An Analysis of Effects of Module Handling Systems on Ginning Costs with Stripper Harvested Cotton

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ABSTRACT

GINMODEL, a computer simulation model for cotton gins, was used to estimate and compare costs associated with alternative seedcotton handling and feeding systems for five plant sizes--7, 14, 21, 28, and 35 bales-per-hour rated capacity plants. The alternatives examined included two seedcotton handling systems--trailers and modules--and three gin feeding systems--suction feeding, automated module feeding using suction, and automated module feeding using blowers. Results indicate that module handling lowers ginning costs for all plant sizes when ginning volumes exceed 50 percent of plant seasonal capacity. Automated seedcotton feeding systems were found to be cost efficient for some plants at high levels of plant utilization. Assembly costs associated with modules were also estimated using GINMODEL and data collected through surveys. Assembly costs are shown to be very sensitive to utilization of the palletless module mover trucks.

Keywords: Cotton ginning, costs, seedcotton handling, module systems

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AN ANALYSIS OF EFFECTS OF MODULE HANDLING SYSTEMS ON GINNING COSTS WITH STRIPPER HARVESTED COTTON

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Introduction

Technological change in the cotton ginning industry has tended to be a steady, evolutionary process. Innovations in areas such as gin stands and presses have brought about higher speed and larger capacity gin plants (1,12), 2/ but with a few notable exceptions such as the development of the lint cleaner, most of the technological innovation has been through improvements in the basic ginning concepts. For example, while gin stands have been developed to much higher capacities, they still operate on the same principles as those of 50 years ago. Most of the technology change has tended to encourage larger gin plant sizes and, consequently, fewer gin plants processing greater volumes (figure 1).

The technology in seedcotton handling followed a similar evolutionary pattern up until the last few years.

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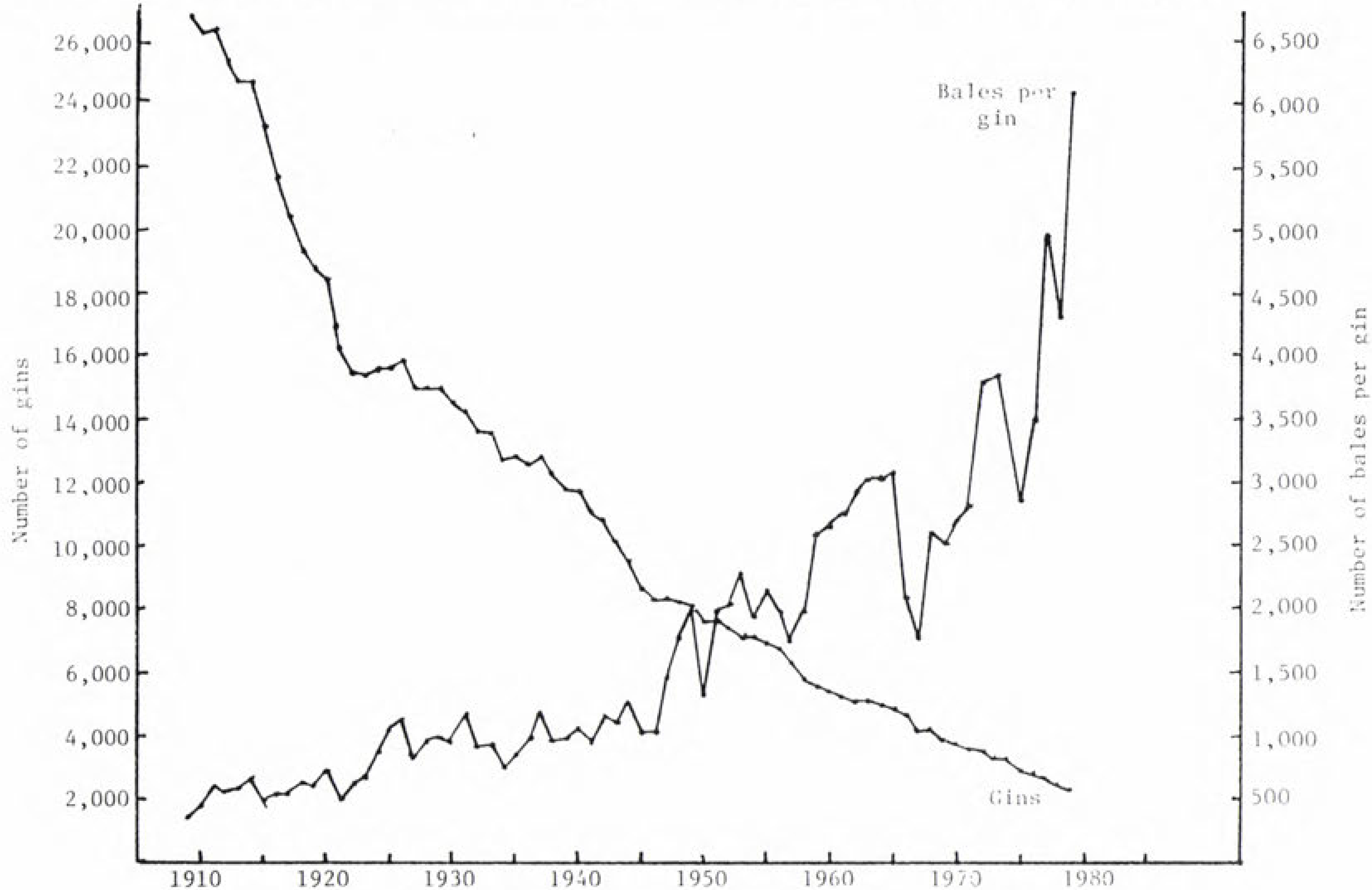
2/ Numbers in parentheses refer to corresponding sources in the List of References.

Figure 1. Number of active gins and number of bales ginned per gin, United States, 1909-1979.



Source: U. S. Dept. of Commerce, "Cotton Ginnings in the United States."

That is, the modern high-capacity cotton trailer pulled with pickups, trucks, and/or tractors is a refined version of the horse or mule-drawn cotton wagon used at the turn of the century. Even the rapid adoption of mechanical harvesting by producers resulted in little change in ginning or handling technology other than the installation of additional seedcotton cleaning, drying, and preparation equipment. However, the development of the module builder and its complements--mover trucks and trailers for palleted and palletless modules and various types of gin module feeding systems--is a major departure in basic technology. The moduling system has the potential to function as a seedcotton storage system as well as a system of handling seedcotton. However, its potential to function as a seedcotton storage system is likely to be severely limited by the institutional framework of the marketing system for cotton lint. Farmers' needs, both real and perceived, to have their cotton ginned, classed, and ready to sell within a short period after harvest are a substantial barrier to extended storage of seedcotton in most circumstances. Even though extended storage may not result from the system, there are advantages to gins from breaking the dependency between harvesting and ginning. For example, short term storage of part of the crop--a few days to a month--can have beneficial effects on the ginning operation by providing a continuing supply of seedcotton during adverse harvesting weather and reducing the urgency to return empty trailers during favorable harvesting weather.

The moduling system has already begun to be widely adopted, especially in the Southwestern and Western regions of the U.S. (table 1). The adoption of moduling by growers has been influenced by risk aversion motives as well as cost considerations. With the trailer handling system, backlogs of loaded trailers at gins cause harvest delays, exposing unharvested cotton to potential quality and yield losses from weather. With the module handling system, growers can harvest as long as weather permits and store the moduled seedcotton on the turnrow and avoid those losses from weather (assuming proper procedures are followed).

The low rate of adoption of modules in the Southeast and Midsouth can be explained in part by factors related to climate and comparative costs. A study done on module builder systems in South Carolina (2) indicated that extended use of module builders with pallets would be required to reduce the cost to that of handling cotton in conventional trailers. The introduction of the palletless module mover truck, which allowed farmers to construct the modules on the ground and avoid the investment, handling, and maintenance of metal or wood pallets to be placed under the modules, led to the rapid adoption of modules by growers in the arid and semi-arid regions where the risk of ground moisture damage to the bottom cotton is low when recommended

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

	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81
	- - - - -	- - - - -	- - - - -	- - Percent - -	- - - - -	- - - - -	- - - - -
United States	2	2	7	13	18	26	32
Southeast 1/	1	3	3	2	1	1	0
Midsouth 2/	2	1	2	5	5	3	2
Southwest 3/	3	5	12	18	23	34	41
West 4/	1	0	6	15	24	34	44

Source: "Charges for Ginning Cotton, Costs of Selected Services Incident to Marketing, and Related Information, __________ Season," yearly reports, 1974/75 - 1980/81. Economics and Statistics Service - National Economics Division and Agricultural Marketing Service - Cotton Division, U.S.D.A.

1/ Alabama, Georgia, North Carolina, South Carolina

2/ Arkansas, Louisiana, Mississippi, Missouri, Tennessee

3/ Oklahoma, Texas

4/ Arizona, California, New Mexico

practices are followed. Early research in California indicated that the palletless system is more cost efficient than the pallet system when fully utilized and that both systems have cost and operational advantages over trailer and rick handling systems (5,7,8).

As farmer interest in moduling increased, ginner interest also increased because (a) the system affected the types of services provided by gins to customers and the competitive relationships among gins and (b) it had potential effects on the gin's operational or cost efficiency. In order for farmers to adopt moduling and purchase module builders, there had to be some assurance that a means of transporting the modules would be available. The most common approach in West Texas has been for the gin in a community to lease or purchase the mover truck and move the modules from farm to gin or arrange for that function to be performed by a custom operator. Fee structures and arrangements for performing this function are highly variable (10). Once the growers in an area begin to adopt modules and some gins arrange to handle the modules, other gins in the area feel competitive pressure to handle modules in order to maintain their market share of seedcotton.

The gin firm has several options in adjusting to handling of modules. For example, the gin may invest in one or more module mover trucks but make no alterations in the gin plant itself. This involves using the same suction feeding system as is used with trailers, the only difference being that modules rather than trailers are moved under the suction and fed into the gin plant. This is typically the first adjustment made by a gin firm. An additional adjustment which the gin firm may make in the handling of modules is to add an automated module feeding system to the gin plant.

Automated (mechanical) feeder systems fall into three major categories, a dump-type system which dumps the module into a bin with a moving floor feeding into dispersing cylinders and two systems which utilize dispersing cylinders that "chew" seedcotton from the end of the module. The dump system, an early innovation designed to handle both trailers and modules, has generally not been widely used in recent applications and was not considered in this study. The difference in the dispersing cylinder systems is in movement of the seedcotton module relative to the dispersing unit. One variation uses a fixed concrete slab varying in length to accomodate from one to four or more seedcotton modules. The dispersing unit moves from one end of a cotton module to the other end of the slab by means of rollers and guides. If the feeder unit is constructed to disperse cotton from either end, the slab is reloaded from the opposite direction and the disperser unloads cotton as it returns. If the feeder unit is constructed to disperse cotton from one end only, the feeder unit returns to the end of the slab, the slab is re-loaded with modules, and the unit resumes feeding. Seedcotton is routed from the dispersing cylinder to a materials conveyor system to either a suction pickup system or a heated-air blower system. The other variation has a fixed set of dispersing cylinders and modules are set on a moving floor which may accomodate from two to four modules. The fixed dispersing cylinders drop seedcotton directly into the suction pipe pickup or into the hot-air blower pipe from the front face of a module which moves into the cylinders by means of a chain or slat-type floor. In general, the moving disperser/fixed slab system is a less expensive system due to its simplicity and is most often adapted to existing gins. The moving floor/fixed disperser system is more complex and requires a higher capital investment; it is generally used in new construction and at larger gins handling a high proportion of modules.

As noted, seedcotton from an automated system is moved into the gin plant either by the suction system or a heated-air blower system. The use of the suction system includes the same physical makeup as used for trailers with the suction pipe pickup extended to the automated module feeder. This system has tended to be the most common adopted because it allows the gin's suction system to be left intact so that the plant can accommodate trailers with the suction system and modules with the automatic feeder and/or the suction. The blower system, which is simply an extension of the gin's heated-air drying system, essentially replaces the suction tubes and piping, the suction fans and feed control unit, and other peripheral suction equipment, and drops the seedcotton into the hot-air line feeding the #1 drying system. Investment, associated maintenance and repairs, and required horsepower are lower with the blower system. However, the dispersing cylinder automatic feeder with a blower can process only modules. Consequently, the automatic blower feeder is feasible only if the entire seasonal volume is in moduled form. While some specific gins are approaching that status, most gin operations are likely to maintain the more flexible system in the near term.

The purpose of this report is to provide estimated impacts of the various seedcotton handling systems on ginning costs. The sets of seedcotton handling systems analyzed consisted of the following:

A. Trailer handling, suction feeding.

B. Module handling, suction feeding.

C. Module handling, automatic feeding using suction.

D. Module handling, automatic feeding using blowers.

Each of the above systems was examined as applied to five gin sizes--7, 14, 21, 28, and 35 bales-per-hour (bph) rated capacity gin plants. Systems B, C, and D were also examined with palletless module mover truck investment and operation included as part of the gin operation as a means of estimating assembly costs. Costs were estimated for West Texas gins processing machine stripped cotton, but the relative cost impacts of the various systems should be generally applicable to other areas, other cottons, and other harvesting methods.

Methods and Procedures

The method of estimating costs for the various systems was that of simulating the cost relationships for each of the 35 plant situations specified. GINMODEL, a computerized cost simulation model (11), was used to process input data and estimate the various cost relationships. The model synthesizes cost relationships from (a) engineering data and/or other estimates of production function components and (b) input costs. Variables such as gin size, annual processing hours, crew requirements, wage rates, efficiency levels, equipment specifications, and dryer fuel are specified in the model program. GINMODEL calculates ginning costs and cost relationships for the situation(s) specified in the input data set which consists of values for both technical and economic variables.

Input data for GINMODEL were obtained from several sources. The data for the five gin size groups in conventional form (trailer handling, suction feeding) were based on the West Texas model gin specifications by Shaw, Cleveland, and Ghetti (12). Input costs, investment costs, interest rates, and other relevant cost data were updated to reflect late 1979/early 1980 price levels. The capital investment cost data in (12) were adjusted to 1979 levels by using the implicit price deflators for non-residential structures and for producers' durable equipment as reported in (3). Investment cost data for module handling and feeding equipment were obtained from equipment manufacturers. Consequently, all estimated costs reflect 1979/80 costs assuming all new buildings and equipment at that time.

Assumptions about gin plant configurations, organization, and equipment requirements were made on the basis of information provided by equipment manufacturers, gin managers, and research engineers knowledgeable of ginning processes and technology. It was assumed that the 7 and 14 bph plants would require one palletless module mover truck, the 21 and 28 bph plants would require two trucks, and the 35 bph plant would need three trucks. Several types of self propelled and tractor operated gin yard module movers are available for use with trucks but were not included in this analysis. The module feeding system for the 7 bph gin plant was assumed to consist of a two-way dispersing unit with a 4-module pad. The feeding system for the 14 and 21 bph plants consisted of fixed dispersing units with moving slatted floors for 3 modules. The 28 and 35 bph plants used fixed dispersing units with moving slatted floors for 4 modules.

Two surveys were also conducted to obtain selected input data for the analysis. Costs associated with module mover trucks were estimated from data obtained from a survey of 21 mover truck owners/operators and from data provided by a major mover truck manufacturer. Another survey of 64 ginning firms in the Texas High Plains provided data on ginning efficiency rates, crew sizes, wage rates, and energy requirements and on how these variables changed as moduled cotton was handled and processed.

Gin Operator Survey

To obtain information on gin operations with and without module handling techniques, a telephone survey of gin operators was conducted during the beginning of the 1979/80 ginning season. The survey was structured to randomly sample West Texas cotton gins stratified geographically and by gin capacity. The population consisted of 328 gins in the Lubbock Classing Territory from which a sample of 20 percent or 66 of the gins was drawn and 64 surveys were completed; the other two gins were found to be dormant.

The gin firm population was first stratified on the basis of the five High Plains production sub-regions described in (9). The population was then stratified on the basis of the size of firms as measured by gin stand rated capacity in 1976. Gins were arranged in order of size within each sub-region and by a random draw of the numbers one through five it was determined that the first and every fifth gin in the population would be sampled. The regions, gin populations, and sample sizes were: Northern, 33 gins, 7 sampled; Western, 86 gins, 17 sampled; Central, 102 gins, 19 sampled; Southwestern, 53 gins, 10 sampled; and Southern, 54 gins, 11 sampled. Topics covered in the interviews of gin operators included:

- --Seedcotton handling system in use
- --Average number of bales handled per season
  - --percent in trailers
  - --percent in modules
  - --percent in ricks
- --Average gin throughput in bales per hour on a sustained basis
  - --for trailer cotton
  - --for module cotton with suction
  - --for module cotton with module feeder
- --Seedcotton and gin yard handling procedures
- --Labor requirements and wages
  - --for trailer cotton
  - --changes for module with suction
  - --changes for module with feeder
- --Energy and power requirements and consumption
  - --for trailer cotton

--changes for module with suction

--changes for module with feeler

Average ginnings per year for the 64 gins reporting was 8,800 bales per gin or a total of 563,200 bales. This was 22.4 percent of the average ginnings in the Texas High Plains region of 2,513,600 bales for the years 1977 through 1979 (4). Survey results indicated that for the 1978/79 harvest season, 46.8 percent of seedcotton ginned was handled in trailers, 46.6 percent in modules, and 6.5 percent in ricks. Only 12.5 percent of the gins did not handle any module cotton and larger gin firms were handling relatively more seedcotton in module form than smaller firms. Sixteen (25 percent) of the gins had automated module feeding equipment during the 1978/79 season.

