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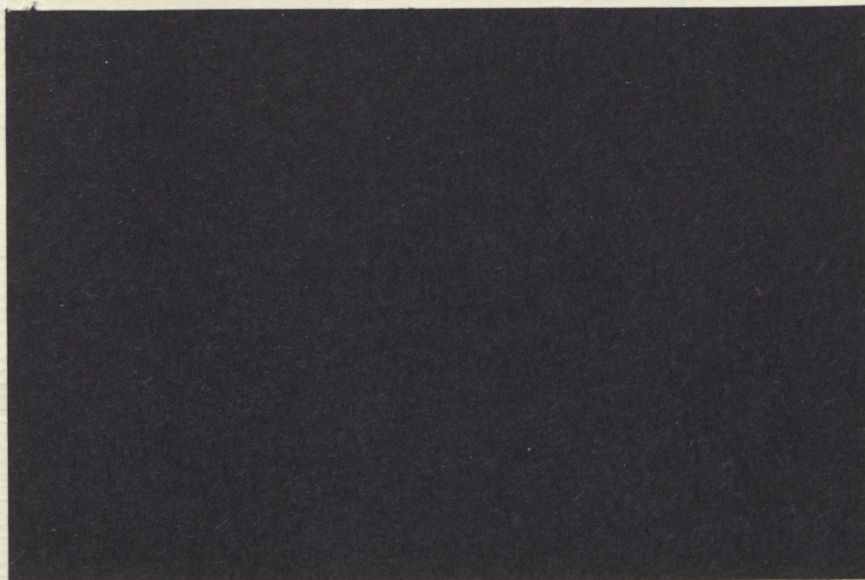
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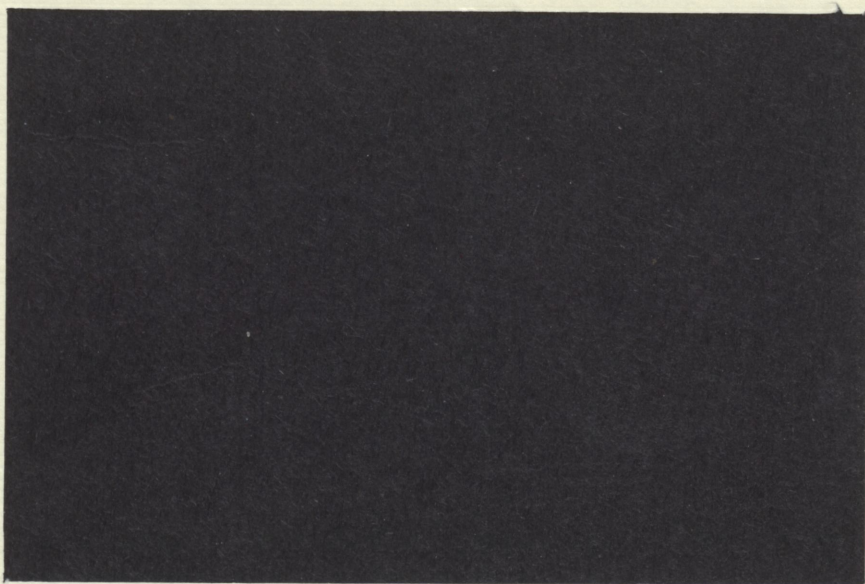


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Documentation of Effective Support
Price and Diversion Payment Series
for Wheat - 1961-1987

by Joe Dillier
and Abner Womack

CNFAP #11-88

October 1988

**Wheat - Effective support price and effective diversion payments
1961-1987**

This paper documents the calculation of the effective support price (ESP) and diversion payment (DP) series for 1961-1987. The first part of the paper gives some justification on the need for these series, as well as the reasoning behind the ESP and DP calculations. The second section notes the way in which programs for the 1961-73 period differed from those over 1974-present, and notes how these differences impact the ESP and DP calculations. The third section covers the yearly ESP calculations over 1961-1987 with documentation on program parameters used in the calculations. The fourth section covers the DP series calculations. A table on page 2 summarizes the results of sections 3 and 4, showing the ESP and DP series for 1961-1987.

Effective Support Price and Diversion Payment - 1961-1987

Year	Total Support Price (\$/bu)	ARP Rate (%)	PLD/PIK (%)	ESP (\$/bu)	DP (\$/bu)
1961	2.00	-	-	2.00	0
1962	2.00	-	10 1/	1.50	0.27
1963	2.00	-	(1) 20 1/ (2) 30 1/	1.52	0.385
1964	2.25	-	(1) 10 1/ (2) 18 1/	1.39	0.05
1965	2.30	10 1/	18 1/	1.41	0.1125
1966	2.57	13 1/	43 1/	1.23	0.215
1967	2.61	-	-	1.71	0
1968	2.63	-	-	1.79	0
1969	2.77	13 1/	43 1/	1.34	0.27
1970	2.82	23 1/	38 1/	1.28	0.24
1971	2.93	25 1/	-	1.46	0
1972	3.02	28 1/	25 1/	1.29	0.24
1973	3.39	27 1/	47 1/	1.19	0.41
1974	2.05	-	-	2.05	0
1975	2.05	-	-	2.05	0
1976	2.29	-	-	2.29	0
1977	2.90	-	-	2.90	0
1978	3.40	20	-	2.72	0
1979	3.40	20	-	2.72	0
1980	3.63	-	-	3.63	0
1981	3.81	-	-	3.81	0
1982	4.05	15	-	3.44	0
1983	4.30	15	5/10-30	3.01	1.47
1984	4.38	20	10/10-20	2.74	0.48
1985	4.38	20	10	3.07	0.27
1986	4.38	22.5	(1) 2.5 (2) 5 or 10	3.07	0.13
1987	4.38	27.5	-	3.18	0

1/ The rate shown was calculated from the announced set-aside rate. See "Notes on ESP calculations for the 1961-73 period" for explanation. See yearly calculation for announced set-aside percentage.

Introduction

WHY AN EFFECTIVE SUPPORT PRICE SERIES?

