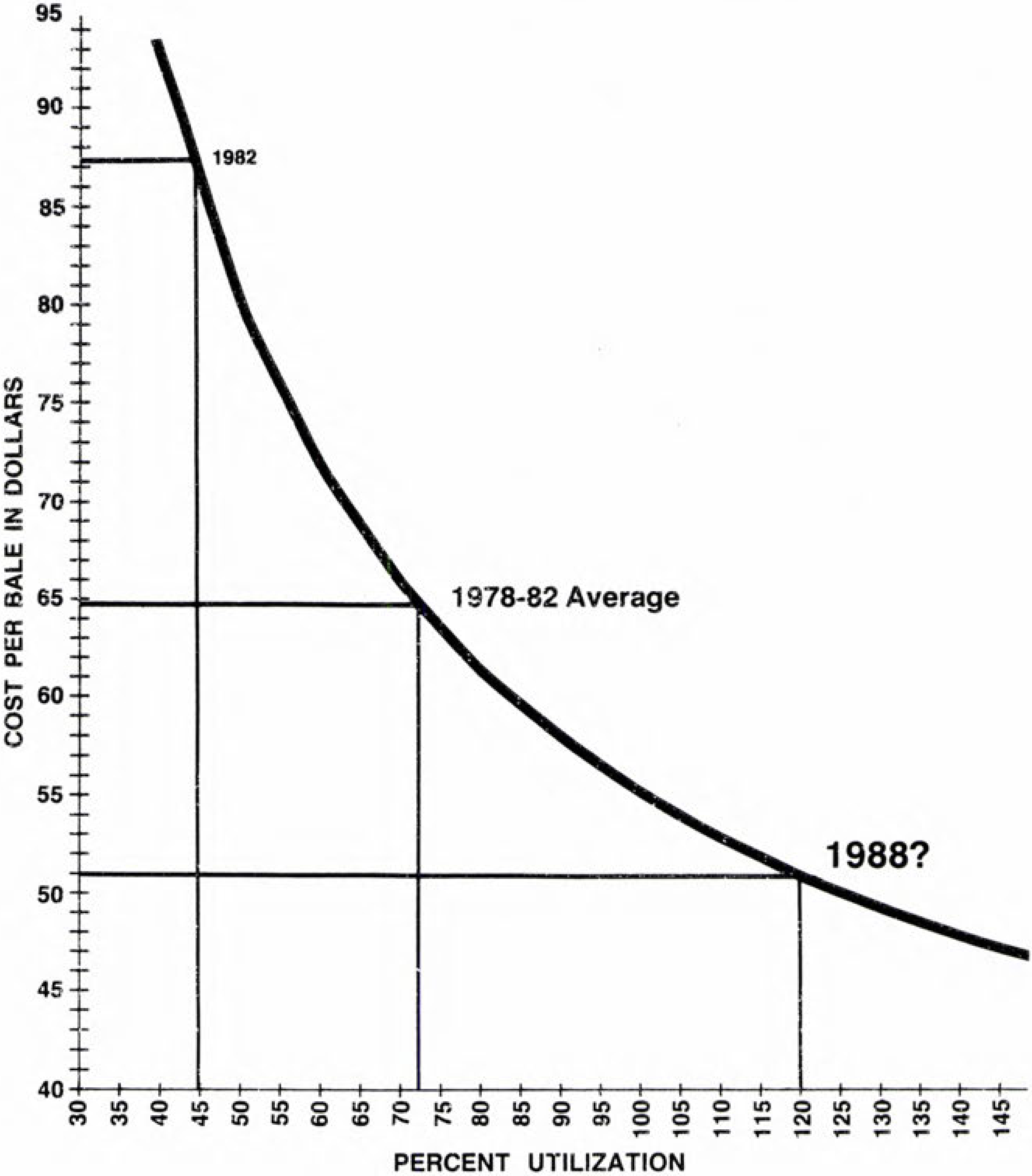
Agricultural Cooperative Service
U.S. Department of Agriculture
February 1984

Reducing Cooperative Ginning Costs In West Texas



PREFACE

This technical assistance report was requested by American Cotton Growers, Farmers Cooperative Compress, Plains Cotton Cooperative Association, Plains Cooperative Oil Mill, Plainview Cooperative Compress, and the Texas Bank for Cooperatives. Its purpose was to examine why cooperative ginning costs in West Texas were so high; and to suggest ways they might be reduced.

Agricultural Cooperative Service will treat this report confidentially, but the requesting organizations are free to use the contents to their best advantage.

Acknowledgements

Many people contributed to and provided vital information for this study. Cooperative ginners in West Texas answered numerous detailed questions about their operations. Staff from Texas A&M and Texas Tech University contributed sound advice in several areas. Management and staff personnel from the regional cooperatives and the Texas Bank for Cooperatives gave freely of their time and talents to all phases of the study. In particular, I want to acknowledge the major contribution of Dale Shaw, PCCA, whose effort and creativity undoubtedly improved the quality and reliability of this report.

Jim Haskell
Agricultural Cooperative Service
U.S. Department of Agriculture

CONTENTS

RECOMMENDATIONS

1. <u>Begin Working Toward an Improved Structure</u>. All cooperative gins in West Texas should immediately initiate plans to examine in detail (a) how to reduce total ginning capacity and (b) how to increase utilization of the remaining capacity. Substantial cost savings would result. Cotton producers must be the catalysts for change since they would be the recipients of the cost savings.

2. <u>Develop Ways to Lengthen the Ginning Season by Increasing Volume</u>. Concurrent with, or in addition to Recommendation #1, cooperative gins should examine ways to purposely lengthen the ginning season. Further substantial cost savings would result. Implementation of this recommendation may require changes in the way cotton is currently marketed in West Texas.

   It's important to recognize that attracting additional volume into the cooperative system is essential and should be a continuing consideration whether or not recommendations 1 and/or 2 is implemented. So long as total cooperative capacity is not increased, additional volume will increase utilization and thereby lower costs.

3. <u>Coordinate Gin-Related Regional Programs</u>. All West Texas regional cotton cooperatives and the Texas Bank for Cooperatives should develop joint coordinated programs for assisting cooperative gins. These programs should include, but not be limited to, member education, joint cooperative advertising and promotion, financial management, and cost planning. In addition, the regional organizations should make available sufficient staff to provide the economic, engineering, and financial expertise needed by cooperative gins in the restructuring effort.

INTRODUCTION

In late spring 1983, the regional cotton cooperatives in West Texas and the Texas Bank for Cooperatives requested the Agricultural Cooperative Service to coordinate a study designed to show how costs of handling and ginning cotton might be reduced. The requesting organizations included American Cotton Growers (ACG), Farmers Cooperative Compress (FCC), Plains Cotton Cooperative Association (PCCA), Plains Cooperative Oil Mill (PCOM), and Plainview Cooperative Compress (PCC).

Regional concerns centered on (1) high and rising costs of ginning cotton, (2) substantial losses suffered by cooperative gins in recent years and the almost certain prospect of another bad year for crop year 1983, (3) the resulting erosion of producer equity in cooperative gins and the cost/volume implications of those losses at all levels of the cooperative system, and (4) an uncertain outlook as to the future of continued cooperative effectiveness in meeting the needs of West Texas cotton producers.

To inform cotton producers and local cooperative leadership about the impending study, a series of meetings were held at various West Texas locations in June and July. All requesting organizations participated in the kickoff sessions. Several important points as well as study guidelines and parameters emerged from these meetings. Among them were:

1. The study should include both the High Plains and Rolling Plains cotton producing areas. South Texas and Oklahoma areas were to be excluded from this particular study.

2. The study should be of a long run (5 years) nature with an overriding objective of measuring potential cost savings for cotton producers of structural, organizational, or other improvements in the cooperative ginning system. It should not analyze existing gins or gin communities but instead consider the cooperative segment of West Texas in the aggregate.

3. If, after the study is complete, the cooperative ginning sector desires to implement results pertaining to them, then a number of "phase two" analyses need be conducted. These would take a more indepth look at individual gins and groups of gins in a given market area to determine optimal numbers, sizes, and utilization of gin facilities in those areas. The phase two studies would need to consider the hard decisions of increasing or decreasing capacity, exact gin sizes and locations, and the like.

THE PROBLEM

The basic problem confronting West Texas cotton producers varies depending on who defines it. A banker might say it's one of getting his money back. A ginner might name the power companies. A regional manager might blame the local gins for not delivering all their lint, or seed, to his organization. And all might put varying degrees of blame on the government. In reality, however, the problem is very easy to define by asking virtually any cotton producer. The difference between what he gets for his cotton and what it costs him to gin, transport, and market it, is very small; and may be declining.

This study focuses primarily on the costs of ginning and how those costs might be reduced. Ginning constitutes the largest single expense item in moving cotton from the farm to the mill. Laferney and Glade (7) estimated that ginning costs account for approximately 50 percent of the total off-farm costs between the producer and the mill customer. Shaw (8) estimates that labor related costs account for nearly 40 percent of ginning costs and energy accounts for another 10 percent. With recent changes in power rate structures and the introduction of monthly demand charges, energy costs may increase as a percentage of total ginning costs.

Most cotton industry studies of ginning costs cite underutilization of plant capacity as the major cause of high ginning costs. Ethridge and Branson (4) estimated that the U.S. ginning industry utilized only 40 percent of its existing capacity during 1974-1977. Fuller and Vastine (5) concluded that excess capacity or underutilization of plant capacity existed even during the peak harvesting season. A summary of estimates of capacity utilization for West Texas is:

Year	Percent of Ginning Capacity Utilized
1965-66	1/ 65
1966-67	1/ 38
1967-68	1/ 33
1968-69	1/ 42
1969-70	1/ 39
1970-71	1/ 48
1971-72	1/ 32
1972-73	1/ 54
1973-74	1/ 74
1974-75	2/ 32
1975-76	2/ 29
1976-77	2/ 39
1977-78	NA
1978-79	3/ 55
1979-80	3/ 75
1980-81	3/ 46
1981-82	3/ 84
1982-83	3/ 36

1/ Source: Economic Research Service, USDA.
2/ Source: Reference (4).
3/ Source: Estimates derived from this study using procedures comparable to those used by USDA and Texas A&M.

A major reason why the ginning industry operates with large excess capacity is to satisfy farmers' demands to have their cotton ginned as soon as possible after they remove it from the stalk. Thus, numbers and sizes of gin plants have traditionally been dictated by the criterion of matching ginning rates and harvest rate during a 2-3 week peak harvest period. Even in years of low production this 2-3 week harvest peak exists and gins have tended to determine their capacity "needs" on this basis. The results are that in most crop years seasonal utilization is low and ginning costs excessively high.

Most studies emphasize that excess capacity is in large part caused by the short (maximum of 14 weeks) ginning season with conventional trailer handling. In the study by Cleveland and Blakely (1), a 32-week ginning season with seed cotton storage on the farm was found to have lower cost than a 14-week season with baled lint storage at the warehouse because of a higher utilization of warehouse plant capacity. Per bale costs were also found to be less for gins of larger size with higher rates of utilization. Ethridge and Branson (4) discussed how module handling and ginning with the use of an automatic module feeder can increase processing efficiency by 15 percent and enhance the feasibility of lengthening the ginning season. Consequently, per bale ginning costs could decrease as plant utilization (and effective size) increases. They estimated that as seasonal ginning volumes increased above breakeven levels for different sizes of gins, per bale costs were significantly lower with the use of this technology.

Ethridge, Shaw, and Robinson (3) analyzed the effects of different module handling systems on cost of ginning stripper harvested cotton. The alternatives examined included two seed cotton handling systems (trailers and modules) and three gin feeding systems (suction feeding, automated module feeding using suction, and automated module feeding using blowers). Using the computer simulation model, GINMODEL (9), on five different plant sizes, results indicated that with plant utilization greater than 50 percent module handling systems lowered the ginning costs below that associated with trailer handling due to a large increase in the gin efficiency rate. Among large gin plants with above 70 percent capacity utilization, the module handling system with blower module feeding was the least cost method assuming that cotton can be ginned totally from modules. With a dual system accommodating both modules and trailers, automatic suction feeding had a lower cost per bale, but only for large gin plants operating at near full capacity utilization. An important observation in this study was that gins can lower their ginning costs and absorb that cost of module assembly only if they can obtain a sufficient increase in volume.

The moduling system has become widely accepted, particularly in the southwestern and western regions of the United States (table 1). Producers and gins in the High and Rolling Plains have adopted modules at a faster rate than Texas as a whole. The gin survey made for this study indicated that cooperative gins processed 67 percent of their volume from modules for the 1982 crop and expect to gin 81 percent from modules by 1988.

Table 1. Percent of cotton ginned from modules, by season, by region.

	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
					Percent				
United States	2	2	7	13	18	26	32	39	36
Southeast 1/	1	3	3	2	1	1	0	2	6
Midsouth 2/	2	1	2	5	5	3	2	5	9
Southwest 3/	3	5	12	18	23	34	41	5/ 57	5/ 54
West 4/	1	0	6	15	24	34	44	48	51

Source: Reference (11)

1/ Alabama, Georgia, North Carolina, South Carolina
2/ Arkansas, Louisiana, Mississippi, Missouri, Tennessee
3/ Oklahoma, Texas
4/ Arizona, California, New Mexico
5/ For Texas, percentage of cotton ginned from modules was 59 percent in 1981/82 and 57 percent in 1982/83.

When cotton gins in West Texas were first built, cotton was transported to the gin on four-wheel trailers. Since these trailers could not be pulled at high speeds for long distances, gins were built close together usually in small communities. Improved seed cotton storage and transportation methods through the use of modules is now making the use of trailers obsolete. It also makes it possible to haul seed cotton long distances which lessens the need to have so many gins located so close together. In spite of this technological breakthrough, however, community pride in the local cooperative gin and reluctance to close them or "throw in with the neighboring co-op" has kept the number of gins high--and likewise their costs.

