Journal of Rural Development 17(1994) : 37-56

EFFICIENCY OF WELFARE REDISTRIBUTION IN THE KOREAN RICE PROGRAM*

KIM YONG-TAEK**

I. Introduction

Rice is the most important staple crop for Korean farmers and consumers. The ratio of farm income earned from rice to total farm income, as well as the ratio of purchasing costs for rice to total living costs of urban household are high for Korea. The rice program, one of Korea's major agricultural policies, has been used as both an income redistribution policy and a price stabilization policy.

The Korean government annually purchases rice from farmers at a price higher than the farm gate price, and sell such rice to consumers at a price lower than the goverment purchase price plus handling costs. This two-tier rice price system has caused chronic excess demand for the goverment's purchase of rice.

The rice program has resulted in a large budget deficit and inefficiency in welfare redistribution since the mid-1980s. The main purposes of the Rice Policy Reforms(RPR) proposed in August of 1933 were not only to facilitate thr rice marketing function of the private sector, but also to introduce a direct income support scheme in order not to distort production and international trade. Although thr proposed government policy reforms were designed to promote the marketing function of the private rice market, thus shifting away direct government intervention, the pros and cons of alternative policies for rice have not been completely examined.

In general, economists think of Pareto-optimal situations as the

* This paper was developed from the paper presented in the 1993 winter academic seminar held by the Korean Agricultural Economics Association. I would like to thank referees for helpful comments and suggestions on earlier drafts of this paper without implicating them in any remaining errors or omissions.
** Research Associate, Korea Rural Economic Institute, Seoul, Korea.

appropriate criteria for evaluating the economic effectiveness of public policies. Since it is very difficult to measure utilities of individuals in the real world, the Pareto-optimal first-best policy cannot be reached through public policies that shift compensation to certain some groups being better off for other groups being worse off.

It is difficult to suggest efficient policy alternatives unless a method is found that can objectively measure and weigh against one another the gains and losses that result from policy options(Gardner, 1987). The process of positively analyzing the efficiency of welfare redistribution illustrates the pros and cons of public policy alternatives, and provides objective information for policy decision-making through measurement of the social costs resulting from policy alternatives. It is, therefore, necessary to analyze the distributional consequences of alternative policies with greater accuracy before raising normative questions such as why the government should set a price ceiling for rice to support farm income.

Furthermore, as interrelations between sectors gets deepen, consensus between interest groups on public policy becomes an increasingly important factor in making policy decisions. Efficiency in redistribution can be an important criterion in reaching a consensus between conflicting interest groups.

Some studies have emphasized redistributional efficiency in agricultural policy decision-making processes. Gardner(1983) insisted that policy variation over time and across commodities can be explained in terms of efficiency in redistribution and argued that the future direction of agricultural policies can be predicted by efficiency in redistribution.

The theoretical studies focusing on efficiency in redistribution include B. Gardner(1987), Oehmke and Yao(1990), Bullock(1990), de Gorter and D. Meike(1989), Lopez(1989), Jukka Kola(1993), and so on. In Korea, however, there have been few studies that analyze specifically the distributional effects of the nation's agricultural policies. And although there have been many studies that dealt with policy alternatives, virtually none of them has assessed policy alternatives in terms of efficiency in redistribution.

A study focusing on the distributional consequences of different rice programs should suggest proper policy alternatives for the period of transition from the government's direct intervention to the market mechanism.

The purposes of this paper are to measure the social costs of several rice programs already suggested in the previous studies as policy options, to analyze how these programs affect the welfare of producers, consumers, and taxpayers, and to try to determine which rice program will be the most favorable with regard to efficiency in welfare redistribution.

II. Model

Assume for simplicity that rice supply and demand curves are inverse linear curves of domestic price. Let Pd, Ps, and Ps' represent total demand, total supply, and adjusted total supply curve, respectively, which are illustrated as follows :

Total demand curve : $Pd = a_0 + a_1 Qd$ (1)

Total supply curve : $Ps = b_0 + b_1 Qs$ (2)

Adjusted total supply curve : $Ps' = b_0' + b_1 Qs$ (3)

The parameters of the total demand curve and total supply curves could be estimated by the econometric approach. Since the prices for rice over the whole year are steadily controlled by the government, the estimation of the parameters for the demand and supply functions under rice program constraints can be biased to reflect the market situation. The non-econometric method suggested by Gardner(1987) is used instead of the econometric method. The non-econmetric method is applied to the supply and demand elasticities to estimate the parameters for the supply and demand curves.