Gin efficiency rate is defined as that percentage of hourly rated gin stand capacity a gin plant can maintain during normal operation given the gin's overall physical organization and management approach. Its primary use within the simulation model is to adjust the rated capacity--an engineering concept--to a realistic indicator of a plant's sustainable capacity--an operational measure (11, pp. 6,7). Efficiency rate may be affected by such diverse factors as arrangement of machinery, proficiency of the gin crew, and condition of the seedcotton. Gin rated capacity for the 64 sample plants ginning cotton with suction from trailers ranged from 5 to 27 bales per hour with a mean of 11.15 bales per hour. The mean efficiency rate was 67.3 percent (11.15 x .673 = 7.47 bales per hour actual production capacity) with a standard deviation of 12.9 percent. Thirty-seven gin operators responded with ginning capacities for gins handling module cotton by suction unloading, with a range from 6 to 31 and mean of 13.13 bales per hour. Most gin operators reported that cotton ginned from modules allowed greater hourly production throughput rates. Efficiency rates were calculated with a mean value of 78.1 percent and standard deviation of 13.3 percent. This increase in efficiency is consistent with prior studies (6, p. 30; 13).

Of 16 gins operating automated module feeding equipment, 14 responded with estimates of average capacity while using that machinery. The mean rated capacity of gins when operating solely with feeder equipment was 17.9 bales per hour with a range from 8.3 to 27.2. The mean efficiency rate was 81.3 percent with a standard deviation of 7.3 percent. The slight increase over module/suction ginning efficiency was anticipated and significant. However, this increase in efficiency rate is substantially lower than the 27.1 percent increase reported in (6,p.7). Two further points are indicated by the data: (a) gins employing module feeder technology generally have larger rated capacities than the average gin and (b) they are a more homogeneous set of operations as shown by the lower standard deviation in efficiency.

The average efficiency rates used in the GINMODEL program for this analysis were as follows:

Trailer handling/suction feeding	-	.67
Module handling/suction feeding	-	.78
Module handling/automatic suction feeding	-	.81
Module handling/automatic blower feeding	-	.81

Module Mover Truck Costs

Data to develop estimates of costs associated with owning and operating trucks for moving cotton modules from field to gin were obtained from (a) a survey of owners/operators of palletless cotton module mover trucks in January, 1980, and (b) repair and maintenance records provided by Reynolds Module Systems, Inc., Lubbock, Texas. A survey of 21 truck owners/operators (primarily gin firms) was used to obtain data on selected costs, extent of use of the trucks, fuel consumption, and charges for moving modules. Repair and maintenance records and selected cost data on 31 trucks were provided by Reynolds. 3/ All data pertain to trucks in use in Texas, either the High Plains or the Lower Rio Grande Valley, and cost estimates are indicative of December 1979 prices and costs (10).

3/ Reynolds provided all data requested, but records were in raw data form and the firm did not participate in the analysis.

Summaries of selected survey results are shown in tables 2 and 3. The 31 trucks were in use from one to five seasons. Modules moved per truck per season ranged from 450 to 1,670 and averaged 850. Repair costs in table 3 include those repairs made to mover trucks under warranty and not paid by owners. Since all trucks were relatively new, inclusion of warranty repairs should more accurately reflect repair costs over the full life of the trucks--repair costs typically increase with age of equipment.

Data from tables 2 and 3 were used to budget module mover costs (10). The cost estimates are summarized as follows:

<u>Estimated Seasonal Costs for a Module Mover Truck</u>

Assumptions: 850 modules, 906 hours of labor per season, 22.8 miles driven per module, diesel fuel @ 95 cents per gallon, 12 percent interest on investment, 15 percent interest on 1/2 operating capital, 10 years useful life.

Item	$/season	$/module
Variable operating expense	6,307	7.42
Fixed operating expense	1,450	1.71
Labor @ $4.00/hour + 22% for fringe benefits	4,421	5.20
Interest on operating capital	913	1.07
Total operating cost	13,091	15.40
Depreciation	7,560	8.90
Interest on investment	6,828	8.03
Total ownership cost	14,388	16.93
Total cost	27,479	32.33

The estimates suggest an average moving cost of about $3.25 per bale, assuming 10 bales per module. However,

Table 2. Results of survey of module mover truck owners in Texas, 1979-80 ginning season.

Owner number	Driver down time	Driver wages	Truck fuel consumption	Annual insurance cost	Annual taxes & license cost	Charge for moving modules
	--- % ---	-$/hr.-	-- m.p.g. --	-$/truck-	-- $/truck --	- $/module -
1	NA [1]	4.00	NA	NA	250	20
2	NA	-- [2]	NA	NA	298	-- [3]
3	17	4.00	8.0	NA	260	30
4	25	3.25	3.9	NA	265	50
5	NA	4.00	4.0	NA	465	NA
6	15	5.00	4.0	900	238	20
7	8	4.00	5.5	NA	250	-- [3]
8	10	5.00	7.0	660	NA	45
9	10	3.50	4.0	NA	NA	25
10	17	3.50	NA	1600	NA	25
11	20	4.00	4.5	NA	350	30
12	NA	4.25	3.5	NA	NA	-- [3]
13	12	4.00	5.5	NA	442	44
14	NA	3.50	7.0	NA	NA	44
15	17	4.00	4.5	750	480	20
16	NA	3.25	5.0	NA	483	30
17	7	NA	6.0	NA	248	-- [3]
18	5	-- [2]	5.5	NA	250	NA
19	25	3.40	4.0	NA	NA	-- [3]
20	33	6.00	6.5	830	550	35
21	19	4.00	5.5	600	750	50
Average	16	4.04	5.2	890	372 [4]	33

1/ No response.

2/ $1 per bale.

3/ Gin did not charge producer a separate fee for handling modules.

4/ Average cost for seasonal license was $257.

Table 3. Module mover operation and repair cost data.

Truck number	Total miles	Total modules	Miles per module	Total repairs [1] ($)	Repair costs per mile (¢/mile)	Repair costs per module ($/module)
1	31,000	2,000	15.5	7,286	23.50	3.64
2	19,250	630	30.6	454	2.36	.72
3	15,098	1,700	8.9	1,116	7.39	.66
4	55,000	1,500	36.7	1,895	3.44	1.26
5	52,000	2,080	25.0	11,916	22.92	5.73
6	52,000	1,800	28.9	2,023	3.89	1.12
7	22,000	600	36.7	1,445	6.57	2.41
8	62,500	2,900	21.6	2,882	4.61	.99
9	28,717	1,000	28.7	1,571	5.47	1.57
10	70,000	5,000	14.0	3,172	4.53	.63
11	60,000	1,500	40.0	920	1.53	.61
12	40,000	1,385	28.9	88	0.22	.06
13	21,000	1,400	15.0	525	2.50	.38
14	17,000	1,000	17.0	808	4.75	.81
15 & 16	49,000	4,387	11.2	2,135	4.36	.49
17 & 18	110,000	7,333	15.0	6,876	6.25	.94
19 & 20	51,000	1,232	41.4	1,669	3.27	1.35
21 & 22	78,000	3,250	24.0	5,540	7.10	1.70
23,24 & 25	96,000	4,400	21.8	9,906	10.32	2.25
26,27 & 28	402,000	20,000	20.1	25,679	6.39	1.28
29,30 & 31	375,000	9,825	38.2	42,030	11.21	4.28
Total	1,706,565	74,922		129,936		
Average	55,050	2,417	22.8	4,191	7.61	1.73

Source: Reynolds Module Systems, Inc., repair and maintenance records.

1/ Repair costs (excluding tires) include repairs made under warranty except for frame repairs on four trucks.

While the average is meaningful as a reference, the range in costs among owners and trucks indicates substantial variation around the average cost. It may be noted that the estimated average cost for moving a module is almost equal to the $33 per module average charge for moving modules. 4/ However, close examination of the data indicates that custom operators and gins which operate mover trucks as an independent enterprise have higher charges for moving modules. On the other hand, many gin firms do not intend to fully recover module moving costs from a module moving fee. Almost 25 percent of the operators surveyed had no separate charge for moving or handling modules. These operations may make up the difference in their ginning charges or from potential cost efficiencies gained in the ginning process when moduled cotton is handled.

General Assumptions

Some assumptions were made regarding gin operating procedures and input costs which applied to all gin plants and all seedcotton handling systems. While operating procedures and other factors vary among gins and from year to year, it was necessary to standardize certain operating assumptions and costs for analytical purposes. These

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4/ The $33 per module is a simple average figure. If charges were weighed by the number of modules moved, the average charge would probably be lower.

assmptions are explained below.

All simulated plant situations assumed an operating season of 906 hours of plant operations; this is based on typical harvesting schedules with trailers and no seedcotton storage (11, pp.6,7). The dryer fuel used was natural gas at the rate of 250 cubic feet per bale in all situations. Fixed non-processing seasonal crew hours--hours for which the crew is paid but not engaged in processing because of crew training, plant breakdown, lack of seedcotton, etc.--were assumed to be 292 hours in all situations (11 pp. 14,15). Variable non-processing seasonal crew hours--hours for which the crew is paid but not engaged in processing, because of paid lunch breaks, interruptions between trailers or modules, etc., were assumed to be 122 hours (11; pp. 14,15). Seasonal crew overtime hours at full seasonal plant utilization were assumed at 208. For each 10 percent reduction in ginning volume, variable non-processing crew hours were reduced 8 percent and overtime hours were reduced 20 percent. All gins were assumed to have universal density presses with automatic strapping and a bagging and tie cost of $3.75 per bale.

Interest rates of 12 percent on capital assets and 15 percent on operating capital were used in all cases. Hourly wage rates for non-salaried employees in all gin situations were: $3.45 for office employees, $5.00 for hourly ginners, $4.00 for assistant ginners, $3.10 for head press employees, and $2.95 for other gin employees. Fringe benefits costs for all employees were assumed to be 21.7 percent of wages for gin employees and 5.85 percent for office employees. The property tax rate was assumed to be 1.4 percent or asset costs. Insurance rates were $.50 per bale on seedcotton insurance, and .6 percent on 90 percent of asset costs (excluding land) for property insurance. GINMODEL subroutines were used to simulate natural gas and electricity costs (11). Natural gas costs were based on the Pioneer Natural Gas Co. rate schedule in effect in late 1979 and electricity costs were based on the Southwestern Public Service rate schedule for gins in late 1979.

The same number of seasonal employees was assumed with module handling and suction feeding as with trailer handling and suction feeding for each gin plant size. However, gin crew sizes were adjusted to reflect the lower labor requirements with the automated seedcotton feeding systems. The 7, 14, and 21 bph plants' seasonal gin crews were decreased by two employees with the automated feeders, the 28 bph plants' crews were decreased by three employees, and the 35 bph plants' crews were decreased by four employees with the automated feeders.

Findings

Investment Costs

Capital investment costs for the various gin plant configurations are shown in table 4. The investment costs for the 7 bph rated capacity plants ranged from about $780,000 for the "conventional" plant (arranged for trailer handling and suction feeding) to almost $970,000 for the plant arranged for module handling and automatic feeding with suction and owning its own module mover truck. Investment cost for the plant with an automatic feeder with a blower is lower because the suction system is unnecessary.

Investment costs ran up to about $2.5 million for the 35 bph plant with automatic suction feeding, module handling, and owning three mover trucks. As indicated previously, not all gins handling modules own the mover trucks. Some gins contract with custom mover truck operators and some gins do custom module moving for other gins in their area. Some gins in the Texas High Plains do custom work or lease their trucks to gins in the Lower Rio Grande Valley and vice versa; the three month difference in the harvest season between the two regions make such arrangements feasible.

Plant Cost Relationships

The GINMODEL program was used to estimate 35 gin plant cost relationships. Seven different plant situations were examined for each of the basic plant sizes. The seven situations were:

A. Trailer handling, suction feeding

Table 4. Plant capital investment costs for West Texas gins; 1979 price level.

Item	Plant size in bales/hour rated capacity				
	7	14	21	28	35
Land	15,000	17,500	22,400	27,400	32,400
Gin buildings	147,100	199,500	367,900	414,600	541,800
Press, ticing, & sampling equipment	223,900	223,900	261,200	261,200	286,100
Other gin machinery	311,600	383,800	636,100	741,500	984,300
Outside equipment	37,300	54,700	72,800	95,200	133,700
Tools	2,500	3,700	5,000	6,200	7,500
Office buidling & equipment	15,700	18,800	21,900	29,400	36,700
Sub-total	753,100	901,900	1,387,300	1,575,500	2,022,500
Suction feeding system	29,600	36,400	49,800	55,600	70,400
Total investment cost for gin with trailer handling, suction feeding	782,700	938,300	1,437,100	1,631,100	2,092,900
Mover trucks	83,500	83,500	167,000	167,000	250,500
Total investment cost for gin with module handling (owning own trucks), suction feeding	866,200	1,021,800	1,604,100	1,798,100	2,343,400
Automatic module feeder system	100,000	115,000	115,000	150,000	150,000
Total investment cost for gin with module handling (owning own trucks) and					
A. Automatic suction feeding	966,200	1,136,800	1,719,100	1,948,100	2,493,400
B. Automatic blower feeding (omit suction feeding system)	936,600	1,100,400	1,669,300	1,892,500	2,423,000

B. Module handling, suction feeding

C. Module handling, automatic suction feeding, and

D. Module handling, automatic blower feeding,

all without any assembly costs being included. In addition, situations B, C, and D were examined with module assembly costs included. Assembly costs included fixed and operating costs associated with the mover trucks for transporting modules to the gins.

Detailed summaries of the estimated ginning costs per bale of cotton for each of the 20 plant situations without assembly costs are shown in Appendix tables 1-20. Per bale costs are shown for both fixed and variable cost components and by individual cost items. Individual cost items with both fixed and variable cost components are not separated into their separate components. For example, interest is not separated into interest on capital assets (fixed cost) and interest on operating capital (variable cost). However, the components of total cost per bale (average total cost), fixed cost per bale (average fixed cost), and variable cost per bale (average variable cost), are shown.

The plant cost relationships are illustrated in figures 2 through 9. Comparisons among plant sizes for three handling/feeding alternatives are shown in figures 2, 3, and 4. The cost curves for module handling, automatic blower feeding are not shown because the per bale costs differ little from those for module handling, automatic suction

Figure 2. Total costs per bale for ginning cotton in West Texas: trailer handling, suction feeding, no assembly costs.