To illustrate, the cost of building a new modern gin plant today ranges from $2 to $4 million, compared with $150,000 to $200,000 in the mid-1950's. Part of this is due to inflation, but a significant portion of the cost is because of higher capacity gins with improved cleaning capability for stripper harvested cotton and universal density presses. In the 1950's a breakeven point for most gins was considered to be 2,500 bales. Many ginners think 7,000-12,000 bales are needed to break even today. Many gins in West Texas are below the breakeven in most years. This has resulted in signficantly higher costs than otherwise might be achieved with fewer gins that utilize a higher percentage of their seasonal capacity.

Many of the underutilized cooperative gins in West Texas are experiencing severe financial difficulties. The combination of short crops, competing crops, low utilization of capacity, and competition from other gins are causing not only bottom line losses but also loss of producer equity in their cooperative gins.

An example of the potentially disastrous loss of producer equity in cooperative gins is provided by a selected sample of approximately half of the co-op gins in West Texas. Gins in this sample are roughly representative of all West Texas cooperative gins in terms of physical efficiency and financial stability. At the close of fiscal 1982 (results of the 1981 crop year) these gins each had, on average, about $830,000 of producer equity. By fiscal 1983 (1982 crop), the average equity position had declined to $680,000, a drop of nearly 20 percent in 1 year. Some gins suffered equity losses in excess of 40 percent in that year. Preliminary estimates for the PIK and weather shortened 1983 crop suggest an even larger equity drain once this year's results are in. Generalized to the entire cooperative ginning industry in West Texas, this translates into a producer equity loss of some $20 million in 1 year and perhaps up to $50 million in only 2 years. The central question is both scary and tragic -- How long can this go on?

Unless something is done soon to halt financial losses, many cooperative gins likely will not be able to continue much longer. Several have permanently closed their doors since this study began. Others will not be around to gin the 1984 crop.

If local cooperative gins are forced to close, it adversely affects the volume and bottom line results of the cooperative family all the way through the regional cooperatives. While some members will patronize other cooperative gins when a local closes, other growers may choose to do business with a noncooperative gin where it is more convenient for them to do so. Since volume is a key element of success at all levels of the cooperative system, loss of any volume at the gin level adversely impacts the costs, margins, and financial stability of the cottonseed processing, compress, and marketing organizations. And since cotton producers own and control the regional cooperatives as well as their local gins, they are the ultimate victims of a system whose costs become prohibitively high as volume declines.

METHODS AND PROCEDURES

The general procedure used in this study was to estimate parameters associated with future production, ginning costs, and seed cotton transportation. In brief the parameters are:

Production	- An estimate of "average" production in 1988 - Deviations from this average to illustrate large and small crop years - Cooperative share of production at the ginning level.
Ginning	- Current costs of ginning the 1988 crop under the current structure, for all three production scenarios. - Current costs of ginning the 1988 crop under an improved structure with greater capacity utilization, all production scenarios. - Current costs of ginning the 1988 crop, improved structure, greater capacity utilization, and moderate extension of the ginning season, all production scenarios. - Current costs for above situations with increased cooperative share of total production.
Module Transportation	- Current costs of hauling modules under the current structure, all production scenarios - Current costs of hauling modules, improved structure, all production scenarios.

Detailed descriptions of the methodology utilized in estimating these parameters follow a brief discussion of data and other information sources.

Data Sources

Information required for this study came from many sources. The most important were:

(1) Cooperative Gin Survey. A questionnaire was mailed to some 120 cooperative gins in the study area. Responses were received from approximately 90 gins and a telephone followup obtained information from several more. Basic areas covered in the survey included:

- Irrigated and dryland cotton acreage and trends
- Estimates of production changes by 1988
- Average and maximum gin capacity
- 5-year data on ginning volumes
- Seed cotton transportation modes and trends
- Costs of seed cotton transportation
- Size and density of trade area.

Information obtained from this survey was used in estimating production, ginning capacity, capacity utilization, and module hauling distances.

(2) Texas Bank for Cooperatives. Until 1980, the Texas Bank had conducted an annual gin cost study of those cooperative gins in Texas financed by them. At the request of the study team, the Bank agreed to update this information for crop years 1980, 1981 and 1982. As will be illustrated later, this information provided valuable input into determining current gin utilization levels and costs of ginning under the various structural parameters.

(3) USDA. Various USDA publications and data sources were used throughout the study. In particular, information on historical county data on cotton production, irrigated and dryland acreages, and yields, and various gin industry studies provided substantial useful input.

(4) Individual Expertise. Many people, in addition to the cooperative ginners mentioned above, provided vital information for this study. They included management and staff personnel from the regionals and the Texas Bank and individuals from Texas A&M and Texas Tech University.

Production Estimates

Estimating cotton production several years in advance is obviously subject to considerable error. This is true for several reasons. Most importantly, two critical variables impacting production--government programs and the weather--are unknown. Also impossible to project are key variables such as cotton prices, prices of competing crops and potentially competing crops, and the extent of irrigation (relatively high cotton prices would likely increase irrigation of cotton in some areas, even with high pumping costs).

It's also difficult to base future production estimates on other "authoritative" studies of that subject. To illustrate, they range from very optimistic (2):

> "All subregions of West Texas will experience an increase of dryland and irrigated cotton production due to improved cultural, genetic, and technological practices."

To very pessimistic (12):

> "The projection . . . was that wheat production would increase by 44 percent, and grain sorghum and cotton would decline by 70 percent and 33 percent, respectively."

To very confusing (6):

> "In general, wheat, corn, and alfalfa were the first irrigated crops displaced with rising natural gas prices. Grain sorghum, cotton, and sunflowers tended to remain in production with relatively high pumping costs, but at a reduced irrigation level, in most subregions."

In most cases, however, there is general agreement on production increases or decreases in the following situations:

(1) In those areas heavily irrigated now for corn, soybeans, vegetables and other crops, there will probably be more cotton in 1988. This would include areas north and northwest of Lubbock.

(2) In those areas irrigated now for primarily cotton production, there will likely be a decline in cotton production by 1988 due to less irrigation. The central portions of the High Plains would fit this category.

(3) In those areas predominantly dryland now, such as the Rolling Plains and certain sandy areas of the High Plains, there probably won't be much change in cotton production by 1988.

The basis for estimating 1988 production was the latest 5-year average production in the study area. Sixty-three counties in the High and Rolling Plains constitute the study area for this analysis. Production in each county for 1978 through 1982 and the 5-year average production by county is shown in table 2. Total production ranged from 1,913,950 bales in crop year 1982 to 4,598,300 bales in 1981; and the 5-year average was 3,140,164 bales.

The next step was to adjust 5-year average production to the 1988 crop year. This was accomplished primarily through responses from the cooperative gin survey. Each gin manager was asked for his or her "best guess" as to what will happen to total production, in bales, in their gin trade area by 1988, as measured against the 1978-82 5-year average. Answers were given in form of no change, plus x percent, or minus x percent. Responses were aggregated for each county based on county location of the gins, and an average adjustment value was calculated on a county-by-county basis. Questionable responses were verified by telephone. Also, for those counties not containing a co-op gin, or those whose co-op gins did not respond to the survey, a zero change in production was assumed for that county. Each county's plus or minus adjustment factor was then multiplied by the 5-year average production for that county to arrive at the average production estimate for the study area for 1988.

Table 2. Cotton Production in 63-County Study Area, By Crop Year and 5-Year Average

County	Crop Year					5-Year
	1978	1979	1980	1981	1982	Average[1/]
			Bales			
Andrews	6,700	17,100	7,300	32,500	13,100	15,340
Armstrong	2,100	2,600	1,700	1,800	650	1,770
Bailey	70,300	91,600	43,000	98,100	8,600	62,320
Borden	5,300	26,700	6,100	22,800	13,900	14,960
Brisco	37,500	25,300	31,300	46,300	7,400	29,560
Carson	NA	NA	30	NA	NA	30
Castro	42,500	39,800	66,900	95,600	26,000	54,160
Childress	26,300	53,600	13,100	36,800	31,800	32,320
Cochran	77,800	138,300	43,100	103,300	26,300	77,760
Coke	280	NA	110	NA	NA	195
Collingsworth	31,100	57,100	25,400	45,800	20,000	35,880
Concho	7,400	13,400	7,500	19,000	17,500	12,960
Cottle	37,600	64,000	15,000	37,500	21,200	35,060
Crane	0	0	0	0	0	0
Crosby	142,000	183,700	128,900	175,800	47,600	135,600
Dawson	92,000	243,800	88,000	270,600	153,400	169,560
Deaf Smith	2,100	3,200	6,700	9,700	3,200	4,980
Dickins	20,700	40,800	13,400	33,800	14,000	24,540
Donley	21,900	30,600	21,000	23,000	11,800	21,660
Ector	NA	NA	NA	NA	NA	NA
Fisher	36,400	93,700	26,300	99,000	52,500	61,580
Floyd	164,900	94,400	173,800	181,500	22,000	127,320
Foard	10,700	18,200	4,200	13,500	6,500	10,620

Table 2. Cotton Production in 63-County Study Area,
By Crop Year and 5-Year Average (Continued)

County	Crop Year					5-Year Average1/
	1978	1979	1980	1981	1982	
			Bales			
Gaines	172,000	228,700	164,000	339,000	163,400	213,420
Garza	20,200	54,400	11,100	38,200	22,300	29,240
Glasscock	31,000	64,700	23,000	68,500	45,000	46,440
Gray	1,350	1,100	900	1,200	300	970
Hale	164,800	138,400	243,000	255,800	74,600	175,320
Hall	54,300	83,900	39,600	51,600	47,000	55,280
Hardeman	19,600	28,800	9,000	20,300	16,300	18,800
Haskell	62,300	142,100	29,400	102,900	42,800	75,900
Hockley	142,000	125,500	165,100	241,000	48,800	144,480
Howard	34,000	113,300	23,200	108,800	62,600	68,380
Irion	260	550	350	NA	NA	387
Jones	60,000	115,200	22,900	85,000	63,700	69,360
Kent	10,200	19,300	3,800	18,400	7,600	11,860
King	6,400	9,900	3,000	7,200	2,500	5,800
Knox	37,400	59,000	14,900	39,200	19,000	33,900
Lamb	164,000	121,400	184,200	213,500	68,000	150,220
Loving	0	0	0	0	0	0
Lubbock	228,000	240,800	213,200	275,400	78,800	207,240
Lynn	124,000	222,000	89,300	228,300	69,100	146,540
Martin	50,500	159,400	34,400	154,300	87,600	97,240
Midland	18,200	36,000	11,000	35,600	24,000	24,960
Mitchell	38,900	91,000	18,200	58,700	27,700	46,900
Motley	20,000	35,800	12,800	26,000	13,700	21,660

Table 2. Cotton Production in 63-County Study Area, By Crop Year and 5-Year Average (Continued)

County	Crop Year 1978	1979	1980	1981	1982	5-Year Average 1/
			Bales			
Nolan	25,700	60,100	10,100	49,600	26,400	34,380
Parmer	43,700	42,800	64,600	87,600	23,000	52,340
Randall	580	830	260	1,100	NA	692
Reagan	14,000	21,500	11,400	31,700	15,800	18,880
Runnels	25,900	36,800	19,000	45,000	26,900	30,720
Scurry	32,000	82,800	20,200	66,300	38,000	47,860
Sterling	0	0	0	0	0	0
Stonewall	11,000	17,900	3,900	16,200	7,400	11,280
Swisher	40,100	66,000	72,600	105,700	30,600	63,000
Taylor	7,000	15,400	6,400	13,500	9,300	10,320
Terry	132,000	197,400	120,300	270,600	129,500	169,960
Tom Green	39,300	43,800	30,200	66,500	45,800	45,120
Upton	5,300	8,700	4,100	13,300	8,200	7,920
Ward	NA	NA	NA	NA	NA	NA
Wheeler	7,200	12,400	5,000	11,200	3,600	7,880
Winkler	0	0	0	0	0	0
Yoakum	40,500	81,300	43,000	104,700	67,200	67,340
Total	2,719,270	4,016,880	2,450,250	4,598,300	1,913,950	3,140,164

1/ The 5-year average value for counties with less than 5 years of production data is the average for the number of years with data.

Note: NA indicates data not available but with some production taking place. 0 indicates no known cotton production in the county.

Recognizing that there is no "average" production year because of the unknowns mentioned earlier, good year and short year production scenarios were estimated also. Overall study area production during the 5-year period 1978-82 varied as much as 39 percent below the average to 46 percent above. Therefore, it is important (particularly in looking at ginning costs) to consider the impacts of a good or bad year on the cooperative cost structure. For purposes of this study, production levels of + 40 percent and - 40 percent from the estimated 1988 average production are considered. It is recognized that year to year variation for individual counties and especially a gins' trade area often exceed the 40 percent average values.

Initially, the plan was to segment each county in the study area into nine grids and then allocate county production, under each production scenario, to each grid. Once cooperative share of production was determined and also assigned to grids, it was thought the task of defining appropriate cooperative gin areas based on production density would be relatively easy. However, the study team finally determined that assignment of production and co-op volume on that basis was impractical for this particular study's purposes. Not only is it difficult to determine precisely from which grid co-op volume is to originate, but also that technique would put the study team in a position of determining gin boundaries, and therefore gin locations. Obviously, this would violate guidelines set forth earlier as to the objectives and limitations of this study.

However, in any phase two analysis conducted subsequent to this study, it may be appropriate to consider the grid approach in helping to determine the optimum size and location of cooperative gin facilities. Once individual gins in given gin communities decide to actively pursue the goal of minimizing costs of seed cotton transportation and ginning, this approach could prove worthwhile. Though not considered further in this study, the reader might be interested in Figure 1 which shows a first attempt at allocating 5-year average production to grids in the study area, based on Texas Extension personnel's estimates of production within counties.