In projecting planted wheat acreage, one major factor is the extent to which producers are likely to participate in the government's wheat program. Program participation generally requires producers to idle a portion of their productive wheat area in return for program benefits (deficiency payments, nonrecourse loans, etc.). The decision to participate in the program, thus, impacts planted area projections as the idling requirement constrains wheat acreage. The economic decision as to whether to participate in the farm program involves comparing program returns to expected market returns. Regression equations designed to forecast planted wheat area may, therefore, require a series which measures the attractiveness of past wheat programs in terms of the average returns the programs offered. The effective support price (ESP) series is designed to do just that - provide a measure of the average \$/bu. returns offered producers by past wheat programs.

WHAT IS THE EFFECTIVE SUPPORT PRICE?

The method used to derive the ESP series is designed to replicate the process a producer goes through in estimating benefits from program participation. In deciding whether to participate, the producer will ultimately compare estimated program returns to projected market returns. This comparison can be made on either a total return or a return per bushel of production basis. Obviously, both approaches must lead to the same conclusion. The ESP series is calculated on a return per bushel basis. The return per bushel basis, coupled with some relatively minor assumptions, means the ESP turns out to be a simple function of program parameters. Thus, armed only with knowledge of program parameters and requiring no assumptions on yield or acreage levels as would be needed for a total return measure, the ESP series provides a measure of annual average returns offered by past wheat programs.

As an example illustrating the ESP logic and calculations plus implicit assumptions consider the following situation. It is Jan. 1, and a spring wheat producer is trying to decide whether to participate in the government wheat program. The producer has a 100 acre base and his expected average yield is 35 bu./acre. It is assumed his program yield is 35 bu./acre as well. The farm program reflects a target price of \$4.38/bu. with a 20% ARP requirement. The producer expects the market price to average \$3.25/bu. over the coming marketing year.

Program calculations:

$$\begin{aligned}\text{Estimated program production} &= \text{permitted planted area} \times \text{yield} \\ &= (1 - \text{ARP}) \times \text{Base} \times \text{Yield} \\ &= 80 \times 35 \\ &= 2,800 \text{ bushels.}\end{aligned}$$

$$\begin{aligned}\text{Estimated program revenue} &= 2,800 \times 4.38 \\ &= \$12,264.\end{aligned}$$

Market calculations:

$$\begin{aligned}\text{Estimated total production} &= 100 \times 35 \\ &= 3,500 \text{ bushels}\end{aligned}$$

$$\begin{aligned}\text{Projected market revenue} &= 3.25 \times 3,500 \\ &= \$11,375\end{aligned}$$

Note whether the producer takes the market or program option, his total area devoted to wheat is 100 acres. That is,

$$\text{Total area devoted} = \text{permitted planted} + \text{required idled}.$$

For the program, total area devoted = $80 + 20 = 100$.

For the market option, total area devoted = $100 + 0$.

From the above figures, it is obvious this producer would elect to participate in the government program given higher total returns. (Ignoring the cost side here.) Equivalently, the producer could make the market-program comparison on a revenue per bushel basis. The conclusion must be the same. For the market option, the \$/bu. return is simply \$3.25/bu. - the average market price expected. For the program option, the \$/bu. return - the ESP - is \$3.50/bu. (= revenue of \$12,264 divided by total estimated production of 3,500 bushels). Note the conclusion is the same - expected revenue is higher for the program option.

Note that total estimated production of 3,500 bushels was used in putting program revenue on a \$/bu. basis, why? Why not use 2,800 bushels - the amount of production generated under the program? (1) In putting total program revenue on a per unit of production basis, the same production figure used as the denominator for the \$/bu. market return must be used as the denominator in the \$/bu. program return calculation. Otherwise, comparing market-program options based upon total revenues or based upon revenue per unit of output could give rise to different conclusions when obviously the two methods must yield the same conclusion. (2) In order to generate \$12,264 in revenue, this producer was required to devote a total of 100 acres to the wheat program. This 100 acres has the potential to generate 3,500 bushels of wheat.

Now note the various steps involved in calculating the above ESP:

$$\begin{aligned}\text{ESP} &= \text{program revenue} / \text{total estimated production} \\ &= \frac{\text{target price} \times \text{yield} \times (1-\text{ARP}) \times \text{base}}{\text{base} \times \text{yield}} \\ &= \text{target price} \times (1-\text{ARP}).\end{aligned}\quad (1)$$

Another formula, which will come in handy later, is

$$\text{ESP} = \frac{\text{target price} \times \text{permitted area}}{\text{total area devoted.}} \quad (2)$$

Formulas (1) and (2) are equivalent general ESP formulas. Note, with the assumption that program yields = estimated yields production components (acres and yields) "cancel out" of the calculation. And, as asserted above, the ESP turns out to be a simple function of the program parameters.

The ESP is probably best interpreted as a measure of the return offered to producers by the government program on a per bushel per acre devoted basis. Why? Again,

$$\begin{aligned}\text{Program revenue} &= \text{permitted area} \times \text{yield} \times \text{target price} \\ &= \text{Base} \times (1-\text{ARP}) \times \text{yield} \times \text{target price}.\end{aligned}$$

Dividing this by total area devoted yields,

$$\begin{aligned}\text{Revenue per acre devoted} &= \text{program revenue} / \text{total area devoted} \\ &= \frac{\text{Base} \times (1-\text{ARP}) \times \text{yield} \times \text{target price}}{\text{Base}} \\ &= \text{yield} \times (1-\text{ARP}) \times \text{target price}.\end{aligned}$$

Dividing this by yield gives,

$$\begin{aligned}\text{Revenue per bushel per acre devoted} &= \text{target price} \times (1-\text{ARP}).\end{aligned}$$

Note that as the idled area requirement increases, the quantity (1-ARP) becomes smaller and thus the ESP declines. The explanation is that as the idled requirement increases program revenue declines, and as the denominator - total area devoted - remains the same, the ESP declines.