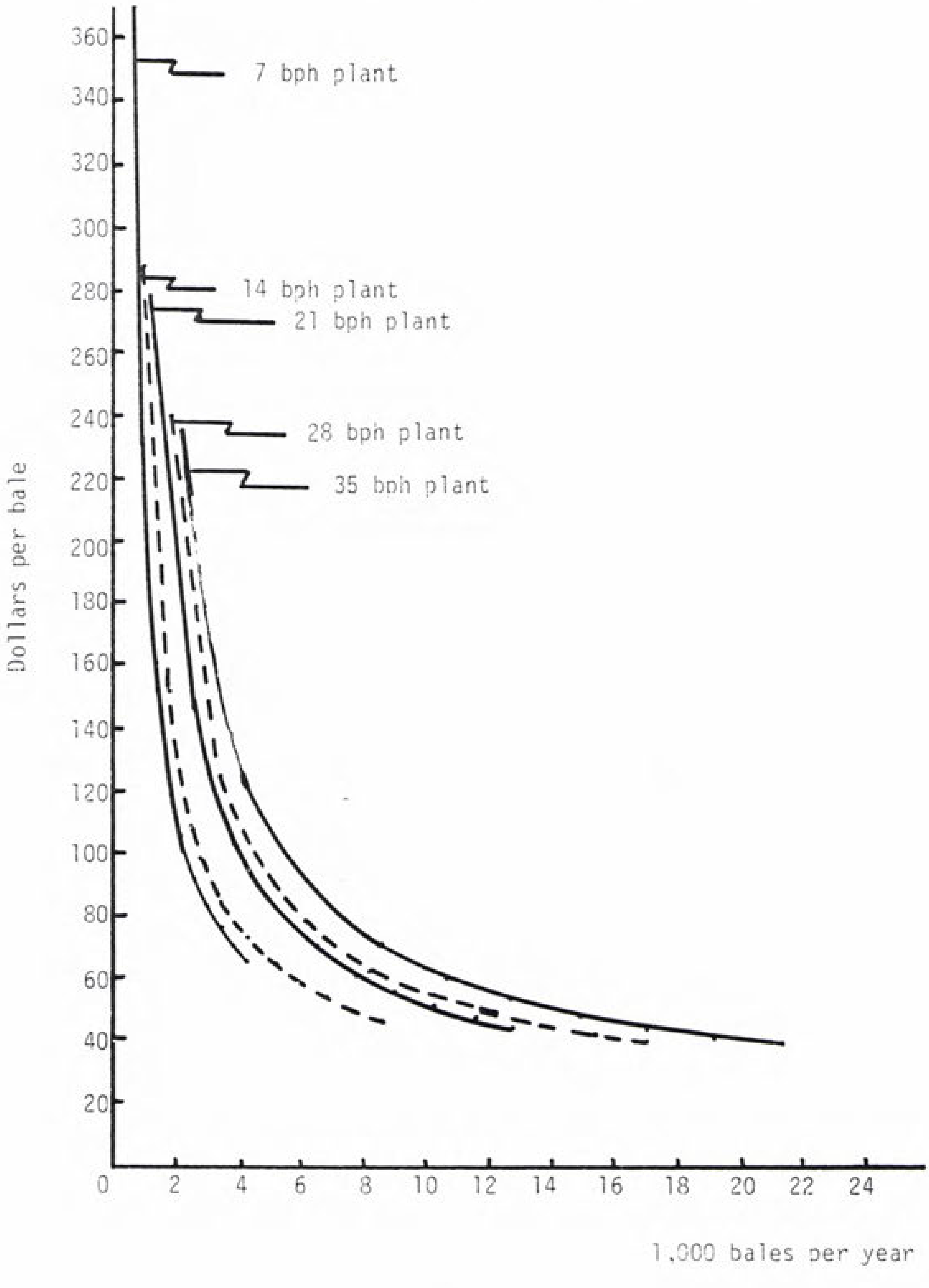


Figure 3. Total costs per bale for ginning cotton in West Texas: module handling, suction feeding, no assembly costs.

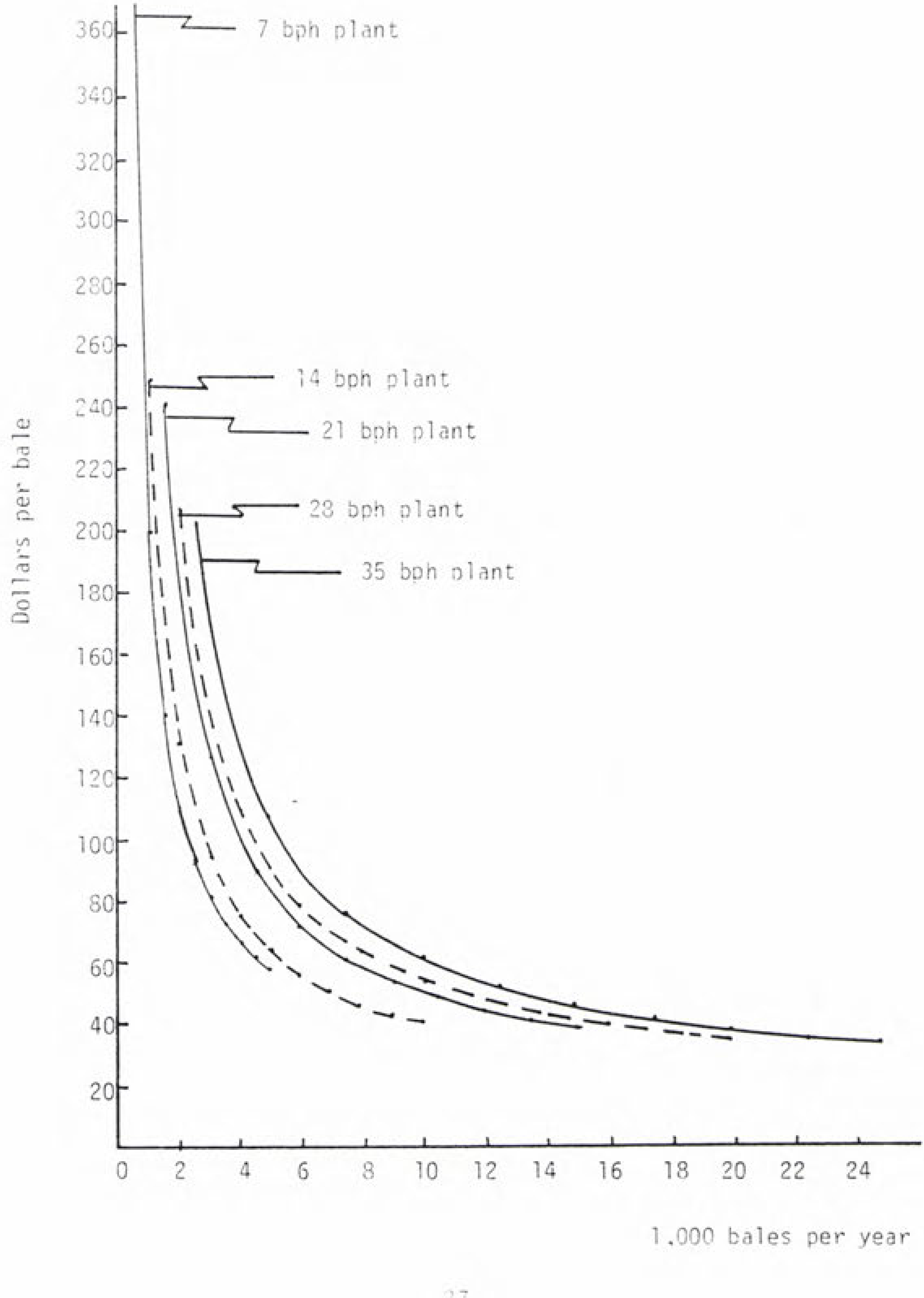
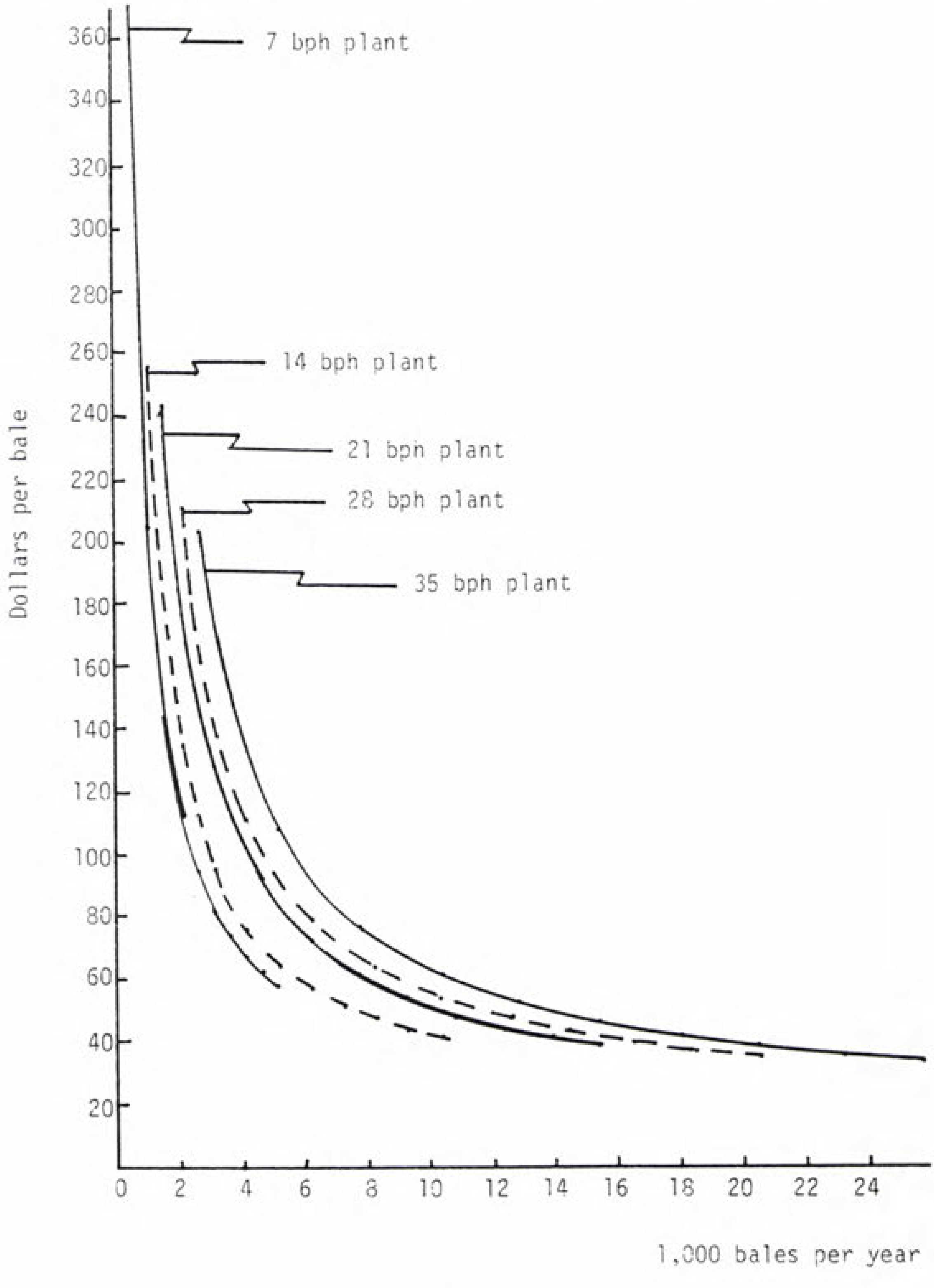


Figure 4. Total costs per bale for ginning cotton in West Texas; module handling, automatic suction feeding, no assembly costs.



feeding. The cost curves which include assembly costs are not shown for the same reason, i.e., the curves bear the same or similar relationship to one another.

Figures 2 through 4 indicate that, irrespective of the handling/feeding system, per bale costs for larger plants fall below those for smaller plants only for levels of output exceeding the seasonal capacities of the smaller plants. For example, the volume with the 14 (21) bph plant must exceed the capacity of the 7 (14) bph plant before its cost per bale falls below the cost for the 7 (14) bph plant. While there are substantial economies of plant size, they occur mostly in the smaller plant sizes. Consider that for the conventional plants, the cost per bale at full plant utilization falls almost $20 when doubling plant size from 7 to 14 bph, but doubling plant size again to 28 bph only lowers per bale costs another $6.50 per bale. The $6.50 per bale is a substantial saving to be realized, provided the volume exists. Economies of plant utilization are greater than economies of plant size. Costs are slightly less responsive to changes in volume ginned for the larger plants. For example, a comparison of the plants having module handling and suction feeding reveals that a 10 percent decrease in seasonal volume from 100 percent utilization results in a 6.8 percent increase in per bale costs for the 7 bph plant but a 5.9 percent increase for the 35 bph plant.

Comparisons among handling/feeding alternatives by plant size are shown in figures 5 through 9. In order to have readable graphs, all cost relationships are not shown and none are shown over the entire range of costs. Costs for three of the handling/feeding alternatives for 7 bph plants are shown in figure 5. Per bale costs are lowest for the plant with module handling, suction feeding (module/suction) up to an annual volume of about 3,300 bales. For volumes greater than 3,300 bales, the plant with module handling, automatic blower feeding (module/automatic blower) has the lowest cost to the limit of capacity--about 5,150 bales. The module/suction plant has lower per bale costs than the plant with trailer handling, suction feeding (trailer/suction) over the entire range of annual volume and it has lower costs than the module/automatic suction plant (not shown) for all levels of annual volume which suction feeding can achieve. The module/automatic blower plant has lower per bale costs than the module/automatic suction plant over all volume levels and lower costs than the trailer/suction plant at a volume over 1,700 bales.

For the 14 bph plants (figure 6) the trailer/suction plant has the lowest per bale cost up to an annual volume of about 2,000 bales, then the module/suction plant has the lowest cost to the limit of its capacity, 9,900 bales. The module/automatic blower plant costs become equivalent to those for the module/suction plant at about 8,000 bales (to

Figure 5. Total costs per bale for ginning cotton in West Texas; 7 bph plants, no assembly costs.

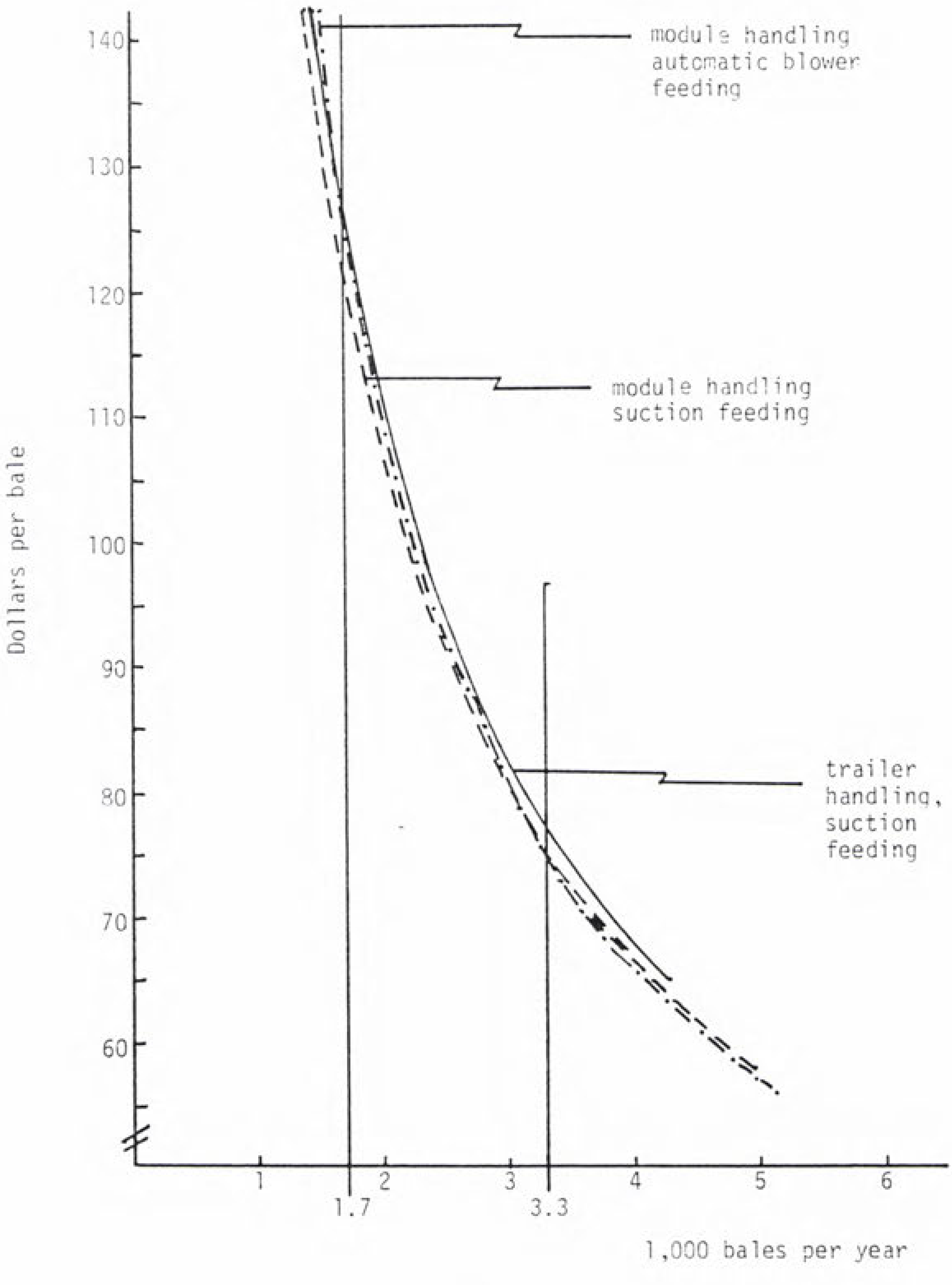
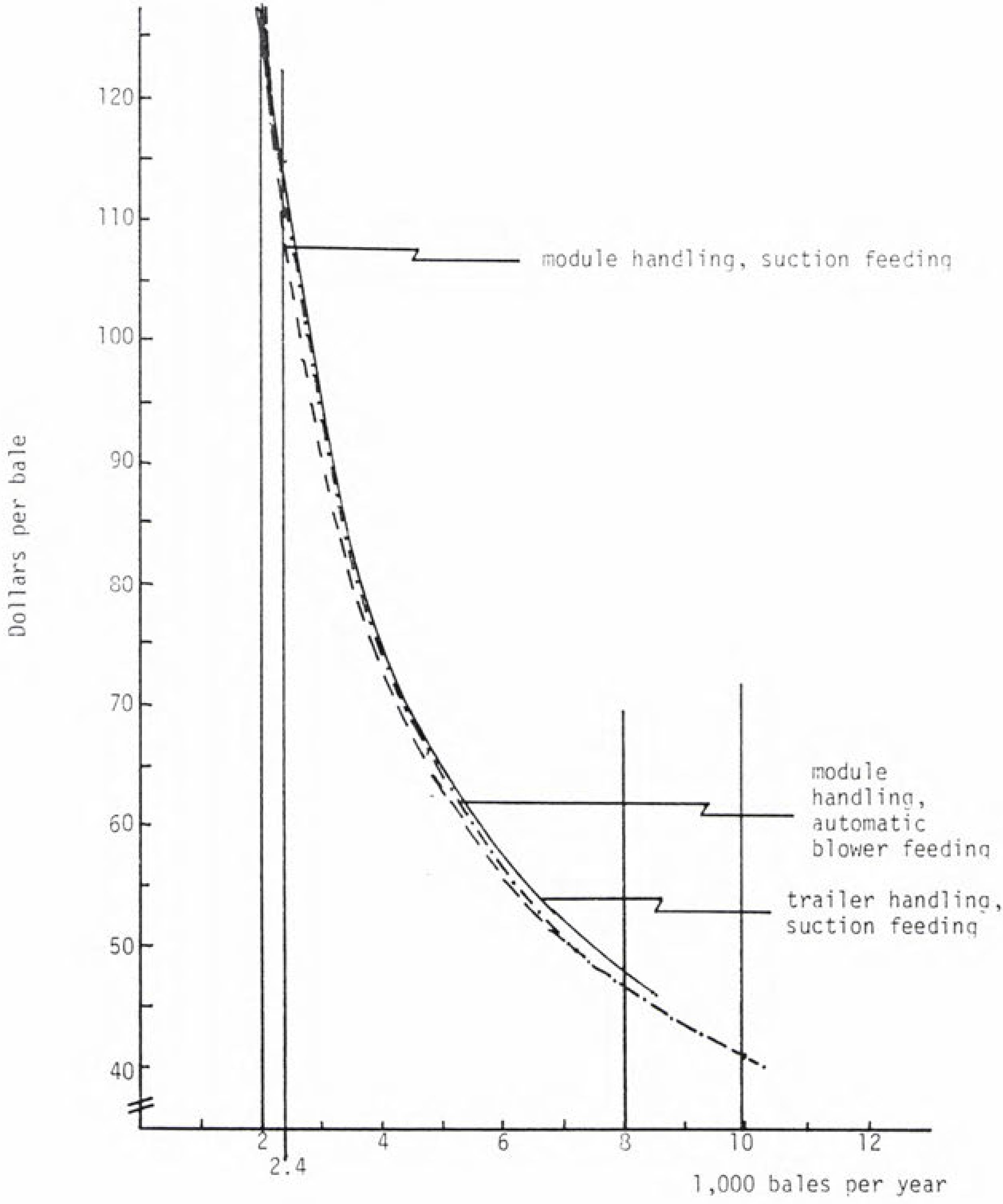


