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ILLINOIS
AGRICULTURAL ECONOMICS
STAFF PAPER *Series E*

A LAND MORTGAGE-IN-KIND

by

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August 1985

85-E322



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Paper Given at the Annual Meeting of the
American Agricultural Economics Association

Ames, Iowa

August, 1985

SCOTT

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A mortgage loan whose payments were denominated in commodity values or a share of the crop in dollar value would protect the farm borrower against yield and price risk. Such mortgages would have given the lender higher present values than fixed rate mortgages 89% of the time over the last 60 years. A national mortgage company or insurance company would be needed to even out the cash flow over time for local lenders.

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August, 1985

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A LAND MORTGAGE-IN-KIND

INTRODUCTION

One of the problems currently impacting especially midwest farmers and all farmers to some extent is the variable interest rate on fixed debt. The interest paid has ballooned out of all normal proportion to both gross and net farm income. This has come about for three reasons: (1) the farm debt including land mortgages has increased substantially since 1970 with the greatest increase coming since 1975. (2) Much of the debt, particularly in the last 10 years, was financed with a variable rate. Had the rate of interest declined, this would have been beneficial to farmers, but with double digit inflation in the late 70's and now high real rates of interest, the nominal rates of interest increased causing a much greater increase in interest payments than the increase in debt itself. Even though most interest rates have declined in the last year, Federal Land Bank which is a major lender has increased rates to offset losses with non-performing loans. The long term Federal bond rate is still about 50% higher than it was as recently as 1977. (3) Farm income has declined. Coupled with declining incomes, the debt service is putting many otherwise technically competent farmers into a financial decline and out of business with losses to creditors in some cases.

To reduce this problem we propose a new type of mortgage for farmland with payments for both interest and principal paid in kind, that is, in terms of bushels of corn or soybeans or some other measure of the value of farm production. The dollar payment would be determined annually by multiplying a fixed number of bushels or a fixed percent of the crop times the price of the crop for that year. This type of debt instrument should be attractive to most farmers buying land or those with existing land mortgages if they could be converted to payment-in-kind mortgages. These new type mortgages could be attractive to most sellers of land who would normally be inclined to provide "seller-financing", especially as sellers are faced with a declining land market.

With a low cash downpayment, the payment in kind is likely to be close to or slightly more than the normal share rent. With a high downpayment, the mortgage payment is likely to be less than the normal share rent for a period of 20 to 30 years. The shorter the payoff period the higher the share and the longer the payoff period, the lower the share of the crop that would be required by the mortgage.

With the economic cycles in asset values, commodity prices, interest rates, rates of inflation, and exchange rates, debts that are completely denominated in fixed monetary terms are at greater risk in debt repayment. The risk fluctuates widely over the life term of the loan; and the risk oscillates between the lender and the debtor. Dollar loan payments could be calculated in physical quantity of a commodity times an average price -- either a fixed amount of commodity or a fixed share of the crop in the case of a farmer. Denominating loan payments in a physical quantity of a

commodity times an average price is what we refer to in this paper as payment-in-kind mortgages, referred hereafter as PK mortgages.

Advantages and Disadvantages Fall Both Ways

Farmer Impact: It would appear that the farmers would have the greatest advantage in PK mortgages. Farmers have had no protection from variable interest rates, and have been unable to protect themselves in any substantial way against commodity yield and price variation. So interest variation has exposed farmers to even greater risks. Over the last ten years interest rate increases have not been correlated with farm income, since farm incomes have declined. PK mortgages would appeal to farmers because it would reduce the debt payment risk coming from inability to meet interest and principle payments in years of low product yields or low commodity prices. Most farmers would likely be willing to pay the surplus (relative to fixed dollar payment loans) resulting from PK payments in the good years to offset the risk of losing their assets for nonpayment of loans in poor years when payment-in-kind would be less than the normal fixed dollar loan. Two major risks which faced most farmers which are also outside the control of the farmer are yield variation due to weather and price variation in the market. Even when prices are relatively stable, farmers still face weather risk. If the payment-in-kind was a share of the total crop produced rather than a fixed physical amount of the commodity, the weather risk would be less for the farmer. Price risk would be reduced for the farmer on both a fixed physical amount of a commodity and also if the payment was a share of the crop produced. Advantages for the farmer are

mainly that the farmer would be able to make the payments on his debt even when the uncontrollable exogenous prices or weather are adverse to the farmer. Disadvantages to the farmer are that as time goes on, if yields increase with improved crop varieties and better technology or if prices increased he would be paying more than he expected on a share of yield basis. The fixed physical commodity basis might turn into an advantage because he would be paying relatively less in commodity terms over time if yields trended upward. He would still have the risk of years with low yields.