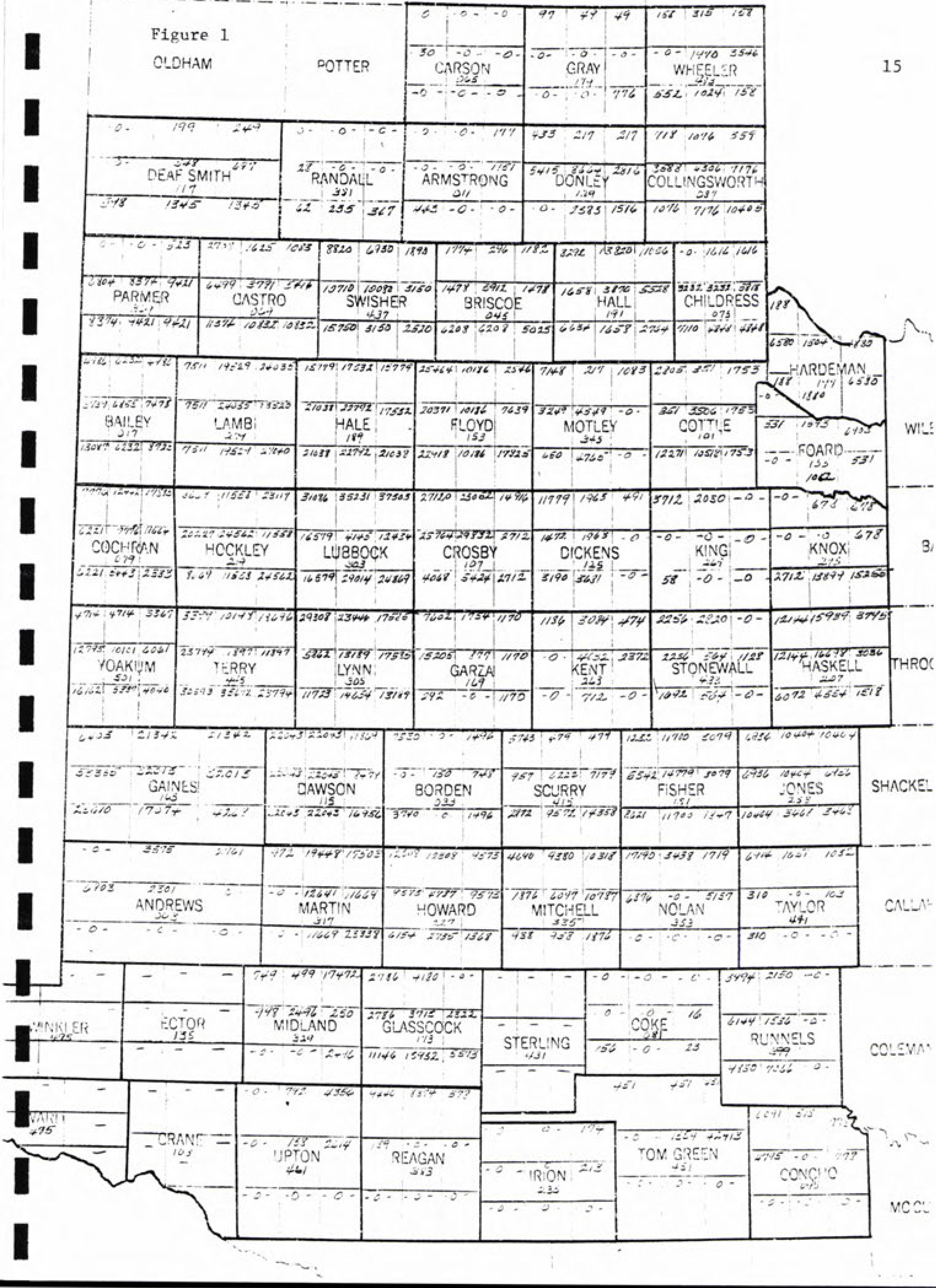
Ginning Cost Estimates

Ginning cost estimates for this study are based on statistical analysis of 3 years of accounting data developed from audit reports for 77 cooperative gins in West Texas. Functional relationships were estimated by econometric methods. 1/ Results obtained are useful for predicting behavior of ginning costs under a variety of circumstances.

Due to widespread variation in accounting methods for interest and depreciation costs, "standardized" figures were calculated and used in the analysis. Interest expense was obtained by charging 11.5 percent on one-half the report initial investment cost of building machinery and

1/ The statistical procedure used relies heavily on the methodology in Reference (4).

Figure 1


OLDHAM
POTTER
CARSON
GRAY
WHEELER
DEAF SMITH
RANDALL
ARMSTRONG
DONLEY
COLLINGSWORTH
PARMER
CASTRO
SWISHER
BRISCOE
HALL
CHILDRESS
HARDEMAN
BAILEY
LAMB
HALE
FLOYD
MOTLEY
COTTLE
FOARD
WIL
COCHRAN
HOCKLEY
LUBBOCK
CROSBY
DICKENS
KING
KNOX
B
YOAKUM
TERRY
LYNN
GARZA
KENT
STONEWALL
HASKELL
THRO
GAINES
DAWSON
BORDEN
SCURRY
FISHER
JONES
SHACKEL
ANDREWS
MARTIN
HOWARD
MITCHELL
NOLAN
TAYLOR
CALLA
ECTOR
MIDLAND
GLASSCOCK
STERLING
COKE
RUNNELS
COLEMA
CRANE
UPTON
REAGAN
IRION
TOM GREEN
CONCHO
MC CU

equipment. Straight line depreciation using the initial investment cost of capital items was based on a 20 year life for buildings, 15 years for gin machinery and equipment, 5 years for transportation equipment, and 7 years for office buildings, furnishings and equipment regardless of age or former method of depreciation. 2/ Bagging and ties are treated as a revenue item and not included in ginning cost. Much of cost associated with ownership and operation of module hauling trucks are included in various cost items such as labor, repairs, taxes, and insurance.

Ordinary least squares multiple linear regression techniques are used to measure the association of per bale ginning cost with (a) utilization of plant capacity and (b) plant size or capacity measured in bales per hour. Representative cost schedules are derived from these results. All estimated coefficients have expected signs. The regression estimation on average ginning cost is:

	Constant	1/Y	S	R^2
Average Cost Per Bale (AC)	38.11 (10.38)	2,516.97 (51.86)	-.476 (-1.98)	0.92

Numbers in parentheses below the coefficients are t-values, indicating all coefficients are statistically significant at no less than the 95 percent confidence level. The R^2 of 0.92 indicates a very strong association of cost per bale (AC) with the inverse of plant utilization (1/Y) and plant size (S) variables. These values indicate that 92 percent of the variation in ginning cost can be explained by plant utilization levels and size.

With regard to average cost behavior, regression results lead to the following general conclusions: (1) The strong positive relations of average cost per bale (AC) with the inverse of percent utilization of seasonal capacity (1/Y) is apparent, both in magnitude and t-value of the coefficient. (2) For a given capacity utilization level (Y) ginning cost (AC) decreases as plant size (S) increases, the decrease is at a rate of $.476 per bale for each 1 bale per hour increase in gin size (S). The low t-value indicates a rather weak, but significant association between costs per bale and plant size. It must be noted, however, that increasing S without changing Y would require increasing V, the ginning volume. For a given ginning volume (V), it is to be expected that average costs AC will <u>increase</u> as gin size (S) increases.

2/ Source: Reference (10).

The size of a gin plant is typically expressed in terms of bales-per-hour that the gin is engineered to process. 3/ If a gin is properly engineered, supporting machinery is sufficient to accommodate the output rate of its gin stands. However, for this study, gin managers were asked for their average bale-per-hour ginning rate over a period of time, say a week during the middle of the ginning season. These values were used as the average hourly ginning capacity for each gin plant. For cooperative gin firms with more than one gin plant, the capacities of each plant were added together to obtain the average ginning capacity for each of the 142 cooperative firms included in the study area.

This study assumes a "base or goal" processing hours of 1,000 per season. Provided seed cotton is available, gins can operate 1,000 hours or more over a 3-4 month season with little or no seed cotton storage.

The base seasonal capacity for a gin firm is the average capacity times 1,000 hours, i.e. a 12 bale per hour capacity gin has a base seasonal capacity of 12,000 bales.

Utilization of seasonal capacity is determined by the ratio of actual bales ginned in a season to computed seasonal capacity. Thus, if a 12 bale per hour gin processed 7,000 bales, then utilization of seasonal capacity is 7,000 divided by 12,000 = 0.58 or 58 percent utilization.

Summing average hourly capacities for all cooperative gin firms within the study area gives an estimate of 1,943 bales per hour or 1,943,000 bales per season at 100 percent or full utilization. This seasonal capacity related to bales ginned at cooperative gins during the past 5 crop years follows.

Year	1978	1979	1980	1981	1982	Average (78-82)
Coop B/C Ginned	1,299,910	1,782,083	1,093,545	1,985,807	854,128	1,403,095
Pct. capacity utilization	66.9	91.7	56.3	102.2	44.0	72.2

Only in high volume production years does the average cooperative gin approach near full season utilization of capacity and averaged only 72.2 percent utilization over the past 5 years. The short 1983 crop will also result in low capacity utilization.

3/ Reference (4) page 5.

The next step was to determine the size of gin(s) that could both represent existing gin size distribution in West Texas and also serve as "representative" gins for analyzing current costs of ginning the 1988 crop. Surprisingly, the 142 cooperative gin firms in the study area fell into five size categories of approximately equal proportions. Distribution of the 142 cooperative gins based on average (bales per hour) capacity is:

Bales Per Hour	Gins	Total Bales Per/Hour Capacity	Avg. Bales Per/Hour Capacity	Representive Gins Bale/Hour Capacity
8 and less	29	214	7.4	8.0
9 - 10	34	329	9.7	10.0
11 - 12	27	321	11.9	12.0
13 - 18	25	388	15.5	16.0
19 and greater	27	691	25.6	26.0
Total or average	142	1,943	13.7	14.4

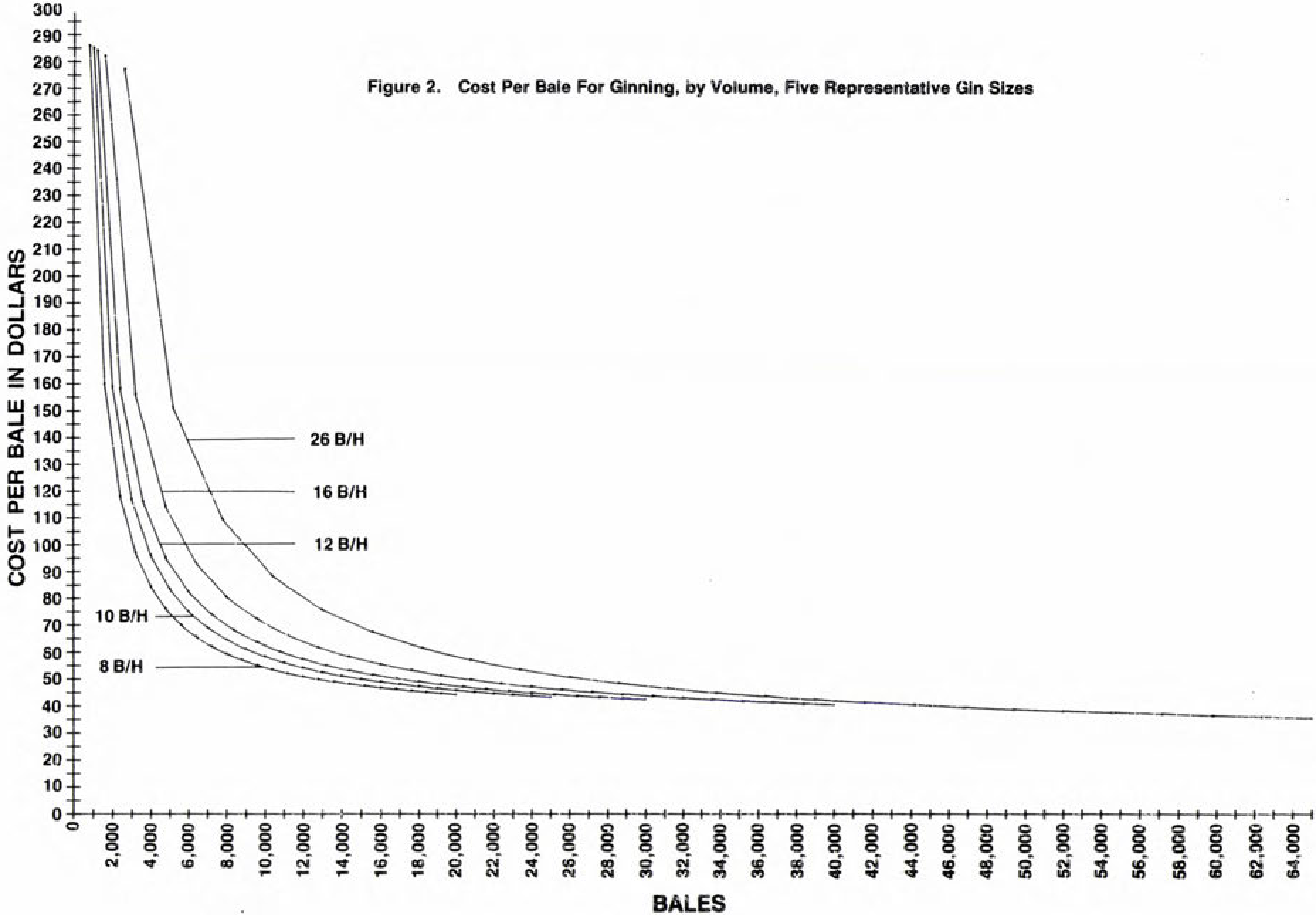
The five representative gin sizes are used throughout the rest of this study to represent the structure of the cooperative gin industry. Using these five gin sizes with the regression equation allows development of ginning costs over a range of volume ginned and/or percent utilization levels for each representative gin, (figures 2 and 3) and weighted average cost per bale for a composite of the five gin sizes (figure 4). The composite values represent a "vertical slice" of all cooperative gins. Multiple or sets of this "vertical slice" are used for estimating ginning costs during the 1978-1982 crop years using average bales ginned and derived utilization levels. The vertical slice procedure was similarly used to estimate costs under various capacity, seasonal length, and volume assumptions.