Figure 6. Total costs per bale for ginning cotton in West Texas: 14 bph plants, no assembly costs.

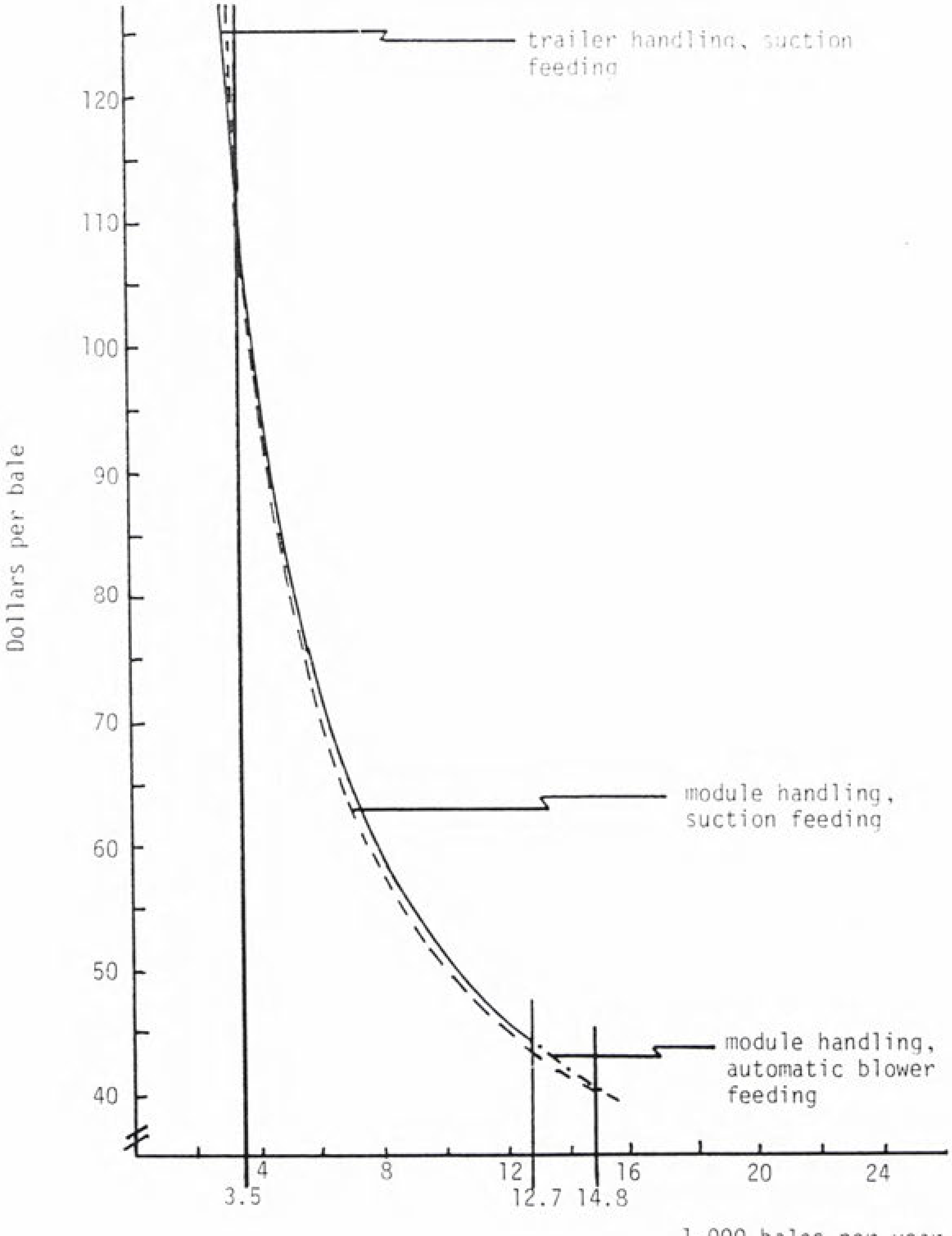


9,900 bales) and has the lowest costs from 9,900 to 10,250 bales per year, the limit of capacity. Costs with the module/automatic blower plant exceed those with the trailer/suction plant to about 2,400 bales, then become lower. Costs with the module/automatic suction plant exceed those with the trailer/suction plant up to about 8,000 bales, then become lower only as the capacity of the trailer/suction plant is exceeded. Module/automatic suction plant costs exceed module/automatic blower plant costs at all volumes.

For the 21 bph plants (figure 7), the trailer/suction plant has the lowest cost to about 3,500 bales, then the module/suction plant has the lowest per bale cost to 14,800 bales, its capacity; as that capacity is exceeded the costs for the module/automatic blower plant are lowest. Module/automatic blower costs exceed those for trailer/suction to about 4,500 bales, then the costs for the two systems become equivalent over their common range of capacity. Module/automatic suction costs (not shown) lie above trailer/suction costs to about 7,700 bales and fall below trailer/suction costs only when the limit of trailer/suction capacity is exceeded.

The trailer/suction plant has the lowest per bale costs among the 28 bph plants to an annual volume of 4,500 bales, at which point the module/suction plant costs become lowest to a volume of 12,400 bales, then the module/automatic

Figure 7. Total costs per bale for ginning cotton in West Texas: 21 bph plants, no assembly costs.



blower plant has the lowest cost to 20,500 bales (figure 8). Costs with module/automatic blower are very near costs with module/suction up to about 12,400 bales. Module/automatic suction costs (not shown) do not fall below trailer/suction costs until a seasonal volume of around 15,500 bales.

The lowest cost per bale for the 35 bph plants (figure 9) are: the trailer/suction plant to about 6,000 bales, then the module/suction and the module/automatic blower plants to 12,000 bales, then the module/automatic blower plant to 25,700 bales. The module/automatic suction plant has the highest costs to 14,000 bales, where its costs equal those for the trailer/suction plant; its costs fall below those for the module/suction plant at about 21,000 bales.

Assembly Costs

While growers have traditionally been responsible for the transportation of seedcotton to gin yards, the emerging pattern with the adoption of the module handling system has been for the gins to assume that responsibility. Consequently, field-to-gin transporting of seedcotton has become more closely associated with the ginning operation than with the harvesting operation as a result of the module handling system. As a means of examining those costs in the context of the specified gin sizes and module handling systems, the appropriate module mover capital and operating cost data were added to the gin plant specifications used in

Figure 8. Total costs per bale for ginning cotton in West Texas; 28 bph plants, no assembly costs.

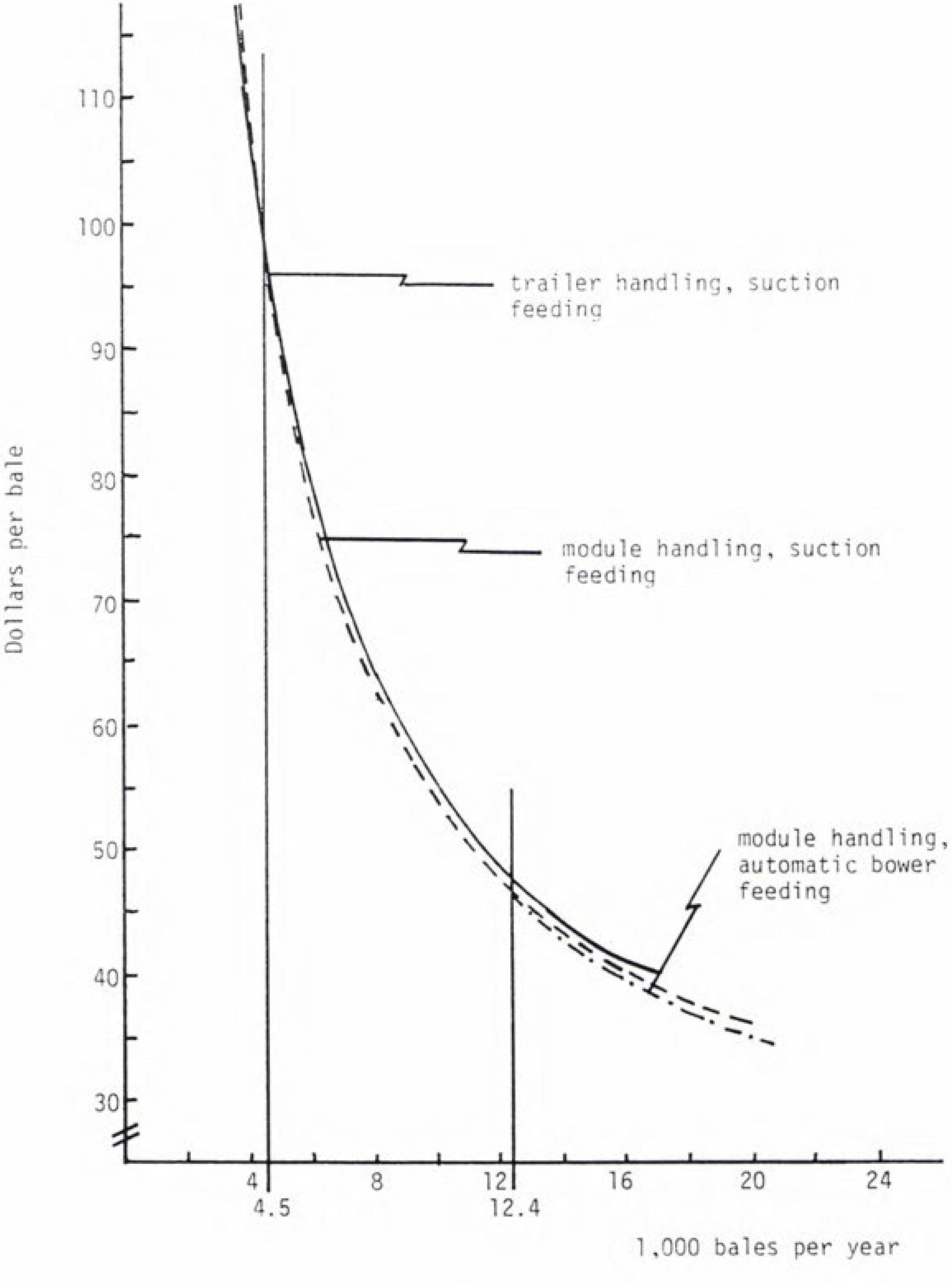
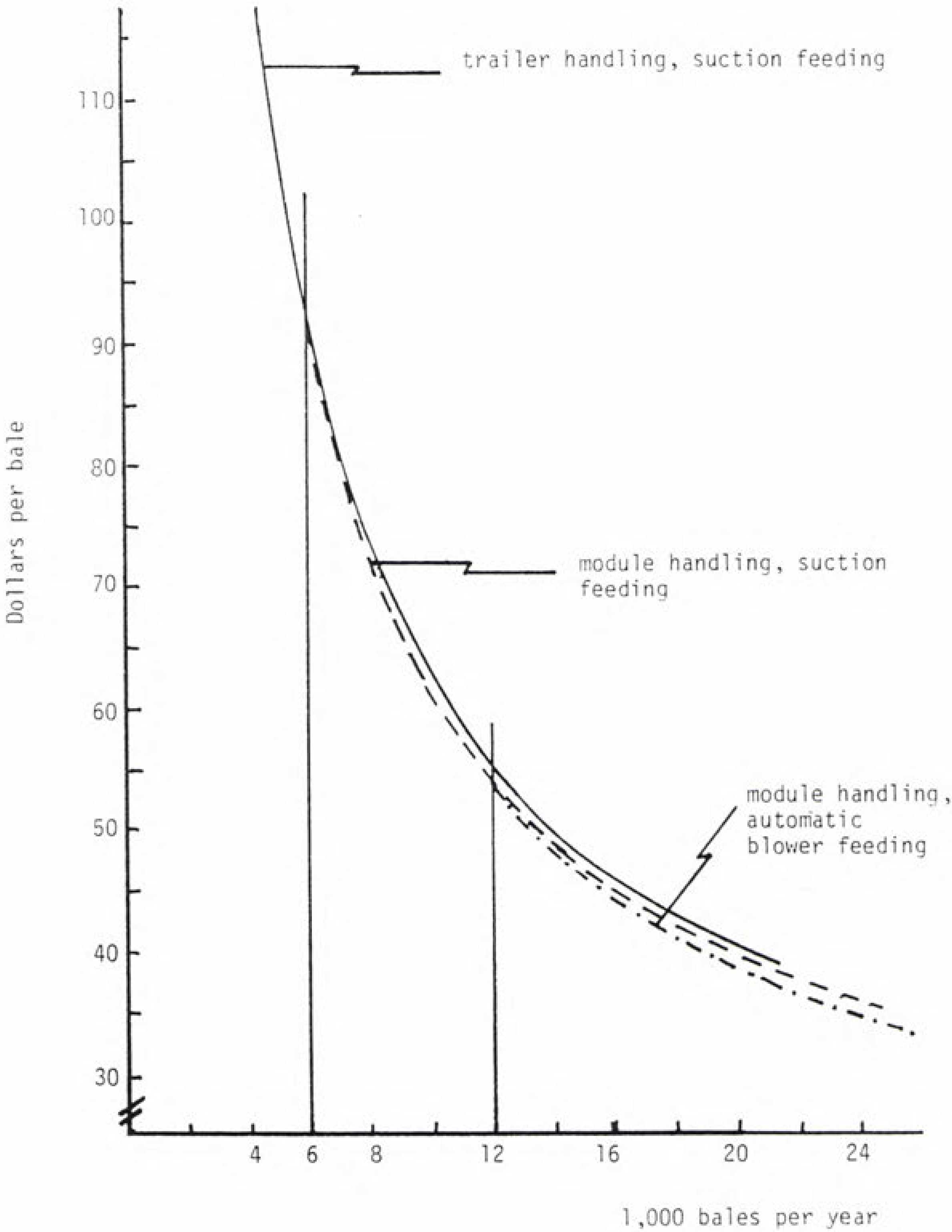


Figure 9. Total costs per bale for ginning cotton in West Texas; 35 bph plants, no assembly costs.



the GINMODEL program.

