THE COST-PRICE SQUEEZE: CAUSES AND IMPLICATIONS FOR KANSAS WHEAT FARMS

By

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CHAPTER 1

INTRODUCTION

Kansas position as the leading wheat producing state in the U.S. has given it a claim to the title of "Breadbasket of the World." Rich natural resources and adoption of efficient production methods have made Kansas farmers the envy of producers all over the world. Kansas has ranked number one nearly every year in total production of U.S. wheat. From 1979-1981, Kansas contributed 18.0 to 18.5 percent of the dollar value of U.S. wheat exports each year.[1]

Rising costs for production inputs have raised concerns of the continued economic viability of Kansas wheat producers. As the share of inputs purchased from non-farm sources increased, price increases for production inputs created greater financial stress to the producer.

Changes in farm structure and demand relationships have altered the effects of input price inflation on farm returns. Most of the production inputs in the past were supplied by the farmer. Land, labor, feed, and livestock were produced on the farm, thus price increases had little effect on the inputs necessary for production.

In the past, demand for farm products was not affected significantly by inflation. In fact, many associated inflation with the increase in demand brought about by economic expansion. Higher income elasticities of demand for farm products caused farm products to be demanded in larger quantities during periods of economic expansion. Farm prices and gross receipts increased with the gains in demand. Higher residual returns to land made mortgages easier to repay. Land values also increased markedly as investment was encouraged because of higher returns and capital gains for farmland.

Economic downturns led to problems in repaying loans, calling of loans by lenders who lacked liquidity, foreclosures, bankruptcy and tight money for farmers. From this, one can see why many considered inflation in prices to be a friend to the farmer.

The situation is different today for most producers. A much higher percentage of farm inputs are purchased from nonfarm sources. Increases in wage rates negotiated by labor unions are passed on to farmers in the form of higher machinery and repair costs. Being highly capital and energy intensive, agriculture is significantly affected by increases in energy prices and interest rates. The low income elasticity of demand for most farm products today has removed much of the positive impact of economic expansion on farm product prices. Many producers no longer own the land they farm so that benefits of capital gains in farmland no longer accrue to them but to the nonfarm landlord.

Price increases in production inputs during the 1970's were sizable. The rate of increase in farm input prices averaged less than three percent during the 1960's but rose at an average annual rate in excess of nine percent during the 1970's. Farmland values also rose at a more rapid rate, up from 5.8 percent in the 1960's to 12.8 percent in the 1970'S. Increases in both production input prices and land values were greater after 1971.[2] Benefits accrued to producers who owned land as farmland values increased faster than the rate of inflation for the nation's economy.

Returns during the 1970's were characterized by considerable variability. The variability in returns created added stress and difficulty for the farm manager to anticipate adjustments necessary to provide the highest return to his investment. Many factors contributed to the changes in supply/demand relationships that created the fluctuations in wheat prices.

A cost-price squeeze resulting from returns not keeping pace with the increase in farm input prices is believed to be evident for most farm commodities in recent years. Evidence for this includes increases in the debt-to-asset and debt-to-equity ratios for farm enterprises, increases in foreclosures and farm failures, and a four percent fall in farm equity in 1982, the largest fall in farm equity during the time that the statistics have been kept since 1940.[3]

Economic theory suggests that in a purely competitive system, producers will continue to produce in the short-run only as long as returns exceed the variable production costs. Changes in input mix and usage may occur as changes in price relationships encourage the producer to make adjustments.

Concerns for a cost-price squeeze raise questions of whether producers are receiving adequate returns to meet their variable costs, the magnitude of fixed costs that are incurred and how long they can continue to operate if they are not meeting all of their fixed obligations.

This study will analyze farm records of costs and returns from Kansas wheat producers who are members of the Kansas Farm Management Association. The objectives of the study are to identify causes of input price increases and the variability of returns; to determine how net incomes of individual producers are affected by various ownership alternatives; to determine the magnitude of the cost-price squeeze to Kansas wheat producers; to identify the effects of the cost-price squeeze on individual farmers and Kansas wheat farming; and draw implications for changes in structure and future viability of Kansas wheat farms.

FOOTNOTES

[1]Kansas State Board of Agriculture, Annual Report and Farm Facts, (Topeka, 1979-1981).

[2]United States Department of Agriculture, Agricultural Statistics, 1981, (Washington, D.C., 1981).

[3]United States Department of Agriculture, Agricultural Finance Outlook and Situation, Economic Research Service, (Washington, D.C., December 1982), p.4.

CHAPTER 2

REVIEW OF LITERATURE

Farmers' response to changing price relationships is difficult to observe because various other factors cannot be held constant. In many of the physical sciences, when the scientist wishes to observe the relationships between two factors--i.e. the effect that a change in one variable will have on the other, he can hold all other influences constant and measure the effects on the dependant variable. Because the process can be repeated and altered, various relationships that govern the physical world can be verified. The agricultural economist is not as fortunate. He must study and predict in a system of which he is a part and does not have control over.

Because the environment of the economy cannot be altered, economic theory has been developed to help predict responses in different factors that influence the decisions of farmers and effect the economy as a whole. Cause-effect relationships, which have been deduced from observations of the economic system, comprise various aspects of economic theory. These relationships and theory can then be used to evaluate past, present, and future courses of action in an attempt to maximize the objective of the firm.

Agricultural production can be considered a function of inputs used to arrive at a usable output. Inputs are classified as variable or fixed, with this classification depending in part on the length of time that is being considered. A resource is called a variable resource if its quantity is to be varied at the start or during the production period. A resource is termed a fixed resource if its quantity is not varied during the production period. In the short-run at least one resource is varied while other

resources are fixed. But given a long enough time period, all resources can be varied.

Several relationships or laws govern agricultural production that carry over into economic analysis. One of the most important in understanding many of the economic concepts is the Law of Diminishing Returns. "The Law of Diminishing Returns states that when successive equal units of a variable resource are added to a given quantity of a fixed resource or resources, there will come a point where addition to total output declines."[1] Several factors are assumed for this law to hold true:

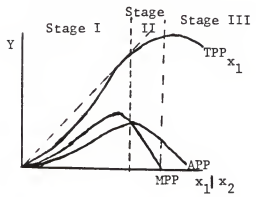
a. A given state of technology is assumed,
b. It must be possible to vary the proportions in which different input factors are combined.[2]

Diminishing marginal returns result when at least one important factor is held fixed while certain other important factors are varied. This relationship gives rise to much of the economic analysis of costs and returns. Diminishing marginal returns and the relationships between costs and returns can also be illustrated graphically. Output from one variable resource with other resources held fixed is graphed as total physical product(TPP). Marginal returns to input, illustrated as the marginal physical product(MPP), reaches a maximum and then declines as the Law of Diminishing Returns takes effect. MPP is zero when total physical product reaches a maximum. Equations and graphs for TPP, MPP and average physical product(APP) are shown in Figure 2.1a.

Stages of production show the areas of resource use. Stage I begins with the addition of the variable input and continues as long as the APP function is increasing. When APP begins to decline, Stage II begins and continues until MPP is equal to zero. Stage III begins from this point and continues on out. For economic efficiency, production will occur within Stage II.

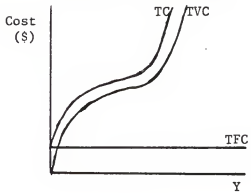
Figure 2.1 Total Product, Total Cost and Average Cost Curves

a) Production Function



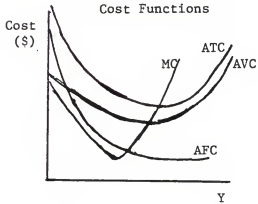
1. $Y=F(x_1 | x_2)$
2. $APP=Y_{x_1}/x_1 = TPP_{x_1}/x_1$
3. $MPP=\Delta Y/\Delta x_1 = \Delta TPP/\Delta x_1$

b) Total Cost Function



4. $TC=\sum_{i=1}^{N} P_{x_i} \cdot x_i$ and N=2
5. $TVC=P_{x_1} \cdot x_1$
6. $TFC=P_{x_2} \cdot x_2$

c) Average and Marginal Cost Functions



7. $ATC=TC/Y = \dfrac{P_{x_1} \cdot x_1 + P_{x_2} \cdot x_2}{APP_{x_1} \cdot x_1}$
8. $AFC=TFC/Y$
9. $AVC=TVC/Y = TVC/(APP_{x_1} \cdot x_1)$
10. $MC=\Delta TVC/\Delta Y = \Delta x_1 \cdot P_{x_1} / (\Delta x_1 \cdot MPP_{x_1})$

The total variable cost function(TVC) is inversely related to the production function. That is, when total production is increasing at an increasing rate, total variable costs are increasing at a decreasing rate. Similarly in Stage II, TVC will be increasing at an increasing rate while total production is increasing at a decreasing rate. Total cost(TC) is the sum of total variable costs and total fixed costs(TFC). The total cost function will always change in the same direction as TVC and will differ from TVC by the amount of total fixed costs. These relationships are shown in Figure 2.1b and defined in equations 4, 5, and 6.

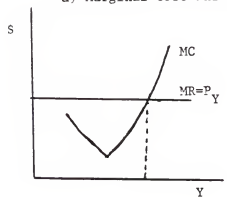
Figure 2.1c illustrates the average total cost(ATC), average fixed cost(AFC), and marginal cost(MC) functions which are defined in equations 7, 8, 9, and 10, respectively. With this simplified production function having one variable input, it should be noted that the minimum average variable cost occurs at the same output as the maximum APP, at the beginning of Stage II. The minimum marginal cost occurs at the same level as maximum MPP. Also, marginal cost will always equal average variable cost at the output level where AVC is at its minimum, because MPP equals APP at that point.

Marginal revenue can be defined as the added revenue from each additional unit of output. In the case of pure competition, this is equal to the price of output(P_y). The criterion for economic efficiency and profit maximization is to produce where the marginal cost is equal to marginal revenue. In other words, one will keep adding inputs until the added cost of that input equals the added returns from the output produced by the input. This relationship is illustrated in figure 2.2a.

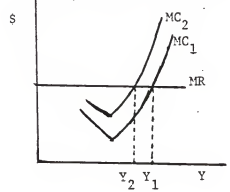
Changes in the price of the variable input will cause a shift in the marginal cost curve and the optimal amount of resource used and output when

Figure 2.2 Marginal Cost, Marginal Revenue Curves, Impact of Change in Price of Input and Price of Output on Optimal Level of Output

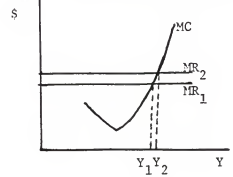
a) Marginal Cost and Revenue Functions



b) Increase in Price of Variable Input



c) Increase in Price of Output



other factors are constant. The change in optimal output for when the price of the variable input increases and the cost curves shift is illustrated in figure 2.2b.

Likewise, a change in the price of the output will affect the optimal combination of resources for the firm. An increase in the price of the output will move the marginal revenue curve upward, resulting in a higher output being optimum to maximize returns. The case of an increase in the price of the product is illustrated in figure 2.2c.

Numerous factors enter into the decision-making process of the farm manager. The nature of variables such as prices, yields, weather and other factors pertaining to crop production make this process especially difficult for the farm manager. As a result, it is not unusual to find farmers arriving at different decisions for crop production under essentially the same conditions. This is partly due to different subjective judgements, experience and behavioral attitudes toward risk.

The major sources of risk and uncertainty in crop production are yields and prices. Yields have generally risen over time due to technological advancements. However, yields are also affected by factors that act in an unpredictable or random manner, such as weather. Prices tend to follow movements in other economic variables, but may also be affected by factors which act unpredictably. For example, the significant adjustments made in price levels due to the influences of world-wide drought and crop shortages in 1973. In general, such factors tend to produce year to year variations in yields and prices.

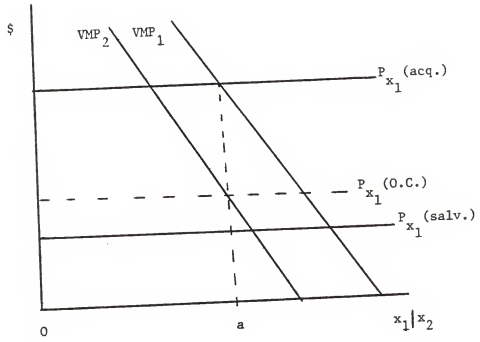
Risk and uncertainty pose a major problem in applying economic theory that has been developed under simplifying assumptions of stable prices and yields. Input-output relations are subject to change due to influences

such as weather, insects, disease and technology. Predicting these changes with any degree of accuracy is a difficult problem for farmers.

Static economic theory has provided a base from which to build. Various studies and theories have been developed to determine the effect of income variability on the decision making process. But because inputs must be committed before output is received relating theory to actual practice is difficult. The farmer must plan his production based upon the price and yields that he expects to receive. Thus, he may invest in new fixed inputs based on expectations of higher returns. If returns do not meet his expectations, the producer will have difficulty returning to optimum levels of production because of the higher fixed costs which he must meet. This relationship has caused many to observe that agricultural production has been characterized by the ability to expand rapidly in times of prosperity and by an inability to return quickly to former levels when prices fall.

Several theories have been advanced as to why this occurs. Johnson has suggested that overcommittment of durable resources, indicated by persistently low rates of return, is an inherent feature of agricultural business activity.[3] The fixed asset theory focuses on a divergence between acquisition and salvage prices of "identical units" of durable resources. The decision rule under acquisition theory is to equate value marginal product (VMP) with marginal factor cost. When the product price is high the firm finds it profitable to purchase Oa units of X_1, Figure 2.3. If the product price should later fall so that a lower value marginal product is relevant, X_1 becomes a fixed asset because the VMP at quantity Oa lies between acquisition and salvage prices. This theory suggests that farmers will continue to produce even though returns have fallen below the expected return when the investment was made at least as long as the VMP does not fall below the salvage value of the resource.

Figure 2.3 Optimal Level of Fixed Asset Usage
Under Opportunity Cost Theory



Single Input--Fixed Asset Case

Pasour and Johnson argue that the rate of return from the investments should not be based upon the acquisition price but upon the opportunity cost to the farmer.[4] The opportunity cost concept suggests that the asset should be valued at the returns from the best alternative use. This means that the VMP would be based upon its use-value in the best alternative enterprise or the salvage value of the asset, whichever is higher. The costs that result from a fall in the value of the asset or a decline in the VMP from price decreases are lost costs and should have no impact on whether to continue to produce.

