ECONOMIC IMPACTS OF FARM PROGRAM PAYMENT LIMITS

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Foreword

This manuscript was written in 1987 but not published at that time. The data are dated but the underlying principals remain the same. The original manuscript addressed the payment limitation problems following the 1985 farm program. Today the Congress is again embroiled in the issue of setting payment limitations. The primary conclusion from this manuscript is that effective payment limitations lead to smaller farm size and given economies of size, payment limits tend to increase production costs and reduce international competitiveness.

The manuscript is presented here in its original form.

The high levels of government payments to farmers resulting from the 1985 farm bill have once again led the Congress to examine the payment limit issue. Payment limits were initially established in 1970 and have since been revised several times.

In this report, policy and farm management economists analyze the consequences of alternative payment limits on economic efficiency, economic viability of family-size farms, international competitiveness, and consumer food costs. Effective payment limits encourage reduced farm size and in the presence of economies of size, tend to increase production costs for program crops.

The Agricultural and Food Policy Center is charged with evaluating economic impacts of policy alternatives -- not recommending, advocating, or opposing particular policies. The Center's orientation is toward Texas agriculture -- evaluating policy impacts on its producers and consumers. Farm prices and income, however, are determined in world markets that are influenced by national economic policy and farm programs. Texas impacts, therefore, must be evaluated in a much broader national and international market and policy context.

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Executive Summary

Farm payment limitations have been used to restrict government payments to farmers since 1970. The level of the payment limit has varied from $20,000 to $50,000 and is presently set at $50,000 for deficiency payments and $250,000 for all government payments. Recent increases in government expenditures and the incidence of sizable payments to large farms has created increased concern about the need for tightening the payment limit. In 1987, the administration implemented stricter enforcement policies and proposed reducing the payment limit from $50,000/$250,000 to a single $50,000 payment per person.

The distribution of farm program payments among farmers has been analyzed extensively; however, there has been no analyses of the effects of farm programs on economic efficiency and farm structure. The purposes of this report were to evaluate the impacts of payment limits (current and proposed) on representative, family-sized crop farms and to determine the payment limits' effect on economic efficiency and farm structure.

The results of a farm level simulation analyses indicate that moderate-size farms currently receiving more than $50,000 per year in deficiency payments would be severely disadvantaged if either the current $50,000/$250,000 limit was strictly enforced or the proposed $50,000 limit was put in place. A reduction of about $10,000 per year in government payments for the Texas cotton farm reduced average net cash income from $11,200 to a negative $200 per year and reduced the farm's chance of earning a 6 percent return on equity from 46 percent to only 20 percent. The administration's proposal would reduce net cash income for the Texas wheat and sorghum farm by about $60,000 per year and drop the farm's chance of a 6 percent return on equity to zero. For farms receiving less than $50,000 per year in government payments there would be no change in their economic viability.

The firm level results confirm that there are significant economic incentives for moderate and large farms to restructure thereby avoiding the payment limit. If economies to size exist in agriculture, such restructuring results in an agricultural structure which is less efficient than it could be. Unit cost relationships (cost per dollar of revenue) were developed for different size farms producing cotton, winter wheat, corn, sorghum, and rice in each crop's three largest producing states.

The unit cost relationships for all five crops over the farm size data studied suggested there are considerable economies of size to be gained as farm size increases. These economies of size extend far beyond the size at which current payment limits become effective. As a result, under current policies, many efficient farms have restructured to avoid the payment limit with the effect of either increasing production costs or legal, accounting, and management expenses. Other farms have simply decided not to participate in the farm program, thus thwarting the production adjustment provisions of the program.

Under a strictly enforced payment limit program, farms exceeding the limit size threshold of as few as 237 acres in California cotton and rice would have to make participation decisions based upon whether they could survive outside the program. If they could not survive outside the program, farms exceeding the payment limit would either have to discontinue farming or divide their operation to create a larger number of independent farm units each having higher production costs.

If all farms exceeding the payment limit threshold divided their farm operation, production costs could increase by as much as $1.6 under a strictly enforced $50,000/$250,000 limit and $2.3 billion under a strictly enforced $50,000 limit. Cotton and rice would suffer the greatest percentage increases in costs, 12 to 28 percent depending on the state and the payment limit under consideration. Similarly, wheat, corn, and sorghum would suffer 1 to 8 percent increases in production costs.

Strict enforcement of the two payment limits would affect a large percent of the farms and acreage normally devoted to the five program crops. From 70 to 93 percent of the cotton acreage and from 90 to 95 percent of the rice acreage in the three principle producing states would be affected. The number of farms producing cotton and rice that are affected by the payment limits range from 36 to 56 percent and from 58 to 81 percent, respectively.

In reality, whether such increases in cost would occur is problematical. Some producers would opt not to participate in the farm program and not divide their operations. These producers would move to a full production posture, reducing the effectiveness of the program and creating increased competition for higher cost producers who divided their operations. The government would be faced with a decision of whether to provide even higher levels of protection for smaller high cost producers or subject all farmers to the pressures of even lower land values and more intense structural adjustment.

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CHAPTER 1
Introduction

In the mid-1980s, U.S. farm program costs approached $30 billion per year. Questions began to arise as to who was receiving these payments and the resulting benefits of government programs (Ambur; U.S. General Accounting Office (GAO)). Such questions are not new. In 1970, shortly after some of the first direct payments were made to farmers under the 1965 farm bill, Wilcox presented Congressional testimony which indicated the magnitude of direct income subsidies received by different size farms. Wilcox's report was a motivating factor for the initial establishment in 1970 of a $55,000 limitation on the amount of direct payments a "person" could receive from the government. Subsequently, the payment limit was reduced to $20,000 per person in the 1973 farm bill. This was at a time when farm prices were relatively high and payments were relatively low. When program crop surpluses developed in the late 1970s, however, the 1977 farm bill increased the payment limit to its current level of $50,000 per person.

Motivating Factors in the Payment Limit Issue

The motivating factors in the current payment limit controversy include:

- increases in the level of direct payments from the government to farmers provided for by the 1985 farm bill, and current supply/demand imbalance for major program crops;
- reductions in the farm size at which the payment limit becomes effective;
- increases in the number of farms that have reorganized their operations allegedly to avoid the payment limit (GAO); and
- exclusion of certain direct payments from the $50,000 limit.

These conditions have led the USDA to tighten enforcement of payment limit provisions that have been in operation since their inception in 1970. In addition, the administration has proposed to expand the scope of payment limit coverage to limit *all* direct farm program payments to $50,000 per farmer (USDA Report to Congress, 1987).

Purpose

The distribution of government payments among farmers has been extensively analyzed (e.g., Ambur; Johnson, Banker and Morehart; Lin, Johnson and Calvin). There has been little study, however, of how farmers and economic efficiency were affected by current and proposed payment limits.

The purposes of this study were two-fold:

- evaluate the potential impacts of payment limits in the 1985 farm bill and the administration's proposed payment limit on representative, family-size crop farms; and
- evaluate the potential impacts of payment limits on economic efficiency and farm structure.

Procedures

The present study emphasizes potential effects of payment limits on efficiency and farm viability. Implications were drawn for the possible impacts on farm structure. Three alternative payment limits were evaluated:

- # The current policy, but assuming the payment limits were not effective.
- # The current $50,000/$250,000 payment limits were effectively enforced and the farm operation was classified as one person.
- # A $50,000 payment limit was applied to all payments, including the regular deficiency payment as well as any payments resulting from either the marketing loan or Findley loan reduction.

Impacts of alternative payment limits on the economic viability of moderate-size farms were projected using a whole-farm simulation approach. Four hypothetical crop farms were simulated over the 1987-90 planning horizon, assuming continuation of the 1985 farm bill. The impacts of changes in the payment limitations were reported in terms of their effects on the farms' chances of economic survival and success, net cash income, and annual government payments. This procedure for quantifying farm level effects of policy changes has been used elsewhere, e.g., Helms, Bailey, and Glover; Skees; Smith; Richardson and Condra; Knutson et al; and Smith, Richardson, and Knutson, 1985.

The impacts of payment limits on economic efficiency were estimated in a two stage process. In the first stage, the presence of economies of size was investigated for major program crops in principle production states. A special tabulation of the 1982 Census of Agriculture (U.S. Department of Commerce), which provided partial costs of production and revenue by type and size of farm for each state, was used to develop unit cost curves (i.e., cost/revenue ratios) for cotton, rice, wheat, corn, and grain sorghum. Data for the three states responsible for producing 30 percent or more of each crop were used in this analysis. Previously published economies of size studies were reviewed to serve as a point of comparison. In the second stage, the change in costs associated with producing the five program crops on smaller size, farms were estimated, as well as the likely impacts of the payment limit enforcement on farm structure.

Organization

The remainder of this publication is divided into two parts:

- # In Chapter 2, the economic impacts of each of the three payment limit policies on four typical farms, including the potential for the farms to earn a reasonable return on investment and survive over the period 1987-90 are estimated, assuming the 1985 farm bill was not modified over the period.
- # In Chapter 3, the cost/revenue relationships for farm program crops are developed based on the 1982 census. The impacts of enforcing the three payment limits on economic efficiency and farm structure are discussed.

CHAPTER 2
Farm Level Impacts of Payment Limits

The purpose of this section is to indicate the potential impacts of alternative payment limits on hypothetical crop farms in two major regions of the United States. Farm-level effects were evaluated by simulating hypothetical crop farms using a firm-level simulation model (FLIPSIM) developed by Richardson and Nixon. The hypothetical farms analyzed were designed to be representative of moderate-size crop farms in their respective regions. Moderate-size, as opposed to large or very large farms, were selected to identify the potential impacts of payment limits on the majority of medium-size, commercial farms.

These farms include:

- 1,360-acre Texas cotton farm designed to be representative of Texas High Plains production conditions;
- 2,194-acre Texas rice-soybean farm representing one of the five major U.S. rice-producing regions;
- 2,240-acre wheat-sorghum farm located in the Texas Panhandle, which is also representative of Western Oklahoma and Kansas production conditions; and
- 982-acre corn-soybean farm designed to be representative of Cornbelt production conditions.

Several of the important economic characteristics of these farms are included in Table 1. Base acreages for each crop indicate the actual size of these farms (Table 1). For example, the 2,194-acre rice and soybean farm actually had only 1,097 acres of rice base, and under the 1987 farm program can plant only 713 acres of rice. Characteristics of each farm were updated to reflect 1987 financial conditions, farm machinery investment costs and productivity relationships. Information on actual farms were utilized, where possible, to make these "representative" farms as realistic as possible.

All four farms were analyzed over the 1987-90 planning horizon under the provisions of the 1985 farm bill and the 1986 Tax Reform Act. The actual farm program provisions used for the analysis were those thought to be most likely for the remaining life of the 1985 farm bill (Knutson et al.). Expected average annual wheat and feedgrain prices for 1987-90 were set at 80 percent of the respective formula loan rate in each year. Average annual cotton and rice prices were set slightly greater than the loan rate based on the expected effects of the marketing loan for these crops on their market price. Average annual prices were used as the means for selecting random crop prices in the FLIPSIM model. Actual prices for the 200 years (4 years replicated 50 times) simulated vary based on historical variability of the respective crop prices. Minimum local prices for grains were set equal to the effective loan rate minus the annual storage cost.