The analysis assumed investment costs for one mover truck with the 7 bph and 14 bph plants, two trucks with the 21 and 28 bph plants, and three trucks with the 35 bph plants (table 4). A salvage value of 10 percent and a ten year useful life was assumed for each truck. Operating costs, including maintenance, variable repairs, fuel, and tires, were assumed to be $.03258 per bale per mile (10). Operating costs varied with size of gin plant due to the assumption of increased average distance of haul for larger plants. Average round-trip distances of 13.2, 18.7, 22.8, 26.0, and 29.4 miles were assumed for the 7, 14, 21, 28, and 35 bph plants, respectively. The basis for these distances was as follows: the 22.8 miles average distance from the survey results (10) was assumed for the 21 bph plant; the remaining distances were in proportion to the distances established by Shaw, Cleveland, and Ghetti (12). The distances resulted in variable operating assembly costs, excluding labor, of $.43, $.61, $.74, $.85, and $.96 per bale for the five plant sizes. Labor costs consisted of one operator per truck per shift at the wage rate of Assistant Ginners; number of hours worked and overtime hours were adjusted in the same manner as the seasonal gin labor with reductions in plant utilization.

Assembly costs are summarized in tables 5 and 6. Cost efficiencies accrue to rate of utilization which result

Table 5. Estimated per bale assembly costs for gin plants with module handling, suction feeding.

Plant size	Percent capacity utilization									
	100	90	80	70	60	50	40	30	20	10
	- - - - - - - - - Dollars/bale	- - - - - - - - -								
7 bph										
No. bales/season	4,947	4,452	3,957	3,463	2,968	2,473	1,979	1,484	989	495
Total cost/bale	5.46	5.88	6.40	7.07	7.97	9.22	11.16	14.38	20.83	40.14
Fixed cost/bale	3.84	4.27	4.80	5.49	6.40	7.68	9.60	12.81	19.21	38.41
Variable cost/bale	1.62	1.61	1.60	1.58	1.57	1.54	1.56	1.57	1.62	1.73
14 bph										
No. bales/season	9,894	8,904	7,915	6,925	5,936	4,947	3,957	2,968	1,979	989
Total cost/bale	3.14	3.34	3.60	3.95	4.40	5.03	5.98	7.60	10.83	20.30
Fixed cost/bale	1.90	2.10	2.37	2.71	3.15	3.78	4.73	6.31	9.48	18.94
Variable cost/bale	1.24	1.24	1.23	1.24	1.25	1.25	1.25	1.29	1.35	1.36
21 bph										
No. bales/season	14,840	13,356	11,872	10,388	8,904	7,420	5,936	4,452	2,968	1,484
Total cost/bale	4.10	4.38	4.72	5.18	5.78	6.61	7.92	10.05	14.34	27.23
Fixed cost/bale	2.56	2.84	3.20	3.66	4.27	5.12	6.41	8.54	12.80	25.61
Variable cost/bale	1.54	1.54	1.52	1.52	1.51	1.49	1.51	1.51	1.54	1.62
28 bph										
No. bales/season	19,787	17,808	15,830	13,851	11,872	9,894	7,915	5,936	3,957	1,979
Total cost/bale	3.38	3.59	3.85	4.18	4.63	5.26	6.22	7.85	11.05	20.74
Fixed cost/bale	1.92	2.14	2.40	2.74	3.20	3.84	4.80	6.40	9.60	19.21
Variable cost/bale	1.46	1.45	1.45	1.44	1.43	1.42	1.42	1.45	1.45	1.53
35 bph										
No. bales/season	24,734	22,260	19,787	17,314	14,840	12,367	9,894	7,420	4,947	2,473
Total cost/bale	3.98	4.25	4.55	4.94	5.48	6.24	7.41	9.35	13.21	24.81
Fixed cost/bale	2.30	2.57	2.88	3.29	3.84	4.61	5.77	7.69	11.52	23.05
Variable cost/bale	1.68	1.68	1.67	1.65	1.64	1.63	1.64	1.66	1.69	1.76

Table 6. Estimated per bale assembly costs for gin plants with module handling, automated gin feeder systems.

Plant size	Percent capacity utilization 100	90	80	70	60	50	40	30	20	10
	- - - -	- - - -	- - - -	- - - -	Dollars/bale	- - - -	- - - -	- - - -	- - - -	- - - -
7 bph										
No. bales/season	5,137	4,623	4,110	3,596	3,082	2,569	2,055	1,541	1,027	514
Total cost/bale	5.27	5.67	6.19	6.82	7.70	8.89	10.77	13.85	20.07	38.68
Fixed cost/bale	3.70	4.11	4.63	5.28	6.17	7.40	9.25	12.32	18.49	36.98
Variable cost/bale	1.57	1.56	1.56	1.54	1.53	1.49	1.52	1.53	1.58	1.70
14 bph										
No. bales/season	10,274	9,247	8,219	7,192	6,164	5,137	4,110	3,082	2,055	1,027
Total cost/bale	3.05	3.25	3.51	3.82	4.25	4.82	5.78	7.35	10.44	19.75
Fixed cost/bale	1.85	2.06	2.32	2.64	3.08	3.66	4.62	6.17	9.25	18.49
Variable cost/bale	1.20	1.19	1.19	1.18	1.17	1.16	1.16	1.18	1.19	1.26
21 bph										
No. bales/season	15,411	13,870	12,329	10,788	9,247	7,706	6,164	4,623	3,082	1,541
Total cost/bale	3.97	4.25	4.58	5.01	5.59	6.40	7.64	9.70	13.84	26.25
Fixed cost/bale	2.46	2.74	3.08	3.52	4.11	4.94	6.16	8.22	12.33	24.66
Variable cost/bale	1.51	1.51	1.50	1.49	1.48	1.46	1.48	1.48	1.51	1.59
28 bph										
No. bales/season	20,548	18,493	16,438	14,384	12,329	10,274	8,219	6,164	4,110	2,055
Total cost/bale	3.28	3.49	3.74	4.07	4.48	5.10	6.02	7.59	10.68	20.00
Fixed cost/bale	1.85	2.06	2.31	2.65	3.08	3.70	4.62	6.17	9.24	18.50
Variable cost/bale	1.43	1.43	1.43	1.42	1.40	1.40	1.40	1.42	1.44	1.50
35 bph										
No. bales/season	25,685	23,117	20,548	17,980	15,411	12,843	10,274	7,706	5,137	2,569
Total cost/bale	3.87	4.12	4.42	4.80	5.32	6.05	7.18	9.03	12.76	23.92
Fixed cost/bale	2.22	2.47	2.77	3.17	3.70	4.44	5.57	7.40	11.10	22.19
Variable cost/bale	1.65	1.65	1.65	1.63	1.62	1.61	1.61	1.63	1.66	1.73

primarily from the spreading of fixed costs over larger volumes. Costs per bale increase with increases in plant size to the 21 and 35 bph plants because of the lumpiness in truck investment. While only one truck is required to service the 7 and 14 bph plants, the increase in costs to the 21 bph plant results from relatively low utilization of the two trucks necessary to service those plants.

These assembly costs are representative of costs under the conditions assumed. However, the cost situation for specific firms varies substantially. Tables 5 and 6 clearly demonstrate that the average cost of moving seedcotton with mover trucks is sensitive to extent of use. As indicated previously, some gins lease trucks and/or engage in custom hauling to take advantage of those economies of utilization. Extension of the ginning season beyond the 906 operating hours assumed through the use of module seedcotton storage would further reduce per bale assembly and ginning costs by spreading the fixed costs over a larger volume.

Economies of Size

Economies of size in ginning may be shown by examining costs as plant sizes change. Each of the 20 plant configurations in this analysis represented a different plant, most of them of different sizes in terms of seasonal capacity. The lowest per bale cost of ginning associated with each level of seasonal volume is a point on the long run average cost curve; long run because plant size is varied. Economies of size with the plant configurations in this study are illustrated in figure 10; data are shown in table 7. The curve becomes quite flat beyond 15,000 bales per year, indicating that costs are not very sensitive to volume ginned at the higher annual volumes and the larger plants (28 and 35 bph plants).

Only eight of the 20 plant configurations are included in the envelope cost curve (figure 10). Each of the eight plants practices module handling, indicating that ginning from modules gives lower per bale ginning costs than ginning from trailers. These costs do not include assembly costs and as the previous section indicates, costs of assembly may vary substantially with plant size. Each of the eight plants with points of lowest long-run cost practiced either suction gin feeding or automatic blower feeding. Automatic suction feeding requires more captial investment and/or more energy to operate than the other gin feeding methods. However, as indicated previously, automatic blower feeding is not practical at gins that are processing cotton from trailers as well as modules.

Summary and Conclusions

Results of the analysis generally indicate that economies of utilization are relatively more important in reducing per bale ginning costs than are economies of plant

Figure 10. Envelope cost curve for the 20 West Texas gin plant configurations: no assembly costs.

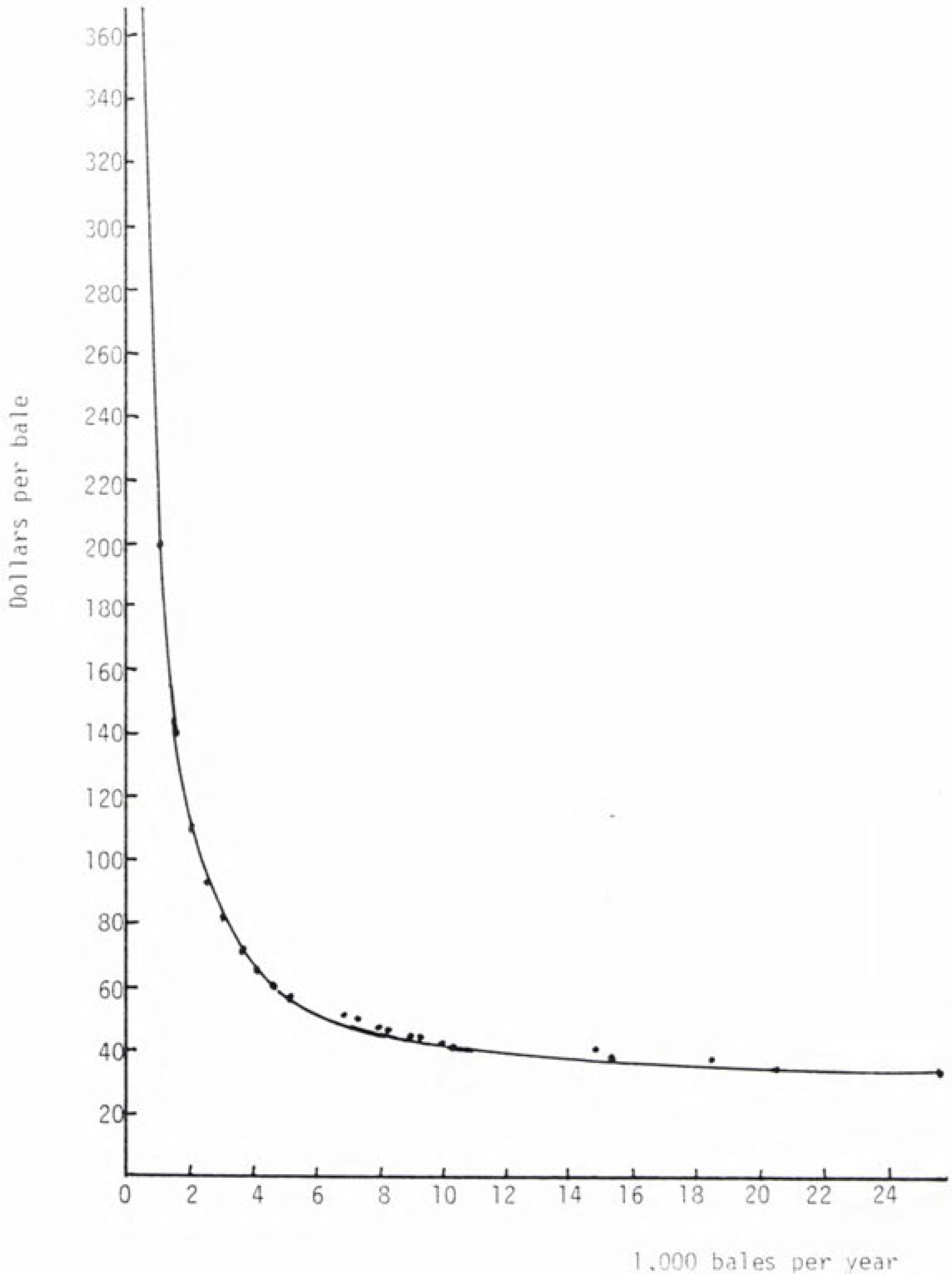


Table 7. Minimum per bale ginning costs among five basic plant sizes, two seedcotton handling systems, and three gin feeding systems; no assembly costs.

No. bales/year	$/bale		Description of gin plant
495	380.91		
989	198.76		7 bph plant, module handling, suction feeding
1,484	139.58		
1,979	110.25		
2,473	92.66		
2,968	81.20		
3,596	71.22		
4,110	64.84		7 bph plant, module handling, automatic blower feeding
4,623	59.84		
5,137	55.84		
6,925	51.10	a	
7,192	49.87	b	(a) 14 bph plant, module handling, suction feeding
7,915	47.09	a	
8,219	45.82	b	
8,904	43.93	a	(b) 14 bph plant, module handling, automatic blower feeding
9,247	42.64	b	
9,894	41.41	a	
10,274	40.10	b	
14,840	39.58		21 bph plant, module handling, suction feeding
15,411	38.13		21 bph plant module handling, automatic blower feeding
18,493	36.55		28 bph plant, module handling, automatic blower feeding
20,548	34.47		
25,685	33.25		35 bph plant, module handling, automatic blower feeding

size. Per bale costs for a given quantity ginned will typically be the lowest with the smallest rated capacity gin plant which is capable of ginning that volume within a given time period (ginning season). Of the various seedcotton handling systems analyzed, the results indicate that module handling lowers ginning costs below that associated with trailer handling over the relevant range of plant utilization--greater than 50 percent. The cost reduction associated with modules results primarily from the large increase in gin efficiency rate from trailer handling to module handling. It is unlikely that gin plants which cannot operate at greater than 50 percent of their potential can remain in business over a very long time anyway.

The effects of automated module seedcotton feeding systems on ginning costs are more difficult to generalize. Under the assumptions of this study, the automatic blower system tended to have lower cost than the conventional (trailer handling, suction feeding) system over relevant ranges of plant utilization, but high levels of plant utilization must be maintained for automatic blower feeding to have lower costs than suction feeding from modules. The module/automatic blower feeding system was the least cost only for the large (28 and 35 bph) plants operating above 70 percent capacity utilization. A problem with the adoption of automatic blower feeding in the near term is that gins must be in a position to gin totally from modules in order to utilize it, and relatively few gins are yet in that situation. The automatic suction feeding system has higher per bale costs than the automatic blower system, but it is a dual system which can accomodate both modules and trailers. When compared to module handling suction feeding, automatic suction feeding has lower per bale costs only for the large (28 and 35 bph) plants operating at near full capacity utilization.

The primary reason that the automatic feeder systems do not show more cost reductions is the relatively small (3 percent) increase in ginning efficiency rate from the module/suction combination to the module/automatic feeder combination. Under the assumptions of the analysis, the cost decreases from the increase in efficiency rate and labor savings exceeded the cost increases from the larger capital investment in the automatic feeders (and the greater energy usage with automatic suction feeding) only at high rates of plant utilization. The 3 percent increase in efficiency rate is an average; the survey indicated that efficiency rates for individual plants varied from 72.5 to 98 percent around the 81 percent average.

Costs of module assembly utilizing palletless module mover trucks are also sensitive to utilization of the equipment. Both the survey of truck owners and the simulation analysis using GINMODEL indicate great variation in assembly costs among different situations. Close examination of the results of the analyses suggests that compared to trailer handling, gins can lower their ginning costs by the amount of module assembly costs only if their annual volume can be increased in proportion to the increase in annual capacity associated with the higher efficiency rates from the module systems. That is, they can totally absorb the cost of module assembly only if they can obtain the additional volume. This conclusion is consistent with the observed wide variation in charges for moving modules.

The results of the simulation analyses and the conclusions from them are conditional on the assumptions specified in the analysis. One of the key assumptions was that of "new" gin plants in each simulated situation. While totally new plants are rare in the industry today, the concept provides a means to make meaningful comparisons among plant sizes. However, the specified plants represent no existing gins. In practice, each gin plant is different and a gin's annual volume ginned may vary substantially among years. Improvements in individual gin efficiency rates associated with module systems depend on many factors, including how effectively new equipment is matched with existing equipment and the proficiency of gin crews. Another key assumption was that with each simulated gin plant the entire volume was processed with a single handling/feeding system; e.g., trailer and module handling were not mixed.

