Cost comparison of alfalfa cubing and baling operations in Arizona

COST COMPARISON OF ALFALFA CUBING AND BALING OPERATIONS IN ARIZONA

by

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STATEMENT BY AUTHOR

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ABSTRACT

John Deere Model 400 hay cubing machines were introduced commercially in Arizona in 1965. Several of the cubers were soon in use on alfalfa hay harvesting operations within the state and in surrounding states.

The intent of this thesis is to determine the extent of utilization of the hay cubers in Arizona and to examine the costs and returns associated with alfalfa hay cubing as opposed to hay baling. A secondary intent is to compare costs associated with baling and cubing in Arizona to similar costs in California and New Mexico. To accomplish such ends, owners and operators of alfalfa hay cubing and baling enterprises in Arizona were interviewed in the fall of 1968. Data gained during the interviews was used to construct budgets representing individual harvesting enterprises and also synthetic budgets representing optimum operations.

It was discovered that approximately 12% of the alfalfa hay in Arizona was harvested by 30 cubing machines considered in the study in 1968. This figure does not consider the hay harvested by seven additional machines in operation in the state at the time.

Results indicated that there were no savings in cost per ton associated with the cubing of alfalfa hay as opposed

to the more traditional method of harvesting. Cubing costs per ton were slightly higher than baling costs per ton. The cubing firms realized higher net profits per ton, however, because of higher prices per ton for hay cubes and cubing services. The higher prices for cubes more than offset the cost disadvantage of the cubing firms. Both baling and cubing costs were highest in California and lowest in New Mexico. Costs for both operations in Arizona fell between similar costs in the other two states.

CHAPTER 1

SITUATION

There are 14 counties in Arizona, each involved to varying degrees in the production of alfalfa hay. The total land devoted to alfalfa hay production in the state was 200,000 acres in 1968. With an average yield per acre of 5.4 tons, total alfalfa hay production for the year was 1,091,000 tons. The total value of this production with an average seasonal price of $24.70 per ton was $26,970,000 (Arizona Crop and Livestock Reporting Service, 1969, p. 21). Such production makes alfalfa hay the second most important field crop in Arizona, exceeded only by cotton in significance. Of approximately 6,477 farms in Arizona in 1964, 1,756 were involved in alfalfa hay production (U.S. Department of Commerce, 1964, pp. 7, 15). Alfalfa hay production occurs on various sized tracts, but 3/4 of the total acreage is accounted for by farms composed of at least 100 acres (U.S. Department of Commerce, 1964, p. 19).

The Central Crop District of Arizona is composed of Maricopa and Pinal Counties, Figure 1. This District is responsible for more than 1/2 of the state's output of alfalfa. In 1968, the Central District's hay production was 652,800

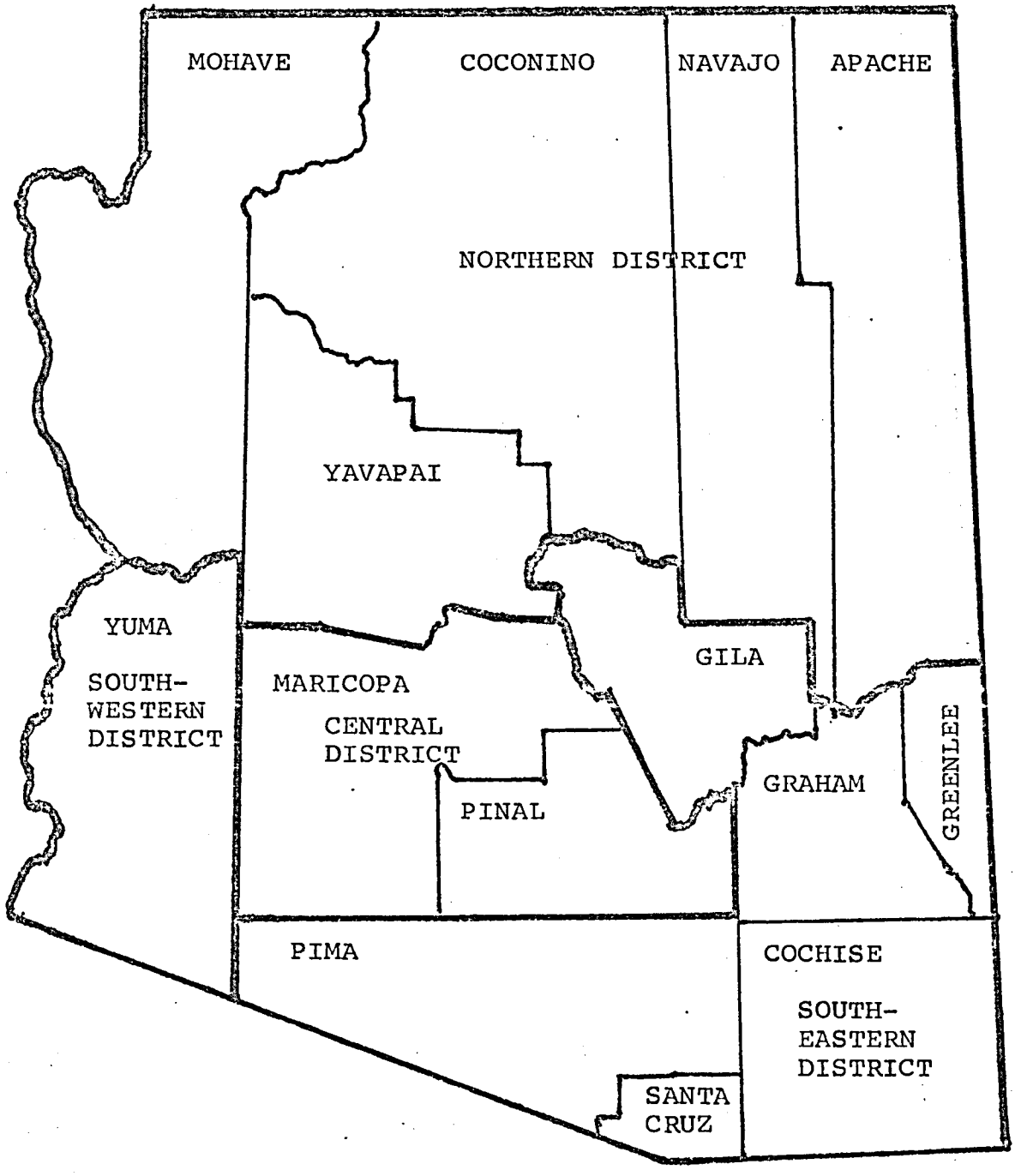

Figure 1. Arizona Counties and Crop Reporting Districts

Source: Arizona Crop and Livestock Reporting Service, Arizona Agricultural Statistics, 1969, Bulletin S-4, March, 1969, p. 10.

tons of a state total of 1,091,000 tons (Arizona Crop and Livestock Reporting Service, 1969, p. 21).

The past two decades have had a profound influence upon interest in the production and distribution of alfalfa hay. Population increase, improved standards of living, and population concentration have greatly increased the western demand for fed beef. Commercial feeding of beef in the West has been stimulated by the increased demand. Patterns of hay transportation, storage, and distribution have been modified in order to better accommodate increasing numbers of cattle in feedlots. Livestock feeds once moved primarily east and west via the railroads but truck transportation has altered the previous pattern. Trucks now haul hay in all directions from hay production areas to cattle feedlots throughout the West (Western Technical Research Committee, 1966, p. 1).

Information concerning the exact disposition of Arizona alfalfa is not available but it is certain that demand for alfalfa hay in the West has increased with the additional livestock feeding operations in the West. This increased demand has brought into sharp focus the need for improved hay market information and efficiency. Studies have indicated that the market is often poorly organized and inefficient with many dealers trading a product without standardization (Western Technical Research Committee, 1966, p. 2). Prices are often not a reflection of quality and

producers are often unaware of prevailing prices and market conditions (Western Technical Research Committee, 1966, p. 2). This situation has been further complicated in recent years by the introduction of new innovations in alfalfa hay harvesting.

Problem and Objectives

Farmers and feeders became interested in a new concept of alfalfa hay harvesting in the early 1950's as a result of efforts by agriculture engineers and machinery manufacturers to develop a feasible hay "wafering" machine. The early machines produced a product termed "wafers" simply because the product closely resembled a wafer. Cal-Cube, Inc. of California, John Deere Ottumwa Works of Iowa, and Lundell Manufacturing Company of Iowa were instrumental in development of such machines (California Grain and Feed Association, 1966, pp. 3-6).

The interest resulted primarily from the potential labor savings possible with the hay "cubes," as they later were termed. The cubes which usually measure 1½ by 1½ by 3 inches are adaptable to a system of handling, storage and feeding more similar to that of grain than to that of baled hay. The wafers or cubes are elevated from the cubing machine into a trailer drawn behind the self-propelled cuber. Hydraulic equipment may then be utilized to elevate the trailer and empty the cubes into a dump truck for hauling

the cubes to storage. The cubes are more dense and require only about 2/3 as much storage space as bales (Wiersma, 1962, p. 3). Therefore, they may be stored on flat concrete slabs or in cribs. From storage, the cubes can be loaded into a truck or feed wagon with a skip loader for delivery to the point of consumption. Furthermore, some stockmen utilize self-feeders for final disposition of the hay. Man-handling of heavy bales from field to storage to feedlot has been eliminated by cubes.

The first wafering machines were commercially introduced in Arizona in the early 1960's by the Lundell Manufacturing Company of Iowa. Their selling price was about $8,000 per machine and could compress alfalfa hay into 2-inch cubes at the rate of three or four tons per hour (Wiersma, 1962, p. 3).

Various other cubing machines were tried and tested in Arizona but the first to find extensive acceptance and utilization was the John Deere 400 Cuber. It was introduced commercially in 1965 and in the fall of 1968 there were 37 of the machines operating in the state.

The John Deere 400 Cuber is a self-propelled machine which with its hydraulic trailer retails for about $33,000 to $36,000. The cuber harvests the alfalfa from a windrow when the moisture content of the hay is approximately 10%. Water is sprayed from the cuber onto the windrow to raise the moisture content of the alfalfa from 10% up to 14%.

Alfalfa from the windrow is then drawn into the cuber by means of a pick-up. There the hay passes through a set of rollers into a cylinder. In this cylinder, a two-knife chopper chops the material and mixes it more thoroughly with the water. The function of the water is to release an adhesive from the alfalfa which helps hold the hay in the form of a cube. The hay then passes by means of a conveyor to a press wheel which revolves and extrudes the hay through 66 1½ inch square dies. The cubes then drop to a conveyor which ends at an elevator. The elevator then delivers the cubes to a hydraulically operated wagon drawn behind the cuber. (California Grain and Feed Association, 1966, pp. 5-6). The John Deere Cuber is capable of averaging five tons of cubes per hour in this manner.

The introduction of the hay cuber and the current scope of the alfalfa hay industry in Arizona have created a need for comprehensive information concerning relative costs, returns, and efficiencies of different methods of alfalfa hay harvesting. Since essentially no information of this description is currently available, this study will represent an attempt to supply the needed information. Comparison of costs and returns associated with cubing operations as opposed to baling operations shall be provided by this study.

The objectives of this study are:

1. To determine the extent to which hay cubers are used in Arizona alfalfa hay harvesting operations.

2. To determine the costs and returns associated with individual alfalfa cubing operations in Arizona in 1968.
3. To determine the costs and returns associated with synthesized[1] alfalfa cubing operations in Arizona in 1968.
4. To determine the costs and returns associated with individual alfalfa baling operations in Arizona in 1968.
5. To determine the costs and returns associated with synthesized alfalfa baling operations in Arizona in 1968.
6. To compare representative costs and returns of alfalfa baling operations with alfalfa cubing operations in Arizona.
7. To compare costs associated with baling and cubing in Arizona with similar operations in California and New Mexico.

Scope and Limitations

This study is not necessarily representative of either baling or cubing costs and returns in any region except

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[1] "Synthesized" refers to a budget for a nonexistent operation. For purposes of construction a certain amount of equipment, labor, management, and output is assumed. The purpose of a synthesized operation is to eliminate differences in equipment inventories and facilitate comparison.

Maricopa, Pinal, and Pima Counties. These were the counties in which all but seven of the Arizona cubers were being utilized in 1968. The seven cubers excluded from the study were operated in Yuma county and were omitted because of budgetary limitations. Baling operations involved in the study were located in the same areas as the cubing operations considered for the purpose of eliminating non-homogneity of cost and return factors. Since costs and returns may vary geographically, inferences drawn from the study of Arizona firms may not be valid universally.

Further restrictions upon the implications of this study are imposed by time. Since prices of productive inputs such as fuel, repair parts, labor and machinery are extremely variable over time, we must assume that inferences drawn from the study must be valid only for 1968.

No attempt shall be made in this thesis to analyze costs or returns associated with use of either cubes or bales after harvest. Hauling for distances greater than 20 miles, storage, handling, and feeding are not within the scope of the study. These items will therefore not be treated. Information on storage, handling and feeding of cubes is available from the California Grain and Feed Association.

Limitations exist to a certain extent in budgeting analysis. Some personal judgments were necessary for construction of the synthetic budgets representing optimum operations.

CHAPTER 2

PROCEDURE AND METHODOLOGY

Realistic information concerning physical assets and operating costs of commercial and noncommercial alfalfa hay harvesting enterprises in Arizona was necessary for development of meaningful budgets.

Data Sources and Population Description

The information requisite for the study was obtained through personal interviews with farmers involved in alfalfa hay harvesting in central Arizona. Such interviewing was accomplished during the fall of 1968 and the information reflected therein represented costs and returns for the spring, summer and fall of that year. Data on machinery and equipment investment, costs of repairs, labor, yields, equipment life and various other expenses were recorded on standardized, confidential interview schedules. A copy of such a schedule is presented in Appendix A. Sources of data included individual farm records, income tax summaries, and in some instances--the manager's memory. The interview schedules provided sufficient information for analysis in all but one instance. The incomplete schedule concerned a baling

operation. All of the interviews representing cubing operations were utilized.