In this paper, a partial equilibrium model for the rice programs is used to highlight the welfare effects due to alternative rice programs. In order to measure the welfare effects of different rice programs on different interest groups, it is assumed that interest groups affected by the rice programs applied are divided into producers, consumers, and taxpayers. It is also assumed that the objective of the rice program is to maximize the weighted sum of the welfare of producers, consumers, and taxpayers.

In welfare analysis, the compensating variation (CV) and equivalent variation (EV) are applied to measure the welfare effects(willingness to pay) of interest groups. However, the CV and EV can be difficult to determine empirically since actual utility levels cannot be observed. The consumer surplus(CS) and producer surplus(PS) derived from the

Marshallian demand curve are used as approximations of CV and EV.

The surplus transformation curve(STC) as the analytical tool developed by Gardner(1983) will be used to compare the marginal income trade-offs between interest groups due to different rice programs and measure the redistributional efficiency of alternative rice programs.

A alternative policies for agricultural commodities can be largely divided into demand adjustment policies and supply control policies. The demand adjustment policies for the rice program may include the school lunch program and the food stamp program, whereas the supply control policies include the production quota system, the acreage reduction system, and so forth. No detailed programs about demand and supply policies mentioned above are, however, addressed in the RPR reported by the government.

In this paper, it is assumed that only the supply control programs - that is, the current rice program(a two-tier pricing system), reduction of the price support, the production quota program, the paid acreage restriction program-are taken into account as rice policy alternatives. The demand adjustment policies are not considered because it usually takes a long time to change the demand for rice.

Figure 1 graphically shows the changes in price and production, and welfare implications due to the alternative rice programs in a closed economy. Let D represent the total demand curve, which is a horizontal summation of the domestic demand for rice. The supply curve S is assumed to represent no rice program, while Sa indicates the adjusted supply curve due to provision of the paid acreage restriction program.

The graphical analysis of the farm program is sensitive to the specification of 1) the magnitude of the supply shifts induced by farm program set aside and compliance requirements, 2) the inclusion of foreign markets, and 3) the nature of the supply and demand curves (Chang, 1992). It is, therefore, assumed that the magnitude of the supply shift due to the paid acreage restriction program is determined by a price higher[1] than the market clearing price decided with no rice program.

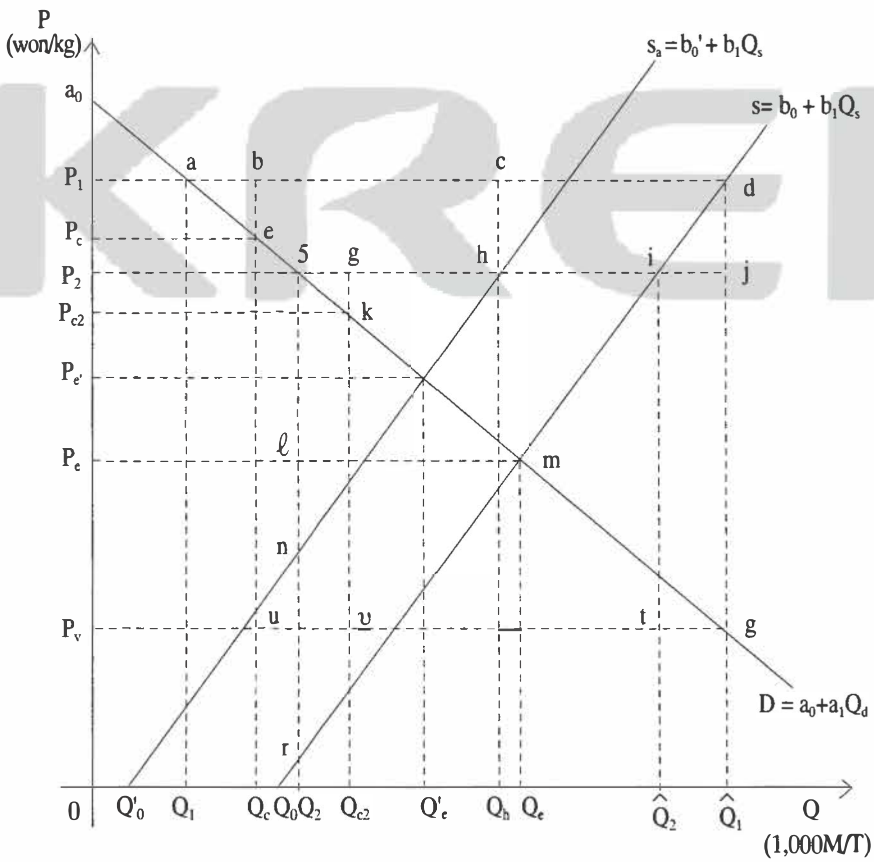
with no rice program(no government intervention), the equilibrium price and quantity are achieved at Pe and Qe in Figure 1. Under the paid

