CHAPTER SEVEN

United States Agricultural Policy

7.1 US Stabilization: Policies and Direct Farm Subsidies

Agricultural commodity and conservation legislation in the United States has its roots in the Agricultural Adjustment Act of 1933. Since that time, the United States has passed more than a dozen farm bills spaced five to seven years apart. This chapter presents the key components of several of the farm bills and analyses some major US crops (e.g., corn, wheat, barley, cotton, oilseeds, and rice) along with the US dairy and sugar programs. In an earlier edition (Schmitz, Furtan, and Baylis 2002), a detailed discussion was presented on peanuts and tobacco programs, which have changed dramatically through quota buyouts (discussed briefly in this chapter).

Agricultural difficulties in the late 1920s led to a dramatic reorientation of agricultural policies in the United States that focused on directly supporting agricultural prices. Previous agricultural policies focused on the developmental aspects of the farm sector, including land settlement. Important agricultural legislation before 1920 included the Homestead Act (1862), the Morrill Act (1862), the Hatch Act (1887), and the Smith-Lever Act (1914), which augmented the human capital resources in agriculture and the rural economy (Benedict 1953).

7.2 US Aggregate Farm Bill Expenditures

US farm programs have generated considerable controversy partly due to the public's perception that too much taxpayer money is spent on agricultural commodity programs. The agricultural commodity programs and agricultural subsidy titles accounted for only 5.6 per cent of the actual 2018 USDA budget expenditures (11,983/213,087) and were budgeted for 12.1 per cent of the 2019 expenditures (28,644/234,840) (Table 7.1). In contrast to expenditures on agricultural commodity expenditures on nutrition programs decreased from US$108.3 billion in 2017 to US$103.4 billion in 2019. Economic growth measured by a reduction in the unemployment rate which fell from 4.7 percent in January of 2017 to 4.0 percent in January of 2019 undoubtedly contributed to the decline in expenditures on nutritional programs

Table 7.1. USDA agricultural budget, 2017–2020 (US$ million)

	Actual		Estimate	Budget
	2017	2018	2019	2020
Farm Production and Conservation	48,586	45,355	65,383	58,081
Farm Service Agency	35,219	29,819	46,796	40,128
Risk Management Agency	8,847	10,333	13,476	12,726
Natural Resources and Conservation Service	4,520	5,202	5,110	4,960
Farm Production and Conservation Business Center		1	1	267
Trade and Foreign Agricultural Affairs	4,032	4,032	7,957	6,098
Rural Development	40,604	41,327	43,902	38,710
Food, Nutrition, and Consumer Services	108,323	105,126	103,421	99,168
Food Safety	1,279	1,071	1,071	1,059
Natural Resources and Environment	6,076	7,290	6,324	7,570
Marketing and Regulatory Programs	2,621	2,862	3,037	2,130
Research, Education, and Economics	3,088	3,231	3,323	3,094
Departmental Activities	426	2,793	422	723

Total USDA Spending	215,035	213,087	234,840	216,633
Farm Services Agency	35,219	29,819	46,796	40,128
Farm Loan and Grant Programs	8,003	8,006	8,048	7,674
Conservation Programs	1,886	1,955	2,089	2,106
Commodity Programs	17,830	11,983	28,644	22,570
Commodity Credit Corporation Export Programs	5,936	5,926	6,466	6,467
Salaries and Expenses	1,516	1,520	1,520	1,307
Other Programs	48	429	29	4

Source: USDA (2019).

USDA Food Assistance Programs

About one in five Americans participate in at least one of USDA's fifteen food assistance programs at some point during the year, and federal outlays for these programs account for over one-half of the USDA total budget. The Economic Research Service of USDA (USDA/ERS) studies and evaluates many aspects of these programs, including their outcomes and effects on vulnerable populations, their operations and integrity, their role in food security, and their relationship with the general economy (USDA/ERS 2008).

7.3 A History of the Agricultural Policy in the United States

There are many excellent treatises on the history of US agricultural policy. The early farm programs are discussed in detail in volumes including Cochrane and Ryan (1976), Tweeten (1970), Gardner (1981), and Knutson, Penn, and Flinchbaugh (1998). In addition, Schmitz et al. (2010) provide a benefit-cost analysis of several US farm programs up through 2008. In what follows is a very short discussion of the historical aspect of the US farm program.

There have been many farm programs implemented in the United States (Table 7.2). These include the Agricultural Marketing Act of 1929, the Agricultural Act of 1949, the Food and Agriculture Act of 1977, the Farm Security and Rural Investment Act of 2002, and the Agricultural Improvement Act of 2018. From an historical perspective, the election of Franklin Roosevelt in 1932 led to more direct policy involvement in the farm sector. The first task of the Franklin Roosevelt Administration was to end the Federal Farm Board by transferring the Board's lending to cooperatives to the newly created Farm Credit Administration (Benedict 1953: 280). Roosevelt's New Deal also would involve direct benefits to farmers.

Table 7.2 US agricultural policies, 1929–2018

Year	Title	Overview
1929	Agricultural Marketing Act	Created Federal Farm Board to lend to cooperatives to stabilize prices through orderly marketing
1933	Agricultural Adjustment Act of 1933	Introduced the concept of parity; moved to "federalize" the cooperative stocks introduced by the Federal Farm Board for cotton, and introduced direct lending titles
1938	Agricultural Adjustment Act of 1938	Formalized the acreage allotments and parity, and introduced the concept of a non-recourse loan (Section 302(h))
1948	Agricultural Act of 1948	Provided a sliding parity level for price support
1949	Agricultural Act of 1949	Formed basis for most of the permanent agricultural legislation
1954	Agricultural Act of 1954	Added trade specifications; allowed disposal of dairy surpluses
1956	Agricultural Act of 1956	Created Soil Bank, which removed agricultural land from production
1965	Food and Agricultural Act	Included voluntary acreage diversion programs for feed grains

Year	Title	Overview
1970	Agricultural Act of 1970	Set the maximum payment to any individual at US$55,000; broadened the acreage diversion to the set-aside program
1973	Agricultural and Consumer Protection Act	Lowered maximum payment to US$20,000, and introduced target prices and deficiency payments
1977	Food and Agriculture Act	Established the Farmer Owned Reserve; continued flexible production controls
1981	Agriculture and Food Act	Set specific target prices for the 4-year life of the bill
1985	Food Security Act	Implemented loan deficiency payments
1990	Food, Agriculture, Conservation, and Trade Act	Continued to set the loan rate at 85 per cent of the Olympic average price with a floor specified by the law
1996	Federal Agricultural Improvement and Reform Act	Replaced deficiency payments with production flexibility contracts; decoupled these payments from production
2002	Farm Security and Rural Investment Act	Introduced direct payments and transformed the production flexibility contracts into countercyclical payments.
2008	Food, Conservation, and Energy Act	Continued the payments in the 2002 act with minor changes
2014	Agricultural Act of 2014	Allowed producers to choose between agricultural risk coverage and price loss coverage
2018	Agricultural Improvement Act of 2018	Expanded programs for trade and energy

Agricultural Marketing Act – June 6, 1929

Section 1(a). That it is hereby declared to be the policy of Congress to promote the effective merchandising of agricultural commodities in interstate and foreign commerce, so that the industry of agriculture will be placed on a basis of economic equality with other industries, and to that end to protect, control, and stabilize the currents of interstate and foreign commerce in the marketing of agricultural commodities and their food products

1) By minimizing speculation.
2) By preventing inefficient and wasteful methods of distribution.
3) By encouraging the organization of producers into efficient associations or corporations under their own control for greater unity of effort in marketing and by promoting the establishment and financing of a farm marketing system of producer-owned and producer-controlled cooperative associations and other agencies.
4) By aiding in preventing and controlling surpluses in any agricultural commodity, through orderly production and distribution to maintain advantageous domestic markets and prevent such surpluses from causing undue and excessive fluctuations or depressions in prices for the commodity.

Agricultural Adjustment Act of 1938

Section 302(h). No producer shall be personally liable for any deficiency arising from the sale of the collateral securing any loan [the corn, wheat, or cotton supporting the loan] under this section unless such a loan was obtained through fraudulent representation.

Section 322(a). Whenever in any calendar year the Secretary determines from available statistics of the Department, including the Crop and Livestock Estimates of the Bureau of Agricultural Economics of the Department that the total supply of corn as of October 1 will exceed the normal supply thereof by more than 10 per centum, marketing quotas shall be in effect in the commercial corn-producing area for the crop of corn grown in such area in such calendar year, and shall remain in effect until terminated in accordance with the provision of this title.

Section 332(b). The Secretary shall determine, on the basis of the estimated average yield of corn in such area for such crop, the acreage in such area which the Secretary determines would make available for the marketing year beginning October 1 a supply of corn (together with the estimated production of corn in the United States outside such area) equal to the normal supply. The percentage which the number of acres so determined is of the total number of acres of the acreage allotment under section 328 shall be proclaimed by the secretary.

- **The Agricultural Adjustment Act of 1933** provided for direct payments to farmers in return for reduced plantings. Also, the Secretary of Agriculture was given the power "[T]o provide for a reduction in the acreage or reduction in the production for market, or both, of any basic agricultural commodity, through agreements with producers or by other voluntary methods, and to provide rental or benefit payments in connection therewith or upon that part of the production of any basic agricultural commodity required for domestic production, in such amounts as the Secretary deems fair and reasonable, to be paid out of any moneys available for such payments… (Agricultural Adjustment Act of 1933, Part 2)."
- As described by Benedict (1953: 307), the wheat program involved signing a contract to reduce the amount of wheat planted by 54 per cent for payments of 30 cents per bushel produced. In addition, the 1933 Act provided for government storage of excess commodities. The Agricultural Adjustment Act of 1933 represented a dramatic departure from the Agricultural Marketing Act of 1929.
- **The Agricultural Adjustment Act of 1938** included soil conservation payments. It also included non-recourse loans. The loan program specified a market price where farmers were given a payment if, at harvest time, the market price was less than the declared loan price. If the market price for the crop exceeded the loan price plus the interest accrued at any time during the marketing year, the farmer could reclaim the loan and sell the crop. However, if the market price never exceeded the loan rate plus accrued interest, the farmer would simply forfeit the output to the government. Given these operations, the loan rate provided a price floor for major commodities (e.g., corn, cotton and wheat). The Commodity Credit Corporation (CCC) was the government entity charged with the loan rate and often accumulated stocks of excess commodities under the terms of 1938 Act.
- **The Agricultural Act of 1948** was intended to support prices received by producers of cotton, wheat, corn, tobacco, rice, and peanuts marketed before June 30, 1950. The 1948 Act also provided for changes in the structure of the support levels in the Agricultural Adjustment Act of 1938.
- **The Agricultural Act of 1949** together with certain provisions of the Agricultural Adjustment Act of 1938 formed the basis of permanent agricultural legislation. The payments and provisions for the Agricultural Improvement Act of 2018 are the marketing years 2019 through 2023. If, for example, the 2018 Act had expired without being replaced by a similar public law, agricultural program payments and provisions would have reverted to the permanent legislation under the Agricultural Adjustment Act of 1938 and the Agricultural Act of 1949. This revision would have required the imposition of acreage allotments following the 1938 Act coupled with much higher price supports linked the historical parity. Table 7.3 gives estimated price supports under permanent legislation.

