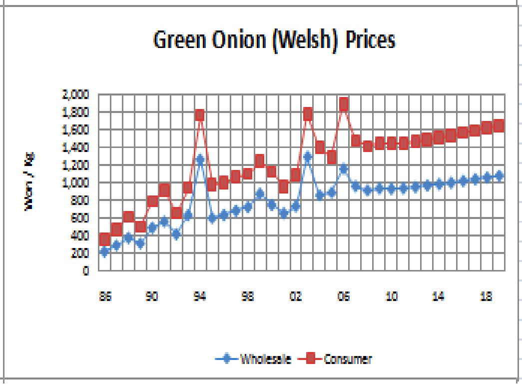

Carrot
Thousand Tons
140
120
100
80
60
40
20
0
86
90
94
98
02
06
10
14
18
Imports
Exports
Ending Stocks

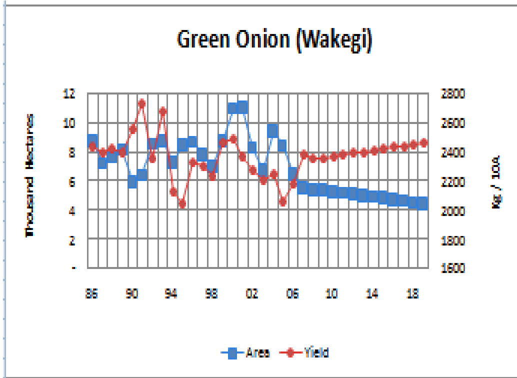

Carrot Prices
Won / Kg
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
86
90
94
98
02
06
10
14
18
Farm
Wholesale
Consumer

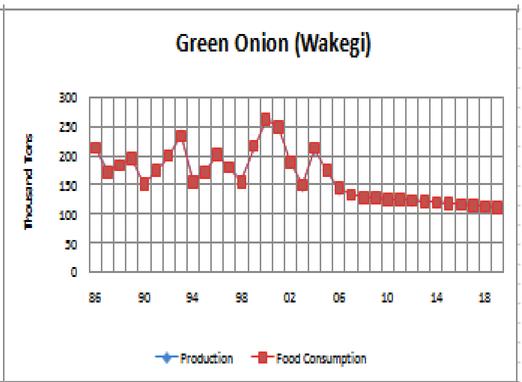

Green Onion (Welsh)
Thousand Hectares
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
-
3200
3000
2800
2600
2400
Kg / 10A
86
90
94
98
02
06
10
14
18
Area
Yield

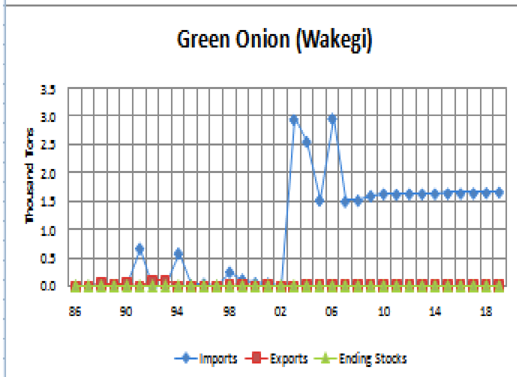

Green Onion (Welsh)
Thousand Tons
600
500
400
300
200
100
0
86
90
94
98
02
06
10
14
18
Production
Food Consumption

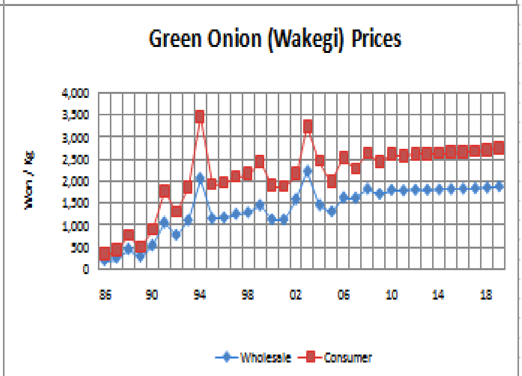

Green Onion (Welsh)
Thousand Tons
60
50
40
30
20
10
0
86
90
94
98
02
06
10
14
18
Imports
Exports
Ending Stocks

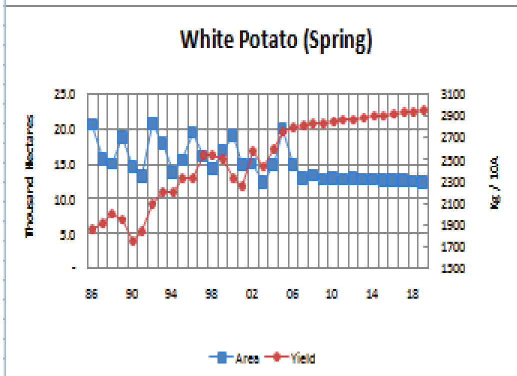

Green Onion (Welsh) Prices
Won / Kg
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
86
90
94
98
02
06
10
14
18
Wholesale
Consumer