Module Transportation Cost Estimates

As pointed out in the previous section, most costs associated with module transportation are included in ginning cost estimates. For several reasons, however, it is desirable to determine what those costs really are. Cooperative gins who charge producers for this service need to have some idea of what the service costs. Likewise, ginners need to know the cost advantages or disadvantages of increasing volume via enlarging their trade area through greater use of module handling equipment. Finally, it is useful to know how module transportation costs per bale vary with high versus low production years.

It was necessary to make many assumptions concerning the module handling equipment, driver compensation, operating time, etc., to arrive at reasonable cost estimates. Assumptions relating to the truck driver, operational time and seed cotton include:

Figure 2. Cost Per Bale For Ginning, by Volume, Five Representative Gin Sizes



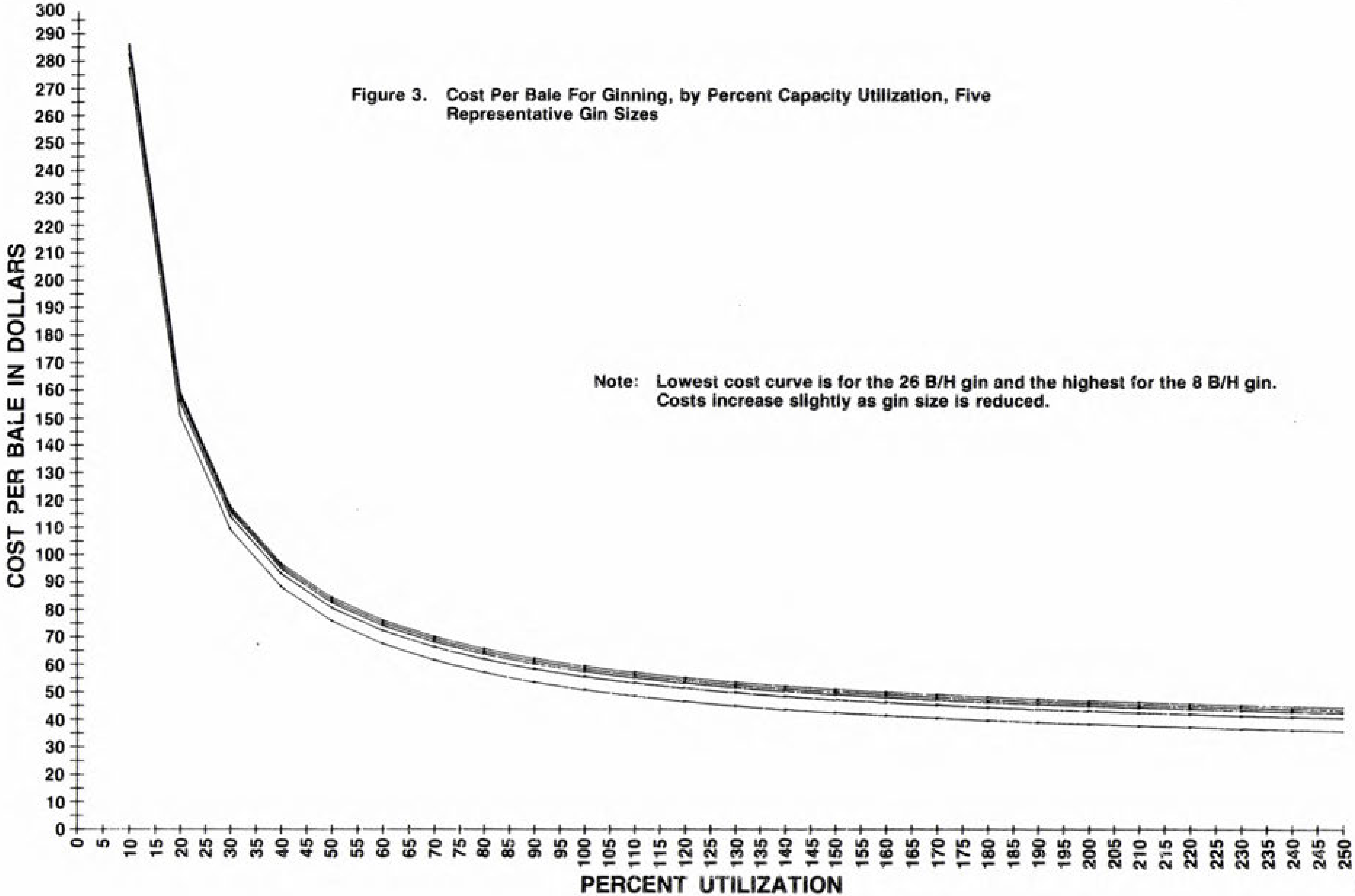


Figure 3. Cost Per Bale For Ginning, by Percent Capacity Utilization, Five Representative Gin Sizes

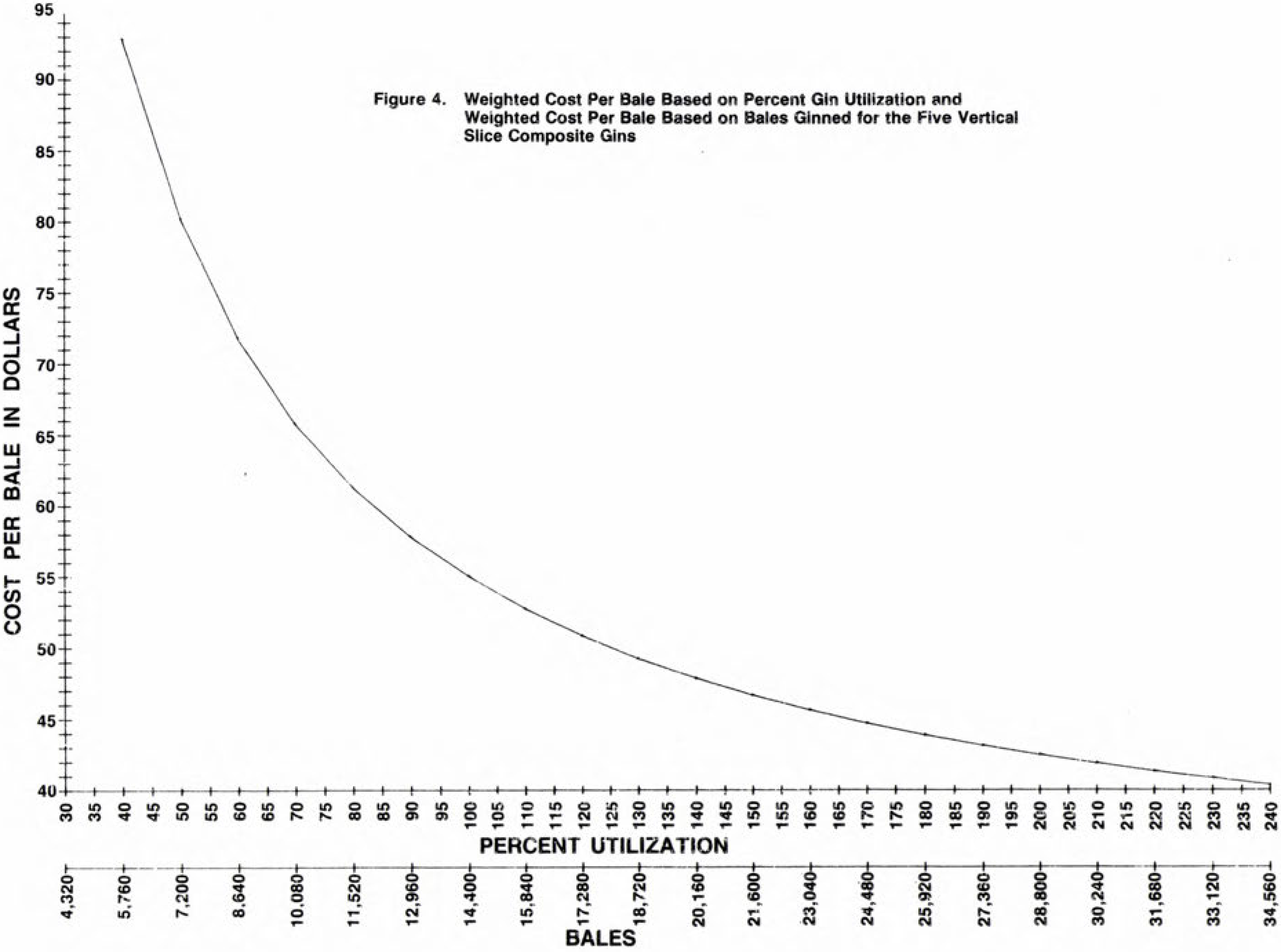


Figure 4. Weighted Cost Per Bale Based on Percent Gin Utilization and Weighted Cost Per Bale Based on Bales Ginned for the Five Vertical Slice Composite Gins

1. Truck driver works 12 hours per day, 7 days per week at $4.00 per hour plus overtime over 40 hours per week.

2. Driver fringe benefit costs are 2.7 percent for unemployment insurance, 8 percent for workman's compensation insurance and 6.7 percent for Social Security for a total of 17.4 percent of wages paid.

3. The truck speed averages 25 mph for the first 2 miles, 40 mph for the next 3 miles and 55 mph for all travel over 5 miles.

4. The time from when the truck enters the field until the module is loaded is 7 minutes.

5. The time required to weigh the module and unload on the gin yard is 8 minutes.

6. Fuel consumption is 6 miles per gallon and fuel cost is $1.00 per gallon.

7. Maintenance and repair costs are 40¢ per mile.

8. The average weight of material required per bale of lint is 2,300 pounds.

9. The average weight per module is 20,000 pounds.

Assumptions relating to the truck itself are:

Truck value (new)	$100,000
Truck life, years	7
Salvage percent	5
Annual insurance cost	$774
Annual license cost	$800
Annual school taxes	$1,150
Annual county taxes	$300
Interest rate, percent	12

Other critical factors influencing transportation costs are the number of trucks, amount hauled per truck, average length of haul, and density of production. Obviously a gin who receives all its volume within a 10-mile radius of the gin should have lower transportation costs than one who needs to go out to a 20-mile radius to get the same volume.

To determine the percentage of gin volume received at varying distances from the gin, responses from the cooperative gin survey were used to determine average distribution of cotton receipts. In 5-mile increments, the percentage of total module volume was:

0-5 miles	24 percent
6-10 "	37 "
11-15 "	24 "
16-20 "	10 "
21-25 "	5 "
	100 percent

The number of trucks required per gin was adjusted to keep actual hauling time below 15 hours per day. Theoretically, trucks could operate 24 hours but the 15-hour limit was chosen to reflect down time, maintenance, refueling, changing crews, etc.

The number of trucks required is a function of average hourly gin capacity, not annual gin volume. The number needed to keep a gin running is the same, regardless of how much volume that gin produces or how long the season is. A high capacity gin requires more trucks than a low capacity gin. For the "vertical slice" representative gin used in this analysis the number of trucks required to keep the gins operating is:

Capacity (bales/hour)	8	10	12	16	26
Number of trucks required	2	2	2	3	4

Taking into consideration all the assumptions and constraints mentioned above, the average cost per bale for module transportation was calculated. Costs were determined for each representative gin size under the current system for each production scenario. They were compared to costs for each representative gin size under an improved system, also for each production scenario.

FINDINGS

Findings are presented in three areas; 1988 Production, Ginning Costs, and Module Transportation Costs.

1988 Production

Table 2 showed total cotton production by county in the 63-county study area and the 5-year average production. Average production was 3,140,164 bales but ranged from 1,913,950 in 1982 to 4,598,300 in 1981.

Each county's average was "adjusted" to reflect expected production changes in 1988. County adjustment factors ranged from plus 15 percent for Bailey County to minus 10 percent in each of eight other counties. Many counties had a zero adjustment factor which means 1988 production is expected to be about the same as the 1978-82 5-year county average.

Table 3 gives the 5-year average production by county, the adjustment percentage, and the average production estimate for 1988. Figure 5 illustrates similar information in map form.

For the study area as a whole, 1988 production is expected to decline slightly (1.7 percent or 52,918 bales) from the 5-year average production. Average total production is 3,087,246 bales. For analysis purposes, 1988 production was also considered at plus and minus 40 percent from average production. Therefore, 1988 total production figures used throughout the remainder of this study are:

1988 average production	3,087,246 bales
Big crop (+40 percent)	4,322,144 bales
Short crop (-40 percent)	1,852,348 bales

Since this study was directed at the cooperative segment of the West Texas cotton industry, it was necessary to determine the cooperative share of estimated 1988 production at the cooperative gin level. Table 4 shows cooperative ginnings for crop years 1978-82 and the 5-year average cooperative volume. The average cooperative share for the study area is determined by comparing total production, table 2, to cooperative ginnings, table 4. Cooperatives' share at the ginning level is therefore 44.7 percent. 4/

Like total 1988 production in the study area, average cooperative volume was also adjusted by plus and minus 40 percent to reflect good and bad years. Table 5 gives this information on a county-by-county basis.

Figure 6 illustrates the number of cooperative and noncooperative gin firms in the study area, by county, and also the cooperative share at the county level. Caution is suggested when looking at this information for

4/ This assumes, of course, that cooperatives' share in 1988 will be the same as their average share during 1978-82. In the next section, the impact on costs of an increase in cooperative share will be examined.