Lender Impact: At first this may be perceived as too risky for the lender. It is true that this payment method would result in much more variable payments on any one mortgage than fixed dollar amounts. For a large lender like a national insurance company or the federal land bank system with loans distributed widely across the nation, yield variance would normally average out year by year. With the wide range of crops grown nationally, price variance also would tend to average out, although somewhat less well in any one year. Local lenders such as rural banks would likely need a loan payment cushion in low payment years from a national insurance company or government agency. Thus underpayments relative to fixed dollar loan payments would be made to the local lender holding the mortgage by the national mortgage company and overpayments to the creditor would be paid by the local lender to the national mortgage company. Normally when a lender loans money, the lender wants his money back eventually and he wants interest and principal payments in money -- not fixed assets which are costly for a lender to market. No lender wants to take over the physical

collateral pledged for the loan. The lender expects to be paid from the cash flow generated by the loan. This is particularly true of long term loans. If a loan is made when commodity prices, resource prices, or interest rates are relatively or historically low, then it is highly probable that a payment-in-kind loan schedule ex post will have a higher present value for the loan than a money denominated loan payment schedule. This is true of either a fixed physical amount or a fixed physical share of production. Occasionally it may be impossible at the time of the loan for either party to know whether or not these conditions exist, but if series of historical prices and interest rates are available, periods of relative lows and highs should be fairly clear. On first approach, it might seem that when these prices (commodities and resources) are relatively high and interest rates are low, it would be disadvantageous to the lender to make a loan denominated by payment-in-kind. In such cases it may be desirable from the lender's standpoint to negotiate a higher in-kind-payment than current prices suggest would be appropriate for the loan (discussed later). At any rate, if payments are calculated in-kind, the lender is more likely to get his scheduled payment when prices go down than if the payment schedule had been initially denominated in money; and the last thing the lender wants is the fixed assets pledged to a loan; because when commodity prices decline, fixed asset values are rarely far behind. When a loan is defaulted the value of the collateral also has declined to a level where the lender may be worse off taking over the collateral than accepting a depressed payment-in-kind. At least the management of the fixed assets is left in the hands of the borrower who is normally the person who is best able to manage and produce with these assets. Over a long term loan such as one

lasting twenty years or longer, a downturn in commodity prices is likely to reverse in time and because of the long term endemic loss of value of most currencies, the payment-in-kind will still give the lender a good return on his loan.

There is always some share of the crop or some fixed physical amount of a commodity which will produce a present value for a loan which will be equal to or greater than the present value of a monetary denominated loan.

Data Used

The empirical data available for initial comparisons and analysis of loan payments-in-kind are partly Illinois data and partly national data. A fairly long history is needed to analyze various outcomes if twenty year mortgages are used. The basic variables include years from 1920 to 1984. Land prices are the average for Illinois farmland. The next variable is the average corn yield in bushels per acre in Illinois over the period. The fourth variable is the average price of corn in the United States in cents or dollars and cents per bushel. The last datum variable used is the interest rate which will be used as the rate at the time loans are made. No long term consistent series for farm mortgage interest rates were found so the rate used in this analysis is the rate of long term triple A industrial bonds which should correspond relatively well to land mortgage rates. In the last 30 years when farmland mortgage rates are readily available the two rates are both highly correlated and the rate levels also correspond very closely. These basic data are shown in Table 1.

Procedure Used

The procedure assumed that a 20 year fixed mortgage was taken for the full value of the farm on an acre basis (no down payment). It would be rare indeed for a lender to give a full price loan. The data can be easily derived for any other percent loan from a full price loan. Also, for the PK mortgages the share for full payment of the farm can be related directly with traditional rental rates. The mortgage payments are level fully amortized and the rate of interest used for the loan is the rate which existed at the time the money was loaned. The same rate is used to discount the cash flows to calculate present values of the two types of PK mortgages. Then the present value of the cash flows from the money payment mortgage (which is the same as the land prices) were compared to the present value of the cash flows from two types of PK mortgages for the same mortgage period. The first PK mortgage is a fixed physical commodity times the commodity price in the year of payment to get the cash flow. The second PK mortgage is a fixed physical share of the crop (yield varying by years) times the commodity price at the time the payment is made to get the cash flow.