---

[1] Under paid acreage reduction, it is assumed that the government supports a price 10% highter than at the maximum level of the market clearing price decided under no rice program.

acreage restriction program, the adjusted supply curve is Sa established at, Qe', an output lower than that with no rice program supply curve S. If the two-tier pricing system is implemented, producer price and quantity are determined at P_1 and Q_1. The consumer price is equal to Pc. The price, Pv, represents the salvage price at which the government stock is sold on the market. The production quota program leads to the lower quantity Q_2 and the higher price P_2 because of the administratively-set quantity.

FIGURE 1 The Distributional Effects Resulting from Alternative Rice Programs



III. The Changes in Gains and Losses Resulting from Alternative Rice Programs

The welfare effects of the alternative rice programs listed in this paper are evaluted by comparing the gains and losses resulting from the alternative programs to those under a no rice program situation.

1. No Rice Program Situation

When compared to the distributional effects of alternative rice programs, a no rice program situation can be a benchmark. The no rice program means that all farm programs are removed. Under the no rice program, total producer surplus(PS) and total consumer surplus (CS) are equal to areas OP_emQ_0 and P_ea_0m, respectively, in Figure 1. Thus, PS and CS are calculated from eq.(4) and eq. (5).

$$PS_1 = P_eQ_e - \int_{Q_0}^{Q_e} (b_0 + b_1Q)dQ = \frac{b_1}{2}Q_e^2 + b_0Q_0 + \frac{b_1}{2}Q_0^2 \tag{4}$$

$$CS_1 = \int_{0}^{Q_e} (a_0 + a_1Q)dQ - P_eQ_e = - \frac{a_1}{2}Q_e^2 \tag{5}$$

2. Maintenance of the Current Rice Program(Two-Tier Pricing System)

Producers react to a price P_1, the weighted sum of the market equilibrium price and the government procurement price rather than only the government procurement price because the amout of the government procurement accounts for 20% to 30% of total production. Consumers respond to a price, pc determined in the rice market. The taxpayers have to pay for the difference between producer prices and consumer prices, as well as, for the losses resulting from the release of government stocks at prices lower than market prices. PS and CS are depicted by areas OP_1dQ_0 and P_ca_0e, respectively, while taxpayers' losses(TL) are equal to the sum of areas P_cP_1be

and ubdg in Figure 1. Hence, the gains and losses due to maintenance of the current rice program are calculated by eq. (6) through eq. (8).

$$PS_2 = P_1\hat{Q}_1 - \int_{Q_0}^{\hat{Q}_1} (b_0 + b_1Q)dQ = \frac{b_1}{2}\hat{Q}_1^2 + b_0Q_0 + \frac{b_1}{2}Q_0^2 \quad (6)$$

$$CS_2 = \int_0^{Q_c} (a_0 + a_1Q)dQ - P_cQ_c = -\frac{a_1}{2}Q_c^2 \quad (7)$$

$$TL_2 = [\,(P_1 - P_c)Q_c + (P_1-P_v)(\hat{Q}_1-Q_c)\,] = -a_1Q_c^2 + a_1Q_1\hat{Q}_1 - a_1\hat{Q}_1^2 + a_1\hat{Q}_1Q_c \quad (8)$$

3. Government Support Price Reduction

The main feature of the RPR are the reduction the quantity and price of government procurement, and the facilitation of market functioning in the private sector. Producers face the weighted sum of the government purchasing price and the market price. As market functioning in the private sector is facilitated, the support price for producers will be reduced to P_2, a price lower than the current level P_1. P_2 and P_{c2} in Figure 1 are the prices which producers and consumers face, respectively. Thus, PS and CS are equal to areas OP_2iQ_0 and $P_{c2}a_0k$, while TL can be described as the sum of areas $P_{c2}P_2gk$ and vgit. These gains and losses due to the reduction of government price support can be calculated by eq. (9) through eq. (11).

