



Current Report

Cooperative Extension Service • Division of Agriculture • Oklahoma State University

Risk Related Decision Making Series

VISCALC Template to Analyze the 1984 Government Wheat Program

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Required Equipment

Viscalc templates are available for Apple II and TRS-80 Models II, XII and XVI with Enhanced Viscalc. A copy of the template can be obtained by contacting the authors.

Advantage of Risk Rated Approach

The 1983 decision to participate or not participate in the government acreage reduction program and/or the payment-in-kind program is a critical decision. With the expected wheat carryover of 1.5 billion bushels and a strong potential for low participation in the program, the harvest price of wheat in 1984 could dip below \$3 per bushel. Also, if wheat yields are reduced by a drought and exports increase, the price of wheat could top \$4 per bushel. No one knows what prices and yields will be. A risk oriented approach allows evaluation where uncertainty exists. This approach shows both the risk of bad outcomes and the potential for good outcomes, thus enhancing the decision process.

1984 Government Program Summary

Provisions of the 1984 government wheat program include:

- A \$4.45 per bushel target price.
- A \$3.30 per bushel national average loan rate.
- No advanced deficiency payment.
- An acreage reduction requirement of 30 percent.
- Farmers participating in the acreage reduction program may divert an

additional 10 to 20 percent of their wheat base and receive payment-in-kind equal to 75 percent of their wheat base yield times the PIK acres diverted.

- 1984 acreage bases will be an average of 1982 and 1983 planted and considered planted acres.
- PIK program participants will not receive wheat from Commodity Credit Corporation stocks. PIK grain will be received in the following order and only to the extent the producer owns grain in: a) reserve loans, b) regular CCC price support loans, and/or c) harvest for PIK. But, if an insufficient amount is harvested to meet PIK requirements, the PIK requirements will not be made up.
- Haying will not be permitted on the conservation use acreage.
- Grazing will be permitted during the six principal growing months.
- Contracts signed by participants for either ARP or PIK will be considered binding and penalties will be accessed for noncompliance.
- If the producer doesn't sign up or comply, no benefits are received.
- Signup is between January 14 and February 26.

Additional information should be obtained from your county ASCS office. Also, the provisions are subject to change.

Risk Rated Decisions

To analyze a situation, the producer should estimate yields and prices. These estimates should include an optimistic, an expected and a pessimistic value. In turn, the net returns will be calculated as optimistic, expected and pessimistic.

The optimistic rating should be assigned a favorable outcome at the one-sixth chance level. Thus, there is one-chance-in-six of an outcome as good or better than an optimistic rated outcome. The expected rating may be assigned the most likely outcome. There is a 50-50 chance that the outcome will be greater than or less than the expected value. The pessimistic rating should be assigned an unfavorable outcome at the one-sixth chance level. Thus, there would be one-chance-in-six of an outcome worse than the pessimistic rating.

For the analysis below, the expected price per bushel is \$3.43. Thus, there is an estimated 50 percent chance that the 1984 harvest wheat price will be below \$3.43 and a 50 percent chance that the price will be above \$3.43.

The optimistic harvest price is \$4.05. Thus, there is an estimated one-in-six chance that the harvest price of wheat will be greater than \$4.05 per bushel. The pessimistic harvest price is \$2.81. Thus, there is an estimated one-in-six chance that the harvest wheat price will be below \$2.81 per bushel. Note that the optimistic and pessimistic prices are not extreme prices but may be thought of as average highs or lows.

Research has shown that wheat price forecast by competent forecasters or forecasts based on the futures market price have had errors of about 18 percent for a one-year forecast, about 16 percent for a nine-month forecast, about 14 percent for a six-month forecast and about 13 percent for a three-month forecast. Thus, as a thumb rule, the optimistic price equals the expected price multiplied by 1.18 for a one-year forecast, 1.16 for a six-month forecast, 1.14 for a

three-month forecast, etc. ($\$3.43 \times 1.18 = \4.05). To obtain the pessimistic price, multiply the expected price by one minus the error term ($1 - .18 = .82$; $\$3.43 \times .82 = \2.81). The decision maker may want to alter the optimistic and pessimistic values to fit their own risk assessment.

Producers should calculate yield error terms for their farm. Estimates of optimistic, expected and pessimistic yields may be based on past yields.

Using The Viscalc Template

The template is set on row and manual calculation. Thus, an exclamation point (!) must be entered too for calculations to be made. The template input format is shown in Table 1. Line 47, ACREAGE Harvested if NON-PART., is the number of acres that will be harvested if the producer does not sign up for the government program.