Table 3. Estimated Average 1988 Production, By County, 63 County Study Area

County	5-Year Average Production	Adjustment Factor	Estimated 1988 Production
	Bales	Percent	Bales
Andrews	15,340	0	15,340
Armstrong	1,770	0	1,770
Bailey	62,320	15	71,668
Borden	14,960	0	14,960
Briscoe	29,560	-10	26,604
Carson	30	0	30
Castro	54,160	-2	53,077
Childress	32,320	0	32,320
Cochran	77,760	0	77,760
Coke	195	0	195
Collingsworth	35,880	0	35,880
Concho	12,960	0	12,960
Cottle	35,060	0	35,060
Crane	0	0	0
Crosby	135,600	-10	122,040
Dawson	169,560	0	169,560
Deaf Smith	4,980	0	4,980
Dickens	24,540	0	24,540
Donley	21,660	0	21,660
Ector	NA	0	NA
Fisher	61,580	-4	59,117
Floyd	127,320	0	127,320
Foard	10,620	0	10,620
Gaines	213,420	-10	192,078

Table 3. Estimated Average 1988 Production, By County, 63 County Study Area (Continued)

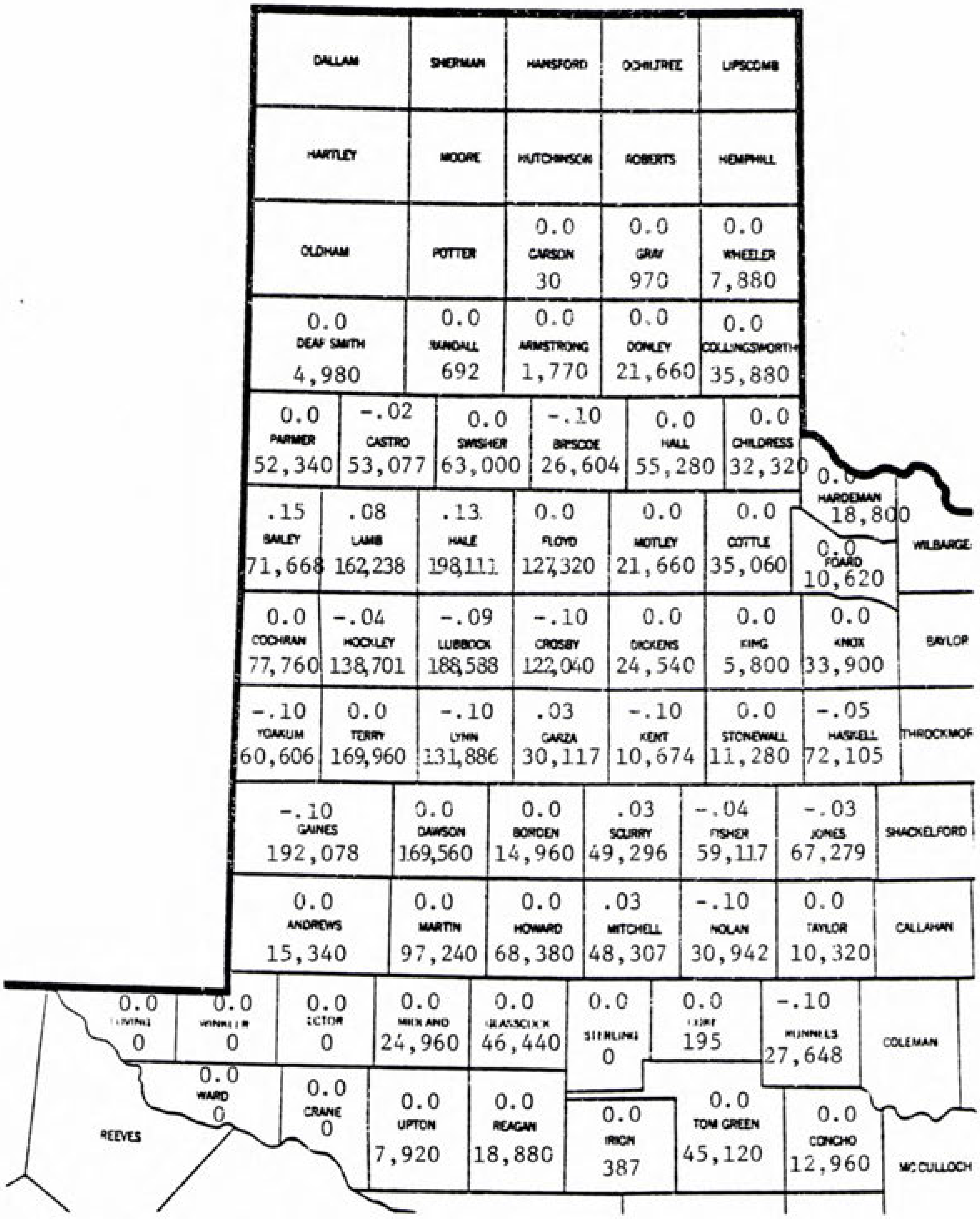
County	5-Year Average Production	Adjustment Factor	Estimated 1988 Production
	Bales	Percent	Bales
Garza	29,240	3	30,117
Glasscock	46,440	0	46,440
Gray	970	0	970
Hale	175,320	13	198,111
Hall	55,280	0	55,280
Hardeman	18,800	0	18,800
Haskell	75,900	-5	72,105
Hockley	144,480	-4	138,701
Howard	68,380	0	68,380
Irion	387	0	387
Jones	69,360	-3	67,279
Kent	11,860	-10	10,674
King	5,800	0	5,800
Knox	33,900	0	33,900
Lamb	150,220	8	162,238
Loving	0	0	0
Lubbock	207,240	-9	188,588
Lynn	146,540	-10	131,886
Martin	97,240	0	97,240
Midland	24,960	0	24,960
Mitchell	46,900	3	48,307
Motley	21,660	0	21,660
Nolan	34,380	-10	30,942

Table 3. Estimated Average 1988 Production, By County, 63 County Study Area (Continued)

County	5-Year Average Production	Adjustment Factor	Estimated 1988 Production
	Bales	Percent	Bales
Parmer	52,340	0	52,340
Randall	692	0	692
Reagan	18,880	0	18,880
Runnels	30,720	-10	27,648
Scurry	47,860	3	49,296
Sterling	0	0	0
Stonewall	11,280	0	11,280
Swisher	63,000	0	63,000
Taylor	10,320	0	10,320
Terry	169,960	0	169,960
Tom Green	45,120	0	45,120
Upton	7,920	0	7,920
Ward	NA	0	NA
Wheeler	7,880	0	7,880
Winkler	0	0	0
Yoakum	67,340	-10	60,606
Total	3,140,164		3,087,246

Figure 5. Composite 1988 Production Change From 1978-82 Five-Year Average and Estimated 1988 Production

1st number = Adjustment Factor
2nd number = 1988 Production



Total 5-yr. avg. = 3,140,164
1988 Estimates = 3,087,246
Change (Bales) = -52,918
Change (%) = -1.69

Table 4. Volume Ginned by Cooperatives, By Crop Year, and 5-Year Average

County 1/	Crop Year 1978	1979	1980	1981	1982	5-Year Average
			Bales			
Bailey	43,504	58,191	29,164	55,935	8,495	39,058
Briscoe	13,000	8,233	11,256	16,187	2,499	10,235
Castro	9,248	8,124	11,814	22,916	5,871	11,595
Childress	13,600	17,008	4,745	11,032	9,672	11,211
Cochran	20,405	32,039	11,269	14,476	4,479	16,534
Collingsworth	29,000	53,571	23,893	42,911	23,588	34,593
Cottle	50,800	28,019	6,295	16,129	7,408	21,730
Crosby	70,967	98,867	68,208	92,560	31,274	72,375
Dawson	15,794	45,986	12,718	35,231	16,895	25,325
Dickens	10,200	20,400	5,959	16,602	6,577	11,948
Donley	10,200	8,818	8,558	8,230	3,606	7,882
Fisher	29,489	71,863	21,496	64,628	32,922	44,079
Floyd	59,400	33,343	58,345	61,995	9,312	44,479
Foard	6,700	13,063	3,104	10,922	5,229	7,804
Gaines	45,985	55,427	30,726	90,116	40,337	52,518
Garza	7,367	21,300	4,486	14,506	10,882	11,708
Glasscock	15,839	25,352	14,319	32,488	25,417	22,683
Hale	69,708	55,563	99,013	102,662	31,392	71,667
Hall	47,600	78,384	34,470	46,464	39,709	49,325
Hardeman	9,588	11,386	4,627	14,164	11,358	10,225
Haskell	23,869	46,858	20,624	68,150	26,357	37,171
Hockley	83,568	56,789	90,230	127,437	30,683	77,741
Howard	14,175	45,252	11,040	45,543	30,515	29,305

Table 4. Volume Ginned by Cooperatives, By Crop Year, and 5-Year Average (Continued)

County 1/	Crop Year					5-Year
	1978	1979	1980	1981	1982	Average
			Bales			
Jones	39,632	78,585	17,858	60,167	37,703	46,789
Kent	8,215	9,775	3,563	10,954	3,978	7,297
Knox	10,168	15,036	5,658	16,082	10,455	11,480
Lamb	97,216	63,865	114,070	135,117	40,214	90,096
Lubbock	140,382	164,711	138,709	181,525	52,521	135,570
Lynn	76,519	144,147	61,321	150,329	55,698	97,603
Martin	23,372	72,725	13,428	68,166	47,827	45,103
Midland	9,785	21,068	6,279	19,241	12,586	13,792
Mitchell	22,206	45,910	10,673	32,726	14,879	25,279
Motley	5,400	8,680	3,956	5,090	2,800	5,185
Nolan	19,217	36,125	6,080	23,930	13,936	19,858
Parmer	7,290	5,311	8,712	12,530	3,457	7,460
Runnels	9,450	11,205	5,585	15,259	9,829	10,266
Scurry	21,415	50,513	11,320	34,838	22,363	28,090
Swisher	9,689	14,569	15,809	21,730	6,363	13,632
Taylor	3,964	5,533	3,172	5,384	4,130	4,437
Terry	48,954	74,466	44,628	96,124	41,603	61,155
Tom Green	21,392	23,451	15,932	32,818	23,807	23,480
Upton	10,880	14,596	7,258	17,741	12,243	12,544
Wheeler	4,200	6,732	2,430	6,016	1,989	4,273
Yoakum	10,558	21,244	10,745	28,756	21,270	18,515
Total	1,299,910	1,782,083	1,093,545	1,985,807	854,128	1,403,095

1/ Includes only those counties in the 63-county study area that contained one or more cooperative gins.

Table 5--Estimated Cooperative Bales for 1988, Average Low, and High Production Scenarios

County 1/	Cooperative Bales		
	Production Scenario		
	Average	Low	High
Bailey	44,916	26,950	62,883
Briscoe	9,211	5,527	12,896
Castro	11,363	6,818	15,908
Childress	11,211	6,727	15,696
Cochran	16,534	9,920	23,147
Collingsworth	34,593	20,756	48,430
Cottle	21,730	13,038	30,422
Crosby	65,138	39,083	91,193
Dawson	25,325	15,195	35,455
Dickens	11,948	7,169	16,727
Donley	7,882	4,729	11,035
Fisher	42,316	25,390	59,243
Floyd	44,479	26,687	62,271
Foard	7,804	4,682	10,925
Gaines	47,266	28,360	66,173
Garza	12,059	7,236	16,883
Glasscock	22,683	13,610	31,756
Hale	80,984	48,591	113,378
Hall	49,325	29,595	69,056