Unstable prices have generally been assumed to inhibit capital investment in agriculture. Robinson has suggested that empirical studies may show that this has not been the case.[5] The reasoning for this hypothesis is as follows. A substantial portion of the investment in agriculture has occured in years of high product prices since these years have provided both the capacity to invest and the incentive due in part to the nature of farmers' attitudes toward avoidance of taxes. Farmers have a high propensity to invest out of retained earnings which are positively correlated with high product prices. Analysis of machinery sales figures has provided support for this hypothesis.

If this hypothesis is true, one must be careful in drawing conclusions of the seriousness of the cost-price squeeze when dealing with the expenses attributed to fixed factors. The variability in prices received and in farm incomes may lead to greater investment in prosperous years which will not be totally reflected in the costs assessed to fixed assets, especially depreciation.

Robinson also points out that periods of low prices may have been effective in increasing the efficiency of agriculture.

"Efficiency is partly a function of forcing managers to make changes in their business or weeding out those with inferior ability. Gains in efficiency, as Liebenstein has emphasized, are not achieved so much by altering factor proportions, but rather by moving from well inside the boundary toward the frontier simply by producing more output with the same set of resources. This he calls "X-efficiency". Improvements in "X-efficiency" are likely to be associated with occasional periods of low prices. During such periods, farmers who use resources inefficiently are forced to make changes."[6]

This process can lead to greater investment and efficiency than under stability because stability can lead to complacency, although this is not always the case.

Luther Tweeten and his associates have conducted several studies on the effect of rising input prices on net farm income.[7] Because farmers cannot directly pass the increased cost of inputs on to consumers as many other industries can, the assumption has been that input price increases have a significant negative impact upon net farm income. Tweeten found in his studies that this may not be as serious as many have believed.

When the prices of inputs used in production rise, farmers restrain their use of inputs. This results in a reduction in output, which when coupled with an inelastic demand curve for farm products results in a rise in product prices at the farm level. This effect is not immediate, as farmers and markets adjust to changes in expectations and output. Tweeten determined that demand would be essentially unchanged at the farm level. Therefore, he concluded that a one percent rise in national inflation would result in a one percent decline in the ratio of prices received to prices paid in the short-run.

Changes in input usage result in changes in both costs and returns. Table 2.1 shows the impact of changing input prices on selected variables as developed by Tweeten. The use of the table will be discussed for fertilizer and lime to demonstrate the relationships present. As indicated

Table 2.1 Estimated Percentage Response of Farming Receipts (E_r), Costs (E_c) and Net Income (E_n) to One Percent Increase in Pespective Input Price, with Basic Production (E_i), Own Price (E_{11}) and Cross Price (E_{i1}) Elasticities

	Elasticities										
		E_{11}		E_{i1}		E_r		E_c		E_n	
Input	E_i	SR	LR	SR	LR	SR	LR	SR	LR	SR	LR
Fertilizer and Lime	.127	-.6	-1.8	.02	-.02	.20	.24	.05	-.08	.42	.74
Machinery Oper. Items	.120	-.6	-1.5	.03	-.06	.17	.21	.07	-.11	.31	.72
Mach. and Equip. Cap. Items	.021	-1.0	-1.0	.02	-.04	.02	.05	.02	-.04	.03	.18
Feed, Seed and Livestock Purch.	.132	-.8	-1.5	.08	-.04	.19	.22	.10	-.14	.31	.77
Misc. Operating Items	.061	-.3	-.5	.02	-.28	.02	.20	.14	-.14	-.17	.74
Hired Labor	.084	-.1	-.5	.00	-.06	.03	.08	.12	.02	-.13	.17
Interest on Non-real Estate	.041	-.2	-.4	.00	-.01	.02	.02	.05	.03	-.02	.01
Service Bldg. Cap. Items	.002	-.9	-.9	.00	-.02	.01	.02	.00	-.02	.01	.07
Service Bldg. Repairs	.006	-.7	-1.5	.01	-.01	-.01	.02	.02	-.02	-.04	.07
Interest on Real Estate	.027	-.1	-.4	.00	-.01	.01	.02	.05	.03	-.06	.00
Taxes on Real Estate	.057	.00	-.1	.00	-.01	.00	.01	.09	.07	-.15	-.09
All Purchased Inputs	.678	-.1	-1.0	.00	.00	.20	.68	.90	.00	-.89	1.74

by E_{11}, Table 2.1, a 10 percent increase in the price of fertilizer and lime results in an estimated six percent decrease in fertilizer usage in 1-2 years and an 18 percent decrease in the long run, if the impact of an increase on other inputs(E_{i1}) is ignored. The increasing price of fertilizer is not offset by the decrease in quantity purchased in the short-run, so fertilizer expenses increase .5 percent when the effects of other inputs are accounted for as shown by E_c. But in the long-run, fertilizer and lime expenditures decrease .8 percent due to the price increase. If a decrease in fertilizer usage did not decrease output, it is apparent that a fertilizer price increase would decrease net returns in the short-run and raise net returns in the long-run.

The effect of a decrease in the use of the input on output is indicated by the elasticity of production E_i. A larger E_i means a greater impact of the input on output. Whether an increase in the price of fertilizer raises or lowers revenue depends on the elasticity of demand for the product. Under the assumption used in developing this table, a 10 percent increase in the price of fertilizer raises revenue(E_r) 2.0 percent in the short-run and 2.4 percent in the long-run. The data and models used suggest that this price increase would result in a 4.2 percent increase in net income in 1-2 years and a 7.4 percent increase in the long-run.

Several conclusions can be made from these studies on the effects of input price inflation. One important observation is that the effects of input price increases are not homogeneous among inputs. Price increases for cash operating inputs with an elastic demand such as fertilizer, machinery, operating items and livestock purchases tend not to disadvantage farmers because individual producers can make adjustments in the quantity purchased of these items with greater ease than is possible with fixed

items. Increases in "costs" for fixed inputs such as real estate, labor and durable inventories through higher taxes, wages and interest rates results in farmers being more seriously disadvantaged.

The impact from input price inflation on net farm income for an individual farmer will depend on the elasticity of demand for the products that he is producing. In an earlier study, Tweeten estimated impacts of price increases under two demand elasticity scenarios[8]. He found that the more elastic the demand for the product, the more unfavorable was the impact of price increases for the farmer in both the short and long-run. He theorized that products sold on the international market would have a more elastic demand and therefore the net result of price inflation on net farm income would be more negative.

Inflation reduces nominal net farm income in the short-run but increases it in the long-run as shown in Table 2.1. Tweeten suggests that real net farm income may be changed little by inflation and that the benefits shown in the rise in nominal net farm income may not be significant. If the prices farmers have to pay for items purchased out of net farm income also rise they may have less buying power, even with more dollars to spend. The reality of price increases also tends to be dominated by the short-run effects on net farm income.

A large share of the impact of the cost-price squeeze can be attributed to the effect of inflation on interest rates. In a study looking at costs and returns of Colorado wheat producers, Miller points out the large negative impact of debt service costs increased by inflation on net farm income.[9] Interest rates are comprised of two portions which are summed to arrive at the nominal rate; a real interest rate, made up of the costs that are necessary for the lender to provide funds which would be equal to the

interest rate under no inflation, and the second portion, which is the expected inflation rate.

The effect of an increase in inflation on finance costs can be demonstrated from a simple example. With a real interest rate of 4 percent and no inflation, interest costs on a $100,000 loan would be about $4,000 per year. An expected inflation rate of 10 percent would result in a nominal interest rate of 14 percent and an interest charge of $14,000 on the same $100,000 loan. The interest payment would be 250 percent greater under an expected inflation rate of 10 percent than when no inflation was present.

Assuming that inflation has a neutral effect on net income as Tweeten proposes, inflation will result in no real change in returns to fixed factors. The nominal return to fixed factors would increase 10 percent while interest costs increase 250 percent. This increase in interest costs has been a major cause of the cost-price squeeze that many producers are facing. But not all producers have been affected in the same manner. Producers who have a significant portion of their total capital investment comprised of equity have not been significantly affected by this effect.

Miller's analysis of Colorado wheat farms suggests that while some farmers are having a difficult time finding enough cash income to meet expenses, others continue to make investments in farmland suggesting that they are still finding wheat production profitable. Many producers with a strong equity base have been able to continue to purchase land on borrowed funds and meet debt service requirements by using income from other sources to pay debt costs. Miller suggests that appreciation in land values has provided an incentive for continued investment in land for those who can find ways to meet financing obligations.

FOOTNOTES

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[2]Kalman J. Cohen and Richard M. Cyert, Theory of the Firm: Resource Allocation in a Market Economy, (Prentice Hall, Inc., 1975), p.113.

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[5]K.L. Robinson, "Unstable Farm Prices: Economic Consequences and Policy Options," American Journal of Agricultural Economics, Vol. 57:5 (December 1975), pp. 767-772.

[6]Robinson, p.770.

[7]Luther Tweeten and Leroy Quance, "The Impact of Input Inflation on the United States Farming Industry," Canadian Journal of Agricultural Economics, Vol. 19:3(November 1971), pp. 35-49.

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CHAPTER 3

AN OVERVIEW OF KANSAS WHEAT PRODUCTION

3.1 Role of Wheat Production in Kansas Agricultural Economy

Wheat production provides an important source of income for the Kansas agricultural economy, ranking second only to livestock production as a share of the total value of Kansas agricultural products. Wheat has maintained approximately a one-fourth share of the total farm value of Kansas farm commodities since 1930.

Harvested wheat acreage has averaged nearly one-half of the total crop acres harvested between 1910 and 1980. Wheat acreage replaced corn as the principle crop planted on Kansas farmland between 1910 and 1920. This shift resulted from the fall in the corn-to-wheat price ratio during the 1910 to 1920 period and Kansas's comparative advantage in the production of wheat relative to corn.

Table 3.1 Percent of Total Farm Value in Kansas by Commodity, 1910-1980

Year	Wheat	Corn	Sorghum	Soybeans	All Hay	Livestock
1910	12	19	0	0	6	58
1920	37	8	0	0	6	43
1930	27	8	1	0	4	56
1940	28	7	3	0	4	50
1949	30	8	4	1	5	52
1959	28	5	8	1	4	51
1969	21	6	11	3	6	52
1978	25	7	11	5	6	42
1980	28	7	8	3	5	48
Average 1910-1980	26.2	8.7	5.1	1.4	5.1	50.2

Source: "The Changing Structure of the Kansas Farm," Kansas Business Review, Vol. 5:6(July-August 1982)

Table 3.2 Percent of Total Acres Harvested in Kansas by Commodity, 1910-1980

Year	Wheat	Corn	Sorghum	Soybeans	Hay	Oats	Barley
1910	25	26	2	0	17	9	1
1920	45	26	3	0	14	9	3
1930	52	27	6	0	8	5	2
1940	44	13	21	0	7	8	7
1949	63	11	10	1	9	4	1
1959	48	9	24	2	9	3	5
1969	52	8	21	4	13	1	0
1978	50	9	22	7	11	1	0
1980	54	8	21	7	10	1	0
Average 1910-80	48.1	17.4	14.4	2.3	10.9	4.6	2.2

Source: "The Changing Structure of the Kansas Farm," Kansas Business Review, Vol. 5:6(July-August 1982).

The major crop production regions for 1979 are illustrated in Figure 3.1. Wheat production is the dominant crop within the shaded regions. Wheat is also produced in the areas outside of these regions but is not the principle crop produced in those areas. Although the development and growth of irrigation has allowed corn and sorghum production to become major crops in the southwestern counties of Kansas, wheat production is still the primary enterprise for dryland crop acres in this region.

3.2 Kansas Wheat Acreage and Production

The average number of acres planted and harvested for 10 year periods since 1900 for Kansas are presented in Table 3.3. The average number of wheat acres planted and harvested in Kansas reached a peak during the 1940-49 decade as farmers were encouraged to produce more during and after World War II. The acres grown are influenced by relative prices and returns compared to other crops, government programs, and the influence of weather conditions before and during the growing season. Yearly data since 1960 for these same factors are given in Table 3.4. The acreages planted to wheat during this period have ranged between 9.5 and 14.2 million acres and harvested acres have ranged between 8.5 and 13.2 million acres.

Figure 3.1: PRIMARY REGION ON WHEAT PRODUCTION, 1979

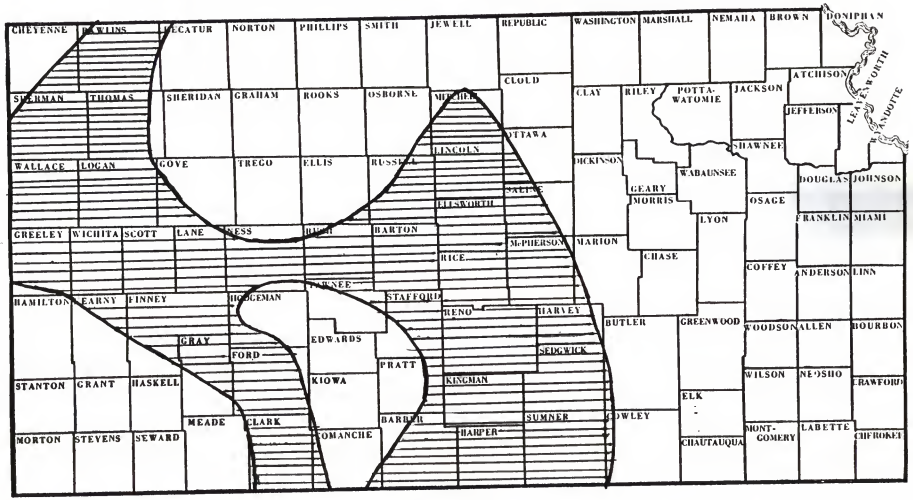


Table 3.3 Kansas Wheat Production, 1910-1982
Ten-year Averages

	Sown	Harvested	Yield	High	Low	Production
	(Thousand Acres)		(Bushels per Acre)			(Mil. Bush.)
1900-09	N.A.	5,581	14.0	18.2	11.0	77,140
1910-19	8,878	7,155	13.2	20.0	10.7	96,877
1920-29	11,744	10,028	13.1	16.3	9.2	132,203
1930-39	14,194	10,768	11.9	18.5	9.1	131,896
1940-49	13,470	12,137	15.9	17.6	11.0	192,798
1950-59	12,046	10,226	17.6	27.5	12.5	180,752
1960-69	11,059	9,876	24.2	31.0	19.5	239,045
1970-79	11,468	10,582	32.1	38.0	27.5	337,547
1980-82	13,733	12,467	31.7	35.0	25.0	395,667

Source: Marketing Kansas Wheat, Kansas State Board of Agriculture.