Table 7.3. Support prices under permanent legislation (US$)

Commodity	Description of Payment	Parity Price	Minimum Support	Farm Price (July 2018)	2018 Farm Bill
Milk (cwt)	Purchase milk and butterfat products at 75–90% parity	52.10	75% parity = 39.08	15.40	Margin-based
Wheat (bu)	Nonrecourse loans and direct purchases. Acreage allotments. Loan rate at 75–90% parity	17.60	75% parity = 13.20	5.00	5.50
Upland Cotton (lb)	Nonrecourse loans and direct purchases. Acreage allotments. Loan rate at 65–90% parity.	2.00	65% parity = 1.30	0.741	
Rice (cwt)	Permanent authority repealed by 1981 farm bill but restored by 1996 farm bill. Loan rate at 50–90% parity.	40.00	50% parity = 20.00	13.70	14.00
Corn (bu)	Nonrecourse loans and direct purchases. Acreage allotments not authorized. Loan rate at 50–90% parity	13.20	50% parity = 6.50	3.47	3.70
Sorghum (bu)	Support for sorghum, barley, oats, and rye based on feeding value with respect to corn	22.40	50% parity = 11.20	6.79	3.95
Barley (bu)		14.90	50% parity = 7.45	4.52	4.95
Oats (bu)		8.59	50% parity = 4.30	2.61	2.40
Rye (bu)		18.50	50% parity = 9.25	4.50	
Honey (lb)	Purchase honey at 60–90% parity	5.15	60% parity = 3.09	2.06	

- **The Agricultural Act of 1956** created the Soil Bank (Title I) to reduce the production of basic crops, maintain farm income, and conserve soil (Helms 1985). The program had two components: The Acreage Reserve Program (ARP) which was intended to reduce the supply of wheat, corn, cotton, tobacco, rice and peanuts in the short run, and the Conservation Reserve Program (CRP) which attempted a permanent shift from farmland to pastor, range, forest, or wildlife uses.
- **The Food and Agriculture Act of 1965** introduced the concept of acreage reductions (e.g., normal crop acres not planted) in place of acreage allotments. The basic concept was to decrease the supply of feed grains to increase the price received by farmers by diverting cropland into conservation including summer fallow.
- **The Agricultural and Consumer Protection Act of 1973** created a new payment system referred to as Deficiency payments based on Target Prices. The Deficiency payment was the difference between the Target Price and either the five-month average market price (after harvest) for the supported crop or the loan rate (whichever was higher) times the historic program yield on the farmer's allotted acres. The Target Price for wheat in the 1973 Act was US$2.05/bu while the Target Price for corn was set at US$1.38/bu. The loan rate for wheat under the 1973 Act was US$1.37/bu, while the loan rate for corn was US$1.10/bu. The introduction of Deficiency payments introduced a two-part program. At one level the loan rate which provided a basic price floor was retained. However, the target price represented an income support payment that was somewhat less tied to current production decisions. In the vernacular of economics, the effect of the loan

rate was coupled to production decisions while the Deficiency payments were more decoupled.

- **The Federal Agriculture Improvement and Reform Act of 1996** represented a significant move toward a more market-oriented agriculture. The Act transformed the Deficiency payments introduced in the 1973 Act into a series of fixed Production Flexibility Contract (PFC) payments which declined slightly over time.
- **The Farm Security and Rural Investment Act of 2002** represented a move away from the market-oriented reforms in the 1996 Act. The 2002 Act included direct payments on harvested crops. For example, the direct payment for wheat was US$0.52/bu and for corn was 0.28/bu. The PFC payments were replaced with Counter-Cyclical Payments (CCPs). The CCP paid 85 per cent of the reference price less the market year average price or the loan rate (which ever was greater) times the base acres times the base yield.
- In the **Agricultural Improvement Act of 2018**, the most long-lasting provision of agricultural policy is the commodity loan rate which has been used since the 1938 Act to set a price floor for most agricultural commodities. Historically, participation in the loan program required that farmers participate in other provisions of commodity policy.
- Under the 2002 Act, farmers were paid 85 per cent of the price difference on historical yields on base acres. As such, the farmer cannot increase the CCP payment by choice of inputs or outputs. This mechanism continues in the Price Loss Coverage (PLC) in the **Agricultural Act of 2014** and the **Agricultural Improvement Act of 2018**. The unique program introduced in the latest round of agricultural policy reform is the Agricultural Risk Coverage.

7.4 The Food, Conservation, and Energy Act of 2014

The latest formulation of agricultural policy was largely established by the Food, Conservation, and Energy (FCE) Act of 2014 with some minor modifications in the Agricultural Act of 2014. The largest change in the FCE Act of 2014 is that it gives farmers a choice of payment mechanisms. The traditional mechanism is referred to as Price Loss Coverage (PLC) which provides payments to farmers based on market prices. The alternative payment mechanism is the Agricultural Risk Coverage (ARC) program, which makes payments based on farmer's total revenue (i.e., price times yield). In the FCE Act of 2014, farmers were required to make a one-time election between the two alternatives on or between November 17, 2014 and April 7, 2015.

The 2014 Act can be seen as the heir of historical agricultural programs. First, the PLC makes payments based on "base acres and yields" for program crops. In this case, each farm's base acres could be determined by (1) historical base program acres and yields, or (2) proven commodity acres and/or yields based on recent plantings. If the market year price is less than the reference price, the PLC payment is then defined as 85 per cent of the difference between the lessor of either the reference price (Table 7.4) minus the market year average or the reference price minus the loan rate for each commodity, times base acres, times base yield. For example, suppose that a farmer in Oklahoma historically planted 320 acres of wheat with a proven program yield of 40 bushels per acre. If the market year average price for 2016 was US$5.00/bu, because (reference price – market year average price) < (reference price – 2014 wheat loan rate), the PLC payment would be 0.85 x (5.50 – 5.00) x (320 x 40) = US$5,440.00. If instead of US$5.00/bu, the market year average wheat price had been US$2.50, the PLC payment would have been 0.85 x (5.50 – 2.94) x (320 x 40) = US$27,852.80, because (reference price – 2014

wheat loan rate) < (reference price – market year average price). Payment is decoupled from production decisions.

Table 7.4. Program prices under 2014 and 2018 US agricultural programs

	Loan Rate		Reference
Crop	2014	2018	Price
Wheat (US$/bu.)	2.94	3.38	5.50
Corn (US$/bu.)	1.95	2.20	3.70
Grain Sorghum (US$/bu.)	1.95	2.20	3.95
Barley (US$/bu.)	1.95	2.50	4.95
Oats (US$/bu.)	1.39	2.00	2.40
Long Grain Rice (US$/cwt)	6.50	7.00	14.00
Medium Grain Rice (US$/cwt)	6.50	7.00	14.00
Soybeans (US$/bu.)	5.00	6.20	8.40
Peanuts (US$/ton)	355.00	355.00	535.00

Source: Reference Price 7 USC Subsection 9011(18).

The Agricultural Risk Coverage alternative is based on the comparison between observed revenue and a target revenue. Consider the historical soybean price and yield data for Tippecanoe County, Indiana (Table 7.5). To determine the ARC payment amount for 2018, it is necessary to calculate the ARC target revenue, the ARC coverage rate, and the observed revenue. The ARC target revenue per acre is calculated by multiplying the baseline yield/acre by the Olympic average price/bushel (or other weight measurement quantity). The ARC coverage rate will cover 86 per cent of the target revenue. The observed revenue is the actual revenue received per acre of a given year. To calculate the ARC, we first assume that the farmer updated his baseline yield in 2014 (before the FCE Act of 2014 took effect) at 50.61 bushels per acre. Next, we construct the Olympic average price for 2018, which is defined as the average price for the period 2013 through 2017, with the high and low prices dropped:(10.20 + 9.69 + 9.61)/3 = US$9.83/bu. Therefore, the 2018 ARC target revenue is ($497.50/acre = 50.61 bu/acre x $9.83/bu.). The 2018 ARC revenue coverage rate is 86 per cent of the target revenue =($427.85/acre = 0.86 x $497.5/acre). For this example, assume that the market year price for soybeans in 2018 is US$9.07/bu and the observed yield per acre in Tippecanoe County is 46.0 bu. As such, the observed revenue would be US$417.22/acre. The ARC payment will be the lessor of either the ARC revenue coverage minus the observed revenue (i.e. the revenue loss) or 10 per cent of the ARC target revenue, whichever is smaller. For this example, the (ARC revenue coverage – observed revenue) = ($427.85/acre – $417.22/acre) = ($10.63/acre). 10 per cent of the target revenue = (0.10 x $497.50/acre) = ($49.75). In this case, the ARC payment will be $10.63/acre, the smaller of the two values.

Alternatively, assume that the market price for soybeans in Tippecanoe County fell to US$8.00/bu, instead of the previous $9.07/bu, with yield remaining at 46.0 bu/acre. The ARC target revenue and ARC revenue coverage remain the same from the original calculation, but the observed revenue would fall to $368.00/acre. The difference between ARC revenue coverage ($427.85) and the observed revenue changes to $59.85/acre. However, unlike the previous example, in this case 10 percent of the target revenue ($49.75) is less than the difference between ARC revenue coverage and the observed revenue. As such, the ARC payment is limited to the

lesser value of $49.75/acre. Therefore, at any market price and production yield, the maximum attainable ARC payment will be 10 per cent of the target revenue.

Table 7.5. Historical Soybean Price and Yield Data for Tippecanoe County, Indiana, 2000-2017

Year	Price (US$/bu.)	Yield (bu./acre)	Year	Price (US$/bu.)	Yield (bu./acre)
2000	4.61	46.4	2009	9.80	51.5
2001	4.42	49.3	2010	11.50	53.8
2002	5.55	51.7	2011	12.70	49.5
2003	7.67	36.1	2012	14.70	40.5
2004	5.66	52.4	2013	13.20	55.8
2005	5.78	53.0	2014	10.20	61.9
2006	6.53	54.5	2015	9.16	50.1
2007	10.20	49.2	2016	9.69	61.1
2008	10.20	53.5	2017	9.61	56.1
Mean	8.95	51.47			

The ARC program is implemented at two levels. Farmers have two choices: (1) collect ARC payments based on individual yields (ARC-IC), or (2) collect ARC payments based on county level yields and prices (ARC-CO).