Line 48, ASCS Base, is the average of the 1982 and 1983 ASCS wheat base acres. This value can be obtained from the county ASCS office and may be different than the value entered in line 47.

The prices entered in lines 51, 52 and 53 are explained in the "Risk Rated Decisions" section above.

The loan rate entered in line 55 should be the county loan rate. The \$3.30 value on the template is the national loan average. The county loan rate can be obtained from the county ASCS office.

Storage cost estimates can be obtained from a local elevator or by calculating on-farm storage costs from local farm records. Storage cost should be entered as cost per month.

Optimistic, expected and pessimistic yield estimates are entered in lines 63, 64 and 65. Optimistic and pessimistic yield values should be determined in the same manner as optimistic and pessimistic prices. The only difference is that the

variability will be different for each farm; thus, thumb rules are not as applicable. Research has indicated that plus or minus 6 bushels per acre is a rough estimate of the optimistic-pessimistic range. As expected bushels per acre increases, the range increases.

Line 66, ASCS Program Yield for the farm being analyzed, should be obtained from the county ASCS office. The value may differ from the expected yield used in line 64.

Values for the STOCKERS section should be obtained by running the VISALC program "LVSTRISK". Two runs are required to analyze the optimistic, expected and pessimistic net returns for selling the stockers around March 1st and for selling the stockers around May 1st. The per head net returns should be entered in the appropriate line between lines 70 and 82. The stocking rate for winter pasture should be entered in line 70 and the graze-out stocking rate should be entered in line 78. Note that total net return should be entered in both lines 72, 73 and 74 and in lines 80, 81 and 82. The same net return is used for all government program acres. Thus, to analyze an increased number of stockers for PIK, an additional analysis must be conducted or the coefficients must be changed in cells F106, F107, F108, N105, N106, N107, P105, P106 and P107. Unless stockers have been wintered on another farm, this change does not appear logical.

Line 84, PRICE-COST CORRELATION, is used to adjust the optimistic and pessimistic net return values for the relationship between selling price and production cost per bushel (yield). If low yields are associated with high selling prices, then the correlation would probably be about -.3. If low yields are associated with low selling prices, the correlation would be about .3. If yields have not relationship to price the value in line 32 would be 0.

The output from the above input is shown in Table 2. CALCULATED: Harvested Yield (Bu./Ac.) is adjusted as poorer cropland removed from production due to the government program. Yield is unchanged for non-participation. Yield is increased 5 percent for 30 percent acreage reduction, 7 percent for APR plus 10 percent PIK, and 8 percent for APR plus 20 percent PIK. The increases can be altered by changing the equations in cells F96, G96 and H36.

Calculated PIK bushels are the total bushels of wheat that will be given to the producer as PIK payments.

To determine the deficiency payment, the larger of the \$3.30 loan or the expected cash price is subtracted from the \$4.45 target price. In this example, \$3.43 was subtracted from \$4.45 to determine a \$1.02 per bushel deficiency payment. To account for the interest cost for receiving the deficiency payment in December, \$1.02 was multiplied by 0.94. This is equivalent to a 1 percent per month interest cost. The interest cost can be modified on the template in cells F94, G94 and H94. The payment amount is based on the per bushel payment, the harvested acres and the ASCS Program Yield.

PRODUCTION COST (\$/Bu.) is calculated by dividing the total production cost by the total bushels produced. Note that the adjusted yields are used. For example, with 30 percent APR the expected cost per bushel is \$2.49 ($105 \times .7 + 60 \times .3 = 91.5$, $91.5 / 36.75 = \$2.49$). Optimistic cost per bushel is \$2.14. Pessimistic cost per bushel is \$2.98.

Net return is presented on a per acre basis and for total acres. Net return is expected to be greater than the optimistic return one time out of six, less than the pessimistic value one time out of six, and either greater or less than the expected value 50 percent of the time. For example, with non-participation, net return will be greater than \$45 per acre

one time out of six. Net return will be less than \$-21 one time out of six. And, there is a 50 percent chance that net return will be greater or less than \$15. If the expected wheat price is greater than the loan rate minus nine months storage, then the wheat produced in the government program is assumed to be sold on the cash market.

The probability that net return will be greater than zero is given as the PROBABILITY OF: Positive Net Returns. And, the PROBABILITY OF: a Negative Net Return is the chance that net return will be less than zero.