Table 3.4 Kansas Wheat Production, 1960-1982

	Sown	Harvested	Yield	Production
	(Thousand Acres)		(Bush./Acre)	(Mil. Bush.)
1960	10,727	10,329	28.5	294,376
1961	10,727	10,329	26.5	273,718
1962	9,762	8,986	23.5	211,171
1963	10,641	8,627	21.5	185,480
1964	10,535	9,490	22.0	208,780
1965	11,272	10,059	23.5	236,386
1966	11,047	10,260	19.5	200,070
1967	13,146	11,081	20.0	221,620
1968	11,963	9,751	26.0	253,526
1969	10,767	9,849	31.0	305,319
1970	9,690	9,061	33.0	299,013
1971	9,593	9,061	34.5	312,605
1972	10,300	9,400	33.5	314,900
1973	10,800	10,400	37.0	384,800
1974	12,000	11,600	27.5	319,000
1975	12,800	12,100	29.0	350,900
1976	12,900	11,300	30.0	339,000
1977	13,200	12,100	28.5	344,850
1978	11,300	10,000	30.0	300,000
1979	12,100	10,800	38.0	410,400
1980	13,000	12,000	35.0	420,000
1981	14,000	12,200	25.0	305,000
1982	14,200	13,200	35.0	462,000

Source: Kansas Wheat Quality Reports, Kansas State Board of Agriculture.

Average yields per acre are also given in Tables 3.3 and 3.4. The high and low yields for each decade are included in Table 3.3. Considerable variability in yields per acre can be found from one year to the next. Yields are influenced by weather conditions, such as hail, freezes and drought, and by disease and insect pests. Wheat yields have trended upward, increasing 127 percent between 1900 and 1980. Increases have been the result of improvements in wheat breeds that have made wheat more resistant to disease, pests and drought, use of fertilizer to improve soil fertility and improvements in cultivation methods. Improvements in yields can be observed by the fact that low yields during the 1960's and 1970's are greater than the high yields of previous decades.

Total wheat production is given in the last column of Tables 3.3 and 3.4. Kansas wheat production increased 338 percent from the decade average of 1900-1909 to the decade average for 1970-1979. The average wheat production in Kansas for the first three years of the 1980's was 17 percent greater than the ten year average for the 1970's.

3.3 Changes in Farm Structure

Much of the increase in wheat yields and production has been achieved through changes in the input mix used to produce wheat. Farming has been transformed through the use of labor-saving and capital-intensive inputs from nearly self-sufficient enterprises to market-oriented business that depend heavily on purchased inputs. This shift in input structure since 1945 is shown for the Northern Plains region which consists of Kansas, Nebraska, North Dakota, and South Dakota. Overall input usage increased only 12 percent over the 1945-80 period. The use of non-purchased inputs has declined 36 percent during this time period however, while purchased input use has risen 112.5 percent. Labor input declined 72 percent and

Table 3.5 Indexes of Farm Input and Major Input Subgoups, Northern Plains Region, 1945-1980 (1967=100)

Year	Total Input All[1]	Non-Purchased[2]	Purchased[3]	Farm Labor[4]	Farm Real Estate[5]	Mechanical Power and Machinery[6]	Agri. Chemicals[7]	Feed, Seed and Livestock Purchases[8]
1945	100	144	64	258	93	68	3	47
1950	96	130	68	188	95	91	7	49
1955	101	130	75	166	96	107	19	61
1960	96	112	81	129	95	100	31	76
1965	95	100	90	103	99	93	62	87
1970	100	98	104	92	99	99	128	111
1975	105	99	112	83	96	118	142	120
1980	112	92	136	72	98	132	220	141

[1]Measured in constant dollars.
[2]Includes operator and unpaid family labor, and operator owned real estate and other capital inputs.
[3]Includes all inputs other than nonpurchased inputs.
[4]Includes hired labor, operator and unpaid family labor.
[5]Includes all land in farms, service buildings, grazing fees, and repairs on service buildings.
[6]Includes interest and depreciation on mechanical power and machinery, repairs, licenses and fuel.
[7]Includes fertilizer, lime and pesticides.
[8]Includes nonfarm value of feed, seed and livestock purchases.

Source: Statistical Bulletin 679; Economics, Statistics and Cooperatives Service, USDA.

land input remained relatively constant during the period. Purchased inputs rose substantially, machinery input more than doubled, and agricultural chemical usage, which includes fertilizer, rose substantially from the small proportion used in 1945.

This substition of inputs has allowed farmers to increase the size of their farms while farm numbers have declined. The average size of the Kansas farm increased 79.9 percent while farm numbers declined 45.4 percent between 1945 and 1978.[1] Data is not available for the changes that have occurred specifically to wheat farms during this period, but wheat farm structure can be safely assumed to have followed a similar trend.

The number of farms and acres of wheat planted by farm size groups for the 1976 and 1981 harvests are presented in Table 3.6. The total number of wheat farms decreased 12 percent between 1976 and 1981 but the number of farms with 500 or more acres increased 7.3 percent during this same period. In 1981, less than seven percent of the wheat farms in Kansas accounted for 29 percent of the total acres of wheat planted.

Table 3.6 Wheat Planted for 1976 and 1981 Harvest, By Size Groups

Acres of Wheat Planted Per Farm	Number of Farms		Percent of Total Farms		Acres of Wheat Planted	
	1976	1981	1976	1981	1976	1981
1- 24	5231	4465	8.94	8.68	71.9	66.0
25- 74	12048	9856	20.59	19.16	524.1	478.0
75- 199	16997	14199	29.05	27.60	1981.1	1845.0
200- 499	16836	14975	28.77	29.11	4789.0	4791.0
500- 749	4397	4470	7.51	8.69	2408.0	2722.0
750- 999	1526	1759	2.61	3.42	1191.0	1525.0
1000-1999	1325	1492	2.26	2.90	1542.2	1962.0
2000-2999	127	170	.22	.33	268.3	403.0
Above 3000	31	57	.05	.11	125.4	208.0
State	58518	51443	100.00	100.00	12900.0	14000.0

Source: Kansas Wheat Quality Reports, Kansas State Board of Agriculture.

3.4 The Past Ten Years

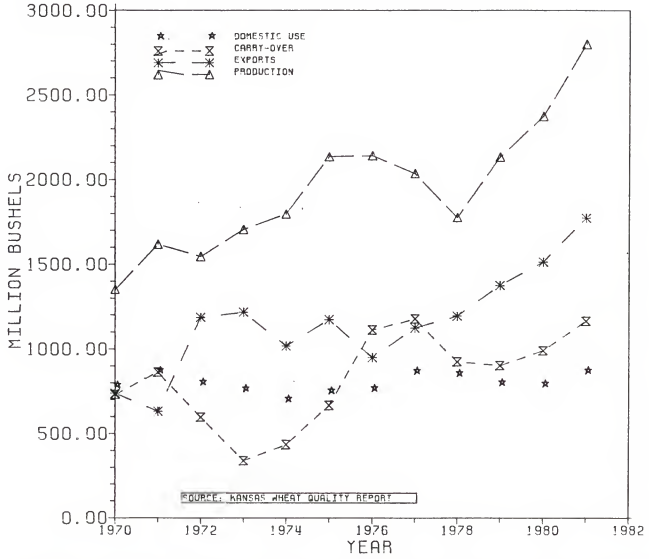
The ten year period from 1973 to 1982 has been characterized by major changes in the level of prices for both inputs and output of the farm sector. An attempt will be made in this section to illustrate the changes that have occurred and the major causes of these changes.

Beginning in late 1972, wheat exports began to increase considerably from earlier levels. New records were set for exports during the June 1972 to June 1973 marketing period. Carry-over stocks were reduced from their high levels of the previous year going into the 1973 marketing year and prices improved. With continued strong demand and prospects for small wheat stocks, wheat prices climbed to record levels. Mid-month farm prices for wheat, which had averaged $2.47 per bushel in July of 1973, advanced to $4.62 in September and topped $5.00 in January of 1974. July to December exports of all wheat were a record 737 million bushels, 47 percent higher that the previous year.

Prospects remained good for continued prosperity for U.S. wheat producers with the 1974 harvest. Although prices had fallen from their record levels in January and February, they began to increase again in June and July. Carry-over levels in the U.S. were at a very low level and total supply was down from the previous year. 1974 was characterized by considerable price variability as can be seen from the monthly average prices presented in Table 3.7. Average prices were at a high of $5.39 in February of 1974, fell to $3.20 per bushel in May, then strengthened to a high of $4.56 for the second half of the year in October. Plantings of wheat increased 25 percent from the fall of 1972 to the fall of 1974 as farmers responded to higher wheat prices.

With a record national production of 2,135 million bushels and increased carry-over from the previous year, stocks of wheat after the 1975

FIGURE 3.2: SUPPLY AND DISAPPEARANCE OF U.S. WHEAT



harvest were at their highest level since 1973. Exports of winter wheat fell during the 1975-76 marketing year but exports of all wheat were 15 percent above the 1974-75 exports. Wheat prices in 1975 were about one dollar lower than in 1974, but still relatively strong compared to the period prior to the second half of 1973. The nation's total fall planting of 57.7 million acres of winter wheat was the largest in nearly a quarter of a century. Average monthly prices fell about $.50 per bushel after this large planting but remained within the $3.25 to $3.55 range through the spring.

A record harvest in 1976 and a sizable carry-over resulted in wheat stocks being at their highest level since the early 1960's. Prices were pressured by this huge supply and from falling exports which fell in response to bumper crops also being harvested by many competing and importing nations. Prices fell from the July average of $3.29 per bushel to $2.22 in November and by May of 1977, they had fallen to $1.82, the lowest level since 1972.

Total stocks were at a high level after the 1977 harvest and farm prices for wheat remained depressed below the $2.00 level. This encouraged participation in the government set-aside and reserve programs. Acreage planted to winter wheat declined 14 percent and harvested acres declined 19.6 percent from the previous year. Increases in exports and use of the farmer held reserve allowed prices to gradually increase throughout the marketing year to about $2.70 after the 1978 winter wheat harvest.

Winter wheat plantings in 1978 increased 8.8 percent over the previous year as improved planting conditions and higher prices encouraged farmers to increase their plantings. Acreage planted to winter wheat for the

Table 3.7 Kansas Average Mid-month Wheat Price (Dollars per Bushel)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1973	2.44	1.86	1.98	2.13	2.10	2.38	2.40	4.26	4.52	4.10	4.10	4.66
1974	5.22	5.39	4.57	3.71	3.20	3.44	3.96	3.89	3.95	4.56	4.45	4.36
1975	3.90	3.72	3.31	3.29	3.02	2.76	3.38	3.70	3.82	3.72	3.30	3.18
1976	3.27	3.52	3.49	3.35	3.25	3.34	3.29	2.85	2.72	2.44	2.22	2.24
1977	2.31	2.35	2.23	2.06	1.82	1.93	1.95	1.92	2.02	2.19	2.35	2.35
1978	2.36	2.43	2.58	2.82	2.67	2.71	2.70	2.74	2.81	2.98	3.00	2.94
1979	2.95	2.96	2.98	3.03	3.22	3.72	3.85	3.67	3.84	3.91	3.93	3.79
1980	3.71	3.73	3.48	3.42	3.44	3.48	3.62	3.78	3.93	4.14	4.18	4.01
1981	4.04	3.96	3.83	3.92	3.81	3.71	3.70	3.67	3.74	3.82	3.95	3.91

Source: Agricultural Prices, USDA, Economics and Statistics Service.

nation totaled 51 million acres. Prices remained steady around the $2.35 range through the fall, then began to climb as the 1979 harvest neared.

Since June of 1979, the average monthly price of Kansas wheat has remained in a range between $3.40 and $4.20 per bushel. Carry-over stocks of U.S. wheat have remained at nearly one billion bushels per year. Although exports were strong during the 1979-1982 period, production has also continued to grow. Total use of U.S. wheat nearly accounted for all of the production each year but did not reduce the high levels of wheat reserves.

Wheat production continued to set records for total output for the 1980 and 1981 harvests. Harvested acres increased 13.3 percent in 1980 to 70.9 million acres, and 13.8 percent in 1981 to 70.9 million acres. Average yields of 33.4 and 34.7 bushels per acre were among the best ever. With this combination of large acreages and good yields, total production set new records in both years.

While wheat prices fell from their high levels of 1973 and 1974, prices of production inputs have risen dramatically during the 1973 to 1982 period. Input prices rose 153 percent as estimated by the index of prices paid for production inputs. Never before has there been such a large increase in the prices paid for farm inputs in such a short span of time. In comparison, farmers had a span of 28 years, from 1945 to 1973, to adjust to a similar rise in prices of production inputs. Indexes of prices paid for selected inputs and services are shown in Table 3.7.

Interest costs and fuel prices have risen most over this period. Interest costs soared 304 percent between 1973 and 1982. This resulted in interest costs, as a proportion of total expenses, nearly doubling from 7.0 percent in 1973 to 15.0 percent in 1982[2]. Farmers with a high proportion of debt to equity have been affected most by this rise in interest costs.

Table 3.8 Index of Prices Paid By Farmers For Selected Inputs and Services 1973-1982 (1967=100)

Year	Family Living Expenses	Production Items	Fertilizer	Agric. Chemicals	Fuels	Farm Supplies	Machinery	Taxes	Interest	Wages
1973	133	146	102	105	116	120	139	146	179	155
1974	151	172	167	119	159	147	159	154	215	177
1975	166	218	217	160	177	168	197	165	252	191
1976	176	225	185	174	187	164	225	178	288	211
1977	181	242	181	157	202	165	246	190	331	229
1978	194	256	180	147	212	171	266	190	391	240
1979	215	292	196	150	276	189	293	203	467	265
1980	245	335	243	160	380	221	326	222	557	287
1981	271	361	268	174	436	245	361	235	646	303
1982	289	369	266	189	433	253	395	250	723	306
Percent Change 1973-82	117	153	161	80	273	111	184	71	304	97

Source: Agricultural Statistics

Fuel prices increased 273 percent between 1973 and 1982. Initial increases in prices were brought about by the oil embargo of 1973 and the growing demand for petroleum purchased from foreign sources. Fuel prices continued to increase sporadically throughout the decade.

Price increases for individual items often can cause increases in prices of other items as adjustments are made. As fuel and interest costs rise, manufacturers increase their prices to maintain an adequate margin of return. Workers demand higher wages and salaries when they realize that they cannot purchase as much with their incomes. Manufacturers must then raise prices again to meet the increased labor costs. This created a vicious circle during the 1970's as workers attempted to maintain their purchasing power and manufacturers attempted to maintain their profit levels.

