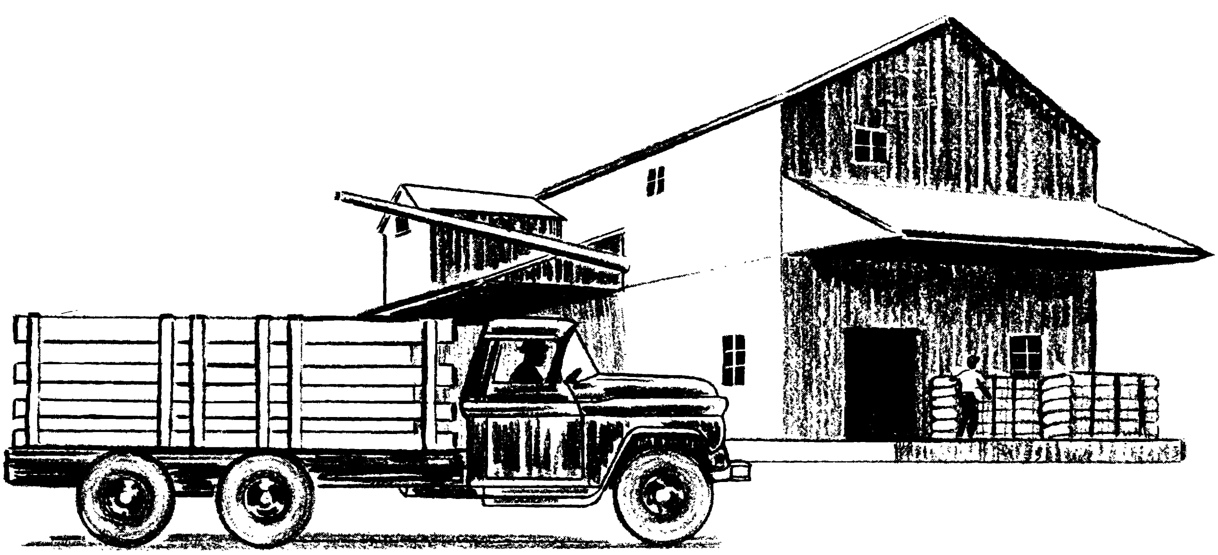
# ENGINEERING AND ECONOMIC ASPECTS OF COTTON GIN OPERATIONS. . . .

## *MIDSOUTH, WEST TEXAS, FAR WEST*





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## SUMMARY AND CONCLUSIONS

Since 1926, U.S. cotton production has increased very slightly, while the number of active gin plants has declined rapidly. Gins in most of the major producing areas, although becoming fewer in number, have increased in size. The one exception to the trend has been the Far West. In this area, both gin numbers and gin size have increased simultaneously. The deviation from the national trend has been due mainly to the earlier and more rapid adoption of mechanical harvesting in this area.

The general adoption of mechanical harvesters and chemical defoliants has resulted in a substantially shorter peak harvest period, accompanied by continually increasing demands on ginning capacity. To meet these mounting requirements, varied combinations of machinery and equipment have been incorporated both in new gin construction and in remodeled plants. Some of these innovations, particularly in remodeled gins, have been based more on individual ginner's personal preference than on proven performance. Frequently, this has resulted in less than satisfactory ginning rate increases and unnecessarily high unit costs of production. This study was undertaken to assist ginners in avoiding costly errors in the future.

Model gin plants were synthesized with peak hourly capacities ranging from 6 to 24 bales for both machine-picked and machine-stripped harvest areas. Sizes and arrangement of seed cotton processing equipment were specified for each gin model as were number and sizes of fans and other materials handling equipment in the ginning equipment array.

Estimated investment costs for the gin models ranged from $200,000 to $505,000, depending upon gin plant size and method of harvest.

Total operating hours for the season were considered as fixed for all gin plant models regardless of size. Consequently, economies of scale were evident in most cost items. For example, in the Midsouth, total ginning costs per bale ranged from $14.94 for the smallest plant to $10.21 for the largest. The range was from $15.58 to $10.61 in the Far West, and from $15.25 to $10.53 in West Texas.

All operating cost calculations were based on the assumption that each gin model would be operated at its full sustained capacity (estimated at 85 percent of manufacturers' rating) while actually ginning, and would handle the maximum seasonal volume attainable without storage of seed cotton.

The determination of optimal gin size for well established areas depends upon gin plant population, production density, relative concentration of the harvest period, availability of seed cotton storage, assembly cost, and anticipated revenue. In developing large, new producing areas where gin plant population and production densities are not limiting factors, the 24-bale per hour model would be generally recommended. However, for older, well established producing areas optimal gin size would be smaller.

# ENGINEERING AND ECONOMIC ASPECTS OF COTTON GIN OPERATIONS.... MIDSOUTH, WEST TEXAS, FAR WEST

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## INTRODUCTION

During the past four decades, cotton production in the United States, although fluctuating widely from year to year, has shown a slight upward trend of about one-tenth of 1 percent a year (fig. 1). The number of active cotton gins, on the other hand, has declined steadily at an average rate of nearly 2 percent a year (fig. 2). This has been partly the result of the common practice of replacing older, multiplant installations with single plants of higher capacities, particularly in the older producing areas. In some of the newer areas of the West, however, both number and size of gins have increased. This has not been the result of any general increase in production but rather of an increase in requirements at the peak of the harvest season. Adoption of mechanical harvesters and chemical defoliants in the Far West has greatly shortened the harvest season and placed increasingly heavy demands on gins during a period of a few weeks.

Attempts to meet these changing conditions by boosting ginning capacity have resulted in numerous and varied combinations of machinery and equipment. Unless gin alterations are engineered with an eye to both rate capabilities and operating costs, they leave much to be desired. The addition of an extra gin stand or the replacement of all stands with newer models of higher hourly capacities often will not achieve the increase in plant output anticipated because of bottlenecks elsewhere in the system. Poorly planned attempts to increase ginning capacity may result in little more than unnecessary increases in unit costs of production.

The study reported here was undertaken to provide ginners with scientifically developed plans for gin machinery combinations and arrangements which may be adapted to meet their specific requirements.

## OBJECTIVES

The objectives of the study were (1) to develop machinery and equipment specifications for 10 different capacity ratings, and for 2 different types of harvesting methods; (2) to estimate operating costs; (3) to examine importance and means of improving operating efficiencies; and (4) to identify and describe factors determining optimal gin size for specific cotton-producing regions.

## PROCEDURE

Performance and cost data on ginning machinery and equipment compiled for previous research studies provided the main sources of information for recommendations in this study. These data consisted of recorded observations of power requirements and energy and labor inputs made in existing gin plants; charges and rates for inputs obtained from gin records or the suppliers of these goods and services; and information obtained during personal interviews with gin operators, designers, and gin manufacturers.

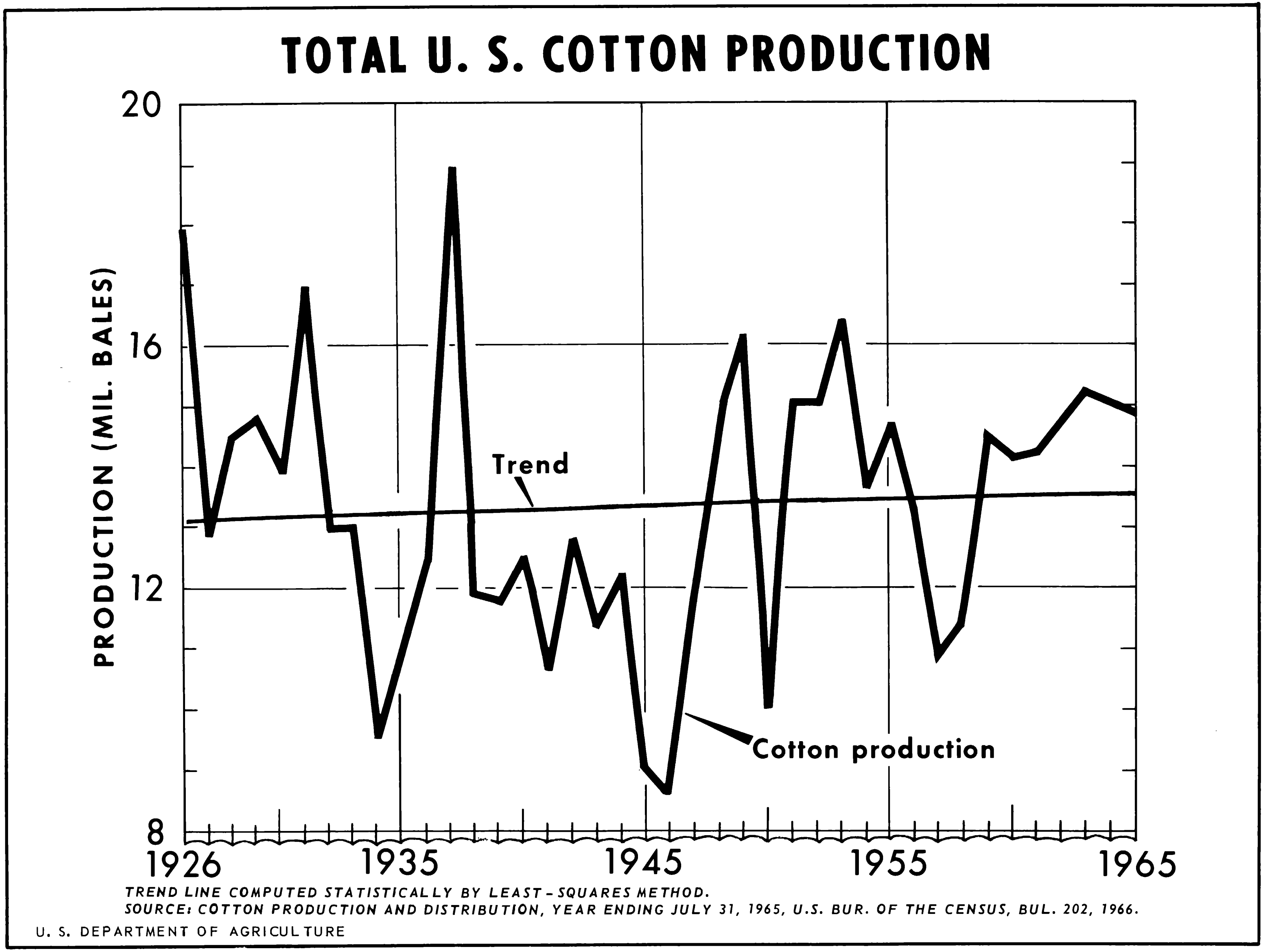
TOTAL U. S. COTTON PRODUCTION
PRODUCTION (MIL. BALES)
20
16
12
8
1926
1935
1945
1955
1965
Trend
Cotton production
TREND LINE COMPUTED STATISTICALLY BY LEAST-SQUARES METHOD.
SOURCE: COTTON PRODUCTION AND DISTRIBUTION, YEAR ENDING JULY 31, 1965, U.S. BUR. OF THE CENSUS, BUL. 202, 1966.
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Figure 1

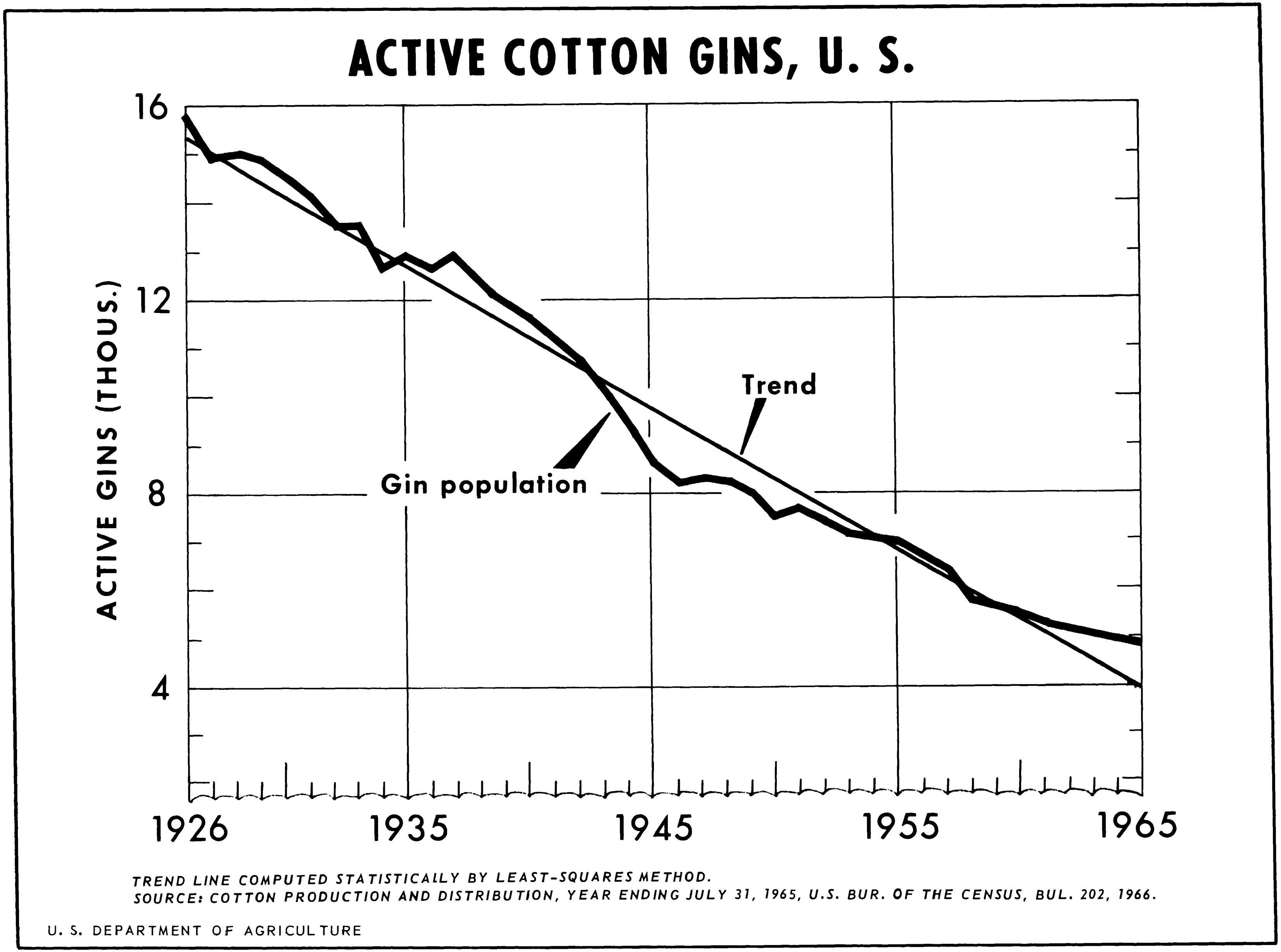
ACTIVE COTTON GINS, U. S.
ACTIVE GINS (THOUS.)
16
12
8
4
Trend
Gin population
1926
1935
1945
1955
1965
TREND LINE COMPUTED STATISTICALLY BY LEAST-SQUARES METHOD.
SOURCE: COTTON PRODUCTION AND DISTRIBUTION, YEAR ENDING JULY 31, 1965, U.S. BUR. OF THE CENSUS, BUL. 202, 1966.
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Figure 2

In setting up the models, physical inputs and costs were estimated for the individual materials handling and processing functions including weighing, seed cotton storage, unloading, seed cotton cleaning, drying, ginning, lint cleaning, waste handling, packaging, sampling and storage of seed and lint, and all the functions combined. Only equipment available from commercial sources at the time of the study was specified in the models although the effects of incorporating equipment and techniques not yet adopted commercially were also studied.

The model gin arrangements were planned for the Far West and the Midsouth, where the cotton is mainly machine picked, and for West Texas, where the cotton is mainly machine stripped. Peak capacity ratings of the models began at 6 bales per hour and increased at 2-bale intervals to the largest capacity rating of 24 bales per hour.

Size specifications for overhead cleaning machinery, fans, and lint cleaners were based on manufacturers' claims. In deriving seasonal volume capabilities of the models, sustained productive capacities were estimated at 85 percent of the manufacturers' ratings.

Production densities used in determining seed cotton assembly costs were based on U.S. Bureau of the Census data for 1960-65. Estimates of transportation costs were based on truck and seed cotton trailer seasonal operating costs and labor rates for 1965-66 in each of the 3 geographic areas.

## DEVELOPING MODEL GINS

Recommendations for the construction of a new gin plant or the modification of an existing plant must be based on a combination of sound engineering and economic principles. The ultimate goal should be to maximize mechanical operating performance at a minimized per unit cost of production.

### Machinery Combinations

Machinery combinations used in gin plants throughout the Cotton Belt are extremely varied. In the past several years, research conducted by the U.S. Department of Agriculture Cotton Ginning Research Laboratories, other Federal research agencies, and the gin machinery manufacturers has resulted in recommendations of machinery combinations which will produce maximum bale value and preserve the inherent qualities of the cotton fiber.

One of the prime factors affecting machinery requirements in gins is the method of harvest. For all practical purposes, harvest methods are of 2 types--machine-picking and machine-stripping. 1/ The practice of hand harvesting has declined to the point that it is no longer of importance in determining gin plant layout.

1/ Machine-picking, the predominant method of harvesting throughout the Cotton Belt, consists of the use of mechanically operated spindles designed to remove only the cotton locks from the plant. Machine-stripping consists of the literal stripping of bolls, leaves, and even some branches from the plant. This method of harvest is employed principally in the High Plains of West Texas.

## Machine-Picked Cotton

Machine-picked seed cotton is conveyed from the trailer to the automatic feeder control unit by an unloading fan. From here it is metered into a hot-air line leading to the first drier, usually a 24-shelf tower unit or the equivalent (fig. 3). The seed cotton then passes through a 6- or 7-cylinder cleaner, a stick or bur machine, a second stage of drying and cleaning, and into the conveyor distributor. A way of by-passing one stage of drying and cleaning should be provided. The final stage of processing prior to the separation of fiber and seed occurs at the extractor-feeders mounted over the gin stands. Following the separation of lint and seed at the stands, lint is conveyed through either 1 or 2 stages of lint cleaning, as required, and then to the press for packaging.

## Machine-Stripped Cotton

Machine-stripped cotton requires more extracting equipment for maximum bale value than does machine-picked cotton. In addition to the regular complement of cleaners required for machine-picked cotton, an air line cleaner, a boll trap, a stick machine, and a bur machine are standard items in the processing machinery setup. The air line cleaner and boll trap are installed ahead of the automatic feed control, the bur machine is usually located just prior to the second drier, and the stick machine follows the second incline cleaner (fig. 4).