The macroeconomic assumptions (interest rates, inflation rates, etc.) for the 1987-90 planning horizon were developed using the COMGEM (Penson, Hughes, and Romain) model, assuming a continuation of high federal budget deficits and rapid growth in the money supply (Knutson et al.).

For the four representative farms, potential payment limit impacts were analyzed under three policy options:

(1) current policy but no effective payment limit;
(2) strict enforcement of the current $50,000/$250,000 payment limit; and
(3) strict enforcement of a single $50,000 payment limit.

Table 1. Characteristics of Representative Crop Farms in Texas and the Cornbelt.

	Texas Southern High Plains	Texas Panhandle	Texas Upper Gulf Coast	Midwestern Cornbelt
Total Cropland (acres)	1,360	2,240	2,194	982
Owned (acres)	340	1,120	10	429
Leased (acres)	1,020	1,120	2,184	553
Total Assets ($1,000)	277.5	514.8	595.3	582.7
Land & Buildings ($1,000)	116.8	370.0	147.0	514.8
Machinery ($1,000)	130.7	84.3	443.3	62.9
Other ($1,000)	30.0	60.5	5.0	5.0
Total Liabilities ($1,000)	76.2	140.0	177.1	173.3
Long-Term ($1,000)	35.0	114.8	44.1	154.4
Interm.-Term ($1,000)	39.2	25.2	133.0	18.9
Other ($1,000)	2.0	0.0	0.0	0.0
Net Worth ($1,000)	201.3	374.8	418.2	409.4
Off-Farm Income ($1,000)	12.0	15.0	12.0	7.4
Crops and Base Acreage[1]	I. Cotton (449) D. Cotton (911)	I. Wheat (560) D. Wheat (1120) I. Sorghum (560)	I. Rice (1097) D. Soybeans (1097)	D. Corn (510) D. Soybeans (472)

Source: Agricultural and Food Policy Center, Texas A&M University.

[1]I refers to irrigated, and D refers to dryland. Base acreages (planted acres in the case of soybeans) are in parentheses.

In this analysis, all direct payments were assumed to be in cash, and the farms are each organized as "one" person for determining payments. The probabilities of survival and success, as well as average annual net cash income and government payments, are provided in Table 2.

No Effective Payment Limit

In the absence of an effective payment limit, the Texas High Plains cotton farm had a 96 percent probability of surviving (Table 2). Probability of survival was defined as the probability that the farm's debt to asset ratio will remain less than 90 percent. The probability of survival for the other three farms was 100 percent, assuming there was no effective payment limit.

The probability of success (earning a 6 percent after-tax return on initial net worth) for the four representative farms ranged from 46 percent for the Texas High Plains farms to 100 percent for the Midwest grain farm. The Texas rice farm had a 72 percent chance of generating a 6 percent return on the operator's initial net worth.

Average annual net cash income values were also provided in Table 2 for the representative crop farms. Net cash income is total receipts, including government payments, minus all cash expenses except principal payments and family living costs. Average annual net cash income was positive for the four farms; however, there was not sufficient income being generated ($11,000 to $68,000) to cover reasonable family living expenses, replace machinery, and retire debt on a moderately leveraged farm. This was particularly true for the two High Plains farms ($11 ,200 to $13,600).

Average annual government payment receipts indicated in Table 2 include all payments (deficiency, marketing loan, and Findley loan payments). The Texas High Plains cotton farm received an average of $57,990 in government payments during each year of the planning horizon. The next lowest level of payments are received by the Midwest grain farm ($62,070); this payment was low due largely to the fact that 48 percent of the cropland was devoted to soybeans which receive no payments. Average receipts from the government exceeded annual net cash income for all four of the representative family-sized farms. Net cash income, therefore, would be negative without government payments These values provided an indication of how dependent these family-sized farms were on income support programs.

Strict Enforcement

Enforcing the current $50,000/ 250,000 payment limit resulted in government payments falling 14 percent for the Texas cotton farm, 25 percent for the Panhandle grain farm, and 57 percent for the Texas rice farm (Table 2). There was no change in average annual government payments for the Midwest grain farm because deficiency payments did not exceed the $50,000 limit.

The loss in government payments caused no reduction in the probability of survival for the Texas High Plains cotton farm and wheat-sorghum farm, but caused a substantial decrease in the probability of survival for the Texas rice farm (100 percent decreases to 84 percent). Probability of success (earning a 6 percent return on initial net worth) declined for the three Texas farms due to strictly enforcing the $50,000/$250,000 limit. Probability of success for the Texas cotton farm fell from 46 percent to only 26 percent. For the Texas High Plains grain farm, the probability of success declined to only a 4 percent chance of success, representing a loss of 42 percentage points. Under the one "person" organization, the Texas rice farm had only an 8 percent chance of earning a 6 percent return on initial equity.

Table 2. Potential Effects of Alternative Payment Limitations on the Economic Viability of Four Representative Crop Farms.

Representative Farm and Evaluation Criteria	No Effective Payment Limit	$50,000/$250,000 Payment Limit	$50,000 Limit on all Payments
Texas Southern High Plains -Cotton			
Probability of survival (%)	96	96	94
Probability of success (%)	46	26	20
Ave. annual net cash income ($1000)	11.19	1.25	-0.18
Ave. annual govt. payments ($1000)	57.99	49.73	48.50
Texas Northern High Plains - Wheat & Sorghum			
Probability of survival (%)	100	100	100
Probability of success (%)	46	4	0
Ave. annual net cash income ($1000)	13.59	-17.14	-52.68
Ave. annual govt. payments ($1000)	104.84	78.62	50.00
Texas Upper Gulf Coast - Rice & Soybeans			
Probability of survival (%)	100	84	80
Probability of success (%)	72	8	6
Ave. annual net cash income ($1000)	68.07	-21.57	-30.62
Ave. annual govt. payments ($1000)	133.86	57.45	50.00
Corn Belt - Corn & Soybeans			
Probability of survival (%)	100	100	100
Probability of success (%)	100	100	76
Ave. annual net cash income ($1000)	36.89	36.89	23.71
Ave. annual govt. payments ($1000)	62.07	62.07	49.99

Source: Agricultural and Food Policy Center, Texas A&M University.

Average annual net cash income was dramatically reduced for the farms affected by the one "person" reorganization. Average net cash income fell 89 percent for the cotton farm, 226 percent for the Panhandle grain farm, and 132 percent for the Texas rice farm. As a result of the loss in income, the average ending financial position for each of these farms was adversely affected.

A Single $50,000 Limit

Imposing the administration's proposal of one $50,000 limit per farm for all government payments reduced average annual payments on all four representative, family-size farms (Table 2). Compared to the no effective payment limit situation, government payments declined 16 percent for the Texas cotton farm, 52 percent for the Panhandle grain farm, 63 percent for the Texas rice farm, and 19 percent for the Midwest corn and soybean farm. For the Texas rice and Panhandle grain farm, average annual payments fall to the maximum allowable of $50,000, indicating that in every year of the simulation these farms were adversely impacted by the payment limit.

The probability of earning a 6 percent return on initial net worth (success) for the three Texas farms diminished as a result of implementing the administration's proposal. The chance of success fell from 72 to 6 percent for Texas rice farms. The Panhandle grain farm had no chance of earning a 6 percent return on initial net worth under the $50,000 limit.

Average annual net cash incomes for each of the farms were adversely affected by the administration's proposed payment limit. The Texas Panhandle grain farm, for example, experienced a 488 percent reduction in net cash income when compared to the no effective enforcement alternative. Average annual net cash income declined by more than 100 percent for Texas cotton and rice farms.

Summary

From the farm-level analyses it is clear that:

- moderate-size commercial farms are extremely dependent on government program benefits for their economic viability, given the current economic environment;
- the proposed changes to the payment limit (enforcement or level) would significantly reduce the small-to-medium size commercial farms' economic viability;
- there is a significant incentive for medium-size farms to restructure to obtain potential government payments; and
- farms with program crop acreage less than the levels which hit the payment limit will not be affected by more restrictive payment limits, however, they will have a disincentive to grow.

The results in this chapter are similar to the results for other recent firm-level analyses which concluded that moderate- and large-scale farms are not able to maintain their economic viability if they are forced to accept either lower government payment limits (Knutson et al.) or exist outside the farm program (Smith, Richardson, and Knutson (1985); Office of Technology Assessment, pp. 163-185 and 333-347). Based on the recent GAO report, under the current $50,000/$250,000 limit, large numbers of farmers have restructured their farming operations to prevent (or reduce) the chance of losing potential deficiency payments. If proposed restrictions on payment limits, effectively enforced, resulted in lower payments, such future restructuring may result in changed rental agreements, division of farm operations, and even liquidation of farm assets. Each of these restructuring alternative have the potential to result in reduced economic efficiency. The next chapter evaluates the economies of size in agriculture and the economic efficiency impacts of payment limit induced restructuring of large farms.

CHAPTER 3
Impacts of Payment Limits on Efficiency

Government policies affect costs of production for program crops through their impacts on farm size and efficiency. The purpose of this chapter was not to debate the merits of any particular payment limit proposal, but to evaluate the impacts of different payment limits on efficiency.

Economists have several views of efficiency, ranging from the firm level to an industry level, on to society's perspective for all consumptive goods. Heady, Jensen, and Brandow each have contributed useful discussions of agricultural efficiency, emphasizing allocation of inputs toward the production and marketing of various outputs demanded by society. In a market economy, an appropriate extension of the theoretical definitions of economic efficiency can be stated as minimizing per unit production costs. As discussed by Jensen and by Doll and Orazem, often an appropriate management strategy for minimizing production costs is to take advantage of economies of size by increasing the size of one's farming operation (in terms of total acres farmed). That is, if a larger-scale farm can produce a commodity for a lower cost than a smaller operation, the larger farm is considered to be more efficient.

Many farms which have sought economic efficiency through farm growth are now confronted with payment limits which tend to discourage growth. The relative small acreage at which payment limits become restrictive appear to be encouraging the dissolution of large farm operations into smaller, and possibly less efficient, businesses. Efficiency, therefore, is an important factor in the analysis of payment limits. If small-to-medium scale commercial farms are more efficient than their larger-scale counterparts, policies which enhance the movement toward large farms could have a negative impact on the performance of U.S. agriculture. If, however, larger-scale operations are more efficient, policies which retard the movement toward larger farms would mean agricultural products would be produced at a higher cost than necessary and thus reduce U.S. agriculture's economic viability and competitiveness.

To determine the existence and magnitude of efficiency in the production of major program crops, two approaches were taken. First, the economies of size literature related to crop production was reviewed to determine if previous studies had identified significant economies or diseconomies of size for crop farms. Second, unit cost curves were developed for the major program crops to determine if aggregate, state-level cost and receipts data show a difference in economic efficiency for different size farms.