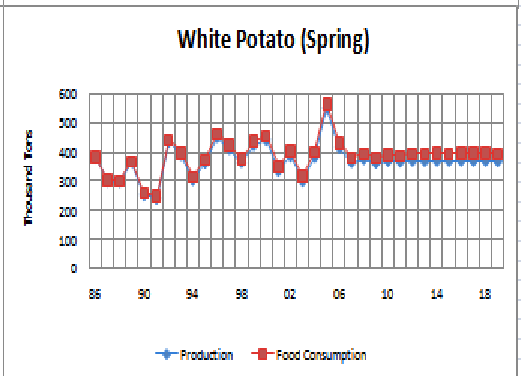

Green Onion (Wakegi)
Thousand Hectares
Kg / 10A
Area
Yield

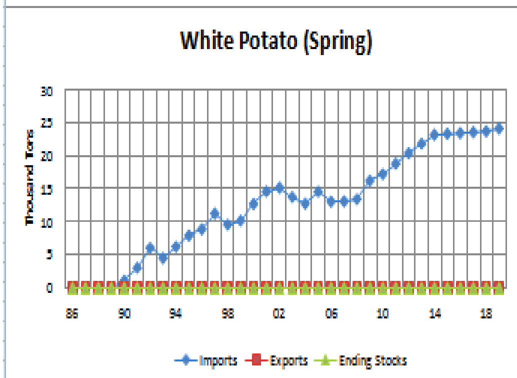

Green Onion (Wakegi)
Thousand Tons
Production
Food Consumption

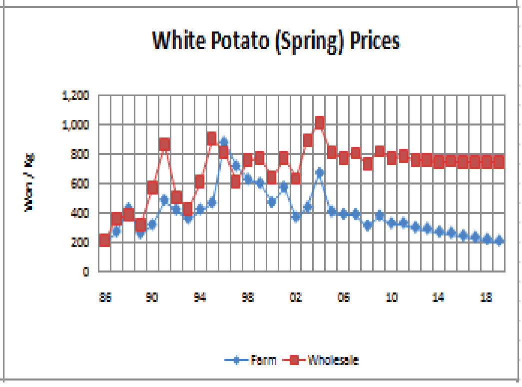

Green Onion (Wakegi)
Thousand Tons
Imports
Exports
Ending Stocks

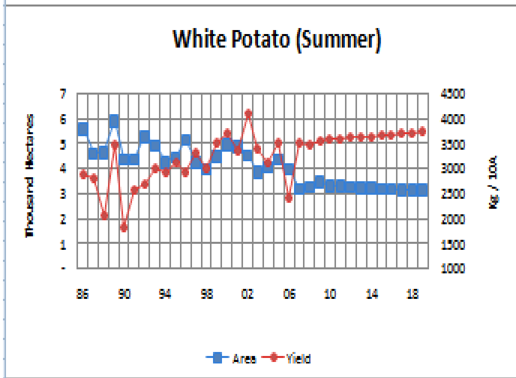

Green Onion (Wakegi) Prices
Won / Kg
Wholesale
Consumer

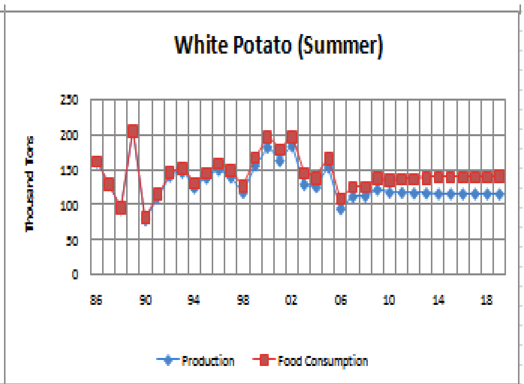

White Potato (Spring)
Thousand Hectares
Kg / 10A
Area
Yield

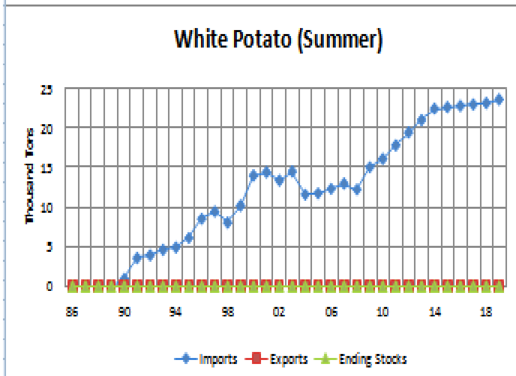

White Potato (Spring)
Thousand Tons
Production
Food Consumption

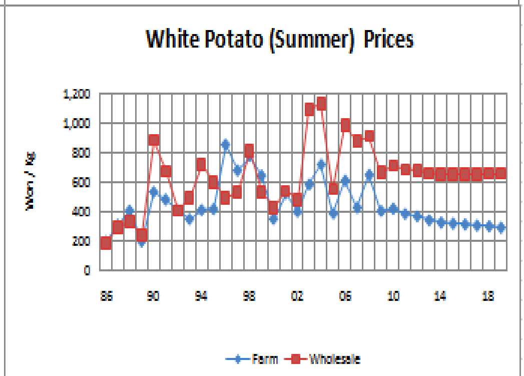

White Potato (Spring)
Thousand Tons
Imports
Exports
Ending Stocks

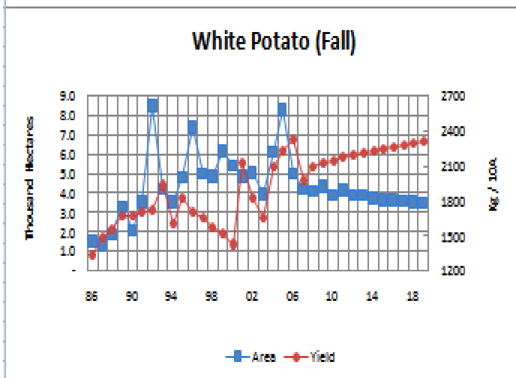

White Potato (Spring) Prices
Won / Kg
Farm
Wholesale

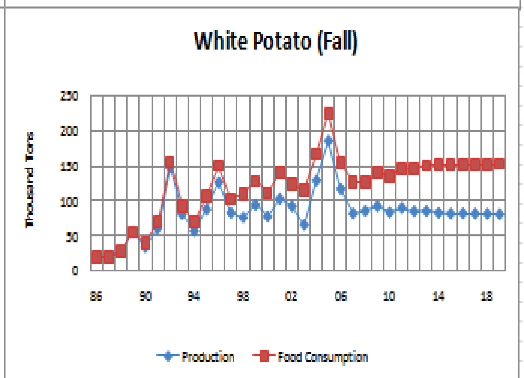

White Potato (Summer)
Thousand Hectares
Kg / 10A
Area
Yield

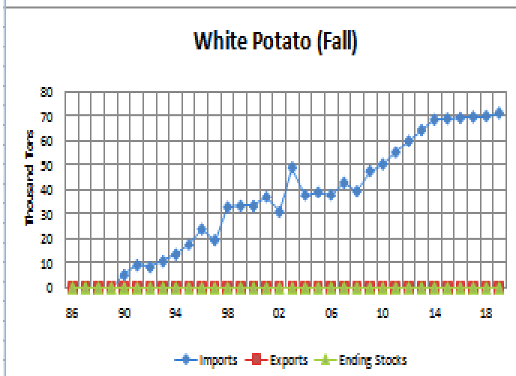

White Potato (Summer)
Thousand Tons
Production
Food Consumption

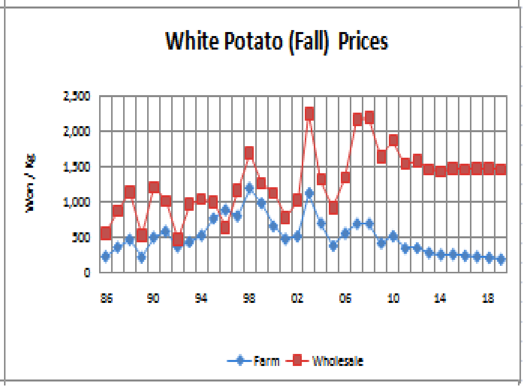

White Potato (Summer)
Thousand Tons
Imports
Exports
Ending Stocks

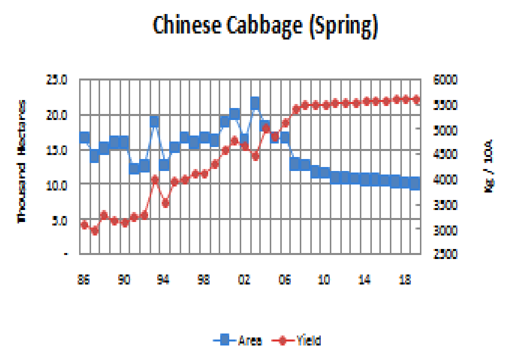

White Potato (Summer) Prices
Won / Kg
Farm
Wholesale

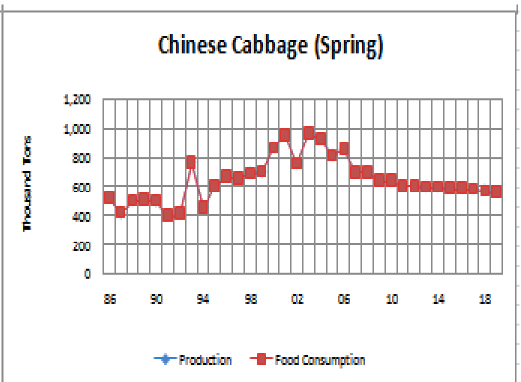

White Potato (Fall)
Thousand Hectares
Kg / 10A
Area
Yield

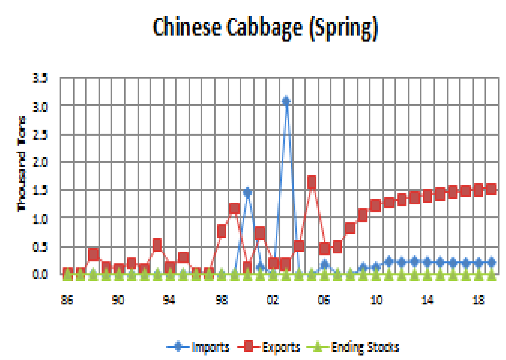

White Potato (Fall)
Thousand Tons
Production
Food Consumption

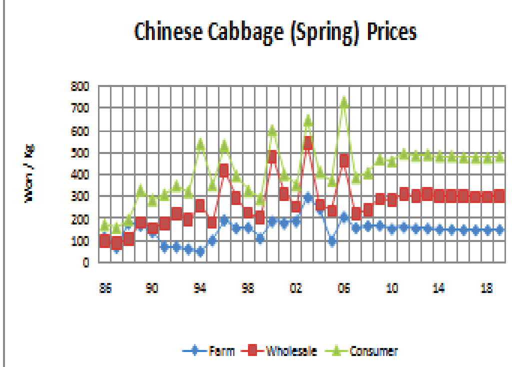

White Potato (Fall)
Thousand Tons
Imports
Exports
Ending Stocks

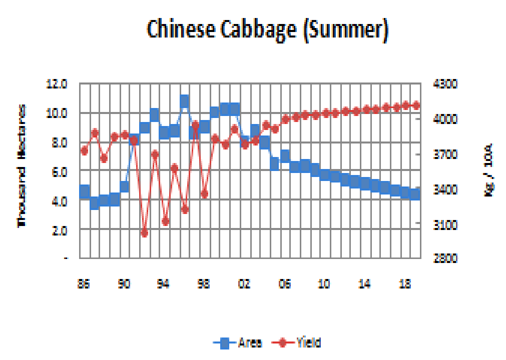

White Potato (Fall) Prices
Won / Kg
Farm
Wholesale

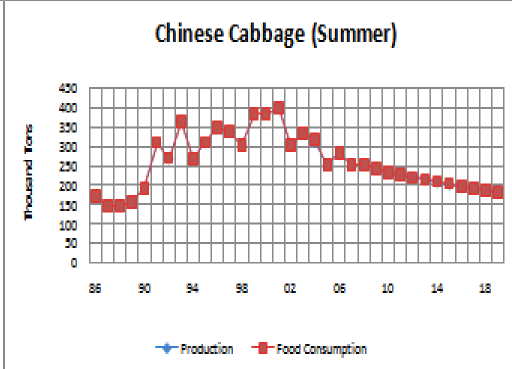

Chinese Cabbage (Spring)
Thousand Hectares
Kg / 10A
Area
Yield

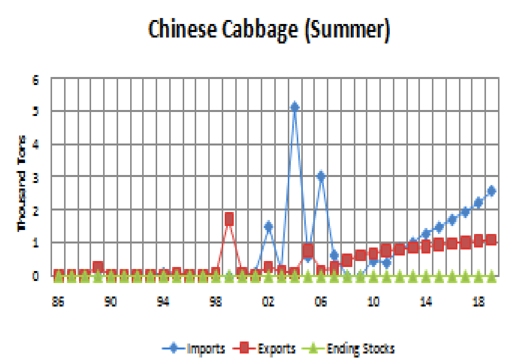

Chinese Cabbage (Spring)
Thousand Tons
Production
Food Consumption

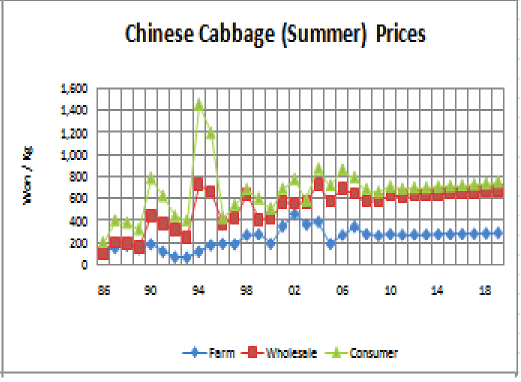

Chinese Cabbage (Spring)
Thousand Tons
Imports
Exports
Ending Stocks

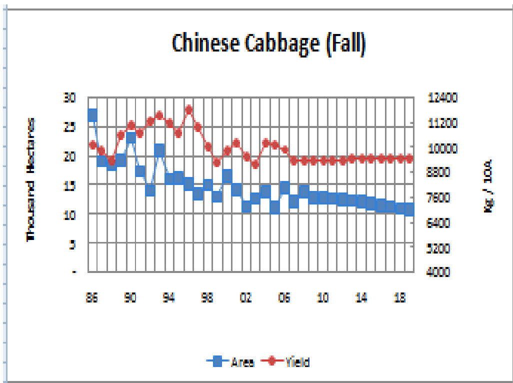

Chinese Cabbage (Spring) Prices
Won / kg
Farm
Wholesale
Consumer

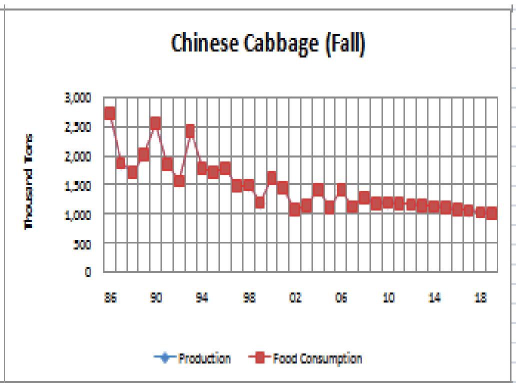

Chinese Cabbage (Summer)
Thousand Hectares
Kg / 10A
Area
Yield

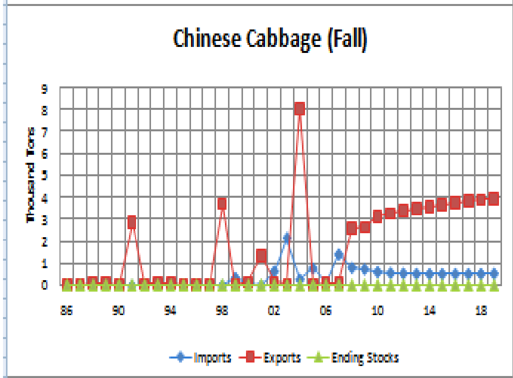

Chinese Cabbage (Summer)
Thousand Tons
Production
Food Consumption

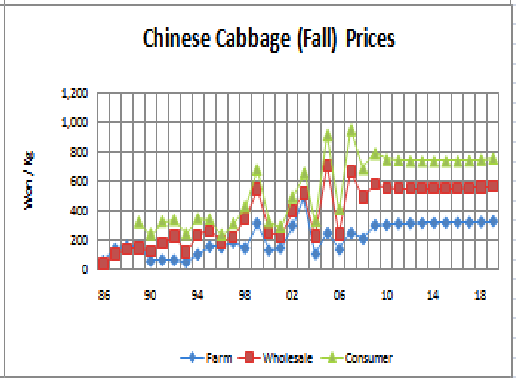

Chinese Cabbage (Summer)
Thousand Tons
Imports
Exports
Ending Stocks

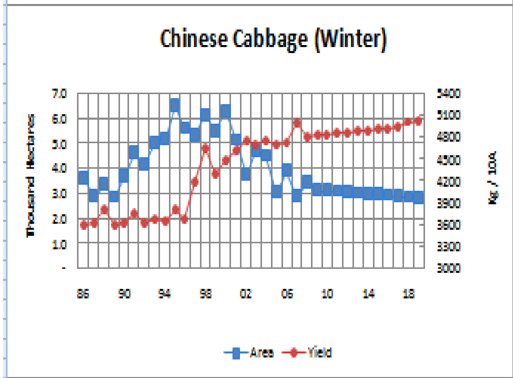

Chinese Cabbage (Summer) Prices
Won / kg
Farm
Wholesale
Consumer

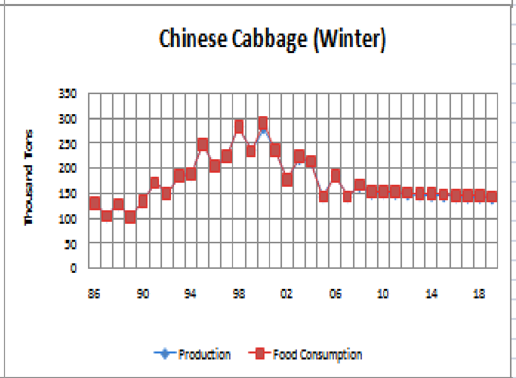

Chinese Cabbage (Fall)
Thousand Hectares
Kg / 10A
Area
Yield

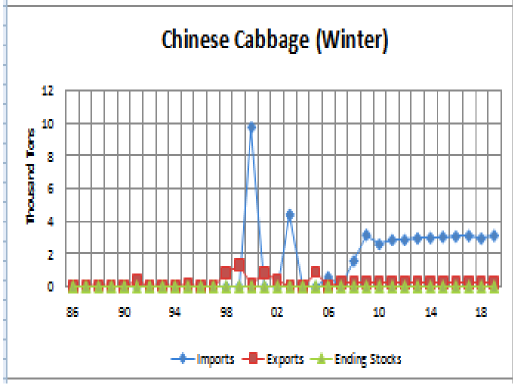

Chinese Cabbage (Fall)
Thousand Tons
Production
Food Consumption

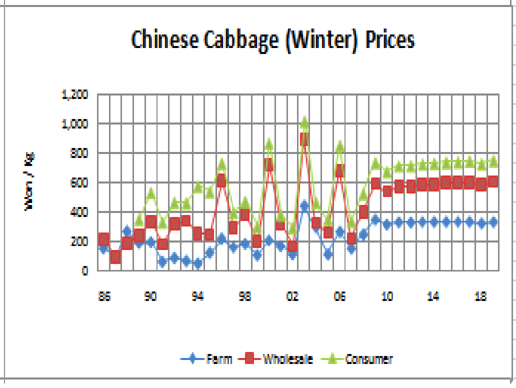

Chinese Cabbage (Fall)
Thousand Tons
Imports
Exports
Ending Stocks

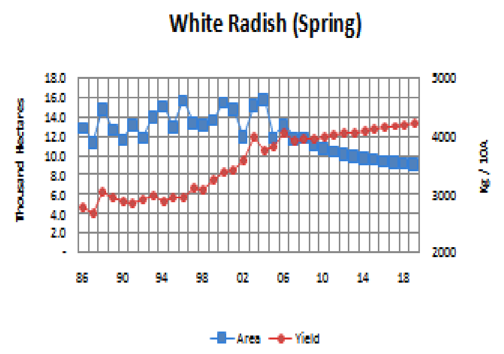

Chinese Cabbage (Fall) Prices
Won / Kg
Farm
Wholesale
Consumer

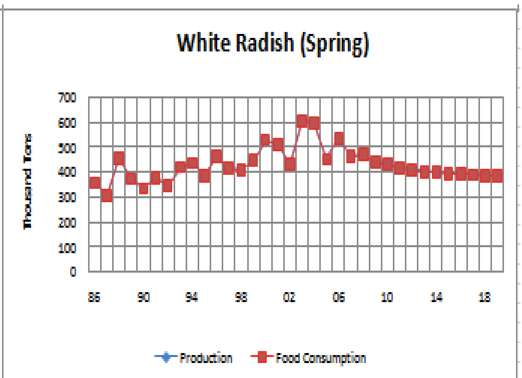

Chinese Cabbage (Winter)
Thousand Hectares
Kg / 10A
Area
Yield

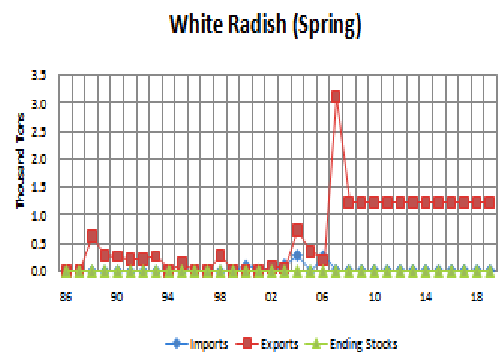

Chinese Cabbage (Winter)
Thousand Tons
Production
Food Consumption

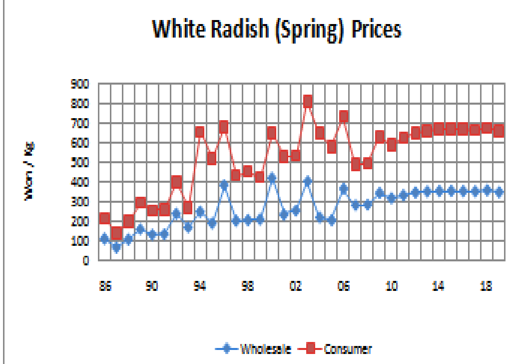

Chinese Cabbage (Winter)
Thousand Tons
Imports
Exports
Ending Stocks

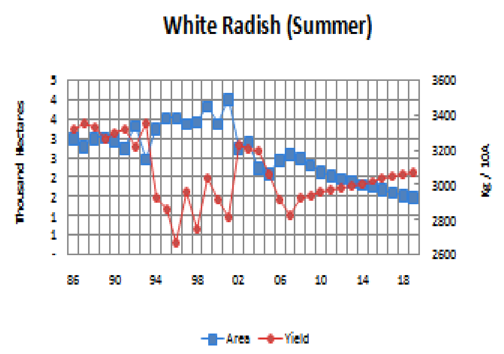

Chinese Cabbage (Winter) Prices
Won / Kg
Farm
Wholesale
Consumer

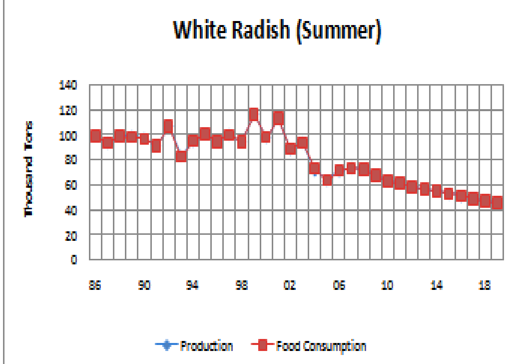

White Radish (Spring)
Thousand Hectares
Kg / 10A
Area
Yield

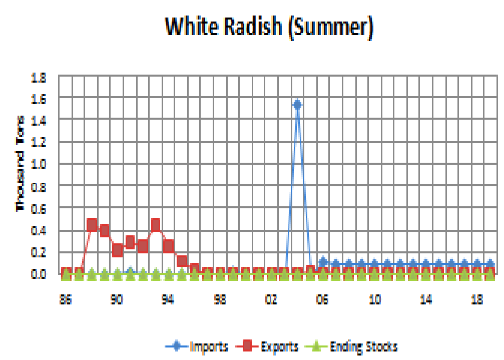

White Radish (Spring)
Thousand Tons
Production
Food Consumption

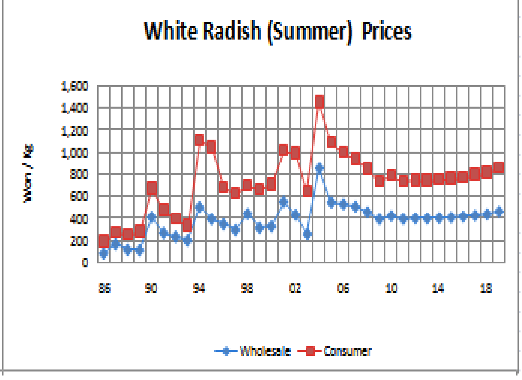

White Radish (Spring)
Thousand Tons
Imports
Exports
Ending Stocks

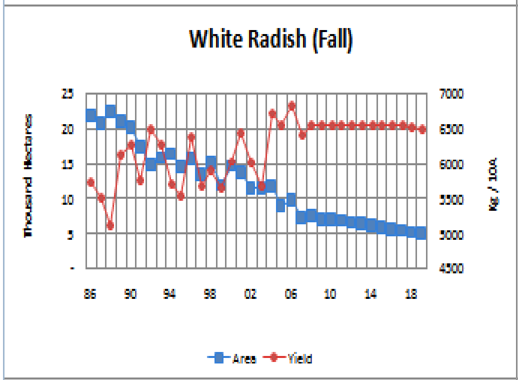

White Radish (Spring) Prices
Won / Kg
Wholesale
Consumer

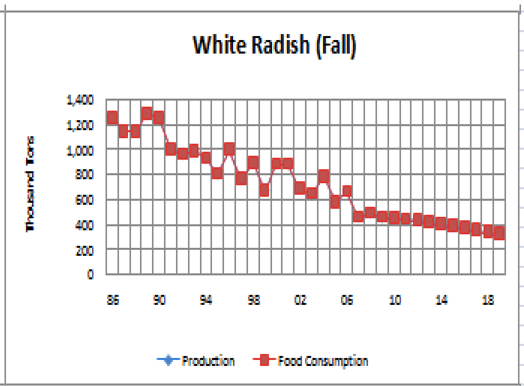

White Radish (Summer)
Thousand Hectares
Kg / 10A
Area
Yield

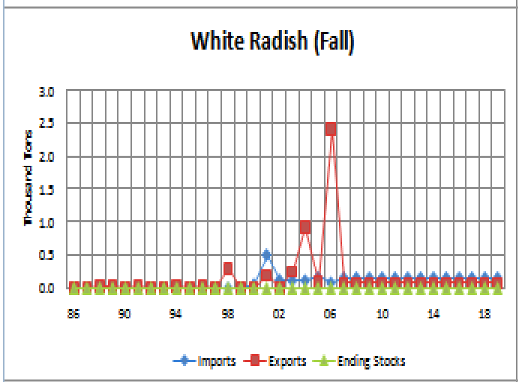

White Radish (Summer)
Thousand Tons
Production
Food Consumption

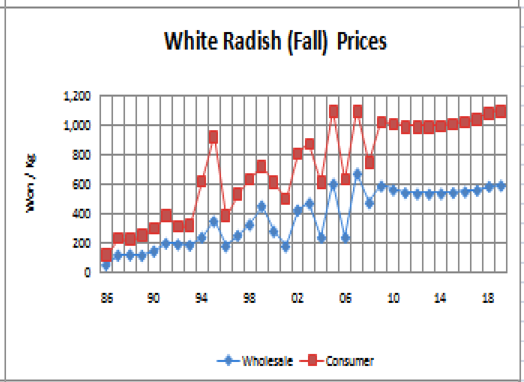

White Radish (Summer)
Thousand Tons
Imports
Exports
Ending Stocks

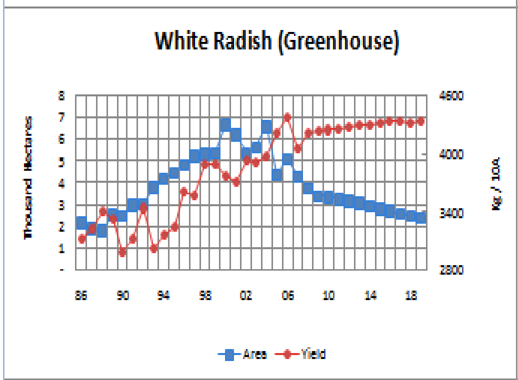

White Radish (Summer) Prices
Won / Kg
Wholesale
Consumer

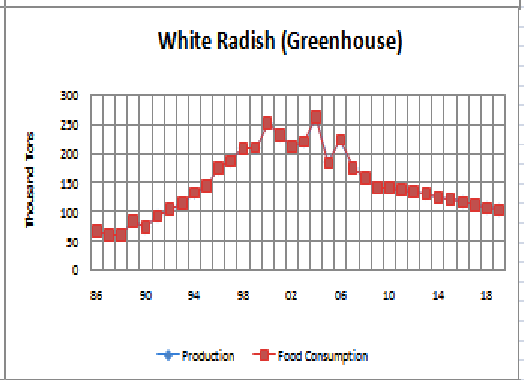

White Radish (Fall)
Thousand Hectares
Kg / 10A
25 20 15 10 5 -
7000 6500 6000 5500 5000 4500
86 90 94 98 02 06 10 14 18
Area
Yield

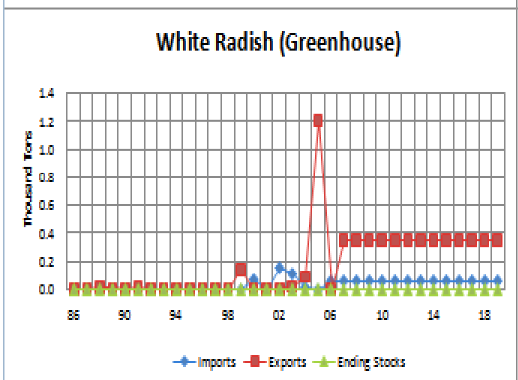

White Radish (Fall)
Thousand Tons
1,400 1,200 1,000 800 600 400 200 0
86 90 94 98 02 06 10 14 18
Production
Food Consumption

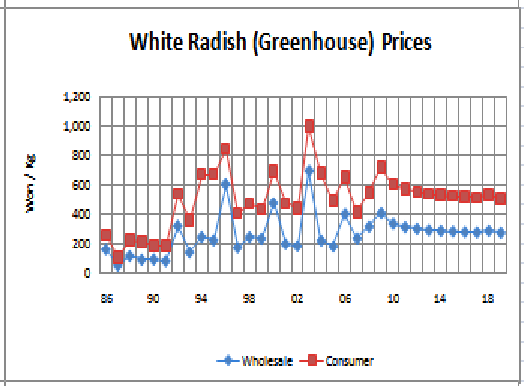

White Radish (Fall)
Thousand Tons
3.0 2.5 2.0 1.5 1.0 0.5 0.0
86 90 94 98 02 06 10 14 18
Imports
Exports
Ending Stocks

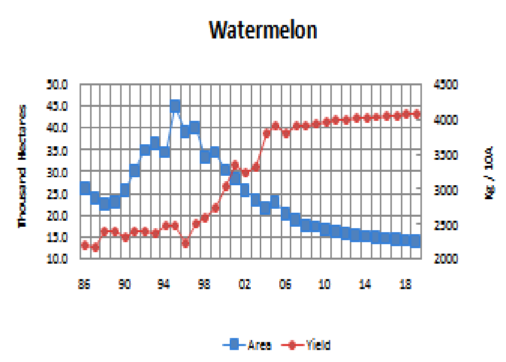

White Radish (Fall) Prices
Won / Kg
1,200 1,000 800 600 400 200 0
86 90 94 98 02 06 10 14 18
Wholesale
Consumer

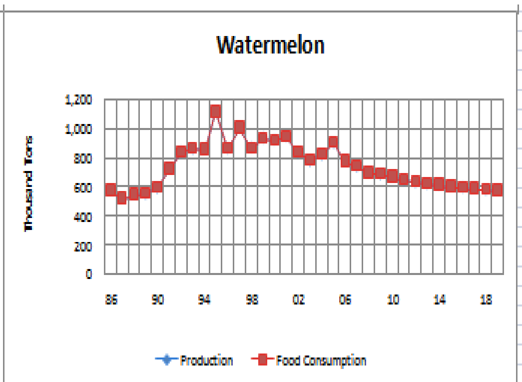

White Radish (Greenhouse)
Thousand Hectares
Kg / 10A
8 7 6 5 4 3 2 1 -
4600 4000 3400 2800
86 90 94 98 02 06 10 14 18
Area
Yield

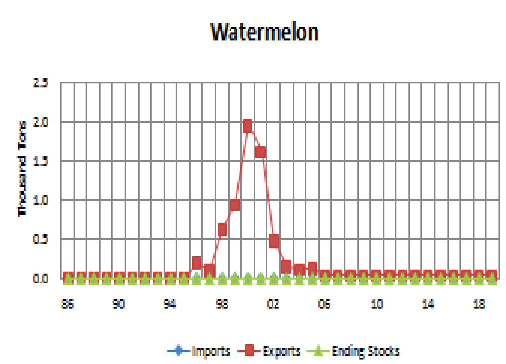

White Radish (Greenhouse)
Thousand Tons
300 250 200 150 100 50 0
86 90 94 98 02 06 10 14 18
Production
Food Consumption

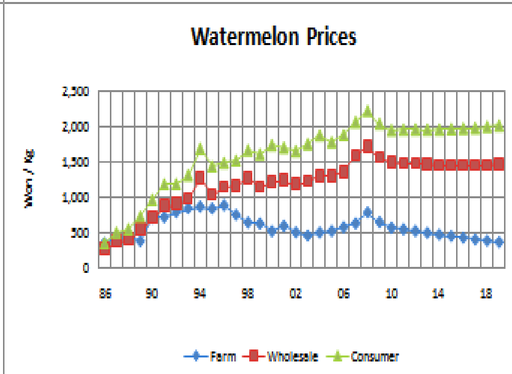

White Radish (Greenhouse)
Thousand Tons
1.4 1.2 1.0 0.8 0.6 0.4 0.2 0.0
86 90 94 98 02 06 10 14 18
Imports
Exports
Ending Stocks

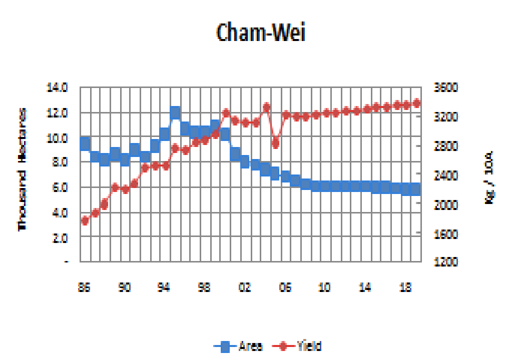

White Radish (Greenhouse) Prices
Won / Kg
1,200 1,000 800 600 400 200 0
86 90 94 98 02 06 10 14 18
Wholesale
Consumer

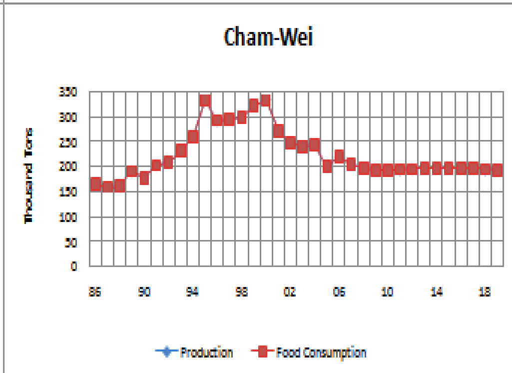

Watermelon
Thousand Hectares
Kg / 10A
86 90 94 98 02 06 10 14 18
Area
Yield

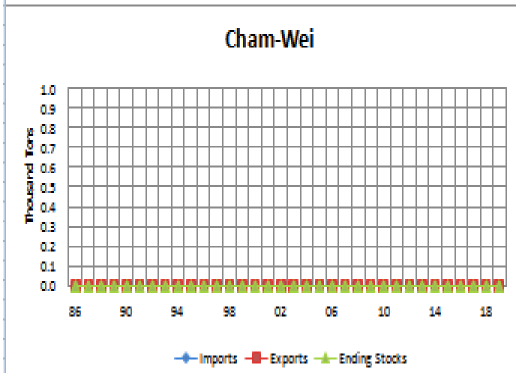

Watermelon
Thousand Tons
86 90 94 98 02 06 10 14 18
Production
Food Consumption

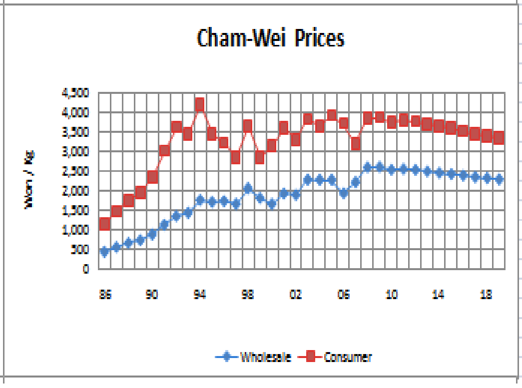

Watermelon
Thousand Tons
86 90 94 98 02 06 10 14 18
Imports
Exports
Ending Stocks

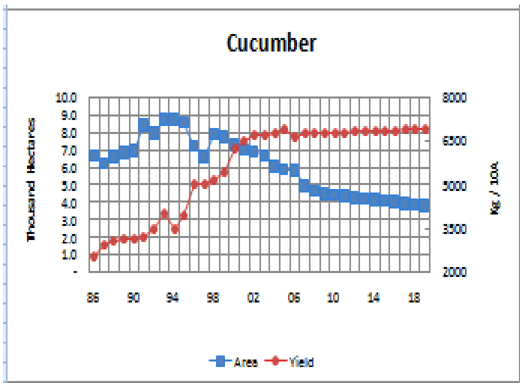

Watermelon Prices
Won / Kg
86 90 94 98 02 06 10 14 18
Farm
Wholesale
Consumer

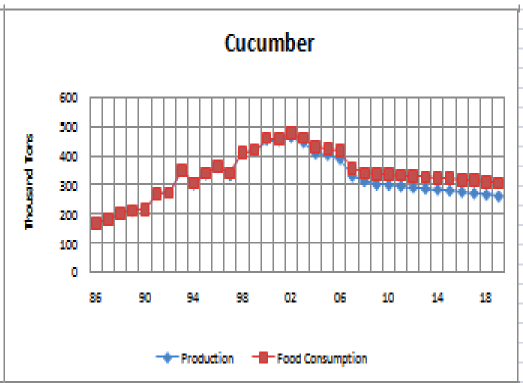

Cham-Wei
Thousand Hectares
Kg / 10A
86 90 94 98 02 06 10 14 18
Area
Yield

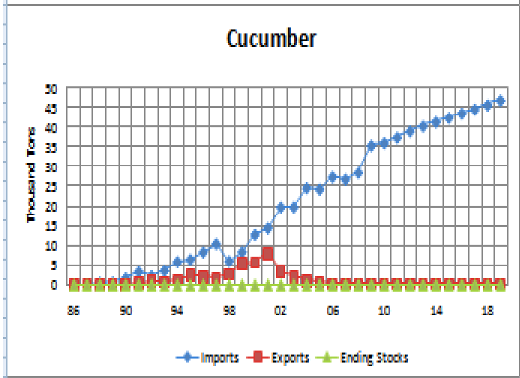

Cham-Wei
Thousand Tons
86 90 94 98 02 06 10 14 18
Production
Food Consumption

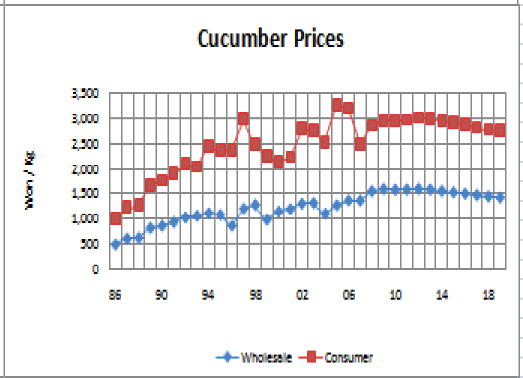

Cham-Wei
Thousand Tons
86 90 94 98 02 06 10 14 18
Imports
Exports
Ending Stocks

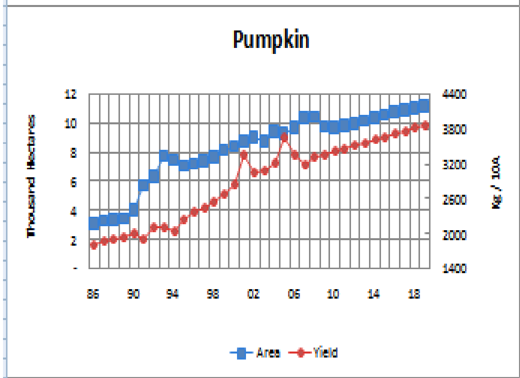

Cham-Wei Prices
Won / Kg
86 90 94 98 02 06 10 14 18
Wholesale
Consumer

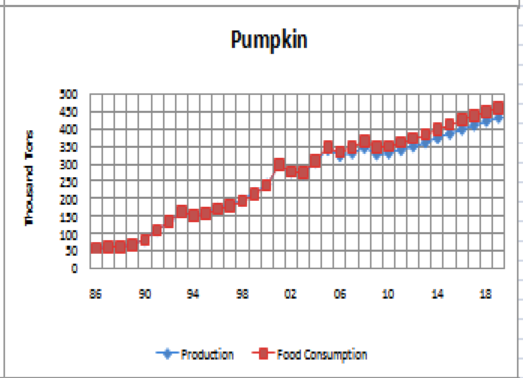

Cucumber
Thousand Hectares
Kg / 10A
Area
Yield

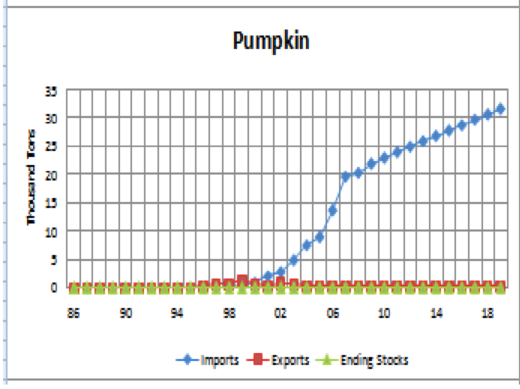

Cucumber
Thousand Tons
Production
Food Consumption

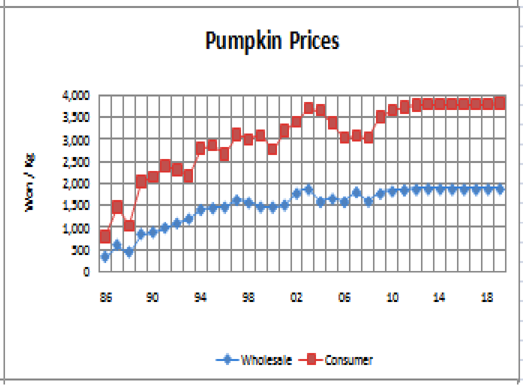

Cucumber
Thousand Tons
Imports
Exports
Ending Stocks

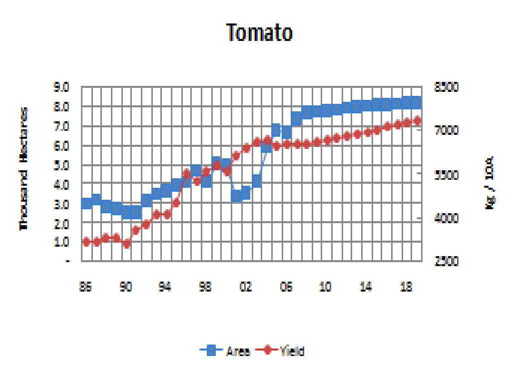

Cucumber Prices
Won / kg
Wholesale
Consumer

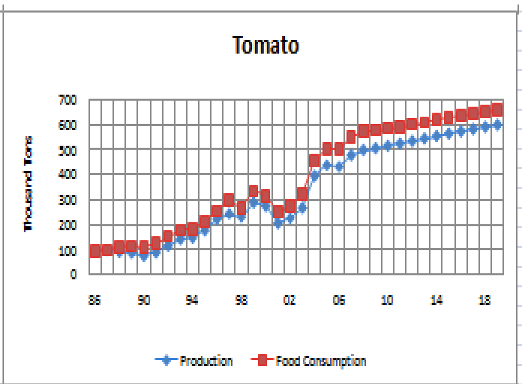

Pumpkin
Thousand Hectares
Kg / 10A
Area
Yield

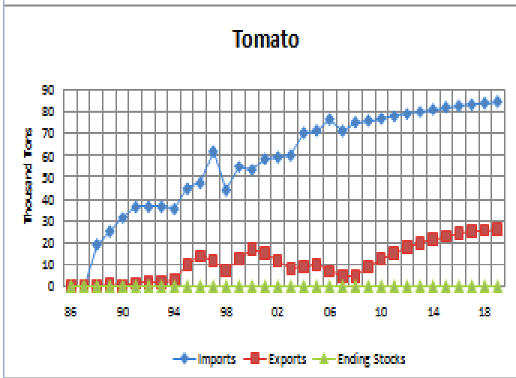

Pumpkin
Thousand Tons
Production
Food Consumption

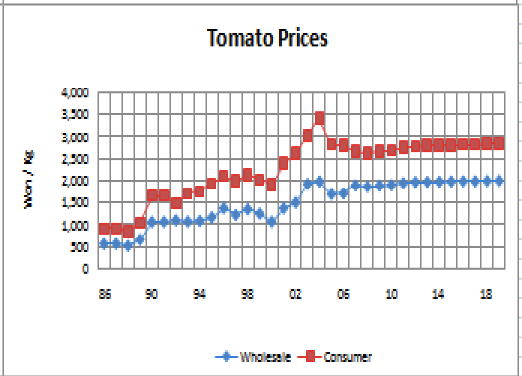

Pumpkin
Thousand Tons
Imports
Exports
Ending Stocks

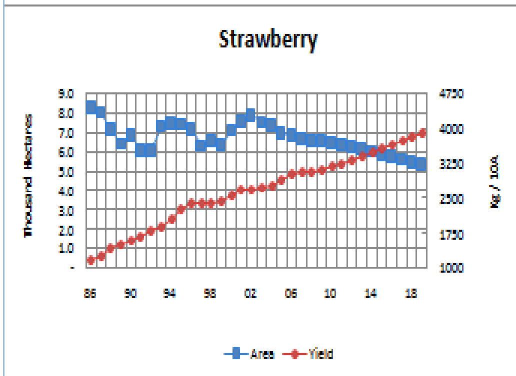

Pumpkin Prices
Won / kg
Wholesale
Consumer

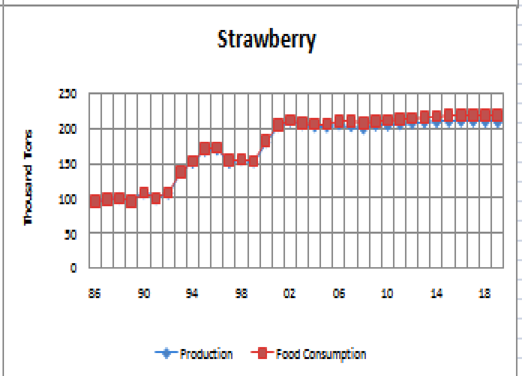

Tomato
Thousand Hectares
Kg / 10A
86 90 94 98 02 06 10 14 18
Area
Yield

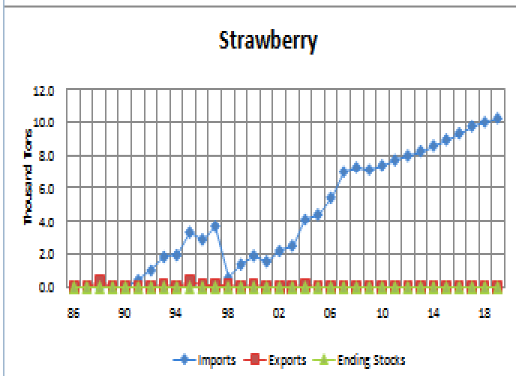

Tomato
Thousand Tons
86 90 94 98 02 06 10 14 18
Production
Food Consumption

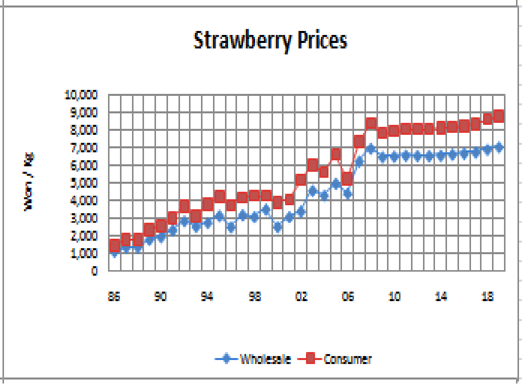

Tomato
Thousand Tons
86 90 94 98 02 06 10 14 18
Imports
Exports
Ending Stocks

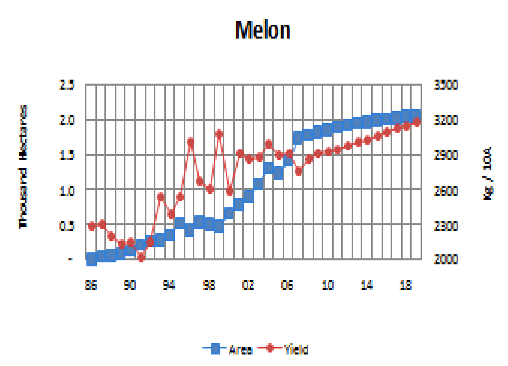

Tomato Prices
Won / Kg
86 90 94 98 02 06 10 14 18
Wholesale
Consumer

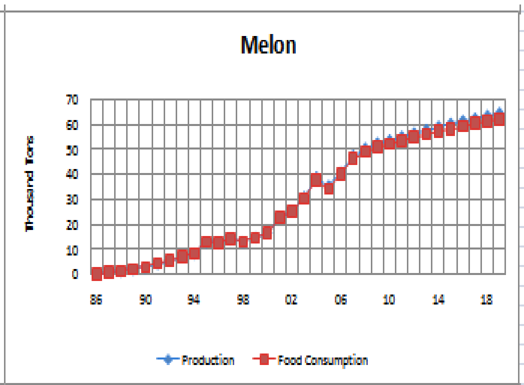

Strawberry
Thousand Hectares
Kg / 10A
86 90 94 98 02 06 10 14 18
Area
Yield

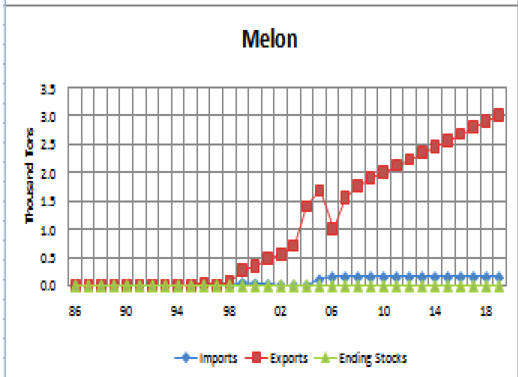

Strawberry
Thousand Tons
86 90 94 98 02 06 10 14 18
Production
Food Consumption

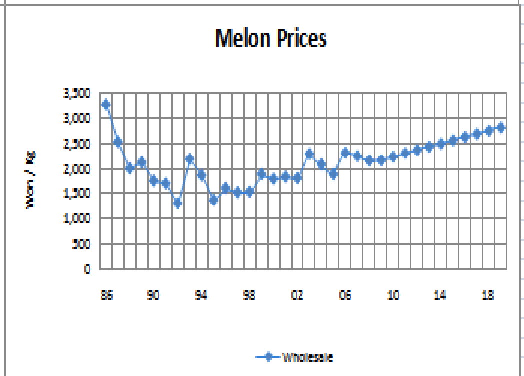

Strawberry
Thousand Tons
86 90 94 98 02 06 10 14 18
Imports
Exports
Ending Stocks