Supplementary information was provided by various firms who supplied input factors such as fuel and insurance to the harvesting operations. Secondary data was extracted from various sources. Among these sources were published and unpublished material in the files of the Agricultural Economics and Agricultural Engineering Departments of The University of Arizona.

The Central Crop District of Arizona with which this study is primarily concerned is composed of Maricopa and Pinal Counties and a small portion of Pima County as indicated in Figure 1. This area accounts for nearly 60% of the alfalfa hay produced in Arizona (Arizona Crop and Livestock Reporting Service, 1969, p. 21). The operations considered in the study handled 25% of the hay in the study area and 15% of the statewide hay production. Total land devoted to alfalfa hay in the study area was 118,200 acres. Cubing operations considered accounted for about 11.6% of the total alfalfa tonnage in the state. The baling operations involved about 3.4% of the total.

Operations considered were classified as either custom or non-custom for the purpose of assigning applicable insurance rates. The criteria for classification are as follows:

1. Alfalfa hay harvesting operations: The enterprise must for profit, harvest alfalfa hay either in the form of bales or cubes.
2. Custom harvesting operation: The operation must harvest at least 1/2 of its annual output from alfalfa not grown under supervision of the owner or manager of the balers or cubers.
3. Noncustom harvesting operation: The inverse of the above is true. The operation must harvest less than 1/2 of its output from alfalfa not grown under supervision of the owner or manager of the balers or cubers.
4. Location: Headquarters of the harvesting operation must be located in Pima, Maricopa or Pinal County.

Of the 10 cubing operations considered, five were custom operations and five were noncustom. Two of the enterprises were located in Pinal County and eight had headquarters in Maricopa County. There were four custom baling operations and six noncustom operations comprising a sample of 10. Of these 10 operations, two were based in Pinal County and eight were in Maricopa County.

Sample Procedure

The sampling procedure for the hay cubers consisted of obtaining information on all machines operating within

the state with the exception of seven cubers in Yuma County. The Yuma operations were deleted because of budgetary limitations of the project.

Quota was used for selection of the baling operations. An attempt was made to select the baling operations from as near proximity of the cubing enterprises as was possible.

Information was obtained on 30 cubing machines utilized in 10 separate hay operations with from one to five machines in each managerial unit. Ten different baling operations were considered which accounted for 15 baling machines.

Names and addresses of cuber and baler owners were obtained from John Deere implement dealers in the study area. They were then contacted first by phone and later in a personal interview.

Budgeting Methodology

Comparison of production costs per ton necessitated construction of budgets representing individual operations considered in the study. An attempt has been made herein to represent accurately each enterprise as it actually existed at the time of the survey in the form of budgets. Individual questionnaires and secondary information provided necessary information. Synthetic budgets were then constructed for hypothetical operations. These budgets represented the author's ideas of what could be achieved with maximum

efficiency in haying operations. For this purpose, certain parts of different operations were segregated and recombined into optimum operation budgets.

The budgeting procedure is summarized as follows:

1. Tons of hay harvested annually per operation and per machine were listed for balers and cubers.
2. Purchase prices of alfalfa standing in the field as well as custom harvesting rates for baling and cubing were computed.
3. Fixed, variable and total costs per ton for both baled and cubed hay were computed.
4. Selling prices per ton for baled and cubed hay at point of sale were computed.
5. Net profits per ton for baled and cubed hay were derived.

Requisite for analysis of individual hay operations was a division of the various costs into the categories of "fixed" or non-cash costs and "variable" or cash costs. The fixed costs were incurred whether or not the equipment is used. These costs include interest on investment, depreciation, taxes, and insurance. Variable costs were assumed to be those costs which were free to vary in direct proportion to the amount of utilization of the equipment. These costs included fuel, wages, and repairs.

Budgets for the individual enterprises were constructed on the basis of the equipment investment inventories

taken from the questionnaires. In addition, each operation was obtained during the interviews. One half of the cost of a pick-up was assigned to each operation.

Expected lives of the various items of equipment in the study were taken in most instances directly from the questionnaires. These estimates represented the managers' expectations and were the criteria upon which their decisions were made. In the case of the balers, cubers, and tractors, standardized life estimates were used. These standard estimates were used. These standard estimates represented modal life estimates given by respondents for the equipment.

Depreciation was then computed utilizing the expected life of the equipment. Salvage values for all equipment except the cubers were obtained from a secondary source (Larsen and Bowers, 1965, p. 7). Salvage values for the cubers were assumed to be 10% of their original price. Depreciation costs were assumed to be average annual costs computed by the straight-line-method of depreciation.

All capital was assumed to be purchased with borrowed funds at a simple annual interest rate of 10%. This rate was obtained from the Main Office of the Valley National Bank in Tucson. Average annual interest expense was then computed for the expected life of the equipment.

Taxes on all equipment were computed according to schedules furnished by the respective county tax assessors

in the three counties. Rates used were averages of all precincts within individual counties.

Computation procedures were the following:

1. Pinal County Tax Rates

   Average annual depreciated value X .18 = tax base

   Tax base X .11 = tax liability

2. Maricopa County Tax Rates

   Average annual depreciated value X .25 = tax base

   Tax base X .115 = tax liability

3. Pima County Tax Rates

   Average annual depreciated value X .25 = tax base

   Tax base X .07292 = tax liability

Insurance rates were furnished by the Don Mahoney Insurance Agency of Coolidge, Arizona. Annual insurance premiums were determined as follows:

1. Farm Tractors

   Premium = .52% of depreciated value

2. Custom Hay Harvesting Machinery

   Premium = 2% of depreciated value

3. Noncustom Hay Harvesting Machinery

   Premium = 1.04% of depreciated value

4. Hauling trucks (bodily injury and property damage liability). Premium = $106

5. Water trucks (bodily injury and property damage liability)

   Premium = $41

6. One half ton pick-up trucks (bodily injury and property damage liability)

   Premium = $55

Fuel costs were derived using both primary and secondary data. Fuel type, annual hours of equipment use and hourly consumption rates were obtained from the interview schedules. Fuel prices were then obtained from the Phillips 66 Petroleum Company in Tucson, Arizona. Hourly consumption rates were then multiplied by annual hourly use to yield annual fuel consumption. This in turn was then multiplied by the applicable fuel price to derive fuel cost.

Labor costs and costs of repairs were taken directly from the interview schedules. Cost of wire was included in repair costs for balers.

Fixed costs and variable costs for all equipment were then summed to yield total operating costs for each operation. Annual tons harvested were then determined from primary data for each operation. Harvesting costs per ton were then derived by dividing total costs by total tons harvested for each enterprise.

For the purpose of determining net profit, the cost of alfalfa standing in the field was added to the harvesting costs per ton. No primary alfalfa production costs were

available and so the modal price paid by custom harvestors was used. This information was furnished by the interview schedules.

Another method of profit determination was also employed. It is explained later in this paper, but it also uses the same information contained in the budgets.

Points of sale of product varied among operations to a certain extent. Managers of baling operations as a rule sold their hay on the roadside. When trucking was required the task was usually accomplished by commercial trucking firms. Cubes were usually hauled without extra charge within a ten-mile radius of the harvesting site. If longer hauls were required, the extra mileage was included in custom charges or prices received for the cubes.

The standard budgets were synthesized for multiple purposes. One was for comparison of efficient Arizona firms with firms operating in California and New Mexico. Recent studies similar to this one were conducted in the two states and are now available. The second purpose was for the comparison of costs and returns associated with baling as opposed to cubing within Arizona.

Synthetic budgets were also necessary to alleviate the problem of differing managerial ability and systems in terms of different combinations of equipment. For instance, one manager might obtain lower per ton costs with used but functional equipment for which depreciation and other fixed

costs might be less than corresponding costs for newer equipment. Another manager might have inadequate hauling equipment and delay harvesting while waiting for trucks to return to the field. The synthetic budgets assume equal managerial aptitude.

Four standardized budgets were constructed. Operations with one cuber, four cubers, two balers and eight balers with all related equipment were synthesized. The purpose for construction of the two cuber budgets was to determine what, if any cost savings might be realized by utilizing four cubers in an operation as opposed to only one. The basis for this question was that equipment such as a water truck or pick-up truck might be utilized in conjunction with more than one cuber, decreasing the per ton costs of such equipment.

Budgets for two-baler and eight-baler operations were constructed for the purpose of cost comparison with the modal cubing enterprises. It was assumed that a two-baler venture would be capable of handling an annual output equivalent to that of a one-cuber operation. The basis for this assumption was that the mean annual output per baler in the study was approximately one-half that of the modal cuber. Similarly, eight balers should have the same productive capacity as four cubers.

Costs were then computed at various levels of output for the representative operations. The variable costs per

ton were assumed to be constant throughout all ranges of utilization. Fixed costs per ton were assumed to be inversely proportional to the amount of use. Thus, higher levels of utilization would result in lower fixed costs per ton. Higher fixed costs per ton would be associated with lower output levels.

CHAPTER 3

ANALYSIS

Budgets were developed for the comparison of costs and returns associated with harvesting alfalfa by the alternative methods of cubing and baling. The budgets for the enterprises considered in the study reflect actual prices received for products and actual costs incurred in their production in 1968. It should be indicated at this point that alfalfa hay prices used in this study may not be entirely representative of normal or average hay prices. This condition was due to the large amount of DDT contamination of alfalfa hay in 1968. This hay was sold at reduced prices because a certain level of DDT contamination precluded its utilization by dairy operations. Different prices could significantly affect the profits or losses incurred by the various operations.

Baler Budgets

Numbers and types of equipment, equipment investment, and expected lives of various items of equipment for the baling operations are indicated in Table 1. Equipment life estimates given by the individual farmers were used for computation of fixed costs with the exception of the balers.

TABLE 1. Investments and Expected Lives for Alfalfa Harvesting Equipment on Baling Enterprises in Arizona, 1968

Operation Number	Item	Number of Items	Expected Life (Years)	Investments in Dollars
20	Swather	1	5	$ 7,200.00
	Rakes	2	5	1,400.00
	Tractors[a]	2	10	7,000.00
	Bale Accumulator	1	7	4,400.00
	Baler	1	6	8,100.00
	Pick-up Truck[b]	½	3	1,300.00
	Total			29,400.00
19	Rakes	2	10	1,600.00
	Tractors	1	10	1,400.00
	Balers	2	6	16,000.00
	Pick-up Truck	½	3	1,300.00
	Total			20,300.00
18	Swathers	2	4	13,400.00
	Rakes	6	6	5,400.00
	Tractors	6	10	24,000.00
	Balers	1	6	6,400.00
	Bale Accumulator	1	7	9,500.00
	Pick-up Truck	½	3	1,300.00
	Total			60,000.00
17	Swathers	2	5	13,900.00
	Rakes	2	3	1,520.00
	Tractors	4	10	2,500.00
	Balers	2	6	23,600.00
	Bale Accumulator	1	7	10,500.00
	Pick-up Truck	½	3	1,300.00
	Total			53,320.00
16	Swathers	2	3	13,400.00
	Rakes	4	4	2,260.00
	Tractors	6	10	6,301.00
	Baler	1	6	7,370.00
	Bale Accumulator	1	7	9,000.00
	Pick-up Truck	½	3	1,300.00
	Total			39,631.00

TABLE 1--Continued

Operation Number	Item	Number of Items	Expected Life (Years)	Investments in Dollars
15	Swathers	2	4	$ 6,150.00
	Rakes	3	10	1,500.00
	Tractors	4	10	9,200.00
	Baler	1	6	3,900.00
	Bale Accumulator	1	7	9,600.00
	Pick-up Truck	½	3	1,300.00
Total				31,650.00
14	Swathers	3	4	19,500.00
	Rakes	3	6	3,200.00
	Tractors	4	10	8,800.00
	Balers	2	6	12,000.00
	Bale Accumulator	1	7	9,000.00
	Pick-up Truck	½	3	1,300.00
Total				53,800.00
13	Swathers	3	3	22,500.00
	Rakes	3	3	3,000.00
	Tractors	4	10	12,500.00
	Baler	1	6	7,400.00
	Bale Accumulator	1	7	10,500.00
	Pick-up Truck	½	3	1,300.00
Total				57,200.00
12	Swather	1	8	5,100.00
	Rakes	2	15	2,000.00
	Tractors	3	10	13,200.00
	Baler	1	6	6,100.00
	Bale Accumulator	1	7	7,200.00
	Pick-up Truck	½	3	1,300.00
Total				34,900.00

TABLE 1--Continued

Operation Number	Item	Number of Items	Expected Life (Years)	Investments in Dollars
11	Swathers	2	5	$16,158.00
	Rakes	4	14	1,800.00
	Tractors	7	10	5,250.00
	Balers	3	6	16,500.00
	Bale Accumulator	1	7	10,600.00
	Pick-up Truck	½	3	1,300.00
Total				51,608.00

a/ Annual percentage of tractor time devoted to alfalfa harvesting for all operations was assumed to be 50%.

b/ Annual percentage of pick-up truck time devoted to alfalfa operation was assumed to be 50% for all firms in the study.

For balers, the weighted average life estimate for all the units in the study was six years. This figure was used for the purpose of standardization.

Total equipment investments per operation in the study ranged from $20,300 for operation number 19 to $60,000 for operation number 18. The average baling operation had an equipment investment of $4,180.90. This included 1.8 swathers, 2.1 rakes, 4.1 tractors, 0.9 bale accumulators, 1.5 balers, and 1.0 pick-up truck. One-half the annual fixed costs of the tractors and pick-up trucks were charged to the baling operations.

Baling enterprises considered harvested from 1,250 to 6,832 tons of alfalfa per year. The mean tonnage harvested annually per operation was 3,754.8 tons. An average baler therefore baled approximately 2,500 tons per year.

Each baling enterprise budgeted was assumed to buy alfalfa standing in the field, harvest it, and deliver the hay within a five-mile radius of the field in which it was harvested. The modal price paid for uncut hay was $18.00 per ton and was derived from primary data. The figure was utilized for lack of a better estimate of a cost of production for alfalfa and was considered as a variable cost for the baling operations.