# Machinery Specifications

Ginning rate is probably the major factor governing specified sizes of machinery components to be used in the ginning process. The number and size of gin stands are usually the bases for establishing the desired ginning rate. Once this has been determined, specifications for other equipment to be incorporated in the system can be made.

## Capacities of 6 to 8 Bales per Hour

For plant capacities of 6 to 8 bales per hour, cylinder cleaners, separators, droppers, and feed control units should be 50 inches wide and the stick machine 72 inches wide. The air line cleaner needed in gins handling machine-stripped cotton should be 50 inches wide and the bur machine should be 10 feet long. Boll traps usually come in only one size.

## Capacities of 10 to 12 Bales per Hour

The widths of cylinder cleaners, feed control separators, and droppers should be increased to 72 inches and the width of stick machines to 96 inches for gins processing from 10 to 12 bales per hour. Bur machines should be increased in length to 14 feet at these capacities.

## Capacities of 14 to 24 Bales per Hour

A split-stream cotton drying and cleaning system is recommended for gins processing in excess of 12 bales per hour. 2/ For 14- to 16-bale capacities, 50-

2/ In a split-stream system, two separate systems of overhead cleaning equipment are installed and operate in parallel. This is necessary when the ginning capacity of the stands exceeds the cleaning capacity of a single stream of overhead equipment.

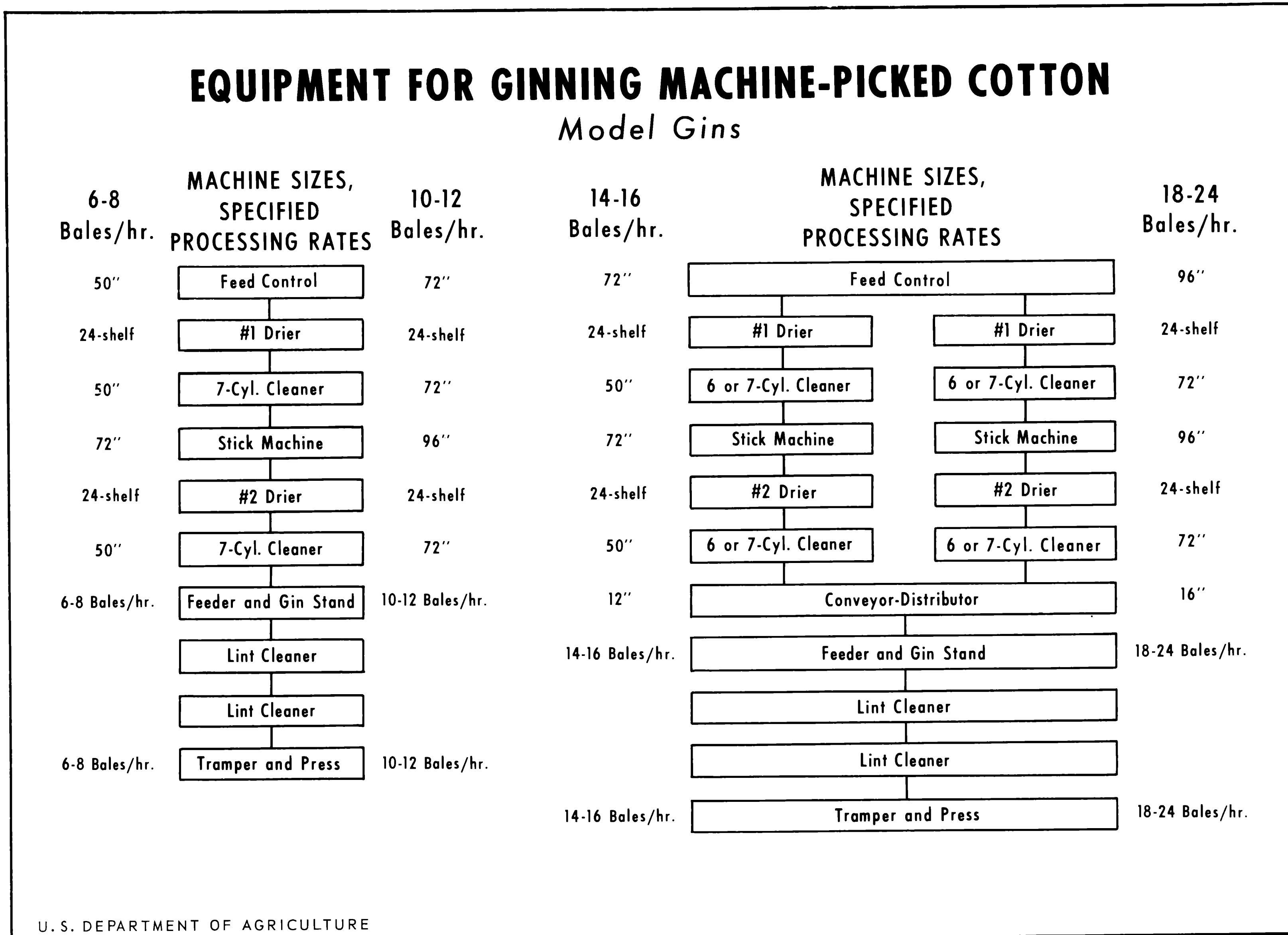
EQUIPMENT FOR GINNING MACHINE-PICKED COTTON
Model Gins
6-8 Bales/hr.
MACHINE SIZES, SPECIFIED PROCESSING RATES
10-12 Bales/hr.
50″
Feed Control
72″
24-shelf
#1 Drier
24-shelf
50″
7-Cyl. Cleaner
72″
72″
Stick Machine
96″
24-shelf
#2 Drier
24-shelf
50″
7-Cyl. Cleaner
72″
6-8 Bales/hr.
Feeder and Gin Stand
10-12 Bales/hr.
Lint Cleaner
Lint Cleaner
6-8 Bales/hr.
Tramper and Press
10-12 Bales/hr.
14-16 Bales/hr.
MACHINE SIZES, SPECIFIED PROCESSING RATES
18-24 Bales/hr.
72″
Feed Control
96″
24-shelf
#1 Drier
#1 Drier
24-shelf
50″
6 or 7-Cyl. Cleaner
6 or 7-Cyl. Cleaner
72″
72″
Stick Machine
Stick Machine
96″
24-shelf
#2 Drier
#2 Drier
24-shelf
50″
6 or 7-Cyl. Cleaner
6 or 7-Cyl. Cleaner
72″
12″
Conveyor-Distributor
16″
14-16 Bales/hr.
Feeder and Gin Stand
18-24 Bales/hr.
Lint Cleaner
Lint Cleaner
14-16 Bales/hr.
Tramper and Press
18-24 Bales/hr.
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Figure 3

# EQUIPMENT FOR GINNING MACHINE-STRIPPED COTTON

*Model Gins*

| 6-8 Bales/hr. | MACHINE SIZES, SPECIFIED PROCESSING RATES | 10-12 Bales/hr. |
|---|---|---|
| -- | Boll Trap | -- |
| 50″ | Airline Cleaner | 72″ |
| 50″ | Feed Control | 72″ |
| 24-shelf | #1 Drier | 24-shelf |
| 50″ | 6 or 7-Cyl. Cleaner | 72″ |
| 10′ | Bur Machine | 14′ |
| 24-shelf | #2 Drier | 24-shelf |
| 50″ | 6 or 7-Cyl. Cleaner | 72″ |
| 72″ | Stick Machine | 96″ |
| 6-8 Bales/hr. | Feeder and Gin Stand | 10-12 Bales/hr. |
| | Lint Cleaner | |
| | Lint Cleaner | |
| 6-8 Bales/hr. | Tramper and Press | 10-12 Bales/hr. |

| 14-16 Bales/hr. | MACHINE SIZES, SPECIFIED PROCESSING RATES | | 18-24 Bales/hr. |
|---|---|---|---|
| -- | Boll Trap | Boll Trap | -- |
| 50″ | Airline Cleaner | Airline Cleaner | 72″ |
| 50″ | Feed Control | Feed Control | 72″ |
| 24-shelf | #1 Drier | #1 Drier | 24-shelf |
| 50″ | 6 or 7-Cyl. Cleaner | 6 or 7-Cyl. Cleaner | 72″ |
| 10′ | Bur Machine | Bur Machine | 14′ |
| 24-shelf | #2 Drier | #2 Drier | 24-shelf |
| 50″ | 6 or 7-Cyl. Cleaner | 6 or 7-Cyl. Cleaner | 72″ |
| 72″ | Stick Machine | Stick Machine | 96″ |
| 12″ | Conveyor-Distributor | | 16″ |
| 14-16 Bales/hr. | Feeder and Gin Stand | | 18-24 Bales/hr. |
| | Lint Cleaner | | |
| | Lint Cleaner | | |
| 14-16 Bales/hr. | Tramper and Press | | 18-24 Bales/hr. |

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Figure 1

inch cylinder cleaners, 72-inch stick machines, and 10-foot bur machines are adequate. To process 18 to 24 bales per hour, the sizes should be increased to 72 inches for the cylinder cleaners, 96 inches for the stick machines, and 14 feet for the bur machines. For machine-picked cotton, the overhead cleaning system should be split immediately following the automatic feed control. For machine-stripped cotton, a dual system of overhead cleaning and conditioning should be employed all the way from the trailer to the conveyor-distributor.

## Fan Requirements

The provision of adequate facilities for conveying seed cotton, lint, cottonseed, and trash during the ginning process should be of major concern in any plant layout and design. Because of additional flexibility, ease of installation, and relatively low initial cost, pneumatic conveying systems are used extensively in today's gin plants.

Three types of fans or blowers are commonly employed in conveying the various materials during processing. Unloading, airblast, and drier push fans are normally of the forward, curved-blade, centrifugal type. These fans are capable of handling relatively clean air at high pressures. Trash-conveying fans, which include the drier pull fans, should be of the straight-blade, centrifugal type. This type also operates at relatively high pressures, and is capable of conveying trash directly through the fan itself, eliminating the need for additional separators and droppers. Air for moving the lint is generated by the gin stand and lint cleaner doffing systems, and is exhausted by vane-axial type fans. These fans are located at each lint cleaner condenser and at the battery condenser. Positive displacement-type blowers or air pumps provide the most economical means of moving cottonseed from within the gin building to outside storage areas.

The number and size of the fans used in the ginning system are dependent upon both the ginning rate and the type of seed cotton cleaning system employed--single- or split-stream. Vane-axial condenser exhaust fans will vary in number and size according to the number of stages of lint cleaning used and the number of lint cleaners employed at each stage.

## Input Requirements and Costs

### Investment

The high cost of constructing modern gin plants is sufficient evidence that ginning can no longer be looked upon as a relatively unimportant business. Little more than a decade ago, the expenditure of $1/4 million on a single-battery gin was almost unknown. Recently, single-battery plants have been built requiring outlays of up to $1/2 million. Table 1 shows total investment in the model gins, and distribution of the investment among land, buildings, machinery, and so on.

The largest single cost item in new plant construction is gin machinery. In the construction cost estimates for the model gin plants, the cost of machinery ranged from about three-fourths of the total investment cost in the smaller models to almost four-fifths in the larger models. 3/ The additional overhead cleaning equipment required to handle machine-stripped cotton raised the investment costs in the West Texas models over those for the Far West and Midsouth by amounts ranging from $6,000 for the smallest to $21,000 for the largest models.

3/ Cost of machinery includes all handling, conditioning, cleaning, and ginning machinery; electric motors; installation; and wiring.

Table 1.--Midsouth, Far West, and West Texas: percentage distribution of investment costs for model gins, 1965-66

| Item | Bale capacity per hour | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 |
| | Thous. dol. | Thous. dol. | Thous. dol. | Thous. dol. | Thous. dol. | Thous. dol. | Thous. dol. | Thous. dol. | Thous. dol. | Thous. dol. |
| Midsouth and Far West (machine picking areas): | | | | | | | | | | |
| Total investment | 200 | 220 | 251 | 280 | 329 | 360 | 391 | 421 | 457 | 484 |
| | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. |
| Distribution: | | | | | | | | | | |
| Land 1/ | 6.0 | 5.5 | 5.6 | 5.0 | 4.9 | 4.4 | 4.6 | 4.3 | 4.4 | 4.1 |
| Gin buildings 2/ | 12.0 | 10.9 | 10.3 | 10.0 | 8.5 | 9.4 | 8.7 | 9.5 | 8.7 | 8.3 |
| Gin machinery | 72.0 | 74.5 | 74.9 | 76.1 | 79.1 | 79.0 | 79.8 | 79.8 | 78.8 | 79.4 |
| Outside equipment 3/ | 3.5 | 3.2 | 3.2 | 2.8 | 2.4 | 2.5 | 2.3 | 2.1 | 2.6 | 2.9 |
| Tractor | 1.0 | .9 | 1.2 | 1.1 | .9 | .8 | .8 | .7 | 1.1 | 1.2 |
| Tools | 1.0 | .9 | .8 | 1.1 | .9 | .8 | .8 | .7 | .9 | .8 |
| Office building | 2.5 | 2.3 | 2.0 | 2.1 | 1.8 | 1.7 | 1.5 | 1.4 | 1.7 | 1.7 |
| Office equipment 4/ | 1.0 | .9 | 1.2 | 1.1 | .9 | .8 | 1.0 | 1.0 | .9 | .8 |
| Auto, truck | 1.0 | .9 | .8 | .7 | .6 | .6 | .5 | .5 | .9 | .8 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| | Thous. dol. | Thous. dol. | Thous. dol. | Thous. dol. | Thous. dol. | Thous. dol. | Thous. dol. | Thous. dol. | Thous. dol. | Thous. dol. |
| West Texas (machine stripping areas): | | | | | | | | | | |
| Total investment | 206 | 226 | 259 | 288 | 344 | 375 | 412 | 442 | 478 | 505 |
| | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. |
| Distribution: | | | | | | | | | | |
| Land 1/ | 5.8 | 5.3 | 5.4 | 4.9 | 4.7 | 4.3 | 4.4 | 4.1 | 4.2 | 4.0 |
| Gin buildings 2/ | 11.6 | 10.6 | 10.0 | 9.7 | 8.1 | 9.1 | 8.3 | 9.0 | 8.4 | 7.9 |
| Gin machinery | 72.8 | 75.2 | 75.6 | 76.8 | 79.9 | 79.7 | 80.8 | 80.8 | 79.8 | 80.1 |
| Outside equipment 3/ | 3.4 | 3.1 | 3.1 | 2.8 | 2.3 | 2.4 | 2.2 | 2.0 | 2.5 | 2.8 |
| Tractor | 1.0 | .9 | 1.2 | 1.0 | .9 | .8 | .7 | .7 | 1.0 | 1.2 |
| Tools | 1.0 | .9 | .8 | 1.0 | .9 | .8 | .7 | .7 | .8 | .8 |
| Office building | 2.4 | 2.2 | 1.9 | 2.1 | 1.7 | 1.6 | 1.4 | 1.4 | 1.7 | 1.6 |
| Office equipment 4/ | 1.0 | .9 | 1.2 | 1.0 | .9 | .8 | 1.0 | .9 | .8 | .8 |
| Auto, truck | 1.0 | .9 | .8 | .7 | .6 | .5 | .5 | .4 | .8 | .8 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

1/ Based on average cost estimated at $1,000 per acre.
2/ Includes foundation.
3/ Incinerator, cyclones, piping, seed hopper, bale trailer, etc.
4/ Includes furniture and fixtures.

Modern gin buildings also represent substantial investments. Much of this cost is for the concrete foundation, which must be sufficiently strong to support the heavy machinery when it is operating at high speeds. Estimated costs for buildings in the models ranged from $24,000 for a 6-bale gin to $40,000 for a 24-bale gin.

Careful planning in selecting a gin plant site can minimize land requirements. 4/ However, the shortening of the harvest period, which results in heavy backlogs of unginned trailer loads at the peak of the season, has placed an extra-heavy demand on trailer parking space at most gin plants. Also, additional acreage is required in areas where baled cotton is stored on the yard. Although the cost of land will vary greatly from area to area and within areas, this item will account for a significant proportion of the total investment cost in any locality.

## Power

During recent years there has been a revolutionary change in the means of powering cotton gins. Twenty years ago an all-electric gin was a rarity. Now, practically all modern gin plants are powered by electricity. In addition, the single motor-line shaft combination has been replaced almost entirely by individual motors for each machine or machine group. The main advantages of individual drives are flexibility and convenience. Individual machines can be shut down when not in use. Also, repairs can be made while partial production is maintained. Under the single motor arrangement, the entire plant has to be shut down. For example, in a plant with 4 individually driven gin stands, production could be maintained at 75 percent of full capacity while extensive repairs were being made to one of the gin stands, feeders, or unit lint cleaners. The disadvantages of the single motor gin stands are the increased possibility of having excessive connected horsepower and the higher initial investment in many small motors as opposed to 1 or 2 very large motors.

The selection of sizes in electric motors is rather limited, so it is often difficult to match connected horsepower to actual load requirements. Power requirements for a machine will vary considerably as a result of changes in the condition of seed cotton and the nature of the ginning operation. However, fluctuations in power requirements, resulting in temporary overloading, usually pose no problem because of built-in overload safety factors in most motors. Nevertheless, to be on the safe side, many ginners have installed larger motors than actually needed throughout the gin plant. Although the total amount of energy used is not affected, excess connected horsepower can result in unnecessarily high seasonal energy costs. 5/

Under some rate schedules in the Cotton Belt, a power factor reading below a certain range increases the cost per kilowatt-hour used. Under other rate schedules, discounts are based on the amount of energy used in relation to total connected load. Therefore, with most schedules it is advantageous from the standpoint of power costs to keep the total connected load as near actual load requirements as practicable for efficient operation.

In addition to direct benefits from maintaining high power factors, certain indirect benefits such as increased voltages and released system capacities will accrue. Although it is difficult to estimate amounts, these benefits can result in additional savings.

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4/ For detailed discussion of gin plant yard plans see Handbook for Cotton Ginners, Agricultural Handbook 260, U.S. Dept. of Agr., Agr. Res. Serv., Feb. 1964.

5/ Wilmot, Charles A., and David M. Alberson. Effects of Oversized Motors on Power Costs in Ginning Cotton. U.S. Dept. Agr., Econ. Res. Serv., ERS 203, Nov. 1964.

Appendix tables 17 and 18 give acutal horsepower requirements and recommended motor sizes under normal conditions for each individually driven machine or machine group to be incorporated in each of the gin models. In areas where machine picking is practiced, requirements for operating the gin models ranged from 349 horsepower for the 6-bale plants to 1,042 horsepower for the 24-bale plants. A disproportionate increase in total power requirements relative to the increase in ginning capacity resulted when rated ginning capacity was increased from 12 to 14 bales per hour. This was because of the doubling of unloading and overhead cleaning equipment which was recommended at this step.