Another basic assumption was that of 906 hours of gin operation per season, which amounts to assuming no seedcotton storage beyond several days on the gin yard and that weather factors do not introduce long harvest delays. Module handling systems may facilitate some extension of ginning seasons, but the extent and rate of adoption are uncertain. To the extent that seedcotton storage is adopted, larger volumes of those gins will result in lower costs per bale of cotton.

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APPENDIX

Table 1. Estimated [1/] per bale ginning costs; West Texas stripper gin, 7 bales/hr. rated capacity, trailer handling, suction feeding, no assembly costs.

	Percent capacity utilization									
	100	90	80	70	60	50	40	30	20	10
No. bales/season	4,249	3,824	3,399	2,974	2,549	2,125	1,700	1,275	850	425
	Dollars/bale									
Depreciation	9.03	10.04	11.29	12.91	15.06	18.07	22.58	30.11	45.17	90.34
Interest	17.05	18.85	21.10	23.99	27.83	33.21	41.29	54.77	81.74	162.85
Insurance	1.56	1.67	1.82	2.01	2.26	2.61	3.14	4.02	5.78	11.07
Taxes	2.58	2.87	3.22	3.68	4.30	5.16	6.45	8.60	12.89	25.79
Gin Manager	3.53	3.92	4.41	5.04	5.88	7.06	8.83	11.77	17.65	35.30
Superintendent	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Office Manager	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Salaried Ginner	2.77	3.04	3.37	3.80	4.37	5.18	6.47	8.63	12.94	25.89
Salaried gin crew	1.92	2.10	2.33	2.63	3.02	3.58	4.47	5.96	8.94	17.89
Seasonal office labor	0.97	0.97	0.96	0.94	0.93	0.90	0.91	0.93	0.97	1.07
Seasonal gin labor	7.10	7.21	7.36	7.55	7.80	8.16	8.94	10.26	12.89	20.77
Energy	6.05	6.20	6.40	6.59	6.70	6.77	6.86	7.03	7.94	15.88
Bagging and ties	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
Repairs	5.03	5.23	5.48	5.80	6.23	6.83	7.74	9.24	12.25	21.29
Dryer fuel	0.54	0.55	0.56	0.57	0.58	0.60	0.63	0.68	0.73	1.06
Miscellaneous	3.56	3.63	3.71	3.81	3.94	4.13	4.41	4.88	5.82	8.65
Total cost/bale	65.44	70.03	75.76	83.07	92.66	106.00	126.49	160.63	229.52	441.58
Fixed cost/bale	42.28	46.98	52.85	60.40	70.46	84.56	105.70	140.93	211.39	422.78
Variable cost/bale	23.16	23.05	22.91	22.67	22.20	21.45	20.79	19.71	18.13	18.80

1/ Assumes .67 efficiency rate, 810 connected horsepower.

Table 2. Estimated [1/] per bale ginning costs; West Texas stripper gin, 14 bales per hour rated capacity, trailer handling, suction feeding, no assembly costs.

	Percent capacity utilization									
	100	90	80	70	60	50	40	30	20	10
No. bales/season	8,498	7,648	6,799	5,949	5,099	4,249	3,399	2,549	1,700	850
	Dollars/bale									
Depreciation	5.42	6.02	6.77	7.74	9.03	10.84	13.54	18.06	27.09	54.18
Interest	10.48	11.56	12.92	14.66	16.98	20.22	25.09	33.21	49.46	98.38
Insurance	1.13	1.20	1.29	1.41	1.56	1.77	2.08	2.61	3.67	6.84
Taxes	1.55	1.72	1.93	2.21	2.58	3.09	3.86	5.15	7.73	15.46
Gin Manager	2.18	2.42	2.72	3.11	3.63	4.35	5.44	7.26	10.88	21.77
Superintendent	1.65	1.83	2.06	2.35	2.75	3.29	4.12	5.49	8.24	16.47
Office Manager	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Salaried Ginner	1.38	1.52	1.69	1.90	2.19	2.59	3.24	4.31	6.47	12.94
Salaried gin crew	0.96	1.05	1.17	1.31	1.51	1.79	2.24	2.98	4.47	8.94
Seasonal office labor	0.73	0.72	0.72	0.71	0.70	0.68	0.69	0.70	0.73	0.80
Seasonal gin labor	4.36	4.44	4.53	4.64	4.80	5.01	5.50	6.31	7.92	12.77
Energy	4.73	4.85	5.00	5.14	5.23	5.27	5.34	5.46	6.15	12.31
Bagging and ties	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
Repairs	4.18	4.30	4.45	4.65	4.91	5.27	5.81	6.71	8.52	13.94
Dryer fuel	0.52	0.52	0.52	0.53	0.53	0.54	0.56	0.58	0.63	0.78
Miscellaneous	3.36	3.41	3.47	3.55	3.65	3.79	4.00	4.35	5.06	7.18
Total cost/bale	46.37	49.31	52.98	57.66	63.77	72.25	85.26	106.94	150.77	286.51
Fixed cost/bale	27.06	30.06	33.82	38.65	45.10	54.12	67.65	90.19	135.29	270.58
Variable cost/bale	19.32	19.25	19.16	19.00	18.67	18.14	17.61	16.74	15.48	15.92

1/ Assumes .67 efficiency rate, 1,195 connected horsepower.

Table 3. Estimated [1/] per bale ginning costs; West Texas stripper gin, 21 bales per hour rated capacity, trailer handling, suction feeding, no assembly costs.

	Percent capacity utilization									
	100	90	80	70	60	50	40	30	20	10
No. bales/season	12,747	11,473	10,198	8,923	7,648	6,374	5,099	3,824	2,549	1,275
	Dollars/bale									
Depreciation	5.55	6.17	6.94	7.93	9.25	11.10	13.87	18.50	27.74	55.49
Interest	10.58	11.68	13.05	14.82	17.17	20.47	25.41	33.66	50.16	99.81
Insurance	1.15	1.22	1.31	1.43	1.58	1.80	2.12	2.66	3.75	6.99
Taxes	1.58	1.75	1.97	2.25	2.63	3.16	3.95	5.26	7.89	15.78
Gin Manager	1.73	1.92	2.16	2.47	2.88	3.45	4.31	5.75	8.63	17.26
Superintendent	1.26	1.39	1.57	1.79	2.09	2.51	3.14	4.18	6.28	12.55
Office Manager	0.78	0.87	0.98	1.12	1.31	1.57	1.96	2.61	3.92	7.84
Salaried Ginner	0.92	1.01	1.12	1.27	1.46	1.73	2.16	2.88	4.31	8.63
Salaried gin crew	0.64	0.70	0.78	0.88	1.01	1.19	1.49	1.99	2.98	5.96
Seasonal office labor	0.32	0.32	0.32	0.31	0.31	0.30	0.30	0.31	0.32	0.36
Seasonal gin labor	3.85	3.92	4.00	4.10	4.24	4.43	4.86	5.57	7.00	11.28
Energy	4.32	4.43	4.57	4.70	4.77	4.81	4.88	4.98	5.60	11.21
Bagging and ties	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
Repairs	4.09	4.21	4.37	4.57	4.83	5.20	5.75	6.68	8.53	14.08
Dryer fuel	0.51	0.51	0.51	0.51	0.52	0.52	0.53	0.55	0.58	0.68
Miscellaneous	3.26	3.30	3.35	3.42	3.51	3.63	3.82	4.14	4.76	6.65
Total cost/bale	44.28	47.15	50.74	55.31	61.30	69.62	82.31	103.47	146.21	278.32
Fixed cost/bale	26.35	29.28	32.94	37.64	43.92	52.70	65.87	87.83	131.75	263.49
Variable cost/bale	17.93	17.87	17.81	17.67	17.39	16.92	16.44	15.64	14.47	14.83

1/ Assumes .67 efficiency rate, 1,690 connected horsepower.

Table 4. Estimated [1/] per bale ginning costs: West Texas stripper gin, 28 bales per hour rated capacity, trailer handling, suction feeding, no assembly costs.

	Percent capactiy utilization									
	100	90	80	70	60	50	40	30	20	10
No. bales/season	16,997	15,297	13,597	11,898	10,198	8,498	6,799	5,099	3,399	1,700
	- - - - - - - - - - - - - - - - - - Dollars/bale -									
Depreciation	4.72	5.24	5.90	6.74	7.86	9.44	11.79	15.73	23.59	47.18
Interest	9.09	10.02	11.20	12.70	14.71	17.51	21.72	28.74	42.79	85.08
Insurance	1.05	1.11	1.19	1.29	1.42	1.60	1.88	2.34	3.26	6.02
Taxes	1.34	1.49	1.68	1.92	2.24	2.69	3.36	4.48	6.72	13.44
Gin Manager	1.50	1.67	1.88	2.14	2.50	3.00	3.75	5.00	7.50	15.00
Superintendent	1.06	1.18	1.32	1.51	1.77	2.12	2.65	3.53	5.30	10.59
Office Manager	0.59	0.65	0.74	0.84	0.98	1.18	1.47	1.96	2.94	5.88
Salaried Ginner	0.69	0.76	0.84	0.95	1.09	1.29	1.62	2.16	3.24	6.47
Salaried gin crew	0.48	0.53	0.58	0.66	0.76	0.89	1.12	1.49	2.24	4.47
Seasonal office labor	0.36	0.36	0.36	0.35	0.35	0.34	0.34	0.35	0.36	0.40
Seasonal gin labor	3.51	3.57	3.64	3.73	3.86	4.03	4.42	5.07	6.37	10.27
Energy	4.30	4.40	4.54	4.67	4.74	4.78	4.84	4.94	5.56	11.12
Bagging and ties	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
Repairs	3.80	3.91	4.04	4.21	4.43	4.75	5.22	6.01	7.58	12.30
Dryer fuel	0.50	0.50	0.50	0.51	0.51	0.52	0.52	0.53	0.56	0.63
Miscellaneous	3.17	3.21	3.26	3.32	3.41	3.53	3.70	4.00	4.59	6.35
Total cost/bale	39.91	42.36	45.42	49.30	54.37	61.41	72.16	90.07	126.32	238.94
Fixed cost/bale	22.46	24.95	28.07	32.08	37.43	44.91	56.14	74.85	112.28	224.56
Variable cost/bale	17.46	17.41	17.35	17.22	16.94	16.50	16.02	15.22	14.04	14.38

1/ Assumes .67 efficiency rate, 2,175 connected horsepower.

Table 5. Estimated [1/] per bale ginning costs; West Texas stripper gin, 35 bales per hour rated capacity, trailer handling, suction feeding, no assembly costs.

	Percent capacity utilization									
	100	90	80	70	60	50	40	30	20	10
No. bales/season	21,246	19,121	16,997	14,872	12,747	10,623	8,498	6,374	4,249	2,125
	- - - - - - - -	- - - -	- - -	- - -	Dollars/bale	- - -	- - -	- - -	- - -	- - -
Depreciation	4.85	5.39	6.06	6.93	8.08	9.70	12.12	16.16	24.25	48.49
Interest	9.25	10.21	11.40	12.94	14.99	17.86	22.16	29.33	43.69	86.91
Insurance	1.07	1.13	1.21	1.31	1.45	1.63	1.92	2.39	3.34	6.17
Taxes	1.38	1.53	1.72	1.97	2.30	2.76	3.45	4.60	6.90	13.79
Gin Manager	1.36	1.52	1.71	1.95	2.27	2.73	3.41	4.55	6.82	13.65
Superintendent	0.94	1.05	1.18	1.34	1.57	1.88	2.35	3.14	4.17	9.41
Office Manager	0.47	0.52	0.59	0.67	0.78	0.94	1.18	1.57	2.35	4.71
Salaried Ginner	0.55	0.61	0.67	0.76	0.87	1.04	1.29	1.73	2.59	5.18
Salaried gin crew	0.38	0.42	0.47	0.53	0.60	0.72	0.89	1.19	1.79	3.58
Seasonal office labor	0.39	0.39	0.38	0.38	0.37	0.36	0.37	0.37	0.39	0.43
Seasonal gin labor	3.05	3.10	3.16	3.24	3.35	3.50	3.84	4.40	5.53	8.92
Energy	4.12	4.23	4.36	4.48	4.55	4.59	4.65	4.74	5.33	10.66
Bagging and ties	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
Repairs	3.71	3.82	3.95	4.13	4.36	4.68	5.16	5.97	7.59	12.44
Dryer fuel	0.50	0.50	0.50	0.50	0.51	0.51	0.52	0.52	0.54	0.60
Miscellaneous	3.10	3.14	3.18	3.24	3.32	3.44	3.61	3.89	4.45	6.15
Total cost/bale	38.87	41.28	44.30	48.13	53.13	60.08	70.67	88.32	124.02	234.83
Fixed cost/bale	22.10	24.56	27.63	31.57	36.84	44.20	55.26	73.67	110.51	221.02
Variable cost/bale	16.77	16.73	16.67	16.55	16.30	15.88	15.41	14.64	13.51	13.81

1/ Assumes .67 efficiency rate, 2,490 connected horsepower.

Table 6. Estimated [1/] per bale ginning costs; West Texas stripper gin, 7 bales per hour rated capacity, module handling, suction feeding, no assembly costs.

	Percent capacity utilization									
	100	90	80	70	60	50	40	30	20	10
No. bales/season	4,947	4,452	3,957	3,463	2,968	2,473	1,979	1,484	989	495
	- - - - - - - - - Dollars/bale - - - - - - - - -									
Depreciation	7.76	8.62	9.70	11.09	12.93	15.52	19.40	25.87	38.80	77.60
Interest	14.71	16.25	18.18	20.66	23.96	28.58	35.53	47.10	70.27	139.94
Insurance	1.41	1.51	1.63	1.80	2.01	2.32	2.77	3.53	5.04	9.58
Taxes	2.22	2.46	2.77	3.16	3.69	4.43	5.54	7.38	11.08	22.15
Gin Manager	3.03	3.37	3.79	4.33	5.05	6.06	7.58	10.11	15.16	30.32
Superintendent	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Office Manager	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Salaried Ginner	2.38	2.61	2.90	3.26	3.76	4.45	5.56	7.41	11.12	22.24
Salaried gin crew	1.65	1.80	2.00	2.26	2.60	3.07	3.84	5.12	7.68	15.36
Seasonal office labor	0.84	0.83	0.82	0.81	0.80	0.78	0.79	0.80	0.83	0.92
Seasonal gin labor	6.10	6.20	6.32	6.49	6.70	7.00	7.63	8.81	11.07	17.84
Energy	5.19	5.33	5.50	5.66	5.76	5.81	5.90	6.04	6.82	13.64
Bagging and ties	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
Repairs	4.77	4.94	5.16	5.44	5.81	6.32	7.10	8.39	10.98	18.74
Dryer fuel	0.54	0.54	0.55	0.56	0.57	0.58	0.61	0.65	0.74	0.98
Miscellaneous	3.49	3.54	3.61	3.69	3.81	3.97	4.21	4.62	5.43	7.85
Total cost/bale	57.81	61.75	66.68	72.96	81.20	92.66	110.25	139.58	198.76	380.91
Fixed cost/bale	36.32	40.35	45.40	51.88	60.53	72.63	90.79	121.05	181.58	363.16
Variable cost/bale	21.50	21.40	21.28	21.08	20.67	20.92	19.46	18.53	17.18	17.75

1/ Assumes .78 efficiency rate, 810 connected horsepower.

Table 7. Estimated [1/] per bale ginning costs; West Texas stripper gin, 14 bales per hour rated capacity, module handling, suction feeding, no assembly costs.

	Percent capacity utilization									
	100	90	80	70	60	50	40	30	20	10
No. bales/season	9,894	8,904	7,915	6,925	5,936	4,947	3,957	2,968	1,979	939
	Dollars/bale									
Depreciation	4.65	5.17	5.82	6.65	7.76	9.31	11.63	15.51	23.27	46.54
Interest	9.06	9.99	11.15	12.65	14.64	17.42	21.61	28.58	42.54	84.56
Insurance	1.04	1.10	1.18	1.28	1.41	1.59	1.86	2.31	3.22	5.94
Taxes	1.33	1.48	1.66	1.90	2.21	2.66	3.32	4.43	6.64	13.28
Gin Manager	1.87	2.08	2.34	2.67	3.12	3.74	4.67	6.23	9.35	18.70
Superintendent	1.42	1.57	1.77	2.02	2.36	2.83	3.54	4.72	7.08	14.15
Office Manager	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Salaried Ginner	1.19	1.30	1.45	1.63	1.88	2.22	2.78	3.71	5.56	11.12
Salaried gin crew	0.82	0.90	1.00	1.13	1.30	1.54	1.92	2.56	3.84	7.68
Seasonal office labor	0.63	0.62	0.62	0.61	0.60	0.58	0.59	0.60	0.62	0.69
Seasonal gin labor	3.75	3.81	3.89	3.99	4.12	4.31	4.72	5.42	6.81	10.97
Energy	4.06	4.16	4.29	4.42	4.49	4.53	4.59	4.69	5.29	10.57
Bagging and ties	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
Repairs	4.03	4.13	4.26	4.43	4.65	4.96	5.43	6.20	7.75	12.41
Dryer fuel	0.51	0.51	0.52	0.52	0.53	0.54	0.55	0.57	0.61	0.74
Miscellaneous	3.30	3.34	3.39	3.46	3.55	3.67	3.85	4.15	4.76	6.58
Total cost/bale	41.41	43.93	47.09	51.10	56.35	63.64	74.81	93.43	131.09	247.68
Fixed cost/bale	23.24	25.83	29.05	33.20	38.74	46.49	58.11	77.48	116.21	232.43
Variable cost/bale	18.17	18.11	18.04	17.90	17.61	17.15	16.71	15.96	14.87	15.25

1/ Assumes .78 efficiency rate, 1,195 connected horsepower.