This is the crux of the ESP calculation: averaging program revenue over the total area devoted to generate that revenue. The governments announced support price - the target price in the above example - provides the measure of program revenue and the ESP simply "averages" this revenue measure over total area devoted.

ESP Modified for several program options

The examples and explanation above assume there is only one program option available (i.e. no voluntary paid land diversion programs are available). How is the ESP calculated when various

program options are available? For a given option, an ESP is calculated and the "overall" ESP is defined to be a simple average of the individual option ESPs. To illustrate for an option, i,

$$ESP_i = (1 - [ARP + PLD_i]) \times \text{Target price.}$$

Then,

$$ESP = \frac{1}{n} \sum ESP_i, \text{ where there are } n \text{ program options.}$$

For example, assume there is a 20% ARP, a 10% voluntary PLD rate and the target price is \$4.38/bu. Define option (1) to be the ARP only and option (2) to be the PLD option. Then,

$$\begin{aligned} ESP_1 &= (1 - .2) \times 4.38 \\ &= \$3.50/\text{bu}, \end{aligned}$$

as PLD for option (1) is 0, and thus, $(ARP + PLD_1) = .2$.
For option 2,

$$\begin{aligned} ESP_2 &= (1 - [.2 + .1]) \times \text{Target price} \\ &= \$3.07/\text{bu. as } (ARP + PLD_2) = (.2 + .1) \end{aligned}$$

Finally the "overall" or annual ESP,

$$ESP = 1/2 (ESP_1 + ESP_2) = \$3.29/\text{bu.}$$

An important point to note here is that the diversion payment, for the PLD, is not added into the ESP series. The effective diversion payment series takes the diversion payment into account, and, analogous to the ESP series, the effective diversion payment allocates the announced diversion payment rate over the total area devoted.

Also this example implicitly assumes that the producer has 2 options, either a 20 percent program or a 20 percent plus 10 percent option. In some cases both the ARP and PLD are required for program participation - implying only one option. In this case ESP is computed as:

$$\begin{aligned} ESP &= (1 - .3) \times 4.38 \\ &= \$3.07/\text{bu.} \end{aligned}$$

Notes on ESP calculations for the 1961-73 period.

Over the 1961-73 period, producers were assigned individual allotments by USDA based on a national allotment, which, in turn, was based on estimated total demand for the coming marketing year. Producers received a fraction of the national allotment based upon their historical plantings. The set aside program was also introduced at this time. The set aside percentage (S.A.%), like the acreage reduction program rate (ARP rate) of today designated the amount of area producers were required to idle in order to qualify for either all or select program benefits.

The allotment set aside system worked differently from the base acreage - ARP system in existence today. Unlike the base system, producers were allowed to plant their entire allotment. Set aside area came in addition to the allotment. Under the base system, the total area devoted is equal to the base as:

$$\text{Permitted planted area} = (1 - \text{ARP}) \times \text{Base}.$$

$$\text{Area required idled} = \text{Base} \times \text{ARP}.$$

$$\text{Total area devoted} = \text{Permitted area} + \text{Idled area}.$$

However, with the allotment set aside system,

$$\text{Total area devoted} = (1 + \text{S.A.\%}) \times \text{Allotment},$$

$$\text{as Permitted planted area} = \text{Allotment}$$

$$\text{and Required idled area} = (\text{S.A.\%}) \times \text{Allotment}.$$

This difference impacts the ESP calculation in the following way: Recall from the introduction, a general formula for the ESP is

$$\text{ESP} = \text{Target price} \times \frac{\text{Permitted planted area}}{\text{Total area devoted}}$$

Under the base system then, assuming no PLD options,

$$\begin{aligned} \text{ESP} &= \text{Target price} \times \frac{(1 - \text{ARP}) \times \text{Base}}{\text{Base}} \\ &= \text{Target price} \times (1 - \text{ARP}) \end{aligned}$$

Under the allotment system, assuming no PLD,

$$\begin{aligned} \text{ESP} &= \text{Target price} \times \frac{\text{Allotment}}{(1 + \text{S.A.\%}) \times \text{Allotment}} \\ &= \text{Target price} \times \frac{1}{(1 + \text{S.A.\%})}. \end{aligned}$$

Thus, under the allotment system it does not follow that multiplying the support price by $(1 - \text{S.A.}\%)$ gives the ESP. However, the S.A.% can be put on the more familiar ARP% basis via the formula

$$\frac{1}{1 + \text{S.A.}\%} = 1 - \text{ARP}\% \text{ or}$$

or,
$$\text{ARP}\% = 1 - \frac{1}{1 + \text{S.A.}\%}$$

The more straight forward formula with $\text{ESP} = f(\text{ARP})$ can then be used. In the documentation of the ESP calculations for 1960-1973 below, the equivalent ARP rate is calculated from the given S.A.% by the above formula.

Voluntary additional set aside options were in effect for some years over this period. Set aside for these options came in addition to the minimum required set aside and earned producers direct \$/bu. payments, analogous to the PLD programs of today. For purposes of calculating the annual ESP over this period, it was assumed this additional paid set aside area would have likely come directly out of the allotment, although this was not a program requirement. Producers could have planted their entire allotment and added both the unpaid minimum set aside and any additional paid set aside to the allotment. Given the above assumption, whether an additional paid set aside option was available, total area devoted was assumed to be $(1 + \text{S.A.}\%) \times$ allotment, where S.A.% denotes the minimum, unpaid, idled area requirement. For the base system, the PLD represents the amount of idled area receiving direct payments as a % of the total area devoted or the base. It is possible to put the paid set aside % rate on the more familiar PLD rate basis via the formula

$$\text{PLD} = \frac{\text{Paid S.A.}\%}{(1 + \text{S.A.}\%)}$$

Again for the ESP calculations over 1961-1973, the PLD rate is calculated from the given paid S.A.% rate via the above formula.