Continued--

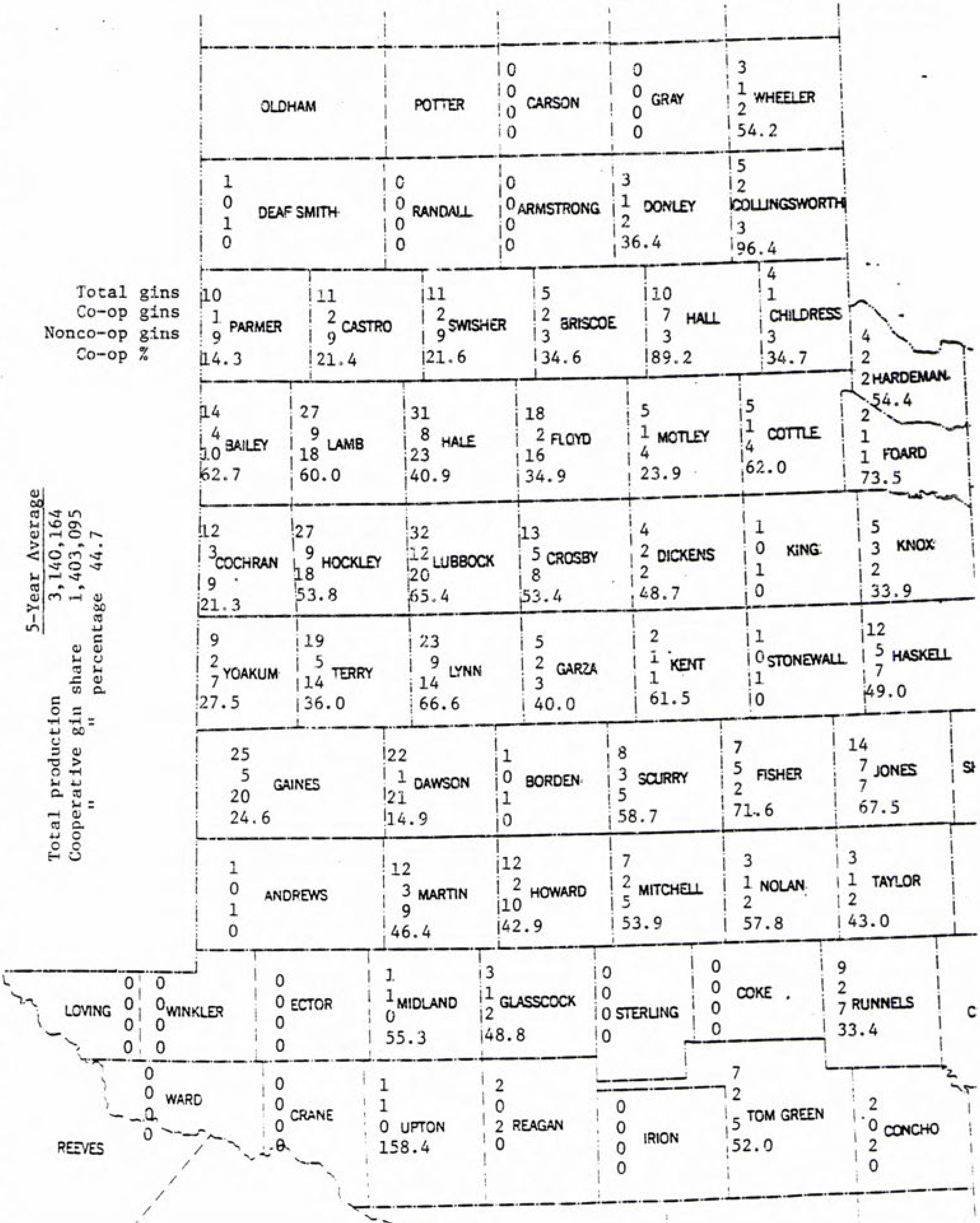
County 1/	Average	Low	High
Hardeman	10,225	6,135	14,314
Haskell	35,313	21,188	49,438
Hockley	74,632	44,779	104,484
Howard	29,305	17,583	41,027
Jones	45,385	27,231	63,539
Kent	6,567	3,940	9,194
Knox	11,480	6,888	16,072
Lamb	97,304	58,382	136,226
Lubbock	123,369	74,021	172,715
Lynn	87,843	52,706	122,980
Martin	45,104	27,062	63,145
Midland	13,792	8,275	19,309
Mitchell	26,037	15,622	36,452
Motley	5,185	3,111	7,259
Nolan	17,872	10,723	25,021
Parmer	7,460	4,476	10,444
Runnels	9,239	5,543	12,935
Scurry	28,932	17,359	40,505
Swisher	13,632	8,179	19,085
Taylor	4,437	2,662	6,211
Terry	61,155	36,693	85,617
Tom Green	23,480	14,088	32,872
Upton	12,544	7,526	17,561

Continued--

County 1/	Average	Low	High
Wheeler	4,273	2,564	5,983
Yoakum	16,663	9,998	23,328
Total	1,377,995	826,797	1,929,193

1/ Estimates not shown for counties that contain no cooperative gins.

Figure 6. Cooperative and Noncooperative Gins in the 63-County Study Area, and Cooperative Gins' Share of 5-Year Average Production



individual counties. Cooperative ginnings are available only for the counties that contain one or more cooperative gins. A cooperative gin in one county might draw cotton production from one or more counties (which obviously is the case in Upton County which has a 158 percent cooperative share). Also, a county not containing a co-op gin may still have co-op production that is ginned in another county. However, those counties without a cooperative gin will show a zero market share in figure 6.

In summary, here are the 1988 production figures that will be used in subsequent ginning and module transportation cost analyses:

	Total Production 1988 (bales)	Cooperative Volume 1988 (bales)
1988 average production	3,087,246	1,377,995
Short crop (-40 percent)	1,852,348	826,797
Big crop (+40 percent)	4,322,144	1,929,193

Ginning Costs

Findings associated with the cost of ginning are presented in four areas: (1) current structure, which includes both historical costs and the current costs of ginning the 1988 crop with no change in gin structure, (2) costs for an "improved structure," (3) costs for an improved structure with a moderate extension of the ginning season, and (4) assumption of an increase in cooperative market share at the gin level. Costs of ginning the 1988 crop are estimated for each of the above four situations at the average 1988 production, -40 percent, and +40 percent crop scenarios. Costs in all sections are consistent and comparable in that all are derived from the same average cost equation developed in the regression analysis and all contain "the vertical slice" of gin sizes representative of those existing today. 5/

The procedure for estimating these costs is relatively simple. Ginning costs per bale for representative "vertical slice" gins at varying rates of capacity utilization were derived earlier and illustrated in figures 2, 3 and 4. Costs are shown in Table 6 for each of the five vertical slice gins at 10 percent to 250 percent utilization levels in 10 percent increments. The table also shows the average value and the weighted cost per bale for a composite of the five vertical slice gins. One need only determine the average percent utilization of capacity and "plug into" the cost equation for each of the five vertical slice gin's capacities to calculate the cost per bale for each gin and then develop a weighted cost based on bales ginned at each of the vertical slice gins.

5/ As a reminder, the composite vertical slice gin cost is the weighted average of the representative 8, 10, 12, 16, and 26 bale per hour gins using the regression equation, cost per bale = \$38.11 + \$2,516.97 (1/% utilization) - \$.476 (average capacity).

Table 6. Estimated Bales Ginned and Ginning Cost for Vertical Slice Gins and the Composite Gin, by Percent of Seasonal Capacity Utilized, 1000 Hour Base

Gin capacity utilization rate	Hours of annual operation	8 Bales/hr.		10 Bales/hr.		12 Bales/hr.	
		Bales	Cost/bale	Bales	Cost/bale	Bales	Cost/bale
Percent		Number	Dollars	Number	Dollars	Number	Dollars
10	100	800	$286.00	1,000	$285.05	1,200	$284.10
20	200	1,600	160.15	2,000	159.20	2,400	158.25
30	300	2,400	118.20	3,000	117.25	3,600	116.30
40	400	3,200	97.23	4,000	96.27	4,800	95.32
50	500	4,000	84.64	5,000	83.69	6,000	82.74
60	600	4,800	76.25	6,000	75.30	7,200	74.35
70	700	5,600	70.26	7,000	69.31	8,400	68.35
80	800	6,400	65.76	8,000	64.81	9,600	63.86
90	900	7,200	62.27	9,000	61.31	10,800	60.36
100	1,000	8,000	59.47	10,000	58.52	12,000	57.57
110	1,100	8,800	57.18	11,000	56.23	13,200	55.28
120	1,200	9,600	55.28	12,000	54.32	14,400	53.37
130	1,300	10,400	53.66	13,000	52.71	15,600	51.76
140	1,400	11,200	52.28	14,000	51.33	16,800	50.38
150	1,500	12,000	51.08	15,000	50.13	18,000	49.18
160	1,600	12,800	50.03	16,000	49.08	19,200	48.13
170	1,700	13,600	49.11	17,000	48.16	20,400	47.20
180	1,800	14,400	48.29	18,000	47.33	21,600	46.38
190	1,900	15,200	47.55	19,000	46.60	22,800	45.65
200	2,000	16,000	46.89	20,000	45.93	24,000	44.98
210	2,100	16,800	46.29	21,000	45.34	25,200	44.38
220	2,200	17,600	45.74	22,000	44.79	26,400	43.84
230	2,300	18,400	45.25	23,000	44.29	27,600	43.34
240	2,400	19,200	44.79	24,000	43.84	28,800	42.89
250	2,500	20,000	44.37	25,000	43.42	30,000	42.47

(Continued)

Table 6. Estimated Bales Ginned and Ginning Cost for Vertical Slice Gins and the Composite Gin, by Percent of Seasonal Capacity Utilized, 1000 Hour Base (Continued)

Gin capacity utilization rate	Hours of annual operation	16 Bales/hr.		26 Bales/hr.		Composite gin 1/	
		Bales	Cost/bale	Bales	Cost/bale	Bales	Cost/bale 2/
Percent		Number	Dollars	Number	Dollars	Number	Dollars
10	100	1,600	$282.19	2,600	$277.43	1,440	$281.61
20	200	3,200	156.34	5,200	151.58	2,880	155.76
30	300	4,800	114.39	7,800	109.63	4,320	113.81
40	400	6,400	93.42	10,400	88.66	5,760	92.84
50	500	8,000	80.83	13,000	76.07	7,200	80.25
60	600	9,600	72.44	15,600	67.68	8,640	71.86
70	700	11,200	66.45	18,200	61.69	10,080	65.87
80	800	12,800	61.96	20,800	57.20	11,520	61.37
90	900	14,400	58.46	23,400	53.70	12,960	57.88
100	1,000	16,000	55.66	26,000	50.90	14,400	55.08
110	1,100	17,600	53.38	28,600	48.62	15,840	52.79
120	1,200	19,200	51.47	31,200	46.71	17,280	50.89
130	1,300	20,800	49.86	33,800	45.10	18,720	49.27
140	1,400	22,400	48.47	36,400	43.71	20,160	47.89
150	1,500	24,000	47.27	39,000	42.51	21,600	46.69
160	1,600	25,600	46.23	41,600	41.47	23,040	45.64
170	1,700	27,200	45.30	44,200	40.54	24,480	44.72
180	1,800	28,800	44.48	46,800	39.72	25,920	43.90
190	1,900	30,400	43.74	49,400	38.98	27,360	43.16
200	2,000	32,000	43.08	52,000	38.32	28,800	42.50
210	2,100	33,600	42.48	54,600	37.72	30,240	41.90
220	2,200	35,200	41.93	57,200	37.17	31,680	41.35
230	2,300	36,800	41.44	59,800	36.68	33,120	40.86
240	2,400	38,400	40.98	62,400	36.22	34,560	40.40
250	2,500	40,000	40.56	65,000	35.80	36,000	39.98

1/ Composite "vertical slice" gin is average of the 8, 10, 12, 16 and 26 bale per hour gins for a 14.4 bale per hour average capacity.
2/ Weighted by bales ginnned at each composite vertical slice gin.

Percent utilization level is determined by dividing the bales to be ginned by the hourly capacity. Hourly capacity of a vertical slice is 72 bales per hour (8 + 10 + 12 + 16 + 26), for a seasonal capacity of 72,000 (72 x 1,000) bales per vertical slice.

Total average bale production divided by 72,000 and rounded to a whole number gives the number of vertical slices needed to gin the average production. The number of "vertical slices" x 72,000 gives the seasonal bale capacity and the number of vertical slices x 5 gives the total number of gins required. The number of gins required for average production remains the same for the -40 percent small crop and the +40 percent large crop to show the effect of volume ginned on ginning cost for a given gin structure.

Current Structure

Figure 7 shows the costs of ginning based on actual gin utilization for crop years 1978-82. As expected, the weather-shortened 1982 crop had the highest average cost per bale ($87.12) while the big, 1981 crop saw the lowest ($54.54) ginning cost per bale. Average per bale costs for the 5-year period was $64.77.

For this study's purpose, however, current costs of ginning the expected 1988 crop is more important than historical costs. There are 142 cooperative gin firms in the study area. However, since the vertical slice composite gin is representative of 5 gin sizes, 28 "vertical slices" (142 divided by 5 = 28.4), and 140 gins (5 x 28) are used for cost estimation purposes.

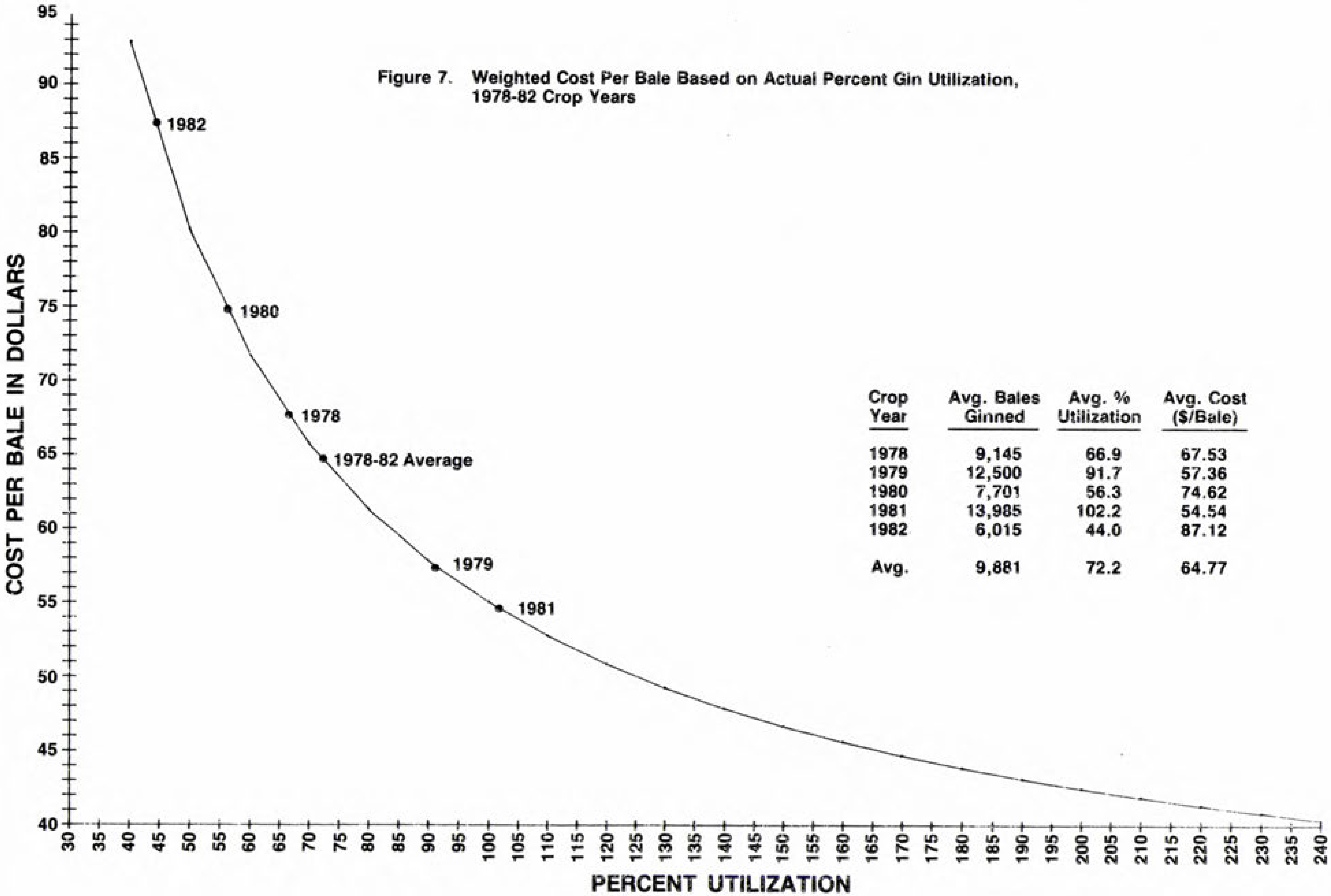
For the three production scenarios then, capacity utilization is calculated by dividing total bales produced by seasonal capacity of 2,016,000 (28 slices x 72,000) and inserting into the regression equation to determine average cost per bale. Weighted average cost per bale can also be estimated, for any utilization level, by reading directly off the composite vertical slice gin curve, figure 8. This same procedure is used for each of the three gin structural considerations that follow.