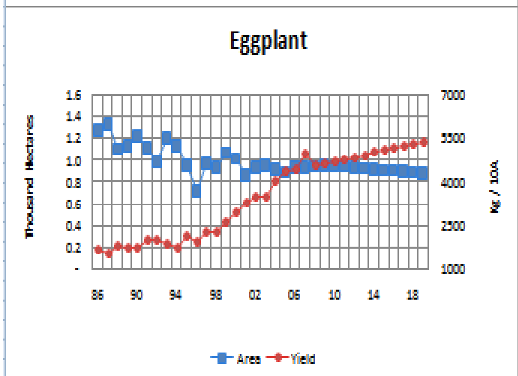

Strawberry Prices
Won / Kg
86 90 94 98 02 06 10 14 18
Wholesale
Consumer

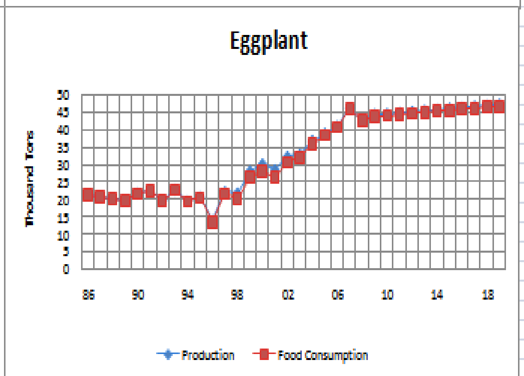

Melon
Thousand Hectares
Kg / 10A
Area
Yield

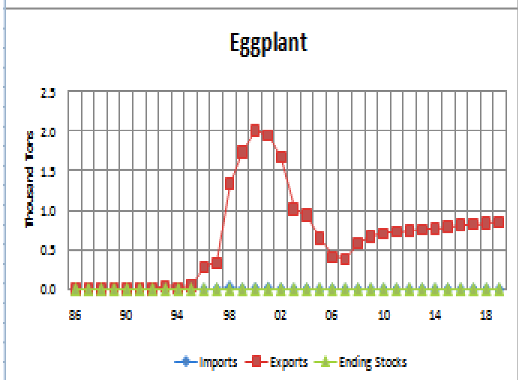

Melon
Thousand Tons
Production
Food Consumption

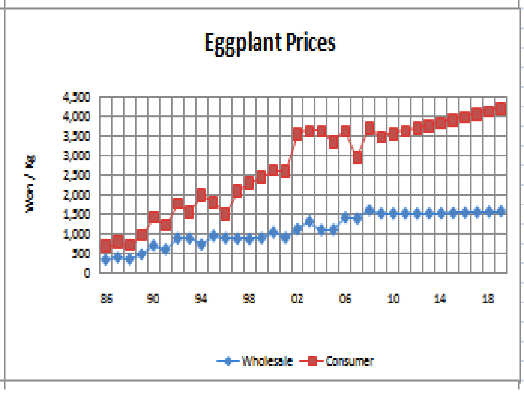

Melon
Thousand Tons
Imports
Exports
Ending Stocks

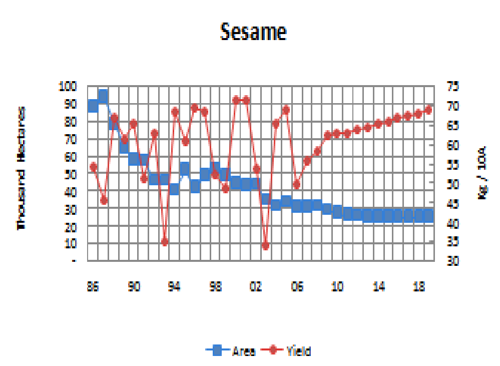

Melon Prices
Won / Kg
Wholesale

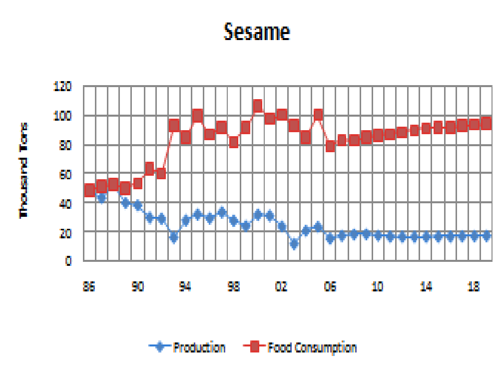

Eggplant
Thousand Hectares
Kg / 10A
Area
Yield

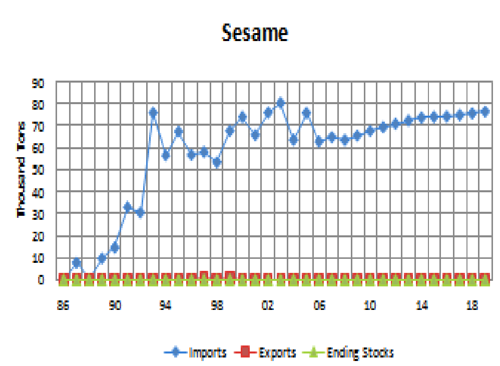

Eggplant
Thousand Tons
Production
Food Consumption

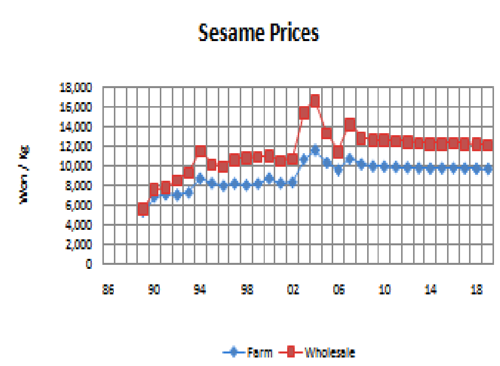

Eggplant
Thousand Tons
Imports
Exports
Ending Stocks

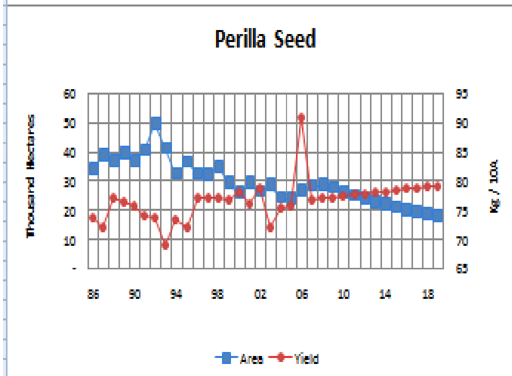

Eggplant Prices
Won / Kg
Wholesale
Consumer

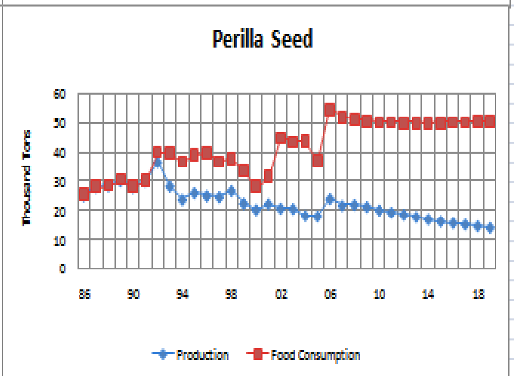

Sesame
Thousand Hectares
Kg / 10A
Area
Yield

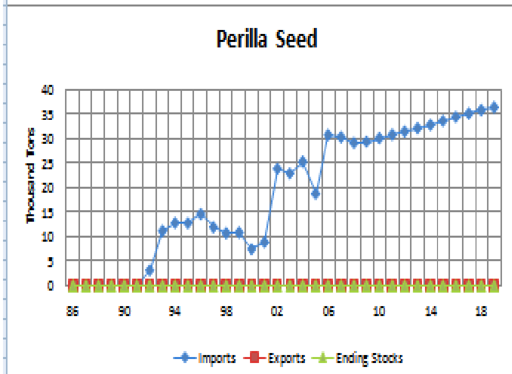

Sesame
Thousand Tons
Production
Food Consumption

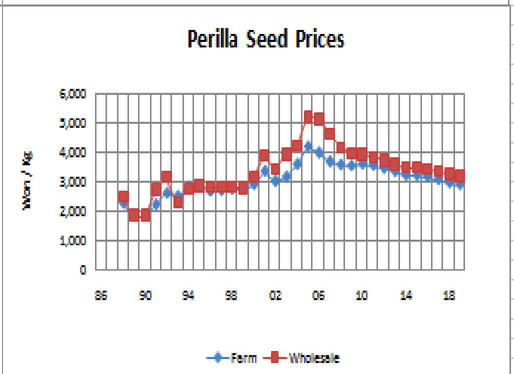

Sesame
Thousand Tons
Imports
Exports
Ending Stocks

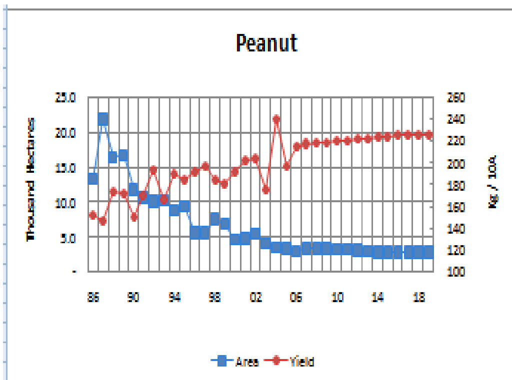

Sesame Prices
Won / kg
Farm
Wholesale

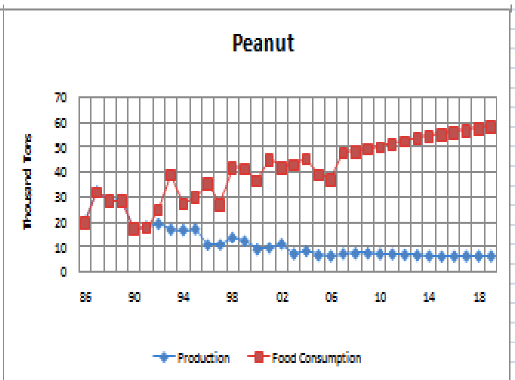

Perilla Seed
Thousand Hectares
Kg / 10A
Area
Yield

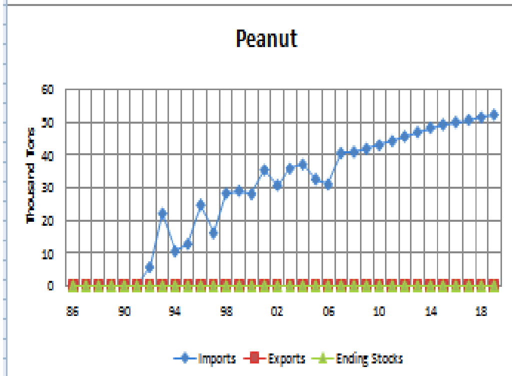

Perilla Seed
Thousand Tons
Production
Food Consumption

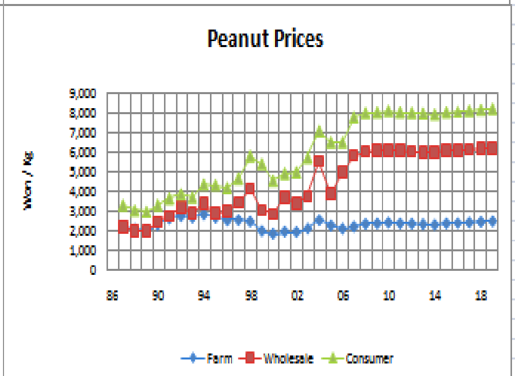

Perilla Seed
Thousand Tons
Imports
Exports
Ending Stocks

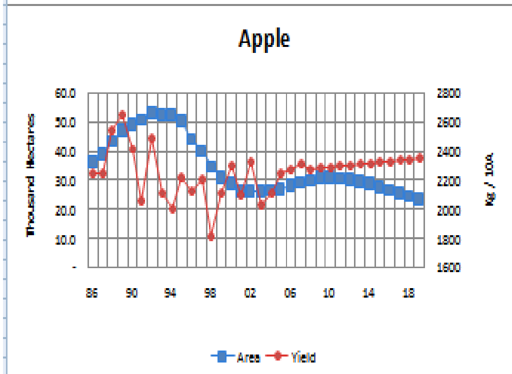

Perilla Seed Prices
Won / kg
Farm
Wholesale

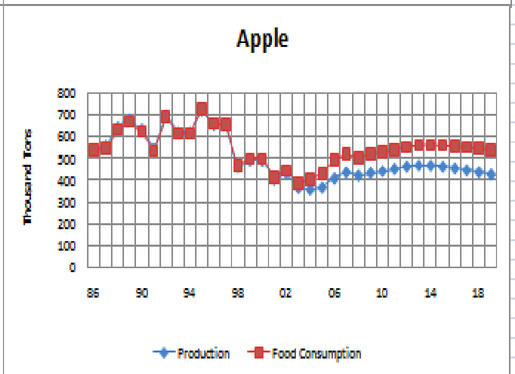

Peanut
Thousand Hectares
Kg / 10A
Area
Yield

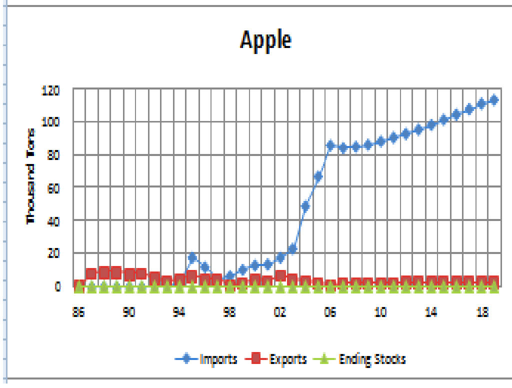

Peanut
Thousand Tons
Production
Food Consumption

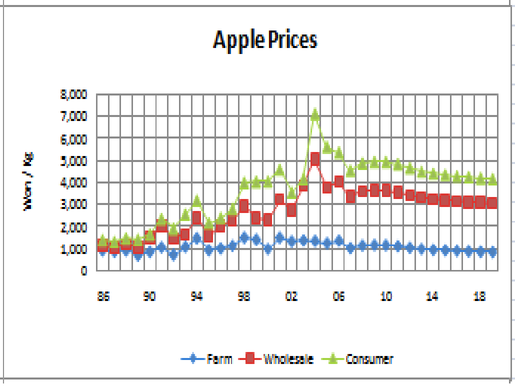

Peanut
Thousand Tons
Imports
Exports
Ending Stocks

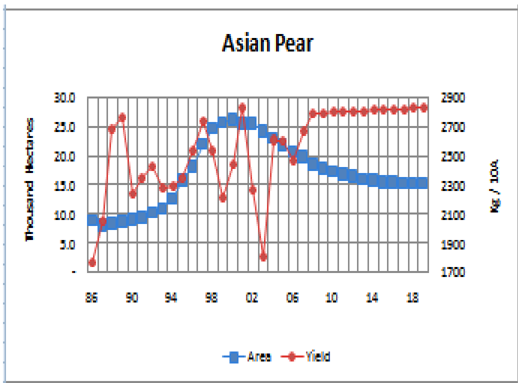

Peanut Prices
Won / Kg
Farm
Wholesale
Consumer

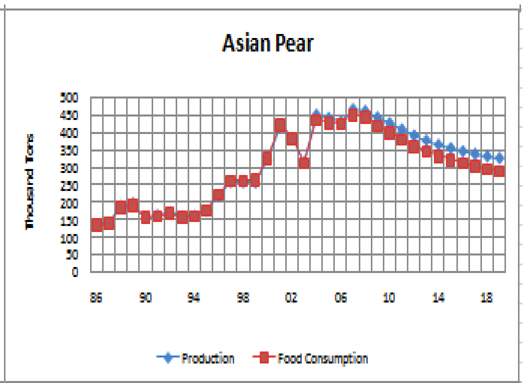

Apple
Thousand Hectares
Kg / 10A
Area
Yield

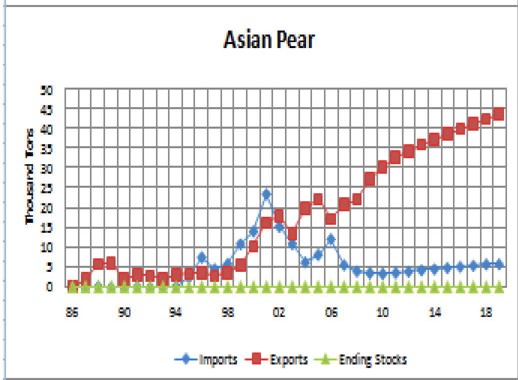

Apple
Thousand Tons
Production
Food Consumption

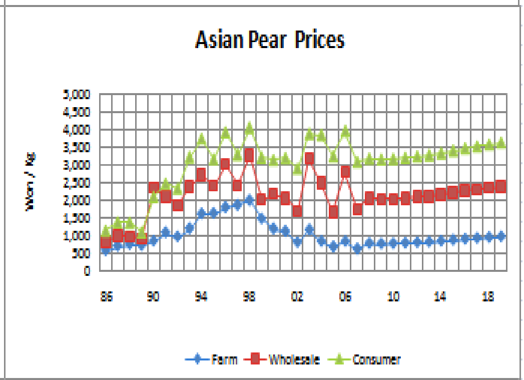

Apple
Thousand Tons
Imports
Exports
Ending Stocks

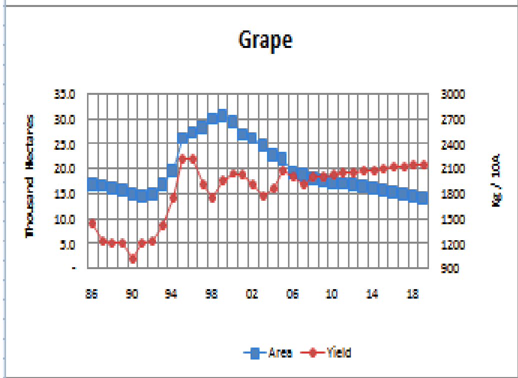

Apple Prices
Won / Kg
Farm
Wholesale
Consumer

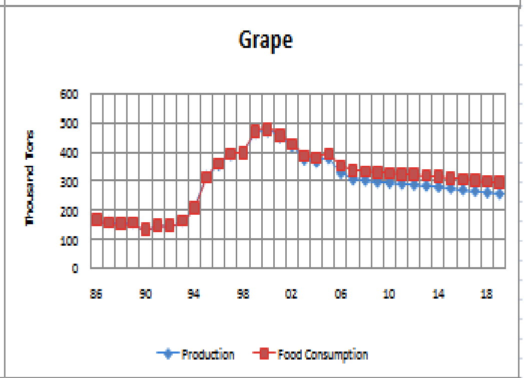

Asian Pear
Thousand Hectares
Kg / 10A
86 90 94 98 02 06 10 14 18
Area
Yield

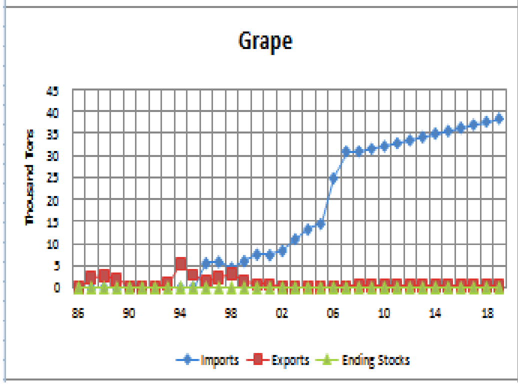

Asian Pear
Thousand Tons
86 90 94 98 02 06 10 14 18
Production
Food Consumption

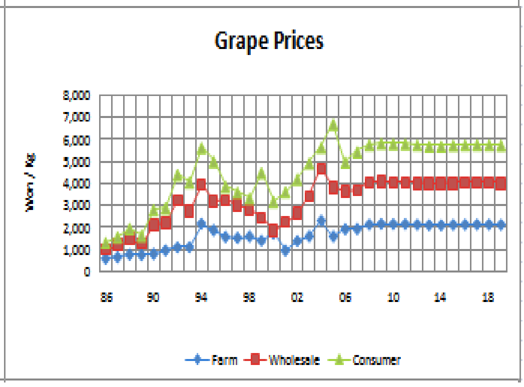

Asian Pear
Thousand Tons
86 90 94 98 02 06 10 14 18
Imports
Exports
Ending Stocks

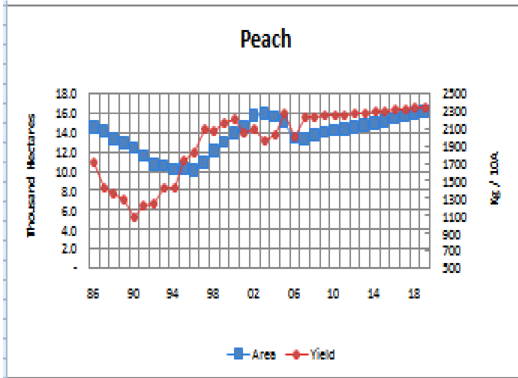

Asian Pear Prices
Won / Kg
86 90 94 98 02 06 10 14 18
Farm
Wholesale
Consumer

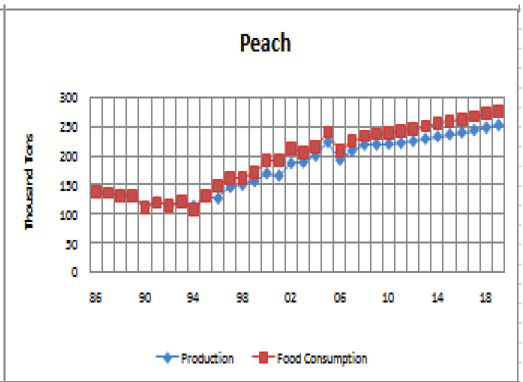

Grape
Thousand Hectares
Kg / 10A
86 90 94 98 02 06 10 14 18
Area
Yield

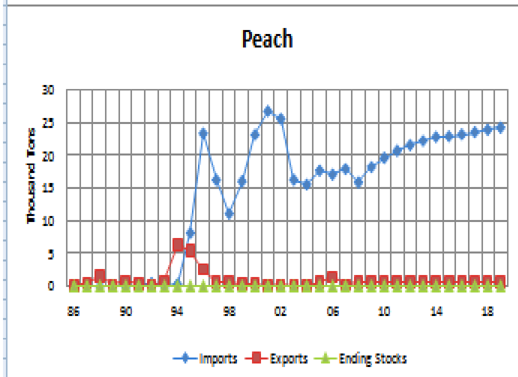

Grape
Thousand Tons
86 90 94 98 02 06 10 14 18
Production
Food Consumption

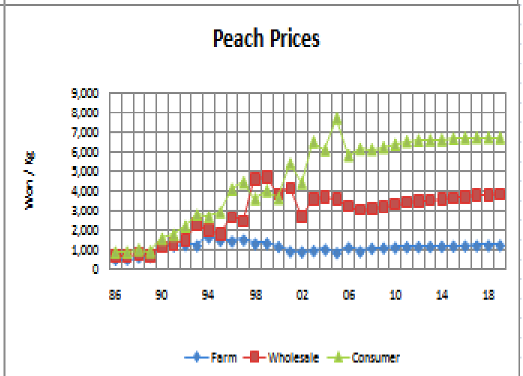

Grape
Thousand Tons
86 90 94 98 02 06 10 14 18
Imports
Exports
Ending Stocks

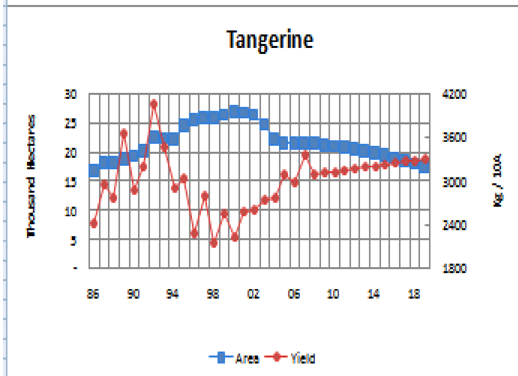

Grape Prices
Won / Kg
86 90 94 98 02 06 10 14 18
Farm
Wholesale
Consumer

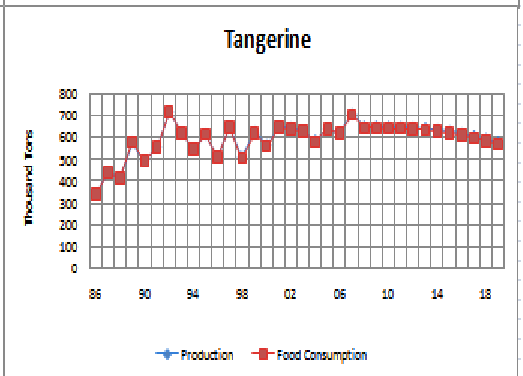

Peach
Thousand Hectares
Kg / 10A
86 90 94 98 02 06 10 14 18
Area
Yield

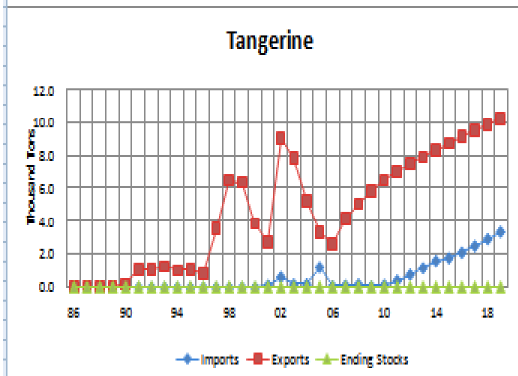

Peach
Thousand Tons
86 90 94 98 02 06 10 14 18
Production
Food Consumption

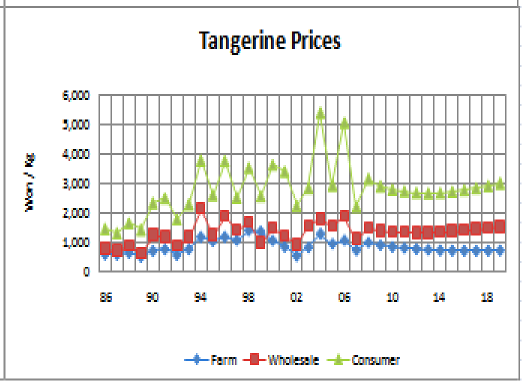

Peach
Thousand Tons
86 90 94 98 02 06 10 14 18
Imports
Exports
Ending Stocks

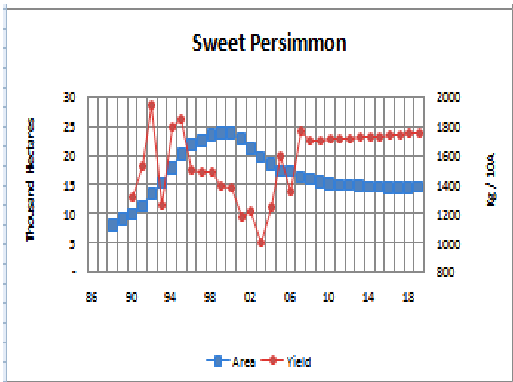

Peach Prices
Won / Kg
86 90 94 98 02 06 10 14 18
Farm
Wholesale
Consumer

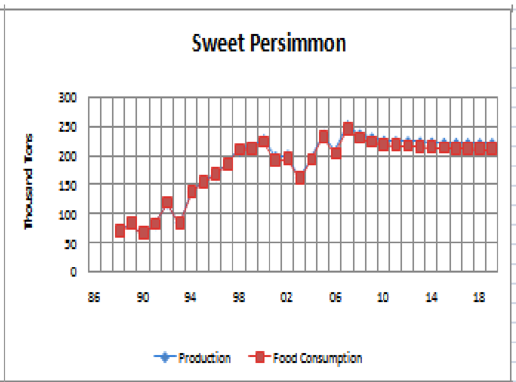

Tangerine
Thousand Hectares
Kg / 10A
86 90 94 98 02 06 10 14 18
Area
Yield

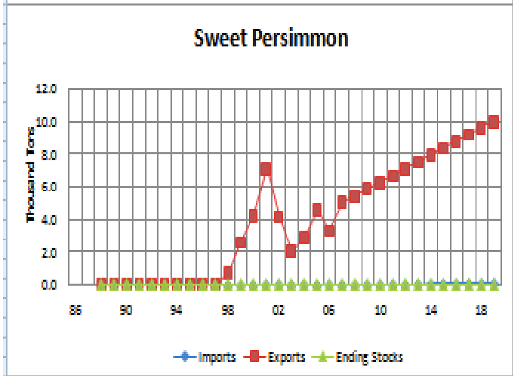

Tangerine
Thousand Tons
86 90 94 98 02 06 10 14 18
Production
Food Consumption

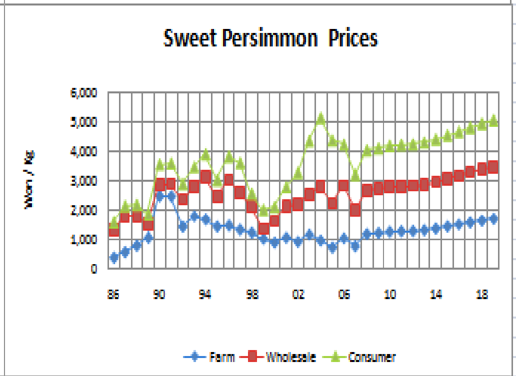

Tangerine
Thousand Tons
86 90 94 98 02 06 10 14 18
Imports
Exports
Ending Stocks

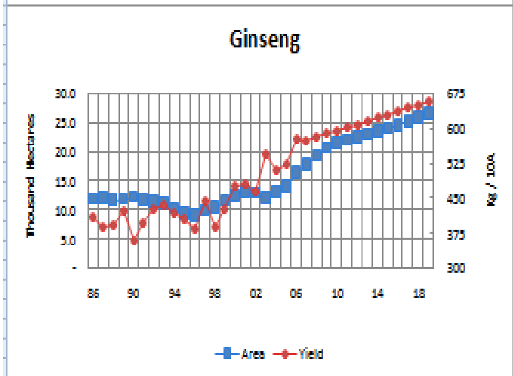

Tangerine Prices
Won / Kg
86 90 94 98 02 06 10 14 18
Farm
Wholesale
Consumer

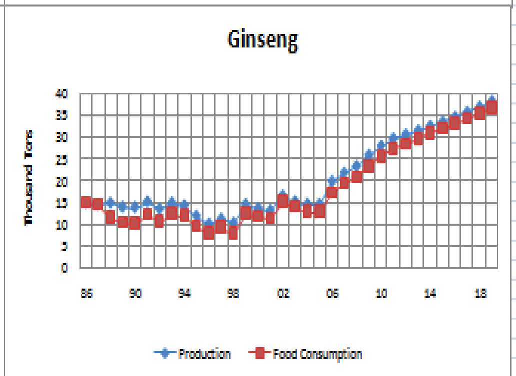

Sweet Persimmon
Thousand Hectares
Kg / 10A
30
25
20
15
10
5
-
2000
1800
1600
1400
1200
1000
800
86
90
94
98
02
06
10
14
18
Area
Yield