The fixed, variable, and total costs for operation number 20 are presented in Table 2. Labor costs were extracted from primary data. The wage rate was $1.50 per hour

TABLE 2. Costs and Returns for Alfalfa Baling Operation Number 20, Arizona, 1968 1,540 Tons Harvested

Item	Dollars Annually	Dollars per Ton
Returns:		
Price of baled hay		$27.00
Total returns	$41,580.00	$27.00
Variable Costs:		
Labor costs	$ 4,320.00	2.81
Swathing		
Fuel	95.20	.06
Repairs	50.00	.03
Rakes		
Repairs	20.00	.01
Tractors		
Fuel	701.40	.46
Repairs	100.00	.06
Bale Accumulator		
Fuel	380.80	.25
Repairs	300.00	.19
Baler		
Fuel	68.40	.04
Repairs	700.00	.45
Pick-up truck		
Fuel	200.00	.13
Repairs	40.00	.03
Alfalfa standing in the field	27,720.00	18.00
Total Variable Cost	34,695.80	22.52
Fixed Costs:		
Swather		
Depreciation	1,296.00	.84
Interest	432.00	.28
Insurance	92.16	.06
Taxes	59.06	.04
Rakes		
Depreciation	182.00	.11
Interest	84.00	.05
Insurance	20.72	.01
Taxes	8.29	.01
Tractors		
Depreciation	319.50	.21
Interest	195.25	.13
Insurance	10.98	.01
Taxes	29.12	.02

TABLE 2 — Continued

Item	Dollars Annually	Dollars per Ton
Bale Accumulator		
Depreciation	$ 502.86	$ .33
Interest	251.43	.16
Insurance	57.83	.04
Taxes	32.08	.02
Baler		
Depreciation	958.50	.62
Interest	472.50	.31
Insurance	114.75	.07
Taxes	52.42	.01
Pick-up Truck		
Depreciation	300.00	.19
Interest	76.00	.05
Insurance	27.50	.02
Taxes	12.70	.01
Total Fixed Cost	$ 5,587.65	$ 3.59
Total Cost	$40,283.45	$26.16[a]
Net Returns	1,296.55	.84

[a] Variable cost per ton of $22.52 and total cost per ton of $3.59 do not equal $26.16 because of rounding error in the individual per ton costs as is indicated in the text.

and managerial or family labor was credited with the same rate as hired labor. Labor costs per ton for operation 20 were $2.81 per ton.

Fuel costs were obtained from the Phillips 66 Petroleum Company in Tucson. Fuel for field equipment was $0.14 per gallon and fuel for road equipment was $0.23 per gallon. Hours of use per year and fuel consumption per hour were obtained from primary data and then used to compute total fuel cost for each piece of machinery. Total fuel cost for all equipment in operation 20 was $0.94 per ton.

Repair costs for each item of equipment were obtained from the interview schedules. They included cost of parts, wire for balers, lubrication, and labor not paid for in normal hay operations. For operation 20, repair costs for all equipment amounted to $0.76 per ton. All of the preceding cost figures were variable costs.

Fixed costs of depreciation, interest, insurance, and taxes were derived as indicated earlier. The costs per ton were then derived by dividing each individual cost by the annual tons harvested.

For operation 20, depreciation cost for all items of equipment was $2.30. Interest cost was $0.98 per ton. Interest cost was assumed to be 10% whether or not equipment was purchased with borrowed or ownership capital. If equipment was purchased with ownership capital, the 10% interest charge represents opportunity cost for the capital. That is

to say, the capital could have at least a 10% return on investment in some alternate employment. Insurance and taxes accounted for a per ton cost of $0.32.

A total variable cost per ton of $22.52 and a total fixed cost per ton of $3.59 yielded a total cost per ton of $26.11. This figure is slightly incorrect due to the rounding of individual costs per ton to two decimal places. When total cost is divided by total tons harvested, the total cost per ton is $26.16. This is the figure which appears in the table. A similar situation exists for almost all of the other operation budgets. Operation number 20 received an average price of $27.00 per ton for baled hay in 1968. This therefore yielded a total net return of approximately $0.84 per ton for the year.

The figure may be somewhat misleading for we have assumed that the operator bought the hay uncut, harvested it and then sold it on the roadside. If instead the operator harvested hay for a custom charge of $10.00 per ton, (as he actually did for a portion of the year), his profit position would be altered. His total cost per ton of baling, excluding $18.00 per ton for uncut alfalfa, was $8.11. A $10.00 per ton return minus an $8.11 per ton total cost would have netted a profit of $1.89 per ton. If the operator charged the modal custom rate for baling of $8.50, his profit would be reduced to $0.39 per ton.

Nine other operations considered in the study are similarly presented in Tables B-1 through B-9. Their profit positions are as follows:

Operation	Net Profit per Ton
11	$-0.71
12	-0.66
13	-4.05
14	2.05
15	-3.08
16	-1.78
17	-1.19
18	-1.16
19	0.31

If we then assume, as with operation 20, that their work is done for a custom charge of $8.50 per ton, their profit or loss position changes. Custom profits are as follows:

Operation	Net Profit per Ton
11	$4.79
12	3.84
13	2.45
14	4.55
15	1.42
16	2.38
17	2.97
18	3.34
19	-0.19

The weighted average net profit for all baler operations was $3.18 per ton. When uncut alfalfa was purchased, the first situation discussed, the weighted average net profit was $-0.98.

Cuber Budgets

Procedure for budgeting of Arizona cubing operations was essentially the same as that for baling operations.

Table 3 illustrates items of equipment, their expected lives, and the investments they represent for the 10 cubing operations considered in this study.

Again, expected life estimates for the equipment are those expressed by the operation managers. Exceptions are the cubers which are assumed to have a life of five years. The fixed costs are based upon this figure.

Equipment and machinery estimates per operation range from $44,300 to $214,750. The average enterprise has an investment of $117,732. This average investment is composed of 2.6 swathers, 2.1 rakes, 2.1 tractors, 3.0 cubers, 1.2 water trucks, 1.8 hauling trucks, 0.9 elevators, and 1 pick-up truck. As in the case of the baling operations, one-half of the fixed costs of the tractors and pick-up truck were charged to the cubing enterprise.

Annual hay outputs for the firms ranged from 4,250 tons to 22,300 tons. Average output of all firms was 12,711 tons per year.

For purposes of comparison, each firm was assumed to buy alfalfa standing uncut in the field for $18.00 per ton, harvest it, and sell it in the form of cubes. Differences in delivery points are assumed to be reflected in the different prices received for cubes by different operations. Some operations did no hauling whatsoever.

Cost computations were made in the same manner as the baling costs. As illustrated in Table 4, operation

TABLE 3. Investments and Expected Lives for Alfalfa Harvesting Equipment on Cubing Enterprises in Arizona, 1968

Operation Number	Item	Number of Items	Expected Life (Years)	Investments in Dollars
10	Swathers	3	4	$19,500.00
	Rakes	3	4	2,340.00
	Tractors[a]	3	10	1,500.00
	Cubers	4	5	132,000.00
	Water Truck	1	10	1,500.00
	Hauling Trucks	3	10	6,400.00
	Elevators	2	10	1,780.00
	Pick-up Truck[b]	½	3	1,300.00
Total				166,320.00
9	Swathers	1	3	8,000.00
	Rakes	3	6	2,650.00
	Tractors	3	10	1,500.00
	Cuber	1	5	36,000.00
	Water Truck	1	10	1,100.00
	Hauling Trucks	2	5	4,600.00
	Elevators	1	10	1,230.00
	Pick-up Truck	½	3	1,300.00
Total				56,380.00
8	Swathers	3	2	21,300.00
	Rakes	5	10	1,000.00
	Tractors	5	10	2,500.00
	Cubers	4	5	134,000.00
	Water Truck	1	5	4,350.00
	Hauling Trucks	4	5	36,000.00
	Elevators	3	5	4,200.00
	Pick-up Truck	½	3	1,300.00
Total				204,650.00
7	Swathers	5	3	34,100.00
	Rakes	5	10	1,600.00
	Tractors	5	10	2,500.00
	Cubers	5	5	172,500.00
	Water Trucks	2	10	2,750.00
	Pick-up Truck	½	3	1,300.00
Total				214,750.00

TABLE 3--Continued

Operation Number	Item	Number of Items	Expected Life (Years)	Investments in Dollars
6	Swathers	2	3	$15,000.00
	Cubers	2	5	70,000.00
	Water Truck	1	3	5,000.00
	Hauling Trucks	2	3	11,050.00
	Elevators	1	4	3,000.00
	Pick-up Truck	½	3	1,300.00
Total				105,350.00
5	Swather	1	5	5,000.00
	Cuber	1	5	34,000.00
	Water Truck	1	10	1,500.00
	Hauling Truck	1	10	1,500.00
	Elevator	1	10	1,000.00
	Pick-up Truck	½	3	1,300.00
Total				44,300.00
4	Swather	1	3	7,000.00
	Rake	1	5	750.00
	Tractor	1	10	500.00
	Cuber	1	5	34,000.00
	Water Truck	1	2	6,000.00
	Hauling Truck	1	4	12,000.00
	Elevator	1	5	2,500.00
	Pick-up Truck	½	3	1,300.00
Total				64,050.00
3	Swathers	2	3	11,000.00
	Cubers	3	5	105,000.00
	Water Truck	1	10	1,500.00
	Pick-up Truck	½	3	1,300.00
Total				118,800.00
2	Swathers	4	3	24,000.00
	Cubers	5	5	160,000.00
	Water Trucks	2	5	4,000.00
	Hauling Trucks	3	5	21,500.00
	Pick-up Truck	½	3	1,300.00
Total				210,800.00

TABLE 3--Continued

Operation Number	Item	Number of Items	Expected Life (Years)	Investments in Dollars
1	Swathers	4	3	$32,000.00
	Rakes	4	5	3,200.00
	Tractors	4	10	2,000.00
	Cubers	4	5	120,000.00
	Water Truck	1	5	1,000.00
	Hauling Trucks	2	10	22,000.00
	Pick-up Truck	½	3	1,300.00
Total				181,500.00

[a] Annual percentage of tractor time devoted to alfalfa harvesting for all operations was assumed to be 50%.

[b] Annual percentage of pick-up truck time devoted to alfalfa operation was assumed to be 50% for all firms in the study.

TABLE 4. Costs and Returns for Alfalfa Cubing Operation Number 10, Arizona, 1968 12,500 Tons Harvested

Item	Dollars Annually	Dollars per Ton
Returns:		
Price of cubed hay		$30.00
Total returns	$375,000.00	$30.00
Variable Costs:		
Labor costs	$16,250.00	1.30
Swathing		
Fuel	1,260.00	.10
Repairs	3,000.00	.24
Rakes		
Repairs	900.00	.07
Tractors		
Fuel	882.00	.07
Repairs	240.00	.02
Cubers		
Fuel	4,992.00	.40
Repairs	14,000.00	1.12
Water truck		
Fuel	120.00	.01
Repairs	125.00	.01
Hauling trucks		
Fuel	552.00	.04
Repairs	900.00	.07
Elevator		
Repairs	380.00	.03
Pick-up truck		
Fuel	200.00	.02
Repairs	40.00	.00
Uncut alfalfa	225,000.00	18.00
Total Variable Cost	268,841.00	21.50
Fixed Costs:		
Swather		
Depreciation	4,387.50	.35
Interest	1,218.75	.10
Insurance	189.60	.02
Taxes	173.73	.01
Rakes		
Depreciation	351.00	.03
Interest	146.25	.01
Insurance	30.84	.00
Taxes	13.89	.00

TABLE 4--Continued

Item	Dollars Annually		Dollars per Ton	
Tractors				
Depreciation	$ 120.00		$ .01	
Interest	82.50		.01	
Insurance	4.98		.00	
Taxes	17.25		.00	
Cubers				
Depreciation	23,760.00		1.90	
Interest	7,920.00		.63	
Insurance	1,436.16		.11	
Taxes	1,976.12		.16	
Water truck				
Depreciation	118.50		.01	
Interest	82.50		.01	
Insurance	41.00		.00	
Taxes	11.73		.00	
Hauling trucks				
Depreciation	1,194.67		.10	
Interest	426.67		.03	
Insurance	318.00		.03	
Taxes	35.48		.00	
Elevator				
Depreciation	160.20		.01	
Interest	97.85		.01	
Insurance	5.00		.00	
Taxes	20.81		.00	
Pick-up truck				
Depreciation	300.00		.02	
Interest	76.00		.01	
Insurance	27.50		.00	
Taxes	12.70		.00	
Total Fixed Cost	$44,757.18		$ 3.57	
Total Cost		$313,598.18		$25.07
Net Returns		61,401.82		4.93

number 10 was charged $18.00 per ton for uncut alfalfa standing in the field. This represented a variable cost to the enterprise.

Labor costs for operation number 10 were $1.30 per ton. Fuel costs were $0.64 per ton and repairs represented a per ton cost of $1.56. Cuber repairs accounted for $1.12 of the $1.56 repair cost. This seemingly high repair cost for the cubing machines is due mostly to the press wheels and cube dies through which the alfalfa is extruded. These replacement parts are quite costly and must be in good condition for peak performance of the machines.

The fuel costs, repair costs, labor costs, and uncut alfalfa costs combined to make a total variable cost per ton of $21.50 for operation number 10.

Depreciation, interest, insurance, and taxes respectively amounted to $2.42, $0.81, $0.16, and $0.17 for the enterprise. They combined to make a total fixed cost of $3.57.

Operation number 10 received an average price per ton of $30.00 for cubed hay in 1968. Including the price of uncut alfalfa, the total operating cost was $25.07. This left a net profit over all costs of $4.93 per ton for the 12,500 tons harvested by the four cubers in 1968.

The other nine cubing operations considered in the study are summarized in Tables B-10 through B-18. Their profit positions are as follows:

Operation	Net Profit Per Ton
1	$4.22
2	0.07
3	-1.02
4	6.48
5	2.67
6	8.74
7	3.13
8	8.39
9	4.23

The range of the cubing profits is from $-1.02 to $8.69 per ton. The weighted average profit level is $4.20.