Total connected loads for models designed for machine-picked cotton ranged from 457.5 horsepower for the 6-bale models to 1,244.5 horsepower for the 24-bale models. The specified motor sizes were generally of the lowest possible ratings available to meet the predetermined power requirements of the machines to be operated.

Actual power requirements and total connected loads were higher for model gins designed for machine-stripped cotton than for those designed for machine-picked cotton because of the additional equipment required. Actual power requirements ranged from 379 horsepower for the 6-bale model to 1,131 horsepower for the 24-bale model. Total connected loads were 495 horsepower for the smallest model and 1,367 horsepower for the largest model.

A study by major functions reveals that the materials handling, drying, and feeding-ginning-doffing functions combined accounted for over 80 percent of the total power requirements (table 2). The relative importance of the materials handling function indicates that this would be a fertile area for research designed to further reduce ginning costs.

Energy

Horsepower requirements can be minimized when the gin is designed by careful selection of machine sizes and combinations and careful planning of the overall layout. After a plant is constructed, however, efficiencies in the utilization of energy will be determined largely by management. 6/

Energy requirements for the gin models designed for machine-picked cotton ranged from 51.03 kilowatt-hours per bale for the 6-bale models to 38.09 kilowatt-hours per bale for the 24-bale models (table 3). Under the rate schedule for 1 of the large utility companies serving the Midsouth, the cost per kilowatt-hour would range from 3.46 cents for the smallest to 3.19 cents for the largest models. This would cause a difference in per bale costs for electricity alone of 55 cents in favor of the 24-bale model, assuming both gins were operating at full capacity.

Because of generally lower electric rates in the Far West, the costs per kilowatt-hour under a specific utility rate schedule would range from 1.90 cents for the 6-bale gin to 1.71 cents for the 24-bale gin. The difference in costs per bale would favor the largest model by 32 cents.

Since actual horsepower requirements are greater for gins designed for stripper harvesting, energy consumption in kilowatt-hours will also be higher. Estimates

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6/ Watson, Harold, and Zolon M. Looney. Start at the Starter Switch for Efficient Gin Operation. The Cotton Gin and Oil Mill Press, Nov. 21, 1964.

Table 2.--Midsouth, Far West, and West Texas: Percentage distribution of total power requirements, by major ginning functions in model gins, 1965-66

| Harvesting method & ginning function | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Bale capacity per hour | | | | | | | | | |
| Midsouth and Far West (machine picking areas): | Hp. | Hp. | Hp. | Hp. | Hp. | Hp. | Hp. | Hp. | Hp. | Hp. |
| Total horsepower | 349 | 404 | 469 | 561 | 719 | 794 | 868 | 918 | 971 | 1,042 |
| Distribution: | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. |
| Materials handling 1/ | 36.1 | 35.6 | 37.0 | 38.0 | 34.1 | 35.3 | 37.1 | 36.2 | 36.2 | 33.9 |
| Drying 2/ | 29.2 | 25.2 | 21.8 | 21.4 | 28.3 | 25.7 | 23.5 | 22.2 | 21.0 | 23.0 |
| Seed cotton cleaning 3/ | 3.2 | 2.7 | 3.2 | 2.7 | 3.1 | 2.8 | 3.0 | 3.3 | 3.2 | 2.9 |
| Feeding, ginning, and doffing 4/ | 20.6 | 23.8 | 25.6 | 25.7 | 23.3 | 24.2 | 24.9 | 26.2 | 27.2 | 27.6 |
| Lint cleaning 5/ | 8.0 | 10.0 | 9.8 | 10.0 | 9.2 | 10.1 | 9.7 | 10.2 | 10.5 | 10.8 |
| Packaging 6/ | 2.9 | 2.7 | 2.6 | 2.2 | 2.0 | 1.9 | 1.8 | 1.9 | 1.9 | 1.8 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| West Texas (machine stripping area): | Hp. | Hp. | Hp. | Hp. | Hp. | Hp. | Hp. | Hp. | Hp. | Hp. |
| Total horsepower | 379 | 443 | 520 | 612 | 815 | 890 | 935 | 1,007 | 1,060 | 1,131 |
| Distribution: | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. |
| Materials handling 1/ | 38.8 | 39.3 | 40.9 | 41.3 | 39.7 | 40.3 | 39.5 | 39.6 | 39.5 | 36.9 |
| Drying 2/ | 26.9 | 23.0 | 19.6 | 19.6 | 25.0 | 22.9 | 21.8 | 20.2 | 19.2 | 21.2 |
| Seed cotton cleaning 3/ | 5.3 | 4.5 | 5.2 | 4.4 | 4.9 | 4.5 | 4.9 | 5.4 | 5.1 | 4.8 |
| Feeding, ginning, and doffing 4/ | 19.0 | 21.7 | 23.1 | 23.6 | 20.6 | 21.6 | 23.1 | 23.8 | 24.9 | 25.5 |
| Lint cleaning 5/ | 7.4 | 9.0 | 8.9 | 9.1 | 8.1 | 9.0 | 9.0 | 9.3 | 9.6 | 9.9 |
| Packaging 6/ | 2.6 | 2.5 | 2.3 | 2.0 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

1/ Unloading fan, feeder control, distributor and overflow separator, overflow fan, trash fan, 2 vane-axial fans in lint cleaner, mote fans, condenser exhaust fan, seed belt, trash auger, seed blower, and air compressor (also, bur fan in mechanical-stripper area).

2/ Includes push and pull fans.

3/ Includes 2 cylinder cleaners and stick machine (also, airline cleaner and bur machine in mechanical-stripper area).

4/ Feeders, gin stands and brushes, or air blast fan.

5/ 2 stages--saw cylinders and brushes.

6/ Condenser, kicker and tramper, and press pump.

Table 3.--Midsouth, Far West, and West Texas: Estimated energy consumption and costs for model gins, 1965-66

| Item | Unit | Bale capacity, per hour | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 |
| Seasonal volume 1/ ..... | Bale | 4,620 | 6,160 | 7,700 | 9,240 | 10,780 | 12,320 | 13,860 | 15,400 | 16,940 | 18,480 |
| Midsouth (machine-picked area): 2/ | | | | | | | | | | | |
| Energy consumption . | Kw.-hr. | 51.03 | 44.30 | 41.14 | 41.01 | 45.06 | 43.54 | 42.31 | 40.27 | 38.72 | 38.09 |
| Cost per kw.-hr. ... | Cent | 3.46 | 3.39 | 3.32 | 3.30 | 3.26 | 3.25 | 3.23 | 3.21 | 3.19 | 3.19 |
| Cost per bale ...... | Dollar | 1.77 | 1.50 | 1.37 | 1.35 | 1.47 | 1.41 | 1.37 | 1.29 | 1.24 | 1.22 |
| Far West (machine-picked area): 2/ | | | | | | | | | | | |
| Energy consumption . | Kw.-hr. | 51.03 | 44.30 | 41.14 | 41.01 | 45.06 | 43.54 | 42.31 | 40.27 | 38.72 | 38.09 |
| Cost per kw.-hr. ... | Cent | 1.90 | 1.88 | 1.83 | 1.78 | 1.75 | 1.74 | 1.73 | 1.72 | 1.72 | 1.71 |
| Cost per bale ...... | Dollar | .97 | .83 | .75 | .73 | .79 | .76 | .73 | .69 | .67 | .65 |
| West Texas (machine-stripped area): 3/ | | | | | | | | | | | |
| Energy consumption . | Kw.-hr. | 55.42 | 48.58 | 45.62 | 44.74 | 51.07 | 48.80 | 45.57 | 44.17 | 42.27 | 41.34 |
| Cost per kw.-hr. | Cent | 2.52 | 2.52 | 2.52 | 2.52 | 2.52 | 2.52 | 2.52 | 2.52 | 2.52 | 2.52 |
| Cost per bale ...... | Dollar | 1.40 | 1.22 | 1.15 | 1.13 | 1.28 | 1.23 | 1.15 | 1.11 | 1.06 | 1.04 |

1/ Based on assumed operating rate of maximum capacity for the season, without seed cotton storage. (See table 12 for 2-week ginning requirements for each of the 10 specific models.)
2/ Model gins designed for machine-picked cotton.
3/ Model gins designed for machine-stripped cotton.

of kilowatt-hours per bale for gins equipped for machine-stripped cotton ranged from 55.42 for the 6-bale model to 41.34 for the 24-bale plant. Under the rate schedule of a utility company serving a large area of West Texas, the cost of electricity would be 2.52 cents per kilowatt-hour for all models regardless of size. The difference between the largest and smallest models in cost of electricity per bale would be 36 cents.

## Labor

Labor is one of the major cost items in cotton ginning, since wage rates paid cotton gin employees are determined largely by competition from other local industries. The cost could become increasingly important if the processing of farm crops is brought under minimum wage laws.

In establishing labor standards for the model gins, statistics on ginning distributions for a number of recent years were assembled and analyzed. 7/ The data indicated that approximately 33 percent of the cotton crop is usually ginned during the peak 2-week period of the season (table 4). Based on the pattern of production shown in table 6, the following minimum labor requirements for a complete ginning season were established. During the first 2-week ginning period, it would be advisable to keep a crew available at the gin 8 hours a day, 6 days a week to handle the initial receipts even though the cotton flow is likely to be sporadic and the total volume small. This would provide an opportunity to train new crew members, to retrain old personnel, and to make final adjustments to the ginning equipment. As the harvest progresses, the length of the shift should be extended to 12 hours, a total of 144 hours of operating time during the third and fourth weeks. At the end of the third week, it would be prudent to add a night shift to familiarize the crew with its duties before the peak of the harvest arrives and to take care of the surplus unginned cotton which would begin to accumulate at this point. During the next 4 weeks, practically continous day and night operations would be required. At the end of the eighth week, generally the rate of harvest will have decreased enough that the day crew can keep abreast of the harvest with only a minimum of overtime. However, to obtain competent workers for the night crew, it might be necessary to assure them of at least 6 weeks of employment, which would necessitate operating that shift for an additional week.

Table 4.--Midsouth, Far West, and West Texas: Distribution of hourly crew requirements by 2-week ginning periods, for model gins 1965-66 1/

| Item | 2-week ginning periods | | | | | | | Season total |
|---|---|---|---|---|---|---|---|---|
| | 1st | 2d | 3d | 4th | 5th | 6th | 7th | |
| Portion of crop ginned (percent) | 2 | 14 | 33 | 25 | 16 | 6 | 4 | 100 |
| Day crew: 2/ | | | | | | | | |
| Total days worked | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 84 |
| Hours worked per day | 8 | 12 | 12 | 12 | 12 | 8 | 8 | --- |
| Total hours worked | 96 | 144 | 144 | 144 | 144 | 96 | 96 | 864 |
| Night crew: 2/ | | | | | | | | |
| Total nights worked | --- | 6 | 14 | 12 | 6 | --- | --- | 38 |
| Hours worked per night | --- | 12 | 12 | 12 | 12 | --- | --- | --- |
| Total hours worked | --- | 72 | 168 | 144 | 72 | --- | --- | 456 |
| Grand total hours worked | 96 | 216 | 312 | 288 | 216 | 96 | 96 | 1,320 |

1/ Allows 12 days during first 2-week ginning period to train new crewmen and to make final repairs and adjustments; 6 night shifts during second ginning period to train new crewmen and also to make job sufficiently appealing to attract necessary laborers; and 6 night shifts during 5th ginning period to handle departure from normal ginning distribution and to make jobs more attractive financially.

2/ Crew size is determined by capacity of gin plant (table 7, p. 18).

7/ Cotton Production and Distribution, Year Ending July 31, 1965. U.S. Bur. of the Census, Bul. 202, 1966.

Operating on the above schedule, the model gins would be in operation 1,320 hours per season. In actual practice, seed cotton storage could be provided if workers were not available for the night shift, or if the harvest rate exceeded maximum peak season capacity of a gin. This would not increase ginnings during the early part of the season, but would either make possible more efficient labor utilization during the latter stages of the ginning season, or extend the season beyond the normal limits.

Establishment of standard gin crews as shown in table 5 was based on actual ginning conditions, allowing a minimum of 25-percent idle time for each worker. For gin models designed to process machine-picked cotton, the yard and suction crews ranged in size from 2 men for the 6-bale models to 4 men for the 24-bale models. Conditioning and ginning required from 1 to 3 men and bale packaging from 2 to 5 men. Total crew sizes ranged from 5 men for the 6-bale models to 12 men for the 24-bale models. If full crews were maintained for a total of 1,320 hours, this would result in 6,600 man-hours per season for the 6-bale models and 15,840 man-hours for the 24-bale models.

For gin models equipped to process machine-stripped cotton, an additional man was required in the yard and suction crew beginning with the 14-bale model, and in the conditioning and ginning crew at each capacity level. Total crew sizes ranged from 6 men for the smallest to 14 men for the largest model.

Man-hours per bale ranged from 1.43 for the 6-bale models to 0.86 for the 24-bale models in gins designed for machine-picked cotton processing maximum seasonal volumes without storage (table 6). Under these same conditions, the range from the smallest to the largest was 1.71 to 1.00 man-hours per bale, in gins designed for mechanically stripped cotton.

Table 5.--Midsouth, Far West, and West Texas: Recommended crew sizes, by functions, for model gins, 1965-66

| Harvesting method and gin crew function | Bale capacity per hour: 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 |
|---|---|---|---|---|---|---|---|---|---|---|
| Midsouth and Far West (machine-picked area): | Men | Men | Men | Men | Men | Men | Men | Men | Men | Men |
| Yard & suction | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 4 |
| Conditioning & ginning | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 3 | 3 |
| Bale packaging | 2 | 2 | 3 | 3 | 4 | 4 | 4 | 5 | 5 | 5 |
| Total | 5 | 6 | 7 | 8 | 9 | 10 | 10 | 11 | 12 | 12 |
| West Texas (machine-stripped area): | | | | | | | | | | |
| Yard & suction | 2 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 5 | 5 |
| Conditioning & ginning | 2 | 2 | 2 | 3 | 3 | 4 | 4 | 4 | 4 | 4 |
| Bale packaging | 2 | 2 | 3 | 3 | 4 | 4 | 4 | 5 | 5 | 5 |
| Total | 6 | 7 | 8 | 9 | 11 | 12 | 12 | 13 | 14 | 14 |

Table 6.--Midsouth, Far West, and West Texas: Estimated labor requirements and labor costs for model gins, 1965-66

| Item | Bale capacity per hour | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 |
| | Bales | Bales | Bales | Bales | Bales | Bales | Bales | Bales | Bales | Bales |
| Seasonal volume 1/ | 4,620 | 6,160 | 7,700 | 9,240 | 10,780 | 12,320 | 13,860 | 15,400 | 16,940 | 18,480 |
| | Man-hrs. | Man-hrs. | Man-hrs. | Man-hrs. | Man-hrs. | Man-hrs. | Man-hrs. | Man-hrs. | Man-hrs. | Man-hrs. |
| Midsouth (machine-picked area): | | | | | | | | | | |
| Labor per bale | 1.43 | 1.29 | 1.20 | 1.14 | 1.10 | 1.07 | .95 | .94 | .94 | .86 |
| | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. |
| Cost per man-hour 2/ | 1.50 | 1.46 | 1.42 | 1.41 | 1.39 | 1.37 | 1.38 | 1.37 | 1.35 | 1.35 |
| Cost per bale | 2.14 | 1.88 | 1.71 | 1.61 | 1.53 | 1.47 | 1.31 | 1.29 | 1.27 | 1.16 |
| | Man-hrs. | Man-hrs. | Man-hrs. | Man-hrs. | Man-hrs. | Man-hrs. | Man-hrs. | Man-hrs. | Man-hrs. | Man-hrs. |
| Far West (machine-picked area): | | | | | | | | | | |
| Labor per bale | 1.43 | 1.29 | 1.20 | 1.14 | 1.10 | 1.07 | .95 | .94 | .94 | .86 |
| | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. |
| Cost per man-hour 3/ | 2.12 | 2.07 | 2.06 | 2.04 | 2.03 | 2.01 | 2.01 | 2.01 | 1.98 | 1.99 |
| Cost per bale | 3.03 | 2.68 | 2.47 | 2.33 | 2.23 | 2.15 | 1.91 | 1.89 | 1.86 | 1.71 |
| | Man-hrs. | Man-hrs. | Man-hrs. | Man-hrs. | Man-hrs. | Man-hrs. | Man-hrs. | Man-hrs. | Man-hrs. | Man-hrs. |
| West Texas (machine-stripped area): | | | | | | | | | | |
| Labor per bale | 1.71 | 1.50 | 1.37 | 1.28 | 1.35 | 1.28 | 1.14 | 1.11 | 1.09 | 1.00 |
| | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. |
| Cost per man-hour 4/ | 1.58 | 1.56 | 1.54 | 1.53 | 1.50 | 1.50 | 1.49 | 1.49 | 1.48 | 1.48 |
| Cost per bale | 2.71 | 2.34 | 2.11 | 1.96 | 2.02 | 1.92 | 1.70 | 1.65 | 1.61 | 1.48 |

1/ Based on assumed operating rate of maximum capacity for the season, without seed cotton storage. (See table 12 for 2-week ginning requirements for each of the models.) 2/ Based on $2.50 per hour for ginner, $1.25 per hour for other crewmen. 3/ Based on $3.00 per hour for ginner, $1.90 per hour for other crewmen. 4/ Based on $2.50 per hour for ginner, $1.40 per hour for other crewmen.

Because of generally higher wage rates in the Far West, estimates of labor costs were highest in that area, ranging from $3.03 per bale for the 6-bale model to $1.71 per bale for the 24-bale model, a difference of $1.32. The 24-bale model plants showed per bale labor cost advantages of $0.98 in the Midsouth, and $1.23 in West Texas.

## Miscellaneous

Other variable cost items necessary in operating cotton gins are bagging and ties, repairs, drier fuel, and supplies. Costs to ginners for bagging and ties vary between areas as a result of differences in quality and differentials in freight rates. In the 3 major producing areas considered in this study, wrapping material is generally highest in the Far West and lowest in West Texas. Repairs run about the same in areas where methods of harvest are similar, but, the large quantities of sticks, stems, burs, dirt, and sand which are incorporated in seed cotton in the machine-stripped harvest areas cause excessive wear on bearings, fans, pipes, and other equipment and thus result in higher repair costs than in machine-picked areas.

Costs of drier fuel vary, depending on prevailing prices in different areas and the type of gas available. Natural gas is usually cheaper than liquefied petroleum. Supplies and other items such as utilities, advertising, and legal fees, will cost about the same in all areas.

The larger gin plants continued to accrue cost advantages for energy consumption and labor utilization. In each of the 3 geographic areas the total miscellaneous operating costs were 67 cents per bale lower for the 24-bale model than for the 6-bale model (table 7). Bagging and ties, and repairs accounted for about two-thirds of the total miscellaneous operating costs for all plant sizes in each of the 3 areas.