The payment-in-kind was arbitrarily set at the amount which when multiplied by the average price for the current and previous two years would equal the annual payment of the fixed monetary mortgage. The share payment-in-kind was fixed at the share of the average current and previous two year's crops which when multiplied by the average price of the current and previous two years would be equal to the annual payment of the fixed monetary mortgage.

A twenty year mortgage situation for all three mortgage types was then estimated for each year 1920 through 1964. The full outcome of these mortgages beginning after 1964 cannot yet be obtained. Nevertheless some comparisons on the latter years with respect to the level of the share of the crop required are illuminating.

Results

The results are shown in Table 2. The land price or present value of a fixed dollar mortgage in 1920 and 1921 was higher than the present value of either the fixed bushel or fixed share payment-in-kind mortgages. Then 1922 and 1923 showed higher present values for the PK mortgage than the land price and 1924, 1925, and 1926 showed lower present values for the PK mortgages than for the price of land. In all successive years starting in 1927, one or the other of the PK mortgages showed higher present values than the price of land.

This shows that for 1920 through 1964, a period of 45 years, 20 year mortgages would have yielded a higher return if they had been payment-in-kind rather than fixed dollar payments except for 5 years: 1920, 1921, 1924, 1925, and 1926. The overage from the PK mortgages received in the 40 years of surplus payments by a national mortgage company would have been many times the shortage the company would have had to pay local lenders for PK mortgages in the five shortage years.

There was a fairly large range (.13 to .54) in the share of the crop which was required to initialize the PK mortgage. However, if we ignore some of the outliers including the World War II period when interest rates



were held artificially low by the government, in most years the range was from about .25 to .50 to amortize the full price of land. Administratively for the lender the payment-in-kind would be in dollars equal to the bushels times the average price rather than actually receiving the commodity.

It is interesting to note that when we make the calculation to determine the share needed to amortize land value after 1964, the share begins to rise slowly and reaches over 40% of the total crop in 1975. It continues to rise and in 1980 and 1981 the share increased so much that it would take more than the total crop to amortize the full price of land. This resulted partly from the land boom of the late 1970's combined with a sharp elevation in interest rates. This was unprecedented and totally out of the realm of rational economics for anyone trying to pay for land from productivity. On the other hand it is likely that very few sellers would ever accept less than .30 of the crop on a contract sale because the normal gross share rent (with no expenses other than taxes for the landowner) is in the neighborhood of 1/3 depending on land quality.

Therefore, we believe that calculating the PK mortgage payment required for a full price loan is another very good way that land buyers or sellers could use to judge whether an attractive relationship of interest rates, production and land values exists at the time of contemplated purchase or sale.

Conclusions

We conclude that a payment-in-kind denominated loan has many advantages to both the lender and the debtor. Most of these advantages are in reduc-

tion of risk for both the lender and the debtor. Since the risks faced by the lender are different than those faced by the debtor, the risks to both can be simultaneously reduced making both in some way better off by using a payment-in-kind denominated loan. However, the amount of the payment needs to be carefully analyzed so it is fair to both parties. Administratively, so the lender would not actually receive physical commodities, the loan would stipulate that the payment would be in dollars equal to a certain amount of commodity times the average price for the year. Further research needs to be conducted to calculate the present value of various in-kind payment procedures based on past historical data and on where the parties perceive the economy to be with regard to peaks and troughs or future trends. On purchase or sale of land, a guide to acceptable land price and interest levels may well be an analysis of the size of loan the traditional share rent will support.