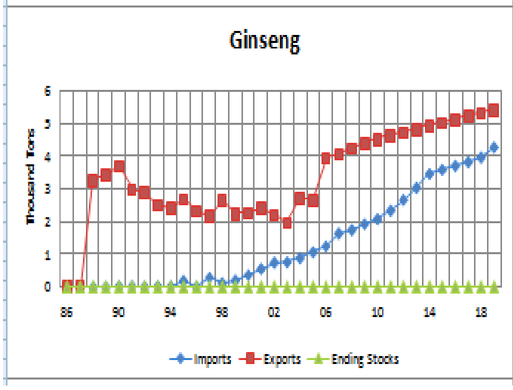

Sweet Persimmon
Thousand Tons
300
250
200
150
100
50
0
86
90
94
98
02
06
10
14
18
Production
Food Consumption

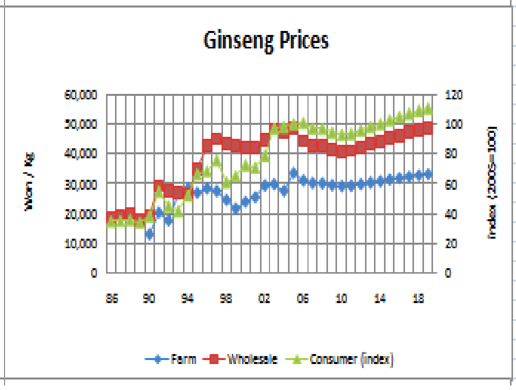

Sweet Persimmon
Thousand Tons
12.0
10.0
8.0
6.0
4.0
2.0
0.0
86
90
94
98
02
06
10
14
18
Imports
Exports
Ending Stocks

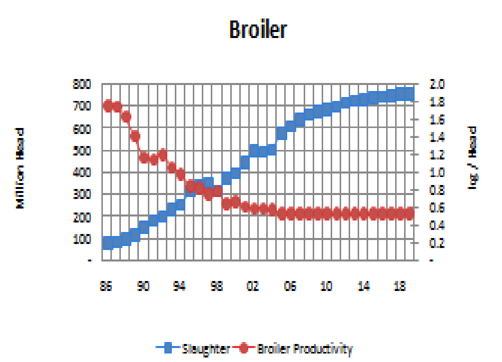

Sweet Persimmon Prices
Won / Kg
6,000
5,000
4,000
3,000
2,000
1,000
0
86
90
94
98
02
06
10
14
18
Farm
Wholesale
Consumer

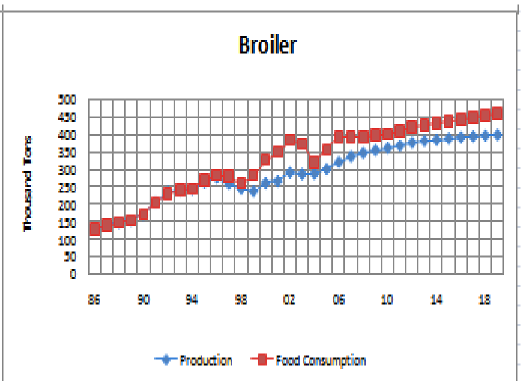

Ginseng
Thousand Hectares
Kg / 10A
30.0
25.0
20.0
15.0
10.0
5.0
-
675
600
525
450
375
300
86
90
94
98
02
06
10
14
18
Area
Yield

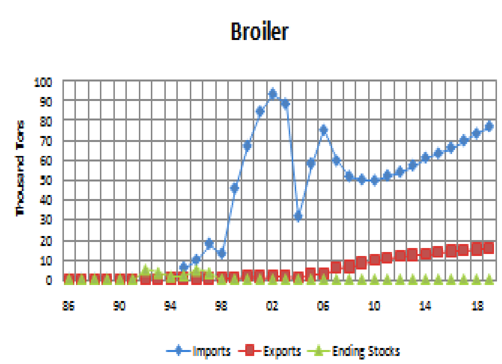

Ginseng
Thousand Tons
40
35
30
25
20
15
10
5
0
86
90
94
98
02
06
10
14
18
Production
Food Consumption

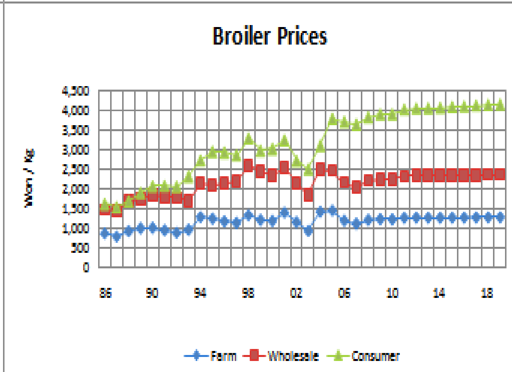

Ginseng
Thousand Tons
6
5
4
3
2
1
0
86
90
94
98
02
06
10
14
18
Imports
Exports
Ending Stocks

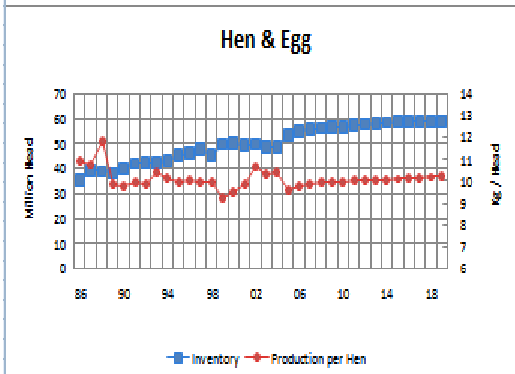

Ginseng Prices
Won / Kg
Index (2005=100)
60,000
50,000
40,000
30,000
20,000
10,000
0
120
100
80
60
40
20
0
86
90
94
98
02
06
10
14
18
Farm
Wholesale
Consumer (index)

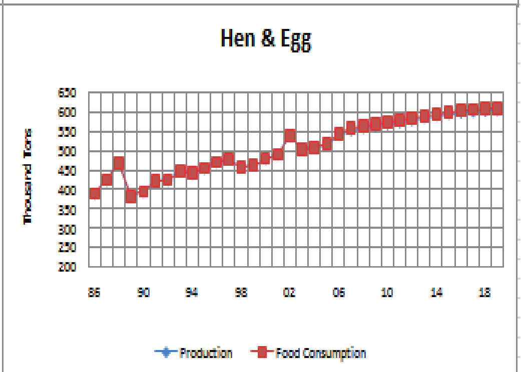

Broiler
Million Head
kg / Head
Slaughter
Broiler Productivity

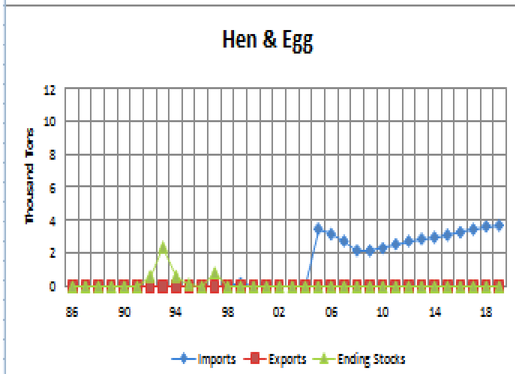

Broiler
Thousand Tons
Production
Food Consumption

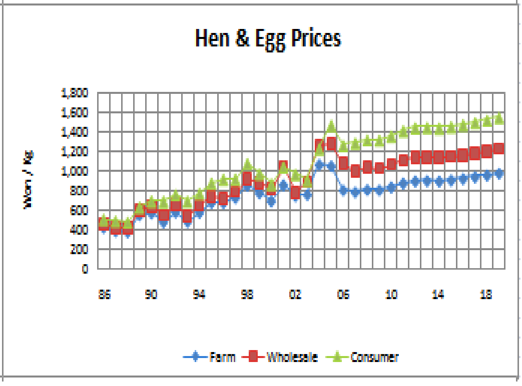

Broiler
Thousand Tons
Imports
Exports
Ending Stocks

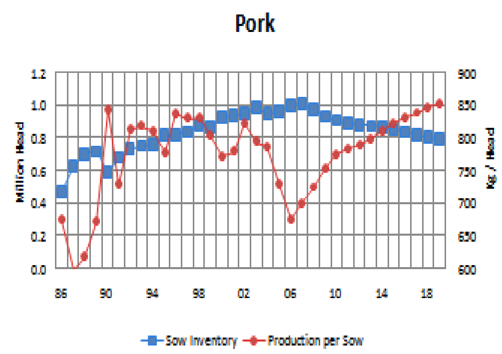

Broiler Prices
Won / kg
Farm
Wholesale
Consumer

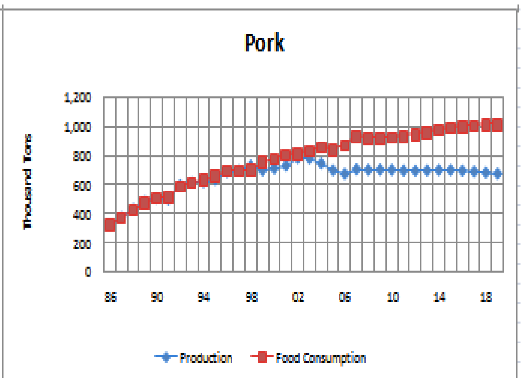

Hen & Egg
Million Head
Kg / Head
Inventory
Production per Hen

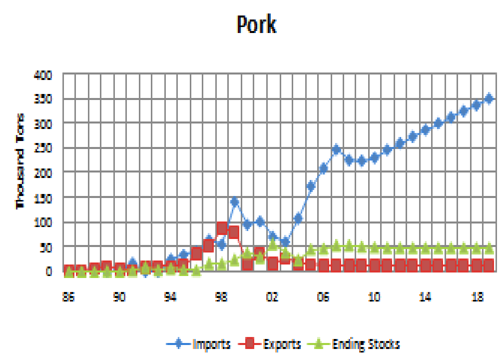

Hen & Egg
Thousand Tons
Production
Food Consumption

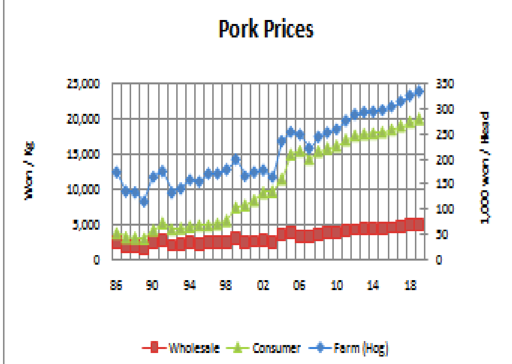

Hen & Egg
Thousand Tons
Imports
Exports
Ending Stocks

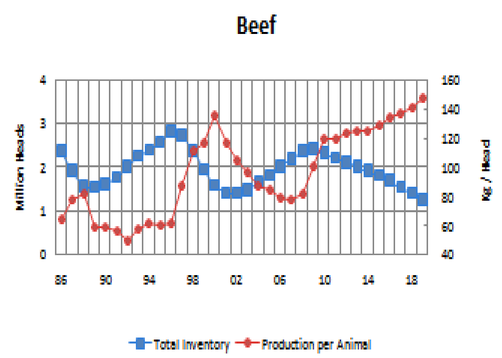

Hen & Egg Prices
Won / kg
Farm
Wholesale
Consumer

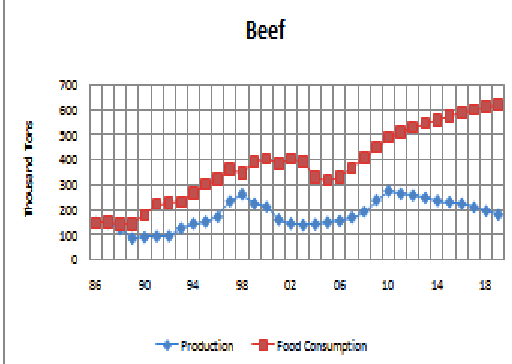

Pork
Million Head
Kg / Head
Sow Inventory
Production per Sow

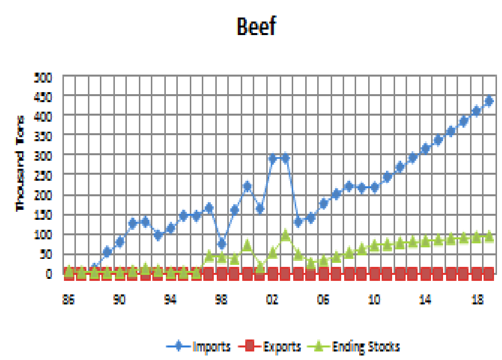

Pork
Thousand Tons
Production
Food Consumption

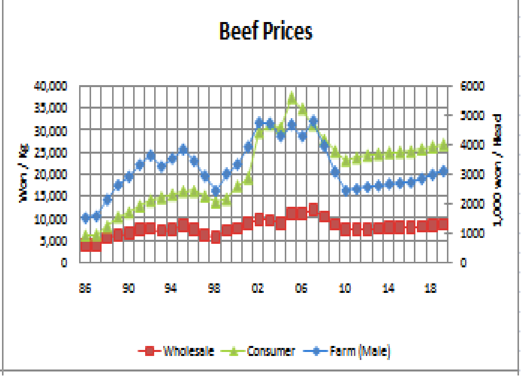

Pork
Thousand Tons
Imports
Exports
Ending Stocks

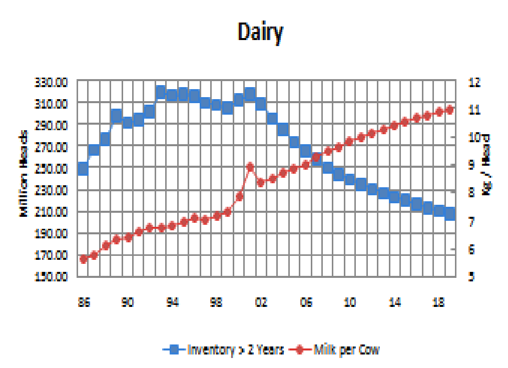

Pork Prices
Won / Kg
1,000 won / Head
Wholesale
Consumer
Farm (Hog)

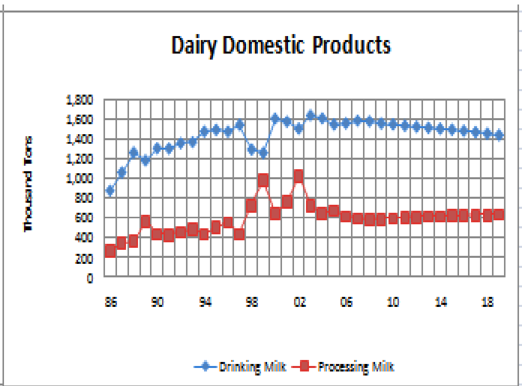

Beef
Million Heads
Kg / Head
Total Inventory
Production per Animal

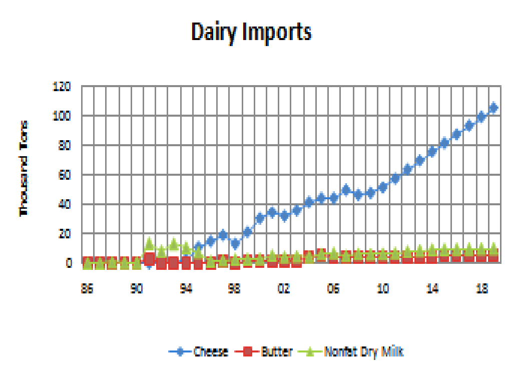

Beef
Thousand Tons
Production
Food Consumption

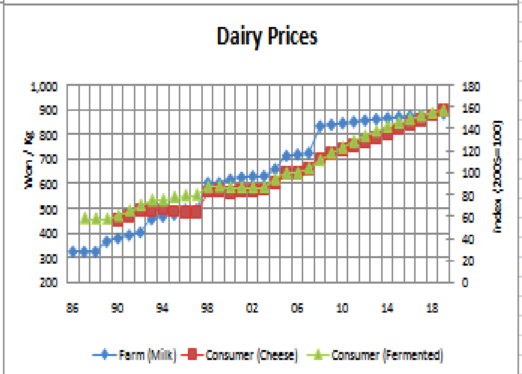

Beef
Thousand Tons
Imports
Exports
Ending Stocks

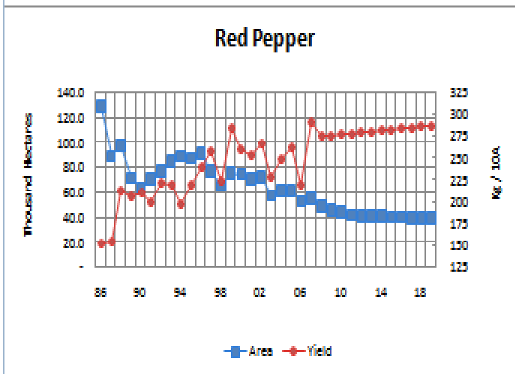

Beef Prices
Won / Kg
1,000 won / Head
Wholesale
Consumer
Farm (Male)

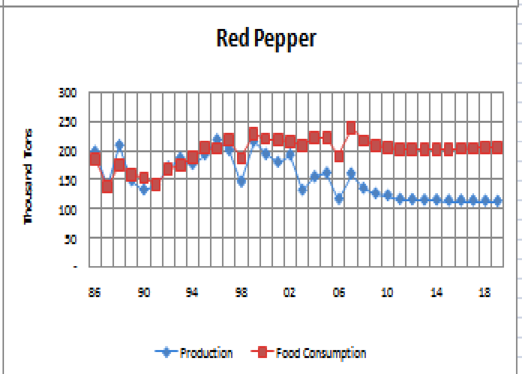

Dairy
Million Heads
Kg / Head
Inventory > 2 Years
Milk per Cow

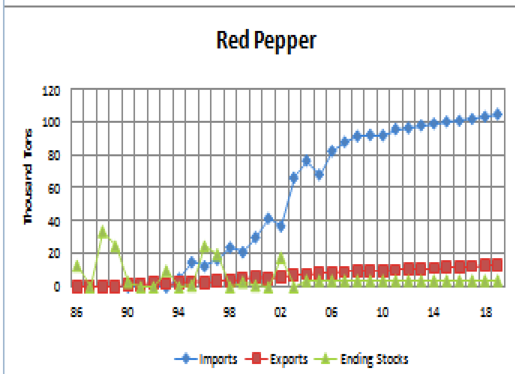

Dairy Domestic Products
Thousand Tons
Drinking Milk
Processing Milk

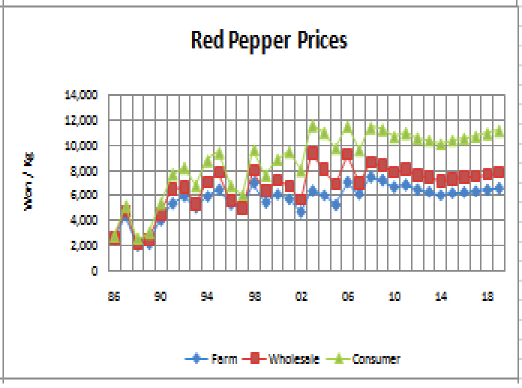

Dairy Imports
Thousand Tons
Cheese
Butter
Nonfat Dry Milk

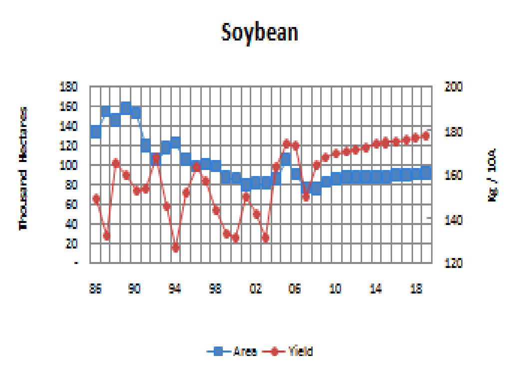

Dairy Prices
Won / Kg
Index (2005=100)
Farm (Milk)
Consumer (Cheese)
Consumer (Fermented)

