EFFECTS OF FARM COMMODITY PROGRAMS: THE CASES OF CORN AND RICE*

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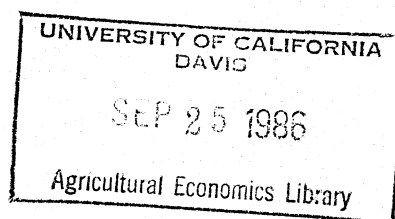
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Abstract

This study estimates price and income effects of the 1985 and 1984 corn and rice programs. On average, the corn programs cost U.S. consumers, taxpayers, and society more than their net gains to producers by $1.4 billion, while dead-weight loss of the rice programs totaled $220 million a year.

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Introduction

Government intervention in farm commodity markets has had a long history over the last five decades. Among program crops, corn traditionally had the largest program payments while rice had the highest payments on a per-acre basis ($200 an acre in the 1985 crop year) in recent years. Corn and rice have been a program crop since their inclusion in the Agricultural Adjustment Act of 1933 as one of the original seven basic commodities. Policies and programs implemented since the early 1930's, although altered over time, have all attempted to address the problems of low farm income, price instability, and periodic surplus stocks of the commodities.

The central economic consequences of Government intervention in supporting farm price and income and in controlling surplus production are to redistribute income from taxpayers and consumers to producers, and to have society bear the cost of stockpiling CCC-owned stocks. Despite this recognition, only a few earlier studies were done to measure price and income effects of farm commodity programs in terms of deadweight losses (Nerlove, Wallace). Deadweight losses are measured in terms of gains to producers, costs to consumers and taxpayers, and costs to the society for stockpiling CCC stocks. The earlier studies focused on tobacco and major grains, little attention was given to rice. In addition, the program have been significantly changed since the earlier studies were completed.

An interesting study was recently conducted by Gardner in an attempt to measure price and income effects of U.S. agricultural policies for many program commodities, including corn and rice. As a general

approach, he assumed that carryin and carryout stocks were to cancel out each other under "normal" market condition. Contrary to this approach, this analysis explicitly recognizes that we are into a stock-building phase of supply and demand conditions for many grains (including corn and rice) under normal weather and stable demand. More specifically, assumptions employed in this analysis differ importantly from those assumed by Gardner. For corn, these include: (1) this analysis assumes a -0.35 short-run price elasticity of total demand, compared to -0.7 assumed by Gardner, (2) only 51 percent of the 1984 corn crop and 65 percent of the 1985 crop are eligible for payments, compared to 75 percent assumed by Gardner for the 1985 corn crop. For rice, these include: (1) this analysis assumes a short-run supply elasticity of +0.15, compared to +0.4 assumed by Gardner, (2) program payments were reduced by $68 million in 1985/86 and $67 million in 1984/85 due to the $50,000 payment limit per person, instead of $50 million assumed by Gardner. In addition, other assumptions employed in this analysis are discussed in later sections. Finally, diversion and storage payments are counted as part of producer gains and CCC operating expenses are counted as societal cost in this study.

The purpose of this paper is to estimate price and income effects of the 1985 and 1984 corn and rice programs by explicitly recognizing that we are into a stock-building phase of grain supply and demand conditions under normal weather and stable demand. Corn and rice are chosen as show-case examples to demonstrate that costs to U.S. consumers, taxpayers, and society outweigh producer gains from two commodity programs.

History of 1982-85 Corn and Rice Programs

The Agriculture and Food Act of 1981 repealed rice allotments and marketing quotas and, like other grain programs, based deficiency payments on normal production from current planting. For both corn and rice, target prices were no longer adjusted by the formula based on the production costs, but according to the discretion of the Secretary of Agriculture, subject to minimum levels. The loan rate was to be adjusted by the same percentage as the target price, but could only be lowered to a minimum of $2.55 a bushel for corn and $8.00 per hundredweight for rice if stocks were excessive (USDA).