## Overhead

Overhead costs are those which accrue with only a slight relationship to volume. Management and office salaries may vary somewhat with changes in volume, but are not as directly related to volume as are operating costs. Depreciation, interest, plant insurance, and taxes are usually fixed when the plant is constructed, and will vary little from year to year regardless of the number of bales ginned.

In estimating overhead costs for model gins, management and office salaries were set at the same level for gins of the same size in each of the 3 areas of production. Depreciation and interest on investment were higher for gins designed for machine-stripped cotton because of the higher costs involved. Insurance and taxes varied depending upon the prevailing local rates. Under some schedules, rate of depreciation declines in successive years and insurance coverage is reduced as the book value of the plant decreases. For the model gins, however, these factors were held constant.

Estimated overhead costs decreased as plant capacity increased in models for all 3 geographic areas. The difference between the largest and the smallest models was $2.53 in the Midsouth, $2.56 in West Texas, and $2.66 in the Far West (table 8). Up to the 18-bale model, depreciation was the most important factor in overhead costs followed by management and interest. These factors combined accounted for approximately 90 percent of the total overhead costs for model gins in all 3 areas.

Table 7.--Midsouth, Far West, and West Texas: Estimated miscellaneous operating costs, per bale, for model gins, 1965-66

| Item | Bale capacity per hour | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 |
| | Bales | Bales | Bales | Bales | Bales | Bales | Bales | Bales | Bales | Bales |
| Seasonal volume 1/ | 4,620 | 6,160 | 7,700 | 9,240 | 10,780 | 12,320 | 13,860 | 15,400 | 16,940 | 18,480 |
| Midsouth (machine-picked area): | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. |
| Total misc. operating costs | 5.59 | 5.52 | 5.44 | 5.37 | 5.29 | 5.22 | 5.14 | 5.07 | 4.99 | 4.92 |
| | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. |
| Bagging & ties | 47.4 | 47.4 | 47.6 | 47.7 | 47.9 | 47.9 | 48.1 | 48.1 | 48.3 | 48.3 |
| Repairs | 18.6 | 18.5 | 18.4 | 18.2 | 18.1 | 18.0 | 17.9 | 17.8 | 17.6 | 17.5 |
| Drier fuel 2/ | 6.1 | 6.0 | 5.9 | 5.8 | 5.7 | 5.6 | 5.4 | 5.3 | 5.2 | 5.1 |
| Misc. supplies | 4.5 | 4.5 | 4.4 | 4.5 | 4.3 | 4.4 | 4.3 | 4.3 | 4.2 | 4.3 |
| All other | 23.4 | 23.6 | 23.7 | 23.8 | 24.0 | 24.1 | 24.3 | 24.5 | 24.7 | 24.8 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Far West (machine-picked area): | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. |
| Total misc. operating costs | 5.82 | 5.75 | 5.67 | 5.60 | 5.52 | 5.45 | 5.37 | 5.30 | 5.22 | 5.15 |
| | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. |
| Bagging & ties | 49.1 | 49.2 | 49.4 | 49.5 | 49.6 | 49.7 | 49.9 | 50.0 | 50.2 | 50.3 |
| Repairs | 17.9 | 17.8 | 17.6 | 17.5 | 17.4 | 17.3 | 17.1 | 17.0 | 16.8 | 16.7 |
| Drier fuel 2/ | 6.2 | 6.1 | 6.0 | 5.9 | 5.8 | 5.7 | 5.6 | 5.5 | 5.4 | 5.2 |
| Misc. supplies | 4.3 | 4.3 | 4.2 | 4.3 | 4.2 | 4.2 | 4.1 | 4.1 | 4.0 | 4.1 |
| All other | 22.5 | 22.6 | 22.8 | 22.8 | 23.0 | 23.1 | 23.3 | 23.4 | 23.6 | 23.7 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| West Texas (machine-stripped area): | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. |
| Total misc. operating costs | 5.65 | 5.58 | 5.50 | 5.43 | 5.35 | 5.28 | 5.20 | 5.13 | 5.05 | 4.98 |
| | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. |
| Bagging & ties | 41.3 | 41.2 | 41.3 | 41.3 | 41.3 | 41.3 | 41.4 | 41.3 | 41.4 | 41.4 |
| Repairs | 25.1 | 25.1 | 25.1 | 25.0 | 25.1 | 25.0 | 25.0 | 25.0 | 25.0 | 24.9 |
| Drier fuel 2/ | 6.0 | 5.9 | 5.8 | 5.7 | 5.6 | 5.5 | 5.4 | 5.3 | 5.1 | 5.0 |
| Misc. supplies | 4.4 | 4.5 | 4.4 | 4.4 | 4.3 | 4.4 | 4.2 | 4.3 | 4.2 | 4.2 |
| All other | 23.2 | 23.3 | 23.4 | 23.6 | 23.7 | 23.8 | 24.0 | 24.1 | 24.3 | 24.5 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

1/ Based on assumed operating rate of maximum capacity for the season, without seed cotton storage. (See table 12 for 2-week ginning requirements for each of the models.) 2/ Liquid petroleum.

Table 8.--Midsouth, Far West, and West Texas: Estimated overhead costs, per bale, for model gins, 1965-66

| Item | Bale capacity per hour | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 |
| | Bales | Bales | Bales | Bales | Bales | Bales | Bales | Bales | Bales | Bales |
| Seasonal volume 1/ | 4,620 | 6,160 | 7,700 | 9,240 | 10,780 | 12,320 | 23,860 | 15,400 | 16,940 | 18,480 |
| Midsouth (machine-picked area): | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. |
| Total overhead costs | 5.44 | 4.44 | 3.95 | 3.62 | 3.53 | 3.35 | 3.20 | 3.08 | 3.00 | 2.91 |
| | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. |
| Management 2/ | 32.2 | 31.3 | 29.6 | 28.2 | 26.1 | 25.1 | 24.4 | 23.7 | 23.0 | 22.7 |
| Depreciation 3/ | 37.4 | 38.1 | 39.0 | 39.8 | 41.1 | 41.7 | 42.2 | 42.5 | 43.1 | 43.2 |
| Interest 4/ | 21.1 | 21.2 | 21.8 | 22.1 | 22.7 | 22.7 | 23.1 | 23.1 | 23.3 | 23.4 |
| Insurance | 5.3 | 5.4 | 5.6 | 5.8 | 5.9 | 6.0 | 5.9 | 6.2 | 6.3 | 6.2 |
| Taxes | 4.0 | 4.0 | 4.0 | 4.1 | 4.2 | 4.5 | 4.4 | 4.5 | 4.3 | 4.5 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Far West (machine-picked area): | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. |
| Total overhead costs | 5.76 | 4.71 | 4.20 | 3.84 | 3.76 | 3.56 | 3.41 | 3.28 | 3.18 | 3.10 |
| | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. |
| Management 2/ | 30.4 | 29.5 | 27.8 | 26.6 | 24.5 | 23.6 | 22.9 | 22.3 | 21.4 | 21.3 |
| Depreciation 3/ | 35.2 | 35.9 | 36.7 | 37.5 | 38.6 | 39.3 | 39.6 | 39.9 | 40.6 | 40.7 |
| Interest 4/ | 20.0 | 19.9 | 20.5 | 20.8 | 21.3 | 21.3 | 21.7 | 21.6 | 22.0 | 21.9 |
| Insurance | 3.1 | 3.2 | 3.3 | 3.4 | 3.4 | 3.4 | 3.5 | 3.7 | 3.4 | 3.5 |
| Taxes | 11.3 | 11.5 | 11.7 | 11.7 | 12.2 | 12.4 | 12.3 | 12.5 | 12.6 | 12.6 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| West Texas (machine-stripped area): | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. |
| Total overhead costs | 5.59 | 4.57 | 4.08 | 3.72 | 3.67 | 3.48 | 3.36 | 3.23 | 3.13 | 3.03 |
| | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. |
| Management 2/ | 31.3 | 30.4 | 28.7 | 27.4 | 25.1 | 24.1 | 23.2 | 22.6 | 22.1 | 21.8 |
| Depreciation 3/ | 37.6 | 38.1 | 39.0 | 39.8 | 41.4 | 42.0 | 42.3 | 42.7 | 43.1 | 43.2 |
| Interest 4/ | 21.1 | 21.2 | 21.8 | 22.0 | 22.6 | 22.7 | 23.2 | 23.2 | 23.3 | 23.4 |
| Insurance | 7.5 | 7.7 | 7.8 | 8.1 | 8.2 | 8.3 | 8.3 | 8.7 | 8.6 | 8.6 |
| Taxes | 2.5 | 2.6 | 2.7 | 2.7 | 2.7 | 2.9 | 3.0 | 2.8 | 2.9 | 3.0 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

1/ Based on assumed operating rate of maximum capacity for the season, without seed cotton storage. (See table 12 for 2-week ginning requirements for each of the models.) 2/ Includes office salaries. 3/ 5 percent on equipment and buildings. 4/ 5 percent on land, plus 5 percent on one-half cost of equipment and buildings.

## Total Ginning Costs

Total ginning costs per bale for the gin models dropped substantially with increases in size. The difference between the 6-bale and 24-bale models was $4.73 in the Midsouth, $4.82 in West Texas, and $4.97 in the Far West (table 9). Of the 4 cost-item groups--energy, labor, overhead, and miscellaneous operating costs--the latter 2 each accounted for slightly over one-third of the total ginning costs in the 6-bale models. However, with increases in gin size, miscellaneous operating costs increased in importance to about 48 percent, while overhead costs dropped to approximately 29 percent of the total in all 3 areas.

Table 9.--Midsouth, Far West, and West Texas: Estimated total ginning costs, per bale, for model gins, 1965-66

| Item | Bale capacity per hour | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 |
| | Bales | Bales | Bales | Bales | Bales | Bales | Bales | Bales | Bales | Bales |
| Seasonal volume 1/ | 4,620 | 6,160 | 7,700 | 9,240 | 10,780 | 12,320 | 23,860 | 15,400 | 16,940 | 18,480 |
| Midsouth (machine-picked area): | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. |
| Total ginning costs | 14.94 | 13.34 | 12.47 | 11.95 | 11.82 | 11.45 | 11.02 | 10.73 | 10.50 | 10.21 |
| | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. |
| Overhead | 36.5 | 33.3 | 31.7 | 30.3 | 29.9 | 29.3 | 29.0 | 28.7 | 28.6 | 28.5 |
| Energy | 11.8 | 11.2 | 11.0 | 11.3 | 12.4 | 12.3 | 12.4 | 12.0 | 11.8 | 12.0 |
| Labor | 14.3 | 14.1 | 13.7 | 13.5 | 12.9 | 12.8 | 11.9 | 12.0 | 12.1 | 11.4 |
| Misc. operating | 37.4 | 41.4 | 43.6 | 44.9 | 44.8 | 45.6 | 46.7 | 47.3 | 47.5 | 48.1 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Far West (machine-picked area): | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. |
| Total ginning costs | 15.58 | 13.97 | 13.09 | 12.50 | 12.30 | 11.92 | 11.42 | 11.16 | 10.93 | 10.61 |
| | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. |
| Overhead | 37.0 | 33.7 | 32.1 | 30.7 | 30.6 | 29.9 | 29.9 | 29.4 | 29.1 | 29.2 |
| Energy | 6.2 | 5.9 | 5.7 | 5.8 | 6.4 | 6.4 | 6.4 | 6.2 | 6.1 | 6.1 |
| Labor | 19.4 | 19.2 | 18.9 | 18.6 | 18.1 | 18.0 | 16.7 | 16.9 | 17.0 | 16.1 |
| Misc. operating | 37.4 | 41.2 | 43.3 | 44.9 | 44.9 | 45.7 | 47.0 | 47.5 | 47.8 | 48.6 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| West Texas (machine-stripped area): | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. |
| Total ginning costs | 15.35 | 13.71 | 12.84 | 12.24 | 12.32 | 11.91 | 11.41 | 11.12 | 10.85 | 10.53 |
| Overhead | 36.4 | 33.3 | 31.8 | 30.4 | 29.8 | 29.2 | 29.4 | 29.0 | 28.8 | 28.8 |
| Energy | 9.1 | 8.9 | 9.0 | 9.2 | 10.4 | 10.3 | 10.1 | 10.0 | 9.8 | 9.9 |
| Labor | 17.7 | 17.1 | 16.4 | 16.0 | 16.4 | 16.1 | 14.9 | 14.8 | 14.8 | 14.0 |
| Misc. operating | 36.8 | 40.7 | 42.8 | 44.4 | 43.4 | 44.4 | 45.6 | 46.2 | 46.6 | 47.3 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

1/ Based on assumed operating rate of maximum capacity for the season without seed cotton storage. (See table 12 for 2-week ginning requirements for each of the models.)

## Effect of Reduction in Volumes Ginned on Costs

Most gins must operate full time during the 2-week peak period. Full time, used in this context, does not imply continuous operation for 336 consecutive hours during any 2-week period without shutting down. While such performance may be attainable on rare occasions, this would not be a realistic, continuous goal. Instead, two 12-hour shifts should be set aside for maintainance or crew rests, and one-half hour each shift should be allocated to cleaning up. This would reduce the maximum operating time available during a 2-week period to 299 hours and determine the gin size necessary to accommodate any given rate of harvest. For example, the maximum volume which the prescribed gin models would process during the 2-week peak period, assuming that one-third of the crop was harvested, would range from 1,525 bales for the 6-bale model to 6,100 bales for the 24-bale model (table 10). At this rate a total of 906 hours would be required to gin the entire crop, with seasonal volume capabilities ranging from 4,620 bales for the 6-bale models to 18,840 bales for the 24-bale models. However, when gins operated at less than full capacity, seasonal volumes would be reduced and ginning costs raised accordingly. 8/

Reductions in seasonal volumes ginned would have the greatest effect on per bale overhead and labor costs, assuming the same number of crew hours were required when operating at 70 percent of capacity as when operating at 100 percent. For example, a drop in seasonal volumes from 100 to 70 percent of capacity in the 6-bale model gins would result in an estimated per bale increase in overhead cost of $2.20 in the Midsouth, $2.27 in West Texas, and $2.34 in the Far West (tables 11, 12, and 13). In the 24-bale models these cost increases would be $1.12 in the Midsouth, $1.18 in West Texas, and $1.20 in the Far West.

Increases in labor costs, accompanying similar reductions in seasonal volumes, would range from $0.92 per bale in the Midsouth to $1.30 per bale in the Far West for the 6-bale models, and from $0.50 per bale in the Midsouth to $0.73 per bale in the Far West for the 24-bale models.

The effect of reductions in total volumes ginned would not be as pronounced on electrical energy costs. When volumes declined from 100 to 70 percent of capacity, energy cost increases would range from $0.09 per bale in West Texas to $0.26 per bale in the Far West for the 6-bale models, and from $0.05 per bale in the Midsouth to $0.17 per bale in the Far West for the 24-bale models.

Increases in miscellaneous operating costs resulting from drops in seasonal volumes from 100 to 70 percent of capacity would average about $0.06 per bale in the 6-bale models and $0.25 per bale in the 24-bale models in all 3 geographic areas.

Reductions in total volumes ginned would have an inverse effect on each of the 4 cost-item groups discussed above, and therefore on total ginning costs. Using the Midsouth as an example, the respective increases in total costs as volumes dropped by 10-percent intervals, from 100 to 70 percent of capacity, would be $0.86, $1.09, and $1.35 per bale in the 6-bale models. In the 24-bale models, these cost increases would be $0.51, $0.63, and $0.78 per bale. With the exception of the 2 smallest gins (6- and the 8-bale models), the total ginning costs for any of the model plants operating at 100, 90, or 80 percent of full capacity would always be lower than those for the next larger size plant operating at only 90, 80, and 70 percent of capacity. For example, in West Texas, ginning costs for a 12-bale gin operating at full capacity would be $0.76 per bale lower than for a 14-bale gin operating at 90 percent of capacity.

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8/ Based on the assumption that the hourly ginning rate for each model will remain fixed, operating levels of less than full capacity would imply corresponding reductions in total hours of actual gin operation.

Table 10.--Midsouth, Far West, and West Texas: Average ginning distribution, actual operating time required, and ginning volumes attainable in model gin plants operating at full capacity during peak season, 1965-66 1/

| 2-week ginning period | Proportion of season's output | Actual ginning time 2/ | Volumes attainable with model gins of specified hourly capacity ratings in bales 3/ | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 |
| | Percent | Hours | Bales | Bales | Bales | Bales | Bales | Bales | Bales | Bales | Bales | Bales |
| 1st...... | 2 | 18 | 92 | 123 | 154 | 184 | 215 | 246 | 277 | 307 | 338 | 368 |
| 2d....... | 14 | 127 | 647 | 862 | 1,078 | 1,294 | 1,509 | 1,724 | 1,940 | 2,156 | 2,372 | 2,588 |
| 3d 4/.... | 33 | 299 | 1,525 | 2,033 | 2,541 | 3,050 | 3,558 | 4,066 | 4,574 | 5,083 | 5,591 | 6,100 |
| 4th...... | 25 | 227 | 1,155 | 1,540 | 1,925 | 2,310 | 2,695 | 3,080 | 3,465 | 3,850 | 4,235 | 4,620 |
| 5th...... | 16 | 145 | 739 | 986 | 1,232 | 1,478 | 1,725 | 1,972 | 2,218 | 2,464 | 2,710 | 2,956 |
| 6th...... | 6 | 54 | 277 | 370 | 462 | 554 | 647 | 740 | 832 | 924 | 1,016 | 1,108 |
| 7th...... | 4 | 36 | 185 | 246 | 308 | 370 | 431 | 492 | 554 | 616 | 678 | 740 |
| Season. | 100 | 906 | 4,620 | 6,160 | 7,700 | 9,240 | 10,780 | 12,320 | 13,860 | 15,400 | 16,940 | 18,480 |

1/ Figures based on data from Bureau of the Census, 1960-65, U.S. Department of Commerce.
2/ Based on the assumption that every hour of actual operation will be at full capacity.
3/ Based on sustained ginning rate capabilities estimated at 85 percent of specified hourly capacity ratings which were made by the manufacturers. For example, the sustained rate capability for the 6-bale model was set at 5.1 bales per hour.
4/ Volume entries for this period based on maximum availability of 336 operating hours less two 12-hour shifts set aside for crew rest or maintenance and one-half hour per shift deducted for cleaning up.