Lets look at an example to clarify these concepts. Assume the same target price of \$4.38/bu. from the example in the introduction. Now, however, assume the producer has a 100 acre allotment instead of a 100 acre base and the set aside rate, rather than ARP rate, is 20%. What is the ESP? Again, from the general formula

$$\text{ESP} = \text{Target price} \times \frac{\text{Permitted area}}{\text{Total area devoted.}}$$

For this example,

$$\text{Permitted area} = 100 \text{ acres} = \text{Allotment}$$

$$\text{Required idled area} = .20 \times 100 = 20 \text{ acres.}$$

Total area devoted = 100 + 20 = 120 acres.

$$\begin{aligned} \text{ESP} &= 4.38 \times \frac{100}{120} \\ &= 3.65. \end{aligned}$$

What about calculating the ARP from the S.A.% given? Will this method generate the same ESP? Calculating the ARP rate yields

$$\begin{aligned} \text{ARP rate} &= 1 - \frac{1}{1 + \text{S.A.\%}} \\ &= 1 - \frac{1}{1.2} \\ &= 16.7\%. \end{aligned}$$

$$\begin{aligned} \text{ESP} &= (1 - \text{ARP}\%) \times \text{Target price} \\ &= .83 \times 4.38 \\ &= \$3.65/\text{bu.} \end{aligned}$$

Thus, the calculated ARP rate does, in fact, give rise to the correct ESP. Does the above check with the revenue per bushel per acre devoted basis? Assume estimated yield = 35 bu/acre = program yield. Note,

$$\text{Total program revenue} = 4.38 \times 100 \times 35.$$

Putting this on a per acre devoted basis yields,

$$\text{Revenue per acre devoted} = \frac{4.38 \times 100 \times 35}{120}.$$

Dividing by yield then gives

$$\begin{aligned} \text{Revenue per bushel per acre devoted} &= 4.38 \times \frac{100}{120} \\ &= \$3.65/\text{bu.} \end{aligned}$$

There are some more minor kinks in the ESP calculation over this period. Contrary to the above example, there was no target price - deficiency payment system prior to 1974. Rather the programs offered producers the following combinations: loan rate only (1961-62), loan rate and price support payment (1963), loan rate and domestic and export certificates (1964-65), loan rates and only domestic certificates (1966-73). Program offers in addition to the loan rate - price support payment, domestic and export certificates - were generally paid only on a designated fraction of the producers allotment. This impacts the ESP calculation in that, with a target price, the ESP is a function

of only one government return parameter; the ARP rate enters the calculation but the target price is the only parameter in the calculation which gives a measure of return. Prior to 1974 with no target price, the ESP becomes the summation of the various program return parameters (loan rate, domestic certificate, etc.) multiplied by the amount of the allotment each covered relative to the total area devoted. Remember, the objective is the same whether program returns are represented by a single parameter - target price - or a series of parameters - loan rates, export certificates, etc: allocate the government's payment offer over the total area devoted to be eligible for the payment.

Another example may help to tie these ideas together. Assume a loan rate of \$1.25/bu. a set aside rate of 15% and a domestic certificate payment of \$1.32/bu. to be paid on 45% of production. Assume producer is eligible for the loan rate for his entire production. (These are, in fact, parameters from the 1966 program.) With a 15% set aside, the total area devoted, as the producer can plant the entire allotment, is

$$\begin{aligned}\text{Total area devoted} &= \text{Permitted planted} + \text{Required idled} \\ &= \text{Allotment} + .15 \times \text{Allotment} \\ &= (1.15) \times \text{Allotment}.\end{aligned}$$

The calculated ARP rate is

$$\begin{aligned}\text{ARP} &= 1 - \frac{1}{1 + \text{S.A.}} \\ &= \frac{\text{Idled area}}{\text{Total devoted}} \\ &= \frac{.15}{1.15} = 13\%.\end{aligned}$$

The producer will earn the loan rate on 87% of his total area devoted. If there were no other revenue components, the ESP would be simply $.87 \times 1.25$. However, he also earns the domestic certificate on 45% of his allotment which should be added with the loan rate contribution to get the total ESP. It must first, however, be allocated over the total area devoted. Since the producer will earn the domestic certificate on 45% of his allotment, he will earn the domestic certificate on $45/115 = .39$ of his total devoted area. Then,

$$\text{ESP} = .87(1.25) + .39(1.32) = \underline{1.60}.$$

It has been asserted the ESP measures the program's revenue offer on a revenue per bushel per acre devoted basis. Does the above ESP check with this assertion? Again assume a producer

with a 100 acre allotment and a 35 bu./acre estimated yield and program yield. Then

$$\text{Program revenue} = 100 \times 35 \times 1.25 + 100(.45) \times 1.32.$$

Dividing this by 115 gives,

$$\begin{aligned} \text{Program revenue per acre devoted} \\ &= \frac{100}{115} \times 35 \times 1.25 + \frac{45}{115} \times 1.32. \end{aligned}$$

Dividing by yield gives,

$$\begin{aligned} \text{Revenue per bushel per acre devoted} \\ &= \frac{100}{115} \times 1.25 + \frac{45}{115} \times 1.32 \\ &= .87 \times 1.25 + .39(1.32) \\ &= 1.60 \\ &= \text{ESP above.} \end{aligned}$$

For the programs 1971-73, additional calculations and assumptions must be made to arrive at ESP's and DP's. For these years, a national domestic allotment was specified based on domestic wheat needs rather than an allotment based on total wheat needs, as had been the case in previous years. As such these allotments were far smaller than in previous years, but, in themselves, represented no restriction as producers were allowed to plant as much wheat as desired. The only reason for the allotments was to calculate set aside area and marketing certificate payments. Thus, in these years participating producers had no area "cap" placed on them by USDA, although they still had to meet set aside requirements: the more a producer planted, the more area received program benefits. In order to calculate ESP's and DP's for these years, it was necessary to assume a national allotment number or a maximum total area devoted nationally. The "effective" ARP and PLD rates and ESP's and DP's could then be calculated by assuming set aside as a percentage of total area devoted to be the same at the national level as for the average producer. The national allotment assumed for these years was 59.3 million acres (= 1968 national allotment).