Table 1. Input Data for Payment-in-Kind Mortgages

Year	Land Price Per Acre	Average Corn Yield bu/acre	Corn Price Per Bushel	Interest Rates
1920	\$ 309	35	\$.64	\$ 6.12
21	294	33	.52	5.97
22	243	32	.73	5.10
23	235	33	.81	5.12
24	221	30	1.06	5.00
1925	\$ 220	34	\$.70	\$ 4.88
26	213	31	.74	4.73
27	191	31	.85	4.57
28	183	32	.84	4.55
29	183	31	.80	4.73
1930	\$ 176	31	\$.60	\$ 4.55
31	154	28	.32	4.58
32	125	28	.32	5.01
33	103	26	.52	4.49
34	110	21	.82	4.00
1935	\$ 117	36	\$.66	\$ 3.60
36	124	22	1.04	3.24
37	132	42	.52	3.26
38	139	42	.49	3.19
39	139	43	.57	3.01
1940	\$ 147	43	\$.62	\$ 2.84
41	147	53	.75	2.77
42	169	54	.92	2.83
43	176	50	1.12	2.73
44	198	45	1.03	2.72
1945	\$ 213	46	\$1.23	\$ 2.62
46	235	56	1.53	2.53
47	272	39	2.16	2.61
48	286	61	1.28	2.82
49	301	54	1.24	2.66
1950	\$ 309	51	\$1.52	\$ 2.62
51	368	55	1.66	2.86
52	397	58	1.52	2.96
53	405	54	1.48	3.20
54	412	50	1.43	2.98
1955	\$ 413	56	\$1.35	\$ 3.06
56	435	68	1.29	3.36
57	471	64	1.11	3.89
58	478	69	1.12	3.79
59	514	67	1.05	4.38

Table 1. Input Date for Payment-in-Kind Mortgages (cont.)

Year	Land Price Per Acre	Average Corn Yield bu/acre	Corn Price Per Bushel	Interest Rates
1960	\$ 522	68	\$1.00	\$ 4.41
61	507	77	1.10	4.35
62	522	83	1.12	4.33
63	551	85	1.11	4.26
64	573	78	1.17	4.40
1965	\$ 647	94	\$1.16	\$ 4.49
66	724	82	1.24	5.13
67	770	104	1.03	5.51
68	801	90	1.08	6.18
69	840	102	1.16	7.03
1970	\$ 787	74	\$1.33	\$ 8.04
71	794	106	1.27	7.39
72	853	110	1.16	7.24
73	949	103	2.00	7.67
74	1,272	83	3.00	9.01
1975	\$1,713	116	\$2.73	\$ 9.17
76	2,131	107	2.55	8.46
77	2,839	105	2.07	8.12
78	3,197	111	2.12	8.90
79	3,615	128	2.44	9.92
1980	\$3,500	93	\$2.78	\$12.68
81	3,699	141 128	3.00	15.65
82	3,397	131 134	2.43	14.95
83	3,037	117 80	3.04	12.43
84	2,985	115 128	3.12	13.45
1985	\$2,573	82 125	\$2.65	\$12.00
86	2,205	126	2.70	11.00
87	1,838	127	2.75	11.00
88	1,617	128	2.81	9.50
89	1,699	129	2.87	9.00

July 1-85 = 76

Results from 1965 to 1984 required projection beyond 1984. Projection for 1985 through 1989 are shown in the table. Interest rate was assumed to be flat at 8½% from 1990 on. $CPI_t = 1.04 CPI_{t-1}$ for $t = 1985$ to 2004. $Y_t = T_{t-1} + 1$ for $t = 1986$ to 2004; $LPI_t = 1.03 LPI_{t-1}$ for $t = 1989$ to 2004; $PC_t = 1.02 PC_{t-1}$ for $t = 1986$ to 2004; where CPI = Consumer Price Index; Y = Yield of corn in bushel per acre; LPI = Land Price Index, and PC = Price of corn.