$$PS_3 = P_2\hat{Q}_2 - \int_{Q_0}^{\hat{Q}_1} (b_0 + b_1Q)dQ \tag{9}$$

$$= \frac{b_1}{2}\hat{Q}_2^2 + b_0Q_0 + \frac{b_1}{2}Q_0^2$$

$$CS_2 = \int_0^{Q_{c2}} (a_0 + a_1Q)dQ - P_{c2}Q_{c2} \tag{10}$$

$$= -\frac{a_1}{2}Q_{c2}^2$$

$$TL_3 = [\ (P_2 - P_{c2})Q_{c2} + (P_2\text{-}P_v)\ (\hat{Q}_2\text{-}Q_{c2})\ ] \tag{11}$$

$$= -a_1Q_{c2}^2 + a_1Q_2\hat{Q}_2 - a_1\hat{Q}_1\hat{Q}_2 + a_1\hat{Q}_1Q_{c2}$$

4. Production Quota Program

Since the production quota program administratively-set the amount of rice output at Q_2, producers are allowed to produce the administratively-set output Q_2. It is assumed that the output is set for the price to be the same as that under price support reduction. The price P_2 determined under the production quota program is not affected by the production quota program. Taxpayers do not pay taxes under the exces supply situation. Under the production quota program, therefore, PS and CS are equal to area OP_2frQ_0 and a_0P_2f, while there are no taxes for taxpayers. The welfare changes due to the production quota program are calculated by eq. (12) and eq. (13).

$$PS_4 = P_2Q_2 - \int_{Q_0}^{Q_2} (b_0 + b_1Q)dQ \tag{12}$$

$$= (a_0 - b_0)Q_2 + (a_1 - \frac{b_1}{2})Q_2^2 + b_0Q_0 + \frac{b_1}{2}Q_0^2$$

$$CS_4 = \int_0^{Q_2} (a_0 + a_1Q)dQ - P_2Q_2 \tag{13}$$

$$= -\frac{a_1}{2}Q_2^2$$

$$TL_4 = 0 \tag{14}$$

5. Paid Acreage Restriction Program

Participating farmers in the paid acreage restrictions program must set aside a portion of their land for non-use. Thus, the adjusted total supply curve of rice will be S_a, shifted to the left from the original supply curve S. The government pays a subsidy to rice producers per hectare of diverted land. The total subsidy payments are equal to amount money lost from diverted production multiplied by the price difference between P_1, the price determined at the current rice program situation and P_2, the market price established under the paid acreage reduction program. It is also assumed that price P_2 is at the same level as the 10% reduction of the support price. Thus, PS is equal to the sum of the areas OP_2fnQ_0' and hcdj, while CS is the same as area $a_0P_{c2}k$. The taxburden on the taxpayers is increased for subsidy payments, which is the same as area hcdj. Consequently, the welfare changes due to the paid acreage restriction program can be calculated by eq. (15) through eq. (17).

$$PS_5 = P_2Q_2 - \int_{Q'_0}^{Q_2} (b'_0 + b_1Q)dQ + (P1 - P2)(\hat{Q}_1 - Qh)$$
$$= (a_0 - b'_0)Q_2 + (a_1 - \frac{b_1}{2})Q_2^2 + b'_0Q'_0 + \frac{b_1}{2}Q_0^2 + b_1(\hat{Q}_1 - Q_h)^2 \qquad (15)$$

$$CS_5 = \int_0^{Q_{c2}} (a_0 + a_1Q)dQ - P_{c2}Q_{c2}$$
$$= -\frac{a_1}{2}Q_{c2}^2 \qquad (16)$$

$$TL_5 = [\,(P_1 - P_2)(\hat{Q}_1 - Q_h)\,]$$
$$= b_1(\hat{Q}_1 - Q_h)^2 \qquad (17)$$

IV. Empirical Analysis: Application to the Rice Program in Korea

In measuring the welfare changes of interest groups due to alternative rice programs proposed in this paper, the data for 1992 was used. The data on production, quantities of supply and demand, government procurment prices, farm gate prices, and consumer prices was collected from the "Data on Grain Policy, 1993" published by the Ministry of Agriculture, Forestry, and Fisheries (MAFF). The values of -0.3 and 0.3 as the demand and supply elasticities were selected to estimate parameters of supply and demand curves[2]. There was some uncertainty about the magnitudes of the demand and supply elasticities. The welfare changes resulting from this paper can be greatly affected by different values for rice demand and supply elasticities. Thus, a sensitivity analysis will be performed in the last part of this paper to reduce some uncertainty with relation to elasticities and to draw more meaningful policy implications. The Gardner method is used to derive the adjusted parameters of the demand and supply curves. The adjusted parameters of the demand and supply curves are presented in Table 2. Table 3 shows the values of prices and outputs decided under alternative rice programs.