Table 11.--Midsouth: Relationship between level of attainment in ginning capacity for the season and cost per bale, by cost-item groups, for model gins, 1965-66

| Cost item, capacity attainment, operating hours 1/ | Bale capacity per hour | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 |
| | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. |
| Electrical energy: | | | | | | | | | | |
| 100 percent (906 hrs.) | 1.77 | 1.50 | 1.37 | 1.35 | 1.47 | 1.41 | 1.37 | 1.29 | 1.24 | 1.22 |
| 90 percent (815 hrs.) | 1.80 | 1.53 | 1.39 | 1.37 | 1.49 | 1.44 | 1.39 | 1.31 | 1.26 | 1.23 |
| 80 percent (725 hrs.) | 1.85 | 1.56 | 1.42 | 1.40 | 1.52 | 1.46 | 1.41 | 1.33 | 1.28 | 1.25 |
| 70 percent (634 hrs.) | 1.89 | 1.59 | 1.45 | 1.43 | 1.55 | 1.48 | 1.43 | 1.35 | 1.30 | 1.27 |
| Labor: 2/ | | | | | | | | | | |
| 100 percent (906 hrs.) | 2.14 | 1.88 | 1.71 | 1.61 | 1.53 | 1.47 | 1.31 | 1.29 | 1.27 | 1.16 |
| 90 percent (815 hrs.) | 2.38 | 2.08 | 1.90 | 1.79 | 1.70 | 1.64 | 1.45 | 1.43 | 1.41 | 1.29 |
| 80 percent (725 hrs.) | 2.68 | 2.34 | 2.14 | 2.01 | 1.91 | 1.84 | 1.64 | 1.61 | 1.58 | 1.45 |
| 70 percent (634 hrs.) | 3.06 | 2.68 | 2.45 | 2.30 | 2.19 | 2.10 | 1.87 | 1.84 | 1.82 | 1.66 |
| Misc. operating: | | | | | | | | | | |
| 100 percent (906 hrs.) | 5.59 | 5.52 | 5.44 | 5.37 | 5.29 | 5.22 | 5.14 | 5.07 | 4.99 | 4.92 |
| 90 percent (815 hrs.) | 5.61 | 5.55 | 5.48 | 5.41 | 5.34 | 5.28 | 5.20 | 5.14 | 5.07 | 5.00 |
| 80 percent (725 hrs.) | 5.63 | 5.58 | 5.51 | 5.45 | 5.39 | 5.33 | 5.27 | 5.21 | 5.14 | 5.09 |
| 70 percent (634 hrs.) | 5.65 | 5.60 | 5.55 | 5.50 | 5.44 | 5.39 | 5.33 | 5.28 | 5.22 | 5.17 |
| Overhead: | | | | | | | | | | |
| 100 percent (906 hrs.) | 5.44 | 4.44 | 3.95 | 3.62 | 3.53 | 3.35 | 3.20 | 3.08 | 3.00 | 2.91 |
| 90 percent (815 hrs.) | 6.01 | 4.90 | 4.35 | 3.99 | 3.89 | 3.69 | 3.52 | 3.39 | 3.31 | 3.20 |
| 80 percent (725 hrs.) | 6.73 | 5.47 | 4.86 | 4.45 | 4.34 | 4.12 | 3.92 | 3.78 | 3.68 | 3.56 |
| 70 percent (634 hrs.) | 7.64 | 6.21 | 5.51 | 5.04 | 4.92 | 4.66 | 4.44 | 4.28 | 4.17 | 4.03 |
| Total cost: | | | | | | | | | | |
| 100 percent (906 hrs.) | 14.94 | 13.34 | 12.47 | 11.95 | 11.82 | 11.45 | 11.02 | 10.73 | 10.50 | 10.21 |
| 90 percent (815 hrs.) | 15.80 | 14.06 | 13.12 | 12.56 | 12.42 | 12.05 | 11.56 | 11.27 | 11.05 | 10.72 |
| 80 percent (725 hrs.) | 16.89 | 14.95 | 13.93 | 13.31 | 13.16 | 12.75 | 12.24 | 11.93 | 11.68 | 11.35 |
| 70 percent (634 hrs.) | 18.24 | 16.08 | 14.96 | 14.27 | 14.10 | 13.63 | 13.07 | 12.75 | 12.51 | 12.13 |

1/ Denotes level of attainment of sustained ginning rate capability for entire season, and operating hours required.

2/ Based on wage rates of $2.50 per hour for the ginner, and $1.25 per hour for other crewmen, assuming 1,320 crew hours a season when operating at all 4 levels of capacity attainment (table 6).

Table 12.--West Texas: Relationship between level of attainment in ginning capacity for the season and cost per bale, by cost-item groups, for model gins, 1965-66

| Cost item, capacity attainment, operating hours 1/ | Bale capacity per hour | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 |
| | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. |
| Electrical energy: | | | | | | | | | | |
| 100 percent (906 hrs.) | 1.40 | 1.22 | 1.15 | 1.13 | 1.28 | 1.23 | 1.15 | 1.11 | 1.06 | 1.04 |
| 90 percent (815 hrs.) | 1.42 | 1.24 | 1.17 | 1.15 | 1.31 | 1.25 | 1.17 | 1.13 | 1.08 | 1.06 |
| 80 percent (725 hrs.) | 1.45 | 1.27 | 1.19 | 1.17 | 1.34 | 1.28 | 1.19 | 1.16 | 1.11 | 1.08 |
| 70 percent (634 hrs.) | 1.49 | 1.31 | 1.23 | 1.20 | 1.37 | 1.31 | 1.22 | 1.19 | 1.14 | 1.11 |
| Labor: 2/ | | | | | | | | | | |
| 100 percent (906 hrs.) | 2.71 | 2.34 | 2.11 | 1.96 | 2.02 | 1.92 | 1.70 | 1.65 | 1.61 | 1.48 |
| 90 percent (815 hrs.) | 3.02 | 2.60 | 2.34 | 2.17 | 2.24 | 2.13 | 1.89 | 1.84 | 1.79 | 1.64 |
| 80 percent (725 hrs.) | 3.39 | 2.92 | 2.64 | 2.45 | 2.52 | 2.40 | 2.13 | 2.07 | 2.02 | 1.85 |
| 70 percent (634 hrs.) | 3.88 | 3.34 | 3.01 | 2.80 | 2.89 | 2.74 | 2.44 | 2.36 | 2.30 | 2.11 |
| Misc. operating: | | | | | | | | | | |
| 100 percent (906 hrs.) | 5.65 | 5.58 | 5.50 | 5.43 | 5.35 | 5.28 | 5.20 | 5.13 | 5.05 | 4.98 |
| 90 percent (815 hrs.) | 5.67 | 5.61 | 5.54 | 5.47 | 5.40 | 5.34 | 5.26 | 5.20 | 5.13 | 5.06 |
| 80 percent (725 hrs.) | 5.69 | 5.64 | 5.57 | 5.51 | 5.45 | 5.39 | 5.33 | 5.27 | 5.20 | 5.15 |
| 70 percent (634 hrs.) | 5.71 | 5.66 | 5.61 | 5.56 | 5.50 | 5.45 | 5.39 | 5.34 | 5.28 | 5.23 |
| Overhead: | | | | | | | | | | |
| 100 percent (906 hrs.) | 5.59 | 4.57 | 4.08 | 3.72 | 3.67 | 3.48 | 3.36 | 3.23 | 3.13 | 3.03 |
| 90 percent (815 hrs.) | 6.18 | 5.03 | 4.50 | 4.10 | 4.05 | 3.84 | 3.70 | 3.55 | 3.46 | 3.34 |
| 80 percent (725 hrs.) | 6.91 | 5.62 | 5.02 | 4.58 | 4.52 | 4.28 | 4.12 | 3.96 | 3.85 | 3.72 |
| 70 percent (634 hrs.) | 7.86 | 6.38 | 5.70 | 5.19 | 5.12 | 4.85 | 4.67 | 4.48 | 4.36 | 4.21 |
| Total cost: | | | | | | | | | | |
| 100 percent (906 hrs.) | 15.35 | 13.71 | 12.84 | 12.24 | 12.32 | 11.91 | 11.41 | 11.12 | 10.85 | 10.53 |
| 90 percent (815 hrs.) | 16.29 | 14.48 | 13.55 | 12.89 | 13.00 | 12.56 | 12.02 | 11.72 | 11.46 | 11.10 |
| 80 percent (725 hrs.) | 17.44 | 15.45 | 14.42 | 13.71 | 13.83 | 13.35 | 12.77 | 12.46 | 12.18 | 11.80 |
| 70 percent (634 hrs.) | 18.94 | 16.69 | 15.55 | 14.75 | 14.88 | 14.35 | 13.72 | 13.37 | 13.08 | 12.66 |

1/ Denotes level of attainment of sustained ginning rate capability for entire season, and operating hours required.

2/ Based on wage rates of $2.50 per hour for ginner, and $1.40 per hour for other crewmen, assuming 1,320 crew hours a season when operating at all 4 levels of capacity attainment (table 6).

Table 13.--Far West: Relationship between level of attainment in ginning capacity and major cost per bale, by cost-item group, for model gins, 1965-66

| Cost item, capacity attainment, operating hours 1/ | Bale capacity per hour | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 |
| | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. | Dol. |
| Electrical energy: | | | | | | | | | | |
| 100 percent (906 hrs.) | .97 | .83 | .75 | .73 | .79 | .76 | .73 | .69 | .67 | .65 |
| 90 percent (815 hrs.) | 1.04 | .89 | .81 | .79 | .84 | .81 | .78 | .74 | .71 | .70 |
| 80 percent (725 hrs.) | 1.10 | .96 | .87 | .85 | .91 | .88 | .84 | .80 | .77 | .75 |
| 70 percent (634 hrs.) | 1.23 | 1.05 | .95 | .93 | .99 | .95 | .92 | .87 | .83 | .82 |
| Labor: 2/ | | | | | | | | | | |
| 100 percent (906 hrs.) | 3.03 | 2.68 | 2.47 | 2.33 | 2.23 | 2.15 | 1.91 | 1.89 | 1.86 | 1.71 |
| 90 percent (815 hrs.) | 3.36 | 2.98 | 2.74 | 2.59 | 2.48 | 2.39 | 2.13 | 2.10 | 2.07 | 1.90 |
| 80 percent (725 hrs.) | 3.79 | 3.35 | 3.09 | 2.91 | 2.79 | 2.69 | 2.39 | 2.36 | 2.33 | 2.13 |
| 70 percent (634 hrs.) | 4.33 | 3.83 | 3.53 | 3.33 | 3.18 | 3.08 | 2.73 | 2.69 | 2.66 | 2.44 |
| Misc. operating: | | | | | | | | | | |
| 100 percent (906 hrs.) | 5.82 | 5.75 | 5.67 | 5.60 | 5.52 | 5.45 | 5.37 | 5.30 | 5.22 | 5.15 |
| 90 percent (815 hrs.) | 5.84 | 5.78 | 5.71 | 5.64 | 5.57 | 5.51 | 5.43 | 5.37 | 5.30 | 5.23 |
| 80 percent (725 hrs.) | 5.86 | 5.81 | 5.74 | 5.68 | 5.62 | 5.56 | 5.50 | 5.44 | 5.38 | 5.32 |
| 70 percent (634 hrs.) | 5.88 | 5.83 | 5.78 | 5.73 | 5.67 | 5.62 | 5.56 | 5.51 | 5.45 | 5.40 |
| Overhead: | | | | | | | | | | |
| 100 percent (906 hrs.) | 5.76 | 4.71 | 4.20 | 3.84 | 3.76 | 3.56 | 3.41 | 3.28 | 3.18 | 3.10 |
| 90 percent (815 hrs.) | 6.37 | 5.20 | 4.63 | 4.23 | 4.15 | 3.92 | 3.75 | 3.62 | 3.52 | 3.41 |
| 80 percent (725 hrs.) | 7.13 | 5.81 | 5.17 | 4.72 | 4.63 | 4.38 | 4.18 | 4.03 | 3.92 | 3.80 |
| 70 percent (634 hrs.) | 8.10 | 6.60 | 5.87 | 5.36 | 5.25 | 4.96 | 4.74 | 4.56 | 4.44 | 4.30 |
| Total cost: | | | | | | | | | | |
| 100 percent (906 hrs.) | 15.58 | 13.97 | 13.09 | 12.50 | 12.30 | 11.92 | 11.42 | 11.16 | 10.93 | 10.61 |
| 90 percent (815 hrs.) | 16.61 | 14.85 | 13.89 | 13.25 | 13.04 | 12.63 | 12.09 | 11.83 | 11.60 | 11.24 |
| 80 percent (725 hrs.) | 17.88 | 15.93 | 14.87 | 14.16 | 13.95 | 13.51 | 12.91 | 12.63 | 12.40 | 12.00 |
| 70 percent (634 hrs.) | 19.54 | 17.31 | 16.13 | 15.35 | 15.09 | 14.61 | 13.95 | 13.63 | 13.38 | 12.96 |

1/ Denotes level of attainment of sustained ginning rate capability for entire season, and operating hours required.
2/ Based on wage rates of $3.00 per hour for ginner, and $1.90 per hour for other crewmen, assuming 1,320 crew hours a season when operating at all 4 levels of capacity attainment (table 6).

## FACTORS DETERMINING OPTIMAL GIN SIZE FOR A SPECIFIC LOCATION

Cost curves for ginning tend to follow the same general pattern as those for other processing industries. Unit operating costs decline rather rapidly at first with increases in plant size and then more slowly, other things being equal. Figure 5 shows individual cost curves and the envelope curve for the model gins in each of the 3 geographic areas studied. The envelope curve which connects the optimal operating positions for each of the model gins is shaped more like a W than the typical U so familiar to students of economic theory. The tendency to turn up at the 12-bale-per-hour capacity level is a result of the doubling of the overhead cleaning and conditioning equipment required at this level of production. If fractional units of resource inputs in both men and machines could be added as needed, this departure from the norm for theoretical industry cost curves would not occur.

The largest model gin plants for which costs were synthesized had a capacity of 24 bales per hour. Costs for plants of larger sizes were not estimated for several reasons. To exceed 24 bales per hour would require the addition of a third line of overhead cleaning and conditioning equipment. Also, a second press, press operating crew, more gin stands, feeders, and related equipment, would be necessary.

Since unit operating costs would be at, or close to a minimum in a gin plant rated at 24 bales per hour when operating at peak capacity, this was determined to be the optimal gin size for large, new producing areas, such as those recently developed in Australia, where gin plant and production densities are not already limiting factors. However, in specifying plant sizes for established producing areas, other factors must be considered, such as gin plants now in operation, production densities, relative concentration of harvest in a brief period, availability of seed cotton storage facilities, assembly costs, and anticipated net revenue.

### Gin Plant Population and Production Densities

In areas where the typical intermingling of competing line companies, cooperatives, and individually owned plants exists, together with production density, the number of existing gin plants will limit the maximum plant size desirable in any given situation. Production or bale density for a specific geographic area is a measure of the total supply of seed cotton available for ginning. Given this information, a gin owner can determine his fair share of the crop in terms of the location of his competitors. The formula for determining the theoretical volume available for a given area is:

$$V = D \pi R^2$$

D = production density
$\pi$ = 3.1416
R = radius

Assuming a density of 1,200 bales per square mile and a drawing radius for a given gin location (Gin A) of 1.57 miles (fig. 6), the volume of seed cotton available would by 5,880 bales. This would indicate a need for a gin plant with a capacity rating of approximately 8 bales per hour. 9/

9/ Based on estimated seasonal capacity of 6,160 bales when operating at peak capacity without seed cotton storage.

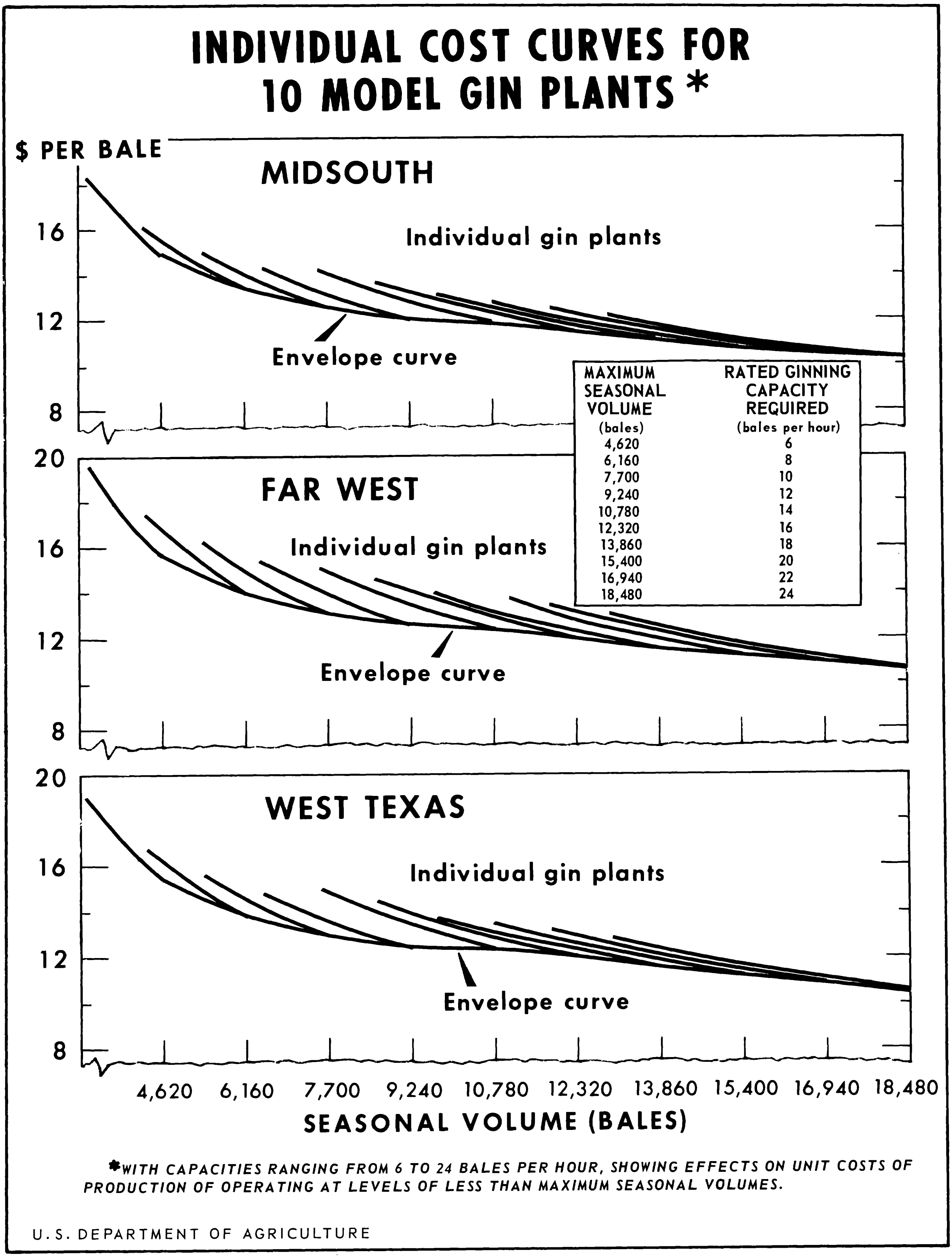

INDIVIDUAL COST CURVES FOR 10 MODEL GIN PLANTS *
$ PER BALE
MIDSOUTH
Individual gin plants
Envelope curve
FAR WEST
Individual gin plants
Envelope curve
WEST TEXAS
Individual gin plants
Envelope curve
20
16
12
8
4,620 6,160 7,700 9,240 10,780 12,320 13,860 15,400 16,940 18,480
SEASONAL VOLUME (BALES)
MAXIMUM SEASONAL VOLUME (bales)
RATED GINNING CAPACITY REQUIRED (bales per hour)
4,620 6
6,160 8
7,700 10
9,240 12
10,780 14
12,320 16
13,860 18
15,400 20
16,940 22
18,480 24
*WITH CAPACITIES RANGING FROM 6 TO 24 BALES PER HOUR, SHOWING EFFECTS ON UNIT COSTS OF PRODUCTION OF OPERATING AT LEVELS OF LESS THAN MAXIMUM SEASONAL VOLUMES.
U.S. DEPARTMENT OF AGRICULTURE