Table 2. Output Table for Wheat Program Analysis

ITEM	NON-PART	30% ARP	10% PIK	20% PIK
CALCULATED:				
Harvested Yield (BU./AC.)	35	36.75	37.45	37.8
Payment In Kind (BU.)			262.5	525
Difficiency Payment (\$)		2499	2142	1785
PRODUCTION COST (\$/BU.)				
Optimistic	2.56	2.14	2.00	1.88
Expected	3.00	2.49	2.32	1.18
Pessimistic	3.62	2.98	2.77	2.59
NET RETURN PER ACRE (\$/AC.)				
Optimistic	42.87	50.25	47.73	43.44
Expected	15.05	31.18	31.30	29.43
Pessimistic	-17.09	14.52	16.93	17.11
NET RETURN TOTAL (\$)				
Optimistic	4287	5025	4773	4344
Expected	1505	3118	3130	2943
Pessimistic	-1709	1452	1693	1711
PROBABILITY OF:				
Positive Net Returns	0.68	0.97	0.99	0.99
Negative Net Returns	0.32	0.03	0.01	0.01

Table 1. Input Table for Wheat Government Program

DESCRIPTION	INPUT VALUE	YOUR VALUE
ACREAGE (AC.)		
Harvested if NON-PART.	100	
ASCS Base	100	
CASH PRICE (\$/BU.)		
Optimistic	4.05	
Expected	3.43	
Pessimistic	2.81	
LOAN RATE (\$/BU.)	3.30	
STORAGE COST (\$/MONTH)	.028	
PRODUCTION COST (\$/AC.)		
For Acreage Harvested	105	
For Acreage Not Harvested	60	
YIELD (BU./AC.)		
Optimistic	41	
Expected	35	
Pessimistic	29	
ASCS Program Yield	35	
STOCKERS: ON ACREAGE TO BE HARVESTED (MARCH 1st SALE)		
Stocking Rate (HD./AC.)	0	
NET RETURNS (\$/HD.)		
Optimistic	0	
Expected	0	
Pessimistic	0	
STOCKERS: ON GOVERNMENT ACRES (MAY 1st SALE)		
Stocking Rate (HD./AC.)	0	
NET RETURNS (\$/HD.)		
Optimistic	0	
Expected	0	
Pessimistic	0	
PRICE-COST CORRELATION	-0.10	

Appendix A.