Table 8. Estimated 1/ per bale ginning costs; West Texas stripper gin, 21 bales per hour rated capacity, module handling, suction feeding, no assembly costs.

	Percent capacity utilization									
	100	90	80	70	60	50	40	30	20	10
No. bales/season	14,840	13,356	11,872	10,388	8,904	7,420	5,936	4,452	2,968	1,484
	Dollars/bale									
Depreciation	4.77	5.30	5.96	6.81	7.94	9.53	11.92	15.89	23.83	47.66
Interest	9.14	10.09	11.27	12.79	14.81	17.64	21.88	28.97	43.14	85.79
Insurance	1.06	1.12	1.20	1.30	1.43	1.62	1.89	2.36	3.29	6.08
Taxes	1.36	1.51	1.69	1.94	2.26	2.71	3.39	4.52	6.78	13.56
Gin Manager	1.48	1.65	1.85	2.12	2.47	2.96	3.71	4.94	7.41	14.82
Superintendent	1.08	1.20	1.35	1.54	1.80	2.16	2.70	3.59	5.39	10.78
Office Manager	0.67	0.75	0.84	0.96	1.12	1.35	1.68	2.25	3.37	6.74
Salaried Ginner	0.79	0.87	0.97	1.09	1.25	1.48	1.85	2.47	3.71	7.41
Salaried gin crew	0.55	0.60	0.67	0.75	0.87	1.02	1.28	1.71	2.56	5.12
Seasonal office labor	0.28	0.28	0.27	0.27	0.27	0.26	0.26	0.27	0.28	0.31
Seasonal gin labor	3.31	3.37	3.43	3.52	3.64	3.80	4.17	4.79	6.01	9.69
Energy	3.71	3.80	3.92	4.04	4.10	4.13	4.19	4.28	4.81	9.63
Bagging and ties	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
Repairs	3.93	4.04	4.17	4.34	4.57	4.89	5.36	6.16	7.75	12.51
Dryer fuel	0.50	0.50	0.51	0.51	0.51	0.52	0.53	0.54	0.57	0.65
Miscellaneous	3.20	3.24	3.28	3.34	3.42	3.53	3.69	3.96	4.50	6.11
Total cost/bale	39.58	42.05	45.14	49.06	54.21	61.35	72.26	90.43	127.14	240.62
Fixed cost/bale	22.63	25.15	28.29	32.33	37.72	45.27	56.58	75.44	113.17	226.33
Variable cost/bale	16.95	16.90	16.85	16.73	16.48	16.09	15.67	14.98	13.98	14.29

1/ Assumes .78 efficiency rate, 1,690 connected horsepower.

Table 9. Estimated [1/] per bale ginning costs; West Texas stripper gin, 28 bales per hour rated capacity, module handling, suction feeding, no assembly costs.

	Percent capacity utilization									
	100	90	80	70	60	50	40	30	20	10
No. bales/season	19,787	17,808	15,830	13,851	11,872	9,894	7,915	5,936	3,957	1,979
	- - - - - - Dollars/bale - - - - - -									
Depreciation	4.05	4.50	5.07	5.79	6.75	8.10	10.13	13.51	20.26	40.52
Interest	7.86	8.67	9.67	10.97	12.69	15.09	18.71	24.74	36.81	73.14
Insurance	0.97	1.03	1.09	1.18	1.29	1.45	1.69	2.08	2.87	5.24
Taxes	1.15	1.28	1.44	1.65	1.92	2.31	2.89	3.85	5.77	11.54
Gin Manager	1.29	1.43	1.61	1.84	2.15	2.58	3.22	4.30	6.44	12.89
Superintendent	0.91	1.01	1.14	1.30	1.52	1.82	2.27	3.03	4.55	9.10
Office Manager	0.51	0.56	0.63	0.72	0.84	1.01	1.26	1.68	2.53	5.05
Salaried Ginner	0.59	0.65	0.72	0.82	0.94	1.11	1.39	1.85	2.78	5.56
Salaried gin crew	0.41	0.45	0.50	0.56	0.65	0.77	0.96	1.28	1.92	3.84
Seasonal office labor	0.31	0.31	0.31	0.30	0.30	0.29	0.29	0.30	0.31	0.35
Seasonal gin labor	3.01	3.06	3.13	3.21	3.31	3.46	3.80	4.35	5.47	8.82
Energy	3.69	3.78	3.90	4.01	4.07	4.11	4.16	4.25	4.77	9.55
Bagging and ties	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
Repairs	3.67	3.76	3.87	4.02	4.21	4.48	4.89	5.56	6.91	10.96
Dryer fuel	0.50	0.50	0.50	0.50	0.51	0.51	0.52	0.53	0.55	0.61
Miscellaneous	3.12	3.16	3.20	3.25	3.33	3.43	3.53	3.83	4.34	5.85
Total cost/bale	35.81	37.91	40.54	43.87	48.23	54.27	63.51	78.89	110.03	206.77
Fixed cost/bale	19.29	21.43	24.11	27.56	32.15	38.58	48.22	64.30	96.45	192.89
Variable cost/bale	16.52	16.48	16.42	16.32	16.08	15.69	15.28	14.59	13.59	13.88

1/ Assumes .78 efficiency rate, 2,175 connected horsepower.

Table 10. Estimated [1/] per bale ginning costs; West Texas stripper gin, 35 bales per hour rated capacity, module handling, suction feeding, no assembly costs.

	Percent capacity utilization									
	100	90	80	70	60	50	40	30	20	10
No. bales/season	24,734	22,260	19,787	17,314	14,840	12,367	9,894	7,420	4,947	2,473
	Dollars/bale									
Depreciation	4.17	4.63	5.21	5.95	6.94	8.33	10.41	13.88	20.83	41.65
Interest	8.00	8.82	9.85	11.17	12.93	15.39	19.09	25.25	37.58	74.71
Insurance	0.99	1.04	1.11	1.20	1.31	1.47	1.72	2.12	2.94	5.37
Taxes	1.18	1.32	1.48	1.69	1.97	2.37	2.96	3.95	5.92	11.85
Gin Manager	1.17	1.30	1.47	1.67	1.95	2.34	2.93	3.91	5.86	11.72
Superintendent	0.81	0.90	1.01	1.16	1.35	1.62	2.02	2.70	4.04	8.09
Office Manager	0.40	0.45	0.51	0.58	0.67	0.81	1.01	1.35	2.02	4.04
Salaried Ginner	0.48	0.52	0.58	0.65	0.75	0.89	1.11	1.48	2.22	4.45
Salaried gin crew	0.33	0.36	0.40	0.45	0.52	0.61	0.77	1.02	1.54	3.07
Seasonal office labor	0.33	0.33	0.33	0.32	0.32	0.31	0.31	0.32	0.33	0.37
Seasonal gin labor	2.62	2.66	2.71	2.78	2.88	3.01	3.30	3.78	4.75	7.66
Energy	3.54	3.63	3.74	3.85	3.91	3.94	3.99	4.07	4.58	9.15
Bagging and ties	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
Repairs	3.57	3.67	3.78	3.93	4.13	4.41	4.82	5.52	6.91	11.07
Dryer fuel	0.50	0.50	0.50	0.50	0.50	0.51	0.51	0.52	0.54	0.58
Miscellaneous	3.05	3.08	3.12	3.18	3.25	3.34	3.49	3.73	4.22	5.67
Total cost/bale	34.89	36.96	39.55	42.84	47.14	53.11	62.20	77.36	108.03	203.21
Fixed cost/bale	18.99	21.09	23.73	27.12	31.64	37.97	47.46	63.28	94.93	189.85
Variable cost/bale	15.90	15.86	15.82	15.72	15.50	15.14	14.74	14.07	13.10	13.36

1/ Assumes .78 efficiency rate, 2,490 connected horsepower.

Table 11. Estimated [1/] per bale ginning costs; West Texas stripper gin, 7 bales per hour rated capacity, module handling, automatic suction feeding, no assembly costs.

	Percent capacity utilization									
	100	90	80	70	60	50	40	30	20	10
No. bales/season	5,137	4,623	4,110	3,596	3,082	2,569	2,055	1,541	1,027	514
	Dollars/bale									
Depreciation	8.45	9.38	10.56	12.07	14.08	16.89	21.11	28.15	42.23	84.46
Interest	15.77	17.44	19.52	22.20	25.78	30.77	38.28	50.79	75.83	151.12
Insurance	1.49	1.60	1.74	1.91	2.15	2.48	2.97	3.79	5.44	10.38
Taxes	2.41	2.67	3.01	3.44	4.01	4.81	6.01	8.02	12.03	24.06
Gin Manager	2.92	3.24	3.65	4.17	4.87	5.84	7.30	9.73	14.60	29.20
Superintendent	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Office Manager	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Salaried Ginner	2.29	2.51	2.79	3.14	3.62	4.28	5.35	7.14	10.71	21.41
Salaried gin crew	1.59	1.74	1.93	2.17	2.50	2.96	3.70	4.93	7.40	14.79
Seasonal office labor	0.80	0.80	0.79	0.78	0.77	0.75	0.76	0.77	0.80	0.89
Seasonal gin labor	3.88	3.94	4.02	4.13	4.27	4.46	4.89	5.61	7.04	11.35
Energy	5.21	5.35	5.52	5.68	5.78	5.83	5.92	6.06	6.84	13.68
Bagging and ties	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
Repairs	4.91	5.10	5.33	5.63	6.04	6.60	7.44	8.85	11.67	20.11
Dryer fuel	0.53	0.54	0.55	0.55	0.57	0.58	0.61	0.65	0.73	0.96
Miscellaneous	3.47	3.52	3.58	3.67	3.78	3.93	4.17	4.56	5.34	7.67
Total cost/bale	57.46	61.58	66.73	73.30	81.93	93.94	112.26	142.80	204.40	393.83
Fixed cost/bale	37.81	42.01	47.27	54.02	63.02	75.63	94.53	126.04	189.07	378.13
Variable cost/bale	19.65	19.56	19.46	19.28	18.91	18.31	17.73	16.75	15.33	15.70

1/ Assumes .81 efficiency rate, 845 connected horsepower.

Table 12. Estimated [1/] per bale ginning costs; West Texas stripper gin, 14 bales per hour rated capacity, module handling, automatic suction feeding, no assembly costs.

	Percent capacity utilization									
	100	90	80	70	60	50	40	30	20	10
No. bales/season	10,274	9,247	8,219	7,192	6,164	5,137	4,110	3,082	2,055	1,027
	- - - - - - - - Dollars/bale - - - - - - - -									
Depreciation	5.04	5.60	6.30	7.20	8.40	10.08	12.60	16.80	25.20	50.41
Interest	9.66	10.66	11.91	13.52	15.66	18.66	23.16	30.66	45.68	90.86
Insurance	1.09	1.16	1.24	1.34	1.48	1.68	1.97	2.47	3.45	6.40
Taxes	1.44	1.59	1.79	2.05	2.39	2.87	3.59	4.78	7.18	14.35
Gin Manager	1.80	2.00	2.25	2.57	3.00	3.60	4.50	6.00	9.00	18.01
Superintendent	1.36	1.51	1.70	1.95	2.27	2.73	3.41	4.54	6.81	13.63
Office Manager	0.0	0:0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Salaried Ginner	1.15	1.26	1.39	1.57	1.81	2.14	2.68	3.57	5.35	10.71
Salaried gin crew	0.79	0.87	0.96	1.09	1.25	1.48	1.85	2.47	3.70	7.40
Seasonal office labor	0.60	0.60	0.59	0.59	0.58	0.56	0.57	0.58	0.60	0.67
Seasonal gin labor	2.61	2.66	2.71	2.78	2.87	3.00	3.29	3.78	4.75	7.65
Energy	4.04	4.14	4.27	4.40	4.47	4.51	4.57	4.67	5.26	10.52
Bagging and ties	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
Repairs	4.11	4.22	4.36	4.54	4.78	5.12	5.62	6.46	8.14	13.18
Dryer fuel	0.51	0.51	0.52	0.52	0.53	0.53	0.55	0.57	0.61	0.73
Miscellaneous	3.29	3.33	3.38	3.44	3.52	3.64	3.82	4.11	4.69	6.44
Total cost/bale	41.24	43.86	47.14	51.31	56.77	64.35	75.92	95.20	134.17	254.70
Fixed cost/bale	24.05	26.72	30.06	34.36	40.08	48.10	60.13	80.17	120.25	240.50
Variable cost/bale	17.19	17.14	17.08	16.95	16.68	16.25	15.80	15.04	13.92	14.20

1/ Assumes .81 efficiency rate, 1,235 connected horsepower.

Table 13. Estimated [1/] per bale ginning costs; West Texas stripper gin, 21 bales per hour rated capacity, module handling, automatic suction feeding, no assembly costs.

	Percent capacity utilization									
	100	90	80	70	60	50	40	30	20	10
No. bales/season	15,411	13,870	12,329	10,788	9,247	7,706	6,164	4,623	3,082	1,541
	Dollars/bale									
Depreciation	4.96	5.51	6.20	7.09	8.27	9.93	12.41	16.54	24.81	49.63
Interest	9.43	10.41	11.64	13.21	15.31	18.24	22.65	29.99	44.69	88.91
Insurance	1.08	1.15	1.23	1.33	1.47	1.66	1.95	2.44	3.40	6.31
Taxes	1.41	1.57	1.76	2.01	2.35	2.82	3.52	4.70	7.05	14.10
Gin Manager	1.43	1.59	1.78	2.04	2.38	2.86	3.57	4.76	7.14	14.28
Superintendent	1.04	1.15	1.30	1.48	1.73	2.08	2.60	3.46	5.19	10.38
Office Manager	0.65	0.72	0.81	0.93	1.08	1.30	1.62	2.16	3.24	6.49
Salaried Ginner	0.76	0.84	0.93	1.05	1.21	1.43	1.78	2.38	3.57	7.14
Salaried gin crew	0.53	0.58	0.64	0.72	0.83	0.99	1.23	1.64	2.47	4.93
Seasonal office labor	0.27	0.27	0.26	0.26	0.26	0.25	0.25	0.26	0.27	0.30
Seasonal gin labor	2.52	2.57	2.62	2.69	2.78	2.90	3.18	3.65	4.58	7.39
Energy	3.67	3.76	3.88	3.99	4.05	4.09	4.14	4.23	4.75	9.51
Bagging and ties	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
Repairs	3.97	4.08	4.22	4.40	4.63	4.97	5.46	6.29	7.94	12.91
Dryer fuel	0.50	0.50	0.51	0.51	0.51	0.52	0.53	0.54	0.57	0.65
Miscellaneous	3.19	3.23	3.27	3.32	3.40	3.50	3.66	3.92	4.44	5.99
Total cost/bale	39.16	41.67	44.80	48.78	54.01	61.26	72.30	90.70	127.87	242.65
Fixed cost/bale	22.91	25.45	28.64	32.73	38.18	45.82	57.27	76.36	114.54	229.09
Variable cost/bale	16.25	16.21	16.16	16.06	15.82	15.45	15.03	14.34	13.32	13.56

1/ Assumes .81 efficiency rate, 1,735 connected horsepower.

Table 14. Estimated [1/] per bale ginning costs; West Texas stripper gin, 28 bales per hour rated capacity, module handling, automatic suction feeding, no assembly costs.