The acreage reduction program (ARP) was introduced as a more specific acreage control method than the earlier set-aside provision established by the Rice Production Act of 1975 and the Food and Agriculture Act of 1977. When in effect, an ARP required a portion of land to be diverted from a farm's base acreage and put into approved conservation in order to be eligible for loans and payments. In addition, a paid land diversion (PLD) program was made available at the Secretary's discretion.

Key program provisions for corn and rice during the 1982-85 crop years are given in table 1 as background for examining price and income effects of the 1985 and 1984 corn and rice programs in later sections.

Analytical Framework

This analysis measures deadweight losses of the 1985 and 1984 corn and rice programs primarily via the commodity supply and demand model, with and without the programs. There are elements besides producer

Table 1. Corn and rice program provisions, 1982-85 crops

| Provision	Unit	1982	1983	1984	1985
Corn					
Base acreage	mil. acres	81.2	81.2	81.4	81.5
Acreage reduction program	% of base	10	10	10	10
Paid land diversion	"	0	10	0	0
Partial PIK	"	0	10-30	0	0
Whole-base PIK	"	0	100	0	0
Loan rates	$/bu.	2.55	2.65	2.55	2.55
Target prices	"	2.70	2.86	3.03	3.03
Program yields	bu./ac.	95.5	100.0	101.3	102.5
Deficiency payment rate	$/bu.	.15	0	.43	.48
Diversion payment rate	"	0	1.50	0	0
Rice					
Base acreage	1,000 acres	3,969	4,010	4,163	4,208
Acreage reduction program	% of base	15	15	25	20
Paid land diversion	"	0	5	0	15
Partial PIK	"	0	10-30	0	0
Whole-base PIK	"	0	100	0	0
Loan rates	$/cwt	8.14	8.14	8.00	8.0
Target prices	"	10.85	11.40	11.90	11.9
Program yields	cwt/ac.	48.2	48.7	49.0	50.3
Deficiency payment rate	$/cwt	2.71	2.77	3.76	3.9
Diversion payment rate	"	NA	2.41	NA	3.5

NA = Not applicable.

surplus, however, that enter the computation of net producer gains: (1) diversion and storage payments as a gain, and (2) rental value of land set-aside as a cost. Similarly, diversion and storage payments in addition to deficiency payments are treated as a cost to taxpayers.

The analytical framework of this analysis differs from Gardner's approach in that instead of assuming carryin and carryout stocks will cancel out each other under "normal" market conditions, this analysis explicitly recognizes that we are into a stock-building phase of grain supply and demand conditions under normal weather and stable demand. Accordingly, this analysis takes into account beginning stocks and imports, as well as production, as components of U.S. corn and rice supplies (rough equivalent). Similarly, ending stocks, farmer-owned reserve (FOR) stocks (for corn only), and CCC stocks were added to domestic and exports demand to clear the market. Thus, in this framework the market is cleared at a price level where supply equals to the sum of domestic use, exports, ending free stocks, FOR stocks, and CCC stocks. Short-run effects of corn and rice programs were estimated for the 1985 and 1984 crop years separately and averaged for a "normal" market condition.

Figure 1 illustrates how the rice supply-demand model was developed for the 1985/86 marketing year. On the supply side, rice farmers who signed up for the 1985 rice program could expect an effective planning price of $12.15 per hundredweight since farmers received $8.25 per hundredweight in 1984/85 and a $3.90 deficiency payment per hundredweight could be expected. Rice farmers who chose not to sign up for the program could possibly expect a $8.25 market price, but no deficiency payments. Based on program participation statistics from ASCS, it is estimated that