As in the case of the baling operations, the profit situation for the cubers may be altered if we assume that all cubing is done for the modal custom cubing rate of $12.00 per ton. This rate includes swathing, raking, cubing, and hauling within a five-mile radius. For operation number 10, $18.00 per ton for uncut alfalfa standing in the field would be subtracted from the total cost of $25.07. This would leave a total cost per ton of $7.07 for all services. With a total custom charge of $12.00 per ton, net profit would be $4.93. This is an odd coincidence, for profit computed in the first manner was also $4.93 per ton.

Profit rates for the other nine enterprises may be altered if computed in the manner indicated above. Their profit positions become the following:

Operation	Net Profit Per Ton
1	$6.18
2	5.02
3	1.98
4	4.48
5	6.17
6	5.19
7	6.13
8	6.39
9	5.73

For these computations the profit range is from $1.98 to $6.39 per ton. The weighted average profit is $5.52 per ton.

Significance Tests

Examination of the profit figures for the baling and cubing enterprises seems to indicate that the average cubing firm enjoyed a more favorable profit position. To substantiate the apparent difference, statistical tests of significance were employed.

Baling profits were compared to cubing profits using both the contractual and custom harvesting methods of profit computation. With the contractual method, average baling profit was $-0.98. The corresponding cubing profit was $4.20. When the custom method was utilized, average baling profit was $3.18. The similar cubing profit was $5.52.

A Student's t test was employed to test for significant differences between the means of the samples. Results indicated that mean differences in profit for both methods of profit computation were statistically highly significant.

Cubing profits were significantly higher than profits for baling in both instances.

A similar comparison was then completed to test for significant differences between costs per ton of the baling and cubing enterprises. The cubing costs per ton ranged from $5.61 to $10.01 and had a mean value of $6.79. The range of the baling costs per ton was $3.94 to $8.74. Average baling cost was $5.92. A Student's t test showed no significant difference between baling and cubing costs per ton at the .05 level of confidence.

We must therefore conclude that the higher profit levels achieved by the cubing operations could not be attributed to cost advantages. The greater profits associated with the cubing operations were due to higher selling prices for the cubes and higher custom rates for cubing.

CHAPTER 4

SYNTHETIC BUDGETS

Model cubing and baling enterprises were constructed and are presented in Tables 6 through 9. These synthetic budgets represent an attempt to compare operations with similar output capabilities, machinery combinations, and equal managerial aptitude. Each of the models also performs the same harvesting operations.

The two-baler operation indicated in Table 6 was assumed to have an annual output of 5,500 tons of alfalfa hay. It was further assumed that the operation paid $18.00 per ton for alfalfa standing in the field, swathed the hay, raked it, baled it, and delivered the bales via bale accumulator within a five-mile radius of the field.

An additional assumption was that the price received was the weighted average of prices received by all the baling operations in the study. Such price was $22.34 per ton for baled alfalfa hay.

The equipment inventory for the model is indicated in Table 5. It consisted of 1 swather, 2 rakes, 2 tractors, 2 balers, 1 bale accumulator, and 1 pick-up truck. This equipment combined had a purchase value of $57,800.

TABLE 5. Investments and Expected Lives for Alfalfa Harvesting Equipment on Model Cubing and Baling Enterprises in Arizona, 1968

Operation Number	Item	Number of Items	Expected Life (Years)	Investments in Dollars
2-Baler	Swather	1	5	$ 7,000.00
	Rakes	2	10	1,500.00
	Tractor[a]	2	10	6,000.00
	Balers	2	6	22,000.00
	Bale Accumulator	1	8	20,000.00
	Pick-up Truck[b]	½	3	1,300.00
Total				57,800.00
4-Baler	Swathers	4	5	28,000.00
	Rakes	8	10	6,000.00
	Tractors	8	10	24,000.00
	Balers	8	6	88,000.00
	Bale Accumulators	3	8	60,000.00
	Pick-up Truck	½	3	1,300.00
Total				207,300.00
1-Cuber	Swather	1	5	7,000.00
	Rake	1	10	750.00
	Tractor	1	10	3,000.00
	Cuber	1	4	34,000.00
	Water Truck	1	10	4,000.00
	Hauling Truck	1	8	6,000.00
	Elevator	1	10	750.00
	Pick-up Truck	½	3	1,300.00
Total				56,800.00
4-Cuber	Swathers	3	5	21,000.00
	Rakes	2	10	1,500.00
	Tractors	2	10	6,000.00
	Cubers	4	4	136,000.00
	Water Truck	1	10	4,000.00
	Hauling Trucks	3	8	18,000.00
	Elevator	1	10	750.00
	Pick-up Truck	½	3	1,300.00
Total				188,550.00

[a] Annual percentage of tractor time devoted to alfalfa harvesting for all operations was assumed to be 50%.

[b] Annual percentage of pick-up truck time devoted to alfalfa operations was assumed to be 50% for all firms in the study.

TABLE 6. Costs and Returns for Model Alfalfa Baling Operation, (2 Balers), Arizona, 1968
5,500 Tons Harvested

Item	Dollars Annually	Dollars per Ton
Returns:		
Price of baled hay		$22.34
Total Returns	$122,870.00	$22.34
Variable Costs:		
Labor Costs	$ 7,185.00	1.31
Swathing		
Fuel	304.00	.06
Repairs	1,000.00	.18
Rakes		
Repairs	488.00	.09
Tractors		
Fuel	701.40	.13
Repairs	120.00	.02
Bale Accumulator		
Fuel	392.00	.07
Repairs	1,100.00	.20
Baler		
Fuel	250.00	.05
Repairs	2,000.00	.36
Pick-up truck		
Fuel	200.00	.04
Repairs	40.00	.01
Uncut Alfalfa	99,000.00	18.00
Total Variable Cost	112,780.40	20.52
Fixed Costs:		
Swather		
Depreciation	868.00	.16
Interest	420.00	.08
Insurance	105.28	.02
Taxes	62.39	.01
Rakes		
Depreciation	120.00	.02
Interest	67.50	.01
Insurance	19.20	.00
Taxes	17.24	.00
Tractors		
Depreciation	198.00	.04
Interest	135.00	.02
Insurance	42.18	.01
Taxes	28.46	.01

TABLE 6--Continued

Item	Dollars Annually	Dollars per Ton
Baler		
Depreciation	$ 2,566.66	$ .47
Interest	1,283.34	.23
Insurance	311.66	.06
Taxes	221.38	.04
Bale Accumulator		
Depreciation	1,000.00	.18
Interest	562.50	.10
Insurance	130.00	.02
Taxes	115.00	.02
Pick-up truck		
Depreciation	300.00	.05
Interest	76.00	.01
Insurance	27.50	.00
Taxes	12.70	.00
Total Fixed Costs	$ 8,689.99	$ 1.56
Total Cost	$121,470.39	$22.09
Net Returns	1,399.61	.25

TABLE 7. Costs and Returns for Model Alfalfa Baling Operation, (8 Balers), Arizona, 1968
22,000 Tons Harvested

Item	Dollars Annually	Dollars per Ton
Returns:		
Price of baled hay		$22.34
Total Returns	$491,480.00	$22.34
Variable Costs:		
Labor Cost	$27,900.00	1.27
Swathing		
Fuel	1,216.00	.06
Repairs	4,000.00	.18
Rakes		
Repairs	1,952.00	.09
Tractors		
Fuel	2,805.60	.13
Repairs	480.00	.02
Baler		
Fuel	1,000.00	.05
Repairs	8,000.00	.36
Bale Accumulator		
Fuel	1,176.00	.05
Repairs	3,300.00	.15
Pick-up truck		
Fuel	200.00	.01
Repairs	40.00	.00
Uncut Alfalfa	396,000.00	18.00
Total Variable Cost	448,069.60	20.37
Fixed Costs:		
Swather		
Depreciation	3,472.00	.16
Interest	1,680.00	.08
Insurance	421.12	.02
Taxes	249.56	.01
Rakes		
Depreciation	480.00	.02
Interest	270.00	.01
Insurance	76.80	.00
Taxes	68.96	.00
Tractors		
Depreciation	792.00	.04
Interest	540.00	.02
Insurance	168.72	.01
Taxes	113.84	.01

TABLE 7--Continued

Item	Dollars Annually		Dollars per Ton	
Baler				
Depreciation	$10,266.64		$ .47	
Interest	5,133.36		.23	
Insurance	1,246.64		.06	
Taxes	885.52		.04	
Bale Accumulator				
Depreciation	3,000.00		.14	
Interest	1,687.50		.08	
Insurance	390.00		.02	
Taxes	345.00		.02	
Pick-up truck				
Depreciation	300.00		.01	
Interest	76.00		.00	
Insurance	27.50		.00	
Taxes	12.70		.00	
Total Fixed Costs	$31,703.86		$ 1.45	
Total Cost		$479,773.46		$21.81
Net Returns		11,706.54		.53

TABLE 8. Costs and Returns for Model Alfalfa Cubing Operation, (1 Cuber), Arizona, 1968 5,500 Tons Harvested

Item	Dollars Annually	Dollars per Ton
Returns:		
Price of cubed hay		$28.70
Total returns	$157,850.00	$28.70
Variable Costs:		
Labor costs	$ 4,329.00	.79
Swathing		
Fuel	304.00	.06
Repairs	1,000.00	.18
Rakes		
Repairs	244.00	.04
Tractors		
Fuel	76.00	.01
Repairs	120.00	.02
Cubers		
Fuel	1,120.00	.20
Repairs	8,500.00	1.55
Water truck		
Fuel	99.00	.02
Repairs	112.00	.02
Hauling trucks		
Fuel	300.00	.05
Repairs	625.00	.11
Elevator		
Repairs	160.00	.03
Pick-up truck		
Fuel	200.00	.04
Repairs	40.00	.01
Uncut Alfalfa	99,000.00	18.00
Total Variable Cost	116,229.00	21.13
Fixed Costs:		
Swather		
Depreciation	868.00	.16
Interest	420.00	.08
Insurance	105.28	.02
Taxes	62.39	.01
Rakes		
Depreciation	60.00	.01
Interest	33.75	.01
Insurance	9.60	.00
Taxes	8.62	.00

TABLE 8--Continued

Item	Dollars Annually		Dollars per Ton	
Tractors				
Depreciation	$ 198.00		$ .04	
Interest	135.00		.02	
Insurance	42.18		.01	
Taxes	28.46		.01	
Cubers				
Depreciation	7,650.00		1.39	
Interest	2,125.00		.39	
Insurance	450.50		.08	
Taxes	439.88		.08	
Water truck				
Depreciation	320.00		.06	
Interest	180.00		.03	
Insurance	106.00		.02	
Taxes	46.00		.01	
Hauling trucks				
Depreciation	600.00		.11	
Interest	337.50		.06	
Insurance	106.00		.02	
Taxes	69.00		.01	
Elevator				
Depreciation	67.50		.01	
Interest	41.25		.01	
Insurance	6.08		.00	
Taxes	9.70		.00	
Pick-up trucks				
Depreciation	300.00		.05	
Interest	76.00		.01	
Insurance	27.50		.00	
Taxes	12.70		.00	
Total Fixed Cost	$14,941.89		$ 2.71	
Total Cost		$131,170.89		$23.85
Net Returns		26,679.11		4.85

TABLE 9. Costs and Returns for Model Alfalfa Cubing Operation, (4 Cubers), Arizona, 1968
22,000 Tons Harvested

Item	Dollars Annually	Dollars per Ton
Returns:		
Price of cubed hay		$28.70
Total returns	$631,400.00	$28.70
Variable Costs:		
Labor costs	$13,169.00	.60
Swathing		
Fuel	912.00	.04
Repairs	3,000.00	.14
Rakes		
Repairs	488.00	.02
Tractors		
Fuel	152.00	.01
Repairs	240.00	.01
Cubers		
Fuel	4,480.00	.20
Repairs	34,000.00	1.55
Water truck		
Fuel	99.00	.00
Repairs	112.00	.01
Hauling trucks		
Fuel	900.00	.04
Repairs	1,875.00	.09
Elevator		
Repairs	160.00	.01
Pick-up truck		
Fuel	200.00	.01
Repairs	40.00	.00
Uncut Alfalfa	396,000.00	18.00
Total Variable Cost	455,827.00	20.73
Fixed Costs:		
Swather		
Depreciation	2,604.00	.12
Interest	1,260.00	.06
Insurance	315.84	.01
Taxes	187.17	.01
Rakes		
Depreciation	120.00	.01
Interest	67.50	.00
Insurance	19.20	.00
Taxes	17.24	.00

TABLE 9--Continued

Item	Dollars Annually		Dollars per Ton	
Tractors				
Depreciation	$ 396.00		$ .02	
Interest	270.00		.01	
Insurance	84.36		.00	
Taxes	56.92		.00	
Cubers				
Depreciation	30,600.00		1.39	
Interest	8,500.00		.39	
Insurance	1,802.00		.08	
Taxes	1,759.52		.08	
Water truck				
Depreciation	320.00		.01	
Interest	180.00		.01	
Insurance	106.00		.00	
Taxes	46.00		.00	
Hauling trucks				
Depreciation	1,800.00		.08	
Interest	1,012.50		.05	
Insurance	318.00		.01	
Taxes	207.00		.01	
Elevator				
Depreciation	67.50		.00	
Interest	41.25		.00	
Insurance	6.08		.00	
Taxes	9.70		.00	
Pick-up truck				
Depreciation	300.00		.01	
Interest	76.00		.00	
Insurance	27.50		.00	
Taxes	12.70		.00	
Total Fixed Cost	$52,589.98		$ 2.36	
Total Cost		$508,416.98		$23.11[a]
Net Returns		122,983.02		5.59

[a] Total cost per ton may be slightly different when total cost is divided by total output than it is when total fixed cost per ton and total variable cost per ton are added. The difference is not significant and is due to rounding error of individual per ton cost items.

Variable and fixed costs per ton of $20.52 and $1.56, respectively, combined to make a total cost per ton of $22.09 for the model. This figure subtracted from the selling price of $22.34 left a net profit of $0.25 for the operation.

If the enterprise did only custom harvesting, total cost would be reduced to $4.09 by deleting the $18.00 per ton for uncut alfalfa. The total return per ton would then be the modal custom charge of $8.50 per ton. This would leave a net profit of $4.41 instead of $0.25 per ton.