Review of Literature

Economies of size are important because of the implication for consumer food costs, competitiveness, farm survival, and ultimately the structure of agriculture. If the relationship between farm size and cost of production can be adequately specified, the impacts of government policy on structure can be more accurately analyzed. Economies of size occur when the cost of producing a unit of output declines as farm size (measured in acres of land for this study) increases. Conversely, if the cost of producing a unit of output increases as farms become larger, then diseconomies of size have occurred; if production costs remain the same as farm size changes, the farm is experiencing constant returns to size. Although many factors contribute to economies of size, three broad forces are mainly responsible:

- # Specialization and division of labor and management can occur as farm size increases. This specialization can contribute considerably to lowering the cost per unit of output.
- # Some inputs, such as heavy machinery and equipment, can be used in a more effective manner on large operations. Additionally, custom services can be replaced with ownership.

Large farms may pay lower per unit prices for inputs and receive higher per unit prices for products marketed. These pecuniary economies (Debertin, pp. 152, 299) occur when, due to volume or sheer market power, a firm is able to obtain a lower price on purchased inputs or a higher price for products sold.

Diseconomies of size usually occur due to management and coordination problems. The point at which such diseconomies occur is debated extensively in agriculture (Knutson).

It is important to distinguish between the short- and long-run average cost curves. Ferguson and Gould conclude that perhaps the best distinction is that firms plan in the long run and operate in the short run. The long run is defined as the length of time necessary for all inputs to be regarded as variable. In theory, all farms gravitate toward producing at the quantity where costs per unit of output are minimum, i.e., where economies of size are a maximum.

Realistically, not all farms in agriculture will operate at the optimum size. This is due to various levels of producer knowledge, variation in management skills, fixed resources, and lags in the adjustment process. Therefore, when analyzing farm data at a specific point in time, one is actually observing points on different short-run average cost curves for different size operations, none of which may be operating at the theoretical optimum.

The most frequently cited economies of size study is Madden's review of the relevant literature in 1967. In his review, he discussed the findings from 14 different farm-size crop studies. He concluded that crop farms requiring one or two man-years of labor can capture most of the available economies of size.

Miller, Rodewald, and McElroy conducted an economies of size study on seven basic field crop-producing regions in the United States. They concluded that "since medium-size commercial farms with gross incomes from $41,000 to $76,000 achieve most technical cost efficiencies, society benefits little in terms of lower real food costs from further increase in farm size." The maximum farm size studied in the seven regions was a 1,887 acre wheat farm in the Pacific Northwest.

Eddleman, Musick, and Hamill in a study of the Delta Region of Mississippi concluded that, with respect to cotton, most economies are achieved at a scale where the operation could fully utilize one 2 row, self-propelled cotton picker (393 acres). The study found, however, that the average total cost of production declined further (about 7 percent) as the farm approached the 1000+ acre category, which was characterized by an average farm of 1,742 acres. Huffman and Vandeveer, in a linear programming study of Louisiana cotton, rice, and soybean farms, found relatively constant to slightly declining cost of production per acre as farms ranged from 300 to 1,800 acres.

The Eddleman, Musick, and Hamill study of rice found diseconomies of size appearing when farms exceeded 700 acres. Soybeans, on the other hand, experienced a 19 percent decline in cost per bushel as farm size increased from 600 to 1,500 acres. Most economies, however, were achieved by soybean operations in the 1,000 to 1,500 acre range.

Cooke estimated per unit cost of production for corn, wheat, rice, and cotton in selected regions using USDA cost of production surveys for individual farms and the USDA budget generator. For most cases, the cost of production for corn was still falling at the largest farm size reported (Illinois, 1,113 acres; Iowa, 576 acres). Slight diseconomies were noted in Indiana when the corn farm moved from 515 to 913 acres. Kansas and Montana wheat farms experienced a 10 to 15 percent decline in costs associated with the large farms (3,909 acres in Kansas; 1,577 acres in Montana). Diseconomies of 5 percent were noted as North Dakota wheat farms moved from 630 to 1,283 acres. The smallest wheat farm analyzed (753 acres) in Washington had the lowest cost of production.

Cooke found diseconomies of size as rice farms in California, Arkansas, Texas, and the Delta expanded from a moderate size (377 to 870 acres) to the largest size (1,619 to 3,575 acres). Cotton production in Alabama and dryland cotton production in Texas experienced significant economies over the range of farms studied (1,842 acres in Alabama; 5,920 acres in Texas). Diseconomies, however, were experienced in California (2,833 acres), and irrigated areas of Texas (1,707 acres). In Mississippi, costs increased about 4 percent as the farm size moved from 754 to 1,202 acres, but declined by 3 percent as acreage increased from 1,202 to 2,868 acres.

Most of the studies cited thus far relied on a synthetic firm approach or a modified synthetic firm approach. A discussion of the synthetic approach can be found in Madden. Like most of the earlier economies of size studies, these studies did not incorporate pecuniary economies gained in the marketplace or from vertical integration. With the exception of the Cooke study, the large size farm category in each study was restricted in terms of maximum farm size analyzed due to data limitations.

Krause and Kyle found that the return on investment was greater for larger Midwestern corn farms due to technical economies as well as pecuniary economies in purchasing and selling. They found evidence that farms in the 5,000-acre range could receive as much as a 20 percent advantage over farms of approximately 500 acres when purchasing inputs. In addition, marketing advantages could result in as much as $5 per acre gain for the larger farms.

Krenz, Heid, and Sitler found evidence of pecuniary economies in both input and output markets when studying large wheat farms in the North Central Great Plains. In comparing farms of up to 12,000 acres to those in the 1,500-acre range, they found that as many as 40 percent of the larger farms were vertically integrated to some extent.

Smith, Richardson, and Knutson (1984) found significant economies to size for farms up to 3,383 acres in a study of Texas Southern High Plains cotton producers. Pecuniary economies through integration contributed greatly to this conclusion.

Batte and Sonka in a cross sectional time series study of 117 producers' records offered statistically significant evidence of economies of size as Illinois farms exceeded 800 acres with no evidence of diseconomies. They state, however, that "the majority of the size economies are captured by farms of 500 to 750 tillable acres."

The literature on economies of size, therefore, offers no definite conclusions. Those studies, however, which abandon the synthetic approach (or normative concept of what could be) and attempt to examine actual records and explore both technical and pecuniary economies, tend to support the existence of economies of size over a substantial range of acres.

Economic Efficiency of Crop Production

Efficiency has previously been defined in this paper as minimizing per unit production costs. Such a definition does not allow for consideration of economies of size associated with larger farms being able to market larger quantities at higher prices than smaller farms (pecuniary marketing economies). An alternative method of evaluating economic efficiency which accounts for such pecuniary economics is to calculate unit cost ratios (i.e., cost of production per dollar of revenue). Tweeten (1979, p. 185; and 1984) calculated unit cost ratios using aggregate data to show the relative efficiency of different size farms in the United States.

Estimation of Unit Cost Curves

To develop unit cost curves (dollar of cost per dollar of revenue) on different size farms for the major program crops, this study utilized an unpublished tabulation of the 1982 Agricultural Census (U.S. Department of Commerce). The special tabulation provided census information for each program crop across five farm size groupings ranging from less than 250 acres to farms exceeding 2,000 acres (Appendix Tables Al-A5). Cotton, corn, sorghum, winter wheat, and rice farms were analyzed in each of the three major producing states for each crop (Figure 1).

The Census data were specific to the designated commodity but did not exclude other crops grown on the farm. The data for Texas cotton farms, for example, were for all farms which reported cotton in 1982 and did not exclude the cost and revenue for other program and non-program crops grown on those farms. A Texas cotton farm in size category 5, therefore, averaged 3,794 acres of which approximately 40 percent was devoted to cotton (Table Al).

The Agricultural Census data provided estimates, by farm size, for selected production costs (energy, fertilizer, chemicals, hired labor, seed, feed, and interest), as well as for value of machinery and equipment, returns from crops and livestock, and value of assets. Production costs not included in the Census data were: depreciation, insurance, repairs, property taxes, other purchased inputs, unpaid family labor, management, and return to equity. Leaving out these costs in computing unit cost ratios would make each farm appear to be more efficient than it really was. But more importantly, it could distort the relative efficiency shown for each farm if the omitted cost per dollar of revenue was different for small farms than for large farms. To minimize the chance of distorting the relative rankings of the unit cost ratios, costs by size groupings were estimated for the following: depreciation, repairs, insurance, property taxes, family labor, management, and return to equity. Insufficient information was available to impute costs for "other purchased inputs," so they were not included.

The declining geometric progression formula used by USDA to compute machinery depreciation (Penson, Hughes, and Nelson) and the census value of machinery and equipment in 1982 were used to estimate annual depreciation expenses by farm size for each crop. The formula calls for multiplying the machinery market value by a fraction which reduces the original market price to its salvage value (5 percent) at the end of the machine's economic life. The fraction used in the present study (0.075) was less than USDA's formula value because in 1982 the actual depreciation in the value of new machinery (tractors and harvesting machinery) purchased in 1977 was considerably less than the formula would have indicated *(Official Guide for Tractors and Farm Equipment).* Machinery was assumed to have an average age of 6 years (i.e., purchased in 1977) based on available census information and age of equipment. The same depreciation fraction (0.075) was used for each farm size, across all crops.

Machinery repair costs were calculated using agricultural engineering repair cost formulas. An annual repair cost fraction (0.058) for a 6 year old, composite machinery complement (wheeled tractors, combines, cotton pickers, planters, drills, plows, and tillage equipment) was developed from agricultural engineering data (Bowers, p. 91). The list price of each farm's machinery complement in 1977 was estimated by adjusting the 1982 Agricultural Census machinery values, by the average percentage change in the price of tractors and harvesting equipment from their respective 1977 list price to their 1982 used price *(Official Guide for Tractors and Farm Equipment).* The repair cost fraction (0.058) was multiplied by each farm's estimated machinery and equipment list price to obtain the annual repair costs for 1982.