The discussion of PLC and ARC is from an *ex post* perspective (i.e., the amount of each payment paid to the farmer after the price/quantity outcome is known). However, the policy impact of each program is *ex ante* (i.e., before the price/quantity outcome becomes known). From this perspective, PLC is a free price insurance policy, while ARC is a free revenue insurance policy. The *ex ante* dimension is an important consideration when producers choose between the two policy alternatives. Table 7.6 presents an *ex ante* distribution for soybean prices and production in Tippecanoe County, Indiana based on historical distribution from Table 7.5. Given that the market price is US$2.864/bu, the PLC pays US$2.20/bu (or the US$8.40/bu reference price for soybeans less the US$6.20/bu loan rate). We assume that the PLC pays on 85 per cent of the base yield (i.e., 0.85 x 51.47 = 43.75), yielding a PLC payment per base acre of US$96.25/acre. When the soybean price increases to US$7.428/bu, the PLC payment decreases to US$42.52/acre. That is, the PLC payment per bushel falls to US$0.972/bu if the soybean market year average price increases to $7.428/bu. (e.g., US$8.40/bu – US$7.428/bu). When the market year price increases above US$8.20/bu, the PLC payment becomes zero. We can compute the expected value of the PLC program given data in Table 7.5:

$$E[PLC] = \sum_{i=1}^{5} \sum_{j=1}^{5} Prob_{ij} PLC_{ij} = 24.563 \quad (1)$$

where $Prob_{ij}$ is the probability for price i and quantity produced j and PLC_{ij} is the Price Loss Coverage payment for the same combination of prices and quantities produced.

Table 7.6. *Ex ante* distribution of soybean production and prices for Tippecanoe County, Indiana

			Per Acre Amounts		
Price ($US)	Yield (bu./acre)	Probability	PLC Payment ($US/acre)	Revenue ($US/acre)	ARC Payment ($US/acre)
2.864	38.993	0.00127	96.25	111.68	49.75
2.864	48.351	0.04267	96.25	138.48	49.75
2.864	51.470	0.01198	96.25	147.41	49.75

2.864	54.589	0.02794	96.25	156.34	49.75
2.864	63.947	0.00379	96.25	183.14	49.75
7.428	38.993	0.07787	42.52	289.64	49.75
7.428	48.351	0.08404	42.52	359.15	49.75
7.428	51.470	0.06189	42.52	382.32	45.53
7.428	54.589	0.09049	42.52	405.49	22.36
7.428	63.947	0.06494	42.52	475.00	0.00
8.950	38.993	0.01189	0.00	348.99	49.75
8.950	48.351	0.04942	0.00	432.74	0.00
8.950	51.470	0.05265	0.00	460.66	0.00
8.950	54.589	0.04425	0.00	488.57	0.00
8.950	63.947	0.01711	0.00	572.33	0.00
10.472	38.993	0.00889	0.00	408.34	19.52
10.472	48.351	0.07133	0.00	506.33	0.00
10.472	51.470	0.05847	0.00	538.99	0.00
10.472	54.589	0.08445	0.00	571.66	0.00
10.472	63.947	0.01062	0.00	669.65	0.00
15.036	38.993	0.00733	0.00	586.30	0.00
15.036	48.351	0.02817	0.00	727.01	0.00
15.036	51.470	0.05336	0.00	773.90	0.00
15.036	54.589	0.02299	0.00	820.80	0.00
15.036	63.947	0.01217	0.00	961.51	0.00

The same basic approach can be used to compute the expected value of the ARC program. Again, starting with the first entry in Table 7.6, a soybean price of US$2.864/bu and a yield of 48.351 bu results in a revenue of US$138.48/acre. Given our discussion of the ARC program, this results in an ARC payment of US$49.75/acre (e.g., 10 per cent of the ARC Benchmark Revenue). Following the same procedure in Equation 1, the expected value of the ARC program is US$18.02/acre.

Table 7.7 presents the historical ARC payments for corn four selected counties. In general, the ARC payments for corn have declined over time. Focusing on the payments in traditional corn growing areas (Fayette County, Ohio, and Tippecanoe County, Indiana), the yields are relatively high in these counties (183.25 bu/acre for Fayette County and 181.50 bu/acre for Tippecanoe County). In fact, the yield is only substantially lower than the Benchmark yield in Tippecanoe County in 2015. In these counties the ARC payment is relatively large in 2014 and declines over time. Most of this decline is due to a general decline in corn's Benchmark price (falling from 5.29 in 2014 to 3.95 in 2017). While not in the Corn Belt, the corn yields in Chicot County, Arkansas are similar to the Corn Belt counties. In addition, the payments more or less mirror those in the Corn Belt counties. The results for Alachua County, Florida are included to highlight the breadth of the impact of commodity program payments.

Table 7.7. County level agricultural risk coverage payments per acre for corn, selected counties

	2009	2010	2011	2012	2013	2014	2015	2016	2017
National Prices ($US/bu.)									
Benchmark Price						5.29	5.29	4.79	3.95
National Price			6.22	6.89	4.46	3.70	3.61	3.36	3.36
Chicot County, Arkansas									

[yield(bu./acre), revenue & payment (US$/acre)]									
County Yield	137	156	154	188	186	189	188	175	181
Benchmark Yield						165	177	187	187
Benchmark Revenue						872.85	936.33	895.73	738.65
Guarantee Revenue						750.65	805.24	770.33	635.24
Maximum Payment						87.29	93.63	89.57	73.87
Actual Revenue						699.30	678.68	588.00	608.16
Difference						51.35	126.56	182.33	27.08
Payment Rate						51.35	93.63	89.57	27.08
Alachua County, Florida									
[yield(bu./acre), revenue & payment (US$/acre)]									
County Yield	152	155	156	166	169	133	164	158	151
Benchmark Yield						159	159	162	163
Benchmark Revenue						841.11	841.11	775.98	643.85
Guarantee Revenue						723.35	723.35	667.34	553.71
Maximum Payment						84.11	84.11	77.60	64.39
Actual Revenue						492.10	592.04	530.88	507.36
Difference						231.25	131.31	136.46	46.35
Payment Rate						84.11	84.11	77.6	46.35
Tippecanoe County, Indiana									
[yield(bu./acre), revenue & payment (US$/acre)]									
County Yield	179	175	160	117	185	207	146	200	180
Benchmark Yield						171	173	164	177
Benchmark Revenue						904.59	915.17	785.56	699.15
Guarantee Revenue						777.95	787.05	675.58	601.27
Maximum Payment						90.46	91.52	78.56	69.92
Actual Revenue						765.90	527.06	672.00	604.80
Difference						12.05	259.99	3.58	0.00
Payment Rate						12.05	91.52	3.58	0.00
Fayette County, Ohio									
[yield(bu./acre), revenue & payment (US$/acre)]									
County Yield	187	172	184	128	180	184	176	175	191
Benchmark Yield						179	179	180	177
Benchmark Revenue						946.91	946.91	862.2	699.15
Guarantee Revenue						814.34	814.34	741.49	601.27
Maximum Payment						94.69	94.69	86.22	69.92
Actual Revenue						680.80	635.36	588.00	541.76
Difference						133.54	178.98	153.49	0.00
Payment Rate						94.69	94.69	86.22	0.00

The ARC payments for wheat in our four selected counties show the same general pattern as the corn payments (Table 7.8). Payments tend to be larger in 2014; however, the observed county level yields in 2014 are significantly below the Benchmark yields. For example, in Beckham County, Oklahoma the county level yield in 2014 was 6 bu/acre which is 15 bu/acre below the benchmark. Hence, larger relative ARC payments for wheat was due to lower yields. This situation had reversed by 2017 when the county level yields were as much as 58 per cent

above the Benchmark yield, but the wheat Market Year Average price was significantly lower than the Benchmark price (e.g., US$4.72/bu MYA price compared with a Benchmark price of US$6.12/bu). The result of this tradeoff is that ARC payments of US$3.60/acre were made in Beckham County, Oklahoma.

Table 7.8 County level agricultural risk coverage payments per acre for wheat, selected counties

	2009	2010	2011	2012	2013	2014	2015	2016	2017
National Prices ($US/bu)									
Benchmark Price						6.60	6.70	6.70	6.12
National Price						5.99	4.89	3.89	4.72
Otero County, Colorado									
[yield(bu./acre), revenue & payment (US$/acre)]									
County Yield	44	65	75	63	39	47	56	69	63
Benchmark Yield						57	58	55	55
Benchmark Revenue						376.20	388.60	368.50	336.60
Guarantee Revenue						323.53	334.20	316.91	289.48
Maximum Payment						37.62	38.86	36.85	33.66
Actual Revenue						281.53	273.84	268.41	297.36
Difference						42.00	60.36	48.50	0.00
Payment Rate						37.62	38.86	36.85	0.00
Ford County, Kansas									
[yield(bu./acre), revenue & payment (US$/acre)]									
County Yield	40	51	33	37	26	25	37	66	51
Benchmark Yield						37	32	32	34
Benchmark Revenue						244.20	214.40	214.40	208.08
Guarantee Revenue						210.01	184.38	184.38	178.95
Maximum Payment						24.42	21.44	21.44	20.81
Actual Revenue						149.75	180.93	256.74	240.72
Difference						60.26	3.45	0.00	0.00
Payment Rate						24.42	3.45	0.00	0.00
Beckham County, Oklahoma									
[yield(bu./acre), revenue & payment (US$/acre)]									
County Yield	17	28	17	33	17	6	21	34	26
Benchmark Yield						21	21	19	24
Benchmark Revenue						138.60	140.70	127.30	146.88
Guarantee Revenue						119.20	121.00	109.48	126.32
Maximum Payment						13.86	14.07	12.73	14.69
Actual Revenue						35.94	102.69	132.26	122.72
Difference						83.26	18.31	0.00	3.60
Payment Rate						13.86	14.07	0.00	3.60
Wheeler County, Texas									
[yield(bu./acre), revenue & payment (US$/acre)]									
County Yield	13	29	13	25	13	9	23	15	27
Benchmark Yield						17	17	17	17
Benchmark Revenue						112.20	113.90	113.90	104.04
Guarantee Revenue						96.49	97.95	97.95	89.47

Maximum Payment	11.22	11.39	11.39	10.40
Actual Revenue	53.91	112.47	58.35	127.44
Difference	42.58	0.00	39.60	0.00
Payment Rate	11.22	0.00	11.39	0.00

To compare the election between ARC and PLC, we start by examining the Market Year Average Price for the marketing years 2000/01 through 2016/17 for corn and soybeans with the reference price and loan rates for each commodity presented in Table 7.9. The market year price was less than the reference price for the marketing years 2002/03 through 2005/06 for corn while the market year average price for soybeans was less than the reference price in marketing years 2002/03, 2004/05, and 2005/06. Hence, throughout the 2002 Act there were several times that Countercyclical payments (the forerunner of PLC) were made on each commodity. However, beginning with the 2006/07 marketing year both the Market Year Average price exceeded the reference price; hence, no countercyclical or PLC payments were made. Table 7.10 presents the computation of the PLC payments for payment bushel and Table 7.11 presents the PLC yields for our selected sets of counties.