A very slight per ton cost savings was realized on an 8-baler firm harvesting 22,000 tons, over the 2-baler operation which harvested only 5,500 tons. Assuming, as in Table 7 that the enterprise bought uncut hay and sold the bales, net profit was $0.53 as opposed to $0.25 for the 2-baler enterprise. If the 8-baler operation did only custom work for $8.50 per ton, its per ton profit would have been $4.69. Profit computed in like manner for the 2-baler operation was $4.41.

The only discernable return to the increased scale of operation was attributed to the bale accumulator and pick-up truck. It was derived that a one bale accumulator could handle more than 5,500 tons of hay per year on one operation. Therefore, only 3-bale accumulators were required to service a 22,000 ton operation instead of 4. This resulted in a

saving of costs attributed to the required equipment. Similar small savings were realized on the one pick-up truck required for both operations.

Two model cubing enterprises are presented in Tables 8 and 9. The 1-cuber operation in Table 8 is assumed to have an annual output of 5,500 tons of cubed hay and the output for the 4-cuber firm is 22,000 tons. Equipment inventories for the two operations are indicated in Table 5. The inventory investments total $56,800 and $188,500, respectively.

First assume that the cubing operations buy uncut alfalfa standing in the field, harvest the hay, and sell it in the form of cubes delivered within a five-mile radius of the field. Total cost would be $23.85 for the 1-cuber operation and $23.11 for the 4-cuber firm. If the hay is then sold for the weighted average cube price of $28.70 for all cubing firms in the study, the net profits may be derived. For the 1-cuber firm, net profits of $4.85 are realized. The 4-cuber firm's profit would be $5.59.

The alternative procedure of harvesting only on a custom basis yields different profit levels. If neither operation buys or sells hay and both do all custom work for $12.00 per ton, net profit for the 1-cuber firm would be $6.15. Net profit for the other firm would amount to $6.89 per ton.

The profit difference between the two firms would be $0.74 per ton by either procedure. Profit differential of

$0.74 between the two cubing firms may be compared with a corresponding difference of $0.28 for the two baling enterprises. This discrepancy results from greater equipment capacities in the cubing firms. For example, one water truck, one elevator, and one pick-up truck are required for a cubing enterprise with an annual output capability of 22,000 tons. Yet the same items of equipment are required for a cubing firm with an output capability of only 5,500 tons. Therefore, the larger operation may assign its costs for such machinery to a larger number of tons, thereby reducing costs per ton.

Comparison of Firms

Comparisons of profit positions of all four firms are now possible. The first situation is that of all firms buying uncut alfalfa in the field, harvesting it, and selling the hay within a five-mile radius of the harvest site. In such case, the total cost of the 5,500 ton baling enterprise is $22.09 per ton as compared to $23.11 per ton for the similar cubing firm. Net profits for the baling and cubing operations are $0.25 and $4.85, respectively. The difference is $4.60 in favor of the cubers.

Profits computed in like manner for the 22,000 ton operations show similar differences. Total cost for the 22,000 ton baling enterprise is $21.81. For the cubing firm with like capacity total cost is $23.11. Their respective

net profits are $0.53 and $5.59 with the difference being a $5.06 per ton profit advantage for the cubing operation.

If the alternative method of profit computation is utilized, profit positions are changed. Custom baling charges are $8.50 and custom cubing charges are $12.00 per ton.

With this method, the 5,500 ton capacity baling operation has a total cost of $4.09 per ton and a net profit per ton of $4.41. The cubing enterprise has a total cost of $5.85 and a net profit of $6.15 per ton. The difference in this instance is $1.74 as compared to $4.60 when profit was computed by the first method.

Utilizing the custom charge method, total cost for the 22,000 ton baling operation is $3.81 and net profit is $4.69 per ton. Total cost for the cubing enterprise of equal capacity is $5.11 per ton and net profit is $6.89 per ton. The difference in profit using this method is $2.20 per ton in favor of the cubers as opposed to $5.06 per ton using the first method of comparison.

It should be reemphasized here that hay prices drastically affect the profit rates of the enterprises considered. Furthermore the prices received by many firms in the study were below average in 1968. This situation was due partially to heavy DDT contamination of the hay. However, the results for the time period considered may be deemed valid for comparison.

The preceding figures are summarized in Table 10. Along with costs, returns, and net profits for the four model enterprises are presented the relative profit ratios. These ratios represent net profits divided by total cost and expressed as a percentage.

Table 10 starkly represents the affect on profit potential created by different methods of harvesting operation. The contractual harvesting technique may encompass either of two situations. The first might be a situation where an entrepreneur with harvesting equipment would buy uncut alfalfa standing in the field, harvest it, and sell it. Another instance might be an entrepreneur who would raise his own alfalfa, harvest it and sell it. In either instance, the $18.00 per ton charged for alfalfa standing in the field represents a variable cost to the harvestor. It does so whether the $18.00 per ton is the production cost of the alfalfa or the price the operator must pay to acquire the crop.

The custom rate is very simple. The operator simply harvests the hay and receives a set payment for the services.

In our models it is obvious that the return for both baling and cubing is much greater for the custom operations at the prices which prevailed in the study period. Profit ratios for the contractual harvestors ranged from 1.13% to 24.19% while custom harvestors received a return of from 105.13% to 134.83%.

TABLE 10. Total Costs, Total Returns, Net Profits, and Net Profits as a Percentage of Total Cost for 4 Model Hay Operations in Arizona, 1968

Operation	Total Cost per Ton	Total Return per Ton	Net Profit per Ton	Ratio of Net Profits to Total Cost per Ton
		Contractual Harvesting[a]		
2-Baler	$22.09	$22.34	$ .25	1.13%
8-Baler	21.81	22.34	.53	2.43%
1-Cuber	23.85	28.70	4.85	20.34%
4-Cuber	23.11	28.70	5.59	24.19%
		Custom Harvesting[b]		
2-Baler	4.09	8.50	4.41	107.82%
8-Baler	3.81	8.50	4.69	123.10%
1-Cuber	5.85	12.00	6.15	105.13%
4-Cuber	5.11	12.00	6.89	134.83%

[a] Contractual harvesting refers to the practice of buying alfalfa standing in the field, performing the harvesting operation, and then selling the hay either in the form of bales or cubes.

[b] Custom harvesting refers to the practice of performing harvesting operations, either cubing or baling, of alfalfa hay for a designated price per ton.

CHAPTER 5

COMPARISON OF ARIZONA, CALIFORNIA, AND NEW MEXICO HARVESTING OPERATIONS

Hay cubers are used in the dry climates of California and New Mexico as well as in Arizona. With cost budgets now available for both baling and cubing operations in the three states, comparison is possible.

Cost information for Arizona firms was taken from primary research already presented in this study. Model California hay harvesting operations were derived from a publication by the University of California Agricultural Extension Service entitled "Hay Cubing and Baling Costs." An unpublished master's thesis by John D. Canady of New Mexico State University entitled A Market Performance Analysis of the New Mexico Alfalfa Hay Market in 1968 provided information on New Mexico hay harvesting operations (1969).

Direct cost comparisons of enterprises in the three states are rather difficult. The difficulty is the result of several institutional dissimilarities among the states. Among the differences are geography, soil, climate, farm size, and time. Climate could affect depreciation and repair or even amount and kinds of equipment utilized. The New Mexico and Arizona studies involved 1968 prices whereas

the California report utilized the 1966 prices. Time could have altered prices. Geographical and political variables might produce different costs such as tax rate structures. Any of these variables might be different from region to region.

Regardless of limitations, comparisons may still be valuable for the purpose of reflecting what actually is done in different regions and the relative costs thereof. Therefore our analysis may be valid for the stated purposes.

Model operations for California and New Mexico are presented in Table 11 along with the average baling and cubing firms in the New Mexico study. The table presents fixed costs per ton, variable costs per ton, and total costs per ton at varying levels of annual output for both baling and cubing enterprises.

Models for both baling and cubing enterprises in the three states indicate a definite trend. Total costs for baling and cubing are highest in California and lowest in New Mexico. Arizona costs fall between those of the other two states. These comparisons are illustrated in Figure 2. Baling costs are lower than cubing costs with one exception. For output levels of approximately 4,300 tons per year to 7,000 tons per year, New Mexico cubing costs are less than California baling costs.

Demand for alfalfa hay cubes and the higher net returns per ton of cubed hay lead the economist to forecast

TABLE 11. Fixed Costs per Ton, Variable Costs per Ton, and Total Costs per Ton for Varying Volumes of Alfalfa Harvested on Cubing and Baling Operations in California, Arizona, and New Mexico

Tons	Fixed Costs per Ton		Variable Costs per Ton		Total Costs per Ton	
	Cubes	Bales	Cubes	Bales	Cubes	Bales
			Model California Operations[a]			
1000	$12.35	$6.38	$4.20	$3.20	$16.55	$9.58
2000	6.19	3.19	4.20	3.20	10.39	6.39
3000	4.12	2.13	4.20	3.20	8.32	5.33
4000	3.09	1.60	4.20	3.20	7.29	4.80
5000	2.47	1.28	4.20	3.20	6.67	4.48
6000	2.06	1.06	4.20	3.20	6.26	4.26
7000	1.76	0.91	4.20	3.20	5.96	4.11
			Model Arizona Operations[b]			
1000	13.89	7.65	2.94	1.77	16.83	9.42
2000	6.94	3.82	2.94	1.77	9.88	5.59
3000	4.63	2.55	2.94	1.77	7.57	4.32
4000	3.47	1.91	2.94	1.77	6.41	3.68
5000	2.78	1.53	2.94	1.77	5.72	3.30
6000	2.31	1.27	2.94	1.77	5.25	3.04
7000	1.98	1.09	2.94	1.77	4.92	2.86
			Average New Mexico Operations[c]			
1000	10.61	1.89	2.26	2.16	12.87	4.05
2000	5.30	0.94	2.26	2.16	7.56	3.10
3000	3.53	0.63	2.26	2.16	5.79	2.79
4000	2.65	0.47	2.26	2.16	4.91	2.63
5000	2.12	0.38	2.26	2.16	4.38	2.54
6000	1.77	0.32	2.26	2.16	4.03	2.48
7000	1.51	0.27	2.26	2.16	3.77	2.43

TABLE 10--Continued

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[a] Cost figures are from "Hay Cubing and Baling Costs," by Philip S. Parsons et. al., University of California Agricultural Extension Service. Cubing operations are swathing, cubing, and hauling. Baling operations are swathing, baling, and roadsiding.

[b] Cubing operations are swathing, cubing, and hauling. Baling operations are swathing, baling and roadsiding.

[c] Cost figures are from an unpublished master's thesis by John D. Canady of New Mexico State University. Cubing operations are swathing, cubing, and hauling. Baling operations are swathing, baling, and roadsiding.

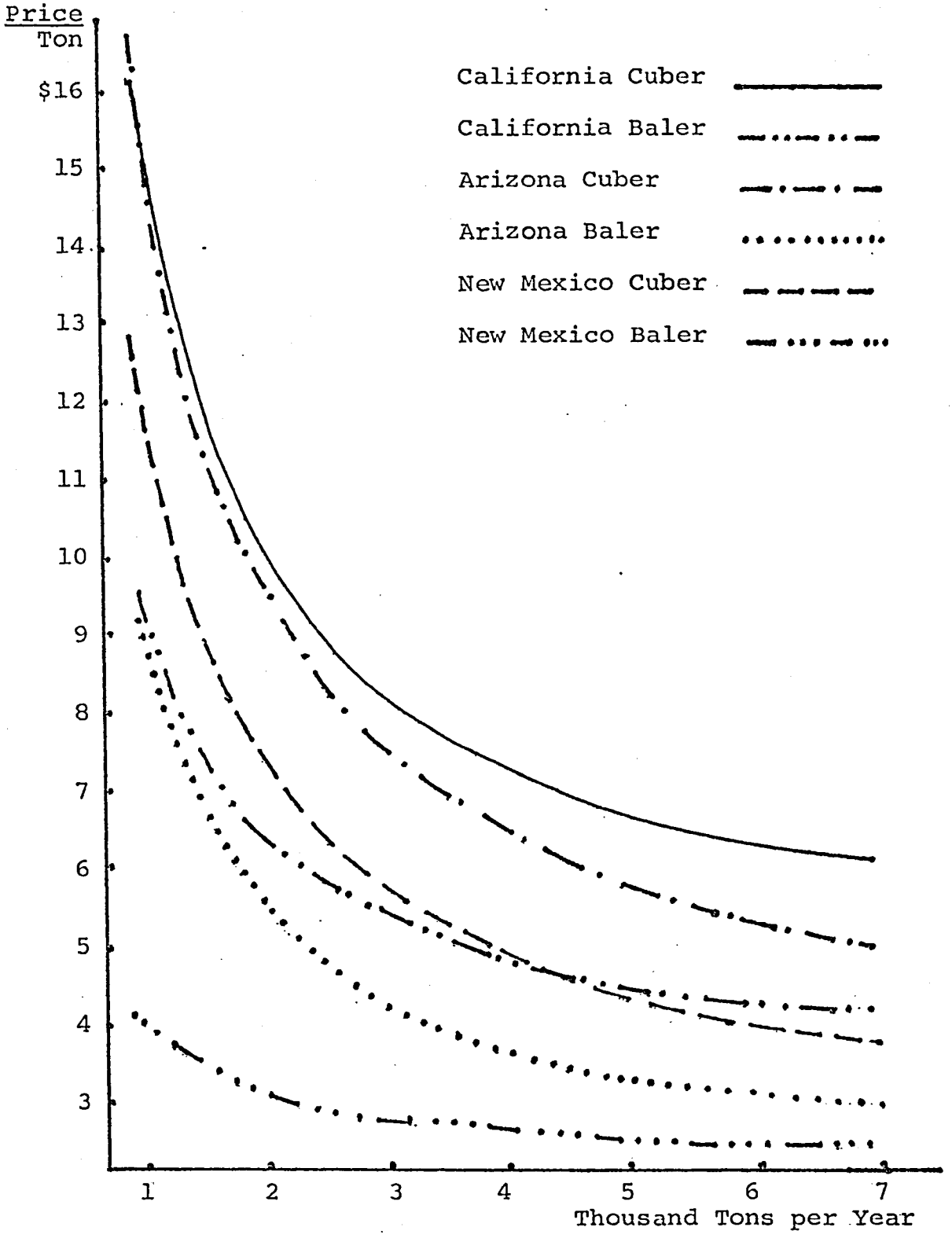

Figure 2. Arizona, New Mexico, and California model operations

that more hay harvesting firms will adopt hay cubing machines in the future. The rate of adoption of the cubing machines will be affected by the profitability of the machines relative to the returns to management and capital used in alternative enterprises. As more hay harvesters adopt the cubing machines and demand for hay cubes is more nearly satisfied, the rate of adoption may decrease.