Figure 5

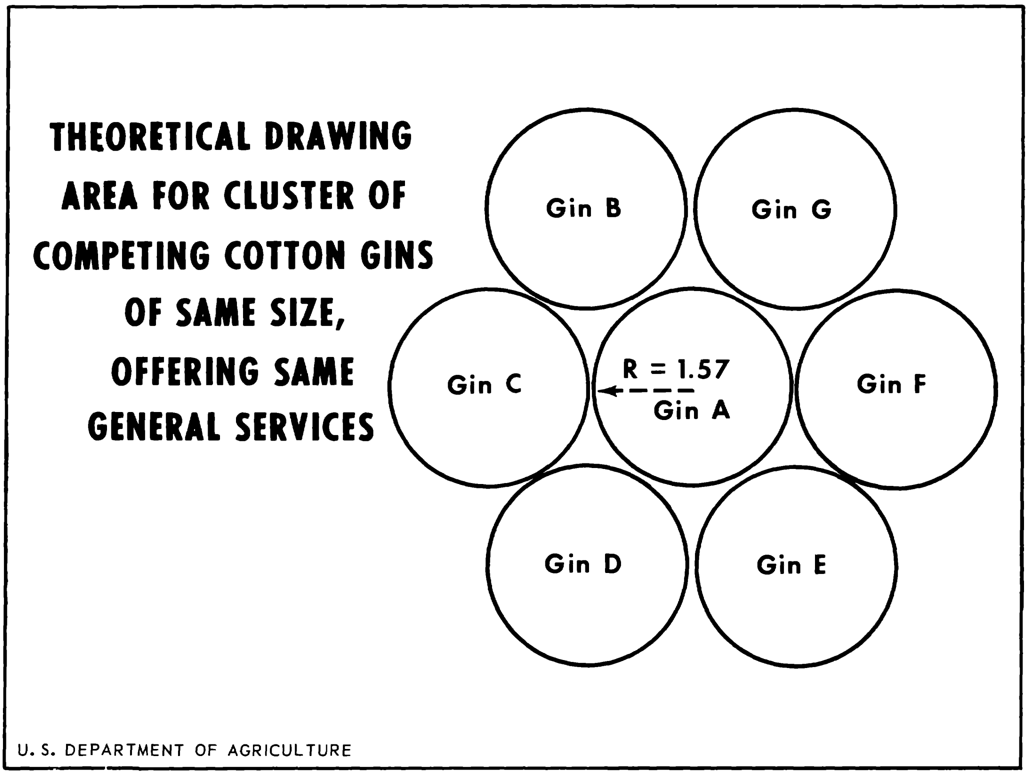



Figure 6

## Relative Concentration of Harvest

The recent narrowing of the peak harvest period in most of the major producing areas has become an important factor in making selections of optimal gin sizes. Where number of existing gins, production density, and general length of the harvest season are already known, determination of optimal gin size would be relatively easy if the rate of the harvest were fairly uniform throughout the harvest season. However, with 2-week harvest rates ranging from as high as 33 percent of the crop to as low as 2 percent during the average season, some compromise has to be made in gin size in order to minimize ginning inefficiencies resulting from excess capacity.

## Availability of Seed Cotton Storage

In recent years, considerable attention has been devoted to the possibility of storing seed cotton. This provides a means of increasing total seasonal capacity for a given gin plant by extending its ginning season beyond the harvest season without altering its hourly rate potential. However, a recent comprehensive study of the various ginning-storage alternatives available concluded that the additional costs of storage would likely offset the reduction in fixed ginning costs resulting from the increase in volumes ginned. 10/ Hence, the decision to incorporate seed

10/ Looney, Zolon M., Charles A. Wilmot, Shelby H. Holder, Jr., and C. Curtis Cable, Jr., Cost of Storing Seed Cotton. U.S. Dept. Agr., Econ. Res. Serv., ERS-712, May 1965.

cotton storage with a ginning operation, unless cheaper bulk facilities can be provided or are already available, should be based on a thorough appraisal of both immediate and long-run prospects for potential volume.

## Assembly Costs 11/

Factors that are usually of a secondary nature may assume increased importance in determining plant size in specific situations. For example, cost of assembling seed cotton at the gin could become a matter of concern if a number of firms were to consolidate into one central operation, thus affecting a very large producing area. To determine the importance of this question, assembly costs for various hauling distances were estimated (table 14). Findings showed that for production densities typical of the 3 geographic areas studied, the average costs per bale for assembly at the gin tended to decline slightly at first as hauling distances increased, and then to go up with further increases in hauling distances. For example, the Midsouth, where production densities average 600 bales per square mile, a hauling distance of 1.57 miles would be required to assemble seed cotton for 4,620 bales at a cost of $0.7138 per bale. By extending this hauling distance to 2.21 miles, an increase of 0.64 mile, the volume of available seed cotton would be doubled and the hauling cost reduced by almost 1 cent per bale. Further increases in hauling distance would result in a very gradual increase in unit hauling costs. With a doubling of the hauling distance from 1.57 to 3.14 miles, which would result in a quadrupling of the available volume, the average increase in costs of hauling would be just slightly over 1 cent per bale.

## Anticipated Net Revenue

No attempt was made to compute gross profits anticipated from the sale of bagging and ties and cottonseed since these vary so widely among gins. Hence, the estimated net revenues for the model gins were based solely on differences between standard ginning charges in the area and estimated operating costs (table 15).

Estimated operating costs were fairly comparable among the 3 geographic areas for model gins of like size, but in the Midsouth a lower average charge for ginning than in the other 2 areas resulted in lower gross revenues. The net revenue for the 6-bale model gin in the Midsouth operating at full seasonal capacity was about one-third that of the Far West and West Texas models. 12/ Differences in net revenue among areas, although substantial in all models, were less pronounced in the larger operations.

11/ For a similar study of assembly cost of cotton in Louisiana see: Charles D. Coney and James F. Hudson. Cotton Gin Efficiency as Related to Size, Location, and Cotton Production Density in Louisiana, pp. 13-20. La. Agr. Expt. Sta. Tech. Bul. 577, Dec. 1963.

12/ Based on estimated average charge of $0.60 per hundredweight of seed cotton plus bagging and ties, or $18.16 per bale for ginning in West Texas. The California rate, which was the basis for the Far West calculations, was $18.82 per bale; and the Midsouth rate (simple average of the Mississippi, Louisiana, Tennessee, and Arkansas rates) was estimated at $16.15. Rates for all but West Texas were taken from Charges for Ginning Cotton, Costs of Selected Services Incident to Marketing and Related Information, Season 1965-66, U.S. Dept. Agr., Econ. Res. Serv., ERS-2 (1966), July 1966.

Table 14.--Midsouth, Far West, and West Texas: Average hauling distances and cost per bale for assembling seed cotton for 10 model gin plants and combinations thereof, 1965-66

| Hourly capacity (bales) | Seasonal volume | Production density per square mile 2/ | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 600 bales | | 700 bales | | 800 bales | | 900 bales | |
| | | Distance | Cost per bale | Distance | Cost per bale | Distance | Cost per bale | Distance | Cost per bale |
| Midsouth: | Bales | Miles | Dol. | Miles | Dol. | Miles | Dol. | Miles | Dol. |
| 6 | 4,620 | 1.57 | .7138 | 1.45 | .7090 | 1.36 | .7055 | 1.28 | .7023 |
| 8 | 6,160 | 1.81 | .7064 | 1.67 | .7008 | 1.57 | .6969 | 1.48 | .6933 |
| 10 | 7,700 | 2.02 | .7045 | 1.87 | .6986 | 1.75 | .6983 | 1.65 | .6899 |
| 12 | 9,240 | 2.21 | .7054 | 2.05 | .6990 | 1.92 | .6939 | 1.81 | .6895 |
| 14 | 10,780 | 2.39 | .7076 | 2.21 | .7005 | 2.07 | .6949 | 1.95 | .6901 |
| 16 | 12,320 | 2.56 | .7107 | 2.37 | .7032 | 2.21 | .6969 | 2.09 | .6921 |
| 18 | 13,860 | 2.71 | .7139 | 2.51 | .7059 | 2.35 | .6996 | 2.21 | .6941 |
| 20 | 15,400 | 2.86 | .7175 | 2.65 | .7092 | 2.48 | .7025 | 2.33 | .6965 |
| 22 | 16,940 | 3.00 | .7213 | 2.78 | .7125 | 2.60 | .7054 | 2.45 | .6995 |
| 24 | 18,480 | 3.13 | .7249 | 2.90 | .7158 | 2.71 | .7083 | 2.56 | .7023 |
| 48 1/ | 36,960 | 4.43 | .7680 | 4.10 | .7549 | 4.00 | .7509 | 3.62 | .7358 |
| 72 1/ | 55,440 | 5.42 | .8044 | 5.02 | .7885 | 4.70 | .7759 | 4.43 | .7652 |
| 96 1/ | 73,920 | 6.26 | .8363 | 5.80 | .8181 | 5.42 | .8030 | 5.11 | .7907 |
| Far West: | | 1,200 bales | | 1,300 bales | | 1,400 bales | | 1,500 bales | |
| 6 | 4,620 | 1.11 | .8527 | 1.06 | .8509 | 1.02 | .8490 | .99 | .8478 |
| 8 | 6,160 | 1.28 | .8425 | 1.22 | .8400 | 1.18 | .8384 | 1.14 | .8368 |
| 10 | 7,700 | 1.43 | .8383 | 1.37 | .8358 | 1.32 | .8337 | 1.28 | .8321 |
| 12 | 9,240 | 1.57 | .8371 | 1.51 | .8346 | 1.45 | .8322 | 1.40 | .8301 |
| 14 | 10,780 | 1.69 | .8371 | 1.62 | .8343 | 1.57 | .8322 | 1.51 | .8297 |
| 16 | 12,320 | 1.81 | .8384 | 1.73 | .8351 | 1.67 | .8326 | 1.62 | .8306 |
| 18 | 13,860 | 1.92 | .8400 | 1.84 | .8367 | 1.78 | .8342 | 1.72 | .8318 |
| 20 | 15,400 | 2.02 | .8418 | 1.94 | .8385 | 1.87 | .8356 | 1.81 | .8332 |
| 22 | 16,940 | 2.12 | .8441 | 2.03 | .8404 | 1.96 | .8375 | 1.90 | .8350 |
| 24 | 18,480 | 2.21 | .8462 | 2.13 | .8429 | 2.05 | .8396 | 1.98 | .8367 |
| 48 | 36,960 | 3.13 | .8753 | 3.01 | .8704 | 2.90 | .8659 | 2.80 | .8618 |
| 72 | 55,440 | 3.83 | .9011 | 3.68 | .8950 | 3.55 | .8897 | 3.43 | .8847 |
| 96 | 73,920 | 4.43 | .9244 | 4.25 | .9170 | 4.10 | .9108 | 3.96 | .9055 |

Continued--

See footnotes at end of table, page 31.

Table 14.--Midsouth, Far West, and West Texas: Average hauling distances and cost per bale for assembling seed cotton for 10 model gin plants and combinations thereof, 1965-66--Continued

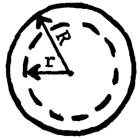
| Hourly capacity (bales) | Seasonal volume | Production density per square mile 2/ | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 500 bales | | 600 bales | | 700 bales | | 800 bales | |
| | | Distance | Cost per bale | Distance | Cost per bale | Distance | Cost per bale | Distance | Cost per bale |
| West Texas: | Bales | Miles | Dol. | Miles | Dol. | Miles | Dol. | Miles | Dol. |
| 6 | 4,620 | 1.71 | .9679 | 1.57 | .9610 | 1.45 | .9550 | 1.36 | .9505 |
| 8 | 6,160 | 1.98 | .9651 | 1.81 | .9566 | 1.67 | .9496 | 1.57 | .9447 |
| 10 | 7,700 | 2.21 | .9666 | 2.02 | .9571 | 1.87 | .9497 | 1.75 | .9437 |
| 12 | 9,240 | 2.43 | .9710 | 2.21 | .9601 | 2.05 | .9521 | 1.92 | .9457 |
| 14 | 10,780 | 2.62 | .9758 | 2.39 | .9644 | 2.21 | .9554 | 2.07 | .9484 |
| 16 | 12,320 | 2.80 | .9813 | 2.56 | .9693 | 2.37 | .9599 | 2.21 | .9519 |
| 18 | 13,860 | 2.97 | .9870 | 2.71 | .9741 | 2.51 | .9641 | 2.35 | .9562 |
| 20 | 15,400 | 3.13 | .9928 | 2.86 | .9793 | 2.65 | .9689 | 2.48 | .9604 |
| 22 | 16,940 | 3.28 | .9984 | 3.00 | .9845 | 2.78 | .9736 | 2.60 | .9646 |
| 24 | 18,480 | 3.43 | 1.0044 | 3.13 | .9895 | 2.90 | .9780 | 2.71 | .9686 |
| 48 | 36,960 | 4.85 | 1.0668 | 4.43 | 1.0459 | 4.10 | 1.0295 | 4.00 | 1.0246 |
| 72 | 55,440 | 5.94 | 1.1184 | 5.42 | 1.0925 | 5.02 | 1.0726 | 4.70 | 1.0567 |
| 96 | 73,920 | 6.86 | 1.1627 | 6.26 | 1.1329 | 5.80 | 1.1100 | 5.42 | 1.0911 |

1/ Multiples of the 24-bale model.
2/ Production density will vary throughout a randomly selected area but it is assumed, for the purposes of computing distances and transportation costs, that it is roughly uniform at some average level. Under these circumstances, the supply of seed cotton available within a given radius is determined by the formula:

$$V = DA = D\pi R^2$$

D = Production density
A = Area
R = Radius of circle

However, seed cotton produced within a circumscribed area will not all be hauled the full distance (R) from the perimeter to the gin location at the center. Instead, the average hauling distance can be described by plotting a concentric circle somewhere in between. Let the new radius be identified as r. Then




$$\tfrac{1}{2}V = D\pi r^2$$

$$r^2 = \frac{V}{2D\pi} = \sqrt{\frac{V}{2D\pi}} = \sqrt{\frac{D\pi R^2}{2D\pi}} = \sqrt{\frac{R^2}{2}} = R(.7071)$$

Then, disregarding the restrictions imposed by the pattern of existing roadways, the average hauling distance is .7071R, which is the shortest distance to the gin from any point on the inner circle. However, in areas where most roads run along section lines, as is true in the Far West and West Texas, the average road distance is increase by $\sqrt{2}$ (the ratio of the hypotenuse to the 2 sides of an isoscels right triangle). In solving for "r" under these areas, the formula becomes:

$$r = R(.7071)(\sqrt{2}) = R(.7071)(1.414) = R(1) = R.$$

Table 15.--Midsouth, Far West, and West Texas: Estimated gross revenue, operating costs, and net revenue, by geographic areas and by total volume ginned per season, for models, 1965-66

| Hourly capacity (bales) | Seasonal volume | Gin rating | Item: Gross revenue 1/ | Item: Operating costs 2/ | Item: Net revenue |
|---|---|---|---|---|---|
| | Bales | Bales | Dollars | Dollars | Dollars |
| Midsouth: | | | | | |
| 6 | 4,620 | 6 | 74,613 | 69,023 | 5,590 |
| 8 | 6,160 | 8 | 99,484 | 82,174 | 17,310 |
| 10 | 7,700 | 10 | 124,355 | 96,019 | 28,336 |
| 12 | 9,240 | 12 | 149,226 | 110,418 | 38,808 |
| 14 | 10,780 | 14 | 174,097 | 127,420 | 46,677 |
| 16 | 12,320 | 16 | 198,968 | 141,064 | 57,904 |
| 18 | 13,860 | 18 | 223,839 | 152,737 | 71,102 |
| 20 | 15,400 | 20 | 248,710 | 165,242 | 83,468 |
| 22 | 16,940 | 22 | 273,581 | 177,870 | 95,711 |
| 24 | 18,480 | 24 | 298,452 | 188,681 | 109,771 |
| Far West: | | | | | |
| 6 | 4,620 | 6 | 86,948 | 71,980 | 14,968 |
| 8 | 6,160 | 8 | 115,931 | 86,055 | 29,876 |
| 10 | 7,700 | 10 | 144,914 | 100,793 | 44,121 |
| 12 | 9,240 | 12 | 173,897 | 115,500 | 58,397 |
| 14 | 10,780 | 14 | 202,880 | 132,594 | 70,286 |
| 16 | 12,320 | 16 | 231,862 | 146,854 | 85,008 |
| 18 | 13,860 | 18 | 260,845 | 158,281 | 102,564 |
| 20 | 15,400 | 20 | 289,828 | 171,864 | 117,964 |
| 22 | 16,940 | 22 | 318,811 | 185,324 | 133,487 |
| 24 | 18,480 | 24 | 347,794 | 196,073 | 151,721 |
| West Texas: | | | | | |
| 6 | 4,620 | 6 | 83,899 | 70,915 | 12,984 |
| 8 | 6,160 | 8 | 111,866 | 84,454 | 27,412 |
| 10 | 7,700 | 10 | 139,832 | 98,868 | 40,964 |
| 12 | 9,240 | 12 | 167,798 | 113,098 | 54,700 |
| 14 | 10,780 | 14 | 195,765 | 132,810 | 62,955 |
| 16 | 12,320 | 16 | 223,731 | 146,731 | 77,000 |
| 18 | 13,860 | 18 | 251,698 | 158,143 | 93,555 |
| 20 | 15,400 | 20 | 279,664 | 171,248 | 108,416 |
| 22 | 16,940 | 22 | 307,630 | 184,138 | 123,492 |
| 24 | 18,480 | 24 | 335,597 | 194,594 | 141,003 |

1/ Based on Charges for Ginning Cotton, Costs of Selected Services Incident to Marketing and Related Information, Season 1965-66, U.S. Dept. Agr., Econ. Res. Serv., ERS-2 (1966), July 1966. The California rate of $18.82 was the basis for the Far West calculations. The Midsouth rate of $16.15 was derived by taking a simple average of the Mississippi, Louisiana, Tennessee, and Arkansas rates. The rate of $18.16 for West Texas was computed by multiplying the average volumes of machine-stripped cotton required per 500-pound bale (2,138 pounds) by an estimated average ginning charge of 60 cents per hundredweight and adding in a $5.33 charge for bagging and ties.