TABLE 2 The Values of the Adjusted Parameters of Rice Demand and Supply Curves(1992)When the Demand and Supply Elasticities Are -0.3 and 0.3. Respectively.

Demand Curve		Supply Curves		
a_0	a_1	b_0	b_1	b'_0
5,399	-0.75	-3,038	0.58	-2,555

TABLE 3 The Estimated Values of Prices and Outputs Under Alternative Rice Programs

Price(won/kg)	Quantity(thousand M/T)
	Q'_0 : 705
	Q_0 : 5,268
P_1 : 1,302	Q_1 : 5,451
P_c : 1,246	Q_c : 5,526
P_2 : 1,095	Q_2 : 5,727
Pc_2 : 1,048	Qc_2 : 5,789
Pe' : 1,041	Qe' : 6,269
Pe : 946	Qe : 6,352
Pv : 688	Q_2 : 7,166
	Q_1 : 7,525

2 A recent study of the Korea Rural Economic Institute(KREI) (1993) econometrically estimated the demand elasticity and the supply elasticity of rice as -0.29 and 0.78, resepectively. In general, the supply of and demand for agricultural commodities, especially for staple crops, are more inelastic. Thus, the values of -0.3 and 0.3 were selected as the demand and supply elasticities of rice.

In order to measure the welfare effects resulting from alternative rice programs, the adjusted parameters for rice demand and supply functions were inserted into derived equations, eq. (3) to eq. (17). Table 4 shows the gains and losses of interest groups resulting from alternative rice programs. The total deadweight losses (TDWL) under alternative rice programs are calculated from the gains in PS plus losses in CS and losses to the taxpayers(TL). Table 5 shows the changes in PS, CS, and TL under alternative rice programs.

TABLE 4 The Gains and Losses Resulting from Alternative Rice Programs

(Unit : billion won)

	No Rice Program	Current Program	Support Price Reduction	Production Quota	Paid ARP
Producer Surplus(PS)	3,633	8,328	6,807	6,210	6,611
Consumer Surplus(CS)	15,162	11,476	12,596	12,325	12,596
Taxpayer Loss(TL)	–	3,425	2,133	–	825

TABLE 5 The Changes In Gains and Losses from Alternative Rice Programs

(Unit : billion won)

	Current Program	Support Price Reduction	Production Quota	Paid ARP
Changes in Producer Surplus(ps)	4,695	3,174	2,577	2,978
Changes in Consumer Surplus(CS)	-3,686	-2,566	-2,837	-2,566
Taxpayer Loss(TL)	3,425	2,133	–	825
TDWL	2,416	1,524	259	413

The changes in PS, CS, and TL under the current rice program were calculated as 4,695, 3,686, and 3,425 billion won respectively. Thus, the current rice program results in about a 2,416 billion won total deadweight loss for society, which is the largest social costs among alternative rice programs. Under the support price reduction program, the change in PS, CS, TL, and TDWL were 3,174, 2,566, 2, 133, and 1,524 billion won, respectively. Under the production quota program, the changes in PS, CS, and TDWL were 2,577, 2,837, and 259 billion won, respectively. Under the paid acreage restriction program, the changes in PS, CS, TL, and TDWL were 2,978, 2,566, 825, and 413 billion won, respectively.

The welfare changes of interest groups related to the rice program show why the policy reforms on the current rice program should be remedied. Among the alternative rice programs, the production quota program gives rise to the smallest deadweight loss. The support price reduction program brings about larger social costs than the case of the paid acreage reduction program. From the view point of social welfare, these results indicate that the paid acreage reduction program and/or the production quota program[3] among alternative supply control programs should be taken to correct the possible oversupply of rice.