Table 7.9 Market year average price, reference prices, and loan rates for corn and soybeans

	Corn (US$/bu)			Soybeans (US$/bu)		
Marketing Year	Market Year Average Price	Reference Price	Loan Rate	Market Year Average Price	Reference Price	Loan Rate
2002/03	2.32	2.60	1.98	5.53	5.80	5.00
2003/04	2.42	2.60	1.98	7.34	5.80	5.00
2004/05	2.06	2.63	1.95	5.74	5.80	5.00
2005/06	2.00	2.63	1.95	5.66	5.80	5.00
2006/07	3.04	2.63	1.95	6.43	5.80	5.00
2007/08	4.20	2.63	1.95	10.10	5.80	5.00
2008/09	4.06	2.63	1.95	9.97	5.80	5.00
2009/10	3.55	2.63	1.95	9.59	5.80	5.00
2010/11	5.18	2.63	1.95	11.30	6.00	5.00
2011/12	6.22	2.63	1.95	12.50	6.00	5.00
2012/13	6.89	2.63	1.95	14.40	6.00	5.00
2013/14	4.46	2.63	1.95	13.00	6.00	5.00
2014/15	3.70	2.63	1.95	10.10	6.00	5.00
2015/16	3.61	2.63	1.95	8.95	6.00	5.00
2016/17	3.36	2.63	1.95	9.47	6.00	5.00

Table 7.10 Price loss coverage payments per bushel, 2014–2018 (US$/bu)

	2014	2015	2016	2017	2018
		Corn			
Reference Price	3.70	3.70	3.70	3.70	3.70
Market Year Average Price	3.70	3.61	3.36	3.36	3.60
Loan Rate	1.95	1.95	1.95	1.95	1.95
PLC Price Effective Price	3.70	3.61	3.36	3.36	3.60
PLC Payment	0.00	0.09	0.34	0.34	0.10
		Soybeans			

Reference Price	8.40	8.40	8.40	8.40	8.40
Market Year Average Price	10.10	8.95	9.47	9.33	8.60
Loan Rate	5.00	5.00	5.00	5.00	5.00
PLC Price Effective Price	10.10	8.95	9.47	9.33	8.60
PLC Payment	0.00	0.00	0.00	0.00	0.00
		Wheat			
Reference Price	5.50	5.50	5.50	5.50	5.50
Market Year Average Price	5.99	4.89	3.89	4.72	5.15
Loan Rate	2.94	2.94	2.94	2.94	2.94
PLC Price Effective Price	5.99	4.89	3.89	4.72	5.15
PLC Payment	0.00	0.61	1.61	0.78	0.35

Table 7.11 Price loss yields for selected US counties

	Corn (bu.)	Peanuts (lbs.)	Sorghum (bu.)	Soybeans (bu.)	Wheat (lb)
Alachua County, Florida	92	3270	38	19	38
Beckham County, Oklahoma	73	3453	33	9	26
Chico County, Arkansas	143		49	37	42
Ford County, Kansas	161		67	51	39
Fayette County, Ohio	146		106	44	58
Otero County, Colorado	146		66	36	64
Tippecanoe County, Indiana	151		64	47	56
Wheeler County, Texas	123	2032	34		21

In general, how do the returns under the ARC election compare with the PLC option. Table 7.12 presents the PLC and ARC payments per acre for corn and wheat in our selected counties. The first point to notice is that Market Year Average Price for all three commodities was above the reference price in 2014; hence, there were no PLC payments for these crops in 2014. In fact, the only PLC payment in 2014 was for wheat (e.g., US$0.61/bu). Further, there has never been a PLC payment for soybeans. Essentially, the price for all these commodities have been historically high for 2014 through 2018.

Table 7.12 Price loss coverage and agriculture risk coverage, 2014–2017 (US$/bu)

	2014	2015	2016	2017
		Corn		
		Chicot County, Arkansas		
PLC (143 bu)	0.00	10.94	41.33	41.33
ARC	51.35	93.63	89.57	27.08
		Alachua County, Florida		
PLC (92 bu)	0.00	7.04	26.59	26.59
ARC	84.11	84.11	77.60	46.35
		Tippecanoe County, Indiana		
PLC (151 bu)	0.00	11.55	43.64	43.64
ARC	12.05	91.52	3.58	0.00
		Fayette County, Ohio		
PLC (146 bu)	0.00	11.17	42.19	42.19
ARC	94.69	94.69	86.22	0.00
		Wheat		
		Otero County, Colorado		
PLC (64 bu)	0.00	33.18	87.58	42.43
ARC	37.62	38.86	36.85	0.00
		Ford County, Kansas		
PLC (38 bu)	0.00	19.70	52.00	25.19
ARC	24.42	3.45	0.00	0.00
		Beckham County, Oklahoma		
PLC (26 bu)	0.00	13.48	35.58	17.24
ARC	13.86	14.07	0.00	3.60

		Wheeler County, Texas		
PLC (21 bu)	0.00	10.89	28.74	13.92
ARC	11.22	0.00	11.39	0.00

The loan rate has been a mechanism used to support agricultural prices since the Agricultural Adjustment Act of 1938. As it was initially implemented, the non-recourse feature of the loan produced a price floor for agricultural commodities. In Figure 7.1, the supply of corn is S while the demand of corn is D. We assume that the US policy has provided a loan rate of p_L for corn so that instead of an equilibrium price and quantity of p^* and q^*, farmers produce q_P and consumers demand q_C. In this equilibrium, the government through Commodity Credit Corporation would purchase and hold stocks of $q_P - q_C$. Notice that in recent years the market price for corn has been well above the loan rate so that no forfeitures would occur.

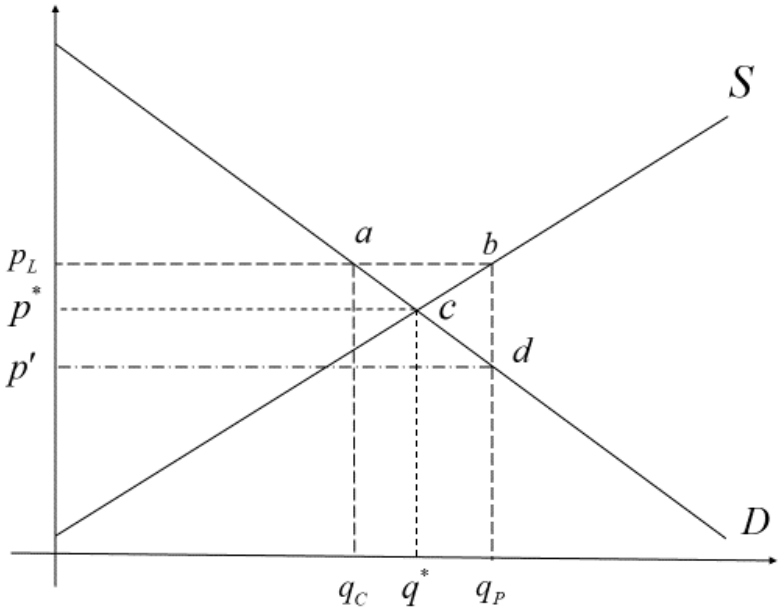

Figure 7.1. Effect of commodity loan rate

At this point, we can derive the economic costs and benefits of an historically important agricultural policy. Starting with the change in consumer surplus, the non-recourse loan program reduced consumer surplus by the area $p_L acp^*$. Specifically, by "purchasing" additional commodity through the non-recourse loan program, the policy increases the price paid by consumers from p^* to p_L. In response, consumers reduce their purchases of the commodity from q^* to q_C. On the other hand, the additional "purchases" through the non-recourse loan program increases producer surplus by $p_L bcp^*$. Whether the net social effect is positive or negative depends, in part, on the assumptions that one makes about the disposition of the stocks. The total value of stocks accumulated by the CCC in the production year is the area $abq_P q_C$ (or $p_L \times (q_P - q_C)$). While several possible outcomes are possible, let us start with the best possible

outcome. Let us assume that there is either an outward shift in demand in the next year, or negative shock to supply. In this case, we could assume that the price of the commodity in the next year is higher than the loan rate in this year (i.e., $p'' > p_L$). In this case the stocks accumulated in this period are sold for a higher price next period. To complicate this formulation slightly, we assume a discount rate of r and a holding or storage cost of ϕ per unit. The net gain from holding CCC stocks then becomes

$$\left(\frac{1}{1+r}p'' - p_L - \phi\right)\times\left(q_P - q_C\right) \tag{5.2}$$

which could be either positive or negative. Let us assume for the moment that the value in Equation 5.2 is zero (e.g., the discounted future price is exactly high enough to pay for original loan rate and the cost of storage). In this case, there is no cost to the non-recourse loan program. Unfortunately, this scenario was relatively rare.

The non-recourse loan was a factor contributing to the accumulation of government stocks (i.e., CCC holdings). In most cases, the law specified market conditions such that the stocks could be released for sale (i.e., in one case stocks could be sold when the market price exceeded 105 per cent of parity). However, over several periods of the non-recourse loan programs, the US farm program has resulted in significant accumulation of a variety of stocks. These accumulations raise several difficulties. First, it is often costly to hold government stocks. In the past, the agricultural program has included funds for the CCC to build storage facilities. In addition, the quality or usability of a variety of commodities decline over time (loss or wastage), or the government stocks may depress agricultural prices in the long-term. In either case, the federal government has tried several mechanisms to reduce the holding of stocks. Several of the Great Depression era nutritional programs were basically surplus distribution programs – the government gave food to the poor. On a similar vein, P.L. 480 provided for the distribution of surplus commodities overseas to address food needs. A further example, the Payment-in-Kind program of 1982 distributed stocks that accumulated under the Farmer Owned Reserve program.

Given the difficulties of holding stocks, the non-recourse loan program was transformed into Loan Deficiency Payments (LDPs). The LDP pays the farmer an amount that would be roughly equivalent to the farmer forfeiting output to the CCC. As a starting point, consider the loan formulation in Figure 7.1 where the producer produces q_P based on the loan rate of p_L. Suppose that the producer sells his production on the market resulting in a market clearing price of p'. The producer would be indifferent between making this market transaction and receiving a payment of $p_L - p'$ for each unit produced (i.e., bushel of corn) and placing the crop into a traditional non-recourse loan program. So, the LDP would be a payment of $\left(p_L - p'\right)\times q_P$. The producer and consumer gains from this program are the same as a traditional subsidy program. As before, producers would gain $p_L bcp^*$, but consumers now gain from increased consumption at lower prices ($p^* cdp'$). The additional cost is borne by the treasury (i.e., the USDA commodity payments) - $p_L bdp'$.