For the current structure of 140 gins with a 1,000 hour base season, the relevant values are:

	1988 Cooperative Production		
	Average	Low (-40%)	High (+40%)
Number of gins	140	140	140
Average bales per gin	9,843	5,906	13,780
Average percent utilization	68.35	41.01	95.69
Average cost per bale	$66.74	$91.29	$56.22

Current cost per bale for ginning the 1988 crop with an average production year and 68 percent utilization is $66.74. A short crop results in low utilization of 41 percent and in much higher ($91.29) costs which is comparable with the short 1982 crop cost estimate of $87.12 at 44 percent utilization. A large crop results in 96 percent utilization and a substantially lower per bale cost of $56.22.

Figure 7. Weighted Cost Per Bale Based on Actual Percent Gin Utilization, 1978-82 Crop Years



Crop Year	Avg. Bales Ginned	Avg. % Utilization	Avg. Cost ($/Bale)
1978	9,145	66.9	67.53
1979	12,500	91.7	57.36
1980	7,701	56.3	74.62
1981	13,985	102.2	54.54
1982	6,015	44.0	87.12
Avg.	9,881	72.2	64.77

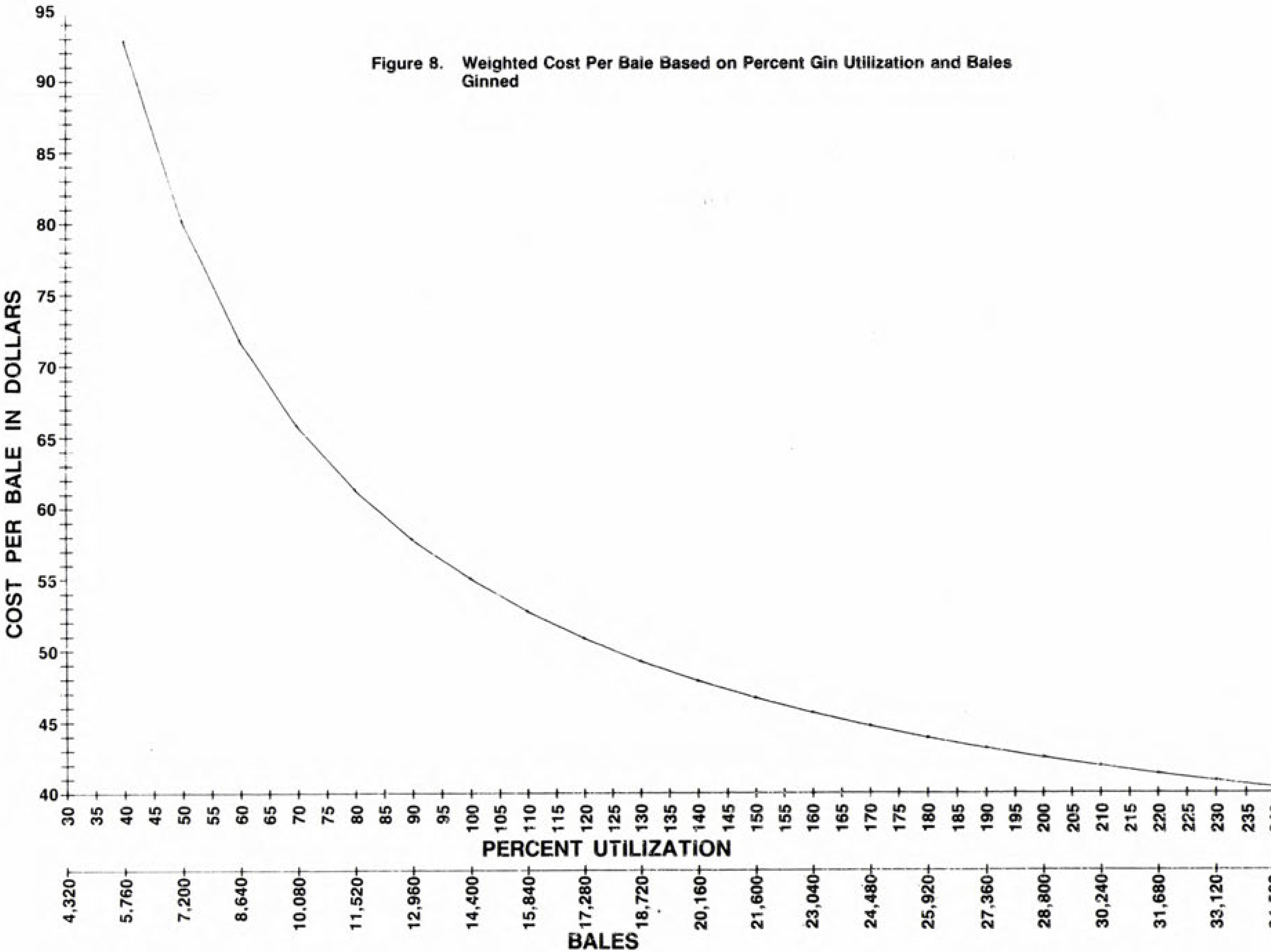


Figure 8. Weighted Cost Per Bale Based on Percent Gin Utilization and Bales Ginned

Improved Structure

The "improved structure" discussed here simply involves increased utilization of gin plant capacity by decreasing the number of gins. The significant impact on ginning costs of increased capacity utilization has already been established.

For any given year, total production available for ginning is fixed. Also, this section examines costs for an improved system with the same length of ginning season, 1,000 hours, as the current structure. Obviously then, to increase plant utilization with fixed production and without changing length of ginning season, a reduction in total capacity is required.

The number of vertical slice gins required to process the average 1988 cooperative production is determined by dividing production (1,377,995 bales) by 72,000 which results in 19 slices and 95 total gins. Therefore, the improved structure results in the following values:

	1988 Cooperative Production		
	Average	Low (-40%)	High (+40%)
Number of gins	95	95	95
Average bales per gin	14,500	8,640	20,160
Average percent utilization	100	60	140
Average cost per bale	$55.08	$71.86	$47.89

Reducing total ginning capacity (by going from 140 gins to 95) and increasing capacity utilization (from 68 to 100 percent) results in a substantial reduction in per bale ginning costs as compared to the current cooperative gin structure. For average 1988 cooperative production, per bale costs are reduced from $66.74 to $55.08, or $11.66 per bale. Even more significant is the cost comparison for a short (-40 percent) crop year. The current structure estimates of per bale costs are $91.29 while the improved structure costs are $71.86, a savings of nearly $20.00 per bale.

Extended Season

Previous sections of this report examined costs of ginning assuming a normal 1,000 hour operating season. This and the following section looks at per bale costs with moderate (20 and 50 percent) extensions of the ginning season to 1,200 and 1,500 operating hours.

The module system of handling cotton is an alternative that can allow a gin to operate 1,000 to 2,000 hours or more during a 3 to 5 month season. The effects on ginning costs of increasing the capacity utilization level from 100 percent to 150 percent (which is mathematically equivalent to increasing seasonal operating hours from 1,000 to 1,500) are significant. The increased utilization rates are the result of operating additional hours at average capacity, not from "forcing" large volumes per hour through the gin.

A longer operating season would require little change in current technology for storing seed cotton, but would necessitate marketing arrangements to alleviate producers' problems with cash flows and fluctuating prices for cotton lint. Producer attitudes for a real or perceived need to have their cotton ginned immediately after harvest must change if ginning costs are to be substantially reduced.

Results of "improving" the improved structure through 1,200 and 1,500 hour ginning seasons are:

	1988 Cooperative Production		
	Average	Low (-40%)	High (+40%)
1,200 hour season			
Number of gins	80	80	80
Average bales per gin	17,280	10,368	24,192
Average percent utilization	120	72	168
Average cost per bale	$50.89	$64.87	$44.89
1,500 hour season			
Number of gins	65	65	65
Average bales per gin	21,600	12,960	30,240
Average percent utilization	150	90	210
Average cost per bale	$46.69	$57.88	$41.90

Effects of increasing the length of the operating season occur in reducing the number of gins required, increasing the volume processed per gin, increasing capacity utilization levels, and most importantly, reducing the average cost per bale. Per bale costs for ginning the average 1988 crop under this gin structure is $50.89 for the 1,200 hour season and $46.69 for the 1,500 hour season. Compared to the current cooperative gin structure, this amounts to per bale savings of $15.85 and $20.05 respectively. In a short crop year, savings total $26.42 and $33.41.

Increased Market Share

This section briefly examines the impact on per bale costs of an increase in cooperative market share at the gin level. For analysis purposes, it was assumed that volume available to cooperative gins, and therefore ginning hours, was increased 10 percent for the improved structure with 1,000, 1,200, and 1,500 hour operating seasons. 6/ Results were:

6/ Increasing cooperative volume 10 percent is mathematically equivalent to increasing utilization 10 percent. Also a 10 percent increase is not the same as a 10 percentage point increase. Cooperative market share at the gin level is currently 44.7 percent. An increase of 10 percent in cooperative volume would raise cooperative market share to 49.2 percent.

	1988 Cooperative Production		
	Average	Low (-40%)	High (+40%)
1,000 hour season (1,100 ginning hours)			
Number of gins	95	95	95
Average bales per gin	15,840	9,504	22,176
Average percent utilization	110	66	154
Average cost per bale	$52.79	$68.05	$46.26
1,200 hour season (1,320 ginning hours)			
Number of gins	80	80	80
Average bales per gin	19,008	11,405	26,611
Average percent utilization	132.0	79.2	184.8
Average cost per bale	$48.98	$61.69	$43.53
1,500 hour season (1,650 ginning hours)			
Number of gins	65	65	65
Average bales per gin	23,760	14,256	33,264
Average percent utilization	165	99	231
Average cost per bale	$45.17	$55.34	$40.81

The number of gins required (95, 80, and 65) for each seasonal operating length (1,000, 1,200, and 1,500) are unchanged from previous analysis. What does change however, is the volume processed per gin, utilization of capacity, and cost per bale for ginning. As might be expected, the lowest ginning cost per bale for average 1988 production is for the 1,500 hour season. This cost is $45.17 per bale or $21.57 less than for the current cooperative structure.

Results of the various structural situations show the overriding importance of fully utilizing a gin plants' seasonal capacity if per bale ginning costs are to be kept down. For an eight bale per hour plant average cost decreases from $97.23 at 40 percent utilization (3,200 bales) to $59.47 at 100 percent (8,000 bales) and to $46.89 at 200 percent (16,000 bales). Values for a 26 bale per hour gin are $88.66 at 40 percent (10,400 bales), $50.90 at 100 percent (26,000 bales) and $38.32 at 200 percent (52,000 bales).

Module Transportation

Costs of module transportation were calculated for (1) the existing system with 140 gins and (2) the improved system with 95 gins. The same representative gin sizes of 8, 10, 12, 16, and 26 bales per hour were used; and costs were calculated for each of the three production scenarios for 1988.

The only change in assumptions from those used to calculate ginning costs is the utilization of capacity in the current system. For this analysis, a utilization rate of 70 percent (rather than 68.35) was assumed.

For the existing system with 700 hours of gin operation, then the total costs per bale for module transportation are:

Gin Size (B/H)	Trucks required	Cost Per Bale ($/B) --- Production Scenario --- Average	-40%	+40%
8	2	12.20	18.94	9.31
10	2	10.20	15.50	7.90
12	2	8.86	13.42	6.92
16	3	9.73	14.73	7.52
26	4	8.34	12.52	6.55

and for the improved system with 1,000 hours of gin operation:

Gin Size (B/H)	Trucks required	Cost Per Bale ($/B) --- Production Scenario --- Average	-40%	+40%
8	2	9.15	13.82	7.18
10	2	7.75	11.48	6.14
12	2	6.81	10.00	5.47
16	3	7.43	10.97	5.90
26	4	6.46	9.39	5.21

Costs are substantially less under the improved system for each gin size and production scenario. This is because of greater utilization rates in the improved system--95 cooperative gins process the entire crop versus 140 in the existing system.

Costs also decline as size of gin increases for any of the three production scenarios. An exception is a slight increase in per bale cost when moving from the 12 B/H gin to the 16 B/H. This is due to the addition of one more truck (3 versus 2) for the larger plant. Actually, the 16 bale per hour requires more than two but less than three trucks--but it's difficult to purchase 2-1/2 trucks. There are several management alternatives available which might allow gin firms to get by with the smaller truck number when confronted with an in-between situation such as this.

SUMMARY AND CONCLUSIONS

Any summary of the results of this study must begin with its major conclusion--that cooperative gins in West Texas, in the aggregate, have more capacity than they need, or their producer members can afford. Reluctance to reduce total ginning capacity and the overall inability to more fully utilize it has resulted in excessively high ginning costs. The closing or merger of several cooperative gins is imminent; the survival of many more hinges on getting costs in line with what producers are willing to pay.