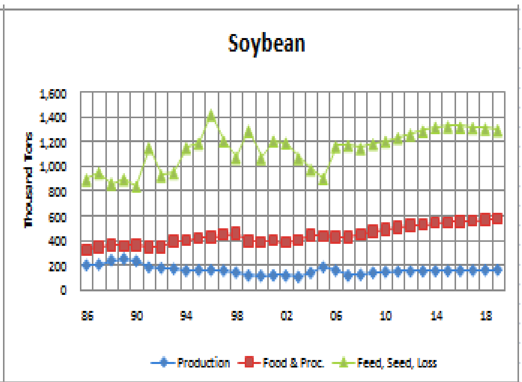

Red Pepper
Thousand Hectares
Kg / 10A
Area
Yield

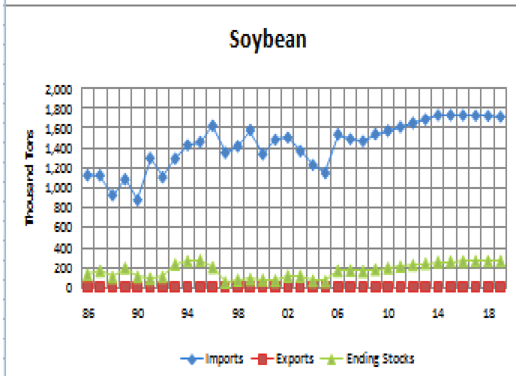

Red Pepper
Thousand Tons
Production
Food Consumption

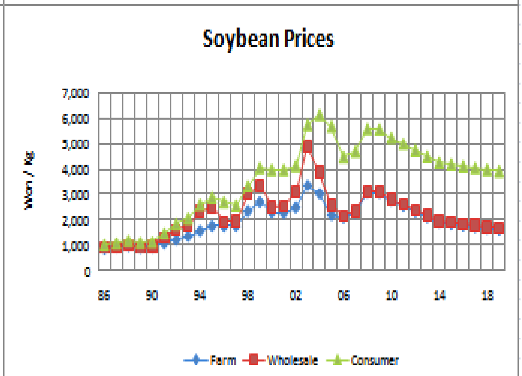

Red Pepper
Thousand Tons
Imports
Exports
Ending Stocks

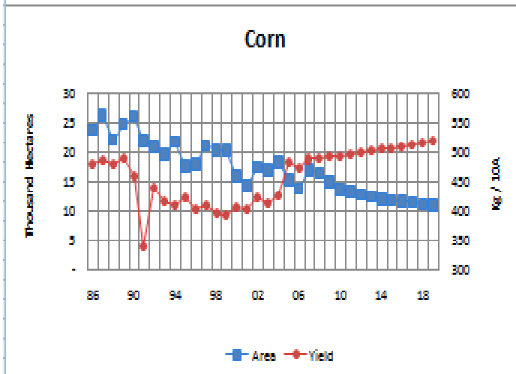

Red Pepper Prices
Won / Kg
Farm
Wholesale
Consumer

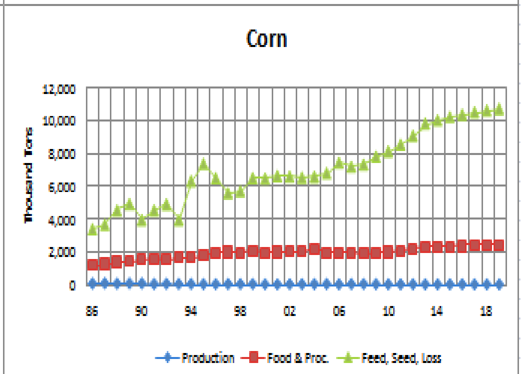

Soybean
Thousand Hectares
Kg / 10A
Area
Yield

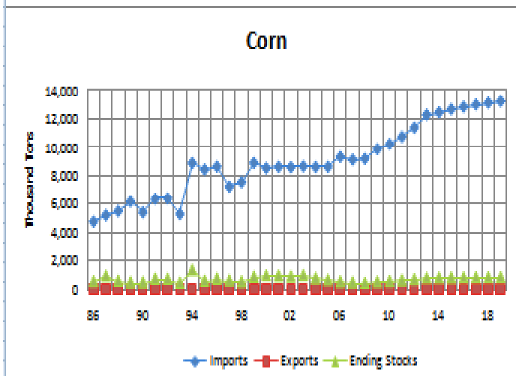

Soybean
Thousand Tons
Production
Food & Proc.
Feed, Seed, Loss

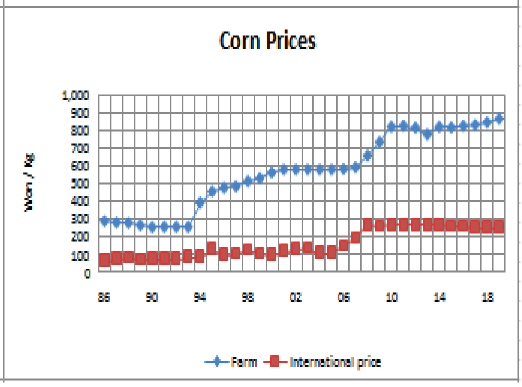

Soybean
Thousand Tons
Imports
Exports
Ending Stocks

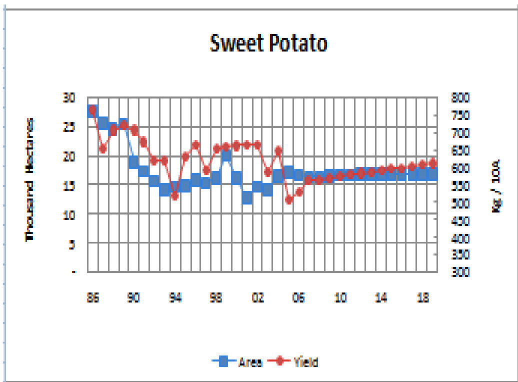

Soybean Prices
Won / Kg
Farm
Wholesale
Consumer

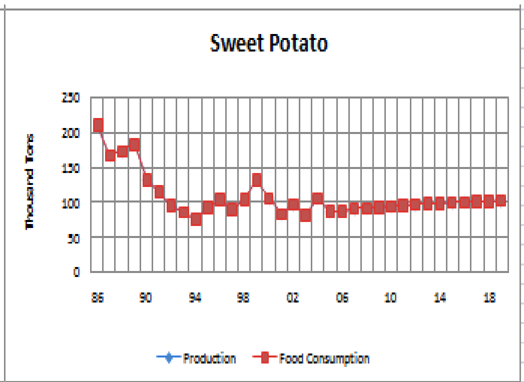

Corn
Thousand Hectares
Kg / 10A
Area
Yield

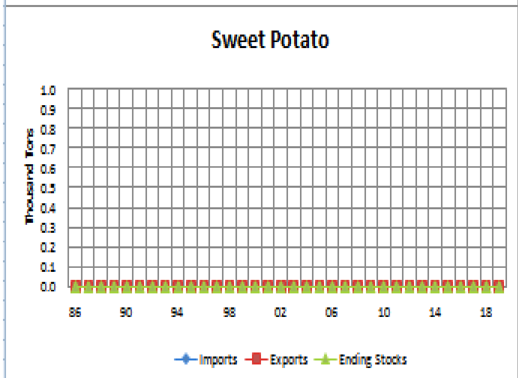

Corn
Thousand Tons
Production
Food & Proc.
Feed, Seed, Loss

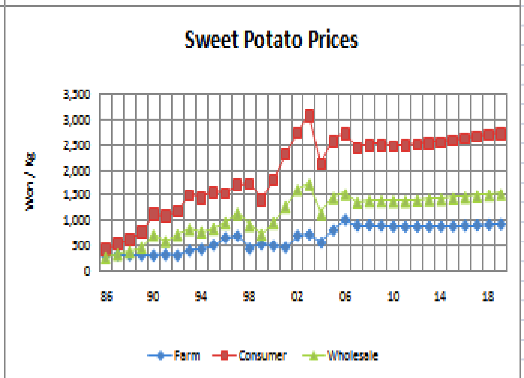

Corn
Thousand Tons
Imports
Exports
Ending Stocks

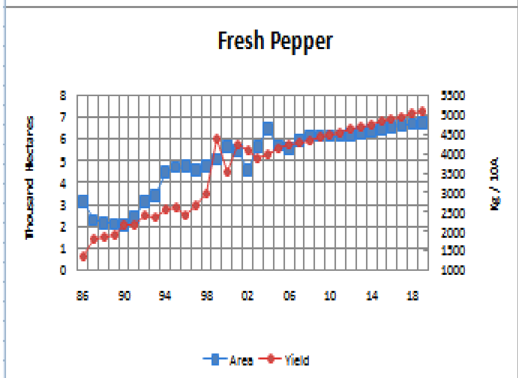

Corn Prices
Won / Kg
Farm
International price

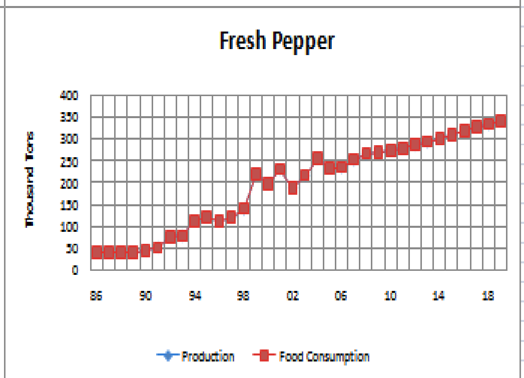

Sweet Potato
Thousand Hectares
Kg / 10A
Area
Yield

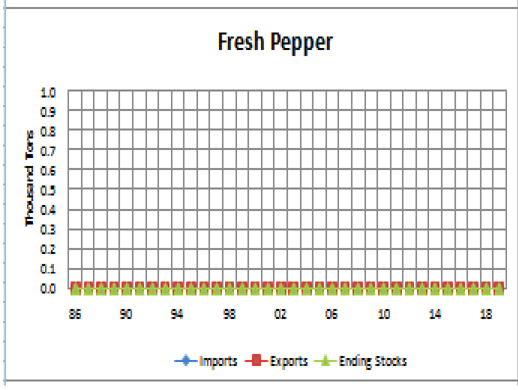

Sweet Potato
Thousand Tons
Production
Food Consumption

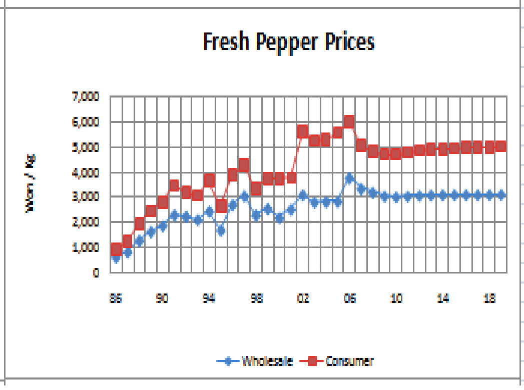

Sweet Potato
Thousand Tons
Imports
Exports
Ending Stocks

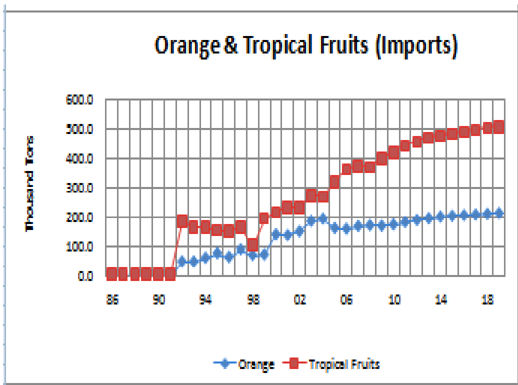

Sweet Potato Prices
Won / Kg
Farm
Consumer
Wholesale

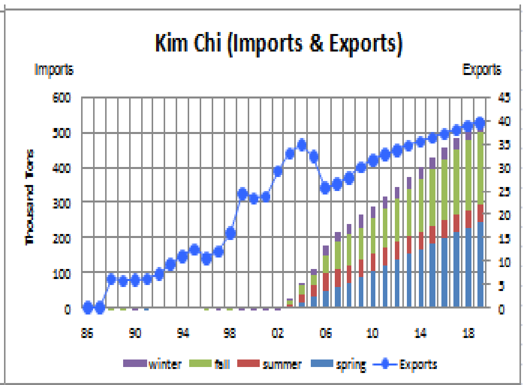

Fresh Pepper
Thousand Hectares
Kg / 10A
Area
Yield


Fresh Pepper
Thousand Tons
Production
Food Consumption

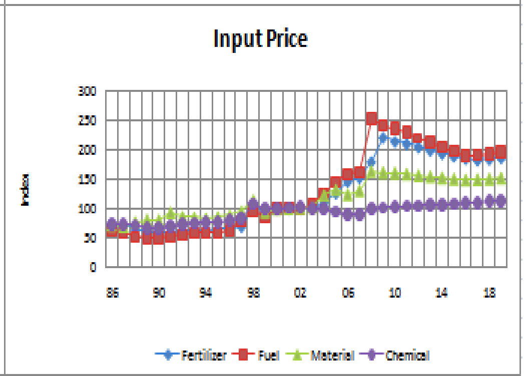

Fresh Pepper
Thousand Tons
Imports
Exports
Ending Stocks

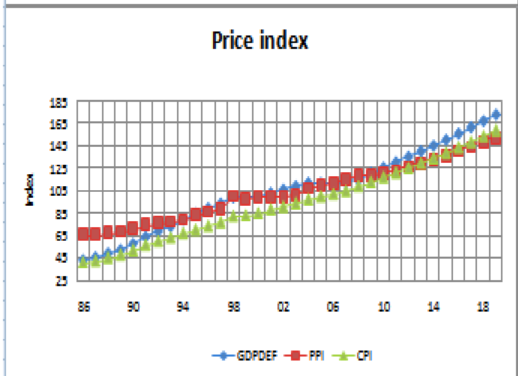

Fresh Pepper Prices
Won / Kg
Wholesale
Consumer

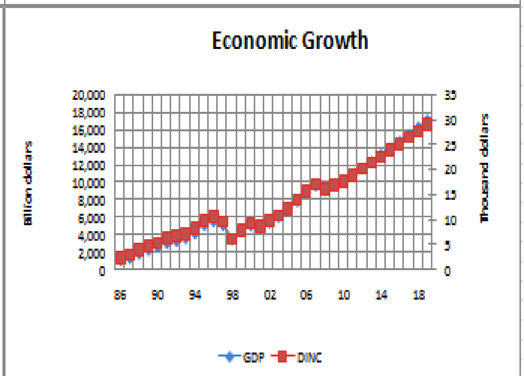

Orange & Tropical Fruits (Imports)
Thousand Tons
Orange
Tropical Fruits

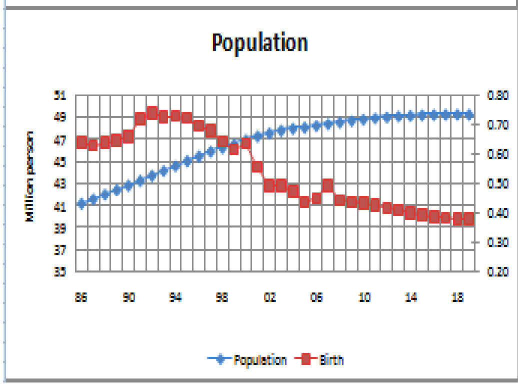

Kim Chi (Imports & Exports)
Imports
Exports
Thousand Tons
winter
fall
summer
spring
Exports

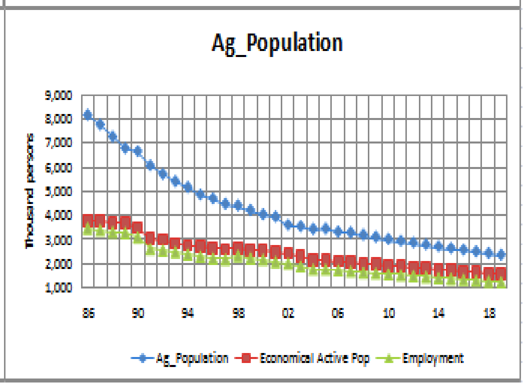

Input Price
Index
Machine
Seed
Rent
Wage

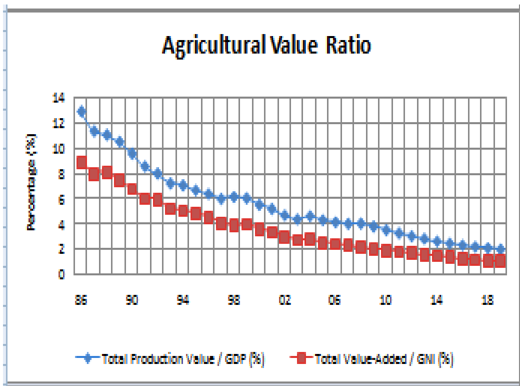

Input Price
Index
Fertilizer
Fuel
Material
Chemical

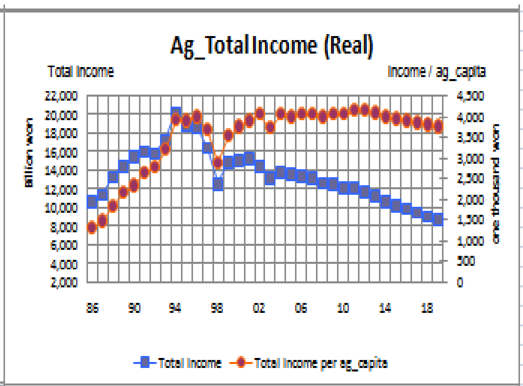

Price index
Index
GDPDEF
PPI
CPI

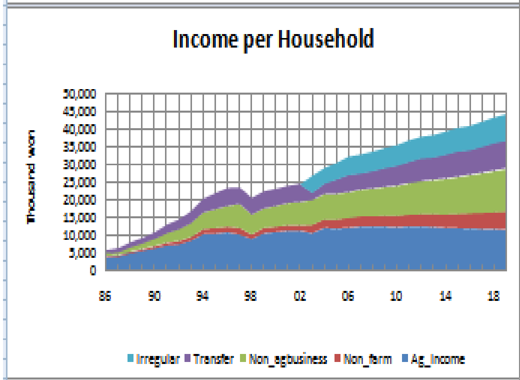

Economic Growth
Billion dollars
Thousand dollars
GDP
DINC

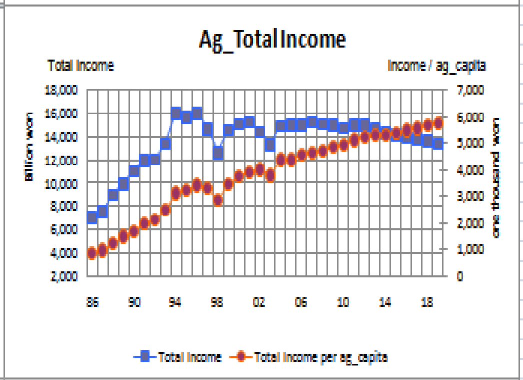

Population
Million person
Population
Birth

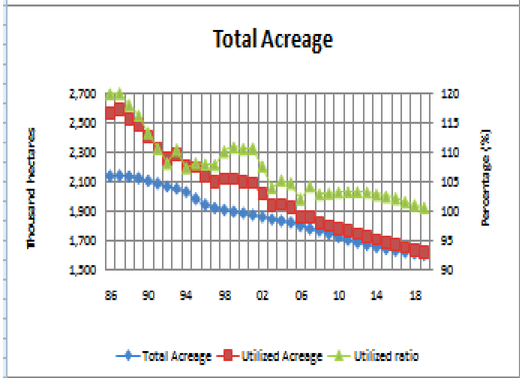

Ag_Population
Thousand persons
Ag_Population
Economical Active Pop
Employment

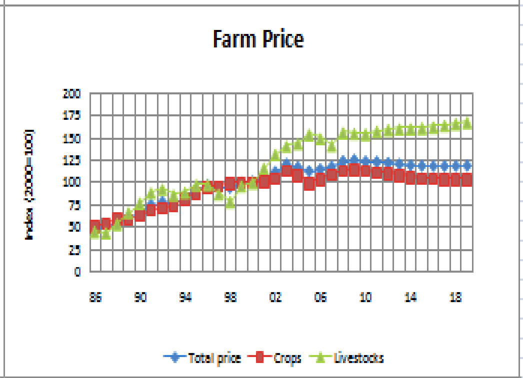

Agricultural Value Ratio
Percentage (%)
Total Production Value / GDP (%)
Total Value-Added / GNI (%)

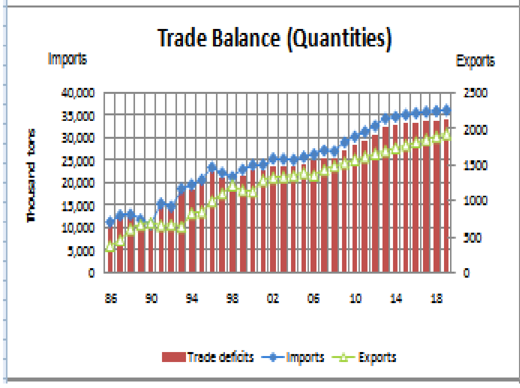

Ag_Total Income (Real)
Total Income
Income / ag_capita
Billion won
one thousand won
Total Income
Total Income per ag_capita

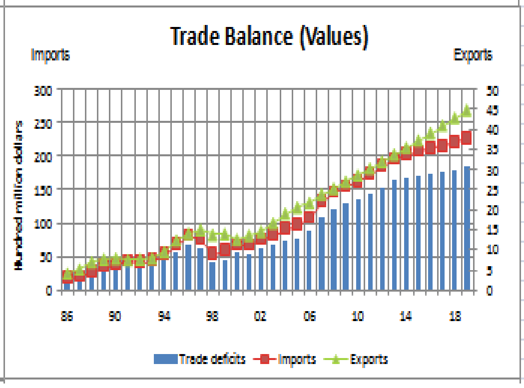

Income per Household
Thousand won
Irregular
Transfer
Non_agbusiness
Non_farm
Ag_income

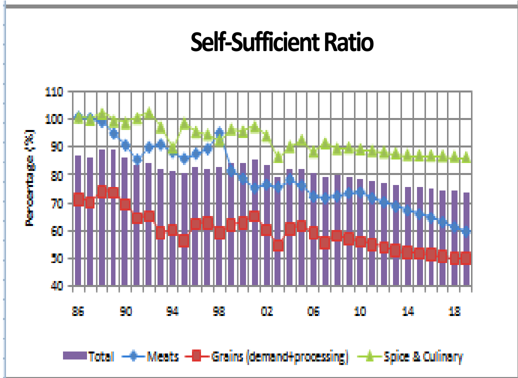

Ag_Total Income
Total Income
Income / ag_capita
Billion won
one thousand won
Total Income
Total Income per ag_capita

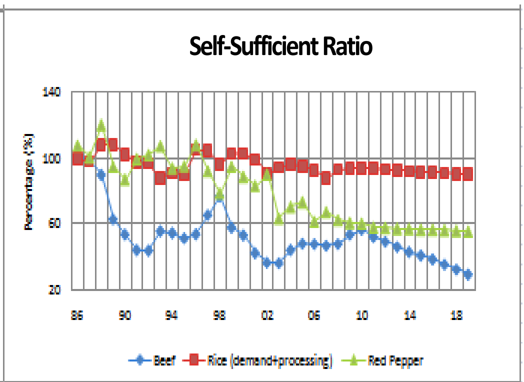

Total Acreage
Thousand hectares
Percentage (%)
Total Acreage
Utilized Acreage
Utilized ratio

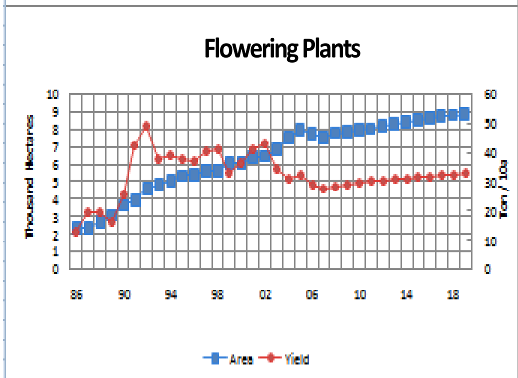

Farm Price
Index (2000=100)
Total price
Crops
Livestocks

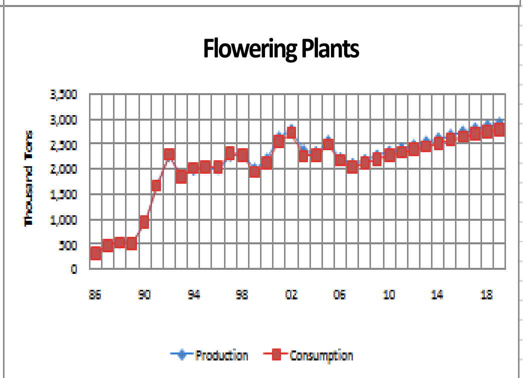

Trade Balance (Quantities)
Imports
Exports
Thousand tons
Trade deficits
Imports
Exports

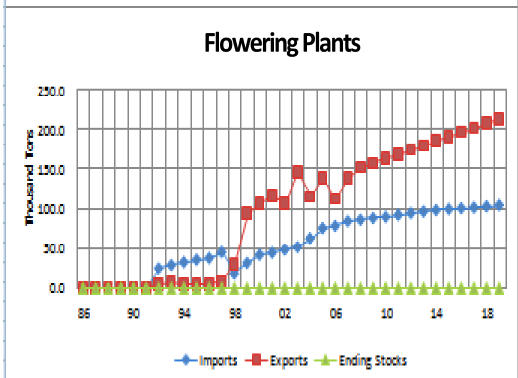

Trade Balance (Values)
Imports
Exports
Hundred million dollars
Trade deficits
Imports
Exports

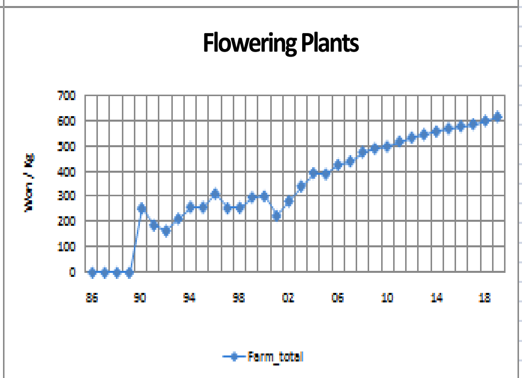

Self-Sufficient Ratio
Percentage (%)
Total
Meats
Grains (demand+processing)
Spice & Culinary

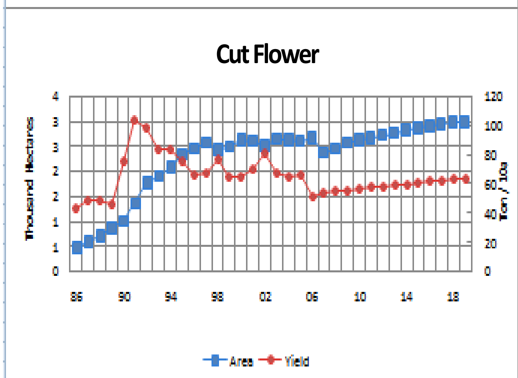

Self-Sufficient Ratio
Percentage (%)
Beef
Rice (demand+processing)
Red Pepper

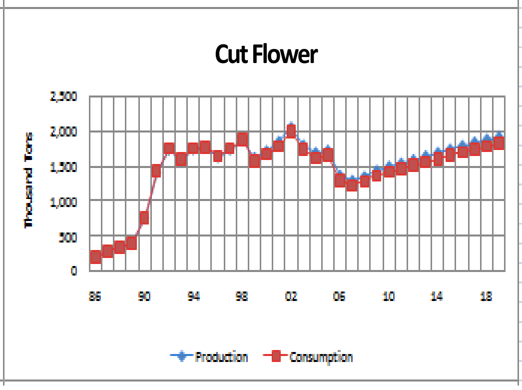

Flowering Plants
Thousand Hectares
Ton / 10a
Area
Yield

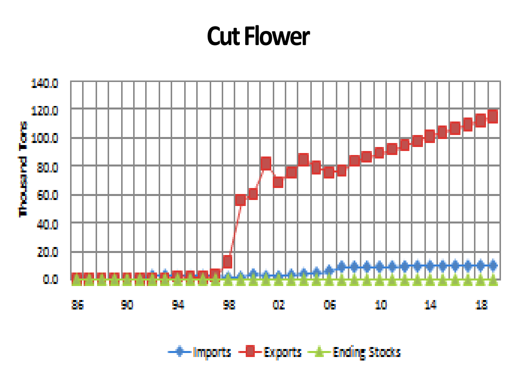

Flowering Plants
Thousand Tons
Production
Consumption

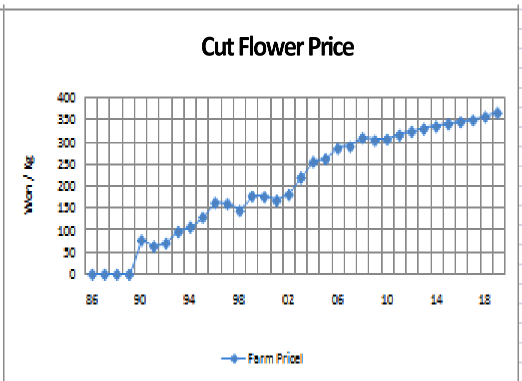

Flowering Plants
Thousand Tons
Imports
Exports
Ending Stocks

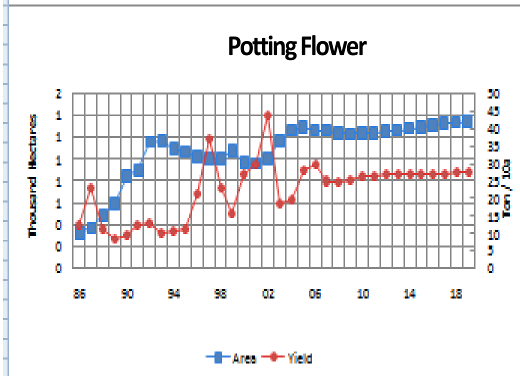

Flowering Plants
Won / kg
Farm_total

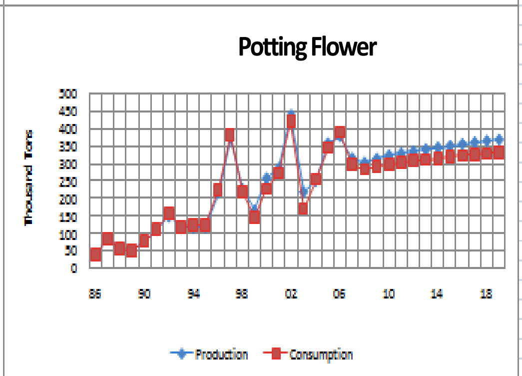

Cut Flower
Thousand Hectares
Ton / 10a
Area
Yield

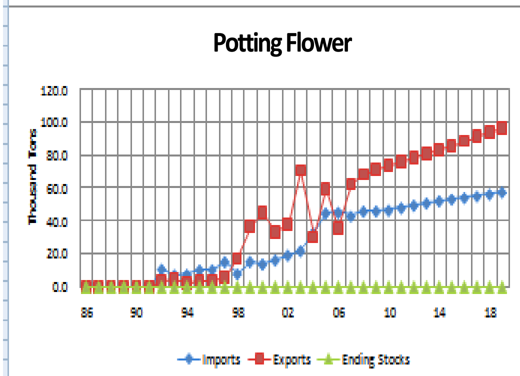

Cut Flower
Thousand Tons
Production
Consumption

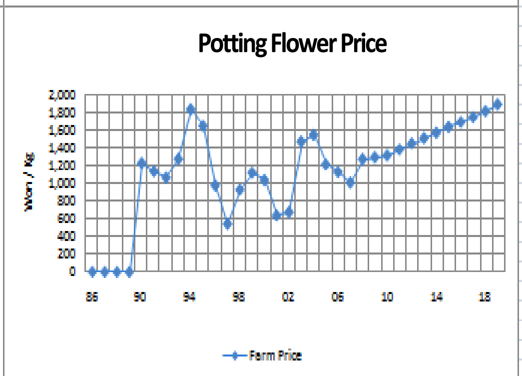

Cut Flower
Thousand Tons
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
86
90
94
98
02
06
10
14
18
Imports
Exports
Ending Stocks

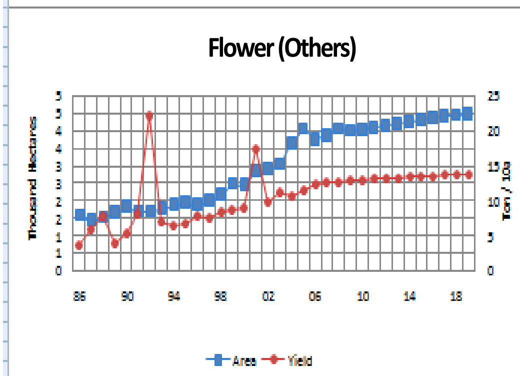

Cut Flower Price
Won / Kg
400
350
300
250
200
150
100
50
0
86
90
94
98
02
06
10
14
18
Farm Price

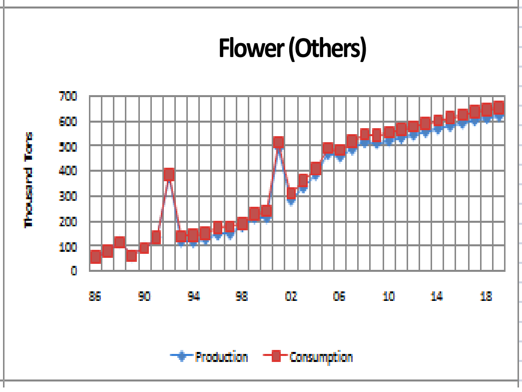

Potting Flower
Thousand Hectares
Ton / 10a
86
90
94
98
02
06
10
14
18
Area
Yield

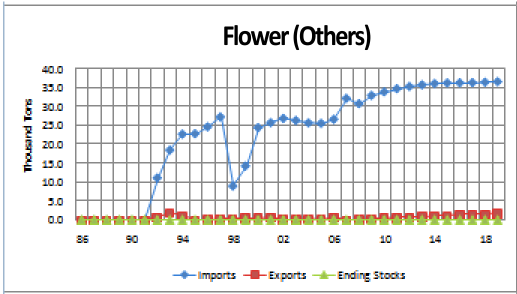

Potting Flower
Thousand Tons
500
450
400
350
300
250
200
150
100
50
0
86
90
94
98
02
06
10
14
18
Production
Consumption

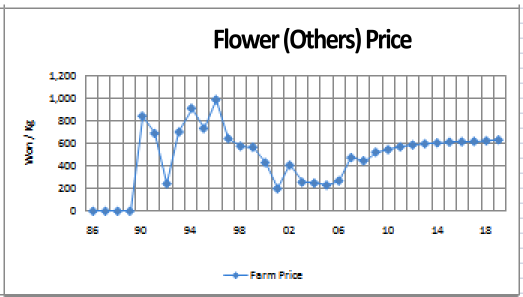

Potting Flower
Thousand Tons
120.0
100.0
80.0
60.0
40.0
20.0
0.0
86
90
94
98
02
06
10
14
18
Imports
Exports
Ending Stocks

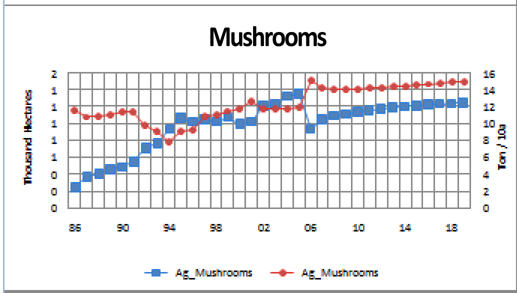

Potting Flower Price
Won / Kg
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
86
90
94
98
02
06
10
14
18
Farm Price

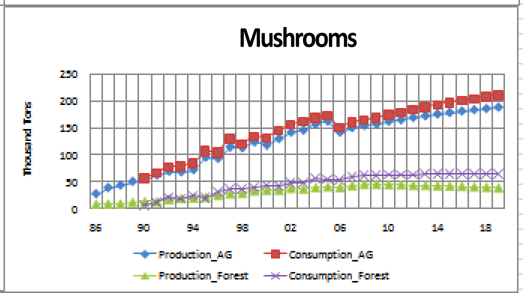

Flower (Others)
Thousand Hectares
Ton / 10a
25
20
15
10
5
0
86
90
94
98
02
06
10
14
18
Area
Yield