Inflation and the resulting high nominal interest rates also have an influence on product prices of farm commodities. They dampen demand for price-sensitive raw commodities, such as wheat, by making it more expensive for users of those commodities to hold inventories. High interest rates also affect exports of U.S. agricultural products. Foreign investors, desiring to benefit from the high interest rates, demand U.S. dollars, causing the value of the dollar to rise. This rise in the value of the dollar makes goods produced in the U.S. more costly relative to products of other countries and reduces demand for these products. The decline in demand translates into lower prices for U.S. agricultural products.

F O O T N O T E S

[1] Rich Sexton and John Ceta, "The Changing Structure of the Kansas Farm," Kansas Business Review, Vol.5:6(July-August 1982), p.4.

[2] Agricultural Finance Outlook and Situation, USDA, Economic Research Service, (December 1982), p.7.

CHAPTER 4

DATA AND PROCEDURE

4.1 Sources of Data

The data for this study was obtained from farm records stored in the KMAR-105 Whole-Farm and Enterprise Databank and Retrieval System. This computer databank has been developed to store economic records of a portion of the Kansas Farm Management Associations member's records since 1973. This data includes information on approximately 411 variables per farm; including financial information, measures of farm size, and other farm characteristics useful for comparison and analysis. Records have been kept for 2600 to 3000 farms each year since 1973.

Six Farm Management Associations cover the entire state of Kansas. Farmers who choose to participate in the program pay a fee in return for the educational program provided. Each farm unit keeps records for the farm business which are then used to develop detailed financial statements and balance sheets in a year-end analysis. This data, along with other farm related information is stored on computer discs. Research can then be conducted utilizing this information as long as data from farm records are analyzed collectively so that individual identities and accounting data are not revealed.

Farms that participate in this program are among the larger and better managed farms in the state of Kansas. Harold Lobmeyer determined in a Master's Thesis in 1977 that in 1974 only two percent of the Kansas Farm Management Association farms had sales of less than $10,000, while 81 percent had product sales of $40,000 or more.[1] In contrast, according to Farm Income Statistics, 29 percent of all commercial farms in Kansas had sales of less that $10,000 and only 28 percent had sales of $40,000 or

more. About two percent of Kansas farmers participate in the program so this is a significant survey of the larger farms of Kansas.

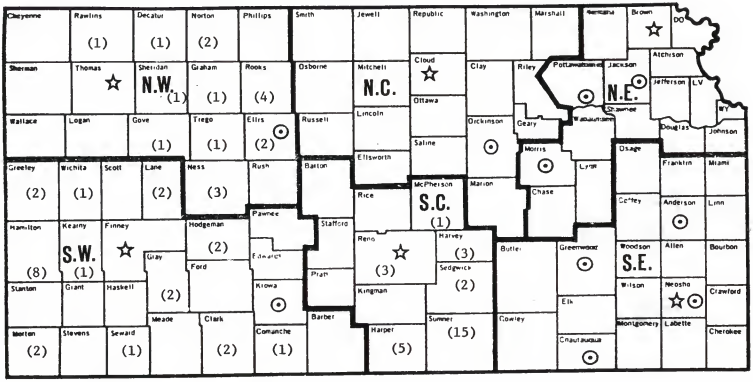
By selecting a group of farms a better understanding can be gained as to how wheat producers have responded to changes in input and product prices over a 10 year period. The use of this time series data will allow comparisons of how total expenditures for different categories have changed relative to the changes in their prices. The analysis of this data will provide answers to such questions as what price increases have had the most impact on net farm income, how have farmers adjusted to increasing input prices, and what impact this has had on the structure and growth of wheat farms in Kansas. Analysis will also provide an understanding of the magnitude of the cost-price squeeze on the net farm income of wheat producers in Kansas.

Three Farm Management Associations were chosen to select information for this study. These asociations are in South Central, Southwest, and Northwest Kansas; S.C., S.W., and N.W. associations respectively. By selecting dryland farms in these regions that had a small share of farm income from livestock enterprises, it was possible to find farms that were primarily wheat farms. Rainfall in these areas limits the cropping alternatives primarily to wheat, grain sorghum, alfalfa and forages. Wheat is the primary crop grown on the farms selected which allows an analysis of responses to changing input and product prices.

4.2 Development of Budgets

Budgets of expenses and returns for wheat production have been developed from a survey of wheat farms in three Farm Management Associations. A summary program was used to compute averages of each of the variables retrieved from the databank for each year. These averages were then used to develop budgets of wheat production costs.

Figure 4.1: **KSU Farm Management Associations**



☆ Association Headquarters

⊙ Satellite Office

*Numbers in parenthisis represent number and location of wheat farms surveyed for analysis.

Although the farms are primarily wheat farms, some livestock and other crops are also raised. The data have been adjusted to remove the effects of livestock production expenses when this was necessary. A livestock production cost on a per head basis was prepared from the enterprise analysis developed each year in the Kansas Farm Management Records Summary and Analysis State Report. This production cost estimate was multiplied by the average number of head raised on the farms surveyed.

The computation of all of the variable expenses, except labor charges and interest expense, was straight forward. Each expense that was affected by livestock production was reduced by the estimated cost of producing livestock on the farm. Other expenses could be found directly from the records' summary. Because interest expense and labor costs show a greater degree of variability from farm to farm, a formula was used to determine the cost estimate for each of these.

Labor expense is determined by multiplying an annual hourly wage rate with a labor input factor. Labor input factors were determined from research done in 1975 for labor requirements for various crops in Kansas.[2] This factor was adjusted to account for increases in machine size and efficiency. The values of the factors used are presented in Table 4.1 for each of the regions used in this analysis. Wage rates used are based on an hourly charge of $2.50 per hour in 1973, and increased by $.50 per hour for each subsequent year.

Interest on operating capital is computed by multiplying the average Production Credit Association interest rate for each year times the sum of all other variable expenses times .75. The factor of .75 was selected because about nine months would elapse from the time that most production expenses are incurred until harvest time when the loan can be repayed.

Table 4.1 Procedures Used in Developing Production Cost Budgets Example Budget and Formulas for Derived Costs, (700 Acres).

Item (Dollars)	Cost	Livestock Adjustment	Derived Cost	Cost per Acre
Mach. and Build Repairs	7388	728	6660	9.51
Seed and Crop Ins.	2017		2017	2.88
Fertilizer	2104		2104	3.00
Machine Hire	7164		7164	10.23
Organization Fees	683	195	488	.70
Gas-Fuel-Oil	4881	350	4531	6.47
Personal Prop. Tax	1132	281	851	1.21
Gen. Farm Insurance	666	116	550	.79
Utilities	1252	335	917	1.31
Herbicides-Insecticides	384		384	.55
Conservation	112		112	.16
Auto Expense	588	122	466	.84
Depreciation	11,283	1296	9987	14.27

Labor Expense = Wage Rate x Labor Input Factor

Interest on Operating Capital = Total Variable Expense x .75 x PCA Rate

Interest on Machinery Investment = Machinery Investment Per Crop Acre x 0.5 x PCA Rate

Real Estate Taxes = Total Crop Acres x Real Estate Taxes per Crop Acre

Fixed machinery costs used in this analysis include depreciation, interest on investment and personal property taxes. There has been considerable discussion on whether the use of depreciation expense is the best method of determining a cost to machinery wear. Many have argued that depreciation expenses under estimate the actual cost and that a share of

replacement cost would be more appropriate in an inflationary economy. Use of depreciation expense in developing cost budgets has been common practice and will be used in this study because the information is readily available.

Interest on machinery investment is arrived at by first calculating the estimated new value of machinery investment per crop acre. This value is computed by multiplying the machinery investment per crop acre by a factor of 2.14 for South Central Kansas and a factor of 2.44 for Southwest and Northwest Kansas. These factors convert the machinery investment to new cost and are based on earlier studies of the machinery values of these areas[3]. An average machinery investment per crop acre is computed by dividing this value by two to convert the new cost to an estimated average investment in machinery. This is done because in general the average age of machinery on the farm is about five years old. Interest on investment is determined by multiplying this derived value times the annual Production Credit Association interest rate.

4.3 Land Charges

Assigning a cost to fixed production factors, such as land and management, necessitates special considerations concerning which cost valuation is appropriate. The value placed on land and management inputs often varies from producer to producer. A farmer who has recently purchased his land will require a high cash return to meet interest and principle payments. The producer who purchased his land earlier with a fixed interest loan, not only has a lower payment for principle and interest costs, but has also received considerable appreciation in his equity due to the increase in land values.

Table 4.2 Values for Factors Used in Computation of Labor Charges, Interest Expense and Income from Wheat Sales.

Year	Labor Input (Hrs./Acre) S.C.	S.W./N.W.	Labor Charge ($/Acre)	PCA Interest Rate	FLB Interest Rate	July 15 Kansas Wheat Price ($/Bushel)
1973	2.35	1.45	2.50	7.84	6.97	
1974	2.25	1.40	3.00	9.37	7.55	3.96
1975	2.15	1.30	3.50	8.94	8.01	3.70
1976	2.05	1.25	4.00	8.44	8.16	2.72
1977	1.95	1.20	4.50	8.03	8.13	1.92
1978	1.85	1.15	5.00	8.96	8.19	2.68
1979	1.75	1.10	5.50	10.94	8.83	3.82
1980	1.70	1.00	6.00	13.46	9.95	3.57
1981	1.60	.95	6.50	15.26	11.69	3.62
1982						3.29

Several alternatives for estimating costs for land are considered to evaluate the effects of different ownership arrangements. These alternatives include using a six percent return to the estimated purchase price of the land, a six percent return on the fair market value of the land, the annual Federal Land Bank(FLB) rate times the estimated purchase price of the land, the annual FLB rate times the fair market value of the land, and a one-third share of the crop income.

To estimate the 1973 purchase price for cropland in the three regions an average of the values computed from two sources was derived. A value for total land owned and rented is calculated yearly for each farm by the Farm Management Association fieldmen. A value for cropland is determined by subtracting the estimated value of pastureland for the farm from the total value of land operated. Dividing by the crop acres for the farm gives a dollar value per acre of cropland for the farm.

The second method used to arrive at a land value involves using data from the Kansas State University Bulletin "Trends in Land Values in Kansas." The 1967 average value for all land in farms for each of the crop-reporting districts is given along with index values of land prices for each year. The 1973 value for all land was computed using the indexes and then multiplied by an index of the value of non-irrigated cropland relative to the value of all cropland for each district. The cropland values arrived at for use in the analysis are $320 per acre for the S.C. association, and $155 for the S.W. and N.W. associations. Market values have been computed using price indexes reported in this publication. The index values and estimated market values for each association are given in Table 4.3.

The management charge is determined by using 10 percent of the gross farm income each year. This results in a higher return to management in

Table 4.3 Land Price Indexes and Estimated Land Values. (1973=100)

	S.C. Association		S.W. Association		N.W. Association	
	Index	Land Value ($/Acre)	Index	Land Value ($/Acre)	Index	Land Value ($/Acre)
1973	100	320	100	155	100	155
1974	122	390	152	236	132	205
1975	160	512	160	248	176	273
1976	170	544	194	301	203	315
1977	191	611	214	332	219	339
1978	193	618	199	308	221	343
1979	227	726	220	341	275	426
1980	252	806	263	408	335	519
1981	248	794	267	414	368	570

Source: Trends in Land Values in Kansas, Kansas Agricultural Experiment Station Bulletin 625.

high income years and a lower return during years when yield and/or prices are low.

4.4 Returns

Gross farm income is comprised of returns from the sale of crops, government farm program payments, and income from insurance and investments. Computation of these income sources is explained below.

Wheat sales--Income from wheat sales is computed using the average wheat yield and the average Kansas wheat price on July 15 of each year. The July 15 wheat price has been chosen to eliminate the need to adjust returns for storage costs.

Government farm program payments--The amount of income from this source is influenced by the level of participation in the government farm program. Factors influencing participation include farmers' expectations of future prices and the level of benefits from participation relative to the expected returns they will receive if they do not participate.

Income from insurance and investments--Income from insurance and investments are pro-rated according to the proportion of crop income relative to total income for each year.

F O O T N O T E S

[1]Harold Lobmeyer, The Nonfarm Income of Kansas Farm Management Association Farmers For Years 1973-1975, Master's Thesis, Kansas State University, 1977, p.20.

[2]Orlan H. Buller, Larry N. Langemeier, and John L. Kasper, Labor Requirements of Western Kansas Crops, Agricultural Ecperiment Station Bulletin 593, Kansas State University, (Manhattan, Kansas, October 1975).

John L. Kasper, Larry N. Langemeier, and Orlan H. Buller, Labor Requirements of Central Kansas Crops, Agricultural Experiment Station Bulletin 589, Kansas State University, (Manhattan, Kansas, July 1975).

[3]Larry N. Langemeier, "Economic Analysis of Crop Machinery Ownership Costs", Contribution No. 589, Department of Agricultural Economics, Kansas Agricultural Experiment Station, 1976.

[4]Wilbur H. Pine and M.E. Johnson, Trends in Land Values in Kansas, Agricultural Experiment Station Bulletin 625, Kansas State University, (Manhattan, Kansas, December 1978) Unpublished Data 1977-1982.

CHAPTER 5

ANALYSIS

In a given problem, an analysis of individual components is required to gain a better understanding of what has happened to the overall situation. This study of the causes and implications of the cost price squeeze to Kansas wheat farms follows this approach. The study includes analysis of the changes that have occurred in prices, the usage of variable inputs, changes in machinery investment, and analysis of the effects of different ownership alternatives on the financial well-being of the farms. Conclusions are drawn from the study based on the changes that have occurred and their impact on the structure and continued viability of Kansas wheat farms.

Expenditures have been computed on a cost-per-acre basis to allow comparisons between years and regions. Figures and tables have been prepared to show the changes in the year to year expenditures. Considerable variation in the expenditures among individual farms can exist and will not be expressed in the averages used in this study. The same farms have been used throughout the analysis so the impact of this variation should not be significant.

5.1 Analysis of Variable Costs

a) S.C. Association

Changes in variable costs are of particular interest in observing what changes have occurred in resource use caused by changing price relationships. Prices for production inputs purchased from non-farm sources increased 153 percent between 1973 and 1982. Prices of many of the major inputs used in wheat production including fuel, fertilizer and machinery costs increased by an even larger percent.