Table 2. Present Values of PK Mortgages

Year	Share of Crop		Bushels of Corn		PV of Fixed \$ Mortgage	PV of Fixed Bu. Mtge.	PV of Share-Crop Mortgage
	Initial	Final	Initial	Final			
1920	.39	.72	12.7	22.8	177.62	100.56	96.26
1921	.50	.67	16.5	21.5	169.14	132.07	126.43
1922	.54	.49	17.9	15.9	139.56	156.85	151.57
1923	.49	.46	16.0	15.0	135.33	140.46	142.17
1924	.37	.42	11.8	14.8	126.87	104.93	112.32
1925	.36	.41	11.8	14.8	126.87	103.51	111.75
1926	.36	.38	11.5	13.5	122.64	105.32	118.48
1927	.35	.30	11.1	12.1	109.95	106.61	124.53
1928	.32	.27	10.1	11.1	105.72	101.39	123.20
1929	.32	.26	10.0	11.0	105.72	100.02	126.59
1930	.33	.23	10.5	9.5	101.50	108.92	142.96
1931	.40	.19	12.0	8.0	88.81	129.97	182.98
1932	.48	.14	14.0	6.0	71.89	156.01	232.10
1933	.43	.10	11.8	3.8	59.21	148.77	242.36
1934	.34	.10	8.4	4.4	63.43	118.23	217.20
1935	.26	.09	7.2	4.2	67.66	108.39	186.74
1936	.22	.08	5.9	3.9	71.89	95.28	175.96
1937	.21	.08	7.1	4.1	76.12	115.66	177.40
1938	.23	.09	8.0	4.0	80.35	137.17	201.35
1939	.24	.08	10.3	4.3	80.35	185.10	230.70
1940	.23	.07	10.0	4.0	84.58	189.06	237.28
1941	.19	.08	8.6	3.6	84.58	167.97	196.97
1942	.17	.09	8.4	4.4	97.27	167.24	184.24
1943	.14	.09	7.2	4.2	101.50	145.23	155.59
1944	.15	.10	7.3	5.3	114.18	149.07	172.06
1945	.15	.10	7.1	5.1	122.64	146.82	183.31
1946	.14	.10	6.9	5.9	135.33	144.42	178.79
1947	.13	.12	6.2	8.2	156.47	127.19	167.04
1948	.13	.14	6.6	10.0	164.93	126.36	158.98
1949	.14	.13	7.2	9.2	173.39	140.06	181.81
1950	.15	.12	8.6	9.6	177.62	165.82	206.00
1951	.18	.16	9.5	11.5	211.45	178.63	235.05
1952	.18	.17	9.8	12.8	228.37	177.62	236.79
1953	.18	.17	10.3	14.3	232.59	179.22	242.34
1954	.20	.16	10.8	13.8	236.82	193.60	283.00