2/ Derived by multiplying total volume ginned by estimated total cost per bale (from table 12).

It has already been shown in tables 11, 12, and 13 that unit costs of production will increase as ginning volumes drop below full capacity. Consequently, gross receipts and net revenue will decline with a drop in seasonal volume ginned, since the charge per bale for ginning is fixed. For example, the net revenue from a 12-bale model gin in the Midsouth could be expected to decline from an estimated $38,808 to $12,160 with a drop in volume ginned from 100 to 70 percent of capacity (table 16). A comparable drop in seasonal volumes in the other 2 areas would decrease net revenue from $58,397 to $22,444 in the Far West and from $54,700 to $22,056 in West Texas.

Table 16.--Midsouth, Far West, and West Texas: Estimated net revenue for 12-bale per hour model gin plants operating at each of 4 different percentage levels of full capacity, 1965-66

| Cost accounting | Percentage level of full capacity | | | |
|---|---|---|---|---|
| | 100 | 90 | 80 | 70 |
| | Dollars | Dollars | Dollars | Dollars |
| Midsouth: | | | | |
| Gross receipts 1/ | 149,226 | 134,303 | 119,381 | 104,458 |
| Ginning costs 2/ | 110,418 | 104,449 | 98,388 | 92,298 |
| Net revenue | 38,808 | 29,854 | 20,993 | 12,160 |
| Far West: | | | | |
| Gross receipts 1/ | 173,897 | 156,507 | 139,117 | 121,728 |
| Ginning costs 2/ | 115,500 | 110,187 | 104,671 | 99,284 |
| Net revenue | 58,397 | 46,320 | 34,446 | 22,444 |
| West Texas: | | | | |
| Gross receipts 1/ | 167,798 | 151,019 | 134,239 | 117,459 |
| Ginning costs 2/ | 113,098 | 107,193 | 101,344 | 95,403 |
| Net revenue | 54,700 | 43,826 | 32,895 | 22,056 |

1/ Based on the theory that each reduction in the percentage level of full capacity would result in a corresponding drop in total seasonal volume ginned. At the 100 percent level total seasonal volume for the 12-bale rated model would be 9,240 bales, at 90 percent, 8,316 bales, at 80 percent, 7,392 bales, and at 70 percent, 6,468 bales.

Ginning charges based on, Charges for Ginning Cotton, Costs of Selected Services Incident to Marketing and Related Information, Season 1965-66, U.S. Dept. Agr., Econ. Res. Serv., ERS-2 (1966), July 1966. The California rate of $18.82 was the basis for the Far West calculations. The Midsouth rate of $16.15 was derived by taking a simple average of the Mississippi, Louisiana, Tennessee, and Arkansas rates. The rate of $18.16 for West Texas was computed by multiplying the average volumes of machine-stripped cotton required per 500-pound bale (2,138 pounds) by an estimated average ginning charge of 60 cents per hundredweight and adding in a $5.33 charge for bagging and ties.

2/ Derived by multiplying total volume ginned by estimated total cost per bale for a gin capable of that volume (table 13).

Table 17.--Machine-stripped harvest area (West Texas): Processing and materials handling equipment in sequential operating order, by recommended size, actual power requirements, and recommended motor size for model gins, 1965-66

| Ginning equipment | Bale capacity per hour | | | | | |
|---|---|---|---|---|---|---|
| | 6 | | | 8 | | |
| | Equipt. size | Power req'mts. | Motor size 1/ | Equipt. size | Power req'mts. | Motor size 1/ |
| | | Hp. | Hp. | | Hp. | Hp. |
| Airline cleaner (4 cyl.) | 50" | 4 | 5 | 50" | 4 | 5 |
| Unloading fan | 40 | 34 | 40 | 45 | 43 | 50 |
| Feed control assembly | 50" | 4 | 5 | 50" | 4 | 5 |
| Push fan, No. 1 drier | 35 | 25 | 30 | 35 | 25 | 30 |
| No. 1 incline cleaner (vacuum wheel) | 50" | 4 | 5 | 50" | 4 | 5 |
| Pull fan, No. 1 cleaner | 35 | 26 | 30 | 35 | 26 | 30 |
| Bur machine | 10' | 5 | 7.5 | 10' | 5 | 7.5 |
| Push fan, No. 2 drier | 35 | 25 | 30 | 35 | 25 | 30 |
| No. 2 incline cleaner (vacuum wheel) | 50" | 4 | 5 | 50" | 4 | 5 |
| Pull fan, No. 2 cleaner | 35 | 26 | 30 | 35 | 26 | 30 |
| Stick machine | 72" | 3 | 5 | 72" | 3 | 5 |
| Distributor & overflow separator | -- | 4 | 5.0 | -- | 4 | 5.0 |
| Live overflow fan | 30 | 12 | 20 | 30 | 12 | 20 |
| Trash fan (feeders & gin stands) | 30 | 12 | 20 | 30 | 12 | 20 |
| Trash fan (bur machine & airline cleaner) | 35 | 21 | 25 | 35 | 21 | 25 |
| Feeding, ginning, doffing | -- | 72 | 75 | -- | 96 | 100 |
| 1st stage lint cleaning: | | | | | | |
| Lint cleaner | -- | 14 | 15 | -- | 20 | 30 |
| Vane-axial fan | -- | 9 | 10 | -- | 18 | 20 |
| Mote fans | 30 | 12 | 20 | 30 | 12 | 20 |
| 2nd stage lint cleaning: | | | | | | |
| Lint cleaner | -- | 14 | 15 | -- | 20 | 30 |
| Vane-axial fan | -- | 9 | 10 | -- | 18 | 20 |
| Mote fans | 30 | 12 | 20 | 30 | 12 | 20 |
| Condenser | -- | 1 | 2 | -- | 1 | 2 |
| Condenser exhaust | -- | 6 | 7.5 | -- | 6 | 7.5 |
| Air compressor | -- | 2 | 5 | -- | 2 | 5 |
| Kicker & tramper | -- | 6 | 15 | -- | 6 | 15 |
| Press pump | -- | 3 | 25 | -- | 4 | 25 |
| Seed belt & trash auger | -- | 2 | 3 | -- | 2 | 3 |
| Seed blower | -- | 8 | 10 | -- | 8 | 10 |
| Total | -- | 379 | 495 | -- | 443 | 580 |

Continued--

See footnote at end of table, page 38.

Table 17.--Machine-stripped harvest area (West Texas): Processing and materials handling equipment in sequential operating order, by recommended size, actual power requirements, and recommended motor size for model gins, 1965-66--Continued

| Ginning equipment | Bale capacity per hour | | | | | |
|---|---|---|---|---|---|---|
| | 10 | | | 12 | | |
| | Equipt. size | Power req'mts. | Motor size 1/ | Equipt. size | Power req'mts. | Motor size 1/ |
| | | Hp. | Hp. | | Hp. | Hp. |
| Airline cleaner (4 cyl.) | 72" | 5 | 7.5 | 72" | 5 | 7.5 |
| Unloading fan | 50 | 52 | 60 | 50 | 52 | 60 |
| Feed control assembly | 72" | 6 | 7.5 | 72" | 6 | 7.5 |
| Push fan, No. 1 drier | 35 | 25 | 30 | 40 | 30 | 40 |
| No. 1 incline cleaner (vacuum wheel) | 72" | 5 | 7.5 | 72" | 5 | 7.5 |
| Pull fan, No. 1 cleaner | 35 | 26 | 30 | 40 | 30 | 40 |
| Bur machine | 14' | 7 | 10 | 14' | 7 | 10 |
| Push fan, No. 2 drier | 35 | 25 | 30 | 40 | 30 | 40 |
| No. 2 incline cleaner (vacuum wheel) | 72" | 5 | 7.5 | 72" | 5 | 7.5 |
| Pull fan, No. 2 cleaner | 35 | 26 | 30 | 40 | 30 | 40 |
| Stick machine | 96" | 5 | 7.5 | 96" | 5 | 7.5 |
| Distributor & overflow separator | -- | 5 | 7.5 | -- | 5 | 7.5 |
| Live overflow fan | 35 | 21 | 25 | 35 | 21 | 25 |
| Trash fan (feeders & gin stands) | 35 | 21 | 25 | 35 | 21 | 25 |
| Trash fan (bur machine & airline cleaner) | 40 | 30 | 35 | 40 | 30 | 35 |
| Feeding, ginning, doffing | -- | 120 | 125 | -- | 144 | 150 |
| 1st stage lint cleaning: | | | | | | |
| Lint cleaner | -- | 23 | 30 | -- | 28 | 45 |
| Vane-axial fan | -- | 18 | 20 | -- | 27 | 30 |
| Mote fans | 30 | 12 | 20 | 35 | 21 | 25 |
| 2nd stage lint cleaning: | | | | | | |
| Lint cleaner | -- | 23 | 30 | -- | 28 | 45 |
| Vane-axial fan | -- | 18 | 20 | -- | 27 | 30 |
| Mote fans | 30 | 12 | 20 | 35 | 21 | 25 |
| Condenser | -- | 1 | 2 | -- | 1 | 2 |
| Condenser exhaust | -- | 6 | 7.5 | -- | 8 | 10 |
| Air compressor | -- | 2 | 5 | -- | 2 | 5 |
| Kicker & tramper | -- | 6 | 15 | -- | 6 | 15 |
| Press pump | -- | 5 | 25 | -- | 6 | 25 |
| Seed belt & trash auger | -- | 2 | 3 | -- | 3 | 5 |
| Seed blower | -- | 8 | 10 | -- | 8 | 10 |
| Total | -- | 520 | 652.5 | -- | 612 | 782.0 |

Continued--

See footnote at end of table, page 38.

Table 17.--Machine-stripped harvest area (West Texas): Processing and materials handling equipment in sequential operating order, by recommended size, actual power requirements, and recommended motor size for model gins, 1965-66--Continued

| Ginnning equipment | Bale capacity per hour | | | | | |
|---|---|---|---|---|---|---|
| | 14 | | | 16 | | |
| | Equipt. size | Power req'mts. | Motor size 1/ | Equipt. size | Power req'mts. | Motor size 1/ |
| | | Hp. | Hp. | | Hp. | Hp. |
| Airline cleaner (4 cyl.) | 2-50" | 8 | 2- 5 | 2-50" | 8 | 2- 5 |
| Unloading fan | 2-45 | 86 | 2-50 | 2-45 | 86 | 2-50 |
| Feed control assembly | 2-50" | 8 | 2- 5 | 2-50" | 8 | 2- 5 |
| Push fan, No. 1 drier | 2-35 | 50 | 2-30 | 2-35 | 50 | 2-30 |
| No. 1 incline cleaner (vacuum wheel) | 2-50" | 8 | 2- 5 | 2-50" | 8 | 2- 5 |
| Pull fan, No. 1 cleaner | 2-35 | 52 | 2-30 | 2-35 | 52 | 2-30 |
| Bur machine | 2-10' | 10 | 2- 7.5 | 2-10' | 10 | 2- 7.5 |
| Push fan, No. 2 drier | 2-35 | 50 | 2-30 | 2-35 | 50 | 2-30 |
| No. 2 incline cleaner (vacuum wheel) | 2-50" | 8 | 2- 5 | 2-50" | 8 | 2- 5 |
| Pull fan, No. 2 cleaner | 2-35 | 52 | 2-30 | 2-35 | 52 | 2-30 |
| Stick machine | 2-72" | 6 | 2- 5 | 2-72" | 6 | 2- 5 |
| Distributor & overflow separator | -- | 6 | 7.5 | -- | 6 | 7.5 |
| Live overflow fan | 40 | 30 | 40 | 40 | 30 | 40 |
| Trash fan (feeders & gin stands) | 40 | 30 | 40 | 40 | 30 | 40 |
| Trash fan (bur machine & airline cleaner) | 2-35 | 42 | 2-25 | 2-35 | 42 | 2-25 |
| Feeding, ginning, doffing | -- | 168 | 175 | -- | 192 | 200 |
| 1st stage lint cleaning: | | | | | | |
| Lint cleaner | -- | 33 | 45 | -- | 40 | 60 |
| Vane-axial fan | -- | 27 | 30 | -- | 36 | 40 |
| Mote fans | 35 | 21 | 25 | 40 | 30 | 40 |
| 2nd stage lint cleaning: | | | | | | |
| Lint cleaner | -- | 33 | 45 | -- | 40 | 60 |
| Vane-axial fan | -- | 27 | 30 | -- | 36 | 40 |
| Mote fans | 35 | 21 | 25 | 40 | 30 | 40 |
| Condenser | -- | 1 | 2 | -- | 1 | 2 |
| Condenser exhaust | -- | 8 | 10 | -- | 8 | 10 |
| Air compressor | -- | 2 | 5 | -- | 2 | 5 |
| Kicker & tramper | -- | 6 | 15 | -- | 6 | 15 |
| Press pump | -- | 7 | 25 | -- | 8 | 25 |
| Seed belt & trash auger | -- | 3 | 5 | -- | 3 | 5 |
| Seed blower | -- | 12 | 15 | -- | 12 | 15 |
| Total | -- | 815 | 994.5 | -- | 890 | 1,099.5 |

Continued--

See footnote at end of table, page 38.

Table 17.--Machine-stripped harvest area (West Texas): Processing and materials handling equipment in sequential operating order, by recommended size, actual power requirements, and recommended motor size for model gins, 1965-66--Continued

| Ginning equipment | Bale capacity per hour | | | | | |
|---|---|---|---|---|---|---|
| | 18 | | | 20 | | |
| | Equipt. size | Power req'mts. | Motor size 1/ | Equipt. size | Power req'mts. | Motor size 1/ |
| | | Hp. | Hp. | | Hp. | Hp. |
| Airline cleaner (4 cyl.) | 2-72" | 10 | 2- 7.5 | 2-72" | 10 | 2- 7.5 |
| Unloading fan | 2-50 | 86 | 2-50 | 2-50 | 86 | 2-50 |
| Feed control assembly | 2-72" | 12 | 2- 7.5 | 2-72" | 12 | 2- 7.5 |
| Push fan, No. 1 drier | 2-35 | 50 | 2-30 | 2-35 | 50 | 2-30 |
| No. 1 incline cleaner (vacuum wheel) | 2-72" | 10 | 2- 7.5 | 2-72" | 10 | 2- 7.5 |
| Pull fan, No. 1 cleaner | 2-35 | 52 | 2-30 | 2-35 | 52 | 2-30 |
| Bur machine | 2-10' | 10 | 2- 7.5 | 2-14' | 14 | 2-10 |
| Push fan, No. 2 drier | 2-35 | 50 | 2-30 | 2-35 | 50 | 2-30 |
| No. 2 incline cleaner (vacuum wheel) | 2-72" | 10 | 2- 7.5 | 2-72" | 10 | 2- 7.5 |
| Pull fan, No. 2 cleaner | 2-35 | 52 | 2-30 | 2-35 | 52 | 2-30 |
| Stick machine | 2-72" | 6 | 2- 5 | 2-96" | 10 | 2- 7.5 |
| Distributor & overflow separator | -- | 6 | 7.5 | -- | 7 | 7.5 |
| Live overflow fan | 40 | 30 | 40 | 45 | 35 | 40 |
| Trash fan (feeders & gin stands) | 40 | 30 | 40 | 45 | 35 | 40 |
| Trash fan (bur machine & airline cleaner) | 2-35 | 42 | 2-25 | 2-40 | 60 | 2-40 |
| Feeding, ginning, doffing | -- | 216 | 225 | -- | 240 | 250 |
| 1st stage lint cleaning: | | | | | | |
| Lint cleaner | -- | 42 | 60 | -- | 47 | 60 |
| Vane-axial fan | -- | 36 | 40 | -- | 36 | 40 |
| Mote fans | 40 | 30 | 40 | 40 | 30 | 40 |
| 2nd stage lint cleaning: | | | | | | |
| Lint cleaner | -- | 42 | 60 | -- | 47 | 60 |
| Vane-axial fan | -- | 36 | 40 | -- | 36 | 40 |
| Mote fans | 40 | 30 | 40 | 40 | 30 | 40 |
| Condenser | -- | 1 | 2 | -- | 1 | 2 |
| Condenser exhaust | -- | 12 | 15 | -- | 12 | 15 |
| Air compressor | -- | 2 | 5 | -- | 2 | 5 |
| Kicker & tramper | -- | 6 | 15 | -- | 6 | 15 |
| Press pump | -- | 9 | 25 | -- | 10 | 25 |
| Seed belt & trash auger | -- | 5 | 7.5 | -- | 5 | 7.5 |
| Seed blower | -- | 12 | 15 | -- | 12 | 15 |
| Total | -- | 935 | 1,152 | -- | 1,007 | 1,217 |

Continued--

See footnote at end of table, page 38.