Why 59.3 million acres? In 1968 there were no set aside requirements, the national allotment was 59.3 million acres and with 0% set aside, for the individual, total area devoted was equal to his allotment. In 1969, the national allotment dropped to 51.6 million acres and the set aside requirement went to 15%. Again producers could plant their entire allotment. For the individual, total area devoted was then $1.15 \times \text{allotment}$. Now note $51.6 \times 1.15 = 59.3$. For 1970, the national allotment dropped to 45.5 million acres and set aside went to 30.3%. Again, note $45.5(1.303) = 59.3$. Thus, nationally, 59.3 million acres would have been the amount devoted to wheat under the

programs for 1968, 1969, & 1970, if all those eligible had participated. Thus, we simply assumed that if there were national allotments in 1971-73, then like the previous 3 years, would have been directly related to the 59.3 million acre allotment of 1968.

To calculate ARP and PLD rates for this period, the announced set aside and diversion rates are multiplied by the domestic allotment given. This yields total acreage set aside and diverted with 100% participation. Dividing each by 59.3 million acres gives assumed ARP and PLD rates.

Wheat Effective Support Prices

----- ESP calculations for 1961-1970 are similar -----

1961 No set aside requirements or PLD options.
Loan Rate=\$2.00/Bu. Non-recourse loans were the only revenue offered by the program.

$$\text{ESP}=\underline{2.00}$$

1962 Loan Rate=\$2.00/Bu.

Set-Aside Requirement: 11.11%. Producers allowed to plant entire allotment, but were required to set aside 11.11% of allotment. Thus, producers were required to devote $1.1111 \times$ allotment to wheat area in order to get program benefits. Producers were paid a direct \$/bu. payment for this diversion. Set Aside, as % of total area devoted then equals $.1111/1.1111 \times 100=10\%$.
 $\text{PLD}_1=10\%$, and $\text{ARP}=0\%$.

Additional Voluntary Set-Aside option: 33.33%.
Optional PLD set aside as % of total area devoted equal to $.3333/1.1111=30\%=\text{PLD}_2 \text{ Rate}$.

$$\text{ESP}_1=(2.00) \cdot .9=1.80$$

$$\text{ESP}_2=(2.00) \cdot .6=1.20$$

$$\text{ESP}=(1.80+1.20)/2=\underline{1.50}$$

note: The ARP rate is 0 for the 1962 program since there was no unpaid mandatory set-aside.

1963 Total Support=\$2.00/Bu. Loan Rate=\$1.82/Bu.
Price Support Payment=\$.18/Bu.

Producers had 3 options:

1. Comply with allotment and devote no area to set aside. Eligible for loan only.
2. Reduce plantings from allotment by 20%. For 1963, diverted area had to come out of the allotment. Producers were paid a direct \$/bu. payment for this set aside. Thus, $\text{PLD}_1=20\%$. Also, they qualified for the price support payment.
3. Reduce plantings from allotment by an additional 30%. Again, this was a paid diversion. Thus, $\text{PLD}_2=30\%$.

$$\text{ESP}_1=1.82$$

$$\text{ESP}_2=.8(1.82)+.18=1.64$$

$$\text{ESP}_3=.5(1.82)+.18=1.09$$

$$\text{ESP}=(1.82+1.64+1.09)/3=\underline{1.52}$$

note: The price support payment was made on normal

1963 (cont'd)

production from 100% of allotment. As noted, 1963 producers were required to reduce plantings from their allotments by the set-aside amount. In this way the 1963 program was unique among the 1960-73 programs.

1964 Domestic Certificate=\$.70/Bu. Loan Rate=\$1.30
Export Certificate=\$.25/Bu.

Producers, basically, had 3 options:

- 1) Comply with allotment-devote no area to set aside.
- 2) Comply with allotment (plant full allotment) and devote 11.11% × allotment to set aside.
- 3) Plant full allotment, devote area to set aside as in 2) above and devote additional 20% of allotment to set aside.

Producers were paid diversion payments for both options 2) and 3) above. For option 1), in essence, there would be no set aside and producers were only eligible for loans. For option 2), total area devoted would equal allotment × 1.1111 and thus PLD_2 rate equal to $.1111/1.1111 \times 100 = 10\%$. For option 3) PLD_3 rate = $.2/1.1111 \times 100 = 18\%$, assuming that the additional set aside area came out of the allotment.

Producers were paid domestic and export certificates on 45% of their normal production. They, thus, earned these payments on $.45/1.111 = 40.5\%$ of their total area devoted.

$$ESP_1 = 1.30$$

$$ESP_2 = .9(1.30) + .405(.70) + .405(.25) = 1.55$$

$$ESP_3 = .72(1.30) + .405(.70) + .405(.25) = 1.32$$

$$ESP = (1.30 + 1.55 + 1.32) / 3 = \underline{1.39}$$

1965 Total Support Price=2.30 Domes. Cert.=.75
Loan Rate=1.25 Export Cert.=.30
Set-Aside Requirement: 11.11% of allotment. Total wheat area then is $1.1111 \times$ allotment and set aside is $.1111/1.1111 = 10\% = \underline{ARP \text{ rate}}$.
Paid Set-Aside, Voluntary: 20% of allotment or $.2/1.1111$ in terms of total area devoted to wheat. $.2/1.1111 = 18\% = \underline{PLD \text{ Rate}}$.
Domestic Certificates: Certificates paid on 45% of normal production or $.45/1.1111 \times 100 = 40.5\%$ of total area devoted.
Export Certificates: Paid on 35% of normal production from allotment or $.35/1.1111 = 31.5\%$ of total area devoted.

$$ESP_1 = .90(1.25) + .405(.75) + .315(.30) = 1.52$$

$$ESP_2 = .72(1.25) + .405(.75) + .315(.30) = 1.29$$

$$ESP = (1.52 + 1.29) / 2 = \underline{1.41}$$

1966

Support Price=2.57 Support Price_(t-1)=2.30* L.R.=1.25

* Support price in 1965 is taken here as the sum of
loan+ domestic certificates+ export certificates.