From a broad, practical standpoint, there are only two ways to reduce these costs. One is to gin a much larger volume with already existing capacity. The other is to gin the same volume with less capacity. Either option entails some hard decisions.

To expand total volume on existing capacity requires increasing cooperatives' share of total ginnings. In any one year, cotton production is fixed. Therefore, to increase the cooperative share, volume which would otherwise go to independent or line gins must be brought into the cooperative ginning system. The difficulty is how to attract it. From an economic standpoint, the best incentive is to be able to offer ginning services at a lower cost. But to achieve lower costs requires higher volumes and/or increased capacity utilization. This apparent "catch 22" situation is illustrated only to point out that before cooperatives can expect to significantly increase their share of total ginnings, it will likely be necessary to get their house in order from a cost standpoint first. This entails the second option--reduce aggregate ginning capacity.

It's important to recognize that the cooperative ginning sector cannot be looked at in isolation of other ginning organizations in West Texas. Reducing aggregate ginning capacity means just that. If a co-op gin sells its facilities to a noncooperative entity, cooperative capacity may be reduced but industry capacity remains unchanged. In this example, total cooperative ginnings may also decline since some customers may find it more convenient to patronize the purchasing firm.

It's apparent that cooperative gins need to get together with each other to find ways of reducing capacity and utilizing to a greater degree more of what remains. That would be a central focus of the "phase two" studies mentioned throughout this report.

In addition, producers and their cooperative gins need to examine ways to lengthen the ginning season to achieve still lower ginning costs. The relatively low utilization of capacity in ginning as compared to most other agricultural processing industries is partially the result of its functional relationship with cotton harvesting. Since cotton cannot enter marketing channels until it is ginned, the producer is interested in getting his cotton ginned as rapidly as possible. There is pressure on the ginner to have adequate capacity and flexibility to provide prompt service to as many producers as possible.

The rapid acceptance of moduling in West Texas makes an extended season even more feasible by providing temporary storage of seed cotton. Lower ginning costs should be sufficient incentive to lengthen the ginning season, even with objections from some producers who want their cotton ginned immediately. Module storage incentives in the form of lower ginning charges for modules stored for longer periods, or similar incentive programs, might help lessen the inherent desire for a short ginning season--a major culprit responsible for high ginning costs.

Realistically, any increased cooperative market share at the ginning level would probably not occur until it became attractive for noncooperative growers to want to gin with the co-op. And, to the extent ginning costs are reflected in ginning charges, the primary economic incentive to "go co-op" is lower ginning costs. That's one reason this study looked first at the existing system, then an improved system with increased capacity utilization, then the improved system with an extended season, and finally, the improved system with an extended season and increased market share.

Total costs per bale decline with each successive step as follows:

Structure	Cost per bale	Savings over existing system
Existing (684 hours)	$66.74	0
Improved (1,000 hours)	55.08	$16,067,421
Improved, extended season (1,500 hours)	46.69	27,628,799
Improved, extended season (1,650 hours) plus 10 percent increase in market share	45.17	29,723,352

Cost savings at the gin level are particularly meaningful when applied to average 1988 cooperative production (1,377,995 bales). The savings of $11.66 per bale by moving from the existing structure to an improved structure becomes $16,067,421 for the cooperative system as a whole. Moving the next step saves $11,561,378 more and to the final step, $2,094,553 more. Total savings potential by moving from the existing structure to an improved one that has high gin utilization, an extended season and increased market share is some $21.57 per bale or $29,723,352 for the entire cooperative ginning system.

It should be kept in mind that the most important factor in lowering ginning costs is to utilize as much of the existing capacity as possible. Basically, this means operating the gin at capacity for the longest possible period of time each season. As noted in the ginning cost analysis, savings occur whenever gin utilization is increased; but beyond 100 percent utilization (1,000 operating hours), the savings increment becomes quite small.

Table 7 summarizes each gin structure alternative analyzed in this study including the number of gins required, average volume per gin, average percent utilization, and most importantly, average cost per bale. Each item is considered with the average, low and high 1988 production scenarios. Graphic illustrations of each of the seven situations and three production scenarios are shown in figure 9. Reader comprehension of costs and cost savings may be enhanced by studying this chart.

All West Texas regional cooperatives should participate in a coordinated effort to assist cooperative gins. Many areas of assistance are candidates for potentially beneficial results. They include member education, financial planning, joint cooperative advertising and promotion campaigns, and physical facility planning. Such coordination should improve the potential for strengthening the cooperatives' overall share of cotton in West Texas. Media advertising, for example, may be effective in objectively convincing growers to join the cooperative family.

To formalize regional activity in the gin assistance area, it might be advisable to organize a coordinating board made up of representatives from each regional to explore areas where joint participation has merit. This group could meet on a regular basis to discuss problems, suggest alternative solutions, and carry out a coordinated program to implement them at the local cooperative level. Existing staff at the regional cooperatives and the Texas Bank have the expertise to carry out the many phase two analyses called for in this study.

Table 7. Summary of Seven Structural Situations, Texas High Plains Cooperative Gins, 1988

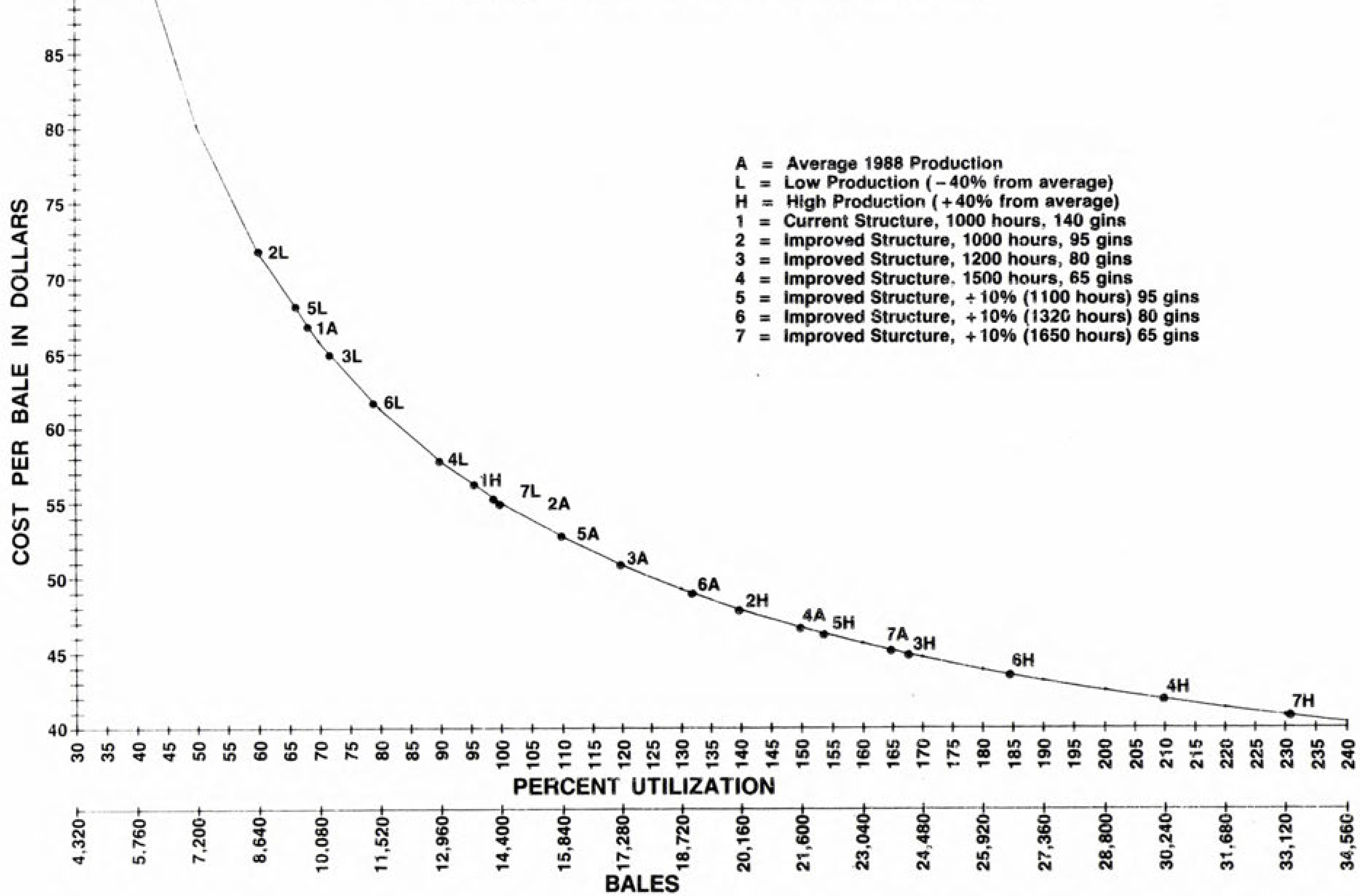
Structure	1988 cooperative production scenario with current co-op share		
	Average 1,377,995	Low (-40%) 826,797	High (+40%) 1,929,193
1. Current structure, 1,000 hours			
Number of gins	140	140	140
Average bales per gin	9,843	5,906	13,780
Average percent utilization	68.35	41.01	95.69
Average cost per bale	$66.74	$91.29	$56.22
2. Improved structure, 1,000 hours			
Number of gins	95	95	95
Average bales per gin	14,400	8,640	20,160
Average percent utilization	100	60	140
Average cost per bale	$55.08	$71.86	$47.89
3. Improved structure, 1,200 hours			
Number of gins	80	80	80
Average bales per gin	17,280	10,368	24,192
Average percent utilization	120	72	168
Average cost per bale	$50.89	$64.87	$44.89
4. Improved structure, 1,500 hours			
Number of gins	65	65	65
Average bales per gin	21,600	12,960	30,240
Average percent utilization	150	90	210
Average cost per bale	$46.69	$57.88	$41.90

(Continued)

Table 7. Summary of Seven Structural Situations, Texas High Plains Cooperative Gins, 1988 (Continued)

Structure	1988 cooperative production scenario with increased co-op share		
	Average	Low (-40%)	High (+40%)
	1,515,795	909,477	2,122,123
5. Improved structure			
10% increase in volume (1,100 hours)			
Number of gins	95	95	95
Average bales per gin	15,840	9,504	22,176
Average percent utilization	110	66	154
Average cost per bale	$52.79	$68.05	$46.26
6. Improved structure			
10% increase in volume (1,320 hours)			
Number of gins	80	80	80
Average bales per gin	19,008	11,405	26,611
Average percent utilization	132.0	79.2	184.8
Average cost per bale	$48.98	$61.69	$43.53
7. Improved structure			
10% increase in volume (1,650 hours)			
Number of gins	65	65	65
Average bales per gin	23,760	14,256	33,264
Average percent utilization	165	99	231
Average cost per bale	$45.17	$55.34	$40.81

Figure 9. Weighted Cost Per Bale Based on Percent Utilization and Bales Ginned, Various Gin Structures and 1988 Production Scenarios



LIST OF REFERENCES

1. Cleveland, O.A., Jr., and L.V. Blakely, "Costs of Marketing Cotton Under Alternative Gin Size and Length of Season Operations in the Oklahoma-Texas Plains." Oklahoma Agricultural Experiment Station. Research Report P-7604, 1976.

2. CONGRESSIONAL BRIEFING, Six-State High Plains-Ogallala Aquifer Regional Resources Study, 1301 Longworth House Office Bldg., Feb. 25, 1981.

3. Ethridge, D.E., D.L. Shaw, and J.A. Robinson, "An Analysis of Effects of Moduling Handling Systems on Ginning Costs with Stripper Harvested Cotton." National Economics Division, ERS, USDA, and Department of Agricultural Economics, Texas Tech University, College of Agricultural Sciences Publication No. T-1-198, August 1981.

4. Ethridge, M.D., and R.E. Branson, "Operating Cost for United States Cotton Gins by Location, Plant Size, and Utilization Rates: Impact of an Automatic Feeding System." Texas Agricultural Market Research and Development Center. Department of Agricultural Economics, Texas A&M University, MRC 77-5, 1977.

5. Fuller, S., and W. Vastine, "Utilization of New Mexico's Cotton Ginning Capacity, 1970-71." New Mexico Agricultural Experiment Station, Research Report 232, 1972.

6. Impact of Rising Natural Gas Prices on Agriculture in the Texas High Plains, The Governor's Energy Advisory Council, State of Texas, Technical Report #77-107.

7. Laferney, P.E., and E.H. Glade, Jr., "Off-Farm Costs of Moving Cotton in the 1969-70 Marketing Season." U.S. Department of Agriculture, Economic Research Service, 1971.

8. Shaw, D.L. "Cotton Ginning Costs With Emphasis on Labor, Energy, and Impact of Changes." Unpublished speech presented to Cotton Gin Manpower Horsepower Conference, Lubbock, Texas, 1978.

9. Shaw, D.L. "Economic-Engineering Simulation of Cotton Ginning Costs, GINMODEL: Program Documentation and User's Guide." U.S. Department of Agriculture, ESCS, August 1978.

10. Shaw, D.L., C.A. Wilmot, and B.K. Heron, Cotton Gin Operating Costs in West Texas, Lower Rio Grande Valley, and the Blacklands of Texas, 1973 Season, USDA, AER 318, Nov. 1975.

11. U.S. Department of Agriculture. "Charges for Ginning Cotton, Cost of Selected Services Incident to Marketing, and Related Information." Economic Research Service and Agricultural Marketing Service, annual reports.

12. Young, Kenneth B., and Jerry M. Coomer. Effects of Natural Gas Price Increases on Texas High Plains Irrigation, 1976-2025, AER Report #448, ESCS-USDA, February 1980.