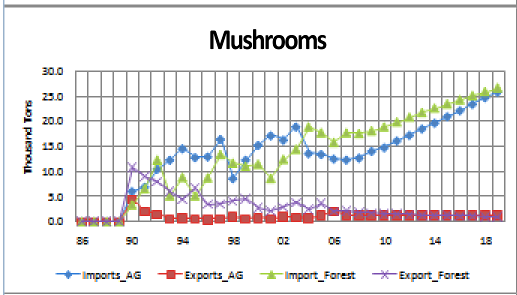

Flower (Others)
Thousand Tons
700
600
500
400
300
200
100
0
86
90
94
98
02
06
10
14
18
Production
Consumption

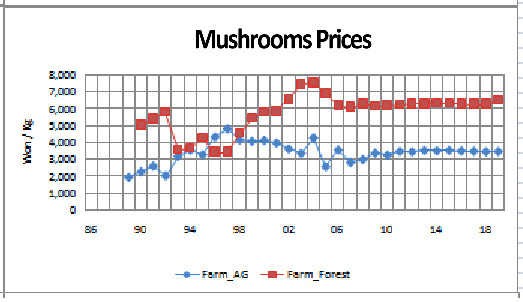

Flower (Others)
Thousand Tons
Imports
Exports
Ending Stocks

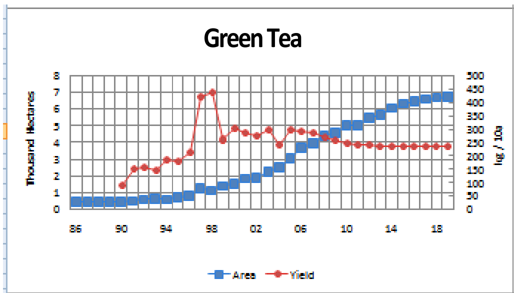

Flower (Others) Price
Won / Kg
Farm Price

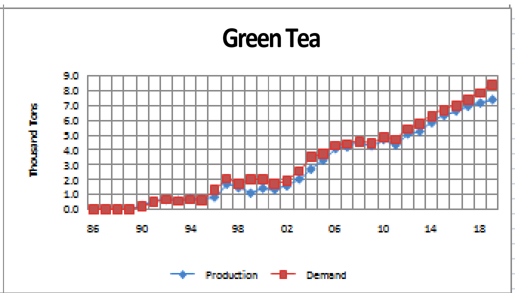

Mushrooms
Thousand Hectares
Ton / 10a
Ag_Mushrooms
Ag_Mushrooms

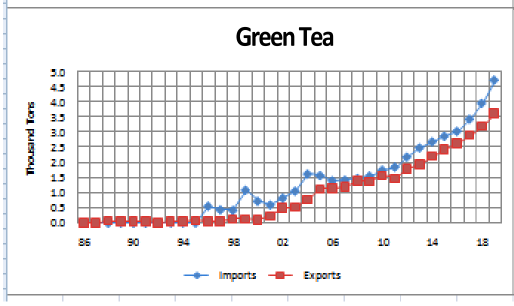

Mushrooms
Thousand Tons
Production_AG
Consumption_AG
Production_Forest
Consumption_Forest

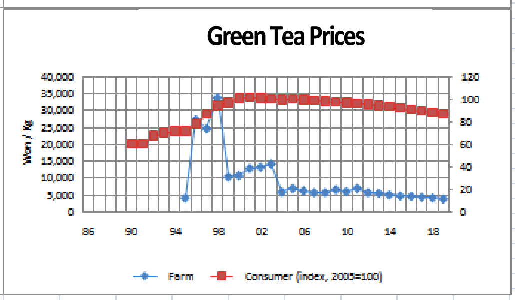

Mushrooms
Thousand Tons
Imports_AG
Exports_AG
Import_Forest
Export_Forest


Mushrooms Prices
Won / Kg
Farm_AG
Farm_Forest


Green Tea
Thousand Hectares
kg / 10a
Area
Yield


Green Tea
Thousand Tons
Production
Demand


Green Tea
Thousand Tons
Imports
Exports


Green Tea Prices
Won / Kg
Farm
Consumer (index, 2005=100)

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Part 2

KOREA LIVESTOCK QUARTERLY MODEL

1. INTRODUCTION

In July 2007 the Food and Agricultural Policy Research Institute (FAPRI) at the University of Missouri and Korea Rural Economic Institute (KREI) entered into an agreement that would result in development and delivery of a new KREI-COMO (KREI-Commodity Model) and expansion and updating of the KREI Quarterly Livestock Model to be estimated by FAPRI. The beef, dairy, pork, broiler and hen sectors are model in this project.

The model is econometrically estimated by dynamic simultaneous equation model and produced in a user-friendly Excel spreadsheet. This paper will provide a summary of this process to provide insight into the final model delivered to KREI. In addition, appendices are added that summarize a procedure of using the Excel model.

2. MODEL FLOW DIAGRAM

Brown (1994) developed U.S. livestock flow diagram. The general approach of each sector was first to identify the primary supply point. The number of heads breeding or hatched drives the supply side. Each equation contains a lagged dependent variable to help capture the dynamics of the supply portions of the sectors. A ratio of output to input prices are also contained in the equations to drive the response of these equations to changing economics. The other sectors contain primary domestic consumption equations. The consumption of each meant product depends on its own price, the price of the other meats in the system and income. The demand side of this model estimated in a single equation approach. The other important portion of the model is the interaction with world markets. Trade equations are estimated that include comparisons of world to domestic prices, exchange rates and other trade barriers that limit trade to something less than the free trade solutions. We used this U.S. livestock flow diagram on Korean livestock modeling.

2.1. Beef

In beef model specification, we need to consider investment behavior, and biological constraints which means supplies may respond differently in the short and long run. Any econometric model of beef industry that captures the underlying structure is fairly complex as indicated in the Figure 1.

This diagram replicates[14] the flow of product through the market channel from the cow-calf producer to the ultimate consumer of the beef product. The cow-calf sector provides an indication of the factors that influence supply. The decision made by cow-calf producers to expand or contract the breeding herd ultimately determines the number of animals that can be produced for a given time period. The number of breeding cows in the herd can be influenced by both the number of cows expected to be culled and the number of heifers retained to enter the cow herd. Calves that enter the feedlot are fed on a full ration of grain to finish them to an appropriate slaughter weight. Once cattle have been fed out in the feedlot, they are slaughtered.

Although Figure 1 shows the path that cattle can take from birth until slaughter, it does not associate the length of time necessary to travel each point of path. Two important factors differentiate the production of beef from that of other meats. One is the offspring produced per animal per period and the other is the length of time needed to adjust production. Figure 2 shows the length of time necessary for each of the beef production stages to occur. From the time a cow-calf producer makes the decision to produce until that production reaches the consumer's table can take over two years.

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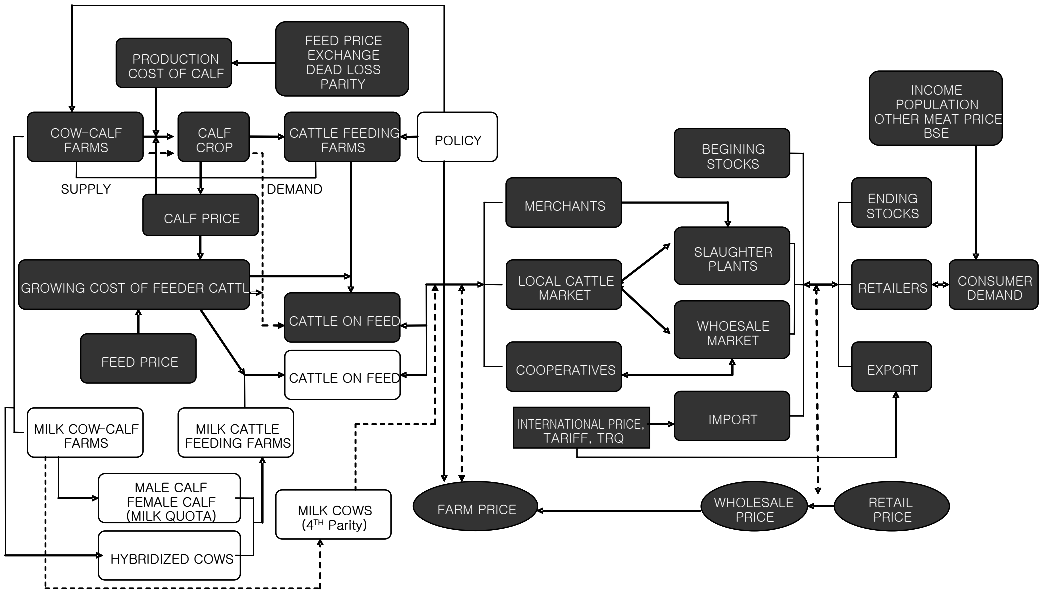
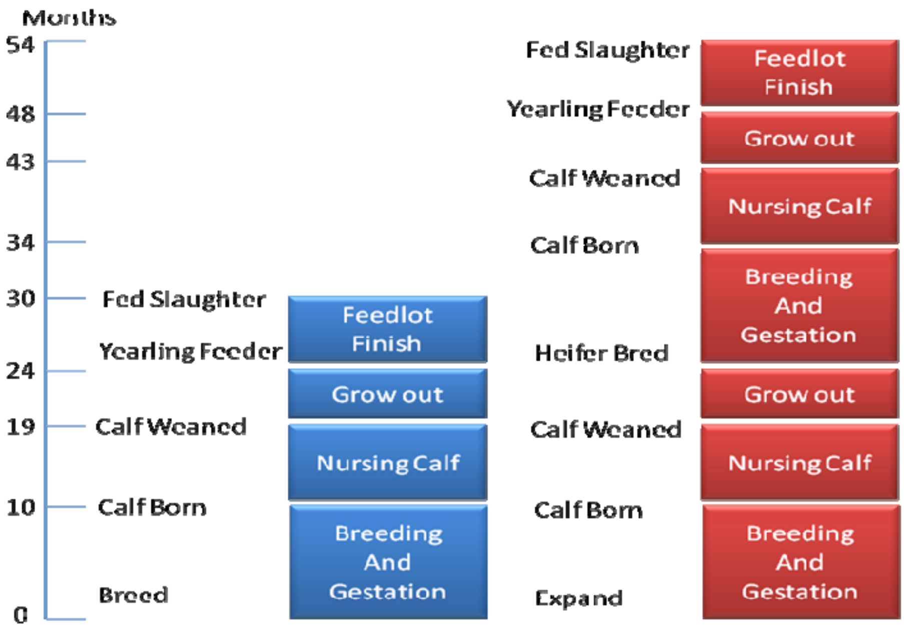
[14] Brown, Scott (1994)

Figure 1. Korean Beef Model Flow Diagram



Source: Han & Brown (FAPRI), 2007.

Figure 2. Beef Production Schedule



Source: Brown, Scott (1994)

2.2. Pork

In pork modeling[15], the most important components are primary supply and demand decisions. On the supply side, the number of sows slaughtered or gilts retained determines the level of the pork breeding herd and pork production. These decisions depend on the expected economic profitability of producing pork. Once the breeding herd is determined, the next step is how often these animals are farrowed each year. In the past, it was not unusual to farrow each sow only once each year. This occurred as farmers staggered different enterprises on their farm, each of which took a significant amount of time. However, as pork production has moved toward confinement operations, the number of times a breeding animal is farrowed has increased dramatically. Some hog producers now farrow more than twice in a year.

Similarly to beef model, there exist biological lags in pork production. From the time a producer chooses to breed a sow, it takes 114 days before that sow produces offspring. It takes approximately another 6 months before that offspring can reach slaughter weight. Even though this time period is much shorter than beef, it remains important that the model deals with the biological lag so that production responds in a correct fashion.

Pork production also responds to changes in economic signals. However, there are still limitations to the extent of response. Once pigs are born and are not used for breeding purposes they are either slaughtered during the current year or remain as market hogs on farms at the end of year. For a given year, barrow and gilt slaughter occurs from market hogs on hand at the beginning of the year and from a portion of the pig crop born during the year. Supplies of barrows and gilts to be slaughtered and packers' demand for those animals determine the price to be paid for barrows and gilts. A similar interaction occurs for sows and boars. Like the beef model, there is no separation of pork into different products. A pound of pork is a pound of pork whether it comes from sows, boars or barrows and gilts.

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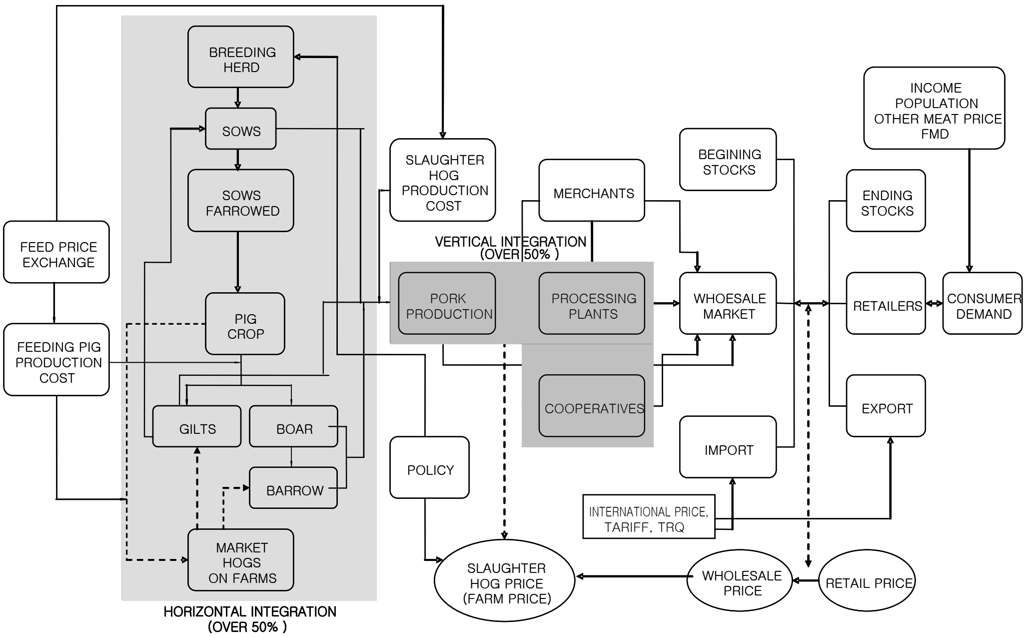
[15] Brown, Scott (1994)

Figure 3. Korean Pork Model Flow Diagram



Source: Han & Brown (FAPRI), 2007.

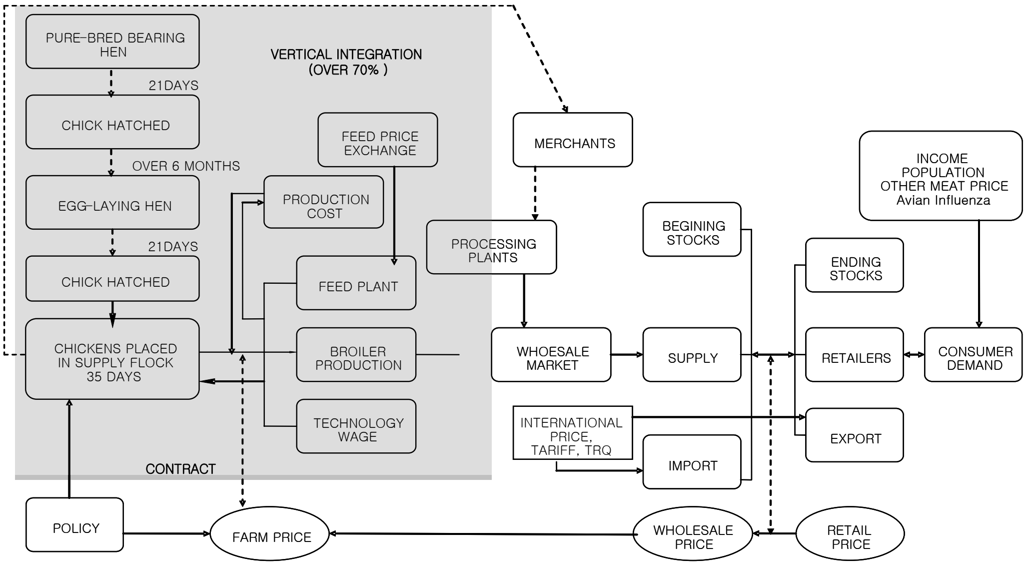
2.3. Broiler

The broiler sector provided different structure than other livestock sectors. The level of complexity is much less. The lack of complexity can also be contributed to the small biological lag that exits in the broiler sector. Production levels can be changed very quickly in response to changes in current economic information. That means that there is no farm level exits within this developed framework of the broiler industry which is related to the degree of vertical integration[16] in broiler industry. The flow

[16] That is, broilers are produced and marketed by companies that own or control breeder flocks, hatcheries, broiler flocks, feed mills, processing plants, and market arrangements. While there are some company-owned farms, typically, birds (both broiler and breeder flocks) are managed by farmers under contract and under supervision of the company. The farmer provides land, labor, houses, litter, equipment, taxes, utilities, and insurance. Contracts provide a base amount and reward efficiency and quality of product with bonuses. The company furnishes birds, feed, vaccines, drugs, and supervision. Broiler chicks are derived from genetically

diagram of the broiler sector is shown in Figure 4. In the supply portion, each decision point can be influenced by changes in the current wholesale broiler price. It is very different to other livestock model due to biological lag is very short. In the demand side of the broiler sector, retail demand is the main determinant of demand with exports and stocks which are less important than in other livestock. The supply decisions depend on feed costs and broiler costs. The primary investment decision is chicks placed in the broiler supply flock. The lagged dependent variable represents the large fixed costs that exist in broiler production. The interaction of production with a packer demand equation determines the wholesale broiler price. Wages are one of the determinants that affect the margin between the wholesale and retail price. The retail demand specification is that per capita consumption of broiler meat depends on income and prices of substitute meat products. This demand interacts with the total supply of broiler meat to determine the retail price of broilers.

Figure 4. Korean Broiler Model Flow Diagram



Source: Han & Brown (FAPRI), 2007.

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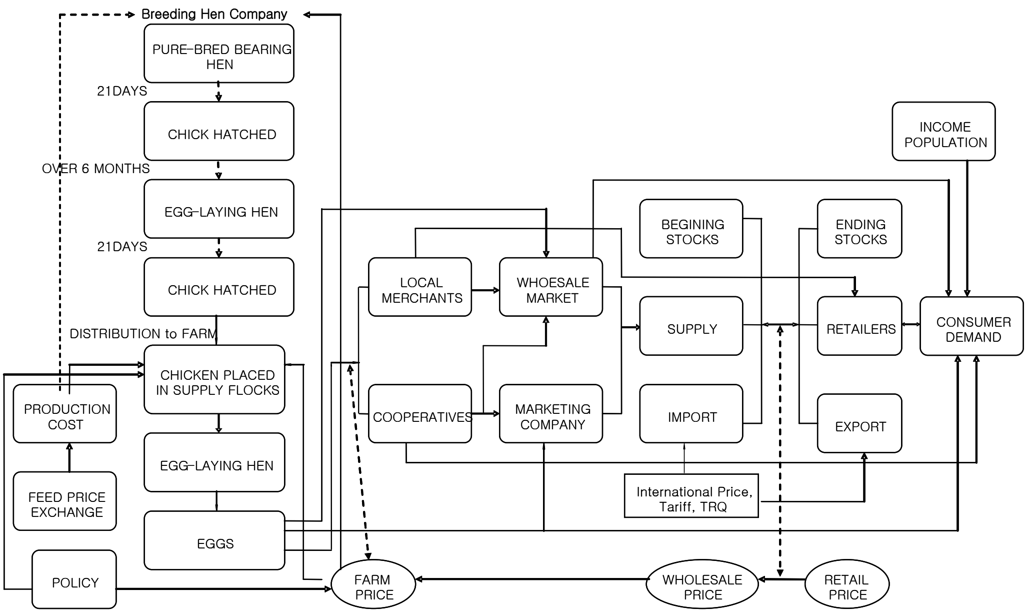
selected male and female lines. The male and female lines are crossed to produce a hybrid offspring referred to as a broiler. The parent stock is referred to as broiler breeders. Integrated broiler companies typically have three types of contract farms - those raising broiler breeder replacement stock, those keeping the broiler breeder stock for production of fertile eggs, and those growing out the broiler chicks.

2.4. Hen & Eggs

The hen & eggs sector is similar to broiler sector. It also provided different structure than other livestock sectors. The level of complexity is much less. The lack of complexity can also be contributed to the small biological lag that exits in the broiler sector. Production levels can be changed very quickly in response to changes in current economic information. Because biological lags are same with broiler sector except hen's life cycle.

Figure 5. Korean Hen & Eggs Model Flow Diagram



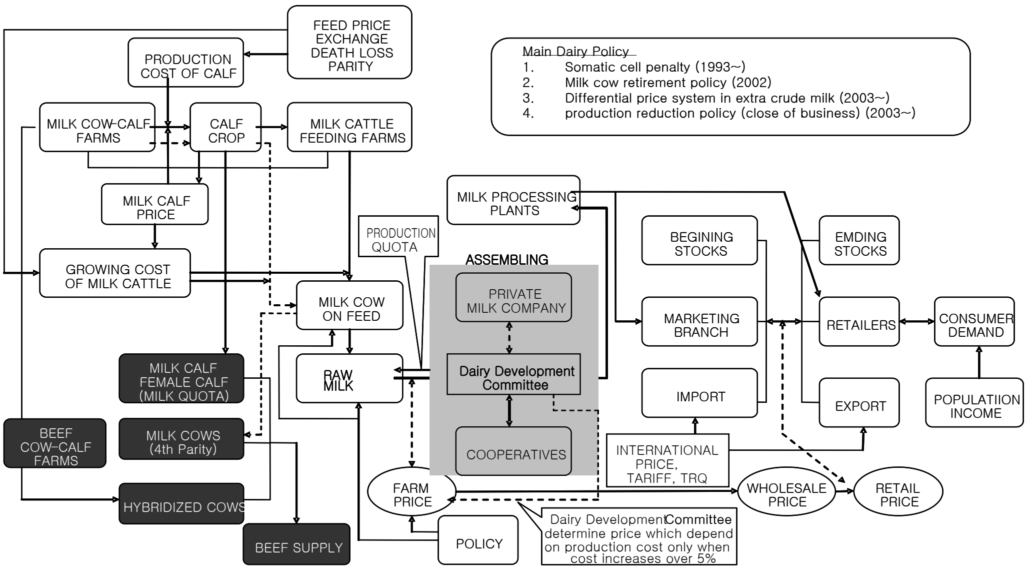
Source: Han & Brown (FAPRI), 2007.

2.5. Dairy

In terms of complexities that exist within the agriculture industry, dairy sector is most complex. Factors which lead to this level of complexity include the numerous products that are produced from raw milk, Korean government or Dairy Development Committee intervention in terms of target price activity. Given all of these factors, an econometric model that retains this level of complexity will be difficult to develop. Figure 6 and Figure 7 lays out the structure that makes up the dairy sector and develops an econometric model that attempts to replicate the important decision points that occur within the sector.

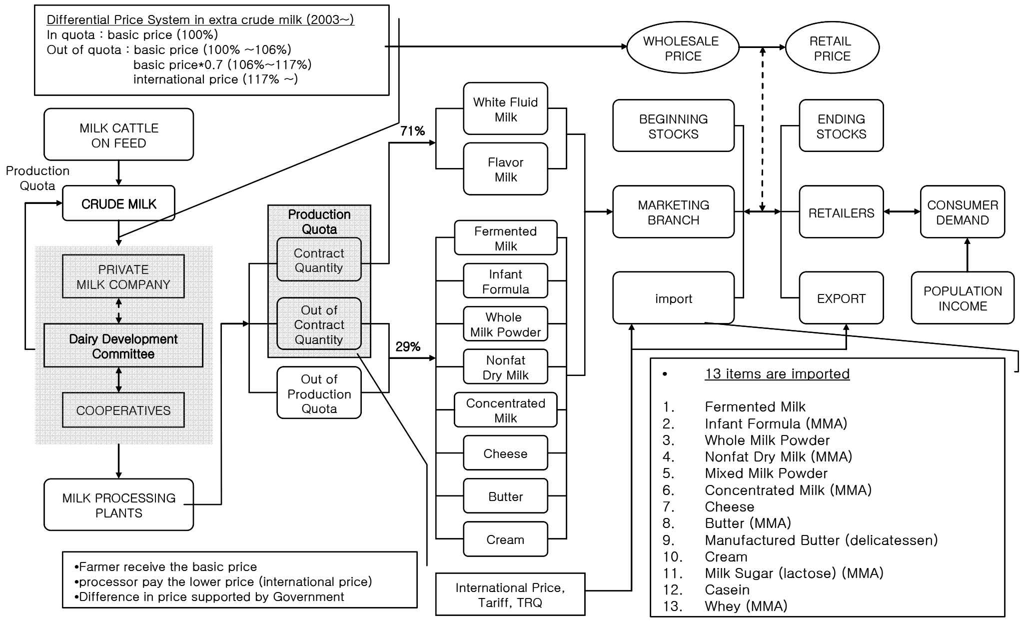
The most important issue involved in this Dairy sector modeling is how we estimate and specify the future milk price and target price. According to historical data, all milk prices just followed the target price made by the government. The government guaranteed fluid milk price has been unchanged for the last 5 years. Over the last 15 years, the government has changed the target price 4 times to increase the price when production cost only increased over 5% compared to previous years. It is not make sense in economic market system. Even though we can assume that current raw milk price would continue into the near future or use the trend of government target price. This method is not realistic in policy analysis. We made new target price deterministic method in this model with using government deterministic method. The first step is predicting the production cost induced from management cost prediction to make dummy variable. If production cost exceeds the 5% compared to last year, dummy variable is one, others are zero. The next step is to forecast the target price. Target price is determined by exchange ratio on production cost and dummy variable's joint product variable because the government increase target price by using exchange ratio for production cost when production cost exceeded 5%.

Figure 6. Korean Milk Cow Model Flow Diagram



Source: Han & Brown (FAPRI), 2007.

Figure 7. Korean Dairy Products Model Flow Diagram



Source: Han & Brown (FAPRI), 2007.

We skip explanation on supply side model specification because milk cow's biological lags are same to beef sector. You can review model flow diagram and model specifications. In milk cow policy modeling, we tried these policies to apply this model however, data was not available. We just used these policy changes by using structural dummy variables or dummy variables.

3. USING THE SPREADSHEET MODEL

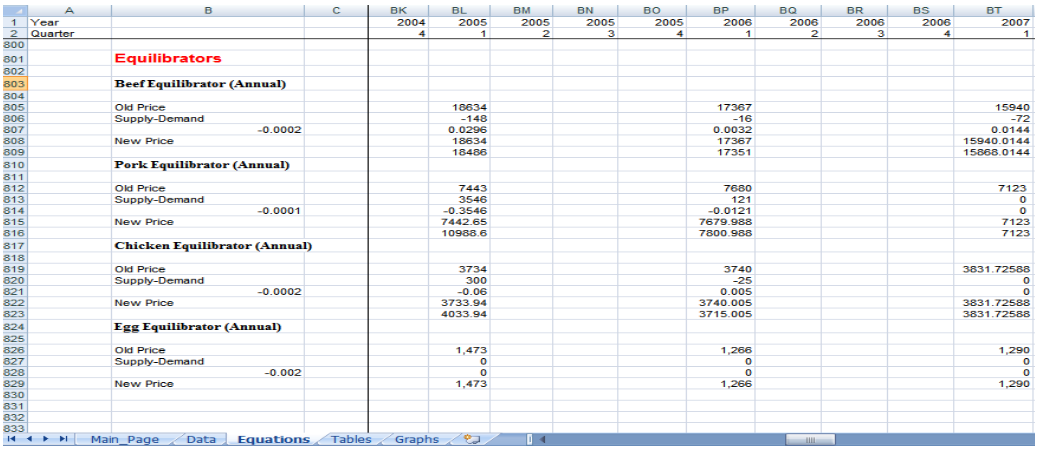
3.1. Turning off the Equilibrators

The model file consists of five worksheets:

10) Main Page
11) Data
12) Equations
13) Tables
14) Graphs

To perform an update for this file, one should first to go to Equilibrators sheet and turn off the equilibrators. This will keep the model from possibly erroring out as new data is introduced. Equilibrators, shown in below Figure 8, consist of a line that reflects the price that is currently being used by the model ("Old Price"). A line that computes the difference in supply and demand that results at the price currently used by the model ("Supply-Demand"), and two line that contain formulas to adjust the model to a new price that more closely aligns supply and demand ("New Price"). This new price is what the Data sheet of the model will access. When a model is in equilibrium, as is the case in Figure 1, the difference in supply and demand is zero. To turn off the equilibrators: 1) Go to the new price lines located in the equilibrators. 2) Perform an Edit-Copy, Edit-Paste Special-Values beginning in the first year of the forecast until the last year of the forecast (Do not overwrite the formulas in historical observations; this will keep the formulas needed to turn the equilibrators back on later).