Figure 1. U. S. Rice Supply, Demand and Prices for 1985/86
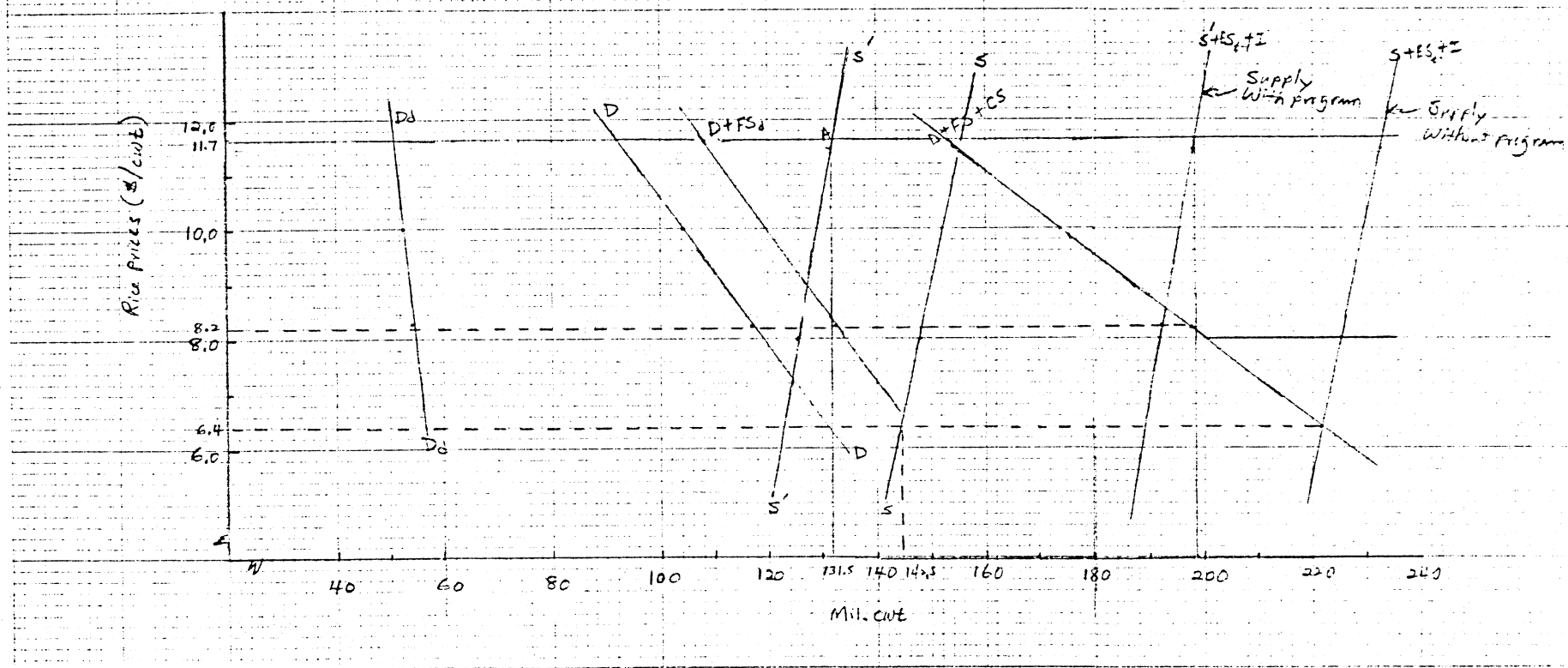
88 percent of the 1985 rice production was eligible for deficiency payments while the remaining 12 percent was not. Thus, a weighted average "planning price" (including deficiency payments) of $11.70 per hundredweight was expected by all rice farmers. This "price", together with the 131.5 million hundredweight rice production in 1985, provides a point on supply curve S'S'. Assuming a short-run supply elasticity of + 0.15 based on a recent study by Grant, et.al., compared to + 0.4 assumed by Gardner, the supply curve S'S' was derived (figure 1).

Similarly, USDA is projecting a $8.25 mid-point average farm price per hundredweight, and 54 and 57 million hundredweight of domestic use and exports, respectively. These statistics form the basis of entering a starting point on domestic demand ($D_d D_d$) curve and total demand (DD) curve. Assuming a - 0.20 and a - 0.75 short-run domestic and exports demand price elasticity, respectively, domestic and exports demand curves were derived (Grant, et.al.).