To complete our picture of the LDP program, a Posted County Price (PCP) is computed for each county. This price is the prevailing price for a 30-day period. The PCPs for each of the selected corn producing counties is presented in Table 7.13. In 2017, the PCPs were higher than the county loan rates so no LDPs were made. However, the derivation of the PCPs and loan rates in Table 7.13 provide several points of discussion. First, county level prices for most agricultural

commodities vary. This variation is largely explained by transportation cost to the closest market. For example, the highest price for wheat in the 1970s was typically the export port of Galveston, Texas. Hence, the county level price for wheat typically fell from Galveston as the distance implied higher trucking costs. However, this relationship was distorted in certain areas by access to large train facilities such as Enid, Oklahoma. This difference between local prices and prices at central markets is typically referred to as "basis." The PCP calculations in Table 7.13 provide two alternative basis calculations for determining local prices. For example, the two markets considered for Chico County, Arkansas are the Gulf of Mexico and Memphis. The price on the Gulf in the past 30 days was US$4.22/bu. Next, assuming a standard basis between Chicot county prices and the Gulf market of -0.62/bu, this yields an implicit Chicot county price of US$3.60/bu. Note that the county level loan rates also include implicit basis adjustment.

Table 7.13 Posted county prices for selected counties, 2017 (US$/bu)

	30-Day PCP	Terminal Market	Terminal Price	Adjustments	Price After Adjustment	Alternative PCP	County Loan Rate
Chicot County, AR	4.18	Gulf	4.22	-0.62	3.60	3.60	2.11
		Memphis	3.91	-0.39	3.52		
Alachua County, FL	3.38	Cincinnati	3.74	-0.04	3.70	3.71	2.22
		Gulf	4.22	-0.51	3.71		
Tippecanoe County, IN	4.06	Gulf	4.22	-0.78	3.44	3.46	1.99
		Kansas City	3.69	-0.23	3.46		
Fayette County, OH	4.10	Cincinnati	3.74	-0.26	3.48	3.48	2.02
		Toledo	3.66	-0.18	3.48		

To determine the cost and benefits of the 2018 program, Table 7.14 presents the estimated market year price received for corn for marketing years 2018/19 through 2020/21. These results suggest that price of corn will be slightly lower than the reference price for the 2018/19 marketing year (i.e., a Market Year Average price of US$3.60/bu compared with a reference price of US$3.70/bu). However, it appears extremely unlikely that the corn price for 2018/19 will fall below the loan rate of US$2.20/bu. Figure 7.2 presents the corn market equilibrium under this policy scenario. Under this set of assumptions the price and quantity of corn is determined by the intersection of the supply and demand curve (e.g., the price of corn is p^* while the quantity of corn produced is q^*). This equilibrium depends on two assumptions. First, the loan rate (p_L) is below the equilibrium price, so it does not affect production decisions. Second, the production decisions are not affected by the reference price (p_R). The farmer receives PLC payments based on historical yields and program base acres. In this case, the consumer surplus is abp^*. The producer surplus comes from two sources. First, the market generates a producer surplus of p^*bc. Second, the government makes PLC payments to farmers based on the market price. To derive this payment, assume that ARC does not exist (e.g., deficiency payments are made as PLC). Under this scenario, payments are made on q_{PLC} bushels (e.g., 85 per cent of program yields on base acres). In this case the PLC payment will be $p_R dep^*$. Given our projections, this payment will be fairly small (slightly less than 10 cents a bushel).

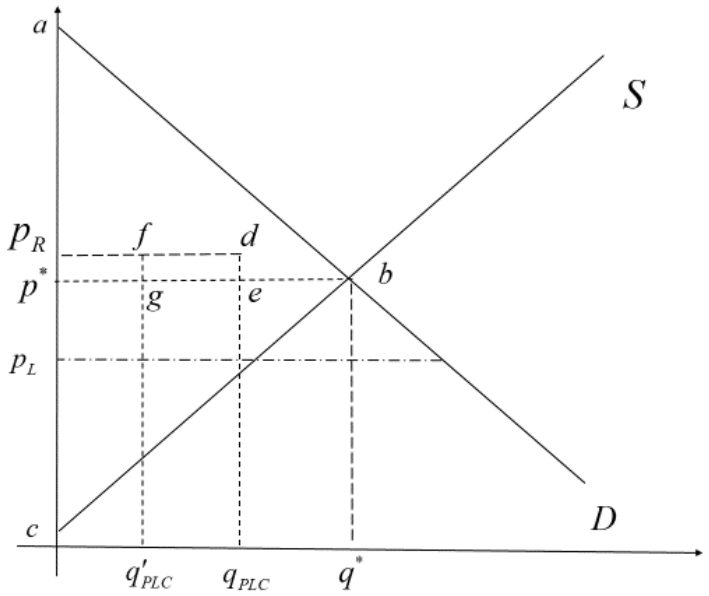

Figure 7.2 Effect of price loss coverage on commodity market

Table 7.14 Quantity and price range for corn in the United States, 2018–2020

	Lower Bound	Mean	Upper Bound
	Corn Quantity (billion bushels)		
2018/19	12.551	14.900	17.249
2019/20	12.681	15.153	17.624
2020/21	12.995	15.489	17.982
	Corn Price (US dollars per bushel)		
2018/19	2.324	3.606	4.888
2019/20	2.466	4.059	5.651
2020/21	2.797	4.574	6.351

One of the unique characteristics of the 2014 and 2018 Acts was the selection of payment contracts. Intuitively, the total payment under PLC can be represented in terms of Figure 7.2. ARC as developed above is a form of revenue insurance that pays off under certain combinations of price and production given a historical benchmark. However, we can depict the effect of the choice between PLC and ARC in Figure 7.2. As stated in the preceding paragraph, we initially assumed that q_{PLC} bushels represent 85 per cent of base acres for program yields (e.g., the quantity of bushels paid the deficiency payment if all acres signed up for PLC). Next, we assume that only q'_{PLC} bushels are eligible for PLC payments. The acres for the $q_{PLC} - q'_{PLC}$ have been enrolled in ARC. Under these assumptions the PLC payment is smaller ($p_R fgp^*$). Table 7.15 presents the PLC/ARC choice for corn by state. In total, 121,526 farms chose PLC while 1,240,419 chose ARC. Hence, 91 per cent of farms chose ARC. In terms of total acres, 6,388,066 acres were enrolled in PLC while 90,380,379 acres were enrolled in ARC (or 93 per cent of corn base acres were enrolled in ARC). Given these statistics, we expect the PLC payments to be very small (e.g., not only due to the fact that PLC payment will only be 10 cents/bu, but also since

only 7 per cent of corn acres are enrolled for PLC payments). For slightly different reasons we also expect that the ARC payments will be small barring major weather events.

Table 7.15 Price loss coverage/agricultural risk coverage election by state (US$)

		PLC	ARC	Total			PLC	ARC	Total
AL	Acres	75,083	167,876	242,960	NE	Acres	417,281	10,161,792	10,579,073
	Farms	5,155	9,581	14,736		Farms	3,895	77,102	80,997
AZ	Acres	40,417	2,967	43,384	NV	Acres	442	1,519	1,961
	Farms	545	19	564		Farms	20	54	74
AR	Acres	32,070	197,809	229,879	NH	Acres	902	11,296	12,198
	Farms	830	4,437	5,267		Farms	27	383	410
CA	Acres	166,020	174,383	340,403	NJ	Acres	7,388	73,184	80,573
	Farms	2,739	1,815	4,554		Farms	226	2,025	2,251
CO	Acres	412,615	1,078,347	1,490,963	NM	Acres	58,622	87,559	146,181
	Farms	2,974	5,902	8,876		Farms	765	437	1,202
CT	Acres	6,178	18,347	24,525	NY	Acres	15,780	1,013,909	1,029,689
	Farms	217	571	788		Farms	357	21,469	21,826
DE	Acres	5,856	161,747	167,603	NC	Acres	32,377	910,484	942,861
	Farms	147	3,460	3,607		Farms	1,957	47,077	49,034
FL	Acres	11,899	49,688	61,586	ND	Acres	55,749	3,025,961	3,081,710
	Farms	507	1,937	2,444		Farms	1,301	25,360	26,661
GA	Acres	57,931	358,690	416,621	OH	Acres	81,181	4,080,599	4,161,780
	Farms	3,123	16,037	19,160		Farms	2,084	89,569	91,653
ID	Acres	98,416	103,050	201,466	OK	Acres	56,957	226,382	283,339
	Farms	1,681	1,461	3,142		Farms	1,400	2,411	3,811
IL	Acres	257,720	12,957,672	13,215,392	OR	Acres	17,420	46,144	63,564
	Farms	3,951	159,772	163,723		Farms	522	777	1,299
IN	Acres	144,860	6,573,290	6,718,150	PA	Acres	54,643	703,970	758,613
	Farms	2,374	104,878	107,252		Farms	1,629	25,107	26,736
IA	Acres	422,434	15,148,095	15,570,529	RI	Acres	110	717	826
	Farms	4,983	148,025	153,008		Farms	3	55	58
KS	Acres	590,065	3,936,996	4,527,061	SC	Acres	23,940	340,992	364,932
	Farms	8,350	40,155	48,505		Farms	1,044	14,888	15,932
KY	Acres	84,448	1,593,310	1,677,758	SD	Acres	113,283	5,812,014	5,925,297
	Farms	3,965	38,767	42,732		Farms	1,062	47,371	48,433
LA	Acres	32,720	279,821	312,541	TN	Acres	11,961	846,920	858,882
	Farms	998	5,555	6,553		Farms	448	27,579	28,027
ME	Acres	122	31,908	32,031	TX	Acres	991,040	1,244,409	2,235,449
	Farms	4	1,144	1,148		Farms	20,552	10,347	30,899
MD	Acres	26,079	452,431	478,510	UT	Acres	9,067	50,816	59,883
	Farms	571	10,922	11,493		Farms	443	1,586	2,029
MA	Acres	0	17,633	17,633	VT	Acres	492	87,828	88,319
	Farms	0	853	853		Farms	29	2,321	2,350
MI	Acres	96,087	2,660,940	2,757,027	VA	Acres	51,203	403,013	454,216
	Farms	2,011	49,937	51,948		Farms	2,955	19,145	22,100
MN	Acres	107,614	8,727,939	8,835,554	WA	Acres	63,805	49,125	112,929
	Farms	1,573	91,052	92,625		Farms	871	688	1,559
MS	Acres	18,703	346,873	365,576	WV	Acres	756	63,066	63,822
	Farms	723	11,398	12,121		Farms	118	2,360	2,478
MO	Acres	1,472,378	2,013,459	3,485,837	WI	Acres	80,553	3,971,390	4,051,943
	Farms	28,934	32,829	61,763		Farms	2,029	81,348	83,377
MT	Acres	62,899	28,893	91,792	WY	Acres	20,500	85,126	105,626
	Farms	1,434	453	1,887		Farms	442	955	1,397