Variable costs per acre for the S.C. association farms are presented in Table 5.1. Total variable costs have shown a definite upward trend, increasing 128 percent between 1973 and 1983. The relationships of most of the major individual variable expenses are illustrated graphically in Figure 5.1.

Gas, fuel and oil expenditures have risen substantially over the period, from 7.1 percent of total variable costs(TVC) in 1973, to 17.1 percent in 1982. A large portion of this increase has been due to the price increases that have occurred in petroleum prices since the early 1970's. Prices for fuels rose an estimated 273 percent, as determined from the index of prices paid for fuels. Total expenditures for fuels rose 453 percent for the S.C. association over this period. Fuel usage per acre has increased an estimated 50 percent which may be partially attributed to the substitution of machinery input for labor.

Fertilizer expenditures have been erratic which is due in part to the price conditions that have existed and in part to the nature of fertilizer usage. The amount of fertilizer used can be varied easily from year-to-year in response to price changes and economic conditions. Fertilizer is truly a variable input in that usage can be varied easily in response to farmer expectations concerning marginal costs and returns. Most other "variable" inputs are more fixed in nature because if the farmer chooses to produce then a certain amount of labor, fuel, repairs and custom hire will be necessary to produce and harvest the crop.

Fertilizer expenditures have not kept pace with increases in price during the ten-year period. Expenditures rose 67 percent between 1973 and 1981, while prices rose 157 percent. Several factors may have contributed to this difference. First, farmers may have substituted different forms of

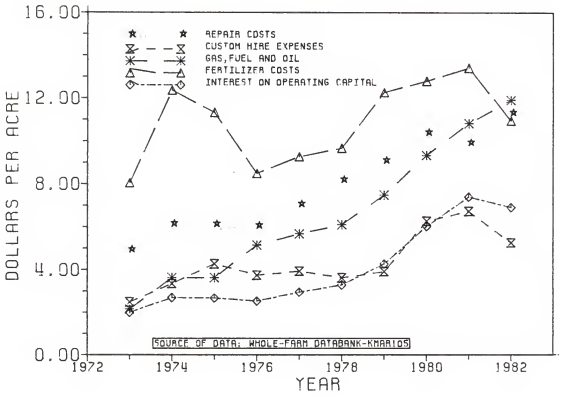
Table 5.1 Variable Production Costs Per Acre
S.C. Association (Dollars per Acre)

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Labor	5.87	6.75	7.52	8.20	8.78	9.25	9.63	10.20	10.40	10.50
Mach. Repairs	4.80	6.00	6.00	5.93	6.93	8.07	8.96	10.27	9.79	11.18
Mach. Hire	2.49	3.35	4.27	3.74	3.93	3.62	3.91	6.28	6.73	5.27
Fuel	2.15	3.62	3.62	5.15	5.68	6.11	7.48	9.33	10.80	11.90
Seed & Crop Ins.	2.80	3.01	3.89	5.41	10.99	7.20	5.70	5.70	6.16	5.71
Fertilizer	8.04	12.35	11.32	8.49	9.27	9.67	12.26	12.79	13.40	10.94
Herb. Ins.	.28	.40	.75	1.68	.41	1.00	.85	.50	3.87	1.31
Org. Fees	.36	.48	.56	.53	.63	.70	.66	.92	1.03	.94
Insurance	.48	.69	.73	.72	.97	1.07	.94	.87	.83	1.18
Utilities	.42	.56	.62	.67	.91	1.10	.94	1.10	1.18	1.48
Conservation	.02	.43	.53	.21	.01	.05	.23	.48	.02	.07
Auto Expense	.52	.59	.60	.55	.72	.87	.63	.66	.79	.80
Int. on Oper. Cap.	2.00	2.69	2.67	2.53	2.95	3.29	4.27	6.03	7.39	6.91
Total Var. Costs	30.23	40.92	43.08	43.79	52.18	52.01	56.48	65.60	71.93	69.00

FIGURE 5.1

VARIABLE PRODUCTION COSTS PER ACRE

S.C. ASSOCIATION



fertilizer that are less expensive. They have also probably become more conscious of the need to make more effective use of the fertilizer that they do purchase. The use of soil fertility tests and other sources of information have allowed farmers to reduce the amount of nutrients that they need to supply. The higher fertilizer prices have also resulted in a lower amount of fertilizer being optimum for maximum ecomomic returns.

Fertilizer expenditures as a share of total variable costs have fallen from the share that they held in the 1973-1976 period. This was due to the fall in price from 1975 to 1976, and then increases in total variable costs at a similar rate to fertilizer expenditures after this period.

A survey of average fertilizer usage of Kansas wheat farms is conducted each year and results are presented in the Fertilizer Situation and Outlook report. Results of these surveys are presented in Table 5.2. Nitrogen usage has remained relatively constant over the period, within a range of 46 to 56 pounds per acre annually. The proportion of acres receiving nitrogen rose steadily except for a decline in 1978. The rate of usage for acres receiving phosphorus fell from a high of 40.6 lbs per acre in 1973, to an average of about 34 lbs. per acre in later years. Potassium usage has trended upward on a per acre basis, but only about 10 percent of the acres received potassium annually.

Table 5.2 Fertilizer Usage by Kansas Wheat Farms

	Percent of Acres Receiving				Rate per Acre Receiving (lbs. per acre)		
	Any Fert.	N	P_2O_5	K_2O	N	P_2O_5	K2O
1973	66.5	66.2	42.3	8.1	53.6	40.6	22.4
1974	69.0	68.2	38.7	10.2	48.9	34.4	18.5
1975	69.0	68.2	42.0	11.0	46.8	31.6	19.2
1976	73.1	73.1	47.1	11.2	51.8	35.4	24.2
1977	71.6	71.3	40.8	8.3	49.1	33.9	21.3
1978	63.5	62.8	30.2	6.3	50.2	30.2	18.0
1979	70.2	70.2	38.2	8.8	49.8	34.8	24.6
1980	75.8	75.8	39.6	9.8	55.6	33.7	31.4
1981	75.9	75.5	43.5	11.9	54.2	34.0	30.1
1982	74.9	74.9	39.7	7.5	55.5	35.3	26.7

Source: Fertilizer Outlook and Situation, USDA, Economic Research Service.

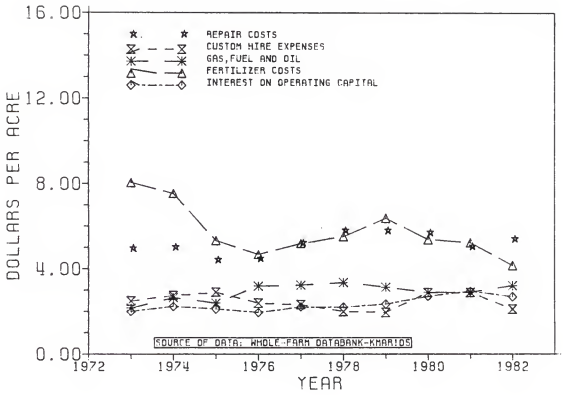
Machinery repair expenditures have risen 133 percent between 1973 and 1982. The index of prices paid for farm supplies rose 101 percent during this same period. Evaluating whether the expenditures were rising primarily because of price changes or due to increased purchase of repairs is difficult. The real cost of repairs may not have increased during this period because the mix of repairs purchased may be different than the index reflects. If returns have not been sufficient to cover costs and thus discourage investment in new machinery, then repair expenditures would be higher as farmers keep their older machinery longer.

Machine hire expenditures remained relatively stable between 1973 and 1979. Changes in expenditures can be largely explained by the increase in prices paid for machine hire. The significant jump in costs between 1979 and 1981 may be the result of the increase in the average number of acres

FIGURE 5.2

VARIABLE PRODUCTION COSTS
INDEXED TO 1973 COSTS

S.C. ASSOCIATION



of wheat harvested. This increase in acres may have required more farmers to hire custom services for harvesting or fertilizing. The stable nature of machiner hire expenditure suggests that a portion of the increased fuel expenditures is due to farmers performing a larger portion of the farming operations themselves.

Changes in seed and crop insurance expenditures are difficult to evaluate due to the combination of the two components. Much of the year-to-year variability has probably been due to changes in the amount of crop insurance purchased and the number of farmers who insured their wheat.

Interest costs for operating capital have grown significantly during the period. The increase in variable costs and interest rates have been the causes of this growth. The estimated interest costs on operating capital have increased 245 percent from 1973 to 1982, from $2.00 per acre to $6.91. The rise in interest rates resulted in interest costs rising from 6.6 percent of total variable costs in 1973 to 10.4 percent of TVC in 1982.

b) S.W. Association

The S.W. Farm Management Association is located in Southwestern Kansas, in a region where rainfall limits the choices among cropping alternatives. Dryland crop production is limited primarily to summer-fallow wheat. Wheat fertilizer expenditures in this region are much smaller than in the continuous crop wheat regions. On average, 60 percent of the farms in the survey applied fertilizer each year and expenditures for those farms which did were about one-third of the value of expenditures for the S.C. association wheat farms.

Fertilizer expenditures rose 125.8 percent between 1973 and 1982, but were within a range of $.97 and $2.19 per acre. These expenditures re-

Table 5.3 Variable Production Costs Per Acre
S.W. Association (Dollars per Acre)

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Labor	3.63	4.20	4.55	5.00	5.40	6.00	6.05	6.00	6.18	6.30
Mach. Repairs	3.95	6.51	6.47	5.93	8.38	9.57	9.28	11.28	11.21	10.48
Mach. Hire	2.39	4.64	3.04	3.51	5.05	3.54	5.17	4.81	6.82	3.25
Fuel	2.41	3.74	4.25	3.63	5.76	5.33	6.42	8.90	10.02	9.32
Seed & Crop Ins.	1.08	1.42	1.01	1.47	1.86	2.83	1.93	2.73	2.77	2.82
Fertilizer	.97	1.22	2.74	2.13	1.53	1.53	2.10	4.76	2.45	2.19
Pesticide	.21	.38	.63	.78	.47	.54	.98	.90	.75	1.12
Org. Fees	.22	.36	.30	.51	.49	.16	.62	.73	1.18	.59
Insurance	.20	.60	.51	.62	.74	.79	.60	.79	.90	.89
Utilities	.31	.57	.63	.80	.84	1.05	.49	1.08	1.59	1.66
Conservation	.13	.10	.14	.06	.36	.42	.94	.89	1.67	.18
Auto Expense	.66	.67	.62	.71	.78	.69	.63	.64	.81	.60
Int. on Oper. Cap	.95	1.72	1.66	1.59	1.90	2.18	2.89	4.39	5.34	4.39
Total Var. Costs	17.11	26.14	26.56	26.75	33.65	34.64	38.12	47.91	52.00	43.78

FIGURE 5.3

VARIABLE PRODUCTION COSTS PER ACRE

S.W. ASSOCIATION

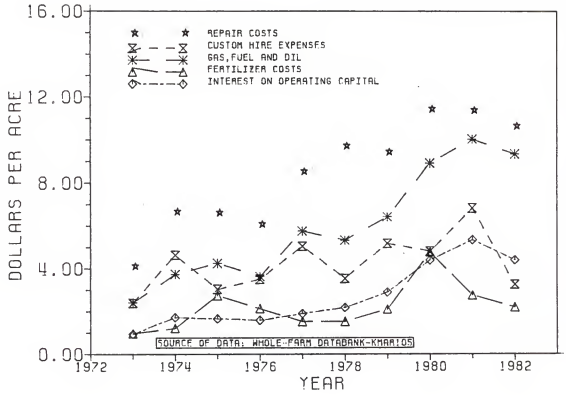
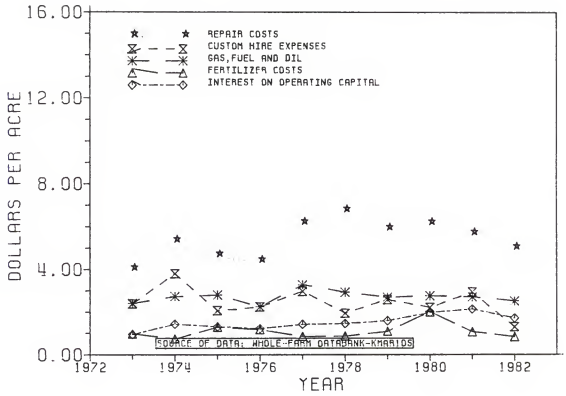


FIGURE 5.4

VARIABLE PRODUCTION COSTS
INDEXED TO 1973 COSTS

S.W. ASSOCIATION



mained relatively constant when indexed to 1973 prices as can be seen in Figure 5.4. Fertilizer was not a major wheat production expenditure for this region as it averaged only six percent of total variable costs.

Fuel costs have shown a significant upward trend during the 10-year period as shown in Figure 5.3. They grew in relation to other variable costs, from 14 percent of TVC in 1973 to 19 percent in 1982. The increase in fuel costs from $2.41 to $10.48 per acre due to increases in prices and an increased share of farming operations being performed by the farmer. This can be seen from Figure 5.4, expenditures indexed to 1973 prices have remained relatively stable during the period.

The largest portion of total variable costs for the S.W. association wheat farms has been comprised of repair expenditures. Repair costs, which comprised over one-fifth of TVC, rose 165 percent during this period, while prices are estimated to have risen 101 percent. The significant jump in expenditures indexed to prices paid between 1976 and 1977 is largely due to the increase in fallow acres and the corresponding decline in harvested acres during 1977, 1978 and 1979.

Machine hire expenditures for the S.W. association are also rather erratic, but when indexed to the prices paid for farm services fall in a range between $1.90 and $3.00 per acre except for in 1974 and 1982. Custom hire costs have averaged about 13 percent of TVC and are the third highest expenditure in most years following repairs and fuel costs.

Interest costs on operating capital have increased more than 200 percent due to the rise in interest rates and total variable costs. The influence of the rise in variable costs can be seen in that interest costs indexed to 1973 interest costs have nearly doubled. Rising interest rates increased interest costs from 5.6 percent of TVC in 1973 to 10.3 percent in 1982.

c) N.W. Association

The N.W. Farm Management Association, located in Northwest Kansas, is similar to the S.W. association in that summer-fallow wheat production is the primary wheat production practice. The region generally receives more precipitation than does the southwestern region thus allowing a greater use of fertilizer in cropping practices.

Fertilizer expenditures were double those of the S.W. association on average, but were only 43 percent of the average fertilizer expenditures of the S.C. association farms. Expenditures for fertilizer rose 57.4 percent but when indexed to the prices paid have generally fallen in a range of $1.50 to $2.40 per acre except in 1973, 1976, and 1979. Fertilizer expenditures as a share of TVC fell from 13.1 percent in 1973 to 9.2 percent in 1982.