V. The Measurement of Efficiency of Redistribution in the Korean Rice Program

The STC(Surplus Transformation Curve) approach developed by Gardner (1986) was used to analyze th redustributional efficiency of alternative rice programs in Korea. STC is defined as the combination of PS and CS attainable by changing prices and quantities. Gardner argued that the slope of STC can be an indicator in measuring the efficiency of redistribution. The STC derived from the trade-off between PS and CTL(which is the sum of CS and TL) is diagrammed in Figure 2. The slope of the STC shows how incomes of consumers(taxpayers) and producers change at the

[3] There might be severe free-rider problems in selecting the production quota program as a policy alternative. Therefore, the administration cost necessary to resolve the free-rider problems due to the production quota program should be considered in selecting a policy alternative to replace the current rice program.

margin. Perfectly efficient redistribution is achieved at the point at which the slope of the STC is -1. This means that a dollar given up by consumers and taxpayers yields a dollar gained by producers. If perfectly efficient redustribution is achieved, no social costs take place in a society. In Figure 2, the cumulative deadweight loss is depicted as the distance between any point on the STC and the efficient redistribution line. Since the slope is related to the distance, the closer to zero the slope becomes, the greater will be the accumulated distance between the STC and the efficient redistribution line(Gardner, 1987). The STCs under alternative rice programs in Figure 2 are obtained by solving the equations showing consumer surplus of different rice programs for policy variables and substituting in PS equations to yield PS as a function of CTL(= CS + TL)

Redistribution efficiency(RE), which is defined as the value of total deadweight losses divided by changes in producer surplus or changes in consumer surplus, can also be used as a criterion for evaluting the efficiency of redistribution in public policies. The RE examines how efficiently producer(or consumer) gains are realized in relation to associated total deadweight losses. RE is useful in specifically examining the changes in producer surplus and consumer surplus. Since taxpayers and consumers do not necessarily coincide and marginal welfare cost in taxation is greater than the usually assumed value of unity, the RE method rather than the STC framework using combined CTL can sometimes provide meaningful policy implications(Kola, 1993).

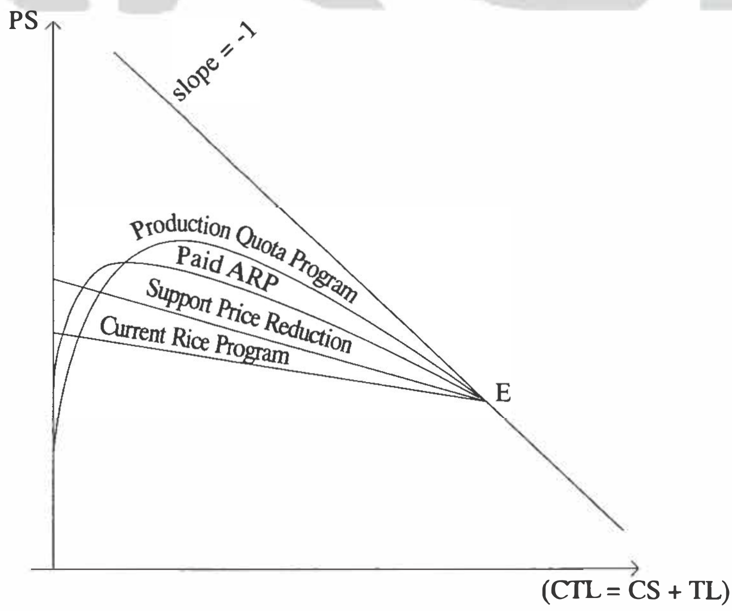
The values of the slopes of the STC curves and RE are derived by using the values of the changes in gains and losses presented in Table 5. The slopes of the STC curves and RE derived from the empirical analysis are shown in Table 6. The slope of the STC in the production quota program is -0.91, which is the closest to -1. This indicates that the production quota program is the most efficient of the alternative rice programs in terms of efficiency in redistribution because of the slowest decrease in PS along with equal increases in CTL. The slope of the STC in the paid acreage restriction program is -0.88 which is closer to -1 than -0.68, the value of the slope of the STC in the support price reduction program. It indicates that the paid acreage reduction program as a policy alternative is more favorable than the government support price program. The relative efficiency rankings decided in the RE framework is the same as those under the STC framework.

Table 6 shows that, when evaluating alternative rice programs with respect to efficiency in redistribution, the most favorable rice program is the production quota program, while the most unfavorable program is the current program. The values of the slopes of the STC and RE indicate that the relative efficiency rankings of the redistribution policy are consistent with the relative efficiency rankings when compared to alternative rice programs in terms of the values of total deadweight losses.