Set-Aside Requirement: 15% of allotment. Again
producers were allowed to plant entire allotment
but were required to devote to conserving uses
acreage equal to .15 × acreage allotment. Total
area devoted to wheat, then, equal to 1.15 ×
allotment. Set aside, as % of total devoted,
equal to .15/1.15=13%=ARP Rate.

Paid Set-Aside, Voluntary: 50% of allotment additional
set aside. Thus, $\text{PLD Rate} = .50/1.15 \times 100 = 43\%$.

Domestic Certificates: certificates paid on 45% of
total production or $.45/1.15 \times 100 = 39\%$ of total area
devoted.

$$\text{ESP}_1 = .87(1.25) + .39(2.30 - 1.25) = 1.50$$

$$\text{ESP}_2 = .44(1.25) + .39(2.30 - 1.25) = .96$$

$$\text{ESP} = (1.50 + .96) / 2 = \underline{1.23}$$

Note: Producers were guaranteed to receive the support
price on the amount of their allotments designated. In
this case, that was 45% of the allotment. However, the
support price for the 1966 program was not announced
until 7/1/66. Given the fact that producers planting
decisions would have already been made, the total
support from the 1965 program was used as a measure of
program returns expected by producers.

1967

Support Price=2.61, Support Price_(t-1)=2.57, L.R.=1.25
No Set-Aside programs in effect.

Domestic certificates were paid on 35% of projected
production.

$$\text{ESP} = 1.25 + .35(2.57 - 1.25) = \$\underline{1.71}$$

note: Support price was not announced until 7/1/67.
Thus, support price in 1966 was assumed.
For more explanation, see 1966 notes.

1968

Support Price=2.63, Support Price_(t-1)=2.61, L.R.=1.25
No Set-Aside programs in effect.

Domestic certificates paid on 40% of projected
production.

$$\text{ESP} = 1.25 + .4(2.61 - 1.25) = \underline{1.79}$$

note: Support price was not announced until 7/1/68.
Thus, support price in 1967 was assumed.
For more explanation, see 1966 notes.

1969

Support Price=\$2.77, Support Price_(t-1)=2.63, L.R.=1.25
 Set Aside-Required: Producers required to set aside 15% of their allotment, but, again, they were allowed to plant their entire allotment. Thus, farmers were required to devote a maximum 1.15 times their allotment to wheat, and $.15/1.15 \times 100 = 13\%$
 = ARP Rate.

Paid Set-Aside: Producers allowed to divert an additional 50% of their allotment for the voluntary paid land diversion. Thus, they could divert an additional $.5/1.15 = 43\%$ of total area devoted to wheat. Thus, $43\% = \text{PLD Rate}$.

Domestic Certificates: Certificates were paid on 43% of projected production. Again, since the parity price used in determining the size of the domestic certificate was not known until July 1, 1969, the support price in t-1 was used in making calculations for ESP. Producers received certificates on $.43/1.15 \times 100 = 38\%$ of their total area devoted to wheat.

$$ESP_1 = .87(1.25) + .38(2.63 - 1.25) = \$1.61$$

$$ESP_2 = .44(1.25) + .38(2.63 - 1.25) = \$1.07$$

$$ESP = (1.61 + 1.07) / 2 = \underline{1.34}$$

1970

Support Price=2.82, Support Price_(t-1)=2.77, L.R.=1.25
 Set Aside Requirements=30.3% of allotment. Producers were allowed to plant entire allotment, but were required to idle an amount equal to 30.3% of their allotment. Thus, producers had to devote 1.303 times their allotment to wheat to earn program benefits. Of the total devoted to wheat, producers were thus required to set aside $.303/1.303 = 23\% = \text{ARP Rate}$.

Paid Set-Aside: Producers could idle an additional 50% of allotment or $.5/1.303 \times 100 = 38\%$ of total area devoted to wheat. Thus, $38\% = \text{PLD Rate}$.

Domestic Certificates: Producers received domestic certificates on 48% of projected production. Assuming they planted their entire allotment, they thus received payments on $.48/1.303 = 37\%$ of their entire area devoted to wheat. The domestic certificates insured that farmers received 100% of parity on the proportion of area designated (48% of their farm allotment in this case). However, since the parity price for a given marketing year was not determined until July 1, of that year, and since farmers planting decisions would already have been made, the support price in year t-1 is used in the ESP calculations.

1970 (cont'd)

$$ESP_1 = .77(1.25) + .37(2.77 - 1.25) = 1.52$$

$$ESP_2 = .39(1.25) + .37(2.77 - 1.25) = 1.05$$

$$ESP = (1.52 + 1.05) / 2 = \underline{1.28}$$

-----Note: ESP Calculations for 1971-73 are similar-----

1971 Support Price=2.93, Support Price_(t-1)=2.82, L.R.=1.25
National Domestic Allotment=19.7
Assumed Allotment=59.3 million acres=1968 Actual Allotment

Required Set Aside= 75% of farm domestic allotment
= (.75)(19.7)=14.78 and 14.78/59.3=25% ARP Rate
No PLD Programs in effect.

Domestic Certificates paid on 100% of domestic allotment. Thus,

19.7/59.3=.33= proportion of acreage receiving domestic certificates.

$$ESP = .75(1.25) + .33(2.82 - 1.25) = \underline{1.46}$$

Again, the support price guaranteed that producers would receive the support price on the amount of area designated. Support price was not announced until July 1, 1971, thus support price in t-1 used in ESP. For justification as to why 59.3 million acre allotment assumed, see notes on ESP calculations for the 1961-73 period.

1972 Support price=3.02, Support price_(t-1)=2.93, L.R.=1.25
National Domestic Allotment=19.7 m. acres
Assumed Allotment=59.3 m. acres=Actual 1968 Allotment
Required Set Aside= 83% of Domestic Allotment

$$= .83 \times 19.7 = 16.35 (16.35 / 59.3) \times 100 \\ = 28\% = \text{ARP Rate}$$

Voluntary Additional PLD=Additional 75% of Domestic Allotment
= (.75)19.7=14.78, (14.78/59.3)×100
=25% PLD Rate.