Table 17.--Machine-stripped harvest area (West Texas): Processing and materials handling equipment in sequential operating order, by recommended size, actual power requirements, and recommended motor size for model gins, 1965-66--Continued

| Ginning equipment | Bale capacity per hour | | | | | |
|---|---|---|---|---|---|---|
| | 22 | | | 24 | | |
| | Equipt. size | Power req'mts. | Motor size 1/ | Equipt. size | Power req'mts. | Motor size 1/ |
| | | Hp. | Hp. | | Hp. | Hp. |
| Airline cleaner (4 cyl.) | 2-72" | 10 | 2- 7.5 | 2-72" | 10 | 2- 7.5 |
| Unloading fan | 2-50 | 104 | 2-60 | 2-50 | 104 | 2-60 |
| Feed control assembly | 2-72" | 12 | 2- 7.5 | 2-72" | 12 | 2- 7.5 |
| Push fan, No. 1 drier | 2-35 | 50 | 2-30 | 2-40 | 60 | 2-40 |
| No. 1 incline cleaner (vacuum wheel) | 2-72" | 10 | 2- 7.5 | 2-72" | 10 | 2- 7.5 |
| Pull fan, No. 1 cleaner | 2-35 | 52 | 2-30 | 2-40 | 60 | 2-40 |
| Bur machine | 2-14' | 14 | 2-10 | 2-14' | 14 | 2-10 |
| Push fan, No. 2 drier | 2-35 | 50 | 2-30 | 2-40 | 60 | 2-40 |
| No. 2 incline cleaner (vacuum wheel) | 2-72" | 10 | 2- 7.5 | 2-72" | 10 | 2- 7.5 |
| Pull fan, No. 2 cleaner | 2-34 | 52 | 2-30 | 2-40 | 60 | 2-40 |
| Stick machine | 2-96" | 10 | 2- 7.5 | 2-96" | 10 | 2- 7.5 |
| Distributor & overflow separator | -- | 7 | 7.5 | -- | 7 | 7.5 |
| Live overflow fan | 45 | 35 | 40 | 45 | 35 | 40 |
| Trash fan (feeders & gin stands) | 45 | 35 | 40 | 45 | 35 | 40 |
| Trash fan (bur machine & airline cleaner) | 2-40 | 60 | 2-40 | 2-40 | 60 | 2-40 |
| Feeding, ginning, doffing | -- | 264 | 275 | -- | 288 | 300 |
| 1st stage lint cleaning: | | | | | | |
| Lint cleaner | -- | 51 | 60 | -- | 56 | 60 |
| Vane-axial fan | -- | 36 | 40 | -- | 36 | 40 |
| Mote fans | 40 | 30 | 40 | 40 | 30 | 40 |
| 2nd stage lint cleaning: | | | | | | |
| Lint cleaner | -- | 51 | 60 | -- | 56 | 60 |
| Vane-axial fan | -- | 36 | 40 | -- | 36 | 40 |
| Mote fans | 40 | 30 | 40 | 40 | 30 | 40 |
| Condenser | -- | 1 | 2 | -- | 1 | 2 |
| Condenser exhaust | -- | 12 | 15 | -- | 12 | 15 |
| Air compressor | -- | 2 | 5 | -- | 2 | 5 |
| Kicker & tramper | -- | 6 | 15 | -- | 6 | 15 |
| Press pump | -- | 11 | 25 | -- | 12 | 25 |
| Seed belt & trash auger | -- | 5 | 7.5 | -- | 5 | 7.5 |
| Seed blower | -- | 14 | 15 | -- | 14 | 15 |
| Total | -- | 1,060 | 1,262 | -- | 1,131 | 1,367 |

1/ The selection of sizes in electric motors is limited rendering it often difficult to match connected horsepower exactly to actual load requirements. Furthermore, certain equipment, such as the press pump, kicker and tramper, and air compressor, require larger motors than indicated by their average power requirements, since their loads are not constant but build up as the peaks of their respective cycles approach.

Table 18.--Machine-picked harvest areas (Far West and Midsouth): Processing and materials handling equipment in sequential operating order, by recommended size, actual power requirements, and recommended motor size for model gins, 1965-66

| Ginning equipment | Bale capacity per hour: 6 | | | Bale capacity per hour: 8 | | |
|---|---|---|---|---|---|---|
| | Equipt. size | Power req'mts. | Motor size 1/ | Equipt. size | Power req'mts. | Motor size 1/ |
| | | Hp. | Hp. | | Hp. | Hp. |
| Unloading fan | 40 | 34 | 40 | 40 | 34 | 40 |
| Feed control assembly | 50" | 4 | 5 | 50" | 4 | 5 |
| Push fan, No. 1 drier | 35 | 25 | 30 | 35 | 25 | 30 |
| No. 1 incline cleaner (vacuum wheel) | 50" | 4 | 5 | 50" | 4 | 5 |
| Pull fan, No. 1 cleaner | 35 | 26 | 30 | 35 | 26 | 30 |
| Stick machine | 72" | 3 | 5 | 72" | 3 | 5 |
| Push fan, No. 2 drier | 35 | 25 | 30 | 35 | 25 | 30 |
| No. 2 incline cleaner (vacuum wheel) | 50" | 4 | 5 | 50" | 4 | 5 |
| Pull fan, No. 2 cleaner | 35 | 26 | 30 | 35 | 26 | 30 |
| Distributor & overflow separator | -- | 4 | 5.0 | -- | 4 | 5.0 |
| Live overflow fan | 30 | 12 | 20 | 30 | 12 | 20 |
| Trash fan (feeders & gin stands) | 30 | 12 | 20 | 30 | 12 | 20 |
| Feeding, ginning, doffing | -- | 72 | 75 | -- | 96 | 100 |
| 1st stage lint cleaning: | | | | | | |
| Lint cleaner | -- | 14 | 15 | -- | 20 | 30 |
| Vane-axial fan | -- | 9 | 10 | -- | 18 | 20 |
| Mote fans | 30 | 12 | 20 | 30 | 12 | 20 |
| 2nd stage lint cleaning: | | | | | | |
| Lint cleaner | -- | 14 | 15 | -- | 20 | 30 |
| Vane-axial fan | -- | 9 | 10 | -- | 18 | 20 |
| Mote fans | 30 | 12 | 20 | 30 | 12 | 20 |
| Condenser | -- | 1 | 2 | -- | 1 | 2 |
| Condenser exhaust | -- | 6 | 7.5 | -- | 6 | 7.5 |
| Air compressor | -- | 2 | 5 | -- | 2 | 5 |
| Kicker & tramper | -- | 6 | 15 | -- | 6 | 15 |
| Press pump | -- | 3 | 25 | -- | 4 | 25 |
| Seed belt & trash auger | -- | 2 | 3 | -- | 2 | 3 |
| Seed blower | -- | 8 | 10 | -- | 8 | 10 |
| Total | -- | 349 | 457.5 | -- | 404 | 532.5 |

See footnote at end of table, page 43.

Continued--

**Table 18.--Machine-picked harvest areas (Far West and Midsouth): Processing and materials handling equipment in sequential operating order, by recommended size, actual power requirements, and recommended motor size for model gins, 1965-66--Continued**

| Ginning equipment | Bale capacity per hour | | | | | |
|---|---|---|---|---|---|---|
| | 10 | | | 12 | | |
| | Equipt. size | Power req'mts. | Motor size 1/ | Equipt. size | Power req'mts. | Motor size 1/ |
| | | Hp. | Hp. | | Hp. | Hp. |
| Unloading fan | 45 | 43 | 50 | 45 | 43 | 50 |
| Feed control assembly | 72" | 6 | 7.5 | 72" | 6 | 7.5 |
| Push fan, No. 1 drier | 35 | 25 | 30 | 40 | 30 | 40 |
| No. 1 incline cleaner (vacuum wheel) | 72" | 5 | 7.5 | 72" | 5 | 7.5 |
| Pull fan, No. 1 cleaner | 35 | 26 | 30 | 40 | 30 | 40 |
| Stick machine | 96" | 5 | 7.5 | 96" | 5 | 7.5 |
| Push fan, No. 2 drier | 35 | 25 | 30 | 40 | 30 | 40 |
| No. 2 incline cleaner (vacuum wheel) | 72" | 5 | 7.5 | 72" | 5 | 7.5 |
| Pull fan, No. 2 cleaner | 35 | 26 | 30 | 40 | 30 | 40 |
| Distributor & overflow separator | -- | 5 | 7.5 | -- | 5 | 7.5 |
| Live overflow fan | 35 | 21 | 25 | 35 | 21 | 25 |
| Trash fan (feeders & gin stands) | 35 | 21 | 25 | 35 | 21 | 25 |
| Feeding, ginning, doffing | -- | 120 | 125 | -- | 144 | 150 |
| 1st stage lint cleaning: | | | | | | |
| Lint cleaner | -- | 23 | 30 | -- | 28 | 45 |
| Vane-axial fan | -- | 18 | 20 | -- | 27 | 30 |
| Mote fans | 30 | 12 | 20 | 35 | 21 | 25 |
| 2nd stage lint cleaning: | | | | | | |
| Lint cleaner | -- | 23 | 30 | -- | 28 | 45 |
| Vane-axial fan | -- | 18 | 20 | -- | 27 | 30 |
| Mote fans | 30 | 12 | 20 | 35 | 21 | 25 |
| Condenser | -- | 1 | 2 | -- | 1 | 2 |
| Condenser exhaust | -- | 6 | 7.5 | -- | 8 | 10.0 |
| Air compressor | -- | 2 | 5 | -- | 2 | 5 |
| Kicker & tramper | -- | 6 | 15 | -- | 6 | 15 |
| Press pump | -- | 5 | 25 | -- | 6 | 25 |
| Seed belt & trash auger | -- | 2 | 3 | -- | 3 | 5 |
| Seed blower | -- | 8 | 10 | -- | 8 | 10 |
| Total | -- | 469 | 590 | -- | 561 | 719.5 |

See footnote at end of table, page 43.

Continued--

**Table 18.--Machine-picked harvest areas (Far West and Midsouth): Processing and materials handling equipment in sequential operating order, by recommended size, actual power requirements, and recommended motor size for model gins, 1965-66--Continued**

| Ginning equipment | Bale capacity per hour | | | | | |
|---|---|---|---|---|---|---|
| | 14 | | | 16 | | |
| | Equipt. size | Power req'mts. | Motor size 1/ | Equipt. size | Power req'mts. | Motor size 1/ |
| | | Hp. | Hp. | | Hp. | Hp. |
| Unloading fan | 50 | 52 | 60 | 50 | 52 | 60 |
| Feed control assembly | 72" | 6 | 7.5 | 72" | 6 | 7.5 |
| Push fan, No. 1 drier | 2-35 | 50 | 2-30 | 2-35 | 50 | 2-30 |
| No. 1 incline cleaner (vacuum wheel) | 2-50" | 8 | 2- 5 | 2-50" | 8 | 2- 5 |
| Pull fan, No. 1 cleaner | 2-35 | 52 | 2-30 | 2-35 | 52 | 2-30 |
| Stick machine | 2-72" | 6 | 2- 5 | 2-72" | 6 | 2- 5 |
| Push fan, No. 2 drier | 2-35 | 50 | 2-30 | 2-35 | 50 | 2-30 |
| No. 2 incline cleaner (vacuum wheel) | 2-50" | 8 | 2- 5 | 2-50" | 8 | 2- 5 |
| Pull fan, No. 2 cleaner | 2-35 | 52 | 2-30 | 2-35 | 52 | 2-30 |
| Distributor & overflow separator | -- | 6 | 7.5 | -- | 6 | 7.5 |
| Live overflow fan | 40 | 30 | 40 | 40 | 30 | 40 |
| Trash fan (feeders & gin stands) | 40 | 30 | 40 | 40 | 30 | 40 |
| Feeding, ginning, doffing | -- | 168 | 175 | -- | 192 | 200 |
| 1st stage lint cleaning: | | | | | | |
| Lint cleaner | -- | 33 | 45 | -- | 40 | 60 |
| Vane-axial fan | -- | 27 | 30 | -- | 36 | 40 |
| Mote fans | 35 | 21 | 25 | 40 | 30 | 40 |
| 2nd stage lint cleaning: | | | | | | |
| Lint cleaner | -- | 33 | 45 | -- | 40 | 60 |
| Vane-axial fan | -- | 27 | 30 | -- | 36 | 40 |
| Mote fans | 35 | 21 | 25 | 40 | 30 | 40 |
| Condenser | -- | 1 | 2 | -- | 1 | 2 |
| Condenser exhaust | -- | 8 | 10.0 | -- | 8 | 10.0 |
| Air compressor | -- | 2 | 5 | -- | 2 | 5 |
| Kicker & tramper | -- | 6 | 15 | -- | 6 | 15 |
| Press pump | -- | 7 | 25 | -- | 8 | 25 |
| Seed belt & trash auger | -- | 3 | 5 | -- | 3 | 5 |
| Seed blower | -- | 12 | 15 | -- | 12 | 15 |
| Total | -- | 719 | 877 | -- | 794 | 982 |

See footnote at end of table, page 43.

Continued--

Table 18.--Machine-picked harvest areas (Far West and Midsouth): Processing and materials handling equipment in sequential operating order, by recommended size, actual power requirements, and recommended motor size for model gins, 1965-66--Continued

| Ginning equipment | Bale capacity per hour | | | | | |
|---|---|---|---|---|---|---|
| | 18 | | | 20 | | |
| | Equipt. size | Power req'mts. | Motor size 1/ | Equipt. size | Power req'mts. | Motor size 1/ |
| | | Hp. | Hp. | | Hp. | Hp. |
| Unloading fan | 2-45 | 86 | 100 | 2-45 | 86 | 100 |
| Feed control assembly | 96" | 7 | 7.5 | 96" | 7 | 7.5 |
| Push fan, No. 1 drier | 2-35 | 50 | 2-30 | 2-35 | 50 | 2-30 |
| No. 1 incline cleaner (vacuum wheel) | 2-72" | 10 | 2- 7.5 | 2-72" | 10 | 2- 7.5 |
| Pull fan, No. 1 cleaner | 2-35 | 52 | 2-30 | 2-35 | 52 | 2-30 |
| Stick machine | 2-72" | 6 | 2- 5 | 2-96" | 10 | 2- 7.5 |
| Push fan, No. 2 drier | 2-35 | 50 | 2-30 | 2-35 | 50 | 2-30 |
| No. 2 incline cleaner (vacuum wheel) | 2-72" | 10 | 2- 7.5 | 2-72" | 10 | 2- 7.5 |
| Pull fan, No. 2 cleaner | 2-35 | 52 | 2-30 | 2-35 | 52 | 2-30 |
| Distributor & overflow separator | -- | 6 | 7.5 | -- | 7 | 7.5 |
| Live overflow fan | 40 | 30 | 40 | 45 | 35 | 40 |
| Trash fan (feeders & gin stands) | 40 | 30 | 40 | 45 | 35 | 40 |
| Feeding, ginning, doffing | -- | 216 | 225 | -- | 240 | 250 |
| 1st stage lint cleaning: | | | | | | |
| Lint cleaner | -- | 42 | 60 | -- | 47 | 60 |
| Vane-axial fan | -- | 36 | 40 | -- | 36 | 40 |
| Mote fans | 40 | 30 | 40 | 40 | 30 | 40 |
| 2nd stage lint cleaning: | | | | | | |
| Lint cleaner | -- | 42 | 60 | -- | 47 | 60 |
| Vane-axial fan | -- | 36 | 40 | -- | 36 | 40 |
| Mote fans | 40 | 30 | 40 | 40 | 30 | 40 |
| Condenser | -- | 1 | 2 | -- | 1 | 2 |
| Condenser exhaust | -- | 12 | 15.0 | -- | 12 | 15.0 |
| Air compressor | -- | 2 | 5 | -- | 2 | 5 |
| Kicker & tramper | -- | 6 | 15 | -- | 6 | 15 |
| Press pump | -- | 9 | 25 | -- | 10 | 25 |
| Seed belt & trash auger | -- | 5 | 7.5 | -- | 5 | 7.5 |
| Seed blower | -- | 12 | 15 | -- | 12 | 15 |
| Total | -- | 868 | 1,064.5 | -- | 918 | 1,094.5 |

See footnote at end of table, page 43.

Continued--

**Table 18.--Machine-picked harvest areas (Far West and Midsouth): Processing and materials handling equipment in sequential operating order, by recommended size, actual power requirements, and recommended motor size for model gins, 1965-66--Continued**

| Ginning equipment | Bale capacity per hour | | | | | |
|---|---|---|---|---|---|---|
| | 22 | | | 24 | | |
| | Equipt. size | Power req'mts. | Motor size 1/ | Equipt. size | Power req'mts. | Motor size 1/ |
| | | Hp. | Hp. | | Hp. | Hp. |
| Unloading fan | 2-50 | 104 | 120 | 2-50 | 104 | 120 |
| Feed control assembly | 96" | 7 | 7.5 | 96" | 7 | 7.5 |
| Push fan, No. 1 drier | 2-35 | 50 | 2-30 | 2-40 | 60 | 2-40 |
| No. 1 incline cleaner (vacuum wheel) | 2-72" | 10 | 2- 7.5 | 2-72" | 10 | 2- 7.5 |
| Pull fan, No. 1 cleaner | 2-35 | 52 | 2-30 | 2-40 | 60 | 2-40 |
| Stick machine | 2-96" | 10 | 2- 7.5 | 2-96" | 10 | 2- 7.5 |
| Push fan, No. 2 drier | 2-35 | 50 | 2-30 | 2-40 | 60 | 2-40 |
| No. 2 incline cleaner (vacuum wheel) | 2-72" | 10 | 2- 7.5 | 2-72" | 10 | 2- 7.5 |
| Pull fan, No. 2 cleaner | 2-35 | 52 | 2-30 | 2-45 | 60 | 2-40 |
| Distributor & overflow separator | -- | 7 | 7.5 | -- | 7 | 7.5 |
| Live overflow fan | 45 | 35 | 40 | 45 | 35 | 40 |
| Trash fan (feeders & gin stands) | 45 | 35 | 40 | 45 | 35 | 40 |
| Feeding, ginning, doffing | -- | 264 | 275 | -- | 288 | 300 |
| 1st stage lint cleaning: | | | | | | |
| Lint cleaner | -- | 51 | 60 | -- | 56 | 60 |
| Vane-axial fan | -- | 36 | 40 | -- | 36 | 40 |
| Mote fans | 40 | 30 | 40 | 40 | 30 | 40 |
| 2nd stage lint cleaning: | | | | | | |
| Lint cleaner | -- | 51 | 60 | -- | 56 | 60 |
| Vane-axial fan | -- | 36 | 40 | -- | 36 | 40 |
| Mote fans | 40 | 30 | 40 | 40 | 30 | 40 |
| Condenser | -- | 1 | 2 | -- | 1 | 2 |
| Condenser exhaust | -- | 12 | 15.0 | -- | 12 | 15.0 |
| Air compressor | -- | 2 | 5 | -- | 2 | 5 |
| Kicker & tramper | -- | 6 | 15 | -- | 6 | 15 |
| Press pump | -- | 11 | 25 | -- | 12 | 25 |
| Seed belt & trash auger | -- | 5 | 7.5 | -- | 5 | 7.5 |
| Seed blower | -- | 14 | 15 | -- | 14 | 15 |
| Total | -- | 971 | 1,139.5 | -- | 1,042 | 1,244.5 |

1/ The selection of sizes in electric motors is rather limited rendering it often difficult to match connected horsepower exactly to actual load requirements. Furthermore, certain equipment, such as the press pump, kicker and tramper, and air compressor, require larger motors than indicated by their average power requirements, since their loads are not constant but build up as the peaks of their respective cycles approach.



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