The policy scenario depicted in Figure 7.2 assumes that the price of corn will remain above the loan rate. Figure 7.3 assumes a significant supply increase (e.g., a shift from S to S' coupled with a reduction in demand from D to D'). The result would be a new equilibrium at a lower price ($\tilde{p}$) and a larger quantity ($\tilde{q}$). Given that the price is lower than the loan rate (p_L), the government will make LDPs on all corn that is produced by farmers that participate in the farm program. Since the loan rate is p_L , farmers will produce q'' bushels of corn. Again, since we assume that the government will make LDPs instead of accumulating stocks, the LDP payment will be $p_L - p''$ per bushel or $p_L bcp''$ in total. Under this scenario consumers gain $\tilde{p}acp''$ while producers gain $p_L ba\tilde{p}$. These producer and consumer gains added to the treasury cost yields the classic deadweight loss of bca . In addition to these market-based transfers, the farmers will also receive a PLC payment of $p_R dep_L$. The net impact of these changes in supply and demand on ARC payments are a little more difficult to determine without additional information. It would depend in part whether the shift in supply and demand occurred slowly over time in which the Benchmark revenue would have also creeped downward due to falling prices and increasing yields. In general, we could approximate the Benchmark revenue as $p^* \times q^*$ and the observed revenue as $p_L \times q''$ so the question is whether $p_L \times q'' \leq 0.86 p^* \times q^*$.

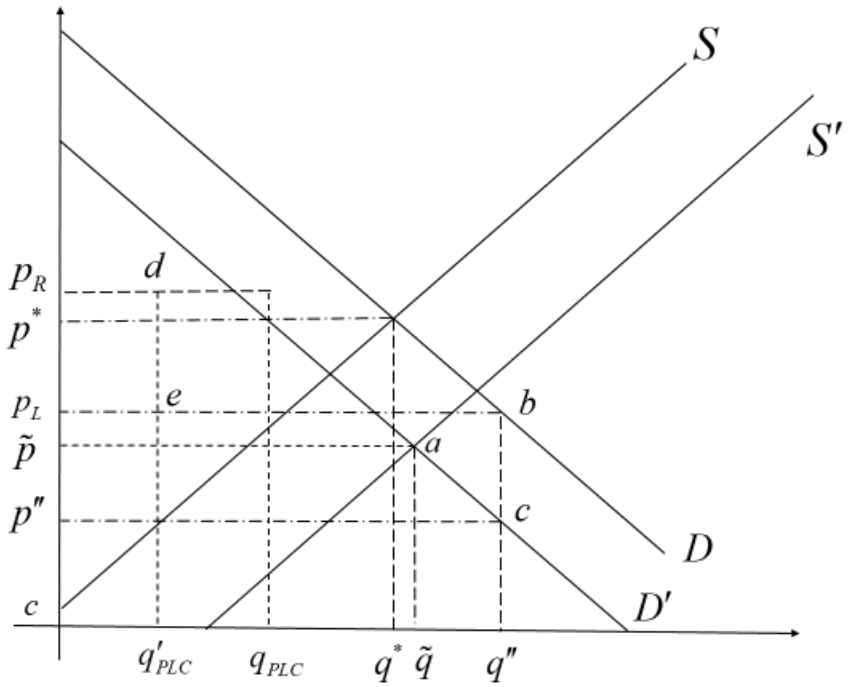

Figure 7.3 Effect of a significant increase in supply on price loss coverage and agricultural risk coverage payments

Setting Loan Rates and Target Prices

Typically, agricultural policy before the 1970s retained the objective of setting loan rates and target prices based on the parity concept. Early legislation attempted to guarantee prices that would return 100 per cent of parity while later acts resulted in less ambitious targets (e.g., 90 per

cent of parity in the Agricultural Act of 1948). The 1996 FAIR Act set more flexible targets. However, the most recent agricultural programs have set loan rates (and target prices) without reference to either market conditions or parity.

7.5 Conservation Reserve Program

The Conservation Reserve Program (CRP) was established by the Food Security Act of 1985. To get support for the 1985 US Farm Bill, a provision to retire highly erodible lands for ten to fifteen years was included. While the primary environmental objective of the CRP was to reduce soil erosion, one of the secondary objectives was to reduce the supply of certain program commodities so as to increase the farm gate price and to bolster net farm income.

To reduce the impact of the Conservation Reserve Program on rural communities should too much cropland be removed in any one area, each county was limited to removing 25 per cent of its total cropland from production. Each year farmers received a per acre payment for their land that was enrolled in the CRP, up to a per person limit of US$50,000. The intent of the CRP was to reduce crop acreage by 40–45 million acres. By 1991, 38 million acres of land had been placed in the CRP by contract holders (Knutson, Penn, and Flinchbaugh 1998). In 2000 the USDA estimated that about 34 million acres of land were in the CRP (USDA/FAS 2008).

Most of the land placed in the CRP under the 1985 Food Security Act was in the Great Plains. To make the program more attractive to farmers in the Midwest, the 1990 Food, Agriculture, Conservation, and Trade (FACT) Act placed its emphasis on water quality. In the 1996 FAIR Act, the preservation of wildlife habitat became one of many criteria for placing land in the CRP. Thus, the emphasis of the Conservation Reserve Program has changed over time.

From a worldwide perspective, this may be one of the most important components of US farm policy. In 2008 there were roughly 32 million acres in the CRP (only about one-half of which were suitable for agricultural production). Because of the high prices in 2007 and 2008, the United States considered removing some of the acreage from the CRP, but it did not. If the United States had removed 15 million acres from the CRP, the impact on commodity prices would have been significant.

Environmental Benefits of CRP

In the signups to the Conservation Reserve Program since 1990, criteria of acceptance to the CRP have been broadened to include environmental indicators, such as water quality and wildlife habitat. A significant amount of the land entering the CRP after 1990 was devoted to the production of row crops such as corn and soybeans. Extensive row-crop production is known to be detrimental to many wildlife populations; it also increases the rate of soil and water erosion. By converting row-crop lands into grasslands, the CRP could positively affect wildlife, increase the quality of water, and reduce soil erosion.

7.6 Dairy, Sugar, Tobacco, and Peanuts

7.6.1 US Dairy Policy and Marketing Orders

The dairy industry is one of the most highly regulated agricultural sectors in the United States (Manchester 1983). Dairy programs are intended to (1) stabilize dairy farm income, (2) lessen the seasonal instability in milk prices, and (3) bring about orderly marketing. These policy

objectives have historically been met using a variety of policy mechanisms. First, milk is marketed under an agricultural marketing order. These orders are basically producer agreements for the orderly marketing of some agricultural product.

7.6.1.1 The US dairy program before 2014

Figure 7.4 depicts the effect of the two-price milk program on the quantities supplied and demand, and the relative price for each grade of milk. The depiction starts with two different demand curves for milk: the demand for fluid milk (D_F) and the demand for milk processed into other products such as cheese and butter (D_P). Summing these two demand curves horizontally yields the total demand for milk (D_T). To solve for the market equilibrium, we assume that the demand curve for fluid milk is

$$q_F = 150.00 - 2.78 p_F \tag{7.2}$$

while the demand curve for milk to be used in the production of processed milk products is

$$q_P = 92.50 - 2.36 p_P . \tag{7.3}$$

To solve for the equilibrium price, we assume that the price for fluid milk and processed milk is the same and equate the sum of the two demand functions with the supply function for milk

$$q_S = 82.5 + 3.75 p \tag{7.4}$$

yielding an equilibrium price for milk of US$18.00/cwt and a total quantity demand of 150 cwt (as depicted in Figure 7.4).

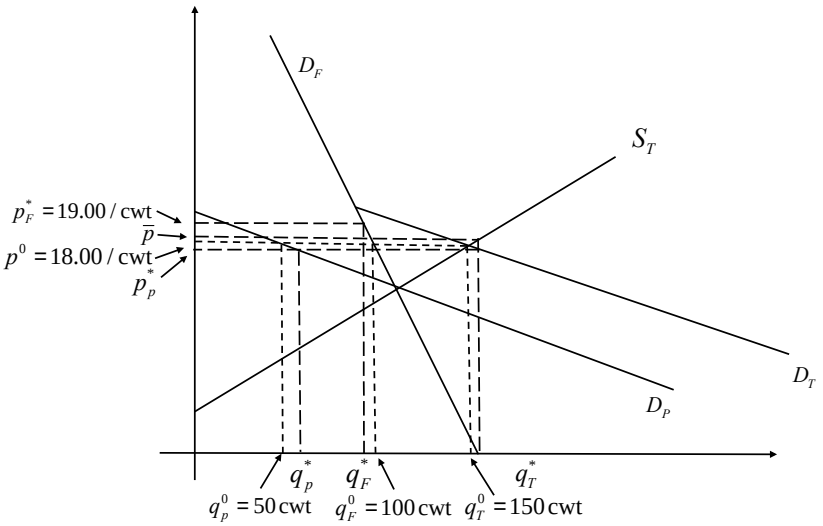

Figure 7.4 Market equilibrium for fluid and processed milk market

The basic design of the traditional milk program was to exploit the differences in the elasticity between the demand curves. In the current example, the demand curve for fluid milk is more inelastic than the demand curve for processed milk (e.g., -0.50 compared with -0.85). The basic concept is to increase the average or blended price by raising the price in the fluid milk market (reducing the quantity of fluid milk consumed) and increasing the supply of processed

milk (decreasing its price). As an example, suppose that we increased the price in the fluid milk market to US$19.00/cwt. This would decrease the quantity of fluid milk consumed to 97.22 cwt. The result would be a blended milk price

$$\overline{p} = \frac{19.00 \times 97.22 + p_P q_P}{97.22 + q_P}. \tag{7.5}$$

This system is solved by introducing the supply function for denominator in Equation 7.5. The quantity of processed milk produced at equilibrium (q_P^*) is 53.33 cwt (i.e., the quantity of processed milk produced increases), the equilibrium price in the processed milk market declines to US$16.59/cwt, and the blend price increases to US$18.15.