	Percent capacity utilization									
	100	90	80	70	60	50	40	30	20	10
No. bales/season	20,548	18,493	16,438	14,384	12,329	10,274	8,219	6,164	4,110	2,055
	Dollars/bale									
Depreciation	4.27	4.74	5.33	6.10	7.11	8.53	10.67	14.22	21.34	42.67
Interest	8.18	9.02	10.08	11.43	13.24	15.76	19.55	25.87	38.51	76.57
Insurance	1.00	1.05	1.12	1.21	1.33	1.50	1.75	2.16	3.00	5.49
Taxes	1.21	1.35	1.52	1.73	2.02	2.43	3.03	4.05	6.07	12.14
Gin Manager	1.24	1.38	1.55	1.77	2.07	2.48	3.10	4.14	6.20	12.41
Superintendent	0.88	0.97	1.09	1.25	1.46	1.75	2.19	2.92	4.38	8.76
Office Manager	0.49	0.54	0.61	0.70	0.81	0.97	1.22	1.62	2.43	4.87
Salaried Ginner	0.57	0.63	0.70	0.79	0.90	1.07	1.34	1.78	2.68	5.35
Salaried gin crew	0.40	0.43	0.48	0.54	0.63	0.74	0.92	1.23	1.85	3.70
Seasonal office labor	0.30	0.30	0.30	0.29	0.29	0.28	0.28	0.29	0.30	0.33
Seasonal gin labor	2.15	2.19	2.24	2.29	2.37	2.48	2.72	3.11	3.91	6.31
Energy	3.64	3.73	3.84	3.95	4.01	4.05	4.10	4.18	4.70	9.41
Bagging and ties	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
Repairs	3.71	3.81	3.93	4.08	4.28	4.57	4.99	5.70	7.13	11.39
Dryer fuel	0.50	0.50	0.50	0.50	0.51	0.51	0.52	0.53	0.55	0.61
Miscellaneous	3.11	3.14	3.18	3.24	3.31	3.40	3.55	3.79	4.28	5.74
Total cost/bale	35.40	37.54	40.23	43.64	48.09	54.28	63.68	79.36	111.08	209.50
Fixed cost/bale	19.64	21.82	24.55	28.06	32.74	39.28	49.10	65.47	98.21	196.41
Variable cost/bale	15.76	15.72	15.67	15.58	15.35	14.99	14.58	13.89	12.87	13.08

1/ Assumes .81 efficiency rate, 2,225 connected horsepower.

Table 15. Estimated [1/] per bale ginning costs; West Texas stripper gin, 35 bales per hour rated capacity, module handling, automatic suction feeding, no assembly costs.

	Percent capacity utilization									
	100	90	80	70	60	50	40	30	20	10
No. bales/season	25,685	23,117	20,548	17,980	15,411	12,843	10,274	7,706	5,137	2,569
	Dollars/bale									
Depreciation	4.30	4.78	5.38	6.15	7.17	8.61	10.76	14.34	21.52	43.03
Interest	8.18	9.03	10.09	11.45	13.26	15.80	19.60	25.94	38.64	76.84
Insurance	1.00	1.06	1.13	1.22	1.34	1.51	1.76	2.18	3.02	5.53
Taxes	1.22	1.36	1.53	1.75	2.04	2.45	3.06	4.08	6.11	12.23
Gin Manager	1.13	1.25	1.41	1.61	1.88	2.26	2.82	3.76	5.65	11.29
Superintendent	0.78	0.87	0.97	1.11	1.30	1.56	1.95	2.60	3.89	7.79
Office Manager	0.39	0.43	0.49	0.56	0.65	0.78	0.97	1.30	1.95	3.89
Salaried Ginner	0.46	0.50	0.56	0.63	0.72	0.86	1.07	1.43	2.14	4.28
Salaried gin crew	0.32	0.35	0.39	0.43	0.50	0.59	0.74	0.99	1.48	2.96
Seasonal office labor	0.32	0.32	0.32	0.31	0.31	0.30	0.30	0.31	0.32	0.35
Seasonal gin labor	1.72	1.75	1.79	1.83	1.90	1.98	2.17	2.49	3.13	5.05
Energy	3.48	3.57	3.68	3.78	3.84	3.87	3.92	4.00	4.49	8.99
Bagging and ties	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
Repairs	3.60	3.70	3.82	3.97	4.17	4.46	4.89	5.61	7.04	11.35
Dryer fuel	0.50	0.50	0.50	0.50	0.50	0.51	0.51	0.52	0.53	0.58
Miscellaneous	3.04	3.07	3.11	3.16	3.23	3.32	3.46	3.69	4.16	5.56
Total cost/bale	34.20	36.29	33.90	42.22	46.56	52.59	61.73	76.98	107.82	203.47
Fixed cost/bale	19.09	21.22	23.87	27.28	31.82	38.19	47.73	63.65	95.47	190.94
Variable cost/bale	15.10	15.07	15.03	14.94	14.74	14.40	14.00	13.34	12.36	12.53

1/ Assumes .81 efficiency rate, 2,540 connected horsepower.

Table 16. Estimated 1/ per bale ginning costs; West Texas stripper gin, 7 bales per hour rated capacity, module handling, automatic blower feeding, no assembly costs.

	Percent capacity utilization									
	100	90	80	70	60	50	40	30	20	10
No. bales/season	5,137	4,623	4,110	3,596	3,082	2,569	2,055	1,541	1,027	514
	Dollars/bale									
Depreciation	8.16	9.06	10.20	11.65	13.60	16.31	20.39	27.19	40.79	81.57
Interest	15.25	16.87	18.88	21.48	24.93	29.77	37.03	49.13	73.35	146.16
Insurance	1.45	1.56	1.69	1.86	2.09	2.41	2.89	3.68	5.27	10.04
Taxes	2.32	2.58	2.91	3.32	3.87	4.65	5.81	7.75	11.62	23.25
Gin Manager	2.92	3.24	3.65	4.17	4.87	5.84	7.30	9.73	14.60	29.20
Superintendent	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Office Manager	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Salaried Ginner	2.29	2.51	2.79	3.14	3.62	4.28	5.35	7.14	10.71	21.41
Salaried gin crew	1.59	1.74	1.93	2.17	2.50	2.96	3.70	4.93	7.40	14.79
Seasonal office labor	0.80	0.80	0.79	0.78	0.77	0.75	0.76	0.77	0.80	0.89
Seasonal gin labor	3.88	3.94	4.02	4.13	4.27	4.46	4.89	5.61	7.04	11.35
Energy	4.57	4.69	4.83	4.98	5.07	5.12	5.19	5.32	6.01	12.02
Bagging and ties	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
Repairs	4.85	5.03	5.26	5.55	5.94	6.48	7.30	8.66	11.38	19.53
Dryer fuel	0.53	0.54	0.55	0.55	0.57	0.58	0.61	0.65	0.73	0.96
Miscellaneous	3.47	3.52	3.58	3.67	3.78	3.93	4.17	4.56	5.34	7.67
Total cost/bale	55.84	59.84	64.84	71.22	79.61	91.29	109.13	138.87	198.79	382.62
Fixed cost/bale	36.69	40.77	45.86	52.42	61.15	73.38	91.73	122.31	183.46	366.92
Variable cost/bale	19.15	19.07	18.97	18.80	18.46	17.91	17.40	16.56	15.33	15.70

1/ Assumes .81 efficiency rate, 740 connected horsepower.

Table 17. Estimated [1/] per bale ginning costs; West Texas stripper gin, 14 bales per hour rated capacity, module handling, automatic blower feeding, no assembly costs.

	Percent capacity utilization									
	100	90	80	70	60	50	40	30	20	10
No. bales/season	10,274	9,247	8,219	7,192	6,164	5,137	4,110	3,082	2,055	1,027
	Dollars/bale									
Depreciation	4.86	5.40	6.08	6.95	8.11	9.73	12.16	16.21	24.32	48.64
Interest	9.33	10.30	11.51	13.07	15.14	18.03	22.38	29.63	44.15	87.80
Insurance	1.07	1.13	1.21	1.31	1.45	1.64	1.92	2.40	3.35	6.19
Taxes	1.39	1.54	1.73	1.98	2.31	2.77	3.46	4.62	6.93	13.86
Gin Manager	1.80	2.00	2.25	2.57	3.00	3.60	4.50	6.00	9.00	18.01
Superintendent	1.36	1.51	1.70	1.95	2.27	2.73	3.41	4.54	6.81	13.63
Office Manager	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Salaried Ginner	1.15	1.26	1.39	1.57	1.81	2.14	2.68	3.57	5.35	10.71
Salaried gin crew	0.79	0.87	0.96	1.09	1.25	1.48	1.85	2.47	3.70	7.40
Seasonal office labor	0.60	0.60	0.59	0.59	0.58	0.56	0.57	0.58	0.60	0.67
Seasonal gin labor	2.61	2.66	2.71	2.78	2.87	3.00	3.29	3.78	4.75	7.65
Energy	3.50	3.59	3.70	3.81	3.87	3.91	3.96	4.05	4.57	9.14
Bagging and ties	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
Repairs	4.07	4.18	4.32	4.49	4.72	5.05	5.53	6.34	7.96	12.83
Dryer fuel	0.51	0.51	0.52	0.52	0.53	0.53	0.55	0.57	0.61	0.73
Miscellaneous	3.29	3.33	3.38	3.44	3.52	3.64	3.82	4.11	4.69	6.44
Total cost/bale	40.10	42.64	45.82	49.87	55.18	62.56	73.83	92.62	130.53	247.42
Fixed cost/bale	23.32	25.91	29.15	33.32	38.87	46.65	58.31	77.74	116.61	233.23
Variable cost/bale	16.77	16.73	16.66	16.55	16.31	15.92	15.53	14.87	13.92	14.20

1/ Assumes .81 efficiency rate, 1,070 connected horsepower.

Table 18. Estimated [1/] per bale ginning costs; West Texas stripper gin, 21 bales per hour rated capacity, module handling, automatic blower feeding, no assembly costs.

	Percent capacity utilization									
	100	90	80	70	60	50	40	30	20	10
No. bales/season	15,411	13,870	12,329	10,788	9,247	7,706	6,164	4,623	3,082	1,541
	Dollars/bale									
Depreciation	4.80	5.33	6.00	6.86	8.00	9.60	12.00	16.00	24.01	48.01
Interest	9.14	10.09	11.27	12.80	14.83	17.67	21.94	29.05	43.29	86.11
Insurance	1.06	1.12	1.20	1.30	1.44	1.62	1.90	2.37	3.31	6.12
Taxes	1.36	1.52	1.71	1.95	2.27	2.73	3.41	4.55	6.82	13.65
Gin Manager	1.43	1.59	1.78	2.04	2.38	2.86	3.57	4.76	7.14	14.28
Superintendent	1.04	1.15	1.30	1.48	1.73	2.08	2.60	3.46	5.19	10.38
Office Manager	0.65	0.72	0.81	0.93	1.08	1.30	1.62	2.16	3.24	6.49
Salaried Ginner	0.76	0.84	0.93	1.05	1.21	1.43	1.78	2.38	3.57	7.14
Salaried gin crew	0.53	0.58	0.64	0.72	0.83	0.99	1.23	1.64	2.47	4.93
Seasonal office labor	0.27	0.27	0.26	0.26	0.26	0.25	0.25	0.26	0.27	0.30
Seasonal gin labor	2.52	2.57	2.62	2.69	2.78	2.90	3.18	3.65	4.58	7.39
Energy	3.18	3.26	3.37	3.46	3.52	3.55	3.60	3.67	4.13	8.27
Bagging and ties	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
Repairs	3.94	4.05	4.18	4.35	4.58	4.90	5.38	6.18	7.78	12.58
Dryer fuel	0.50	0.50	0.51	0.51	0.51	0.52	0.53	0.54	0.57	0.65
Miscellaneous	3.19	3.23	3.27	3.32	3.40	3.50	3.66	3.92	4.44	5.99
Total cost/bale	38.13	40.56	43.60	47.48	52.57	59.64	70.41	88.35	124.56	236.03
Fixed cost/bale	22.25	24.72	27.81	31.78	37.08	44.49	55.62	74.16	111.24	222.47
Variable cost/bale	15.88	15.84	15.79	15.70	15.49	15.15	14.79	14.20	13.32	13.56

1/ Assumes .81 efficiency rate, 1,505 connected horsepower.

Table 19. Estimated [1/] per bale ginning costs; West Texas stripper gin, 28 bales per hour rated capacity, module handling, automatic blower feeding, no assembly costs.

	Percent capacity utilization									
	100	90	80	70	60	50	40	30	20	10
No. bales/season	20,548	18,493	16,438	14,384	12,329	10,274	8,219	6,164	4,110	2,055
	Dollars/bale									
Depreciation	4.13	4.59	5.17	5.90	6.89	8.26	10.33	13.77	20.66	41.32
Interest	7.93	8.75	9.77	11.09	12.84	15.28	18.96	25.08	37.34	74.23
Insurance	0.98	1.04	1.10	1.19	1.31	1.47	1.71	2.11	2.92	5.33
Taxes	1.18	1.31	1.47	1.68	1.96	2.35	2.94	3.92	5.88	11.76
Gin Manager	1.24	1.38	1.55	1.77	2.07	2.48	3.10	4.14	6.20	12.41
Superintendent	0.88	0.97	1.09	1.25	1.46	1.75	2.19	2.92	4.38	8.76
Office Manager	0.49	0.54	0.61	0.70	0.81	0.97	1.22	1.62	2.43	4.87
Salaried Ginner	0.57	0.63	0.70	0.79	0.90	1.07	1.34	1.78	2.68	5.35
Salaried gin crew	0.40	0.43	0.48	0.54	0.63	0.74	0.92	1.23	1.85	3.70
Seasonal office labor	0.30	0.30	0.30	0.29	0.29	0.28	0.28	0.29	0.30	0.33
Seasonal gin labor	2.15	2.19	2.24	2.29	2.37	2.48	2.72	3.11	3.91	6.31
Energy	3.17	3.25	3.35	3.45	3.50	3.53	3.58	3.65	4.10	8.21
Bagging and ties	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
Repairs	3.69	3.78	3.89	4.04	4.24	4.51	4.93	5.61	6.99	11.12
Dryer fuel	0.50	0.50	0.50	0.50	0.51	0.51	0.52	0.53	0.55	0.61
Miscellaneous	3.11	3.14	3.18	3.24	3.31	3.40	3.55	3.79	4.23	5.74
Total cost/bale	34.47	36.55	39.16	42.47	46.81	52.85	62.02	77.32	108.23	203.79
Fixed cost/bale	19.07	21.19	23.84	27.24	31.79	38.14	47.68	63.57	95.36	190.71
Variable cost/bale	15.40	15.36	15.32	15.23	15.03	14.70	14.35	13.75	12.87	13.08

1/ Assumes .81 efficiency rate, 1,914 connected horsepower.

Table 20. Estimated [1/] per bale ginning costs; West Texas stripper gin, 35 bales per hour rated capacity, module handling, automatic blower feeding, no assembly costs.

	Percent capacity utilization									
	100	90	80	70	60	50	40	30	20	10
No. bales/season	25,685	23,117	20,548	17,980	15,411	12,843	10,274	7,706	5,137	2,569
	- - - - - - - - - - Dollars/bale - - - - - - - - - -									
Depreciation	4.17	4.63	5.21	5.95	6.94	8.33	10.42	13.89	20.83	41.66
Interest	7.93	8.75	9.78	11.10	12.86	15.31	19.00	25.15	37.45	74.46
Insurance	0.99	1.04	1.11	1.20	1.31	1.47	1.72	2.12	2.94	5.37
Taxes	1.18	1.32	1.48	1.69	1.97	2.37	2.96	3.95	5.92	11.84
Gin Manager	1.13	1.25	1.41	1.61	1.88	2.26	2.82	3.76	5.65	11.29
Superintendent	0.78	0.87	0.97	1.11	1.30	1.56	1.95	2.60	3.89	7.79
Office Manager	0.39	0.43	0.49	0.56	0.65	0.78	0.97	1.30	1.95	3.89
Salaried Ginner	0.46	0.50	0.56	0.63	0.72	0.86	1.07	1.43	2.14	4.28
Salaried gin crew	0.32	0.35	0.39	0.43	0.59	0.59	0.74	0.99	1.48	2.96
Seasonal office labor	0.32	0.32	0.32	0.31	0.31	0.30	0.30	0.31	0.32	0.35
Seasonal gin labor	1.72	1.75	1.79	1.83	1.90	1.98	2.17	2.49	3.13	5.05
Energy	3.01	3.08	3.18	3.27	3.32	3.35	3.39	3.46	3.89	7.78
Bagging and ties	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
Repairs	3.57	3.67	3.78	3.93	4.13	4.41	4.82	5.52	6.91	11.07
Dryer fuel	0.50	0.50	0.50	0.50	0.50	0.51	0.51	0.52	0.53	0.58
Miscellaneous	3.04	3.07	3.11	3.16	3.23	3.32	3.46	3.69	4.16	5.56
Total cost/bale	33.25	35.28	37.82	41.04	45.27	51.14	60.06	74.92	104.94	197.69
Fixed cost/bale	18.52	20.57	23.15	26.45	30.86	37.03	46.27	61.72	92.58	185.16
Variable cost/bale	14.74	14.71	14.67	14.59	14.41	14.11	13.77	13.20	12.36	12.53

1/ Assumes .81 efficiency rate, 2,195 connected horsepower.