Insurance costs for machinery were computed by multiplying each farm's 1982 value of machinery by an insurance rate fraction (0.01). This fraction was suggested by McGrann et al. (p. 77) for calculating insurance on farm machinery. Property taxes were calculated by multiplying the market

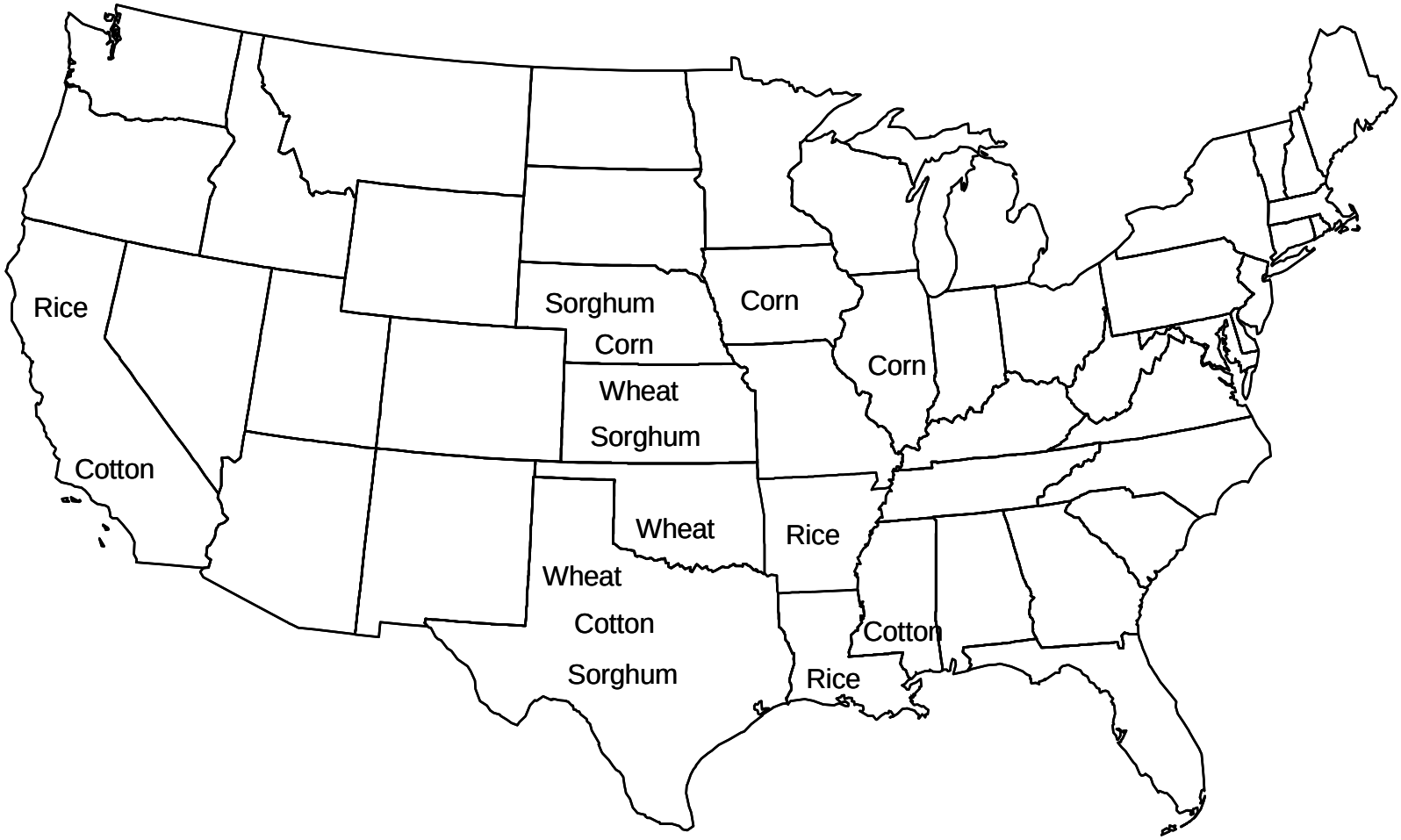

Figure 1. States and Program Crops Included in the Cost of Production Analysis.

value of non-machinery assets for the different size farms by the property tax fraction for the respective state. The property tax fraction, or more explicitly the real estate tax per dollar of full market value in 1982 for each state, was taken from USDA's *Farm Real Estate Market Developments* report.

Family labor was assumed to have an opportunity cost of $15,000 per full-time operator. This value was prorated by the labor requirement for each size of farm. In other words, the small size farm was not allocated a full year's family labor requirement (cost). Labor requirements by farm size were allocated based on recommendations from several agronomists, production economists, and producers (Table A6). By the same token, the largest size farms were not allocated operator labor due to the farm operator's time being devoted entirely to management activities.

A management cost was calculated based on information provided by farm management consultants (Whitson and Schott) and the *Farm and Ranch Management Manual* (American Society of Farm Managers and Rural Appraisers). The imputed management cost reflected an estimated value of all farm management services whether performed by the owner or by a consultant. The estimated value of farm management services was calculated as a percent of total revenue for farms having more than $50,000 of total revenue per year (Table A7). Farms with $25,000 to $50,000 per year of total revenue were assigned a conservative value of $5,000 for management services. None of the farm sizes used in this study had less than $25,000 of total revenue.

Opportunity costs for capital were calculated assuming a 7 percent return to farm equity. Total assets were available for farms in each size category; however, estimates of debt were not provided in the Census data. Debt levels were developed from the USDA balance sheet of the farm sector by value of sales class, as of December 31, 1982 (USDA - *Economic Indicators of the Farm Sector - National Financial Summary*, p. 77). These national debt levels were adjusted to reflect state conditions by farm size, using the relationship between the state and federal debt/asset ratios reported by USDA for 1982 (USDA - *Economic Indicators of the Farm Sector -State Financial Summary*, p. 210-232).

Total value product (revenue in the unit cost ratio) represents the estimated value of all crops harvested during the 1982 crop year, including deficiency payments paid on the 1982 farm program crops. These values were provided in the special tabulation for farms that participated in the farm program, as well as for those farms who did not participate.

Unit Cost Relationships

The estimated unit cost curve relationships were summarized in Figures 2-6 and Tables A8-A12 for the crops and states analyzed. The unit cost curves for each crop are discussed briefly by commodity in this section.

Cotton. The cost/revenue relationships were developed for farms with cotton acreage in California, Texas, and Mississippi. It was estimated that these three states account for approximately 64 percent of total U.S. cotton revenue (Table A 14). Cost economies were exhibited throughout the range of farm sizes (Figure 2). As a cotton farm increases from about 1,500 acres to 3,300 acres in Mississippi and from 2,000 acres to nearly 8,000 acres in California, cost/revenue declines by more than 5 percent, while the Texas cotton farm reduces costs by 23 percent as the farm grows from 1,726 to 3,794 acres (Table A8).

Wheat. As was the case with cotton, significant economies for wheat were observed across the full farm size spectrum for farms in Kansas and Oklahoma (Figure 3). One notable exception was in Texas (Table A9), where cost/revenue was observed to increase as the farm moved from size 3 to 4. Further

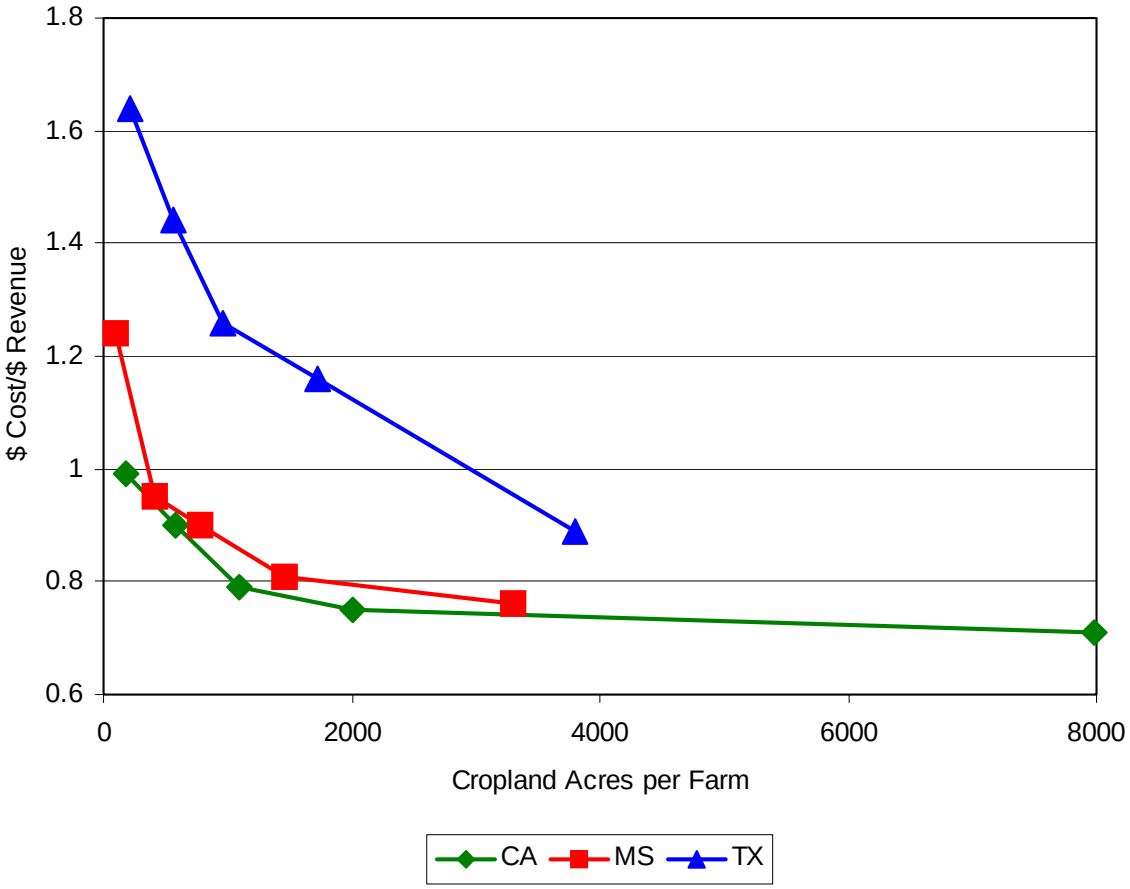

Figure 2. Average Costs per Dollar Revenue by Farm Size for Farms with Cotton Acreage in 1982.

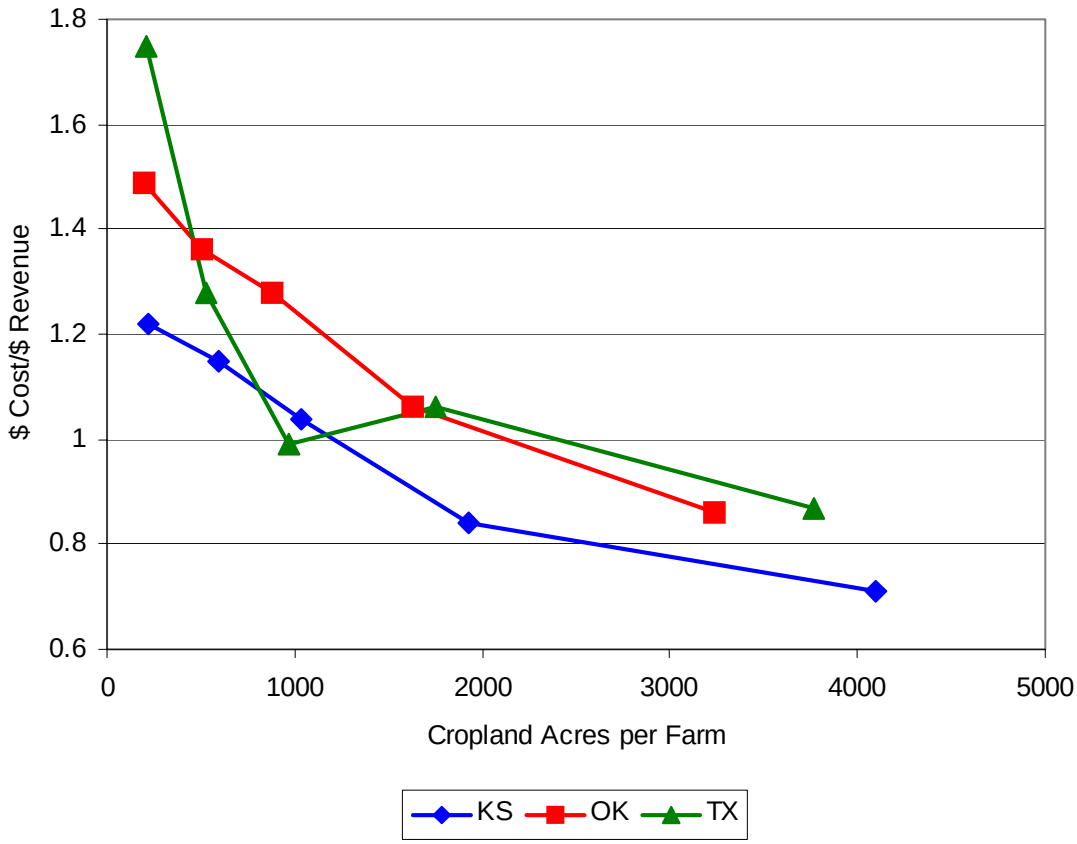

Figure 3. Average Costs per Dollar Revenue by Farm Size for Farms with Wheat Acreage in 1982.