Domestic certificates paid on 100% of domestic allotment.

Thus,

19.7/59.3=.33=percentage of acreage receiving domestic certificates.

options: i) $ESP_1 = .72(1.25) + .33(2.93 - 1.25) = 1.45$

ii) $ESP_2 = .47(1.25) + .33(2.93 - 1.25) = 1.14$

$$ESP = (1.45 + 1.14) / 2 = \underline{1.29}$$

note: Assumptions made for above calculations similar to those for 1971.

1973 Support Price=\$3.39, L.R.=\$1.25, Support Price_{t-1}=3.02
National Domestic Allotment= 18.7 million acres
Set Aside Requirement=86% of domestic allotment
Assume 59.3 million acre national allotment.
Required Acreage Set-Aside=.86×18.7=16.1,
16.1/59.3=27% ARP
Vol. Additional Diverted=1.5×18.7=28.05,
28.05/59.3=47% PLD
Domestic certificates paid on 100% of domestic
allotment.
Domestic Allotment/Assumed Allotment=18.7/59.3=32%

options: i) $ESP_1 = .73(1.25) + .32(3.02 - 1.25) = 1.48$
 ii) $ESP_2 = .26(1.25) + .32(3.02 - 1.25) = .89$

$ESP = (1.48 + .89) / 2 = \1.19

notes: see explanation on 1971.

-----Note: ESP calculations for 1974-87 are similar-----

1974 T.P. 2.05
 L.R. 1.37
 ARP 0%
 PLD 0%

ESP=2.05

1975 T.P. 2.05
 L.R. 1.37
 ARP 0%
 PLD 0%

ESP=2.05

1976 T.P. 2.29
 L.R. 2.25
 ARP 0%
 PLD 0%

ESP=2.29

1977 T.P. 2.90
 L.R. 2.25
 ARP 0%
 PLD 0%

ESP=2.90

1978 T.P. 3.40
 L.R. 2.35
 ARP 20%
 PLD 0%

$$ESP = .8(3.40) = 2.72$$

1979 T.P. 3.40
 L.R. 2.50
 ARP 20%
 PLD 0%

$$ESP = .8(3.40) = 2.72$$

1980 T.P. 3.63
 L.R. 3.00
 ARP 0%
 PLD 0%

$$ESP = \underline{3.63}$$

1981 T.P. 3.81
 L.R. 3.20
 ARP 0%
 PLD 0%

$$ESP = \underline{3.81}$$

1982 T.P. 4.05
 L.R. 3.55
 ARP 15%
 PLD 0%

$$ESP = .85(4.05) = \underline{3.44}$$

1983 T.P. 4.30
 L.R. 3.65
 ARP 15%

PLD=5% Mandatory. Payment Rate=\$2.70/Bu.

PIK 10-30% Voluntary-payment rate set at 95% of normal production on added set aside. Also, whole base PIK option with 95% payment rate.

Options:

$$ESP_1 = .8(4.30) = 3.44$$

$$ESP = \underline{3.01}$$

$$ESP_2 = .6(4.30) = 2.58$$

note: for option 2, PIK set aside assumed at 20%-midpoint of optional range. Also, the whole base PIK option, option 3, would imply an ESP_3 of 0. As this would pull down the ESP drastically, it was ignored.

1984 T.P. 4.38
 L.R. 3.30
 ARP 20%

PLD=10% Mandatory. Payment Rate=\$2.70/Bu.
PIK 10-20% Voluntary w/ Payment Rate=85% of normal
production on set aside acreage.

Options:

$$ESP_1 = .7(4.38) = 3.07$$

$$ESP_2 = .55(4.38) = 2.41$$

$$ESP = \underline{2.74}$$

Note: For option 2, PIK set aside assumed at 15%.

1985 T.P. 4.38
 L.R. 3.30
 ARP 20%

PLD=10% Mandatory. Payment Rate=\$2.70/Bu.

$$ESP = .7(4.38) = \underline{3.07}$$

1986 T.P. 4.38
 L.R. 2.40
 ARP 22.5%

PLD=2.5% Mandatory. Payment Rate=\$1.10/Bu.
Additional 5 or 10% Voluntary PLD w/ payment rate
\$2.00/Bu.

Options:

$$ESP_1 = .75(4.38) = 3.29$$

$$ESP_2 = .65(4.38) = 2.85$$

$$ESP_3 = .7(4.38) = 3.07$$

$$ESP = \underline{3.07}$$

1987 T.P. 4.38
 L.R. 2.28
 ARP 27.5%
 PLD 0.0%

$$ESP_1 = (.725)(4.38) = 3.18$$

Wheat Effective diversion payment rates 1961-1987

The wheat effective diversion payment (DP) series represents the same concept as the ESP: allocate the government's diversion payment rate over the total area required devoted to earn the payment. The general DP formula is

$$DP = PLD \text{ Rate} \times \text{payment rate.}$$

when multiple PLD options are available the "overall" DP is simply the average of the DP's for each option. For years prior to 1974, given the allotment-paid set aside system, the equivalent PLD rate must be calculated from the announced paid set-aside rate. (See "notes on ESP calculations for the 1961-73 period" for explanation.)