Expenditures for fuel rose 413 percent between 1973 and 1982, from $2.61 to $13.39 per acre. This increase has been primarily due to the 273 percent rise in fuel prices during this period. The expenditures for fuel have risen 38 percent when the effect of rising prices has been removed, as is illustrated in Figure 5.6. This is mostly appears to be mostly attributable to an increase in farming operations being performed on the farm by the producer. The decline in real expenditures for custom hire operations bears supports this conclusion. The price rise resulted in fuel costs increasing from 9.4 percent of TVC in 1973 to 20.4 percent in 1982.

Machinery repair expenditures for the N.W. association averaged 9.4 percent greater than the S.C. association farms, and 5.0 percent greater than the S.W. association farms' machinery expenses. Repair expenditures increased 157 percent between 1973 and 1982, increasing from $4.85 to $12.45 per acre in 1982. A significant portion of this increase in costs

Table 5.4 Variable Production Costs Per Acre
N.W. Association (Dollars per Acre)

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Labor	3.63	4.20	4.55	5.00	5.40	6.00	6.05	6.00	6.18	6.30
Mach. Repairs	4.85	6.12	7.10	7.59	8.59	8.43	10.42	9.61	9.37	12.45
Mach. Hire	6.17	5.37	6.55	8.70	11.48	9.07	8.12	9.53	8.23	8.43
Fuel	2.61	3.85	4.51	4.69	5.76	5.68	8.57	10.71	11.44	13.39
Seed & Crop Ins.	3.27	3.91	3.88	3.72	4.27	2.55	5.58	4.39	4.03	4.52
Fertilizer	3.64	2.61	5.02	5.25	3.80	2.66	6.07	5.71	5.17	5.73
Herb. Ins.	1.04	1.00	.95	.49	.71	.49	.82	.90	.62	.86
Org. Fees	.21	.35	.35	.60	.56	.62	.86	.72	1.52	.95
Insurance	.08	.38	.60	.67	.66	.70	.96	1.16	1.02	1.05
Utilities	.29	.56	.43	.61	.96	1.16	1.02	1.05	1.46	2.01
Conservation	.12	1.13	.16	.31	.42	.14	1.05	.65	.14	.88
Auto Expense	.35	.39	.24	.64	.70	.59	.84	1.31	1.13	.31
Int. on Oper. Cap	1.54	2.11	2.23	2.41	2.60	2.55	4.12	5.21	5.75	6.22
Total Var. Costs	27.79	31.97	35.57	40.67	45.92	40.39	54.47	56.69	56.02	62.06

FIGURE 5.5

VARIABLE PRODUCTION COSTS PER ACRE

N.W. ASSOCIATION

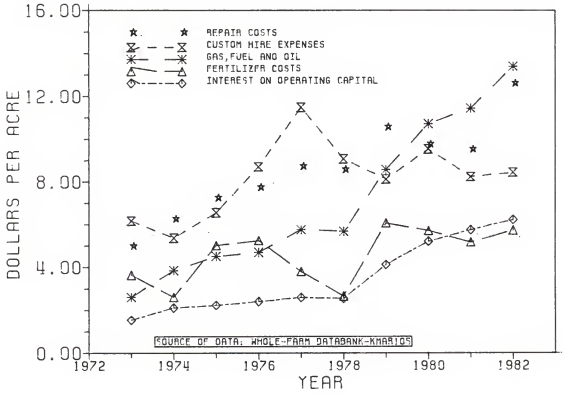
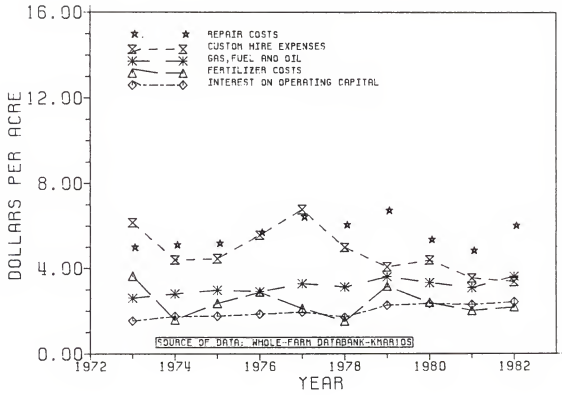


FIGURE 5.6

VARIABLE PRODUCTION COSTS
INDEXED TO 1973 COSTS

N.W. ASSOCIATION



is due to price increases. Values indexed to 1973 prices are shown in Figure 5.6 and average $5.50 per acre.

Interest on operating capital for the N.W. association increased from $1.54 to $6.22 per acre between 1973 and 1982. Increases in interest costs resulted in interest costs as a share of total variable costs increasing from 5.5 percent in 1973 to 10.3 percent in 1982.

5.2 Analysis of Machinery costs

Fixed machinery costs are comprised of depreciation, personal property taxes and interest on machinery investment. These costs are presented in Table 5.5 and illustrated in Figures 5.7, 5.8, and 5.9 for each association.

Certain differences are apparent in the S.C. association depreciation costs as compared to the two other associations. Depreciation expenses per acre are much lower for the S.W. and N.W. associations in early years but they increase to a higher per acre value in later years. Depreciation expenses for S.C. association farms increased from $9.07 to $14.65 per acre, S.W. association expenses from $5.52 to $15.04 and N.W. association expenses from $6.32 to $17.21. These differences are probably due to timing of machinery purchases or differences in size or type of machinery purchased.

Interest on machinery investment rose substantially for all three associations. Assumptions used in arriving at this cost may cause a comparison between regions to be difficult. This is because machinery investment per crop acre is computed using the average machinery investment for all crop acres. Differences in the estimated average machinery investment may occur due to variation in the proportion of summer fallow acres between the regions.

Table 5.5 Fixed Machinery Costs (Dollars per Acre)

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
S.C. Association										
Per. Prop. Taxes	.50	.62	.60	.87	1.43	1.40	1.23	1.16	1.88	2.45
Interest on Invest.	1.91	2.73	2.94	3.06	2.85	3.28	4.22	5.89	7.33	6.93
Depreciation	9.07	11.92	13.40	11.24	11.91	12.16	12.31	12.43	12.66	14.63
Total	11.48	15.28	16.94	15.17	16.19	16.84	17.76	19.48	21.87	24.01
S.W. Association										
Per. Prop. Taxes	.18	.44	.44	.59	.87	1.28	1.06	1.01	1.01	1.86
Interest on Invest.	1.10	1.40	1.64	1.73	1.55	2.01	2.32	2.61	4.12	3.56
Depreciation	5.52	9.49	10.23	9.25	12.08	13.08	13.14	14.48	14.93	15.04
Total	6.80	11.33	12.31	11.57	14.50	16.37	16.52	18.10	20.91	19.95
N.W. Association										
Per. Prop. Taxes	.34	.41	.69	.68	1.07	1.08	1.16	1.26	1.31	1.39
Interest on Invest.	1.31	2.23	2.32	2.51	2.35	2.62	3.69	5.20	5.88	5.50
Depreciation	6.32	9.16	10.22	12.78	13.87	12.64	16.39	15.74	15.58	17.21
Total	7.97	11.80	13.23	15.98	17.30	16.33	21.24	22.21	22.77	24.10

FIGURE 5.7

MACHINERY EXPENDITURES PER ACRE

S.C. ASSOCIATION

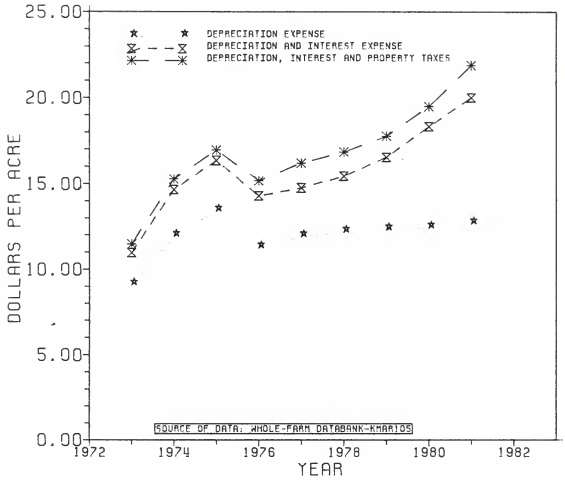


FIGURE 5.8

MACHINERY EXPENDITURES PER ACRE

S.W. ASSOCIATION

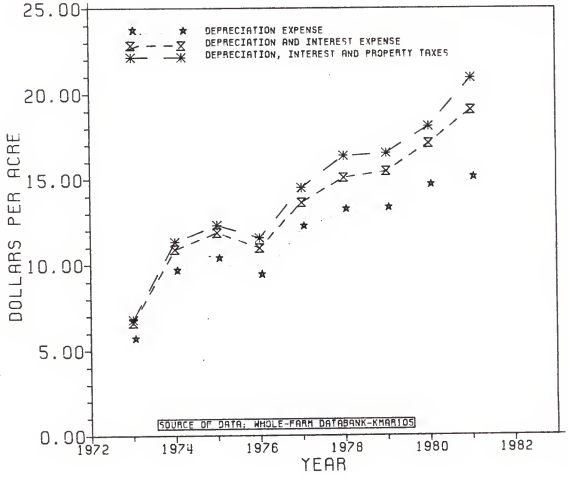


FIGURE 5.9

MACHINERY EXPENDITURES PER ACRE

N.W. ASSOCIATION

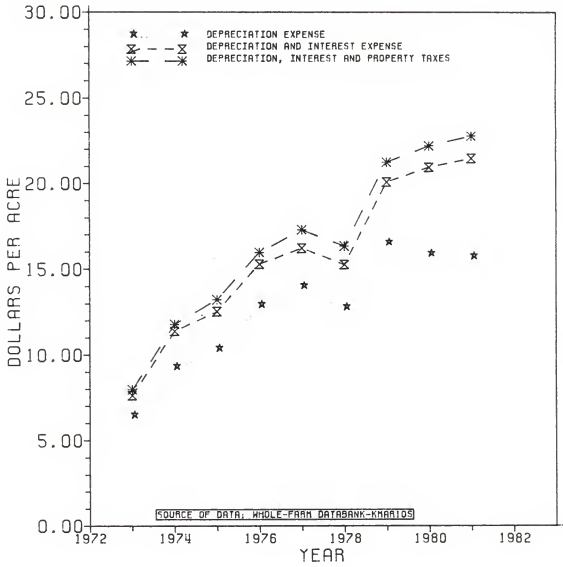


Table 5.6 Income from Crop Sales, Other Investments, and Government Program Payments (Dollars per Acre)

	1974	1975	1976	1977	1978	1979	1980	1981	1982
S.C. Association									
Crop Sales	116.89	113.92	73.00	59.75	89.31	163.50	121.09	117.51	130.42
Other Investments	3.55	3.87	3.80	2.37	4.76	2.13	4.50	6.11	6.03
Government Payment	.20	.52	1.12	10.63	13.43	4.04	2.03	6.27	10.43
Total Income	120.64	118.31	77.92	72.75	107.97	169.66	127.62	129.89	146.88
S.W. Association									
Crop Sales	112.30	94.02	61.01	48.25	77.83	139.00	109.96	77.18	98.74
Other Investments	3.63	3.26	3.04	2.65	1.48	3.17	6.91	6.82	2.55
Government Payment	.17	2.47	5.15	12.86	12.65	2.82	1.46	7.83	9.15
Total Income	116.15	99.74	69.20	63.76	91.96	145.00	118.33	91.83	110.44
N.W. Association									
Crop Sales	111.51	132.83	106.73	64.44	85.63	151.00	146.01	65.88	122.37
Other Investments	4.58	3.44	3.02	3.08	2.63	2.99	8.13	4.19	4.17
Government Payment	2.54	.77	.91	13.26	12.44	2.50	1.13	11.07	13.29
Total Income	118.63	137.04	110.67	80.78	100.70	156.49	155.26	81.14	139.82

5.3 Analysis of Land Costs and Returns

Assigning a cost to land is necessary to evaluate the returns to the operator. One of the problems involved in evaluating the financial condition of the farming economy is in determining the cost for the land input. Each producer has a different share of debt to equity or rental cost for the cropland that he farms. No single method of valuing land costs has been found satisfactory for estimating land costs to all producers. Several alternative methods of assigning a cost to land will be considered in the following section.

Land costs are considered a return to the owners equity or opportunity cost of investment in the land. Equity invested in land must earn a return for the producer to find it profitable to own the land. Returns to equity have come from two sources, annual returns from the sale of crops and appreciation in value of the land. Capital gains have been sizable during the 1970's as land prices increased at a rate greater than the rate of inflation in most years.

Balancing costs and returns to the farmer can be done by two methods. If the nominal or observed opportunity cost of land and capital are used as total factor costs then returns should include both annual income and capital gains. Capital gains are difficult to estimate for an individual year however, and are realized only by selling the asset.

The other method involves using annual use costs to balance annual returns. A real rate of interest is used to compute the annual use cost for factors that have a capital appreciation to the owner of the asset. Thus the inflation premium on interest rates can be considered an additional cost incurred to obtain the benefits of capital gains.