Figure 8. The Equilibrators



	A	B	C	BK	BL	BM	BN	BO	BP	BQ	BR	BS	BT
1	Year			2004	2005	2005	2005	2005	2006	2006	2006	2006	2007
2	Quarter			4	1	2	3	4	1	2	3	4	1
800													
801		Equilibrators											
802													
803		**Beef Equilibrator (Annual)**											
804													
805		Old Price			18634				17367				15940
806		Supply-Demand			-148				-16				-72
807			-0.0002		0.0296				0.0032				0.0144
808		New Price			18634				17367				15940.0144
809					18486				17351				15868.0144
810		**Pork Equilibrator (Annual)**											
811													
812		Old Price			7443				7680				7123
813		Supply-Demand			3546				121				0
814			-0.0001		-0.3546				-0.0121				0
815		New Price			7442.65				7679.988				7123
816					10988.6				7800.988				7123
817		**Chicken Equilibrator (Annual)**											
818													
819		Old Price			3734				3740				3831.72588
820		Supply-Demand			300				-25				0
821			-0.0002		-0.06				0.005				0
822		New Price			3733.94				3740.005				3831.72588
823					4033.94				3715.005				3831.72588
824		**Egg Equilibrator (Annual)**											
825													
826		Old Price			1,473				1,266				1,290
827		Supply-Demand			0				0				0
828			-0.002		0				0				0
829		New Price			1,473				1,266				1,290
830													
831													
832													
833													

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3.2. Updating Historical Data

Once the equilibrators have been turned off, the next step is to update historical data in the Data sheet. In order to update data that was already available historically and has just been revised (this data will appear as a typed in number in the Data sheet), simply type over the old historical data with the revised number. In order to update data that has previously been forecasted by the model, note the formula that resides in the cell before typing in the new historical data number. This is important so that you can see which equation (or calculated data) now has an additional observation. How to deal with this fact will be discussed later. The endogenous data calculated by the model section is different from the other data sections. All of the data that exists historically has been computed by formulas referencing other available data. In the forecast period, some of these data lines reference the Equations sheet, while others continue to run with formulas. The most important thing to remember when updating this section is when one should copy formulas to the right as more data becomes available, allowing more historical calculated data to be available.

3.3. Forecasting Exogenous Data

The next step after updating the historical data in the Data sheet involves forecasting the exogenous data. The exogenous data resides in the bottom section of the data sheet. Analyst employ judgment about past trends and market knowledge to forecast exogenous data not available in data publication forecasts.

Figure 9. The Data

	A	B	C	D	E	F	G	H	I	J
1	Year	YEAR	1,990	1,990	1,990	1,990	1,991	1,991	1,991	1,991
2	Quarter	QUARTER	1	2	3	4	1	2	3	4
3		COUNT	1	2	3	4	5	6	7	8
4	**Endogenous Beef Data**		1,486,001	1,561,792	1,646,541	1,621,654	1,609,617	1,712,072	1,799,864	1,772,957
5										
6	Female beef cattle under 1 year	NBFI51	253,066	272,951	286,780	277,673	269,376	299,300	319,726	300,962
7	Female beef cattle 1-2 years	NBFT51	117,892	125,910	137,884	138,160	146,480	152,679	157,825	162,675
8	Female beef cattle over 2 years	NBFY51	665,757	672,537	685,682	691,686	710,267	735,963	764,368	773,397
9	Female beef cattle slaughter	SL51F	.	33,825	32,027	32,401	26,557	22,979	28,535	33,189
10	Male beef cattle under 1 year	NBMI51	356,198	387,411	413,918	396,863	383,559	420,201	438,770	422,804
11	Male beef cattle 1-2 years	NBMT51	83,957	95,111	113,414	105,267	90,649	95,522	109,137	104,037
12	Male beef cattle over 2 years	NBMY51	9,131	7,872	8,863	12,005	9,286	8,407	10,038	9,082
13	Male cattle slaughter	SL51M	.	63,100	60,811	86,747	97,088	70,996	65,571	89,560
14	Male beef calf price	NFP51MC	1,069,333	1,177,000	1,240,667	1,286,333	1,378,000	1,561,333	1,552,667	1,577,667
15	Female beef calf price	NFP51FC	744,667	827,000	906,333	937,333	1,083,000	1,269,000	1,262,667	1,296,667
16	Female beef cattle price	NFP51F	1,980,833	2,161,000	2,141,167	2,185,500	2,346,500	2,552,667	2,546,500	2,569,167
17	Male beef cattle price	NFP51M	2,178,667	2,459,000	2,442,000	2,431,833	2,519,667	2,747,000	2,767,500	2,799,000
18	Artificial Inseminations	AI51F	172	175	299	227	156	206	336	258
19	Calf Production Cost	COST51C	330,809	330,809	330,809	330,809	356,358	356,358	356,358	356,358
20	Retail Beef Price	NCP51	5,216	5,645	5,837	5,928	6,087	6,319	6,495	6,627
21	Beef Imports	M51	.	.	.	.	.	.	.	.
22	Retail Beef Price (Annual)	ANCP51	5,656				6,382			
23	Dairy Slaughter (Annual)	ASL52					108,865			
24	Beef Production (Annual)	AQ51	94,924				98,529			
25	Beef Consumption (Annual)	AD51	176,988				223,270			
26	Beef Imports (Annual)	AM51	81,855				128,960			
27	Beef Exports (Annual)	AX51	0				0			
28	Beef Ending Stocks (Annual)	AEST51	4,229				8,448			
29							0			
30	**Cow Slaughter(over 2year)**	SL51FY	.	**19,973**	**20,176**	**20,570**	**20,751**	**21,308**	**22,079**	**22,931**
31	**Female 1-2 Slaughter**	SL51FT	.	**13,852**	**11,851**	**11,831**	**5,806**	**1,671**	**6,456**	**10,258**
32	**Females 1-2 Added to over 2**	NB51FOY	.	**30,081**	**36,684**	**30,003**	**42,790**	**50,555**	**54,164**	**35,782**
33	**Females <1 Moving to 1-2**	NB51FOT	.	**52,541**	**61,138**	**42,799**	**57,607**	**59,158**	**66,529**	**51,679**
34	**Female Calf Crop**	CH51F	**59,047**	**60,637**	**68,192**	**52,971**	**74,755**	**70,713**	**77,846**	**52,787**
35	**Residual to Make Female <1 balance**	NB51FR		**18,116**	**13,599**	**-12,110**	**-18,503**	**25,103**	**16,592**	**-11,878**
36	**Male >2 Slaughter**	SL51MY	.	**2,739**	**2,362**	**2,659**	**3,602**	**2,786**	**2,522**	**3,011**
37	**Male 1-2 Slaughter**	SL51MT		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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3.4. Lining up the Equations

The Equations sheet contains equations for all endogenous variables, other than those generated by a simple calculation process. A typical equation, as shown in

Figure 10, contains a description of the independent variable and parameter estimates for the dependent variables in Column A, and lists dependent variables in Column B. In addition, SUM, ADJUSTMENT, ESTIMATE, and ACTUAL lines are denoted in Column B. the rows corresponding to the parameter estimates and dependent variable descriptions contain formulas of the product of the parameter estimate and the dependent variable as it resides in the Data sheet. The SUM row merely adds together the contributions of each dependent variable. The ADJUSTMENT line is the error term of the equation, and historically is simply actual level of the variables less the SUM line. In the forecast period, analysts use the ADJUSTMENT line to alter error terms as deemed appropriate due to market knowledge, identification of trends, etc. The ADJUSTMENT line often begins as a formula setting future error terms equal to the ESTIMATE line purely adds the SUM and ADJUSTMENT lines, and this is the ACTURAL line references the Data sheet to show the current value of the independent variable as it resides in the Data sheet.

When additional historical data observations become available, an analysts must copy the (ACTUAL-SUM) formula in the ADJUSTMENT line forward in order to account for the fact that new data now exists for the equation. This allows the analyst to incorporate the additional observed error term into the decision process for setting the path of future error terms.

Figure 10. The Equations

	A	B	C	BK	BL	BM	BN	BO	BP	BQ	BR	BS	BT	BU	E
1	Year			2004	2005	2005	2005	2005	2006	2006	2006	2006	2007	2007	
2	Quarter			4	1	2	3	4	1	2	3	4	1	2	
3	Beef Equations														
4															
5	**Female Beef Cattle Over 2 Years**														
6															
7	-25.26627	* Intercept		-25.2663	-25.2663	-25.2663	-25.2663	-25.26627	-25.26627	-25.2663	-25.2663	-25.2663	-25.26627	-25.2663	-25
8	0.93159	* LAG (Female beef cattle over 2 years)		574.706	574.655	579.6875	602.7536	624.5994	629.0832	647.8584	681.7925	703.5796	709.87158	723.845	760
9	27.42178	* Avg. male, female cattle prices (	70.8757	74.1762	68.9714	75.02951	80.19385	80.70315	65.6639	70.25997	68.72431	66.65073	66.6858966	58.8553	56.9
10	-0.01142	* Q3 * LAG (Female beef cattle over 2 years					-7.38892				-8.35783				-9.3
11	-0.03372	* Q4 * LAG (Female beef cattle over 2 years		-20.8022				-22.60811				-25.4669			
12	39.05316	* D931T982													
13	19.86977	* Shift953		19.8698	19.8698	19.86977	19.86977	19.86977	19.86977	19.86977	19.86977	19.86977	19.86977	19.8698	19.8
14	-29.79315	* D003T041													
15		SUM		622.684	638.23	649.3205	670.1621	677.298	689.3506	712.7219	736.7625	739.367	771.160977	777.304	802
16		ADJUSTMENT		-5.82982	-15.9739	-2.30447	0.303934	-2.018956	6.082441	19.1371	18.4835	22.63304	5.83902343	38.6958	20
17		ESTIMATE		616.9	622.3	647.0	670.5	675.3	695.4	731.9	755.2	762.0	777.0	816.0	8
18		ACTUAL	839.4	616.9	622.3	647.0	670.5	675.3	695.4	731.9	755.2	762.0	777.0	816.0	8
19															
20		short-run	0.084												
21		long-run	1.234												
22															
23															
24															
25	**Females 1-2 Slaughter**														
26															
27	2897.01391	* Intercept		2897.01	2897.01	2897.014	2897.014	2897.014	2897.014	2897.014	2897.014	2897.014	2897.01391	2897.01	289
28	0.23782	* LAG (Female beef cattle 1-2 years)		41925.8	42122.2	43677.07	45545.86	47088.36	48154.74	50350.77	51558.42	51288.02	51844.76	53985.1	55
29	-4032.13539	* Male beef cattle price deflated b	-21083.4	-15492.9	-14607.3	-14634.6	-15516.3	-17320.89	-14416.2	-13506.4	-13806.2	-14523.7	-14667.822	-14760	-15
30	30641	* D974T024													
31	56779	* D973N984													
32	-11011	* D052t063				-11011	-11011	-11011	-11011	-11011	-11011				
33		SUM		29329.9	30411.9	20928.44	21915.6	21653.48	25624.56	28730.34	29638.29	39661.38	40073.9518	42122.2	434
34		ADJUSTMENT		3338.85	6831.45	-3895.12	-1965.08	4753.539	3058.069	5061.671	-7013.06	-4056.76	-3855.9518	-16586.2	-14
35		ESTIMATE		32668.7	37243.4	17033.32	19950.52	26407.02	28682.63	33792.01	22625.23	35604.62	36218	25536	2
36		ACTUAL	43085.75	32668.7	37243.4	17033.32	19950.52	26407.02	28682.63	33792.01	22625.23	35604.62	36218	25536	2
37															

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3.5. Turning up the Equilibrators Back on

In order for the model to be in equilibrium, the equilibrators must be turned back on at some point. The timing of this depends on the preference of the analyst as well as the level of disparity between supply and demand. When the equilibrators are turned off, as occurred in the first step, market clearing prices are not allowed to move with changes in supply and demand. Instead, non-zero values appear in the supply-demand line of Equilibrators sheet.

Once the equilibrators are turned back on, the market clearing prices will adjust in order to balance supply and demand. Through experience, an analyst can often have a feel for how much price adjustment must take place in order for the model to be in equilibrium from a non-equilibrated state. If the level of price adjustment seems to be in reason, the analyst will turn the equilibrators on. If the level of price adjustment appears to be too radical, the analyst may re-examine the error terms in the Equations sheet to better align supply and demand before turning on the equilibrator.

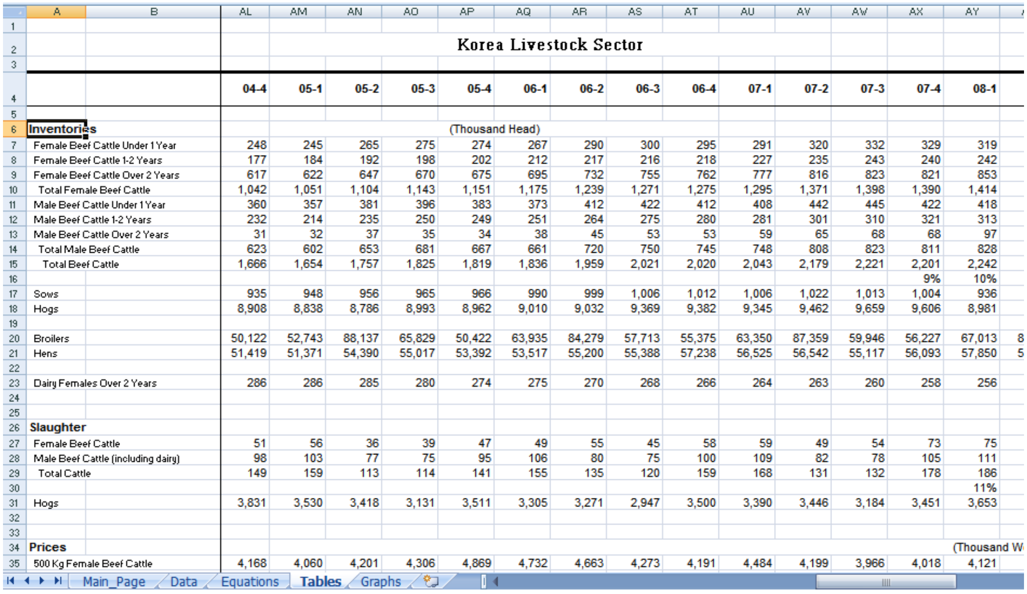
The process of turning on the equilibrator is simply undoing what was done in the first step.

- Go to the formula residing historically in the New Price line.
- Copy it forward into the forecast period.
- Calculate each cell containing the just copied formula (F2-ENTER) before calculating the entire spreadsheet by simply hitting F9.

3.6. Tables and Graphs

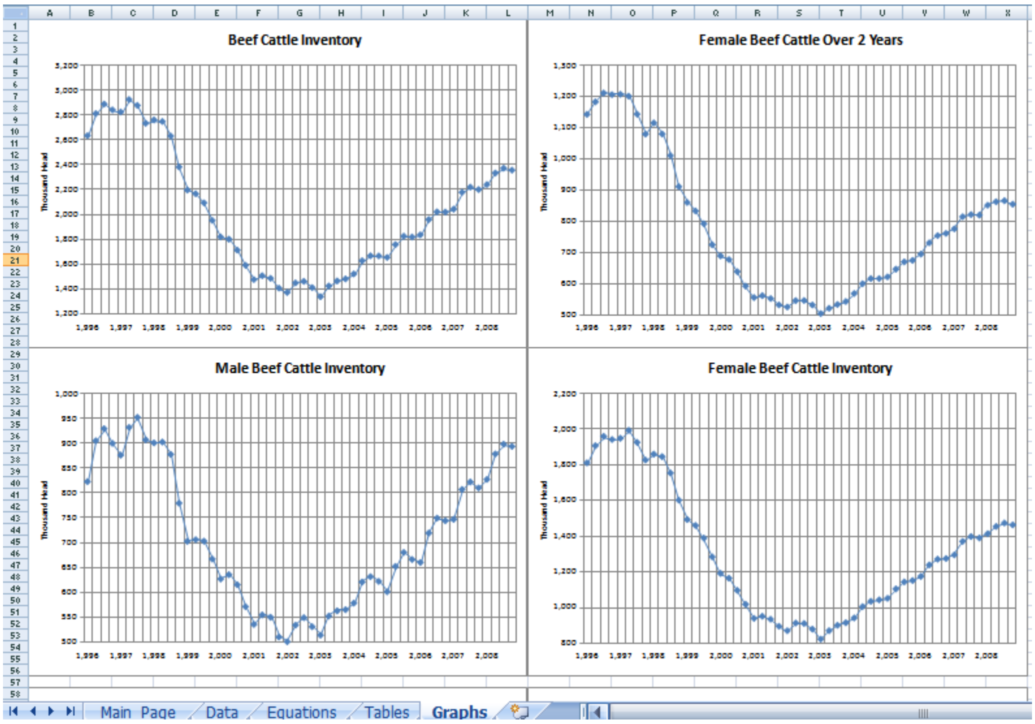
The Tables sheet contains the output tables for the model. The Graphs sheet contains selected graphics from the model output. Feel free to make any modifications to these sheets, in order to provide the output desired by the modelers.

Figure 11. The Tables



	04-4	05-1	05-2	05-3	05-4	06-1	06-2	06-3	06-4	07-1	07-2	07-3	07-4	08-1
Korea Livestock Sector														
Inventories	(Thousand Head)													
Female Beef Cattle Under 1 Year	248	245	265	275	274	267	290	300	295	291	320	332	329	319
Female Beef Cattle 1-2 Years	177	184	192	198	202	212	217	216	218	227	235	243	240	242
Female Beef Cattle Over 2 Years	617	622	647	670	675	695	732	755	762	777	816	823	821	853
Total Female Beef Cattle	1,042	1,051	1,104	1,143	1,151	1,175	1,239	1,271	1,275	1,295	1,371	1,398	1,390	1,414
Male Beef Cattle Under 1 Year	360	357	381	396	383	373	412	422	412	408	442	445	422	418
Male Beef Cattle 1-2 Years	232	214	235	250	249	251	264	275	280	281	301	310	321	313
Male Beef Cattle Over 2 Years	31	32	37	35	34	38	45	53	53	59	65	68	68	97
Total Male Beef Cattle	623	602	653	681	667	661	720	750	745	748	808	823	811	828
Total Beef Cattle	1,666	1,654	1,757	1,825	1,819	1,836	1,959	2,021	2,020	2,043	2,179	2,221	2,201	2,242
													9%	10%
Sows	935	948	956	965	966	990	999	1,006	1,012	1,006	1,022	1,013	1,004	936
Hogs	8,908	8,838	8,786	8,993	8,962	9,010	9,032	9,369	9,382	9,345	9,462	9,659	9,606	8,981
Broilers	50,122	52,743	88,137	65,829	50,422	63,935	84,279	57,713	55,375	63,350	87,359	59,946	56,227	67,013
Hens	51,419	51,371	54,390	55,017	53,392	53,517	55,200	55,388	57,238	56,525	56,542	55,117	56,093	57,850
Dairy Females Over 2 Years	286	286	285	280	274	275	270	268	266	264	263	260	258	256
Slaughter														
Female Beef Cattle	51	56	36	39	47	49	55	45	58	59	49	54	73	75
Male Beef Cattle (including dairy)	98	103	77	75	95	106	80	75	100	109	82	78	105	111
Total Cattle	149	159	113	114	141	155	135	120	159	168	131	132	178	186
														11%
Hogs	3,831	3,530	3,418	3,131	3,511	3,305	3,271	2,947	3,500	3,390	3,446	3,184	3,451	3,653
Prices														(Thousand W
500 Kg Female Beef Cattle	4,168	4,060	4,201	4,306	4,869	4,732	4,663	4,273	4,191	4,484	4,199	3,966	4,018	4,121

Figure 12. The Graphs



4. ESTIMATION RESULTS

4.1. Beef

1) **Female Beef Cattle Over 2 Years**

NBFO51 = -25.26627 + 0.93159 * LAG (NBFO51)
(-1.28) (43.87)

- 0.01142 * (D3 * LAG (NBFO51)) – 0.03372 * (D4* LAG (NBFO51))
(-2.14) (-6.27)

+ 27.42178 * (NPMY51 + NPFY51)/2 / ACY51 + 19.8698 * SHIFT953
(10.52) (3.79)

+ 39.05316 * D931T982 – 29.79315 * D003T041
(5.05) (-4.68)

R^2 = 0.9960 D. W. = 1.836

2) **Female Beef Cattle 1-2 Years Slaughter**

NBFA51S = 2897.01391 + 0.23782 * LAG (NBFA51)
(0.31) (8.49)

– 4032.13539 * (NPMO51/ACY51) + 30641 * D974T024
(-4.11) (9.59)

+ 56779 * (D973 – D984) – 11011 * D052T063
(8.26) (-2.39)

R^2 = 0.8962 D. W. = 1.114

3) **% Of Female Beef Cattle Over 2 Years Artificially Inseminated**

AI / LAG (NBFO51) = 0.1718 + 0.03581 * (NPMY51 + NPFY51)/2 / ACY51
(23.03) (14.29)

- 0.05776 * D1 + 0.14975 * D3 – 0.00938 * (D3*TREN9099)
(-10.67) (13.72) (-6.21)

+ 0.05498 * SHIFT033 + 0.02258 * D932T981
(9.31) (4.47)

R^2 = 0.9473 D. W. = 1.944

4) Female Calf Crop As % of LAG3, LAG4 (Artificially Inseminated)

NBFYCC / (LAG3 (AI) + LAG4 (AI)) / 2 = 0.3109 + 0.0904 * D1
(39.51) (7.28)

+ 0.1007*SHIFT012 - 0.1263*D972T981 + 0.25035*(D971 – D021)
(8.65) (-5.58) (8.09)

R^2 = 0.7881 D. W. = 2.229

5) Female Beef Cattle Under 1 Year

NBFY51 = 0.975 * LAG (NBFY51) + NBFYCC + NBFYRES - NBFYTOA

6) Female Beef Cattle 1-2 Years

NBFA51 = 0.995 * LAG (NBFA51) + NBFYTOA – NBFA51S – NBFO51A

7) Female Beef Cattle 1-2 Years Added To Over 2 years

NBFO51A = NBFO51 – 0.995 * LAG (NBFO51) + NBFO51S

8) Female Beef Cattle Inventory

NBF51 = NBFY51 + NBFA51 + NBFO51

9) Female Beef Cattle Under 1 Year Moved to Female Beef Cattle 1-2 Years

NBFYTOA = 0.975 * LAG4 (NBFYCC)

10) Female Beef Cattle Over 2 Years Slaughter

NBFO51S = MAX (LAG (NBFO51) * 0.03,

0.995 * LAG (NBFO51) – (NBFO51))

11) Female Beef Cattle Slaughter

SLF51 = NBFO51S + NBFA51S

12) Male Beef Cattle Over 2 Years

NBMO51 = 1847.813 + 0.07364 * LAG4 (NBMA51)
(1.64) (12.19)

+ 0.05998 * SHIFT023 * LAG4 (NBMA51)
(15.83)

+ 0.05814 * SHIFT06 * LAG4 (NBMA51)
(9.40)

R^2 = 0.9450 D. W. = 1.092

13) Male Beef Cattle 1-2 Years Slaughter

NBMA51S = 931.9628 + 0.9723 * AVG (LAG4-7 (NBMYCC))
(0.13) (16.15)

- 0.1529 * D2 * AVG (LAG4-7 (NBMYCC))
(-5.46)

- 0.12561 * D3 * AVG (LAG4-7 (NBMYCC)) – 0.1277 * SHIFT032
(-4.49) (-3.71)

R^2 = 0.8720 D. W. = 1.566

14) Male Calf Crop As % of LAG3, LAG4 (Artificially Inseminated)

NBMYCC / (LAG3 (AI) + LAG4 (AI))/2 = 0.36723 + 0.15462*D1
(44.67) (13.29)

+ 0.14917 * D4 + 0.09561 * SHIFT992 + 0.07833 * D013T042
(12.84) (8.73) (5.60)

R^2 = 0.8849 D. W. = 1.837

15) Male Beef Cattle Under 1 Year

NBMY51 = 0.975*LAG (NBMY51) + NBMYCC +NBMYRES–NBMYTOA

16) Male Beef Cattle 1-2 Years

NBMA51 = 0.995*LAG (NBMA51) + NBMYTOA–NBMA51S–NBMO51A

17) Male Beef Cattle Inventory

NBM51 = NBMY51 + NBMA51 + NBMO51

18) Beef Cattle Inventory

NB51 = NBF51 + NBM51

19) Male Beef Cattle Over 2 Years Slaughter

NBMO51S = 0.3 * LAG (NBMO51)

20) Male Beef Cattle Slaughter

SLM51 = NBMO51S + NBMA51S

21) Beef Cattle Slaughter

SL51 = SLM51 +SLF51

22) Male Beef Cattle 1-2 Years Moved to Male Beef Cattle Over 2 Years

NBMO51A = NBMO51 – 0.995 * LAG (NBMO51) + NBMO51S

23) Male Beef Cattle Under 1 Year Moved to Male Beef Cattle 1- 2 Years

NBMYTOA = 0.975 * LAG4 (NBMYCC)

24) Beef Imports

M51 = - 9104.27 + 1.56774 * (NPMO51- (ICP51* 22.04622 / 2 * EXCH
(-2.36) (10.59) *(1+TA51/100)))/PPI

+ 7336.932 * (YEAR – 1994) – 47366 * BSE – 11779 * SHIFT05
(17.80) (-10.97) (-2.73)

- 21695 * (D012 + D013 + D014)
(-5.05)

R^2 = 0.8938 D. W. = 1.942

25) Female Beef Cattle Price

NPFO51/PPI = 16916 + 216.47157 * (NCP51/PPI) – 0.09425 * SLF51
(10.29) (17.05) (-9.88)

- 6718.5 * SHIFT042 + 4337.6 * D944T962 + 3836.7 *
D984T021
(-6.83) (4.84) (4.76)

R^2 = 0.9243 D. W. = 1.279

26) Male Beef Cattle Price

NPMO51/PPI = 29074 + 188.05715 * (NCP51/PPI)
(10.47) (10.87)

- 0.08456 * SLM51 – 363.76008 * TREN9506
(-6.03) (-12.30)

- 3717.68 * D2 – 2688.28 * D3 + 7707.3 * (D013 + D014 + D021)
(-5.03) (-3.72) (5.13)

$R^2 = 0.8684$ D. W. = 1.397

27) Female Calf Price

NPFY51 = -428196 + 0.645 * NPFO51 + 0.18074 * (SHIFT033*NPFO51)
(-5.57) (25.79) (14.02)

- 0.1056 * SHIFT06 – 287581 * D971T011 - 397607 * (D021 – D032)
(-6.59) (-7.43) (-4.63)

$R^2 = 0.9840$ D. W. = 0.957

28) Male Calf Price

NPMY51 = -634211 + 0.75587 * NPMO51 + 0.04637 * D2 + 0.0279 * D3
(-7.73) (29.47) (4.68) (2.94)

- 245050 * D971T001 – 421836 * (D014+D021) + 254616 * D032T043
(-6.95) (-5.70) (5.72)

$R^2 = 0.9727$ D. W. = 1.350

29) Calf Production Cost

ACY51 = 4554 * ((0.8*CP/56 + 0.2*SMP/2000)*EXCH*0.453) + 3710 * PPI
(5.75)

(17.61)

+ 105412*SHIFT93 + 174782*SHIFT98 + 130052*SHIFT03 + 82998*SHIFT043
(11.51) (23.72) (11.69) (5.75)

$R^2 = 0.9991$ D. W. = 0.863

30) Beef Production (Annual)

Q51 = 1816.72858 + 404.74565 *

(0.19) (25.53)

$$((\sum_{i=1}^{4}(SLM\,51_i)*0.423+\sum_{i=1}^{4}(SLF\,51_i)*0.381)/1000\ ) +$$

13.22221 *

(10.50)

((YEAR-1991)*

$$((\sum_{i=1}^{4}(SLM\,51_i)*0.423+\sum_{i=1}^{4}(SLF\,51_i)*0.381)/1000\ ))$$

+ 678.36143 * ((ASLF52*0.381)/1000)
(2.60)

R^2 = 0.9915 D. W. = 1.628

31) Beef Per Capita Consumption (Annual)

LN(PERD51) = 3.748 – 0.440 * LN(ANCP51/CPI) + 0.304 *
(5.70) (-12.57) (5.88)

LN(ANCP53/CPI) + 0.069 * LN(ANCP541/CPI) + 1.235 *
(0.79) (27.70)

LN(DINC/POP) – 0.369 * BSE + 0.043*(D92+D04) – 0.093*D01
(-8.83) (1.82) (-4.10)