In the absence of the rice program, supply curve S'S' would be shifted to the right due to the elimination of production control. Assuming a 50-percent slippage of the acreage reduction and paid diversion programs, a supply curve (SS) in the absence of the program was derived as a parallel shift to supply curve S'S'. Adding beginning stocks (ES_{t-1}) of 64.7 million hundredweight and imports (I_t) of 2.0 million hundredweight to both S'S' and SS supply curves, total supply curves, $S' + ES_{t-1} + I_t$ and $S + ES_{t-1} + I_t$, were derived as shown in figure 1. Similarly, assuming a - 0.1 short-run free stocks price elasticity, a total demand plus free stocks (D + FS) curve was derived (Grant, et.al.). The total demand plus total ending stocks (free stocks and CCC stocks) was derived by assuming a - 0.80 short-run CCC stocks

price elasticity for prices above the loan rate and perfectly elastic at the $8.00 loan rate in the presence of the programs, and was shown as D + FS + CS in figure 1 (Grant, et.al.).

The rice market estimated by this supply-demand model is cleared at a price of $8.20 per hundredweight when total supply of 198 million hundredweight intercepts with the total demand plus ending stocks (D + FS + CS) at that price level. Thus, the model yields a rice price forecast which happens to be near the midpoint of USDA's current projection ($7.75 - $8.75 per cwt), adding confidence to the estimates of program effects. In the absence of the program, the total demand plus ending stocks curve (D + FS + CS) would likely continue to slope downward without price protection of the loan rate. Under this scenario, the U.S. rice market is expected to reach an equilibrium price of $6.40 per hundredweight at a total supply of just over 220 million hundredweight.

The supply-demand model for corn follows the same patterns as the one for rice. The "other" assumptions include: (1) a -0.30 short-run domestic demand price elasticity, (2) a -0.50 short-run exports demand price elasticity, (3) -0.03 short-run free stocks price elasticity, (4) -1.45 short-run FOR stocks price elasticity, (5) a -0.80 short-run CCC stocks price elasticity for prices above loan rates and perfectly elastic at loan rates in the presence of the programs, (6) a -0.80 short-run CCC stocks price elasticity irregard of prices being above or below loan rates in the absence of the programs, and (7) program payments were reduced by $270 million in 1985/86 due to the $50,000 payment limit per person. The model for U.S. corn supply and demand is not presented here due to space limitation, but it follows the same procedures as for rice.

Short-Run Price and Income Effects

This section estimates short-run price and income effects of the 1985 and 1984 corn and rice programs in terms of producer and consumer surpluses, other gains and losses to producers, costs to taxpayers, and costs to the society for stockpiling CCC stocks. The short-run effects were then averaged and compared to the estimates in the Gardner study which focuses on the 1985/86 marketing year.

Rice Programs

Net producer gains were estimated by including producer surplus, diversion payments and rental value of land set-aside as an opportunity cost of participating in the program. For example, producer surplus for 1985/86 rice ($0.73 billion) was estimated by multiplying the difference between the prices received by farmers (i.e., $11.7 - $6.4) with and without the program by the average production (137 million hundredweight) under the two scenarios, according to Gardner (table 2). Given the 92-percent program participation rate and 15 percent paid land diversion requirement, about 580 thousand acres were diverted from production under the PLD program. This together with the $3.50 diversion payment rate per hundredweight and 50.3 hundredweight program yield per acre results in diversion payments of about $102 million. Rental value of land set aside under the ARP and PLD programs was estimated to total $70 million, based on the assumption that 20 percent of the rice crop is distributed to land owners for their contribution of land input under the share-rent arrangement. Arithmetically, this was computed as follows: 131.5 million cwt x 88% x 0.35 x $1.70/cwt, where 131.5 mil. cwts is the rice production, 88% refers to the proportion of production eligible for payments, 0.35 refers

Table 2. Price and Income Effects of the 1984 and 1985 Corn and Rice Programs

CORN

Program Effects	Gardner Study	This study		
		1984/85	1985/86	Average
	--------- Billion dollars -------			
U.S. corn producers				
Producers surplus	+4.35	+1.96	+3.58	+2.77
Rental value of land setaside	-0.68	-0.51	-0.58	-0.55
FOR storage payments	N.A.	+0.13	+0.15	+0.14
Net producer gains	+3.7	+1.58	+3.15	2.36
U.S. Corn Consumers				
Consumer surplus	-1.5	-0.59	-0.54	-0.57
U.S. Taxpayer				
Deficiency payments	-2.9	-1.68	-2.45	-2.07
FOR storage payments	N.A	-0.13	-0.15	-0.14
Total	-2.9	-1.81	-2.60	-2.21
CCC loss on stocks disposal or CCC operating express (excluding payments)	-1.2	-0.33	-1.69	-1.01
NET DOMESTIC EFFECTS	-1.9	-1.15	-1.68	-1.43