FIGURE 5.10

ESTIMATED LAND CHARGES FOR
VARIOUS INVESTMENT ASSUMPTIONS

S.C. ASSOCIATION

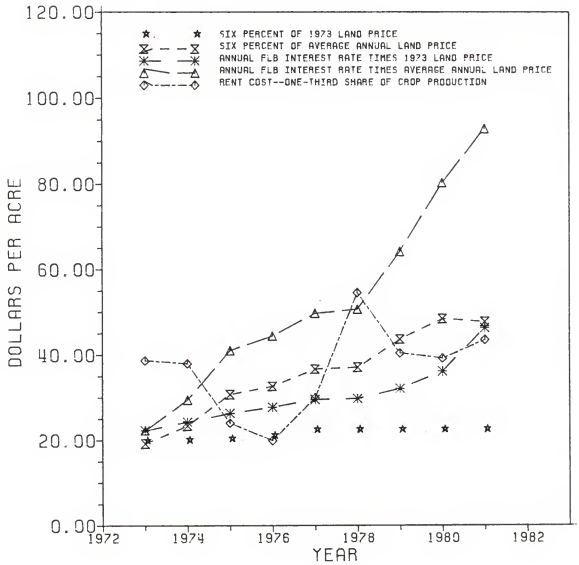


FIGURE 5.11

ESTIMATED LAND CHARGES FOR
VARIOUS INVESTMENT ASSUMPTIONS

S.W. ASSOCIATION

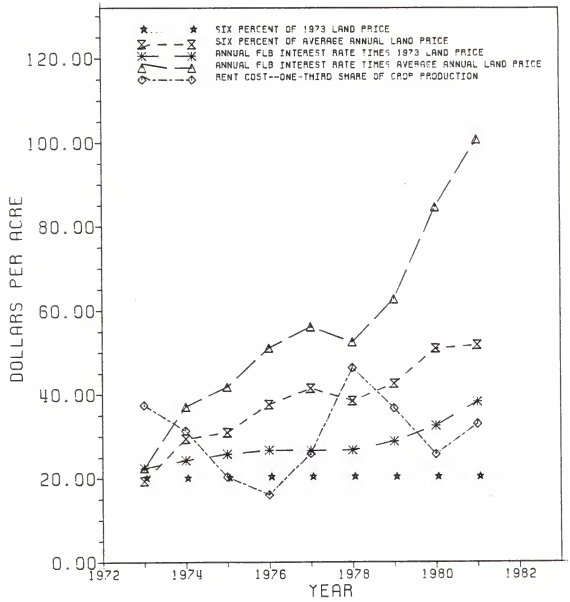
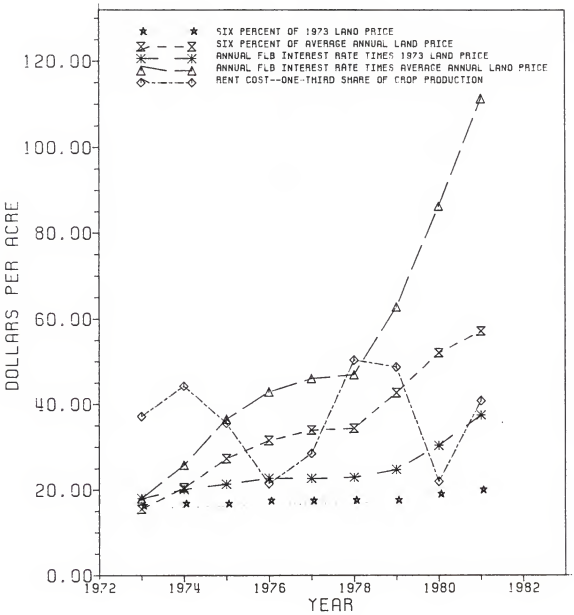


FIGURE 5.12

ESTIMATED LAND CHARGES FOR
VARIOUS INVESTMENT ASSUMPTIONS

N.W. ASSOCIATION



Estimated land charges are illustrated in Figures 5.10, 5.11 and 5.12. The six percent of 1973 cost is the cash outlay of a producer who purchased land in 1973 or prior at a fixed rate of interest on the investment. A sizable difference is apparent between this cost and the scenario computed by multiplying the average annual Federal Land Bank interest rate times the average annual land price. This second alternative may be considered to be the opportunity cost to the producer. This cost is similar to returns that could be received by selling the land and investing the proceeds in savings.

Income, expense, and returns to the operator are presented in Tables 5.7, 5.8, and 5.9 for each association. Returns are computed from production costs for one year and income from the following year. The values in the tables are given for the year in which expenses are incurred. For example, the returns for the 1973-74 production period are shown in the tables as 1973 returns. Total expenses excluding land, management and family living expenses have trended upward for all three associations. The amount of increase per acre from 1973 to 1981 has been similar for each association, $54 for the S.C. association, $51 for the S.W. association, and $47.50 for the N.W. association.

While total expenses trended upward, total income per acre has been quite variable. Wheat prices and average yields were the primary determinants of the variability in total income per acre. Gross returns per acre ranged from $72.75 to $169.70 for the S.C. association, $63.75 to $145.00 for the S.W. association, and from $80.80 to $156.50 for the N.W. association. The higher average yields for the S.C. and N.W. associations resulted in average total income averaging nearly $20 greater per harvested acre than for the S.W. association.

The values in columns 5-8 of the tables are the return to the farmer after costs for all factors of production have been accounted for under various land cost alternatives. Positive values are funds available for use for investments, family living expenses or principle payments on loans.

A farmer who financed the purchase of land in 1973, or prior to this time, would generate cash returns similar to the six percent return on the 1973 price scenario. Returns under this investment assumption have been greater than the costs assessed in most years resulting in a positive cash flow. Returns above total costs averaged $13.30 per acre for the S.C. association, $18.39 for the S.W. association, and $26.45 for the N.W. association. These returns have been quite variable due to fluctuations in prices received and wheat yields. Returns above total costs ranged from -$18.90 to $55.28 for the S.C. association, -$8.17 to $54.45 for the S.W. association and from -$29.39 to $60.18 for the N.W. association. Farmers with land purchased prior to 1973 could build a reserve for years of negative returns and use a portion of the positive returns for other investments.

Returns above costs to the producer who purchased land on a variable interest rate loan are illustrated in column 4 of Tables 5.7, 5.8, and 5.9. Average returns above costs from 1973 to 1981 were positive, but averaged about $10 per acre less than under the six percent fixed interest obligation. The rise in interest rates has caused the cash flow stress to be significant in the last three years under this assumption. Although actual interest payments would be expected to decrease as a reduction in the loan principal is made, interest costs would still be sizable on a 30 year loan after the first ten years. Returns above costs averaged $3.65 per acre for

Table 5.7 Income, Expenses, and Returns Per Acre
S.C. Association (Dollars per Acre)

Year	Gross Farm Income	Total Expense	Returns to Land & Mgt.	Returns to Land	Returns above Total Costs: Six Percent 1973 Cost	Six Percent Mkt. Value	FLB Rate X 1973 Price	FLB Rate X Mkt. Value	Rent
1973	120.64	46.07	75.57	62.51	43.31	43.31	40.21	40.21	23.82
1974	118.31	60.81	57.50	45.67	26.35	22.27	21.37	16.23	7.68
1975	77.92	64.59	13.11	5.54	-14.20	-25.18	-20.78	-35.47	-18.50
1976	72.75	63.98	8.16	1.50	-18.90	-31.14	-26.25	-42.89	-18.42
1977	107.50	75.05	32.45	21.65	-.13	-15.01	-7.88	-28.02	-8.28
1978	169.67	75.64	94.03	77.06	55.28	39.98	47.32	26.45	22.56
1979	127.62	80.27	47.62	34.59	12.81	-8.97	2.52	-29.52	-5.77
1980	129.89	90.37	39.52	26.53	4.75	-21.83	-9.61	-53.67	-12.64
1981	146.88	100.04	46.84	32.15	10.31	-15.49	-14.08	-60.67	-11.32
Ave.	119.02	72.98	45.97	34.13	13.30	-1.34	3.65	-18.59	-2.31

Table 5.8 Income, Expenses, and Returns Per Acre
S.W. Association (Dollars per Acre)

Year	Gross Farm Income	Total Expense	Returns to Land & Mgt.	Returns to Land	Returns above Total Costs: Six Percent 1973 Cost	Six Percent Mkt. Value	FLB Rate X 1973 Price	FLB Rate X Mkt. Value	Rent
1973	116.15	27.74	88.41	76.79	57.45	57.45	54.33	54.33	39.36
1974	99.75	42.55	57.20	47.23	27.89	17.78	22.89	10.16	15.89
1975	69.20	43.42	25.78	18.86	-.48	-12.09	-6.92	-22.93	-1.47
1976	63.76	42.07	21.69	15.13	-4.28	-22.25	-11.42	-35.77	-.77
1977	91.96	53.79	38.17	28.97	9.38	-12.45	2.29	-27.17	3.03
1978	144.99	56.57	88.42	73.92	54.33	35.48	47.17	21.44	27.59
1979	118.33	58.75	40.42	47.75	28.16	5.19	18.92	-14.88	11.10
1980	91.83	71.23	20.60	11.42	-8.17	-39.50	-21.09	-73.03	-14.31
1981	110.44	78.59	31.85	20.81	1.22	-30.85	-17.36	-79.86	-12.10
Ave.	100.71	52.77	45.84	37.87	18.39	-.14	9.87	-18.36	7.59

Table 5.9 Income, Expenses, and Returns Per Acre
N.W. Association (Dollars per Acre)

Year	Gross Farm Income	Total Expense	Returns to Land & Mgt.	Returns to Land	Returns above Total Costs				
					Six Percent 1973 Cost	Six Percent Mkt. Value	FLB Rate X 1973 Price	FLB Rate X Mkt. Value	Rent
1973	118.63	38.94	79.69	67.83	52.30	52.30	49.79	49.79	30.66
1974	137.04	47.21	89.83	76.13	60.10	55.59	55.96	50.28	31.85
1975	110.66	52.23	58.43	47.36	31.33	20.01	25.98	10.84	11.78
1976	80.78	60.55	20.23	12.15	-4.58	-19.41	-10.63	-30.77	-9.33
1977	100.70	69.10	31.60	21.53	4.80	-12.44	-1.17	-24.50	-7.01
1978	156.49	63.83	92.66	77.01	60.18	42.64	54.05	30.10	26.68
1979	155.27	81.56	73.71	58.18	41.35	15.49	33.43	-4.63	9.51
1980	81.14	84.17	-3.03	-11.14	-29.39	-63.14	-41.50	-97.38	-33.10
1981	139.83	84.62	55.21	41.23	21.99	-15.88	3.81	-70.04	.44
Ave.	120.06	64.69	55.37	43.36	26.45	8.35	18.86	-9.59	6.83

the S.C. association, $9.87 for the S.W. association, and $18.86 for the N.W. association.

The third scenario, a six percent return on the market value of land is presented primarily to give a point of reference between the other valuation methods. This reference point illustrates the impact of increases in land prices on cash flows in later years without the inflation premium on interest rates. Differences in returns per acre between this alternative and the FLB rate times market value, become quite pronounced in later years, increasing from $10 per acre in 1975 to $45 per acre in 1981. The inflationary impact on interest rates would result in a significant cash outflow for the producer who purchased land in later years.

Historical rates of return to land values have averaged 4-6 percent for farmland. The rate of return for the wheat farms surveyed averaged approximately six percent under the assumptions used to compute the costs to other factors. Returns for 1980 and 1981 have been negative under this assumption however, helping to justify the concern over a short-term cost-price squeeze in last two years.

The fourth scenario, the average annual FLB interest rate times the market value of the land demonstrates the significant negative cash flows that would have resulted from a purchase of farmland in later years at market interest rates. Appreciation in land values and inflation's impact on interest rates resulted in per acre returns above total costs in 1982 being -$60.67, -$79.86, and -$70.04 for each respective association under this assumption. This demonstrates the difficulty for a new entrant to purchase farmland in recent years. Thus high market interest rates and appreciation in land values have restricted entry into farming as demonstrated by these negative cash flows.

FIGURE 5.13

RETURNS ABOVE TOTAL COSTS
FOR VARIOUS INVESTMENT ASSUMPTIONS

S.C. ASSOCIATION

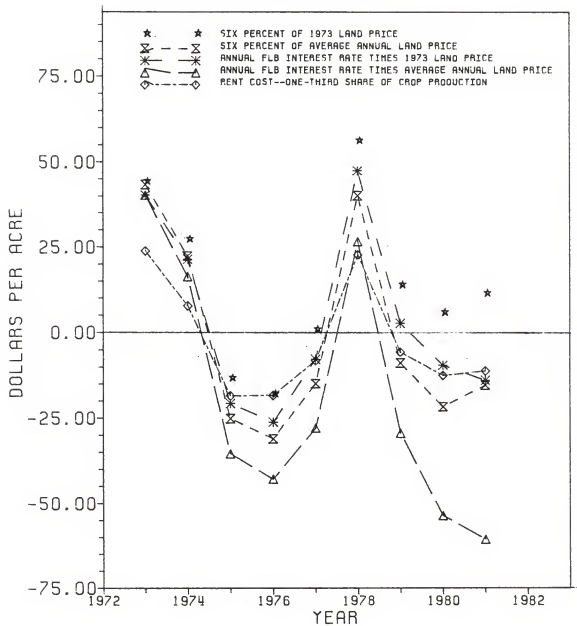


FIGURE 5.14

RETURNS ABOVE TOTAL COSTS
FOR VARIOUS INVESTMENT ASSUMPTIONS

S.W. ASSOCIATION

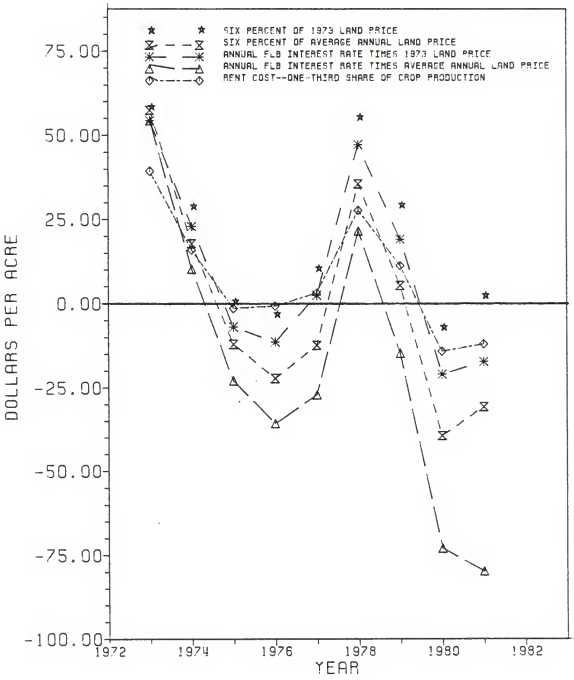
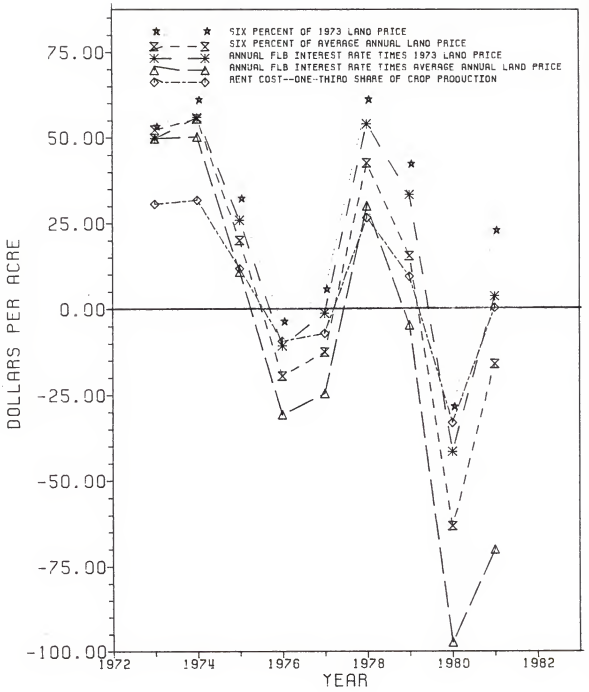


FIGURE 5.15

RETURNS ABOVE TOTAL COSTS
FOR VARIOUS INVESTMENT ASSUMPTIONS

N.W. ASSOCIATION



Returns above total costs under the one-third share rent cost are much less variable and have generally provided a return above all costs under the assumptions used. A portion of the differences between the S.C. association farms and the other two associations is due to this cost being computed only on harvested acreages. Actual returns under rental agreements for the S.W. and N.W. associations probably will generally be lower than those computed.