R^2 = 0.9945 D. W. = 1.945

32) Beef Consumption (Annual)

CDIS51 = Q51 + LAG (ST51) +AM51 – ST51 – AX51

33) Beef Per Capita Consumption (Annual)

PERD51 = CDIS51 / POP

4.2. Pork

34) Number of Sows

NBF53 = 48.59 + 0.851*LAG (NBF53) + 0.00078*TREN024*LAG (NBF53)
(0.75) (10.64) (1.63)

+ 43.8657 * (NP53/ACH53* 0.5 + LAG (NP53/ACH53)*0.5)
(4.21)

+ 0.01117 * D1 * LAG (NBF53) + 0.00921 * D2 * LAG (NBF53)
(2.57) (2.34)

+ 45.24615 * (D932 + D981) + 32.43313 * (D012 + D031)
(5.59) (4.81)

R^2 = 0.9882 D. W. = 1.343

35) Pig Crop

NBYPC = 79.15537 + 3.36325 * LAG (NBF53)
(0.20) (6.61)

+ 0.0316 * TR971032 * LAG (NBF53) - 0.4632 * SHIFT04 * LAG (NBF53)
(6.17) (-5.87)

- 0.27015*SHIFT06*LAG (NBF53)
(-2.76)

R^2 = 0.9292 D. W. = 2.026

36) Hog Slaughter

SL53 = 186.27653 + 0.41273* LAG (NB53) – 0.03072 * D3 * LAG (NB53)
(2.83) (45.36) (-8.92)

+ 0.01212 * D4 * LAG (NB53) - 0.03129 * SHIFT034 * LAG (NB53)
(3.59) (-7.35)

- 0.03632 * SHIFT054 * LAG (NB53) – 141.62419 * D934T003
(-6.92) (-5.95)

$R^2 = 0.9808$ D. W. = 1.733

37) Number of Hogs

NB53 = 0.985 * LAG(NB53) + NBYPC – SL53

38) Slaughter Hog Price

NCP53 / PPI = 1370.97 + 34.32665 * NCP53/PPI - 0.15049 * SL53 / 1000
(5.45) (8.94) (-2.59)

- 2.54645*D1*NCP53/PPI – 6.10548*D4*NCP53/PPI – 35.63173*TR984041
(-3.35) (-7.79) (-5.00)

+ 218.0574 * (D963 + D964) – 214.0534 * D003T011 + 405.03 * D041T051
(3.18) (-3.92) (7.19)

$R^2 = 0.9137$ D. W. = 1.580

39) Slaughter Hog Production Cost

ACH53 = -3609.72 + 454.02 * ((0.8*CP/56+0 .2*SMP/2000)*EXCH*0.453)
(-1.27) (5.77)

+ 1390.72 *PPI – 8134.16 * (D94 + D95 + D96) + 8937.21 * SHIFT06
(36.30) (-8.73) (5.31)

- 7167.56 * (D00 + D01 + D02 + D03)
(-8.17)

$R^2 = 0.9845$ D. W. = 1.138

40) Pork Production (Annual)

Q53 = 74698 + 0.04546 * ASL53 + 24520*ANP53/ACH53
(0.72) (11.27) (0.55)

- 23267 * SHIFT02 + 75290*(D92+D93+D94+D95+D96+D97+D98)

(-1.58) (6.02)

R^2 = 0.9720 D. W. = 2.466

41) Pork Per Capita Consumption (Annual)

LN(PERD53) = 6.811 – 0.268 * LN(ANCP53/CPI) + 0.081 *
(27.44) (-4.21) (1.80)

LN(ANCP51/CPI) + 0.152 * LN(ANCP541/CPI) + 0.606 *
(2.43) (15.59)

LN(DINC/POP) + 0.102 * SHIFT99 – 0.064 * (D94T97 – D06)
(3.90) (-4.41)

R^2 = 0.9915 D. W. = 2.092

42) Pork Imports (Annual)

AM53 = -47879 + 49.6327*(NCP53-(ICP53*2.204622*EXCH*(1+
(-4.64) (3.74) TA53/100)))/PPI

+ 12588.45 * (YEAR - 1990) - 59660 * (D02 + D03 + D04)
(14.21) (-5.19)

R^2 = 0.9473 D. W. = 2.040

43) Pork Consumption (Annual)

CDIS53 = Q53 + LAG (ST53) +AM53 – ST53 – AX53

44) Pork Per Capita Consumption (Annual)

PERD53 = CDIS53 / POP

4.3. Chicken

45) Broilers Hatched

$$BH541 = -4.79442 + 0.62921 * LAG4(BH541)$$
(-0.62) (5.01)

$$+ 24.82352 * (0.25 * NP541/ACB541 + 0.75 * LAG(NP541/ACB541))$$
(5.51)

$$+ 0.00508 * TREND03 * LAG4(BH541) - 12.46323 * D98$$
(2.63) (-3.12)

$R^2 = 0.9534$ D. W. = 1.862

46) Broiler Slaughter

$$SL541 = 264.44432 + 0.96359 * (0.5 * BH541 + 0.5 * LAG(BH541))$$
(0.22) (60.73)

$$- 0.024*D2*(0.5*BH541+0.5*LAG(BH541)) + 0.161*D3*(0.5*BH541+0.5*LAG(BH541))$$
(-2.08) (14.09)

$$- 0.05097 * D4 * (0.5 * BH541 + 0.5 * LAG(BH541))$$
(-4.40)

$R^2 = 0.9934$ D. W. = 3.039

47) Number of Broilers

$$NB541 = 0.975 * LAG(NB541) + BH541 - SL541$$

48) Wholesale Chicken Price

$$WCP541/PPI = 3.63513 + 0.81653 * NCP541/PPI$$
(1.78) (12.66)

$$+ 0.10006 * SHIFT983 * NCP541/PPI - 0.06196 * SL541 - 2.32137 * D4$$

(5.71) (-8.55) (-4.30)

R^2 = 0.7936 D. W. = 1.897

49) Broiler Price

NP541 = -263.52 + 0.67845 * WCP541 + 74.56229 * D931T971
(-9.79) (55.59) (6.54)

- 173.60716 * D963T004 – 50.71626 * D011T042
(-14.90) (-4.00)

R^2 = 0.9800 D. W. = 1.692

50) Chicken Net Imports

(M551– X541) = -4962 + 415.78 * (WCP541-(ICP541*2.204622/100*EXCH
(-4.61) (4.75)

*(1+TA541/100)))/PPI

+ 1038 * TREN023 – 1095 * AVIANI – 8554 * (D051+D052+D061-D041)
(22.28) (-15.77) (-7.23)

R^2 = 0.9400 D. W. = 1.510

51) Broiler Production Cost

ACB541 = 340.59 + 6.788 * ((0.8*CP/56+0.2*SMP/2000)*EXCH*0.453)
(5.68) (5.45)

+ 4.6291 * PPI – 104.241 * SHIFT02 + 68.312 * D043T054
(6.35) (-6.22) (3.09)

R^2 = 0.6932 D. W. = 0.658

52) Chicken Production (Annual)

AQ541 = 132710 + 0.5135 * ABH541 + 12164 * (D96 + D98 – D99)
(18.70) (14.43) (6.47)

+ 16386 * (D03 + D04) – 10292 * TREN9205
(5.51) (-9.53)

R^2 = 0.9881 D. W. = 3.010

53) Chicken Per Capita Consumption (Annual)

LN(PERD541) = 5.669 – 0.307 * LN(ANCP541/CPI) + 0.111 *
(12.55) (-4.07) (2.22)

LN(ANCP51/CPI) + 0.060 * LN(ANCP53/CPI) + 0.725 *
(1.07) (9.66)

LN(DINC/POP) – 0.013 * AVIANI + 0.079 * (D01 – D03)
(-6.94) (3.40)

R^2 = 0.9819 D. W. = 2.932

54) Chicken Consumption (Annual)

CDIS541 = Q541 + LAG (ST541) +AM541 – ST541 – AX541

55) Chicken Per Capita Consumption (Annual)

PERD541 = CDIS541 / POP

4.4. Hen & Eggs

56) Total Hen Inventory

NB543 = 7613.41 + 0.72889 * LAG4 (NB543)
(1.80) (10.53)

+ 115149 * (0.25 * NFP543eg/ACH543 + 0.75 * LAG (NFP543eg/ACH543))
(3.28)

+ 4227.306 * SHIFT044 + 4594.187 * D992T002
(7.51) (7.12)

$R^2 = 0.8682$ D. W. = 1.215

57) Egg Production

Q543egg = 419.09 + 0.04378 * (NB543+LAG(NB543))/2
(1.95) (9.64)

– 0.0021*D1*(NB543+LAG(NB543))/2 - 0.00078*D4* (NB543+LAG(NB543))/2
(-5.89) (-2.21)

+ 0.000165 * QTREND98 * (NB543+LAG(NB543))/2 - 151.655 * SHIFT044
(7.61) (-4.96)

$R^2 = 0.9360$ D. W. = 1.931

58) Wholesale Egg Price

NWP543eg = -48.5 + 0.859 * NCP543eg + 0.01015 * TREND92*NCP543eg
(-0.87) (11.60) (3.56)

- 0.17529 * SHIFT052
(-8.64)

$R^2 = 0.9421$ D. W. = 1.552

59) Egg Farm Price

NFP543eg / PPI = 0.36405 + 1.08327 * NWP543eg / PPI
(0.38) (28.48)

- 0.000357*Q543egg–0.146*SHIFT01*NWP543eg/PPI+0.954*(D052-D063)
(-1.15) (-10.73) (5.07)

$R^2 = 0.9648$ D. W. = 2.844

60) Egg Production Cost

ACH543 = -4025.8 + 96.69 * ((0.8*CP/56+0.2*SMP/2000)*EXCH*0.453)
(-7.18) (5.93)

+ 206.3*PPI – 557*(D94+D95+D96) + 1939*(D98+D99) + 1705*D043T061

(26.38) (-3.05) (9.10) (6.29)

R^2 = 0.9788 D. W. = 1.129

61) Egg Per Capita Consumption (Annual)

LN(D543egg) = 3.758 – 0.2085 * LN(NCP543eg/CPI)
(32.11) (-7.36)

+ 0.4485 * LN(DINC/POP) - 0.0766 * D03
(19.64) (-7.03)

– 0.035 * (D02 + D04 – D90 – D05)
(-7.94)

R^2 = 0.9828 D. W. = 2.006

62) Egg Consumption (Annual)

D543egg = Q543egg

4.5. Dairy

63) Female Dairy Over 2 Years

NBFY52 = 0.95871 * LAG(NBFY52) + 815389 *
(53.83) (2.29)

NFP52MILK/COST52MILK - 522.96379 * TREND05
(-2.10)

R^2 = 0.999 D. W. = 1.824

64) Female Under 1 Year

NBFI52 = 0.39439 * LAG(NBFY52) - 0.000833 *
(122.60) (-10.63)

COUNT * LAG(NBFY52)

R^2 = 0.998 D. W. = 0.640

65) Female Dairy Between 1 and 2 Years

NBFT52 = 0.81131 * LAG1-4(NBFI52)/4 + 616.28855 *
(108.51) (29.00)

COUNT53

R^2 = 0.999 D. W. = 0.503

66) Milk Production Costs

COST52MILK = -9610.74155 + 199.60175 * ((0.8*CP/56+0.2*SMP/2000)
(-7.90) (5.30)

*EXCH*0.453) + 383.25129*PPI
(24.99)

R^2 = 0.944 D. W. = 0.630

67) Milk Yield (Annual)

Y52A = 5.52424 + 0.1863 * (YEAR – 1989)
(4.34) (10.52)

+ 75.37748 * NFP52MILK/COST52MILK
(1.00)

R^2 = 0.909 D. W. = 1.647

68) Milk Net Imports (Annual)

MN52A = -249263 + 624341107 * NFP52MILK/INTERP52*EXCH
(-1.12) (0.89)

+ 58323 * (YEAR – 1989) - 161195 * D03
(9.78) (-1.87)

$R^2 = 0.938$ D. W. = 2.003

69) Milk Per Capita Consumption (Annual)

LN(D52A) = 3.42762 – 0.21111 * LN(NFP52MILK/CPI)
(2.16) (-0.54)

+0.13483 * LN(DINC/CPI) + 0.03735 * TREND90-00
(0.63) (4.61)

+0.14499 * D90 + 0.06647 * D91 – 0.07561 * (D97 + D98)
(2.97) (1.62) (-2.83)

$R^2 = 0.973$ D. W. = 2.344

70) Milking Cows

NBMC52F = NBFY52 * LAG(NBMC52F/NBFY52)

71) Milk Production (Annual)

Q52MILKA = Average Q1-4(NBMC52F1-4)* Y52A

72) Milk Ending Stocks (Annual)

EST52A = Lag(EST52A) + Q52MILKA + MN52A – D52A

4.6. Formulas Used to Make Endogenous Beef Data Calculated

Female Beef Cattle Over 2 Years Slaughter

NBFO51S = MAX (LAG (NBFO51) * 0.03, 0.995 * LAG (NBFO51) – NBFO51)

Female Beef Cattle 1-2 Years Slaughter

NBFA51S = SLF51 – NBFO51S

Female Beef Cattle 1-2 Years Added To Female Beef Cattle Over 2 Years

NBFO51A = NBFO51 – 0.995 * LAG (NBFO51) + NBFO51S

Female Beef Cattle Under 1 Year Moved To Female Beef Cattle 1-2 Years

NBFYTOA = NBFA51 – 0.995 * LAG (NBFA51) + NBFA51S + NBFO51A

Female Calf Crop

NBFYCC = 1.025 * NBFYTOA $_{t+4}$

Residual To Make Female Beef Cattle Under 1 Year Balance

NBFYRES = NBFY51 – 0.975 * LAG (NBFY51) – NBFYCC + NBFYTOA

Male Cattle Over 2 Years Slaughter

NBMO51S = 0.3 * LAG (NBMO51)

Male Cattle 1-2 Years Slaughter

NBMA51S = SLM51 – NBMO51S

Male Cattle 1-2 Years Moved To Male Cattle Over 2 Years

NBMO51A = NBMO51 – 0.995 * LAG (NBMO51) + NBMO51S

Male Cattle Under 1 Year Moved To Male Cattle 1-2 Years

NBMYTOA = NBMA51 – 0.995 * LAG (NBMA51) + NBMA51S + NBMO51A

Male Calf Crop

NBMYCC = 1.025 * NBMYTOA $_{t+4}$

Residual To Make Male Cattle Under 1 Year Balance

NBMYRES = NBMY51 – 0.975 * LAG (NBMY51) + NBMYTOA – NBMYC

5. VARIABLES [17]

Variable	Description	Unit	Source
NBFY51	Female Beef Cattle Under 1 year	Head	National Agricultural Products Quality
	Management Service		
NBFA51	Female Beef Cattle 1 - 2 years	Head	
NBFO51	Female Beef Cattle Over 2 years		Head
NBF51	Female Beef Cattle Inventory	Head	Calculated
NBFYCC	Female Calf Crop	Head	
NBFYTOA	Female Beef Cattle Under 1 year Moved to Female Beef Cattle 1 - 2 years	Head	
NBFO51A	Female Beef Cattle 1 -2 years Added to Female Beef Cattle Over 2 years	Head	
NBFYRES	Residual to make Female Beef Cattle Under 1 year Balance	Head	
NBMY51	Male Beef Cattle Under 1 year	Head	National Agricultural Products Quality
	Management Service		
NBMA51	Male Beef Cattle 1 - 2 years	Head	
NBMO51	Male Beef Cattle Over 2 years	Head	
NBM51	Male Beef Cattle Inventory	Head	Calculated
NB51	Beef Cattle Inventory	Head	
NBMYCC	Male Calf Crop	Head	
NBMYTOA	Male Beef Cattle Under 1 year Moved to Male Beef Cattle 1 - 2 years	Head	

[17] All variables are quarterly unless noted (Annual)

Variable	Description	Unit	Source
NBMO51A	Male Beef Cattle 1 -2 years Added to Male Beef Cattle Over 2 years	Head	
NBMYRES	Residual to make Female Beef Cattle Under 1 year Balance	Head	

Variable	Description	Unit	Source
NBFA51S	Female Beef Cattle 1-2 years Slaughter	Head	Calculated
NBFO51S	Female Beef Cattle Over 2 years Slaughter	Head	
SLF51	Female Beef Cattle Slaughter	Head	Ministry of Agriculture and Forestry
NBMA51S	Male Beef Cattle 1-2 years Slaughter	Head	Calculated
NBMO51S	Male Beef Cattle Over 2 years Slaughter	Head	
MSL51	Male Beef Cattle Slaughter	Head	Ministry of Agriculture and Forestry
SL51	Beef Cattle Slaughter	Head	Calculated
NPMY51	Male Calf Price	Won/Head	National Agricultural Cooperative Federation
NPFY51	Female Calf Price	Won/Head	
NPFO51	Female Beef Cattle (500 kg) Price	Won/Head	
NPMO51	Male Beef Cattle (500 kg) Price	Won/Head	
NCP51	Retail Beef Price	Won/500g	
PERD51	Beef Per Capita Consumption (Annual)	g	Calculated
ASLF52	Female Cattle Slaughter except Beef Cattle Slaughter (Annual)	Head	Calculated
ICP53	U.S. Barrow and Gilt Price	Dollars/100 lbs	
NBF53	Number of Sows	Head	National Agricultural Products Quality Management Service
NB53	Number of Hogs	Head	
SL53	Hog Slaughter	Head	Ministry of Agriculture and Forestry
NP53	Hog (100 Kg) Price	Won/Head	National Agricultural Cooperative Federation

Variable	Description	Unit	Source
NCP53	Retail Pork Price	Won/500g	
ANCP53	Retail Pork Price (Annual)	Won/500g	
ANP53	Hog (100 Kg) Price (Annual)	Won/Head	
ACH53	Slaughter Hog Production Cost	Won/100Kg	National Agricultural Products Quality Management Service
Q53	Pork Production (Annual)	Ton	Materials On Price, Supply & Demand of Livestock products
CDIS53	Pork Consumption (Annual)	Ton	
ST53	Pork Ending Stock (Annual)	Ton	
AM53	Pork Imports (Annual)	Ton	
AX53	Pork Exports (Annual)	Ton	
PERD53	Pork Per Capita Consumption (Annual)	g	Calculated
NB541	Number of Broilers	Head	National Agricultural Products Quality Management Service
ANB541	Number of Broilers (Annual)	1000 Head	
NP541	Broiler Price	Won/Kg	National Agricultural Cooperative Federation
WCP541	Wholesale Chicken Price	Won/Kg	National Agricultural Cooperative Federation
NCP541	Retail Chicken Price	Won/Kg	
ANCP541	Retail Chicken Price (Annual)	Won/Kg	
ACB541	Broiler Production Cost	Won/Kg	National Agricultural Products Quality Management Service
M51	Chicken Imports	Ton	Materials On Price, Supply & Demand of Livestock products
X51	Chicken Exports	Ton	
Q541	Chicken Production (Annual)	Ton	
CDIS541	Chicken Consumption (Annual)	Ton	

Variable	Description	Unit	Source
ST	Chicken Ending Stock (Annual)	Ton	
AM541	Chicken Imports (Annual)	Ton	
AX541	Chicken Exports (Annual)	Ton	
PERD541	Chicken Per Capita Consumption (Annual)	g	
ACH543	Eggs Production Cost	1000 Won/100	
D543egg	Egg Consumption (Annual)	Million Units	
NB543	Total Hen Inventory	1000 Head	
COST52MILK	Milk Production Cost	Won/100 L	
D52A	Milk Consumption (Annual)	Ton	
EST52A	Milk Ending Stocks (Annual)	Ton	
MN52A	Milk Net Imports (Annual)	Ton	
NCP543eg	Egg Consumer Price	Won/10 Units	
NFP543eg	Egg Farm Price	Won/10 Units	
NWP543eg	Egg Wholesale Price	Won/10 Units	
Q543egg	Egg Production	Million Units	
INTERP52	International Milk Price	US Dollars/Ton	Calculated
NBFI52	Female Dairy Cattle Under 1 year	Head	
NBFT52	Female Dairy Cattle 1-2 years	Head	
NBFY52	Female Dairy Cattle Over 2 years	Head	
NBMC52F	Total Milking Cows	Head	
NFP52MILK	Milk Target Price	Won/Kg	
Q52MILKA	Milk Production (Annual)	Ton	
Y52A	Milk Yield per Cow (Annual)	Ton/Head	
EXCH	Exchange Rate	Won/Dollar	Bank of Korea
POP	Population (Annual)	1000 Person	Korea National Statistics Office
DINC	Real Disposable Income, 2000=100 Billion (Annual)	Won	Bank of Korea

TA51	Beef Tariff Rate	%	C/S Schedule
TA53	Pork Tariff Rate	%	
TA541	Chicken Tariff Rate	%	
PPI	Producer Price Index, 2000=100		Bank of Korea
CPI	Consumer Price Index, 2000=100 (Annual)		

Variable	Description
D1	1 in 1st Quarter, Otherwise 0
D2	1 in 2nd Quarter, Otherwise 0
D3	1 in 3rd Quarter, Otherwise 0
D4	1 in 4th Quarter, Otherwise 0
D90	1 in Year 1990, Otherwise 0
D91	1 in Year 1991, Otherwise 0
D92	1 in Year 1992, Otherwise 0
D93	1 in Year 1993, Otherwise 0
D931T971	1 from 1st Quarter of Year 1993 to 1st Quarter of Year 1997, Otherwise 0
D931T982	1 from 1st Quarter of Year 1993 to 2nd Quarter of Year 1998, Otherwise 0
D932	1 in 2nd Quarter of Year 1993, Otherwise 0
D932T981	1 from 2nd Quarter of Year 1993 to 1st Quarter of Year 1998, Otherwise 0
D934T003	1 from 4th Quarter of Year 1993 to 3rd Quarter of Year 2000, Otherwise 0
D94	1 in Year 1994, Otherwise 0
D944T962	1 from 4th Quarter of Year 1994 to 2nd Quarter of Year 1996, Otherwise 0
D94T97	1 from Year 1994 to Year 1997, Otherwise 0
D95	1 in Year 1995, Otherwise 0
D96	1 in Year 1996, Otherwise 0
D963	1 in 3rd Quarter of Year 1996, Otherwise 0
D963T004	1 from 3rd Quarter of Year 1996 to 4th Quarter of Year 2000, Otherwise 0
D964	1 in 4th Quarter of Year 1996, Otherwise 0

Variable	Description
D97	1 in Year 1997, Otherwise 0
D971	1 in 1st Quarter of Year 1997, Otherwise 0
D971T001	1 from 1st Quarter of Year 1997 to 1st Quarter of Year 2000, Otherwise 0
D971T011	1 from 1st Quarter of Year 1997 to 1st Quarter of Year 2001, Otherwise 0
D972T981	1 from 2nd Quarter of Year 1997 to 1st Quarter of Year 1998, Otherwise 0
D973	1 in 3rd Quarter of Year 1997, Otherwise 0
D974T024	1 from 4th Quarter of Year 1997 to 4th Quarter of Year 2002, Otherwise 0
D98	1 in Year 1998, Otherwise 0
D981	1 in 1st Quarter of Year 1998, Otherwise 0
D984	1 in 4th Quarter of Year 1998, Otherwise 0
D984T021	1 from 4th Quarter of Year 1998 to 1st Quarter of Year 2002, Otherwise 0
D99	1 in Year 1999, Otherwise 0
D992T002	1 from 2nd Quarter of Year 1999 to 2nd Quarter of Year 2000, Otherwise 0
D00	1 in Year 2000, Otherwise 0
D003T011	1 from 3rd Quarter of Year 2000 to 1st Quarter of Year 2001, Otherwise 0
D003T041	1 from 3rd Quarter of Year 2000 to 1st Quarter of Year 2004, Otherwise 0
D01	1 in Year 2001, Otherwise 0
D011T042	1 from 1st Quarter of Year 2001 to 2nd Quarter of Year 2004, Otherwise 0
D012	1 in the 2nd Quarter of Year 2001, Otherwise 0
D013	1 in the 3rd Quarter of Year 2001, Otherwise 0
D013T042	1 from 3rd Quarter of Year 2001 to 2nd Quarter of Year 2004, Otherwise 0
D014	1 in the 4th Quarter of Year 2001, Otherwise 0
D02	1 in Year 2002, Otherwise 0
D021	1 in the 1st Quarter of Year 2002, Otherwise 0
D03	1 in Year 2003, Otherwise 0
D031	1 in the 1st Quarter of Year 2003, Otherwise 0

Variable	Description
D032	1 in the 2nd Quarter of Year 2003, Otherwise 0
D032T043	1 from 2nd Quarter of Year 2003 to 3rd Quarter of Year 2004, Otherwise 0
D04	1 in Year 2004, Otherwise 0
D041	1 in the 1st Quarter of Year 2004, Otherwise 0
D041T051	1 from 1st Quarter of Year 2004 to 1st Quarter of Year 2005, Otherwise 0
D043T054	1 from 3rd Quarter of Year 2004 to 4th Quarter of Year 2005, Otherwise 0
D043T061	1 from 3rd Quarter of Year 2004 to 1st Quarter of Year 2006, Otherwise 0
D05	1 in Year 2005, Otherwise 0
D051	1 in the 1st Quarter of Year 2005, Otherwise 0
D052	1 in the 2nd Quarter of Year 2005, Otherwise 0
D052T063	1 from 2nd Quarter of Year 2005 to 3rd Quarter of Year 2006, Otherwise 0
D06	1 in Year 2006, Otherwise 0
D061	1 in the 1st Quarter of Year 2006, Otherwise 0
D063	1 in the 3rd Quarter of Year 2006, Otherwise 0
SHIFT93	1 beginning in 1st Quarter of Year 1993, Otherwise 0
SHIFT953	1 beginning in 3rd Quarter of Year 1995, Otherwise 0
SHIFT98	1 beginning in 1st Quarter of Year 1998, Otherwise 0
SHIFT983	1 beginning in 3rd Quarter of Year 1998, Otherwise 0
SHIFT99	1 beginning in 1st Quarter of Year 1999, Otherwise 0
SHIFT992	1 beginning in 2nd Quarter of Year 1999, Otherwise 0
SHIFT01	1 beginning in 1st Quarter of Year 2001, Otherwise 0
SHIFT012	1 beginning in 2nd Quarter of Year 2001, Otherwise 0
SHIFT02	1 beginning in 1st Quarter of Year 2002, Otherwise 0
SHIFT03	1 beginning in 1st Quarter of Year 2003, Otherwise 0
SHIFT032	1 beginning in 2nd Quarter of Year 2003, Otherwise 0
SHIFT033	1 beginning in 3rd Quarter of Year 2003, Otherwise 0

Variable	Description
SHIFT034	1 beginning in 4th Quarter of Year 2003, Otherwise 0
SHIFT04	1 beginning in 1st Quarter of Year 2004, Otherwise 0
SHIFT042	1 beginning in 2nd Quarter of Year 2004, Otherwise 0
SHIFT043	1 beginning in 3rd Quarter of Year 2004, Otherwise 0
SHIFT044	1 beginning in 4th Quarter of Year 2004, Otherwise 0
SHIFT05	1 beginning in 1st Quarter of Year 2005, Otherwise 0
SHIFT052	1 beginning in 2nd Quarter of Year 2005, Otherwise 0
SHIFT054	1 beginning in 4th Quarter of Year 2005, Otherwise 0
SHIFT06	1 beginning in 1st Quarter of Year 2006, Otherwise 0
COUNT	Quarterly Trend Beginning in 1990 Quarter 1
COUNT53	Quarterly Trend From 1990 Quarter 1 to 2003 Quarter 1
QTREND98	Quarterly Trend Beginning in 1998 Quarter 1
TR971032	Quarterly Trend From 1997 Quarter 1 to 2003 Quarter 2
TR984041	Quarterly Trend Beginning in 1998 Quarter 4 and Ending in 2004 Quarter 1
TREN023	Quarterly Trend Beginning in 1996 Quarter 1 and Ending in 2002 Quarter 3
TREN024	Quarterly Trend Beginning in 1991 Quarter 2 and Ending in 2002 Quarter 4
TREND90-00	Annual Trend Beginning in Year 1990 and Ending in 2000
TREN9099	Annual Trend Beginning in Year 1990 and Ending in Year 1999
TREN9205	Annual Trend Beginning in Year 1992 and Ending in Year 2005
TREN9506	Annual Trend Beginning in Year 1995 and Ending in Year 2006
TREND92	Annual Trend Beginning in Year 1992
TREND03	Quarterly Trend Ending in 2002 Quarter 4
TREND05	Quarterly Trend Beginning in Year 2005 Quarter 1 and Ending in 2008 Quarter 1
BSE	Percentage Reduction in US Beef Exports to Korea Relative to 2000-2003 Average
AVIANI	Number of Human Avian Influenza Deaths Reported in Thailand

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