Following are the equations for the government wheat program template. The titles can be obtained from Tables 1 and 2. Rows 1 through 42 contained instructions.

```

>H117:/F$1-H116
>G117:/F$1-G116
>F117:/F$1-F116
>E117:/F$1-E116
>H116:/F$@IF(Y114,(AC114),1-AC114)
>G116:/F$@IF(T114,(X114),1-X114)
>F116:/F$@IF(O114,(S114),1-S114)
>E116:/F$@IF(J114,(N114),1-N114)
>AC114:+AB114*((.31938153*AA114)-(.356563782*(AA114^2))+
  (1.781477937*(AA114^3))-(1.821255978*(AA114^4))+
  (1.330274429*(AA114^5)))
>AB114:.398942281*((2.71828)^((-Z114^2)/2))
>AA114:1/(1+(.2316419*Z114))
>Z114:@MIN(2.5,@ABS((H107-0)/@IF(Y114,P105,P106)))
>Y114:(H107<0)
>X114:+W114*((.31938153*V114)-(.356563782*(V114^2))+
  (1.781477937*(V114^3))-(1.821255978*(V114^4))+
  (1.330274429*(V114^5)))
>W114:.398942281*((2.71828)^((-U114^2)/2))
>V114:1/(1+(.2316419*U114))
>U114:@MIN(2.5,@ABS((G107-0)/@IF(T114,O105,O106)))
>T114:(G107<0)
>S114:+R114*((.31938153*Q114)-(.356563782*(Q114^2))+
  (1.781477937*(Q114^3))-(1.821255978*(Q114^4))+
  (1.330274429*(Q114^5)))
>R114:.398942281*((2.71828)^((-P114^2)/2))
>Q114:1/(1+(.2316419*P114))
>P114:@MIN(2.5,@ABS((F107-0)/@IF(O114,N105,N106)))
>O114:(F107<0)
>N114:+M114*((.31938153*L114)-(.356563782*(L114^2))+
  (1.781477937*(L114^3))-(1.821255978*(L114^4))+
  (1.330274429*(L114^5)))
>M114:.398942281*((2.71828)^((-K114^2)/2))
>L114:1/(1+(.2316419*K114))
>K114:@MIN(2.5,@ABS((E107-0)/@IF(J114,M105,M106)))
>J114:(E107<0)
>H113:/FI(H108*E48)
>G113:/FI(G108*E48)
>F113:/FI(F108*E48)
>E113:/FI(E108*E47)
>H112:/FI(H107)*E48
>G112:/FI(G107)*E48
>F112:/FI(F107)*E48
>E112:/FI(E107)*E47
>H111:/FI(H106*E48)
>G111:/FI(G106*E48)
>F111:/FI(F106*E48)
>E111:/FI(E106*E47)
>H108:/F$(H107-P106)
>G108:/F$(G107-O106)
>F108:/F$(F107-N106)
>E108:/F$(E107-M106)

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>H107:/F\$(H106-P105)
 >G107:/F\$(G106-O105)
 >F107:/F\$(F106-N105)
 >E107:/F\$(E106-M105)
 >P106:@SQRT(((N104*.5)^2)+(N96^2)+(((E52-E53)*E66*.2*.75)^2))
 >O106:@SQRT(((N104*.6)^2)+(N96^2)+(((E52-E53)*E66*.1*.75)^2))
 >N106:@SQRT(((N104*.7)^2)+(N96^2))
 >M106:@SQRT((N103^2)+(N94^2))
 >H106:/F\$(K56-H102)*H96*.5+(H98/E48)-(E60*.5)+(E66*.75*E52*.2)+
 (E78*E81*.3)+P105
 >G106:/F\$(K56-G102)*G96*.6+(G98/E48)-(E60*.4)+(E66*.75*E52*.1)+
 (E81*E78*.3)+O105
 >F106:/F\$(K56-F102)*F96*.7+(F98/E48)-(E60*.3)+(E81*E78*.3)+N105
 >E106:/F\$(E52-E102)*E96+(E73*E70)+M105
 >P105:@SQRT(((M104*.5)^2)+(M96^2)+(((E51-E52)*E66*.2*.75)^2))
 >O105:@SQRT(((M104*.6)^2)+(M96^2)+(((E51-E52)*E66*.1*.75)^2))
 >N105:@SQRT(((M104*.7)^2)+(M96^2))
 >M105:@SQRT((M103^2)+(M94^2))
 >N104:@SQRT(((K56-J56)/2)^2)+((F103-F102)^2)-(2*((K56-J56)/2)*(F103-
 F102)*E84)*(F96^2))
 >M104:@SQRT(((E51-K56)^2)+((F102-F101)^2)-(2*(E51-K56)*(F102-F101)*
 E84)*(F96^2))
 >N103:@SQRT(((E52-E53)^2)+((E103-E102)^2)-(2*(E52-E53)*(E103-E102)*
 E84)*(E96^2))
 >M103:@SQRT(((E51-E52)^2)+((E102-E101)^2)-(2*(E51-E52)*(E102-E101)*
 E84)*(E96^2))
 >H103:/F\$((E59*.5)+(E60*.5)/(E65-E96+H96))
 >G103:/F\$((E59*.6)+(E60*.4)/(E65-E96+G96))
 >F103:/F\$((E59*.7)+(360*.3)/(E65-E96+F96))
 >E103:/F\$(E59/E65)
 >H102:/F\$((E59*.5)+(E60*.5)/H96)
 >G102:/F\$((E59*.6)+(E60*.4)/G96)
 >F102:/F\$((E59*.7)+(E60*.3)/F96)
 >E102:/F\$(E59/E64)
 >H101:/F\$((E59*.5)+(E60*.5)/(E63+E96-E96))
 >G101:/F\$((E59*.6)+(E60*.4)/(E63+G96-E96))
 >F101:/F\$((E59*.7)+(E60*.3)/(E63+F96-E96))
 >E101:/F\$(E59/E63)
 >H98:(E48*E66*.5*(4.45-(@MAX(E52,E55)))*.94
 >G98:(E48*E66*.6*(4.45-(@MAX(E52,E55)))*.94
 >F98:(E48*E66*.7*(4.45-(@MAX(E52,E55)))*.94
 >H97:(E66)*E47*.2*.75
 >G97:(E66)*.75*E47*.1
 >N96:(E81-E82)*E78*.3
 >M96:(E80-E81)*E78*.3
 >H96:(E64)*1.08
 >G96:(E64)*1.07
 >F96:(E64)*1.05
 >E96:(E64)
 >N94:(E73-E74)*E70
 >M94:(E72-E73)*E70
 >K56:@MAX(E52,J56)
 >J56:(E55-(E56*9))
 >E53:/F\$(E52*.82)