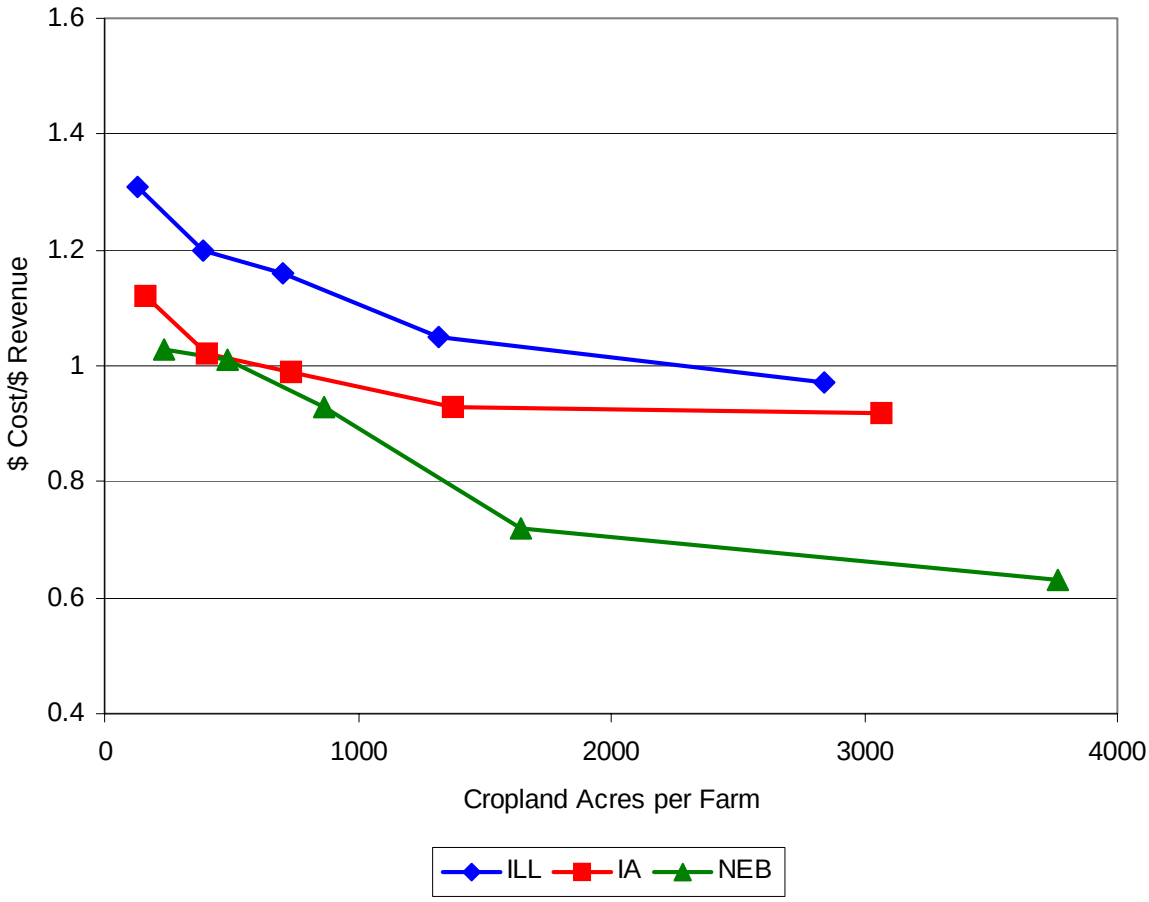

Figure 4. Average Costs per Dollar Revenue by Farm Size for Farms with Corn Acreage in 1982.

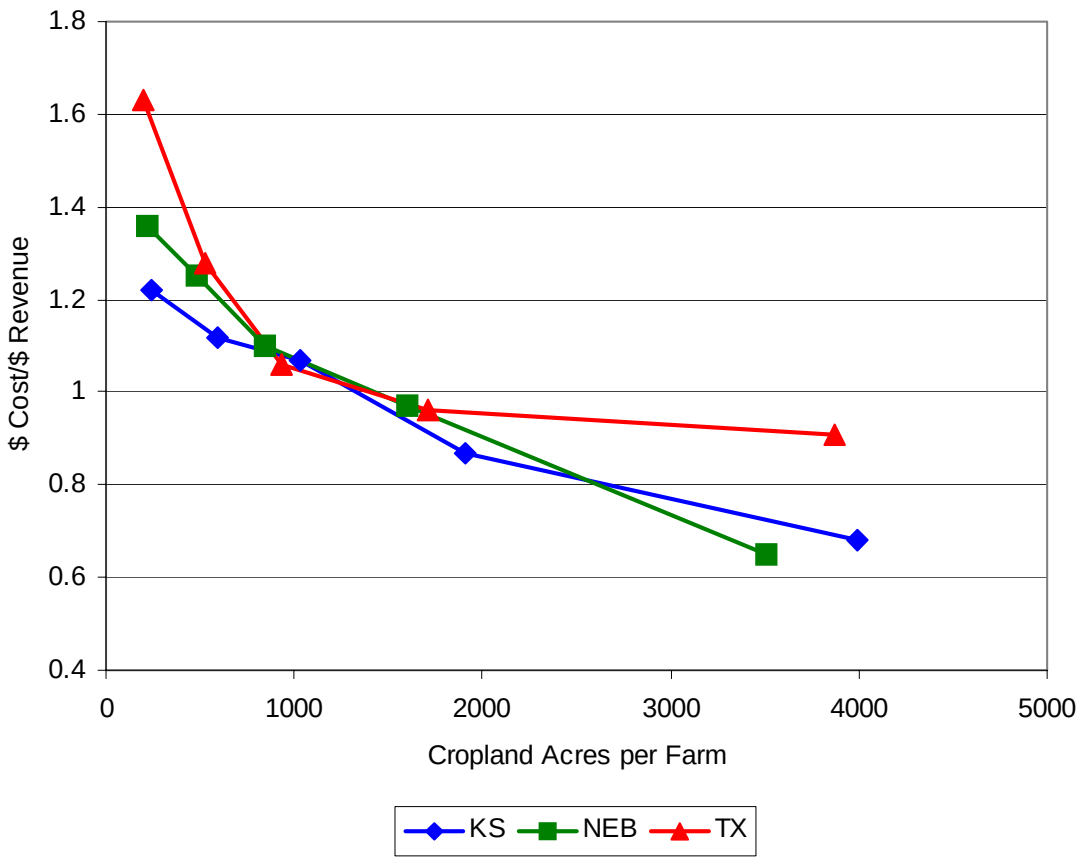

Figure 5. Average Costs per Dollar Revenue by Farm Size for Farms with Sorghum Acreage in 1982.

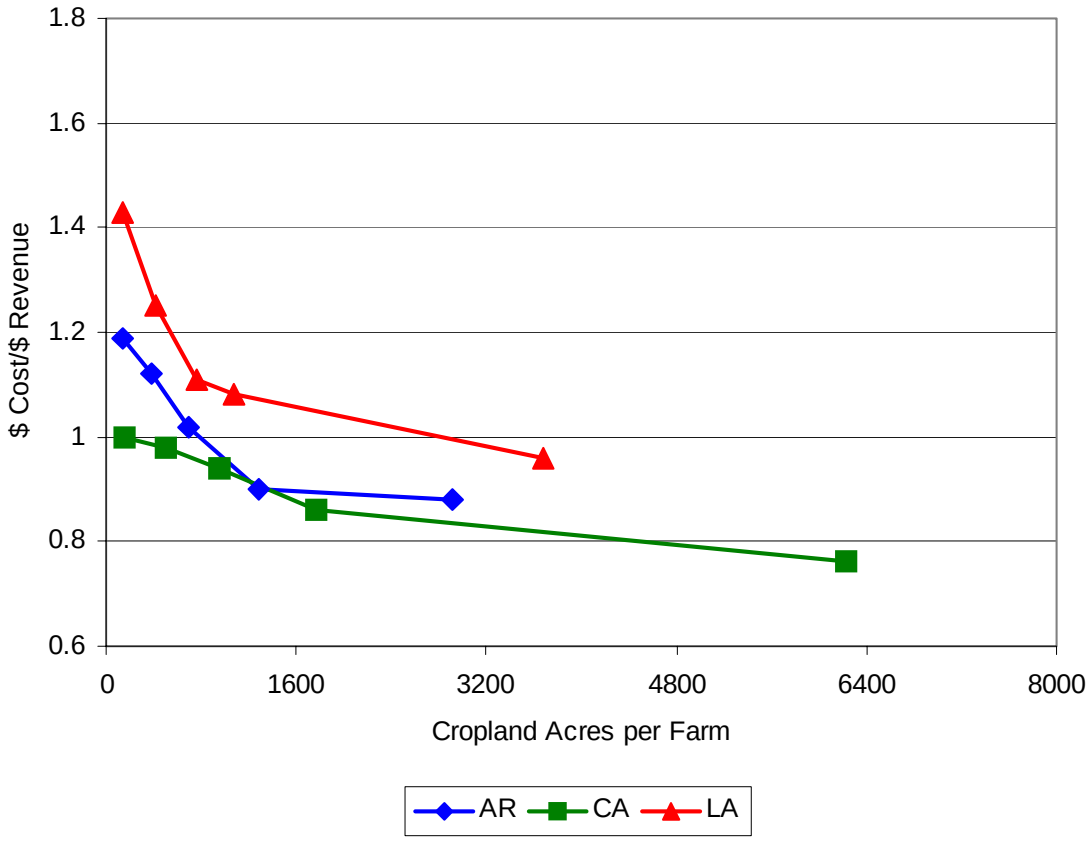

Figure 6. Average Costs per Dollar Revenue by Farm Size for Farms with Rice Acreage in 1982.

economies, however, were observed at farm size 5 (3,769 average acres). In all three states, the lowest cost/revenue relationship was observed at the largest farm size. The cost/revenue relationship for farm size 5 was from 12 to 20 percentage points lower than that observed for any other farm size. The top three winter wheat producing states, Kansas, Oklahoma, and Texas, represent approximately 31 percent of the revenue generated from all U.S. wheat production (Table A 14).