RICE

Program Effects	Gardner study	This study		
		1984/85	1985/86	Average
	--------------Billion dollars-----------------			
U.S. rice producers				
Producer surplus	N.A.	+0.46	+0.73	+0.60
Rental value of land set aside	N.A.	-0.05	-0.07	-0.06
Diversion payments	N.A.	--	+0.10	+0.05
Net producer gains	+0.5	+0.41	+0.76	+0.59
U.S. consumers				
Consumer surplus	-0.1	-0.05	-0.10	-0.08
U.S. taxpayers				
Deficiency payments	-0.5	-0.38	-0.38	-0.38
Diversion payments	-0.07	--	-0.10	-0.05
Disaster payments	--	--	--	--
Total	-0.6	-0.38	-0.48	-0.43
CCC loss on stocks disposal or CCC operating expenses (excluding payments)	N.A.	-0.32	-0.28	-0.30
NET DOMESTIC EFFECTS	-0.1	-0.34	-0.10	-0.22

N.A. = Not available.
-- = Not applicable.

to the set-aside requirement, and $1.70 refers to the worth of 20-percent rice crop distributed to land owners per hundredweight. Thus, net producer gains totaled $0.76 billion by subtracting $70 million rental value of land set-aside from the sum of producer surplus and diversion payments ($0.73 billion + $0.10 billion).

Loss of consumer surplus to domestic consumers totaled about $100 million as a result of implementing the 1985 rice program. This was estimated by multiplying the difference between the two market clearing prices (i.e., $8.20 - $6.40) with and without the program by the average domestic demand under the two scenarios (55.5 million hundredweight). Loss of consumer surplus to foreign consumers was not accounted for in this analysis.

The rice program cost U.S. taxpayers about $480 million--$380 million in deficiency payments and $100 million in diversion payments. The deficiency payments were computed by multiplying the deficiency payment rate by the volume of rice production eligible for payments, minus the $68 million affected by $50,000 per person payment limit. Diversion payments were discussed earlier.

Stockpiling CCC stocks increased net loan expenses and costs of storing rice in commercial warehouses. In 1985/86, ASCS estimates the former to cost $220 million and the latter $60 million. Altogether, CCC operating expenses is estimated to cost society about $0.28 billion.

On average, the 1984 and 1985 rice programs resulted in (1) $0.6 billion net producer gains, (2) $0.1 billion loss of consumer surplus to

U.S. consumers, (3) $0.4 billion costs to U.S. taxpayers, and (4) $0.30 billion costs to society for stockpiling CCC stocks. Deadweight loss totaled $220 million a year.

Corn Programs

Price and income effects of the corn programs were obtained by following the same procedures as for rice. The 1984 and 1985 corn programs, on average, resulted in (1) $2.4 billion net producer gains, (2) $0.6 billion loss of consumer surplus, (3) $2.2 billion costs to taxpayers, and (4) $1.0 billion costs to society for stockpiling CCC stocks. Net domestic effects of the programs amounted to $1.4 billion, which is $0.5 billion lower than Gardner's estimates. The $1.4 billion deadweight loss means that the 1984 and 1985 corn programs, on average, cost U.S. consumers, taxpayers, and society more than their net gains to producers by $1.4 billion.

Athough the total deadweight loss does not greatly differ between the two studies, there are important differences in individual effects. Foremost of all, net producers gains are estimated at $2.4 billion in this study, compared to $3.7 billion estimated by Gardner. Loss of consumer surplus for U.S. consumers and costs to U.S. taxpayers are lower in this study than Gardner's study.

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