CHAPTER 6

SUMMARY AND CONCLUSIONS

Information used in this study was obtained during the summer of 1968. The primary data was collected by means of personal interviews with managers of baling and cubing enterprises in Arizona. Thirty-seven cubing machines were found to be in operation in the state. Information was obtained on 30 of these 37 machines. Seven cubers were located in Yuma County but were not considered in the study. The 30 machines were located on 10 separate operations. Information was obtained from 10 operators of 15 baling machines. The baling operations were selected for their near proximity to the cubing enterprises. The study involved the counties of Pinal and Maricopa as well as a small portion of Pima County.

Budgets were constructed to represent each of the firms involved in the study. Primary data from the personal interviews was used in conjunction with secondary data for development of the budgets. The budgets represented costs and returns for the 1968 hay season.

The budgets for individual operations were constructed for the purpose of comparison of costs and returns associated

with cubing versus baling of alfalfa hay in Arizona. Actual operations were compared by this method.

Synthetic budgets were then prepared for two purposes. The first purpose was to standardize equipment inventories, output levels, and managerial aptitude among operations for comparison of baling and cubing operations of similar output capability. The second purpose was for comparison of Arizona operations with model firms in California and New Mexico.

Utilization of Cubers

Hay cubers were found to be employed in Yuma, Pinal, and Maricopa Counties. The 30 cubers considered in the study were located in Pinal and Maricopa Counties. These machines had a combined annual output of 127,108 tons, which was approximately 11.6% of the total alfalfa tonnage in the state.

Individual Baling and Cubing Operations

Budgets were constructed representing each baling operation considered in the study. There were 10 such budgets.

Profit was computed to reflect two different operational procedures. The first was the contractual method in which the manager purchases alfalfa standing in the field, performs all harvesting operations, and sells the hay. The second or custom operation occurs when the manager simply performs the harvesting tasks for a predetermined fee per ton.

Baling costs per ton ranged from $3.94 to $8.74 and had a mean value of $5.92. The contractual method of profit computation yielded a weighted average net profit of $-0.98 per ton for the 10 baling enterprises. Profits ranged from $2.05 to $-4.05 per ton.

Profits computed by the custom method ranged from $4.79 to $-0.19 per ton. The weighted average net profit computed in this manner was $3.18 per ton.

Budgets were constructed for 10 cubing enterprises considered in the study. Profits were computed for these enterprises in the same manner as were the baling profits. Cubing costs per ton ranged from $5.61 to $10.01 and had a mean value of $6.79. With the contractual method of profit determination, net profits per ton ranged from $8.74 to $-1.02. The weighted average net profit was $4.20 per ton.

Profits computed for the cubing operations by the custom method ranged from $6.39 to $1.98 per ton. The weighted average net profit computed in this manner was $5.52.

Statistical tests showed no significant difference, (at the .05 level of confidence), between average baling and cubing costs per ton obtained from budgets for actual individual enterprises. However, cubing profits proved to be significantly higher than profits for baling in both contractual and custom profit computations.

Synthetic Budgets

Synthetic budgets were constructed for 1-cuber, 4-cuber, 2-baler, and 8-baler operations. These model enterprises represent an attempt to compare operations with similar output capabilities, machinery combinations, managerial aptitude, and harvesting functions. Two-baler and 1-cuber firms were assumed to have an annual output capability of 5,500 tons. Annual outputs for the 4-cuber and 8-baler firms were assumed to be 22,000 tons.

When the contractual method of profit computation was utilized, the total cost of the 5,500 ton baling enterprise was $22.09 per ton as compared to $23.11 per ton for the similar cubing firm. Net profits for the baling and cubing operations were $0.25 and $4.85, respectively. The differences were noted for the 22,000 ton operations. Total cost for the baling and cubing enterprises respectively were $21.81 and $23.11 per ton. Profits were $0.53 and $5.59 with the difference being a $5.06 per ton profit advantage for the cubing operation.

Profit positions are altered by using the custom method of profit computation. With this method, the 5,500 ton capacity baling operation had a total cost of $4.09 per ton and a net profit per ton of $4.41. The cubing enterprise of like capacity had a total cost of $5.85 per ton and a net profit of $6.15. The difference in profit using this method was $1.74 per ton in favor of the cubers as opposed

to $4.60 per ton using the first method of comparison. The 22,000 ton baling operation had a total cost of $3.81 and a net profit of $4.69 per ton. Total cost for the cubing enterprise of equal capacity was $5.11 per ton and net profit was $6.89. The difference in this instance was $2.20 per ton in favor of the cubers as opposed to $5.06 per ton when profit was computed by the first method.

Though total costs were consistently lower per ton for the baling enterprises, net profits were consistently higher for the cubing firms. This situation resulted from the price differential between bales and cubes. Cubes sold for an average of $6.36 per ton more than the bales. On the average, custom cubing charges were $3.50 more than custom baling charges. Therefore, the higher costs associated with cubing were more than compensated for by the bonus prices received for cubes.

Arizona, California, and New Mexico Comparisons

Difficulties are associated with comparison of firms located in different regions and different time periods. However, comparison of hay harvesting firms in the three states may be useful. The figures are at least rough indicators of hay harvesting operations in the three states.

Model Arizona baling and cubing operations were compared with similar model operations in California and New

Mexico. Harvesting functions performed by the baling enterprises were swathing, baling, and roadsiding. Similar cubing functions were swathing, cubing, and hauling.

Total costs for baling and cubing were highest in California and lowest in New Mexico. Arizona costs fell between those of the other two states. Baling costs were lower than cubing costs with one exception. For output levels of approximately 4,300 tons to 7,000 tons per year, New Mexico cubing costs were less than California baling costs.

No attempt was made to compare returns and profit levels for baling and cubing among the three states.

Conclusions

Valid interpretation of the data herein presented may be masked to a certain degree by the hay price situation prevailing in 1968. Much of the alfalfa hay that year was heavily contaminated by DDT. As a result, hay prices were significantly lower than usual. However, the unusual price situation should only have affected the profit positions of the firms and should have had very slight, if any, bearing on their cost structures. Furthermore, the price differential between cubes and bales should have been approximately the same during 1968 as during a more normal production year.

Results indicated that firms utilizing John Deere 400 cubing machines enjoyed a substantially more favorable profit position than firms using the more conventional hay balers.

The more favorable profit position was not found to result from any cost savings associated with the cubers.

Average costs per ton of harvesting hay cubes were instead found to be higher than per ton costs of the baling enterprises. Such differences in costs per ton were not found to be statistically significant for the actual operations studied. When synthesized model operations with comparable equipment, managerial ability, and utilization levels were considered, costs for baling operations were lower than those for cubers.

It might be therefore concluded that higher cubing profits resulted from higher prices received for cubes and higher custom cubing charges. These higher rates and prices for cubes more than offset the cost disadvantages of the cubers.

The bonus prices received for cubes and cubing services indicated strong consumer acceptance of the cubed hay. Additional research is required to determine if the bonus price for cubes is actually justified by cost benefits in storage and feeding after harvest.

APPENDIX A

CONFIDENTIAL

MARKET PERFORMANCE SCHEDULE

DEPARTMENT OF AGRICULTURAL ECONOMICS

UNIVERSITY OF ARIZONA

1968

MARKET PERFORMANCE SCHEDULE

Schedule No:_____

Date:_____

1. Name & Address:_____

_____Phone No:_____

2. What is your major type of operation? (If both what percent)

a. Livestock _____ _____. b. Crop Production _____ _____%

1. Dairy _____
2. Feeding _____
3. Ranching _____
4. Other (specify)

_____

1. Hay _____
2. Cotton _____
3. Feed Grains _____
4. Other (specify)

_____

3. How many irrigated acres do you farm? _____Acres

4. How do you harvest your alfalfa? Cuber _____%, Baler _____%,

Self-propelled Baler _____%, Other (specify) _____

_____

5. If you use a cuber, how long have you used it? _____ Years

MARKET PERFORMANCE SCHEDULE--Continued

6. Why did you change to a cuber? (specify)

   a. _____

   b. _____

   c. _____

   d. _____

7. What are the advantages of a cuber?

   a. _____

   b. _____

   c. _____

   d. _____

8. What percent of your baled hay do you feed? _____%, Sell?____ Store?_____%

9. What percent of your cubed hay do you feed? _____%, Sell?____ Store?_____%

10. What rate do you charge for doing custom work with your baler? Does this include swathing? _____Rate (Explain)_____

_____

_____

MARKET PERFORMANCE SCHEDULE--Continued

11. What rate do you charge for doing custom work with your cuber? Does this include swathing? _____Rate (Explain)_____

_____

_____

12. What price do you pay for alfalfa contracted to harvest with your baler? Do you buy it uncut, out of the windrow, or some other method? _____Price (Explain)_____

_____

13. What price do you pay for alfalfa contracted to harves with your cuber? Do you buy it uncut, out of the windrow or some other method? _____Price (Explain)_____

_____

14. What was the high, low, and average price received for baled hay in 1968?

High_____$/ton, Low_____$/ton, Average_____$/ton

MARKET PERFORMANCE SCHEDULE--Continued

15. What price have you received this year for your baled hay?

First cutting_____$/ton, Second cutting_____$/ton, Third cutting_____$/ton,

Fourth cutting_____$/ton, Fifth cutting_____$/ton,_____

16. What was the basis of this price?

In the field _____ Delivered_____

On the truck _____ Other (specify)_____

Out of stack _____ _____

17. What percent of your baled hay do you market in the field _____%

On the truck _____%, Out of the stack _____%, Delivered _____%

Other (explain) _____

_____

_____

18. What was the high, low, and average price received for your cubed hay in 1968?

High _____$/ton, Low _____$/ton, Average _____$/ton

19. What price have you received so far this year for your cubed hay?

First cutting _____$/ton Second cutting _____$/ton

MARKET PERFORMANCE SCHEDULE--Continued

Third cutting _____$/ton Fourth cutting _____$/ton

Fifth cutting _____$/ton Sixth cutting _____$/ton

---

20. What was the basis for this price?

In the field _____ Delivered _____

On the truck _____ Other (specify) _____

Out of stack _____ _____

21. What percent of your cubed hay do you market in the field _____%,

On the truck _____%, Out of the stack _____%, Delivered _____%

Other (explain) _____

---

22. How many acres do you bale per day?

a. Self-propelled baler

_____ acres per day

_____ hours per day

b. Tractor drawn balers

_____ acres per day

_____ hours per day

23. Labor requirements

a. How many laborers do you have for your baling operation?

_____ total number of laborers (Explain) _____

_____

_____

b. What are your labor requirements per day for the following?

1. Swather:_____number of men, _____hours per day
2. Raking: _____number of men, _____hours per day
3. Baling: _____number of men, _____hours per day
4. Roadsiding:_____number of men, _____hours per day
5. Nonmechanical:_____number of men, _____hours per day

24. How many acres do you cube per day? _____acres per day

How many hours per day _____hours per day

MARKET PERFORMANCE SCHEDULE--Continued

25. Labor requirements

a. How many laborers do you have for your cubing operation?

_____ total number of laborers (Explain) _____

_____

_____

b. What are your labor requirements per day for the following?

1. Swather:_____number of men, _____hours per day
2. Raking: _____number of men, _____hours per day
3. Cubing: _____number of men, _____hours per day
4. Field to Storage: _____number of men, _____hours per day
5. Nonmechanical:_____number of men, _____hours per day
6. Other (Specify)

_____ : _____number of men, _____hours per day

_____ : _____number of men, _____hours per day

26. What wage rate do you pay?

Nonmechanical labor _____ dollars per hour

Baler operators _____ dollars per hour

MARKET PERFORMANCE SCHEDULE--Continued

Cuber operators _____ dollars per hour

Roadsider _____ dollars per hour

Self-propelled operators _____ dollars per hour

Others (explain) _____ dollars per hour

_____ dollars per hour

_____ dollars per hour

27. What are your variable (operating) costs for cubing operations?

a. Maintenance Labor _____ total for year

b. Fuel _____ total for year

c. Grease and Oil _____ total for year

d. Repairs and Maintenance _____ total for year

(Explain) _____

_____

28. What are your variable (operating) costs for baler operations?

a. Maintenance labor _____ total for year

b. Fuel _____ total for year

MARKET PERFORMANCE SCHEDULE--Continued

c. Grease and Oil _____ total for year

d. Repairs and Maintenance _____ total for year

(Explain) _____

_____

MARKET PERFORMANCE SCHEDULE--Continued

ACRES HARVESTED, NUMBER OF CUTTINGS AND YIELDS OF ALFALFA HARVESTED BY ALTERNATIVE METHODS IN 1968

Method Used	Owned*	Number Cuttings	Yield/ Acre	Custom	Number Cuttings	Yield/ Acre	Contracted	Cuttings	Yield/ Acre
Baler	acres			acres			acres		
S. P. Baler									
Cuber									

*Includes rented and/or leased

MARKET PERFORMANCE SCHEDULE--Continued

HAY HARVESTING EQUIPMENT INVENTORY FOR BALER OPERATIONS

Implement Kind	Size or HP	Fuel Type	Year New	Cost	Total Hrs Use/ Yr.	Hrs Use/ Hay Oper.	Tons/ Hr.	Fuel Cons/ Hr.	Est. Life	Insured Yes No	Total Cost All Repairs	No. of Workers	Wage Rate
Swather													
Mowing Machine													
Rake													
Tractor													
Baler													
Bale Accum Trailer													