Economic theory suggests that in the long-run returns above total costs for the farming industry will equal zero. Excess returns above an appropriate value for labor, management and return to operator's equity will encourage new investment in land by existing operators or new firms will enter the industry. The increased demand for land will result in the excess returns being capitalized into land values.

Evaluating whether returns are adequate for the farming industry becomes a value judgment because the returns to labor, management and operator's equity required are individual to each producer. In view of the increases in land values and high returns during 1973 and 1974, we can conclude that returns were in excess of the required rate. Evaluating the present situation is much more difficult because of the disparity in cash flows that exists between the producer who has a low level of leverage vs. the firm which is more highly leveraged.

The effect on the rate of return to equity capital under various leverage ratios and interest costs is illustrated in Table 5.11. With low rates of return on capital, as has occurred in the late 1970's and early 1980's, leverage has worked against the producer to produce extremely tight, even negative, cash flows. This is a reversal of the trends that existed in the early 1970's when producers were encouraged to borrow to

purchase capital goods whose prices were increasing at a rate exceeding interest carrying charges. The cost-price squeeze thus appears to be a problem that has primarily affected producers who have attempted to grow too quickly in order to receive the benefit of increases in wealth through capital gains.

Table 5.11 Effect of Alternative Debt Leveraging Rates and Interest Costs on Rate of Return to Equity (Rate of Return to Assets Equal to 3.3 percent)

Debt/Asset Ratio	Interest Rate on Outstanding Debt		
	7 %	11 %	17 %
	Rate of Return to Equity Capital		
0	3.3	3.3	3.3
10	2.9	2.4	1.8
20	2.4	1.4	1.8
30	1.7	.0	-2.6
40	.8	-1.8	-5.8
50	-.4	-4.4	-10.4
60	-2.2	-8.2	-17.2
70	-5.3	-14.7	-28.7
80	-11.5	-27.5	-51.5
90	-30.0	-66.0	-120.0

The rate of return to current land values have been calculated and are presented in Table 5.12 for the wheat farms surveyed in each association. Rates of return are useful in evaluating the ability of producers to meet financing obligations and analyzing the return to their investment. The rate of return to land investment showed considerable variability in all three associations during the 1970's, ranging from a high of 23.8 to a low of -1.3 among the associations.

Table 5.12 Rates of Return to Current Land Values

Year	S.C. Association Cash	S.C. Association Total[1]	S.W. Association Cash	S.W. Association Total[1]	N.W. Association Cash	N.W. Association Total[1]	Ave. Treasury Yield 1 Yr.	Ave. Treasury Yield 10 Yr[2]
1973	19.5	34.0	23.8	76.2	26.2	58.2	7.24	6.73
1974	11.7	43.0	9.6	14.7	22.3	55.6	8.23	7.31
1975	1.1	7.3	3.7	25.0	10.4	25.7	6.65	7.42
1976	.3	12.6	2.4	12.8	2.3	9.9	7.20	7.86
1977	3.5	4.7	4.2	-3.0	3.8	4.7	5.94	7.36
1978	12.5	13.8	11.5	22.1	13.4	37.5	8.20	8.33
1979	4.8	14.4	6.7	27.8	8.2	30.1	10.54	9.34
1980	3.3	1.8	1.3	2.8	-1.3	8.5	12.07	11.38
1981	4.1	7.1	2.4	12.3	4.3	13.5	14.45	13.88
Ave.	6.8	15.4	7.3	21.2	10.0	25.6		

[1] Sum of annual net income and change in land value.
[2] Source: Quarterly Review, Federal Reserve Bank of New York, Vol. 7:3(August 1982), p.34.

As previously mentioned, a portion of the incentive for investment in farmland has been the increases in wealth received by the farmer through appreciation in land values. The rate of return calculated including capital appreciation averaged nearly two and one-half times greater during this period than the rate of return computed from net farm income alone. Growth in wealth through capital appreciation has slowed during the last three to four years though, suggesting that expectations for growth in future incomes have declined.

5.4 Summary of Analysis

The cost-price sqeeze, with low or negative returns and cash flows to producers, is a relatively recent phenomena. Net incomes were negative for individual years during the 1970's, but these were of short duration, resulting from low crop prices and/or low yields. Net income in 1976 was negative for all three associations due to the low wheat price at harvest time. Income for individual associations have been negative during other years due to below average years.

Since 1979, however, returns have been negative for nearly all investment and land cost assumptions except the six percent return to 1973 land price. Increases in prices paid for production inputs created a need for higher returns to the producer through greater output or higher wheat prices.

Total variable expenditures per acre more than doubled between 1973 and 1982, increasing $35 to $40 per acre for the three associations. Increases in repair expenditures, fuel costs, and interest on operating capital made up the largest share of the increase in expenditures.

Major differences in variable expenditures per acre among region included fertilizer, labor, and machine hire. Fertilizer expenditures were highest in the S.C. association where continuous wheat production is the

general cropping practice. Labor costs per acre were also highest for the S.C. association because of the more intensive cropping practices. Machine hire expenditures varied from year to year and between associations.

Adjustments in variable input usage due to rising input prices and the cost-price squeeze are not easily discernable due to the short duration of the cost-price squeeze and the slight degree of change that may have occurred. Decreases in fertilizer expenditures appear to be the only major adjustment that has occurred that is verifiable. Changes in other variable costs have probably been minor for wheat production. Most expenditures indexed to 1973 prices appear to be relatively constant to trending slightly downward in the last three years.

Decreases in machinery expenditures would be anticipated under a cost-price squeeze, but again the short duration of the records makes this difficult to evaluate. Depreciation expense is computed for tax purposes and may not adequately reflect changes that have been made due to an averaging effect of investment in machinery from previous years.

Differences in ownership and financing arrangements resulted in a disparity in returns to individual producers. Rising interest costs and land values created negative returns to land purchased in the past 3 to 5 years. The producer who did not have sufficient equity in the land or other sources of income would be forced out of business.

Appreciation in land values during the 1970's at a higher rate than the inflation rate encouraged many producers to make speculative purchases of farmland as a hedge against inflation and to increase their wealth. Expectations of growth in future income through improved crop returns also encouraged investment in farmland. Growth in farm returns have not kept pace with the expectations of many producers. Investment in farmland at

high rates of interest and leverage has been a major source of the cost-price squeeze to individual producers.

Producers with land purchased prior to 1973 at a fixed rate of interest have generated positive returns even during the last three years. Not only has their production generated positive income, but the appreciation in land value increased their wealth. They can use these returns and increased equity to invest in land and machinery.

Increasing costs for machinery and variable inputs have had a negative effect on returns to producers, but the cost-price squeeze is primarily affecting producers with high rates of leverage for purchased land.

CHAPTER 6

SUMMARY AND CONCLUSIONS

Kansas wheat producers are facing many challenges brought about by the dramatic changes in financial indicators during the last 10 years. Rising input costs and uncertainty of the farm prices received have contributed to a financial management problem. Termed a cost-price squeeze, this problem has arisen because returns are inadequate to meet inadequate to meet costs and to provide a favorable return to the farmer's equity.

Many of the underlying causes have been brought about by changes in the structure of farming. Use of purchased inputs increased as producers substituted machinery and agricultural chemicals for farm labor. This substitution allowed many individual farmers to expand. Farm size rose and farm numbers fell as producers expanded to increase their incomes and wealth. High labor costs relative to the costs of many other inputs led to increasing use of purchased inputs as producers substituted machinery and agricultural chemicals to increase profits.

The growing reliance on purchased inputs has contributed to the severity of the cost-price squeeze. Producers must now purchase most inputs while in the past many inputs were produced on the farm and were not affected by rising input prices.

High returns resulting from the world grain shortages in 1973 accelerated the trend of growth in farm size. Expectations of continued prosperity prompted farmers to expand by purchase of additional cropland. Many acres of marginal farmland were also brought into production to take advantage of high returns. Capital gains, interest rates less than the rate of inflation, and expectations of continued growth in returns encouraged many producers to make speculative purchases of farmland.

The growth of world markets brought prosperity and hope for continued growth in future income. The expanding market for farm products encouraged increased production through more intensive cultivation , adaptation of new technology, and larger machinery. These new markets also brought increased variability in prices and incomes that many producers did not foresee.

As inflation increased and the value of the dollar fell grain from the United States became less expensive relative to products from other countries. When emphasis in monetary policy shifted from trying to peg interest rates at a certain level to an effort to reduce the level of inflation, interest rates rose and the value of the dollar strengthened. The stronger dollar depressed farm prices as the cost of commodities produced in the U.S. rose relative to the cost of commodities from other nations.

Increased supply and reduced demand for wheat and other farm commodities depressed farm prices and placed considerable strain on government farm programs to absorb excess supplies. Acreage reduction programs were again used to reduce production.

Price increases for production inputs resulting from inflation or supply/demand factors has created financial management problems. Although studies suggest that price inflation in most variable inputs should not have a real effect on net farm income, supply/demand relationships have been such that a negative real effect has occurred in the short-run.

Price increase were most significant for fuel and interest expenses. Fuel prices, which were at low levels prior to 1973, rose significantly between 1973 and 1982. Real expenditures for fuel on the farms surveyed increased during the period most likely due to increases in machine size.

Interest costs soared in the late 1970's as changes in the monetary policy were implemented. A disparity in the financial situation of farmers

and a reversal of previous trends of investment resulted. Producers with a high degree of leverage faced a severe cash flow problem as interest costs pushed upward. Producers who purchased land prior to 1973 at fixed rates of interest or have complete ownership of their land have generated positive cash flows even during the last three years when the cost-price squeeze has been prevalent. However, farmers with higher rates of leverage and interest costs have had negative cash flows from acres purchased in later years through debt financing. Analysis of land costs under various investment assumptions illustrated this result.

The producer in this situation may find it necessary to reduce the level of land holdings or other assets to bring the debt load to a manageable level. Emphasis should be placed on cash flow analysis and careful planning of expenditures. Producers can also adapt by using wise management practices in the use of inputs and marketing of products.

The cost-price squeeze is a relatively recent phenomenon brought on by changes in structure and price relationships. Many of these changes have been in factors outside the farmers control. As farmers adopt to these changes, further structural change in the farming industry will result. If the problem persists, many of the financial strategies that were profitable during the 1970's will no longer be viable alternatives for the growth of the farm firm.

Because of the negative impact of leveraging and increased risk to the farm operator, entry into farming by new individuals will be seriously limited. The huge capital requirements for fixed inputs and low rates of return to current farmland prices make entry into farming impossible without considerable equity available for investment or income from other sources.

Separation of operation and ownership will result as those who are able to provide the capital necessary to purchase machinery must make rental agreements to acquire land for production. The trend of growth in farm size will continue as managers who have sufficient machinery and capital are able to make rental arrangements for additional land.

Several factors and limitations should be considered in the final evaluation of this study. First, the data used in the analysis were averages of the accounting data for a group of selected farms from each association. This does not allow comparisons or conclusions to be drawn concerning the relative cost differences among individual farms. Studies have shown that higher costs often result in increased production, which translates into higher net incomes. A portion of the production cost increases that have occurred may be the result of changes in the mix of inputs used during the period.

Returns to the producer would in actual practice be different from the computed returns because of the impact of marketing decisions by the individual producer. Considerable variability in market prices was evident in the monthly averages for wheat prices received by Kansas producers. Many producers would have higher incomes for individual years than those computed through fortuity or skill in the marketing of their wheat.

The farms studied are among the larger farms in Kansas are generally managed by more progressive managers than most farms in Kansas. The cost structure therefore may not be representative of all wheat farms in Kansas. However, trends that have occurred in input prices and farm returns are similar for most producers who are managing the farm as a business.

This study strongly suggests that producers need to evaluate their cost and debt structures in planning and managing their farm business. The

risks and uncertainties of crop prices and yields create a situation where careful management is critical to the farm business. Tools for the managing of risk and marketing of farm crops become increasingly important as a means of providing an adequate return to the farm operator.

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THE COST-PRICE SQUEEZE: CAUSES AND IMPLICATIONS FOR KANSAS WHEAT FARMS

By

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AN ABSTRACT OF A MASTER'S THESIS

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Kansas wheat producers are facing many financial management problems created by rising input prices and uncertainty of farm returns. This study was concerned with the causes and implications of a cost-price squeeze that has gripped producers in the last three to four years.

A growing dependance on purchased inputs in order to reduce labor costs and increase effeciency has left producers more vulnerable to rising input costs and variability in crop prices and yields.

During the 1970's and early 1980's, prices for production inputs rose dramatically. The index of prices paid for production inputs increased 152 percent between 1973 and 1982. Increases in fuel, fertilizer and interest costs were even larger. Although many studies suggest that inflation in most input prices will not seriously disadvantage producers in the long-run, residual returns to land, labor, and management have not kept pace with inflation on the farms surveyed.

Increases in interest costs have had the largest impact on individual producers. A severe cash flow problem has resulted for producers with a high degree of leverage. Significant outlays for interest costs resulted in tight or negative cash flows in years of low returns. The problem is either compounded as the producer must refinance in order to meet the interest payments or sell a portion of his assets.

A disparity in the financial situation of many producers resulted from the high interest costs for individual producers. Farmers who purchased land prior to the second half of the 1970's on fixed interest obligations or have considerable equity in their land have been able to use these returns and equity to purchase additional cropland. Capital gains in cropland values have been a contributing factor to this investment.

Changes in the structure of farming are likely to continue under the current conditions. The sizable capital investment in machinery and land and low rates of return to current land values present a major barrier to entry into farming. Farm size may not grow as rapidly as during the 1960's and 1970's, but is likely to continue to increase. As farmers retire or take other forms of employment land will come available for lease or purchase. Because of the advantage that established producers have in purchasing or leasing land, average farm size will continue to grow.