TABLE 6 The Measurment of Efficiency of Redistribution under Alternative Rice Programs

	Current Program	Support Price Reduction	Production Quota	Paid ARP
Slope of STC	- 0.66	- 0.68	- 0.91	- 0.88
RE (=TDWL/△PS)	- 0.51	- 0.48	- 0.10	- 0.19

FIGURE 2 Surplus Transformation Curves of Alternative Rice Programs



VI. Sensitivity Analysis

Since efficiency in redistribution resulting from alternative rice programs depends heavily on the demand and supply elasticities as well as the level of the support price reduction, a sensitivity analysis is needed to assess more meaningful policy implications. For simplicity, however, this paper does not consider such a sensitivity analysis with respect to the level of the support price reduction.

Table 7 shows the distributional consequences of alternative rice programs when the demand(supply) elasticity changes from -0.3 (0.3) to -0.7(0.7). As the supply elasticity becomes more elastic (changes from 0.3 to 0.5 and 0.7 while holding the demand elasticity constant at -0.3), the values of total social costs in alternative rice programs decrease, except in the case of maintenance of the current rice program, and the values of the slopes of the STC and RE as shown in Figure 7 indicate that the current rice program and support price reduction program become more efficient, while the production quota program become less efficient, in redistribution.

Furthermore, as the supply elasticity changes, the values of PS, CS, TL, and TDWL change at the absolute level. The relative efficiency rankings of alternative rice programs, however, do not change. The maintenance of the current rice program brings about the largest social costs and is the most inefficient rice program with regard to efficiency in redistribution while the production quota program results in the smallest social costs and is the most efficient program among alternative rice programs.

As the demand elasticity becomes more elastic(changes from -0.3 to -0.5 and -0.7 while holding the supply elasticity constant at 0.3), total social costs of the current rice program and support price reduction program increase while the total social costs of the paid acreage program decrease, and the production quota program does not show the consistent trend in changes in TDWL. Unlike the changes in the supply elasticity, as the demand for rice become more elastic, the relative efficiency ranking among alternative rice programs do change.

Low demand elasticity with high supply elasticity tends to make the production quota program and the paid acreage reduction program preferable alternatives, while high demand elasticity with

TABLE 7 Comparison of Simulated Different Rice Programs with the Demand(Supply) Elasticities Changing from -0.3(0.3) to -0.7(0.7)

(Unit : Billion Won)

Elasticity[1]	Policy Option[2]	△PS	△CS (-)[3]	△TL (-)	TDWL	Slope of STC(=△PS/△CS) (-)	RE (=TDWL/△PS) (-)
εs (εd)							
	1	4,695	3,686	3,425	2,416	0.66	0.51
0.3	2	3,174	2,566	2,133	1,524	0.68	0.48
(-0.3)	3	2,577	2,836	-	259	0.91	0.10
	4	2,978	2,566	825	413	0.88	0.19
	1	3,348	2,532	3,425	2,608	0.56	0.78
0.5	2	1,853	1,411	1,809	1,368	0.58	0.74
(-0.3)	3	1,604	1,682	-	79	0.95	0.05
	4	1,630	1,411	495	276	0.86	0.24
	1	2,601	1,894	3,425	2,718	0.49	1.04
0.7	2	1,130	774	1,486	1,129	0.50	1.00
(-0.3)	3	1,016	1,045	-	28	0.97	0.03
	4	1,046	774	354	81	0.93	0.12
εd (εs)							
	1	3,793	2,917	2,223	1,347	0.74	0.36
-0.5	2	2,273	1,779	1,182	668	0.77	0.30
(0.3)	3	1,781	2,057	-	276	0.87	0.15
	4	2,118	1,779	825	487	0.81	0.38
	1	3,205	2,412	1,709	916	0.78	0.29
-0.7	2	1,684	1,257	794	367	0.82	0.22
(0.3)	3	1,288	1,542	-	254	0.84	0.20
	4	1,560	1,257	825	522	0.75	0.71

Footnote 1): εs : Supply elasticity
εd : Demand elasticity
2) 1 : Current rice program
2 : Reduction of the government support price
3 : Production quota program
4 : Paid acreage reduction program
3) (-) implies that values are negative

low supply elasticity makes the production quota program and the support price reduction program preferable alternatives.

The assumption of inverse linear demand and supply curves explains why the values of total social costs increase only under the current rice program, and the relative efficiency rankings change with more elastic demand for and more elastic supply of rice. In general, since the supply curves of agricultural commodities are closer to exponential function forms, the specificication of linear supply curves of rice can lead to unexpected results.