MARKET PERFORMANCE SCHEDULE--Continued

HAY HARVESTING EQUIPMENT INVENTORY FOR CUBER OPERATIONS

Implement Kind	Size or HP	Fuel Type	Year New	Cost	Total Hrs Use/ Yr.	Hrs. Use/ Hay Oper.	Tons/ Hr.	Fuel Cons/ Hr.	Est. Life	Insured Yes No	Total Cost All Repairs	No. of Workers	Wage Rate

APPENDIX B

ACTUAL CUBING AND BALING OPERATION MODELS

TABLE B-1 Costs and Returns for Alfalfa Baling
Operation Number 19, Arizona, 1968
1,250 Tons Harvested

Item	Dollars Annually	Dollars per Ton
Returns:		
Price of baled hay		$27.00
Total returns	$33,750.00	$27.00
Variable Costs:		
Labor Costs	$ 1,823.00	1.46
Rakes		
Repairs	250.00	.20
Tractors		
Fuel	204.12	.16
Repairs	30.00	.02
Balers		
Fuel	349.92	.28
Repairs	4,000.00	3.20
Pick-up truck		
Fuel	200.00	.16
Repairs	40.00	.03
Alfalfa in Windrow	22,500.00	18.00
Total Variable Cost	29,397.04	23.51
Fixed Costs:		
Rakes		
Depreciation	128.00	.10
Interest	78.00	.06
Insurance	20.48	.02
Taxes	18.40	.01
Tractors		
Depreciation	63.00	.05
Interest	38.50	.03
Insurance	2.16	.00
Taxes	9.05	.01
Balers		
Depreciation	1,893.34	1.51
Interest	933.41	.75
Insurance	225.34	.18
Taxes	163.30	.13

TABLE B-1 Continued

Item	Dollars Annually		Dollars per Ton	
Pick-up truck				
Depreciation	$ 300.00		$ .24	
Insurance	27.50		.02	
Interest	76.00		.06	
Taxes	12.70		.01	
Total Fixed Cost	$ 3,988.18		$ 3.18	
Total Cost		$33,385.22		$26.69
Net Returns		364.78		.31

TABLE B-2 Costs and Returns for Alfalfa Baling
Operation Number 18, Arizona, 1968
3,500 Tons Harvested

Item	Dollars Annually	Dollars per Ton
Returns:		
Price of baled hay		$22.00
Total returns	$77,000	$22.00
Variable Costs:		
Labor Costs	$ 3,038.00	.87
Swathing		
Fuel	196.00	.06
Repairs	400.00	.11
Rakes		
Repairs	200.00	.06
Tractors		
Fuel	529.20	.15
Repairs	1,800.00	.51
Bale Accumulator		
Fuel	117.60	.03
Repairs	600.00	.17
Baler		
Fuel	75.60	.02
Repairs	300.00	.09
Pick-up truck		
Fuel	200.00	.06
Repairs	40.00	.01
Alfalfa standing in the field	63,000.00	18.00
Total Variable Cost	70,496.40	20.14
Fixed Costs:		
Swather		
Depreciation	3,015.00	.86
Interest	837.50	.24
Insurance	92.32	.03
Taxes	173.36	.05
Rakes		
Depreciation	611.98	.17
Interest	314.98	.09
Insurance	40.24	.01
Taxes	52.80	.02
Tractors		
Depreciation	1,080.00	.31
Interest	660.00	.19
Insurance	37.14	.01
Taxes	155.25	.04

TABLE B-2 Continued

Item	Dollars Annually		Dollars per Ton	
Baler				
Depreciation	$ 757.33		$ .22	
Interest	373.33		.11	
Insurance	46.87		.01	
Taxes	65.32		.02	
Bale Accumulator				
Depreciation	1,085.71		.31	
Interest	542.86		.16	
Insurance	64.93		.02	
Taxes	109.25		.03	
Pick-up truck				
Depreciation	300.00		.09	
Interest	76.00		.02	
Insurance	27.50		.01	
Taxes	12.70		.00	
Total Fixed Cost	$10,532.37		$ 3.02	
Total Cost		$81,028.77		$23.16
Net Returns		-4,028.77		-1.16

TABLE B-3 Costs and Returns for Alfalfa Baling
Operation Number 17, Arizona, 1968
5,000 Tons Harvested

Item	Dollars Annually	Dollars per Ton
Returns:		
Price of baled hay		$22.34
Total returns	$111,700.00	$22.34
Variable Costs:		
Labor Costs	$ 7,050.00	1.41
Swathing		
Fuel	672.00	.13
Repairs	2,900.00	.58
Rakes		
Repairs	280.00	.06
Tractors		
Fuel	336.00	.07
Repairs	200.00	.04
Bale Accumulator		
Fuel	392.00	.08
Repairs	1,200.00	.24
Baler		
Fuel	540.00	.11
Repairs	2,300.00	.46
Pick-up truck		
Fuel	200.00	.04
Repairs	40.00	.01
Alfalfa standing in the field	90,000.00	18.00
Total Variable Cost	106,110.00	21.23
Fixed Costs:		
Swather		
Depreciation	2,502.00	.50
Interest	834.00	.17
Insurance	117.92	.02
Taxes	179.83	.04
Rakes		
Depreciation	283.74	.06
Interest	101.34	.02
Insurance	24.72	.00
Taxes	12.24	.00
Tractors		
Depreciation	112.50	.02
Interest	68.75	.01
Insurance	3.87	.00
Taxes	16.17	.00

TABLE B-3 Continued

Item	Dollars Annually		Dollars per Ton	
Bale Accumulator				
Depreciation	$ 1,200.00		$ .24	
Interest	600.00		.12	
Insurance	138.00		.03	
Taxes	120.75		.02	
Baler				
Depreciation	2,792.67		.56	
Interest	1,376.67		.28	
Insurance	332.56		.07	
Taxes	240.86		.05	
Pick-up truck				
Depreciation	300.00		.06	
Interest	76.00		.02	
Insurance	27.50		.01	
Taxes	12.70		.00	
Total Fixed Cost	$11,519.79		$ 2.30	
Total Cost		$117,629.79		$23.53
Net Returns		- 5,929.79		-1.19

TABLE B-4 Costs and Returns for Alfalfa Baling Operation Number 16, Arizona, 1968
5,875 Tons Harvested

Item	Dollars Annually	Dollars per Ton
Returns:		
Price of baled hay		$22.34
Total Returns	$131,247.50	$22.34
Variable Costs:		
Labor Costs	$12,835.50	2.18
Swathing		
Fuel	392.00	.07
Repairs	3,200.00	.54
Rakes		
Repairs	200.00	.03
Tractors		
Fuel	3,024.00	.51
Repairs	3,600.00	.61
Baler		
Fuel	236.52	.04
Repairs	800.00	.14
Bale Accumulator		
Fuel	280.00	.05
Repairs	1,300.00	.22
Pick-up truck		
Fuel	200.00	.03
Repairs	40.00	.01
Alfalfa standing in the field	105,750.00	18.00
Total Variable Cost	131,858.02	22.43
Fixed Costs:		
Swather		
Depreciation	4,020.00	.68
Interest	893.40	.15
Insurance	187.60	.03
Taxes	173.36	.03
Rakes		
Depreciation	344.66	.06
Interest	141.26	.02
Insurance	34.86	.01
Taxes	19.80	.00
Tractors		
Depreciation	283.54	.05
Interest	173.28	.03
Insurance	9.70	.00
Taxes	41.66	.01

TABLE B-4 Continued

Item	Dollars Annually	Dollars per Ton
Baler		
Depreciation	$ 872.17	$ .15
Interest	429.92	.07
Insurance	103.79	.02
Taxes	75.22	.01
Bale Accumulator		
Depreciation	1,028.57	.18
Interest	514.29	.09
Insurance	118.29	.02
Taxes	103.50	.02
Pick-up truck		
Depreciation	300.00	.05
Interest	76.00	.01
Insurance	27.50	.00
Taxes	12.70	.00
Total Fixed Cost	$ 9,985.07	$ 1.69
Total Cost	$141,843.09	$24.12
Net Returns	-10,595.59	-1.80

TABLE B-5 Costs and Returns for Alfalfa Baling
Operation Number 15, Arizona, 1968
1,356 Tons Harvested

Item	Dollars Annually	Dollars per Ton
Returns:		
Price of baled hay		$22.00
Total Returns	$29,832.00	$22.00
Variable Costs:		
Labor Costs	$ 1,012.35	.75
Swathing		
Fuel	PTO	
Repairs	488.00	.36
Rakes		
Repairs	60.00	.04
Tractors		
Fuel	263.76	.19
Repairs	450.00	.33
Baler		
Fuel	69.12	.05
Repairs	943.00	.70
Bale Accumulator		
Fuel	121.52	.09
Repairs	99.00	.07
Pick-up truck		
Fuel	200.00	.15
Repairs	40.00	.03
Alfalfa standing in the field	24,408.00	18.00
Total Variable Cost	28,154.75	20.76
Fixed Costs:		
Swather		
Depreciation	1,413.00	1.04
Interest	386.00	.28
Insurance	42.52	.03
Taxes	79.57	.06
Rakes		
Depreciation	120.00	.09
Interest	82.50	.06
Insurance	9.99	.01
Taxes	17.25	.01
Tractors		
Depreciation	418.50	.31
Interest	253.00	.19
Insurance	14.24	.01
Taxes	59.51	.04

TABLE B-5 Continued

Item	Dollars Annually		Dollars per Ton	
Baler				
Depreciation	$ 461.50		$ .34	
Interest	227.50		.17	
Insurance	28.56		.02	
Taxes	15.92		.01	
Bale Accumulator				
Depreciation	1,097.14		.81	
Interest	548.57		.40	
Insurance	65.61		.05	
Taxes	110.40		.08	
Pick-up truck				
Depreciation	300.00		.22	
Interest	76.00		.06	
Insurance	27.50		.02	
Taxes	12.70		.01	
Total Fixed Cost	$ 5,867.48		$ 4.32	
Total Cost		$34,022.23		$25.08
Net Returns		-4,190.23		-3.09

TABLE B-6 Costs and Returns for Alfalfa Baling Operation Number 14, Arizona, 1968 5,400 Tons Harvested

Item	Dollars Annually	Dollars per Ton
Returns:		
Price of baled hay		$24.00
Total returns	$129,600.00	$24.00
Variable Costs:		
Labor Costs	$ 3,080.70	.57
Swathing		
Fuel	257.60	.05
Repairs	3,500.00	.65
Rakes		
Repairs	300.00	.06
Tractors		
Fuel	268.80	.05
Repairs	500.00	.09
Baler		
Fuel	155.52	.03
Repairs	650.00	.12
Bale Accumulator		
Fuel	252.00	.05
Repairs	300.00	.06
Pick-up truck		
Fuel	200.00	.04
Repairs	40.00	.01
Alfalfa standing in the field	97,200.00	18.00
Total Variable Cost	106,704.62	19.78
Fixed Costs:		
Swather		
Depreciation	4,387.50	.81
Interest	1,218.75	.23
Insurance	134.34	.02
Taxes	252.27	.05
Rakes		
Depreciation	362.67	.07
Interest	186.67	.03
Insurance	23.84	.00
Taxes	31.28	.01
Tractors		
Depreciation	396.00	.07
Interest	242.00	.04
Insurance	13.62	.00
Taxes	56.92	.01

TABLE B-6 Continued

Item	Dollars Annually	Dollars per Ton
Baler		
Depreciation	$ 1,420.00	$ .26
Interest	700.00	.13
Insurance	87.88	.02
Taxes	113.82	.02
Bale Accumulator		
Depreciation	1,028.57	.19
Interest	514.29	.10
Insurance	61.51	.01
Taxes	103.50	.02
Pick-up truck		
Depreciation	300.00	.06
Interest	76.00	.01
Insurance	27.50	.01
Taxes	12.70	.00
Total Fixed Cost	$11,751.63	$ 2.17
Total Cost	$118,456.25	$21.95
Net Returns	11,143.75	2.06

TABLE B-7 Costs and Returns for Alfalfa Baling
Operation Number 13, Arizona, 1968
4,620 Tons Harvested

Item	Dollars Annually	Dollars per Ton
Returns:		
Price of baled hay		$20.00
Total returns	$92,400.00	$20.00
Variable Costs:		
Labor costs	$ 4,485.00	.97
Swathing		
Fuel	336.00	.07
Repairs	4,500.00	.97
Rakes		
Repairs	100.00	.02
Tractors		
Fuel	609.00	.13
Repairs	200.00	.04
Baler		
Fuel	PTO	
Repairs	300.00	.06
Bale Accumulator		
Fuel	392.00	.08
Repairs	1,800.00	.39
Pick-up truck		
Fuel	200.00	.04
Repairs	40.00	.01
Alfalfa standing in the field	83,160.00	18.00
Total Variable Cost	96,122.00	20.78
Fixed Costs:		
Swather		
Depreciation	6,750.00	1,46
Interest	1,500.03	.32
Insurance	163.80	.04
Taxes	291.09	.06
Rakes		
Depreciation	560.01	.12
Interest	200.01	.04
Insurance	25.38	.01
Taxes	24.15	.01
Tractors		
Depreciation	1,057.50	.23
Interest	646.25	.14
Insurance	36.00	.01
Taxes	152.02	.03

TABLE B-7 Continued

Item	Dollars Annually	Dollars per Ton
Baler		
Depreciation	$ 875.67	$ .19
Interest	308.33	.05
Insurance	52.11	.01
Taxes	75.53	.02
Bale Accumulator		
Depreciation	1,200.00	.26
Interest	600.00	.13
Insurance	71.76	.02
Taxes	120.75	.03
Pick-up truck		
Depreciation	300.00	.06
Interest	76.00	.02
Insurance	27.50	.01
Taxes	12.70	.00
Total Fixed Cost	$15,126.59	$ 3.27
Total Cost	$111,248.59	$24.05
Net Returns	-18,848.59	-4.08

TABLE B-8 Costs and Returns for Alfalfa Baling Operation Number 12, Arizona, 1968 2,625 Tons Harvested