An example will verify that calculating the DP in the manner given by the above formula puts the announced diversion payment rate on a per bushel per acre devoted basis. Assume the payment rate is 2.00/bu. and a producer has a 100 acre base with a 35 bu/acre program yield. Then, for this producer,

$$\text{total diversion revenue} = 100 \times (.10) \times 35 \times 2.00.$$

Dividing by the total area required devoted of 100 acres yields,

$$\text{diversion revenue per acre devoted} = .10 \times 35 \times 2.00.$$

Putting this on a per bushel basis gives,

$$\begin{aligned} \text{diversion revenue per bushel per acre devoted} &= .10 \times 2.00 \\ &= PLD \text{ rate} \times \text{payment rate.} \end{aligned}$$

1961 No PLD programs

$$DP = \underline{0}$$

1962 Producers were paid (1) for devoting to set aside an area equal to 11.11% × allotment and (2) an additional area equal to 33.33% × allotment.

$$PLD \text{ Rate (1)} = .1111 / 1.1111 = 10\%$$

$$PLD \text{ Rate (2)} = .3333 / 1.1111 = 30\%$$

$$\text{Payment rate for option (1)} = 2.00 \times .45 = .90.$$

$$\text{Payment rate for option (2)} = 2.00 \times .60 = 1.20.$$

See ESP documentation on calculation of PLD rate.

$$DP_1 = (.1) .9 = .09$$

$$DP = (.09 + .45) / 2 = \underline{.27/bu.}$$

$$DP_2 = .3(1.20) + .09 = .45$$

note: For the PLD payment rate, producers were paid the loan rate on 45% and 60% of their normal production for options (1) and (2), respectively. The loan rate was \$2.00/bu.

1963 Producers were paid for setting aside (1) 20% of their allotment or (2) an additional 30%. Thus, PLD rates=20% and 30%. Diversion area came out of allotment (See ESP notes).

Payment rate (\$/bu.) per acre diverted=.5×1.82=.91
For the PLD, producers were paid the loan rate,
\$1.82/bu., on 50% of their normal production.

$$DP_1 = (.2) .91 = .1820$$

$$DP_2 = (.3) .91 + .182 = .455$$

$$DP = (.1820 + .455) / 2 = \underline{.385}$$

1964 Two options:

- 1) PLD Rate = 10%*
- 2) PLD Rate = 18%

Payment Rate = (.2) 1.30 = .26 = loan rate × 20% of projected production from diverted area, in \$/bu.

$$DP_1 = (.1) (.26) = .026$$

$$DP = (.026 + .0728) / 2 = \underline{.05}$$

$$DP_2 = (.18) (.26) + .026 = .10$$

* See effective support rate documentation for explanation

1965

PLD Rate = 18%*

Payment Rate = .5(1.25) = .625 = loan rate × 50% of production.

$$(.18) (.625) = \underline{.1125}$$

* See effective support rate documentation for explanation

1966

PLD Rate = 43%*

Payment Rate .4(1.25) = .50 = loan rate × 40% of production

$$DP = .43(.50) = \underline{.2150}$$

* See wheat effective support rate documentation for explanation

1967

No ARP or PLD programs.

$$DP = \underline{0}$$

1968 No ARP or PLD programs.
DP=0

1969 PLD rate = at 43%*
Payment Rate @ $.5(1.25) = .625$ = Loan rate paid on .50 of projected production.
DP= $.43(.625) = .27$
* See wheat effective support rate documentation for explanation.

1970 PLD Rate=38%*
Payment Rate= $1.25 \times .5 = .625$ = county loan rate times 50% of projected production.
DP= $(.38) .625 = .24$
* See wheat effective support rate documentation for explanation.

1971 No optional PLD Program DP=0

1972 Optional Set-Aside= 75% of domestic allotment.
Domestic allotment=19.7 million acres
Assumed national allotment=59.3 million acres (see ESP documentation)
PLD as % of national allotment= $.75(19.7)/59.3 = .25$ = PLD rate. PLD payment rate= \$.94/bu.
DP= $(.94) .25 = .24$

1973 Optional Paid Set-Aside= 150% of domestic allotment.
Domestic allotment=18.7 million acres
Assumed national allotment=59.3 million acres
(see ESP wheat documentation for explanation.)
Optional Set-Aside as % of national allotment
= $(1.5)18.7/59.3 = 47\%$ = PLD rate assumed. Payment rate= \$.88/bu.
DP= $(.88) (.47) = .41$

1974 No PLD DP=0

1975 No PLD DP=0

1976 NO PLD DP=0

1977 NO PLD DP=0

1978 No PLD DP=0

1979 NO PLD DP=0

1980 NO PLD DP=0

1981 No PLD DP=0

1982 No PLD DP=0

1983 i) 5% PLD mandatory. Payment rate=\$2.70/bu.
ii) 10-30% optional. PIK payment rate=95%.
iii) Whole base bid option - 95% maximum PIK payment rate (i.e. 95% of program yield).

$$DP_1 = (.05)(2.70) = .135$$

$$DP_2 = (.2)(.95)(3.65) + .135 = .83$$

$$DP_3 = (.95)(.95)(3.65) + .135 = 3.43$$

$$DP = (.135 + .83 + 3.43) / 3 = \underline{1.47}$$

Notes: Have mandatory diversion thus, DP_1 is added into DP_2 and DP_3 . PIK valued at loan rate. For option 2, midpoint of range assumed.

1984 Two options:
i) 10% PLD mandatory. Payment rate=\$2.70/bu.
ii) 10-20% optional PLD. PIK payment rate at 85% of normal production on set aside acres.

$$DP_1 = (.1)(2.70) = .27$$

$$DP_2 = (.85)(.15)(3.30) + .27 = .69$$

$$DP = (.27 + .69) / 2 = \underline{.48/bu.}$$

note: For DP_2 midpoint of optional PLD range is assumed. Also, DP_1 is mandatory, thus it is added into DP_2 . PIK valued at loan rate.

1985 10% PLD mandatory.
 \$2.70/Bu. Payment rate.
 No voluntary PLD.

$$DP = (.10)(2.70) = \underline{.27/bu.}$$

1986 Options:
 i) 2.5% PLD mandatory.
 ii) 5% voluntary.
 iii) 10% voluntary.

For option i), payment rate was \$1.10/bu.
For option ii), payment rate was \$2.00/bu.
For option iii), payment rate was \$2.00/bu.

$$DP_1 = .025(1.10) = .028$$

$$DP_2 = (2.00)(.1) + .028 = .228 \quad DP = (.028 + .228 + .128) / 3 = \underline{.13/bu}$$

$$DP_3 = (2.00)(.05) + .028 = .128$$

note: Since DP_1 is mandatory it is added into both DP_2
and DP_3 .

1987 DP=0 No diversion program was offered.