VII. Concluding Comments

It is argued that policy variation over time and across commodities as well as the future direction of agricultural policies, can be better understood and predicted by closely evaluation efficiency in welfare redistribution. An analysis of the welfare effects of alternative rice programs provides important criteria not only for establishing the future direction of rice policy, but also for developing and alternative rice policy in Korea.

The purposes of this paper, therefore, are to measure the social costs of several rice programs as policy options suggested by previous studies, to analyze how these programs will affect producers, consumers, and taxpayers, and to evaluate which rice program will be more efficient in redistribution.

The analysis of the welfare effects of alternative rice programs indicates that the maintenance of the current rice program gives rise to the largest social costs from a societal standpoint. These results tell us why current debates on rice policy reform in Korea are timely and appropriate. If a policy of efficient redistribution is taken as a policy alternative, the production quota program would be a leading alternative, rice program because it shows the smallest social costs. Evaluating alternative rice programs by such criteria as the slope of the STC and RE indicates that the production quota program would be a more favorable rice program than the paid acreage restriction program.

Sensitivity analysis of the demand and supply elasticities helps to enhance the accuracy of policy implications of different rice programs. The values of total social costs decrease under alternative rice programs as the supply becomes more elastic, but not under the current rice program, and the values of the slopes of STCs and RE indicate that the current rice program and the support price reduction program become more efficient, while the production quota program becomes less efficient. Although the absolute values of PS, CS, TL, and TDWL change, the relative efficiency rankings among alternative rice programs do not. The maintenance of the current rice program still brings about the greatest social costs and the most inefficiency in redistribution, while the production quota program results in the smallest social costs and the most efficiency in redistribution among the alternative rice programs.

As demand becomes more elastic, total social costs of the current rice program and the support price reduction program increase while the costs of the paid acreage program decrease, and the production quota program does not show the consistent trend in the changes in TDWL. Unlike the changes in the supply elasticity, as the demand for rice becomes more elastic, the relative efficiency ranking among alternative rice programs does change.

A low demand elasticity with a high supply elasticity tend to make the production quota program and the paid acreage reduction program the preferable alternatives, while a high demand elasticity with a low supply elasticity make the production quota program and the support price reduction program the preferable alternatives.

REFERENCE

Becker, Gary s., "A Theory of Competition Among Pressure Groups for Political Influence," *Quarterly Journal of Economics*, 98 (1983) : 371 - 400.

Bullock, D. S., "Are Government Transfer Efficient? : Problems in Testing The Efficient Redistribution Hypothesis, " Paper. *American Journal of Agricultural Economics*, 1991.

Cramer, G. L. et. al., "Regulation in the U.S. Rice Industry, 1965 - 89," *American Journal of Agricultural Economics*, 72(1990): 1056 - 65.

de Gorte, H. and K. D. Meike, "Efficiency of Alternative Policies for the EC's Common Agricultural Policy," *American Journal of Agricultural Economics*, 72(1990): 131 - 37.

Kim, Myung Hwan, "Structure of the Rice Market and Proposals for Rice Policy Changes in Korea," *Journal of Rural Development*, Vol 16. No 1, Summer 1993.

Kola, Jukka, "Efficiency of Supply Control Programmed in Income Distribution," *European Review of Agricultrual Economics*, 1993 : 183 - 98.

Lopez, R. A., "Political Economy of U.S. Sugar Policies," *American Journal of Agricultrual Economics*. 71(1989): 20 - 31.

Gardner, Bruce L., "Efficient Redistribution through Commodity Markets," *American Journal of Agricultural Economics*, 65 (1983): 225 - 34.

______, *The Economics of Agricultrual Policies*, New York: Macmillian Publishing Company, 1987.

Guymard, H., "Agriculture in the Uruguay Round: Ambitions and Realities," *European Review of Agricultural Economics,* 1993 : 245-63.

Ministry of Agricultural, Forestry, and Fishery(MAFF) of Korea, *Data On Grain Policy*, 1993.

Korea Rural Economics Institute, "The Impacts of Agricultural Trade Liberalization on Agricultural and Livestock Commodities," 1993.

Oehmke, J.F. and X. Yao, "A Policy Preference Function for Government Intervention in the U.S. Wheat Market," *American Journal of Agricultural Economics*, 68: 528 - 42, 1986.

Rausser, G. C. and W. Foster. "Political Preference Functions and Public Policy Reform," *American Journal of Agricultural Economics*. 72 : 641 - 52. 1990.