While the two-price plan increases farmer income, an additional level of price support was introduced by government purchases to milk to create butter and cheese. To demonstrate this program, we start by introducing government purchases of milk produce butter and milk (q_G) the new blend price can then be written as

$$\overline{p} = \frac{19.00 \times 97.22 + p_P \left(q_P + q_G \right)}{97.22 + q_P + q_G}. \tag{7.6}$$

We will assume that the policy goal is a blended price of milk of US$18.25/cwt. Given this objective, the price of processed milk becomes

$$p_P = \frac{18.25 \times q_T^* - 19.00 \times 97.22}{q_P + q_G}. \tag{7.7}$$

Next, we note that if the blended price of milk is set at US$18.25/cwt, the total supply of milk will be 150.94 (e.g., from the supply function in Equation 7.4). This total supply also determines the private demand of milk for processed products and the amount of milk purchased for government uses

$$q_P + q_G = 150.38 - 97.22 = 53.71. \tag{7.8}$$

Substituting the total production of milk and the amount of milk used for processing into Equation 7.7 yields a processed milk price of US$16.89/cwt. At this price, the private milk processors will demand 52.61 cwt of milk (e.g., using Equation 7.3) and the government purchase of milk is determined as 1.10 cwt.

7.6.1.2 Margin protection program for dairy

The political support for the traditional milk program waned over time, in part due to the significant quantity of government butter and cheese accumulated by the government. As a result, the Margin Protection Program for Dairy (MPP) was introduced in the 2014 Farm Bill. This program provides for an insurance payment per hundredweight of milk sold if the dairy margin defined as the milk price minus feed cost drops below a specified level. Table 7.16 presents the margins and cost of protection in the 2018 Act. As an example, suppose that a farmer has 150 cows producing 22,000 pounds of milk per cow, or 3,300,000 pounds of milk. This individual is a "Tier I" producer. Next, we assume that the producer completely covers production at US$7.50 coverage – 0.300 * 3,300,000/100 = US$9,900. If the milk margin declined to US$7.25, the farmer would collect – (7.50-7.25)*3,300,000/100 = US$8,250.

Table 7.16. Margin protection program premiums per hundredweight (cwt)

	Tier I	Tier II
Margin	Less Than 5 Million Pounds	Greater Than 5 Million Pounds

$4.00	0.000	0.000
$4.50	0.000	0.020
$5.00	0.000	0.040
$5.50	0.009	0.100
$6.00	0.016	0.155
$6.50	0.040	0.290
$7.00	0.063	0.830
$7.50	0.067	1.060
$8.00	0.142	1.360

Dairy Program Costs

The net cost of the dairy program was sizeable in the early 1980s because the government purchased large quantities of milk products. However, in the 1990s, the cost of the dairy program was greatly reduced because the milk support price was well below the market price. For example, throughout 1999 average market prices exceeded support prices by US$2 per cwt. From 1977 to 1991 the US government purchased from 5 per cent to almost 10 per cent of domestic production, although this quantity dropped substantially after the 1996 US Farm Bill (Sumner 1999).

7.6.2 US Sugar Rate and the Tariff Rate Policies

The US sugar program is a perennial point of discussion in the arena of agricultural policy (Schmitz and Christian 1993). The program supports the price of sugar in the United States through the operation of a tariff rate quota. The TRQ on sugar in the United States is set to guarantee a domestic sugar price of 18 cents a pound on raw sugar and 22.9 cents a pound on sugar refined from sugar beets.

The tariff rate quota is based on two different quota rates (Figure 7.5). The first quota rate t_0 is relatively low and allows for a basic minimum access to the domestic market (Figure 7.5b). The second rate t_i is typically prohibitive. Figure 7.5a is the supply and demand of sugar produced in foreign countries. Subtracting the foreign demand D_F from the foreign supply S_F yields the excess supply of foreign sugar into the US market before the tariff ES_F (Figure 7.5c). The excess demand from the United States is ED_{US}. Figure 7.5b depicts the tariff rate. The lower (first level) tariff t_0 is charged on all imports below the minimum access quantity $\tilde{Q}_E$ x. Above the minimum access quantity $\tilde{Q}_E$, any imports into the US market are charged a higher tariff t_i. Figure 7.5c depicts the excess supply and excess demand. The effective excess supply curve ES'_F (the discontinuous line $abcd$) is derived by adding the tariff to the excess supply curve from foreign suppliers. The effective excess supply curve is discontinuous at the minimum access quantity resulting in the domestic market price of $\tilde{P}$. The goal of the US sugar program is to generate a domestic market price higher than 18 cents a pound for raw cane sugar. In Figure 7.5a, the foreign market price of sugar $\tilde{P}^*$ is equal to that price balancing supply and demand in overseas markets after the minimum access quantity of sugar has been exported to the United States. In Figure 7.5a, $\tilde{Q}_F^S$ pounds of sugar are produced in the foreign market and $\tilde{Q}_F^D$ pounds of

sugar are consumed in the foreign market. The quantity of sugar exported to the United States is $\left(\tilde{Q}_F^S - \tilde{Q}_F^D\right)$.

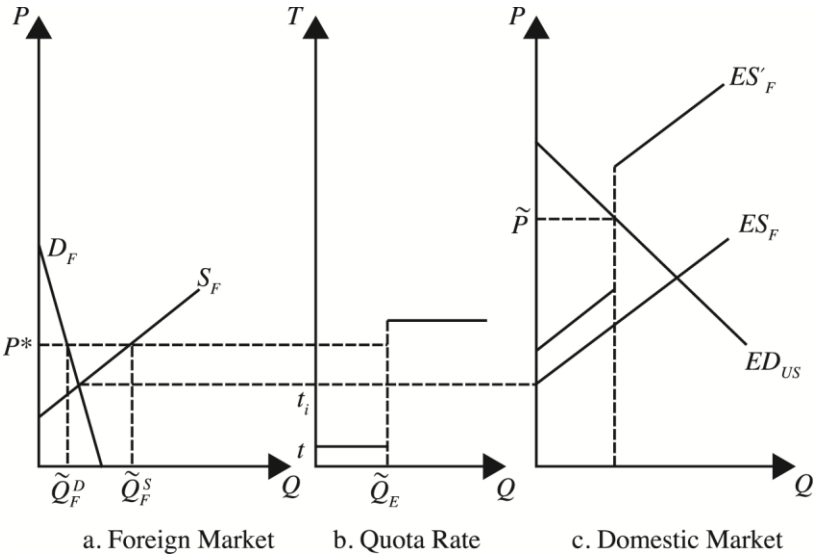

Figure 7.5. Tariff rate quota program for US sugar, 1995–2008

In addition to the tariff rate quota, the FCE Act of 2008 includes a non-recourse loan program to provide a floor for domestically produced raw sugar from sugarcane at 18 cents a pound in 2008, 18.25 cents a pound in 2009, 18.50 cents a pound in 2010, and 18.75 cents a pound in 2011 and 2012. The operation of this particular loan program is complicated by the Dole Amendment of the 1985 US Farm Bill, which requires that the sugar program be conducted at no cost to the US Treasury (Messina and Seale 1993). One result of the Dole Amendment is that payments under the loan rate provisions for sugar will be typically made using payments-in-kind.

World Sugar

Many of the studies that have been critical of both the EU and US sugar policies base their analyses on world sugar prices. These are generally below the US domestic support levels. The US Sugar Alliance argues that the world price of sugar would be roughly the same as the internal support price if production subsidies in countries such as India were removed.

7.6.3 Peanuts

Historically, the US peanut policy consisted of a volume (poundage) quota system in which production was regulated for the domestic edible market (Schmitz, Furtan, and Baylis 2002). Quota peanut production exceeded domestic edible demand in the mid-1990s, about the same time that the North America Free Trade Agreement (NAFTA) and World Trade Organization (WTO) agreements began to loosen the import restrictions that had been necessary to implement the price support (Dohlman and Livezey 2005). To balance the market, the 1996 US Farm Bill lowered the peanut loan rate. Other changes followed with the passage of the 2002 Farm Act. For example, US peanut policy includes linking direct and countercyclical payments to historical

production levels on specific 'peanut base acres' (similar to those for grains and cotton) – thus introducing greater flexibility and market incentives to peanut producers (Ibid).

The US peanut quota buyout program was terminated in 2002, and producers were compensated for losses from removal of the program. Compensation was based on the quota owner's 2001 quota. The unit value of this program was worth US$220 per ton, offered in annual installments between 2002 and 2006, or was offered as a lump-sum payment in the fiscal year of the owner's choice. The dollar amount of the US peanut buyout was based on the production quota values (Schmitz and Schmitz 2010) According to Dohlman and Livezey (2005), compliance with international trade agreements (e.g., NAFTA and WTO) was a source of concern that influenced the demise of the peanut marketing quota system in 2002.

7.6.4 Tobacco

The federal tobacco program dates back to 1938, and was designed to stabilize the US tobacco market and ensure fair prices for tobacco farmers. Marketing quotas and price supports were the two basic elements of the US tobacco program (Schmitz, Furtan, and Baylis 2002). Tobacco farmers were allocated an annual acreage-based quota, limiting the quantity of tobacco that quota owners could place on the market. Initially, tobacco quotas were allotted to each producer on the basis of historical tobacco production. Over time, most of the tobacco produced in the United States was converted from acreage-based production quotas to poundage-based marketing quotas. Annual quotas were set on the basis of a formula that included the purchase intentions of domestic tobacco manufacturers, a three-year average of exports, and a stock adjustment giving the US secretary of agriculture limited flexibility for quota adjustments.

As the quantity and quality of foreign-grown tobacco increased over time, lower-priced imported tobacco began to displace significant quantities of domestic tobacco used in manufacturing, and there was limited ability to adjust domestic prices within the constraints of the program. Other problems also emerged that put pressure on the tobacco price support program. For example, domestic tobacco manufacturers began to bypass traditional auction markets in favour of direct contracts with producers (Schmitz, Schmitz, and Rossi 2006).

In response, tobacco producers supported a tobacco quota buyout. In October 2004 the US Congress included the Fair and Equitable Tobacco Reform Act (the tobacco buyout) as part of larger corporate tax reform legislation (American Jobs Creation Act of 2004, PL 108–357). Beginning with the 2005 crop, the tobacco quota buyout: (1) terminated the federal tobacco price support and supply control programs; (2) made compensation payments to tobacco quota owners and to active tobacco growers for the elimination of the tobacco quota asset; and (3) provided for the orderly disposal of existing Commodity Credit Corporation tobacco pool stocks. Payments to tobacco quota owners and growers totaled US$9.6 billion by the end of the 2005 crop year, with annual payments being spread evenly over the following ten years. Additional funding for handling CCC tobacco pool stocks and administration costs brought the total buyout package at US$10.14 billion, which was funded entirely by tax assessments on tobacco product manufacturers and tobacco product importers. Since 2005, farmers have had no restrictions on the amount or location of tobacco production. Similarly, they can sell tobacco to anyone they want, at any price.