Corn. Illinois, Iowa, and Nebraska were estimated to generate 46 percent of the revenue derived from the U.S. production of corn (Table A 14). Significant cost economies were observed throughout the size spectrum in Nebraska as farms approached 3,000 to 4,000 acres (Figure 4). The cost/revenue ratios observed for Iowa and Illinois declined more gradually, but continued to show increased efficiency at farm sizes of 3,000 acres (Table A10).

Sorghum. Kansas, Texas, and Nebraska, which account for approximately 69 percent of U.S. sorghum revenue (Table A14), show substantial cost/revenue economies across all farm sizes (Figure 5). In fact, cost savings of 22 to 33 percent were observed for the largest size studied (3,500 to 4,000 acres) over the next smaller farm size (1,600 to 1,900 acres) in Kansas and Nebraska (Table A11). Cost savings for Texas sorghum farms were only 5 percent at 3,874 acres over the next smaller farm size (1,711 acres).

Rice. Significant cost economies were observed across all farm sizes in California and Louisiana (Figure 6). In Arkansas, however, the cost/revenue ratios stabilize for farms having over 1,300 to 2,900 acres. Arkansas experiences significant economies of size up to 1,300 acres (Table A12) before falling a marginal 2 percent as the farm size expands to about 2,900 acres. The cost/revenue ratios for California and Louisiana decline 11 percent as the farm size increases from 1,800 to 6,200 acres and from 1,100 to 3,700 acres, respectively. These three rice states account for an estimated 74 percent of U.S. rice revenues (Table A 14).

Comparisons to Previous Studies

In most all cases, the unit cost curves showed significant economies of size exist, and that large-scale producers were considerably more efficient than small- and moderate-scale farms. Economies of size estimated here generally exceed those in most previous studies. There appear to be several reasons why this was the case:

- # Considerably larger farm sizes were analyzed in this study than in previous studies. Those studies which analyzed larger farm sizes generally found economies extending throughout the range of sizes analyzed.
- # Previous studies indicated a persistent trend toward a larger optimum size farm. This trend was consistent with progressive and more complex technologies and with improved management.
- # Several of the previous studies were based on synthetic analysis of cost, rather than actual experience. Several cost variables which occur under actual operating conditions may not be captured in a synthetic study.
- # Most previous studies ignored the marketing economies large farms may enjoy over smaller farms as they sell their production at higher per unit prices. The unit cost methodology used in this study incorporates such marketing economies.

Impacts of Payment Limit Proposals

Considerable economic efficiency can be gained by allowing farms to expand to larger sizes based on the unit cost curves estimated for cotton, wheat, corn, sorghum, and rice. In a competitive market, food and fiber consumers benefit in the long run from increased efficiency in the production of these crops.

Payment limits have multiple effects on those farms affected by the limit, depending on whether they can survive outside the program:

- # Farms that *cannot* survive outside the farm program are forced to restructure into smaller, less efficient units or to liquidate. Reduced efficiency makes U.S. production less competitive in world markets and results in increased pressure for higher levels of government subsidies.
- # Farms that *can* survive outside the government program pursue farming in a full production posture. Production outside the program undermines acreage reduction provisions designed to reduce surplus stocks.

These payment limit effects distort farm structure. If allowed to continue, the trend toward a bimodal structure of farms -- an agriculture made up primarily of small and large farms with few moderate size farms -- would be accelerated. Pressure would build for government to deal with the issue of the disappearing moderate-size farm and the noncompetitiveness of small-scale farms which were formed to avoid the impacts of payment limits. Two government policy reactions become apparent:

- # The decentralized noncompetitive structure of farming could be protected. This could be accomplished through a system of targeted income supports that would have to be higher than currently exist due to reduced efficiency. Alternatively, it might be accomplished with a closed system of high price supports and mandatory production controls. If export markets were to be retained under the later policy option, large direct or indirect export subsidies would be required, and U.S. consumers and agribusiness would likely suffer (Knutson et al.).
- # Structural adjustment could be allowed to occur with continued reduction of target prices, as provided for in the 1985 farm bill. Resulting lower farm incomes would precipitate further reduction in land values. Small- and moderate-size farms would encounter increased difficulty surviving. Increased incentives would exist for large farms to produce outside the farm program. Policies which impede export competitiveness, such as loan rates above world market prices, would result in the accumulation of government stocks and increased program costs.

Such a series of potential actions and reactions make it difficult to precisely evaluate the potential costs associated with implementation of effectively enforced payment limits. That is, economic costs associated with payment limit enforcement are dependent on the assumptions made regarding producer and government policy reactions to the implementation of payment limits.

The following analysis indicates the costs imposed if all farms respond to the payment limit by dividing their farm operation sufficiently to capture all payments. The divided farms are operated as individual independent farm units. Thus, the analysis indicates the extent to which farms operate at a higher cost because of their smaller size due to strict enforcement of the payment limit. An estimate, therefore, is provided of the increased cost incurred if the existing farms are restructured to fall within the threshold size imposed by a strictly enforced $50,000/$250,000 payment limit and by a $50,000 payment limit where all payments are included within the limit including the Findley and marketing loan reductions.

The cost/revenue ratios developed for the different crops in this chapter were used to estimate the increased cost if all farms were forced to operate at or below the payment limit thresholds. The following assumptions were made to estimate the change in production costs for 1988:

- # The relative difference in cost/revenue that existed among different size farms in 1982 would exist in 1988.
- # The proportion of cropland devoted to program crops, by size category, that existed in 1982 would still exist in 1988.
- # Farm program participation rates for 1987 (USDA - ASCS Press Release) were assumed for 1988.
- # Farm program base and yield values for 1987 (USDA -ASCS Press Release and telephone conservations with ASCS analysts) were assumed for 1988.
- # Non-participation in farm programs was equal across farm sizes for a given program crop.
- # Farms were treated as single-crop farms for determining the acreage at which the payment limit was reached.
- # Farm program provisions and expected prices summarized in Table A13 will exist for 1988.

These assumptions were used with the unit cost ratios in Tables A8-A12 to estimate a weighted average cost/revenue ratio for each crop by state under the two alternative payment limits (Table 3). The weighted average cost in the absences of an effective payment limit was referred to as the baseline cost/revenue ratio. The base acreages at which a single-crop farm reached the relevant payment limit were used to estimate the weighted average cost/revenue ratios for the current and proposed payment limits.

Under the $50,000/$250,000 per person payment limit it was assumed the eligibility rules were tightened and enforced to the extent that all participating farms larger than the threshold level would operate only at the size which reached the payment limit. The $50,000 limit strictly enforced assumed all payments were included in a single $50,000 per person limit, and the eligibility rules were enforced to the extent that all participating farms larger than the threshold level operated at the size of farm which met this limit. Cotton and rice marketing loan benefits were calculated against the $50,000 limit. Avoidance of the limit on the marketing loan by utilizing the CCC loan was, therefore, not assumed for these two crops. If the current operation of the marketing loan was assumed to continue, then cotton and rice producers would not be impacted by the single $50,000 per person limit, and the increased cost would be approximated by the $50,000/$250,000 strictly enforced.

The change in the cost/revenue ratios due to restructuring were multiplied by the estimated 1988 revenue for each program crop to estimate the increase in cost of production induced by the payment limit change. The cost increases for the three principal producing states were expanded to the nation based on their expected percentage of total revenue for the crop (Table A 14). Proportion of total revenue was derived based on average production and prices reported by USDA *(Agricultural Prices; Crop Production).* The impacts on each crop are discussed briefly below.

Cotton. As indicated in Table 3, a 100 percent cotton farm would hit the payment limit at a relatively low base acreage. California farms, because of high farm program yields (Table A 14), reached the payment limit at 243 base acres under the $50,000/$250,000 limit strictly enforced alternative and at 173 base acres under a $50,000 per person limit applying to all payments. Mississippi and Texas farms reached the limits at approximately 253 and 473 base acres, respectively, when the $50,000 per person limit is applied (Table 3).

Costs of production were increased 12 to 28 percent due to strict enforcement of the payment limit proposals (Table 4). Costs in Texas, for example, increase 18.6 percent under strict enforcement of the current limit. Given the current level of production, Texas cotton producers could incur an additional $112 million in production costs if the $50,000/$250,000 "one person" limit was implemented in 1988 (Table 4). Estimated cost to cotton producers across the nation was $718 to $945 million in 1988 for the $50,000/$250,000 "one person" and $50,000 "one person" limit, respectively.

It was estimated that 48 percent of the farms in California representing 91 percent of the cotton acreage were adversely affected by the alternative payment limits (Table). In Texas, 36 percent of the cotton farms and 69 percent of the cotton acreage were affected.

Wheat. Wheat farms hit the payment limit at a much larger acreage base due to the lower amount of payments per acre. The Kansas farm under the $50,000/$250,000 strict enforcement option hit the limit at 1,274 acres (Table 3). The corresponding acreage for Oklahoma and Texas was 1,387 and 1,592 acres, respectively. Increased production cost due to this option amounted to 2 to 4 percent and was estimated to cost the nation's wheat producers an additional $270 million in 1988 (Table 4). About 5 percent of the wheat farms in Oklahoma were affected, representing 24 percent of that state's wheat acreage (Table 5). In Kansas, however, 22 percent of the farms representing 58 percent of the wheat acreage were adversely impacted by this proposal.

Because the Findley loan adjustment is currently excluded from the $50,000 limit, its inclusion in the $50,000 all payments option reduced the base acreage at which wheat farms hit the limit by approximately 25 percent (Table 3). This additional restriction in farm size was expected to cost the nation's wheat producers an additional $126 million for a total increase in cost of $396 million.

Corn. Approximately 10 to 17 percent of the corn farms in Illinois, Iowa, and Nebraska would be affected by strict enforcement of the $50,000/$250,000 option (Table 5). These farms represented 30 to 50 percent of the corn acreage in the three states. The increase in cost due to strict enforcement is approximately 2 percent in Illinois, less than 1 percent in Iowa, and more than 5 percent in Nebraska (Table 4). Farms in these states reach the payment limit at approximately 700 acres under the $50,000/$250,000 strictly enforced option (Table 3). The added production cost for corn producers from implementing this option was estimated at $409 million in 1988.

Inclusion of the Findley loan in the $50,000 payment limit reduced the size at which corn farms reach the payment limit by approximately 35 percent (Table 3). This additional restriction on farm size was expected to impact 30 to 40 percent of the farms in Iowa and Illinois, representing about 74 percent of the acreage (Table 5). Total production costs to the nation's corn producers under the all payments $50,000 option was estimated to increase $643 million in 1988 (Table 4).