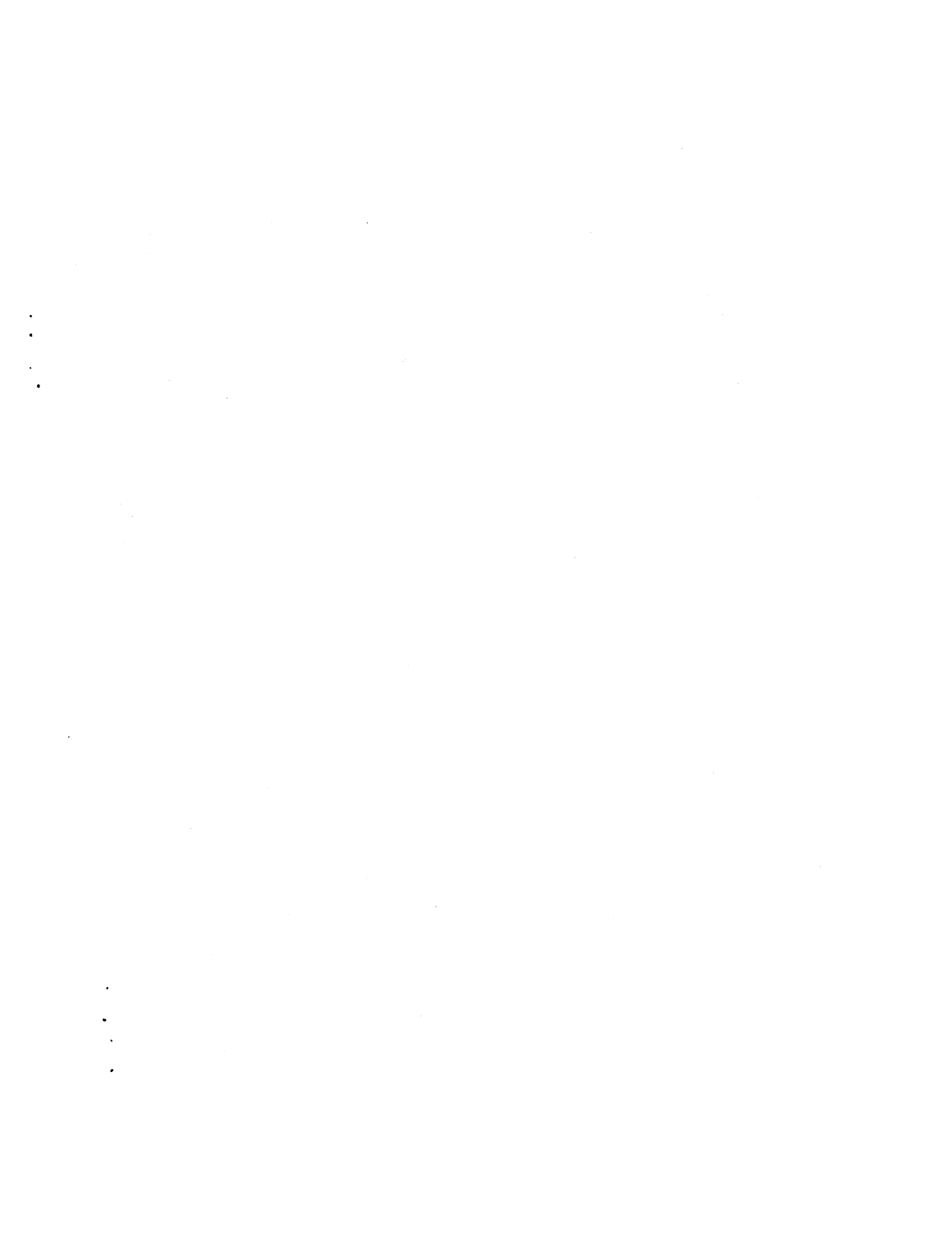


Table 2. Present Values of PK Mortgages (continued)

Year	Share of Crop		Bushels of Corn		PV of Fixed \$ Mortgage	PV of Fixed Bu. Mtge.	PV of Share-Crop Mortgage
	Initial	Final	Initial	Final			
1955	.22	.16	11.5	13.5	241.05	213.60	326.18
1956	.22	.15	13.0	14.0	253.74	243.46	359.57
1957	.26	.17	16.0	14.0	274.88	293.88	412.09
1958	.26	.16	17.2	14.2	279.11	328.28	442.05
1959	.31	.17	20.1	15.9	300.26	387.36	535.09
1960	.32	.16	21.7	14.7	300.26	417.82	585.91
1961	.30	.14	21.4	14.4	296.03	437.20	597.64
1962	.29	.13	21.5	13.5	304.49	462.93	605.89
1963	.27	.14	21.8	13.8	321.40	491.87	614.01
1964	.28	.14	22.8	13.8	338.32	532.20	658.41
1965	.28	.14	24.4	14.4	363.69	589.67	714.59
1966	.33	.16	28.2	17.2	414.44	667.39	826.77
1967	.34	.17	31.6	17.6	431.36	747.72	855.02
1968	.38	.17	35.2	18.2	444.04	820.36	956.56
1969	.41	.19	40.0	20.0	460.96	907.75	996.67
1970	.44	.19	38.8	19.8	452.50	849.21	1,041.51
1971	.38	.17	35.8	18.8	460.96	865.80	1,028.13
1972	.40	.17	38.9	18.9	507.48	1,002.85	1,167.36
1973	.37	.19	39.8	21.8	592.06	1,047.78	1,112.88
1974	.42	.27	41.5	31.5	778.13	1,014.90	1,167.10
1975	.40	.33	40.2	38.2	934.61	961.55	1,123.88
1976	.47	.41	47.5	49.5	1,243.32	1,199.11	1,393.80
1977	.59	.48	64.4	58.4	1,535.12	1,686.38	1,855.63
1978	.77	.55	82.6	66.6	1,708.51	2,096.13	2,367.51
1979	.88	.64	100.4	78.4	1,903.05	2,435.91	2,601.58
1980	1.03	.80	114.4	97.4	2,013.00	2,352.60	2,571.70
1981	1.11	.99	128.8	122.8	2,131.41	2,232.20	2,383.80
1982	.97	.88	114.5	108.5	1,966.48	2,058.42	2,157.51
1983	.75	.65	85.1	80.1	1,746.57	1,833.44	1,998.40
1984	.80	.65	90.8	84.8	1,716.97	1,832.20	2,099.65