Schmitz, Haynes, and Schmitz (2016b) estimated that the payments made to tobacco growers and tobacco quota owners was generous in that the buyout payments exceeded the true value of the producer gain from the use of quotas. The payments appeared to be based on the

value of quota, which can be far greater than the value of the net producer gain from quotas. In the Canadian case, compensation to Canadian tobacco growers for terminating the tobacco program was based on quota levels established in the 1950s (Schmitz, Haynes, and Schmitz 2016a).

7.7 In Perspective

The support of agricultural commodity prices in the United States has long history dating back to the Agricultural Marketing Act of 1928. Early mechanisms attempted to increase agricultural income by providing higher prices through "orderly marketing" of agricultural products. During the Great Depression era, these efforts focused on the allotment of the right to grow certain commodities coupled with a price support mechanism referred to the commodity loan rate. Interestingly, several of these commodity mechanisms were integrated into the 2018 Farm Bill. Specifically, the 2018 Farm Bill still incorporates a commodity loan rate in the guise of the Loan Deficiency Payment, and the price support mechanism initially referred to as the Price Deficiency Payment still exists as the Price Loss Coverage program. However, there have been changes, such as the transition from traditional price-based programs to programs that reduce production risk through insurance-like programs (e.g., the Agricultural Risk Coverage program and the Margin Protection Program for Dairy).

Regardless of the movement toward more insurance-based agricultural program payments, commodity prices have been above most of the program targets over the past decade. Figure 7.6 depicts the Market Year Average price for corn compared to the Loan Rate and Reference Price for corn. In general, the corn price exceeded the both the loan rate and reference prices from 2006 through 2014. After 2014, the market corn price was higher than the loan rate but lower than the reference price. Empirically, there was no countercyclical payments (the forerunner of PLC) between 2006 and 2014, with a small PLC payment in recent years. Figure 7.7 depicts the same pattern for soybean prices in the United States. These figures demonstrate that the commodity payments have been small in recent years. However, as will be discussed in the chapter on biofuels, much of the increase in commodity prices can be traced to biofuels (e.g., ethanol production).

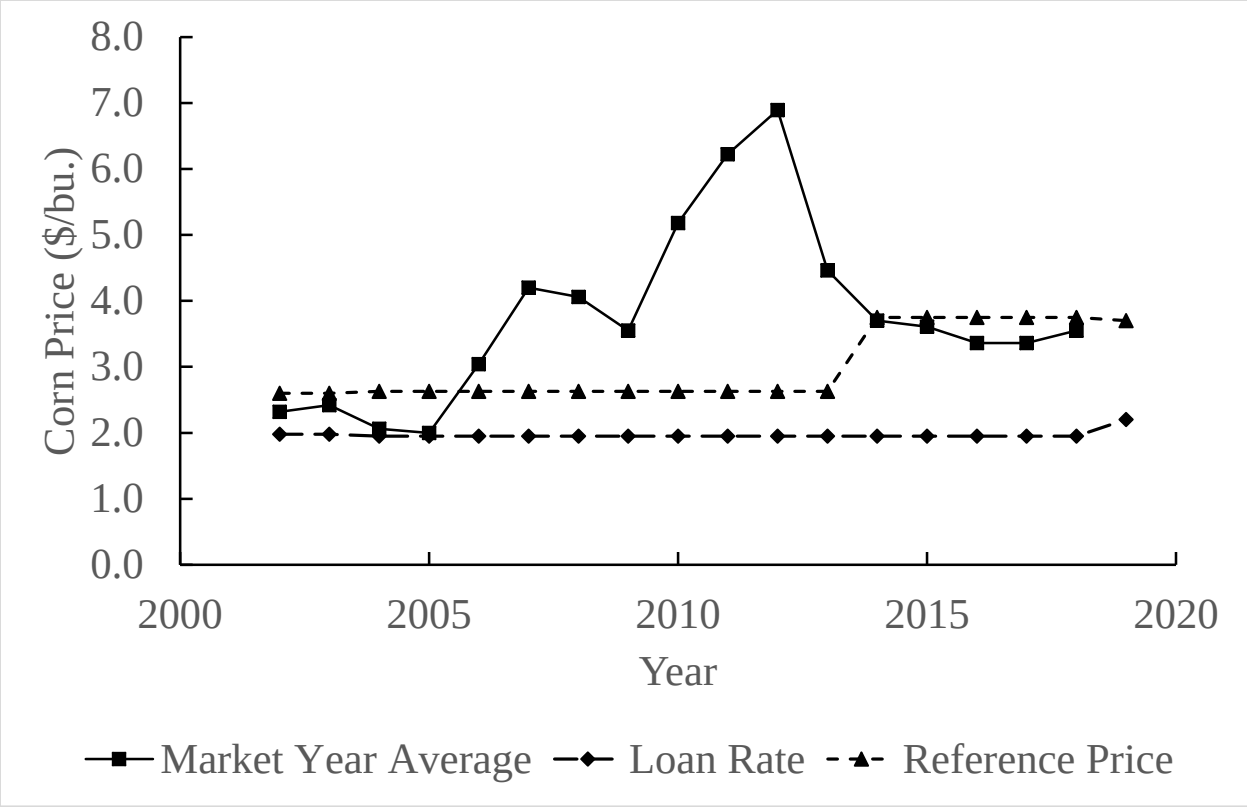

Figure 7.6 Comparison of corn price with loan rate and reference price

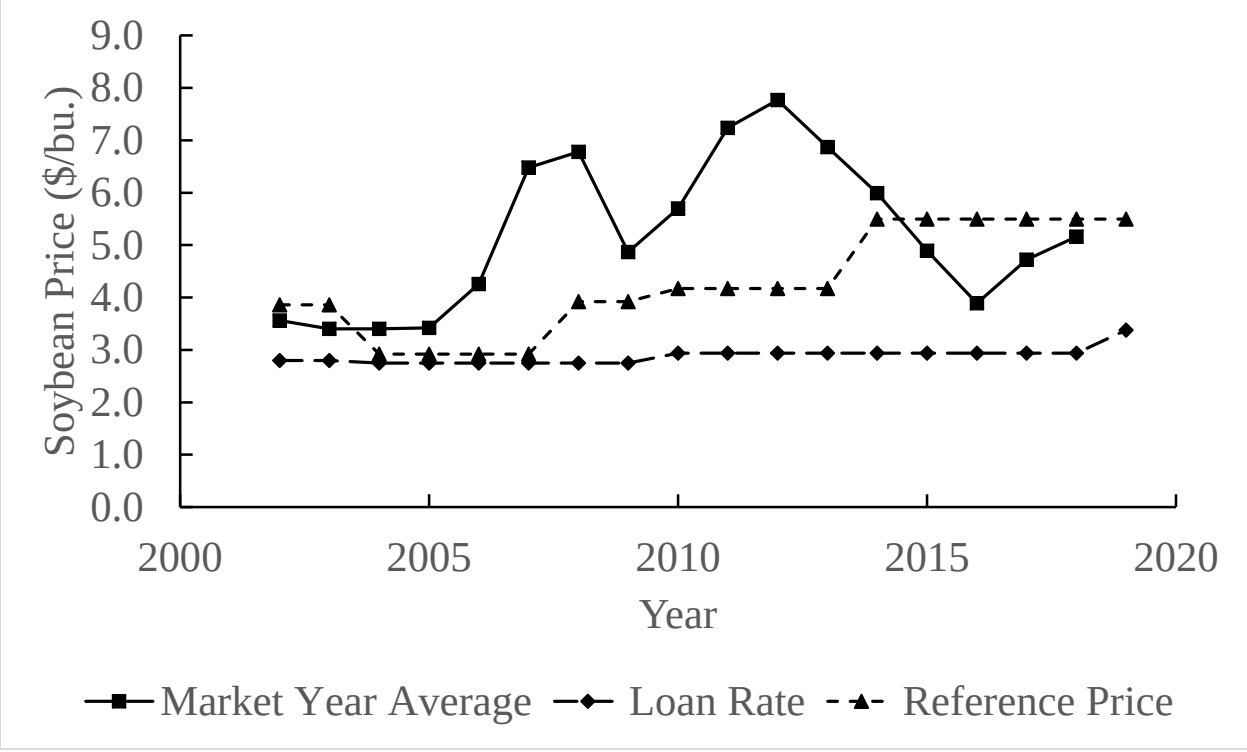

Figure 7.7 Comparison of soybean price with loan rate and reference price

Regardless of the low commodity payments from 2006 through 2018, the overall decline in recent years suggest that program payments may increase in the near future. Specifically, Figures 7.6 and 7.7 illustrate that the PLC program payments may increase, but more dramatic changes will have to occur before commodity prices fall to the loan rate.

Debate continues about the overall effect of farm programs. To what extent are farm programs of a PERT nature or of a PEST nature? Empirically estimating the effect of farm programs is extremely time consuming, and this is perhaps why few empirical estimates about the impacts of policy are available, except for example in the Canadian supply management case and the US tobacco program.

Moving Forward

With the increase emphasis on business risk management and the increase prominence of subsidized crop insurance programs in several countries, new issues about efficient risk-management instruments and the appropriate role of the government are germane. Moreover, one can ask whether any farm programs are still needed at all since farm incomes and wealth have increased significantly after they were introduced during the Great Depression. There is work to be done to ensure the continued evolution and improvement of farm policies worldwide (van Kooten, Orden, and Schmitz 2019: 373

7.8 Summary and Conclusions

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- Agricultural policies in the United States shifted from policies that promoted the development of agricultural resources toward the support of agricultural prices.
- Historically, farm policies attempted to increase farm income by increasing the price received by farmers.
- Early programs attempted to increase farm prices using a two-pronged approach. First, programs reduced the output produced by allotments that limited the amount of product the farmer produced by limiting the farmer's acreage in program crops. Second, the programs allowed for a variety indirect and direct payments to farmers.
- Starting in the 1980s, a variety of policy innovations were implemented to make commodity programs more market oriented. Market orientation culminated with the passage of Federal Agricultural Improvement and Reform Act of 1996, which implemented several policy instruments that attempted to decouple commodity supports from production decisions. The passage of the Food Security and Rural Investment Act of 2002 represented a return to more traditional instruments of commodity programs. More recent Acts (e.g., the Agricultural Act of 2014 and the Agricultural Improvement Act of 2018) have moved toward more market-oriented policies by the introduction of risk-reducing agricultural policies akin to subsidized insurance products such as Agricultural Risk Coverage and the Margin Protection Program for Dairy.
- The US sugar import quota program remains in place despite consumer opposition. The United States is a net importer of sugar. The domestic sugar price is supported with a tariff rate quota that restricts the amount of imported sugar.
- The peanut and tobacco production quota programs were terminated through buyouts where the future rents under the program were purchased by the federal government.
- Farm programs contribute to the value of farmland.

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