Sorghum. Sorghum farms, like wheat farms, reached the payment limit under strict enforcement of the $50,000/$250,000 limit at 1,200 to 1,500 base acres in the regions analyzed (Table 3). In Kansas and Texas, 9 to 14 percent of the farms representing 31 to 46 percent of the sorghum acreage (Table 5) were affected, and as a result increased production costs by 1 to 4 percent (Table 4). Only 3 percent of the farms in Nebraska, representing 9 percent of the acreage were affected by the strictly enforced $50,000/$250,000 option. As a result, Nebraska sorghum producers experience less than a 1 percent increase in total production cost. At the national level, the cost to produce sorghum was estimated to increase by $53 million.

Table 3. Weighted Average Cost/Revenue Under Different Payment Limit Assumptions and Base Acreage Where a 100 Percent Single Program Crop Would Reach the Payment Limit.

	Baseline	$50,000/250,000 Limit Strictly Enforced		$50,000 Limit All Payments	
	Cost/Revenue	Base Acreage Hitting Limit	Cost/Revenue	Base Acreage Hitting Limit	Cost/Revenue
	(fraction)	(acres)	(fraction)	(acres)	(fraction)
Cotton					
California	0.774	243	0.908	173	0.916
Mississippi	0.860	350	1.020	253	1.098
Texas	1.266	654	1.266	473	1.487
Wheat					
Kansas	1.034	1,274	1.079	949	1.103
Oklahoma	1.277	1,387	1.302	1,034	1.325
Texas	1.155	1,592	1.177	1,186	1.164
Corn					
Illinois	1.181	690	1.201	449	1.213
Iowa	1.039	682	1.045	443	1.051
Nebraska	0.938	750	0.987	488	1.011
Sorghum					
Kansas	1.025	1,423	1.070	924	1.102
Nebraska	1.210	1,168	1.219	759	1.237
Texas	1.108	1,540	1.128	1,000	1.144
Rice					
Arkansas	0.966	354	1.114	272	1.137
California	0.887	237	0.990	183	0.993
Louisiana	1.138	399	1.276	308	1.325

Source: Agricultural and Food Policy Center, Texas A&M University.

Table 4. Change in Total Cost as a Percentage of Current Levels and in Total Dollars By State and U.S. Under Different Payment Limit Assumptions.

	$50,000/$250,000 "One Person"		$50,000 Limit "One Person"	
	Increase in Cost	Increased Cost	Increase in Cost	Increased Cost
	(%)	(million $)	(%)	(million $)
Cotton				
California	11.93	173.7	17.44	253.9
Mississippi	17.35	174.9	18.43	185.8
Texas	18.63	112.5	27.72	167.3
United States	—	718.0	—	945.4
Wheat				
Kansas	4.30	60.1	6.67	93.4
Oklahoma	2.02	13.3	3.79	24.9
Texas	1.88	10.1	0.78	4.2
United States	—	270.1	—	396.3
Corn				
Illinois	1.73	57.8	2.74	90.4
Iowa	0.63	23.9	1.17	44.8
Nebraska	5.13	106.8	7.74	161.1
United States	—	409.2	—	643.0
Sorghum				
Kansas	4.43	25.6	7.50	43.3
Nebraska	0.73	2.2	2.61	7.7
Texas	1.79	8.7	3.59	17.5
United States	—	53.0	—	99.4
Rice				
Arkansas	15.28	81.1	17.67	93.8
California	11.62	29.5	11.96	30.4
Louisiana	12.11	24.6	16.40	33.3
United States	—	182.0	—	212.0

Source: Agricultural and Food Policy Center, Texas A&M University.

Table 5. Percentage of Acreage and Farms Affected By Different Payment Limit Assumptions.

	Current Limit "One Person"		$50,000 Limit "One Person"	
	% of Farms Affected	% of Acreage Affected	% of Farms Affected	% of Acreage Affected
	(percent)			
Cotton				
California	48	91	48	91
Mississippi	56	93	56	93
Texas	36	69	36	69
Wheat				
Kansas	22	58	22	58
Oklahoma	5	24	5	24
Texas	11	42	11	42
Corn				
Illinois	17	48	42	78
Iowa	10	32	34	67
Nebraska	17	45	17	45
Sorghum				
Kansas	9	31	29	62
Nebraska	3	9	18	37
Texas	14	46	14	46
Rice				
Arkansas	81	95	81	95
California	58	90	58	90
Louisiana	66	90	66	90

Source: Agricultural and Food Policy Center, Texas A&M University.

As was the case for corn, sorghum acreage reached the maximum limit under the $50,000 payment limit at approximately 65 percent of the base acreage under the $50,000/$250,000 payment limit (Table 3). The added acreage restriction was estimated to cost the nation's sorghum producers an additional $46 million for a total of $99 million in 1988.

Rice. In Arkansas, California, and Louisiana, only the smallest farm size category escaped the impacts of either of the two payment limit options. In all three states, 90 percent or more of the acreage was impacted by strict enforcement of the payment limits (Table 5).

Strict enforcement of the $50,000/$250,000 limit option resulted in an 11 to 15 percent increase in production costs (Table 4). Estimated cost to the rice industry approached $182 million in 1988. If the marketing loan provision of the rice program was allocated against a single $50,000 payment limit, total cost of production to the rice industry would increase approximately $30 million in 1988 to $212 million.

Summary

Substantial economies of scale were demonstrated to exist in crop farming. These economies extend far beyond the size at which current payment limits become effective. Under current policies, many farms have restructured their operations to avoid the payment limit (GAO).

Restructuring has taken many forms (GAO). In some cases, new limited partnerships and/or corporations have been established with little or no change in production costs. Profits, however, have been reduced by extra legal and accounting costs associated with the larger number of new organizational units required to legally avoid the payment limit. In other instances, restructuring has taken the form of establishing units having higher costs of production because of their smaller size.

Under a tight payment limit enforcement policy the impact on farm structure and costs would be more direct. Farms exceeding the payment limit size threshold would have to make participation decisions based on whether they could survive as an operating unit outside the program or divide their operation to create a larger number of independent farm units each having higher production costs.

If all farms exceeding the payment limit threshold divided their operation, production costs would potentially increase by $1.6 billion to $2.3 billion depending on the payment limit policy implemented. With strict enforcement of the $50,000/$250,000 limit, the potential cost increase would be $1.6 billion. With a $50,000 limit covering all payments, the potential cost increase would be $2.3 billion.

In reality, whether such increases in costs would be realized is problematical. Some large scale producers would opt not to participate in the farm program and, therefore, not divide their operations. These producers would reduce the effectiveness of the program and create increased price and competitive pressure on the higher cost producers who divided their operations. The higher cost producers would likely pressure Congress and the administration for even higher levels of price and income support to cover their higher cost of production. If Congress and the administration bowed to this pressure, the predicted higher societal costs would be realized. If the government did not bow to the pressure, land values would decline even further and the economic viability of many small and large farmers would be in even more doubt than it is today.

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Table A1. Profile of Acreage on Different Size Farms Reporting Cotton in the 1982 Agricultural Census for Selected States.

State and Farm Size	No. of Farms	Ave. Size	Percent of Cropland Acreage						
			Cotton	Corn	Sorghum	Wheat	Rice	Soybean	Other
	(1,000)	(acres)	(%)						
California									
Size 1	1.6	190	43	2	1	5	0	0	49
Size 2	0.5	580	45	3	1	11	0	0	40
Size 3	0.4	1,091	44	2	1	12	0	0	41
Size 4	0.3	2,001	43	2	1	15	1	0	38
Size 5	0.2	7,981	46	1	0	17	1	0	35
Mississippi									
Size 1	1.6	103	48	1	1	3	0	27	20
Size 2	0.5	418	46	0	1	5	1	39	8
Size 3	0.7	777	42	0	1	8	1	44	4
Size 4	0.6	1,457	41	0	1	9	3	46	0
Size 5	0.3	3,300	32	0	1	13	5	49	0
Texas									
Size 1	6.3	217	39	1	9	6	0	1	44
Size 2	4.0	563	44	2	13	9	0	2	30
Size 3	3.8	967	43	4	17	12	0	2	22
Size 4	1.7	1,726	42	4	21	13	0	2	18
Size 5	0.4	3,794	40	4	27	15	0	2	12

Source: Special tabulations of the 1982 Agricultural Census.

Table A2. Profile of Acreage on Different Size Farms Reporting Wheat in the 1982 Agricultural Census for Selected States.

State and Farm Size	No. of Farms	Ave. Size	Percent of Cropland Acreage						
			Cotton	Corn	Sorghum	Wheat	Rice	Soybean	Other
	(1,000)	(acres)	(%)						
Kansas									
Size 1	26.7	224	0	1	7	37	0	5	50
Size 2	11.5	592	0	3	10	44	0	5	38
Size 3	7.8	1,039	0	4	12	47	0	6	31
Size 4	2.7	1,924	0	6	14	46	0	5	29
Size 5	0.5	4,097	0	9	13	46	0	4	28
Oklahoma									
Size 1	13.9	193	2	0	2	49	0	1	46
Size 2	4.6	506	4	0	3	64	0	2	27
Size 3	3.3	886	5	0	5	69	0	2	19
Size 4	1.1	1,631	5	1	8	66	0	3	17
Size 5	0.2	3,235	7	1	11	66	0	6	9
Texas									
Size 1	11.7	205	4	1	7	35	0	1	52
Size 2	4.4	534	10	3	14	38	0	2	33
Size 3	4.0	965	14	4	18	37	0	2	25
Size 4	2.0	1,747	14	5	20	39	0	3	19
Size 5	0.6	3,769	11	5	20	44	1	3	16

Source: Special tabulations of the 1982 Agricultural Census.

Table A3. Profile of Acreage on Different Size Farms Reporting Corn in the 1982 Agricultural Census for Selected States.

State and Farm Size	No. of Farms	Ave. Size	Percent of Cropland Acreage						
			Cotton	Corn	Sorghum	Wheat	Rice	Soybean	Other
	(1,000)	(acres)	(%)						
Illinois									
Size 1	42.4	131	0	45	0	6	0	29	20
Size 2	18.4	388	0	49	0	5	0	37	9
Size 3	10.1	707	0	51	0	6	0	39	4
Size 4	2.2	1,319	0	52	0	6	0	39	3
Size 5	0.3	2,840	0	54	2	7	0	37	0
Iowa									
Size 1	61.0	163	0	47	0	0	0	22	31
Size 2	22.5	405	0	51	0	0	0	33	16
Size 3	7.6	733	0	54	0	0	0	35	11
Size 4	1.2	1,374	0	59	0	1	0	34	6
Size 5	0.1	3,065	0	62	0	1	0	31	6
Nebraska									
Size 1	18.7	233	0	36	4	4	0	9	47
Size 2	10.1	489	0	45	7	7	0	13	28
Size 3	4.6	863	0	47	8	11	0	13	21
Size 4	1.1	1,644	0	49	6	13	0	11	21
Size 5	0.2	3,769	0	54	2	14	0	8	22

Source: Special tabulations of the 1982 Agricultural Census.

Table A4. Profile of Acreage on Different Size Farms Reporting Sorghum in the 1982 Agricultural Census for Selected States.

State and Farm Size	No. of Farms	Ave. Size	Percent of Cropland Acreage						
			Cotton	Corn	Sorghum	Wheat	Rice	Soybean	Other
	(1,000)	(acres)	(%)						
Illinois									
Size 1	12.2	244	0	2	18	24	0	6	50
Size 2	7.0	593	0	2	18	37	0	6	37
Size 3	5.3	1,035	0	3	19	43	0	6	29
Size 4	2.0	1,909	0	6	20	42	0	5	27
Size 5	0.4	3,992	0	7	20	44	0	4	25
Iowa									
Size 1	7.6	217	0	13	28	12	0	8	39
Size 2	4.8	481	0	23	28	15	0	11	23
Size 3	2.2	842	0	29	25	17	0	11	18
Size 4	0.4	1,596	0	33	22	18	0	12	15
Size 5	0.03	3,506	0	47	11	17	0	12	13
Nebraska									
Size 1	9.1	192	8	2	32	10	0	1	47
Size 2	4.2	524	15	3	35	16	0	2	29
Size 3	4.2	928	19	4	35	19	1	2	20
Size 4	2.1	1,711	18	4	35	22	1	2	18
Size 5	0.6	3,874	14	5	42	23	2	2	12

Source: Special tabulations of the 1982 Agricultural Census.

Table A5. Profile of Acreage on Different Size Farms Reporting Rice in the 1982 Agricultural Census for Selected States.

State and Farm Size	No. of Farms	Ave. Size	Percent of Cropland Acreage						
			Cotton	Corn	Sorghum	Wheat	Rice	Soybean	Other
	(1,000)	(acres)	(%)						
Arkansas									
Size 1	1.0	138	1	0	3	10	43	35	8
Size 2	1.1	374	2	0	3	12	37	46	0
Size 3	1.6	698	3	0	2	14	31	49	1
Size 4	1.1	1,279	4	0	2	18	26	49	1
Size 5	0.5	2,910	5	0	2	23	19	50	1
California									
Size 1	0.6	163	0	0	1	2	65	0	32
Size 2	0.3	500	1	2	1	4	65	0	27
Size 3	0.2	957	2	2	1	6	63	0	26
Size 4	0.2	1,769	3	4	1	10	58	0	24
Size 5	0.08	6,225	16	5	1	17	31	0	30
Louisiana									
Size 1	0.8	139	1	0	0	1	51	24	23
Size 2	0.6	425	1	0	1	1	45	41	11
Size 3	0.7	766	2	0	1	2	40	50	5
Size 4	0.3	1,081	5	0	2	5	36	51	1
Size 5	0.08	3,674	10	0	3	10	30	45	2
Texas									
Size 1	0.3	276	0	1	3	0	46	2	48
Size 2	0.3	592	0	0	6	0	53	4	37
Size 3	0.3	921	0	1	7	0	57	14	21
Size 4	0.2	1,834	0	2	11	0	45	21	21
Size 5	0.08	3,743	0	3	18	3	37	29	10

Source: Special tabulations of the 1982 Agricultural Census.

Table A6. Operator Labor Imputed as a Percentage of a Full Time Equivalent for Different Size Crop Farms.

	Size 1	Size 2	Size 3	Size 4	Size 5
	(Fraction)				
Cotton					
California	0.50	0.70	1.00	0.50	0.00
Mississippi	0.50	0.90	1.00	0.80	0.00
Texas	0.50	0.70	1.00	0.60	0.00
Wheat					
Kansas	0.50	0.70	1.00	0.40	0.00
Oklahoma	0.50	0.70	1.00	0.40	0.00
Texas	0.50	0.70	1.00	0.40	0.00
Corn					
Illinois	0.50	0.70	1.00	0.70	0.00
Iowa	0.50	0.70	1.00	0.70	0.00
Nebraska	0.50	0.70	1.00	0.50	0.00
Sorghum					
Kansas	0.50	0.70	1.00	0.50	0.00
Nebraska	0.50	0.70	1.00	0.50	0.00
Texas	0.50	0.70	1.00	0.50	0.00
Rice					
Arkansas	0.80	1.00	0.90	0.60	0.00
California	1.00	0.75	0.50	0.20	0.00
Louisiana	0.80	1.00	0.90	0.60	0.00
Texas	1.00	0.75	0.50	0.20	0.00

Source: Agricultural and Food Policy Center, Texas A&M University

Table A7. Imputed Management Fees for Different Farm Sizes, Based on Gross Revenues.[a]

Total Revenue	Management Fee
($1,000)	(%)
25-50	*
50-100	10
100-250	9
250-400	8
400-600	7
600-1,000	6
1,000+	5

Source: Farm Management Consultants (Whitson and Schott) and *Farm and Ranch Management Manual* prepared by Farm and Ranch Management Manual Committee for the American Society of Farm Managers and Rural Appraisers.

[a] Imputed management fees are intended to reflect the value of management time and services (both owner/operator and hired personnel) required for planning, control, implementation, and other activities associated with supervision of farms producing the corresponding annual gross revenues.

* For farms with annual gross revenue of $25,000 to $50,000, management services are conservatively valued at a flat $5,000 per year.

Table A8. Average Cost/Revenue by Farm Size and State for Cotton - 1982.

	California		Mississippi		Texas	
Size Class	Average Acreage	Cost/ Revenue	Average Acreage	Cost/ Revenue	Average Acreage	Cost/ Revenue
	(acres)	(fract.)	(acres)	(fract.)	(acres)	(fract.)
Size 1	190	0.99	103	1.24	217	1.64
Size 2	580	0.90	418	0.95	563	1.44
Size 3	1,091	0.79	777	0.90	967	1.26
Size 4	2,001	0.75	1,457	0.81	1,726	1.16
Size 5	7,981	0.71	3,300	0.76	3,794	0.89

Source: Special tabulations of the 1982 Agricultural Census.

Table A9. Average Cost/Revenue by Farm Size and State for Wheat - 1982.

	Kansas		Oklahoma		Texas	
Size Class	Average Acreage	Cost/ Revenue	Average Acreage	Cost/ Revenue	Average Acreage	Cost/ Revenue
	(acres)	(fract.)	(acres)	(fract.)	(acres)	(fract.)
Size 1	224	1.22	193	1.49	205	1.75
Size 2	592	1.15	506	1.36	534	1.28
Size 3	1,039	1.04	886	1.28	965	0.99
Size 4	1,924	0.84	1,631	1.06	1,747	1.06
Size 5	4,097	0.71	3,235	0.86	3,769	0.87

Source: Special tabulations of the 1982 Agricultural Census.

Table A10. Average Cost/Revenue by Farm Size and State for Corn - 1982.

	Illinois		Iowa		Nebraska	
Size Class	Average Acreage	Cost/ Revenue	Average Acreage	Cost/ Revenue	Average Acreage	Cost/ Revenue
	(acres)	(fract.)	(acres)	(fract.)	(acres)	(fract.)
Size 1	131	1.31	163	1.12	233	1.03
Size 2	388	1.20	405	1.02	489	1.01
Size 3	707	1.16	733	0.99	863	0.93
Size 4	1,319	1.05	1,374	0.93	1,644	0.72
Size 5	2,840	0.97	3,065	0.92	3,769	0.63

Source: Special tabulations of the 1982 Agricultural Census.

Table A11. Average Cost/Revenue by Farm Size and State for Sorghum - 1982.

	Kansas		Nebraska		Texas	
Size Class	Average Acreage	Cost/ Revenue	Average Acreage	Cost/ Revenue	Average Acreage	Cost/ Revenue
	(acres)	(fract.)	(acres)	(fract.)	(acres)	(fract.)
Size 1	244	1.22	217	1.36	192	1.63
Size 2	593	1.12	481	1.25	524	1.28
Size 3	1,035	1.07	842	1.10	928	1.06
Size 4	1,909	0.87	1,596	0.97	1,711	0.96
Size 5	3,992	0.68	3,506	0.65	3,874	0.91

Source: Special tabulations of the 1982 Agricultural Census.

Table A12. Average Cost/Revenue by Farm Size and State for Rice - 1982.

	Arkansas		California		Louisiana	
Size Class	Average Acreage	Cost/ Revenue	Average Acreage	Cost/ Revenue	Average Acreage	Cost/ Revenue
	(acres)	(fract.)	(acres)	(fract.)	(acres)	(fract.)
Size 1	138	1.19	163	1.00	139	1.43
Size 2	374	1.12	500	0.98	425	1.25
Size 3	698	1.02	957	0.94	766	1.11
Size 4	1,279	0.90	1,769	0.86	1,081	1.08
Size 5	2,910	0.88	6,225	0.76	3,674	0.96

Source: Special tabulations of the 1982 Agricultural Census.

Table A13. Farm Program Provisions and Price Expectations for 1988.

	Cotton	Wheat	Corn	Sorghum	Rice
Set Aside (%)	25	30	20	20	35
Target Price ($)	0.77/lb	4.29/bu	2.97/bu	2.82/bu	11.30/cwt
Loan Rate ($)	0.5225/lb	2.71/bu	2.17/bu	2.06/bu	6.50/cwt
Findley Loan ($)	NA	2.17/bu	1.74/bu	1.65/bu	NA
Farm Price ($)	0.418/lb	2.17/bu	1.74/bu	1.65/bu	5.20/cwt

Source: Agricultural and Food Policy Center, Texas A&M University.

Table A14. Farm Program Yield, Base Acreage, Program Participation, and Percent of Total Revenue Assumed for 1988.

Crop and State	Farm Program Yield	Base Acreage	Program Participation	Percent of Total Revenue
	(yield units/acre)	(million acres)	(%)	(%)
Cotton (dryland)				
California	1,096/lb	1.5	65	21.10
Mississippi	762/lb	1.4	95	12.64
Texas	408/lb	7.2	92	30.48
United States	586/lb	15.0	89	—
Wheat				
Kansas	35.5/bu	13.9	90	16.68
Oklahoma	32.6/bu	7.6	91	7.83
Texas	28.4/bu	7.2	82	6.39
United States	35.0/bu	89.6	83	—
Corn				
Illinois	114.6/bu	12.0	92	16.51
Iowa	113.2/bu	14.7	93	19.15
Nebraska	104.2/bu	8.3	94	10.42
United States	109.0/bu	83.3	88	—
Sorghum				
Kansas	57.8/bu	5.2	90	29.24
Nebraska	70.4/bu	2.1	95	14.89
Texas	53.4/bu	5.1	78	24.74
United States	55.7/bu	18.1	83	—
Rice				
Arkansas	42.26/cwt	1.71	93	39.93
California	67.51/cwt	0.64	92	19.10
Louisiana	40.19/cwt	0.75	95	15.29
United States	47.99/cwt	4.22	93	—

Source: Agricultural and Food Policy Center, Texas A&M University.