Item	Dollars Annually	Dollars per Ton
Returns:		
Price of baled hay		$22.00
Total Returns	$57,750.00	$22.00
Variable Costs:		
Labor costs	$ 3,937.00	1.50
Swathing		
Fuel	280.00	.11
Repairs	300.00	.11
Rakes		
Repairs	100.00	.04
Tractors		
Fuel	441.00	.17
Repairs	300.00	.11
Baler		
Fuel	126.00	.05
Repairs	550.00	.21
Bale Accumulator		
Fuel	420.00	.16
Repairs	350.00	.13
Pick-up truck		
Fuel	200.00	.08
Repairs	40.00	.02
Alfalfa standing in the field	47,250.00	18.00
Total Variable Cost	54,194.00	20.69
Fixed Costs:		
Swather		
Depreciation	573.75	.22
Interest	286.88	.11
Insurance	33.09	.01
Taxes	41.84	.02
Rakes		
Depreciation	120.00	.05
Interest	106.66	.04
Insurance	12.06	.00
Taxes	16.40	.01
Tractors		
Depreciation	594.00	.23
Interest	363.00	.14
Insurance	20.44	.01
Taxes	56.88	.02

TABLE B-8 Continued

Item	Dollars Annually	Dollars per Ton
Baler		
Depreciation	$ 721.83	$ .27
Interest	355.83	.14
Insurance	44.67	.02
Taxes	39.48	.02
Bale Accumulator		
Depreciation	822.86	.31
Interest	411.43	.16
Insurance	49.21	.02
Taxes	52.50	.02
Pick-up truck		
Depreciation	300.00	.11
Interest	76.00	.03
Insurance	27.50	.01
Taxes	12.70	.00
Total Fixed Cost	$ 5,139.01	$ 1.97
Total Cost	$59,333.01	$22.66
Net Returns	-1,583.01	- .60

TABLE B-9 Costs and Returns for Alfalfa Baling Operation Number 11, Arizona, 1968 6,382 Tons Harvested

Item	Dollars Annually	Dollars per Ton
Returns:		
Price of baled hay		$21.00
Total returns	$134,022.00	$21.00
Variable Costs:		
Labor Costs	$ 4,708.80	.74
Swathing		
Fuel	336.00	.05
Repairs	2,780.00	.44
Rakes		
Repairs	200.00	.03
Tractors		
Fuel	640.92	.10
Repairs	700.00	.11
Baler		
Fuel	235.44	.04
Repairs	1,800.00	.28
Bale Accumulator		
Fuel	357.28	.06
Repairs	1,400.00	.22
Pick-up truck		
Fuel	200.00	.03
Repairs	40.00	.01
Alfalfa standing in the field	114,876.00	18.00
Total Variable Cost	128,274.44	20.11
Fixed Costs:		
Swather		
Depreciation	2,908.00	.46
Interest	646.32	.10
Insurance	107.56	.02
Taxes	209.02	.03
Rakes		
Depreciation	115.72	.02
Interest	96.44	.02
Insurance	10.92	.00
Taxes	23.28	.00
Tractors		
Depreciation	236.25	.04
Interest	144.38	.02
Insurance	8.12	.00
Taxes	33.95	.01

TABLE B-9 Continued

Item	Dollars Annually	Dollars per Ton
Baler		
Depreciation	$ 1,952.49	$ .31
Interest	962.49	.15
Insurance	120.84	.02
Taxes	168.39	.03
Bale Accumulator		
Depreciation	1,211.43	.19
Interest	605.71	.09
Insurance	72.44	.01
Taxes	121.90	.02
Pick-up truck		
Depreciation	300.00	.05
Interest	76.00	.01
Insurance	27.50	.00
Taxes	12.70	.00
Total Fixed Cost	$10,171.85	$ 1.60
Total Cost	$138,446.29	$21.71
Net Returns	- 4,424.29	- .69

TABLE B-10 Costs and Returns for Alfalfa Cubing
Operation Number 9, Arizona, 1968
6,120 Tons Harvested

Item	Dollars Annually	Dollars per Ton
Returns:		
Price of cubed hay		$28.50
Total returns	$174,420.00	$28.50
Variable Costs:		
Labor costs	$ 5,610.00	.92
Swathing		
Fuel	315.00	.05
Repairs	2,380.00	.39
Rakes		
Repairs	570.00	.09
Tractors		
Fuel	277.20	.05
Repairs	240.00	.04
Cubers		
Fuel	1,170.00	.19
Repairs	11,100.00	1.81
Water truck		
Fuel	99.00	.02
Repairs	30.00	.00
Hauling trucks		
Fuel	460.00	.08
Repairs	250.00	.04
Elevators		
Repairs	180.00	.03
Pick-up truck		
Fuel	200.00	.03
Repairs	40.00	.01
Uncut alfalfa	110,160.00	18.00
Total Variable Cost	133,081.20	21.75
Fixed Costs:		
Swathing		
Depreciation	2,400.00	.39
Interest	533.33	.09
Insurance	112.00	.02
Taxes	103.50	.02
Rakes		
Depreciation	300.33	.05
Interest	154.58	.03
Insurance	33.68	.01
Taxes	25.91	.00

TABLE B-10 Continued

Item	Dollars Annually	Dollars per Ton
Tractors		
Depreciation	$ 120.00	$ .02
Interest	82.50	.01
Insurance	4.98	.00
Taxes	17.25	.00
Cubers		
Depreciation	6,480.00	1.06
Interest	2,160.00	.35
Insurance	460.80	.08
Taxes	465.75	.08
Water truck		
Depreciation	86.90	.01
Interest	60.50	.01
Insurance	41.00	.01
Taxes	12.49	.00
Hauling trucks		
Depreciation	598.00	.10
Interest	276.00	.05
Insurance	212.00	.03
Taxes	39.98	.01
Elevator		
Depreciation	110.70	.02
Interest	67.65	.01
Insurance	3.50	.00
Taxes	15.91	.00
Pick-up truck		
Depreciation	300.00	.05
Interest	76.00	.01
Insurance	27.50	.00
Taxes	12.70	.00
Total Fixed Cost	$15,395.44	$ 2.52
Total Cost	$148,476.64	$24.27
Net Returns	25,943.36	4.23

TABLE B-11 Costs and Returns for Alfalfa Cubing
Operation Number 8, Arizona, 1968
22,300 Tons Harvested

Item	Dollars Annually	Dollars per Ton
Returns:		
Price of cubed hay		$32.00
Total returns	$713,600.00	$32.00
Variable Costs:		
Labor costs	$16,662.00	.75
Swathing		
Fuel	1,008.00	.05
Repairs	6,399.00	.29
Rakes		
Repairs	1,220.00	.05
Tractors		
Fuel	420.00	.02
Repairs	400.00	.02
Cubers		
Fuel	4,160.00	.19
Repairs	34,000.00	1.52
Water truck		
Fuel	99.00	.00
Repairs	112.00	.01
Hauling trucks		
Fuel	1,840.00	.08
Repairs	2,500.00	.11
Elevator		
Repairs	480.00	.02
Pick-up truck		
Fuel	200.00	.01
Repairs	40.00	.00
Uncut alfalfa	401,400.00	18.00
Total Variable Cost	470,940.00	21.12
Fixed Costs:		
Swather		
Depreciation	9,585.00	.43
Interest	1,065.00	.05
Insurance	162.96	.01
Taxes	189.78	.01
Rakes		
Depreciation	80.00	.00
Interest	55.00	.00
Insurance	6.54	.00
Taxes	7.90	.00

TABLE B-11 Continued

Item	Dollars Annually		Dollars per Ton	
Tractors				
Depreciation	$ 200.00		$ .01	
Interest	137.50		.01	
Insurance	8.30		.00	
Taxes	28.75		.00	
Cubers				
Depreciation	24,120.00		1.08	
Interest	8,040.00		.36	
Insurance	1,457.92		.07	
Taxes	1,193.92		.05	
Water truck				
Depreciation	565.50		.03	
Interest	261.00		.01	
Insurance	41.00		.00	
Taxes	27.99		.00	
Hauling trucks				
Depreciation	4,680.00		.21	
Interest	2,160.00		.10	
Insurance	424.00		.02	
Taxes	231.68		.01	
Elevator				
Depreciation	792.00		.04	
Interest	264.00		.01	
Insurance	13.00		.00	
Taxes	39.20		.00	
Pick-up truck				
Depreciation	300.00		.01	
Interest	76.00		.00	
Insurance	27.50		.00	
Taxes	12.70		.00	
Total Fixed Cost	$56,254.14		$ 2.49	
Total Cost		$527,194.14		$23.61
Net Returns		186,405.86		8.39

TABLE B-12 Costs and Returns for Alfalfa Cubing
Operation Number 7, Arizona, 1968
21,000 Tons Harvested

Item	Dollars Annually	Dollars per Ton
Returns:		
Price of cubed hay		$27.00
Total returns	$567,000.00	$27.00
Variable Costs:		
Labor costs	$12,750.00	.61
Swathing		
Fuel	1,050.00	.05
Repairs	8,500.00	.40
Rakes		
Repairs	380.00	.02
Tractors		
Fuel	441.00	.02
Repairs	400.00	.02
Cubers		
Fuel	4,524.00	.22
Repairs	34,500.00	1.64
Water truck		
Fuel	180.00	.01
Repairs	280.00	.01
Hauling trucks		
Fuel	(No Hauling)	
Repairs		
Elevator		
Repairs	(No Handling)	
Pick-up truck		
Fuel	200.00	.01
Repairs	40.00	.00
Uncut alfalfa	378,000.00	18.00
Total Variable Cost	441,245.00	21.01
Fixed Costs:		
Swather		
Depreciation	10,230.00	.49
Interest	2,273.33	.11
Insurance	405.79	.02
Taxes	441.17	.02
Rakes		
Depreciation	128.00	.01
Interest	88.00	.00
Insurance	17.42	.00
Taxes	18.40	.00

TABLE B-12 Continued

Item	Dollars Annually		Dollars per Ton	
Tractors				
Depreciation	$ 200.00		$ .01	
Interest	137.50		.01	
Insurance	8.30		.00	
Taxes	28.75		.00	
Cubers				
Depreciation	31,050.00		1.48	
Interest	10,350.00		.49	
Insurance	1,876.80		.09	
Taxes	2,192.20		.10	
Water truck				
Depreciation	217.25		.01	
Interest	151.25		.01	
Insurance	82.00		.00	
Taxes	31.23		.00	
Hauling trucks	(No Hauling)			
Elevator	(No Handling)			
Pick-up truck				
Depreciation	300.00		.01	
Interest	76.00		.00	
Insurance	27.50		.00	
Taxes	12.70		.00	
Total Fixed Cost	$60,343.59		$ 2.86	
Total Cost		$501,588.59		$23.87
Net Returns		65,411.41		3.13

TABLE B-13 Costs and Returns for Alfalfa Cubing Operation Number 6, Arizona, 1968 8,800 Tons Harvested

Item	Dollars Annually	Dollars per Ton
Returns:		
Price of cubed hay		$33.50
Total returns	$294,800.00	$33.50
Variable Costs:		
Labor costs	$11,604.00	1.32
Swathing		
Fuel	812.00	.09
Repairs	2,000.00	.23
Rakes	(No Raking)	
Tractors	(No Tractor)	
Cubers		
Fuel	3,188.64	.36
Repairs	10,000.00	1.14
Water truck		
Fuel	177.00	.01
Repairs	500.00	.06
Hauling trucks		
Fuel	542.00	.06
Repairs	1,000.00	.11
Elevator		
Repairs	200.00	.02
Pick-up truck		
Fuel	200.00	.02
Repairs	40.00	.00
Uncut alfalfa	158,400.00	18.00
Total Variable Cost	188,663.64	21.42
Fixed Cost:		
Swather		
Depreciation	4,500.00	.51
Interest	1,000.00	.11
Insurance	109.20	.01
Taxes	194.06	.02
Rakes	(No Raking)	
Tractors	(No Tractor)	

TABLE B-13 Continued

Item	Dollars Annually	Dollars per Ton
Cubers		
Depreciation	$12,600.00	$ 1.43
Interest	4,200.00	.48
Insurance	419.32	.05
Taxes	905.62	.10
Water truck		
Depreciation	933.33	.11
Interest	333.33	.04
Insurance	41.00	.00
Taxes	40.25	.00
Hauling trucks		
Depreciation	2,062.67	.23
Interest	736.67	.08
Insurance	212.00	.02
Taxes	88.95	.01
Elevator		
Depreciation	675.00	.08
Interest	187.50	.02
Insurance	9.50	.00
Taxes	38.81	.00
Pick-up truck		
Depreciation	300.00	.03
Interest	76.00	.01
Insurance	27.50	.00
Taxes	12.70	.00
Total Fixed Cost	$29,703.41	$ 3.34
Total Cost	$218,367.05	$24.76
Net Returns	76,432.95	8.74

TABLE B-14 Costs and Returns for Alfalfa Cubing Operation Number 5, Arizona, 1968 3,888 Tons Harvested

Item	Dollars Annually	Dollars per Ton
Returns:		
Price of cubed hay		$26.50
Total returns	$103,032.00	$26.50
Variable Costs:		
Labor costs	$ 4,125.00	1.06
Swathing		
Fuel	252.00	.06
Repairs	1,200.00	.31
Rakes	(No Raking)	
Tractors	(No Tractor)	
Cubers		
Fuel	780.00	.20
Repairs	4,000.00	1.03
Water truck		
Fuel	150.00	.04
Repairs	200.00	.05
Hauling trucks		
Fuel	230.00	.06
Repairs	200.00	.05
Elevator		
Repairs	150.00	.04
Pick-up truck		
Fuel	200.00	.05
Repairs	40.00	.01
Uncut alfalfa	69,984.00	18.00
Total Variable Cost	81,511.00	20.96
Fixed Costs:		
Swather		
Depreciation	900.00	.23
Interest	250.00	.06
Insurance	28.60	.01
Taxes	64.69	.02
Rakes	(No Raking)	
Tractors	(No Tractor)	

TABLE B-14 Continued

Item	Dollars Annually		Dollars per Ton	
Cubers				
Depreciation	$ 6,120.00		$ 1.57	
Interest	2,040.00		.52	
Insurance	226.30		.06	
Taxes	439.88		.11	
Water truck				
Depreciation	118.50		.03	
Interest	82.50		.02	
Insurance	41.00		.01	
Taxes	17.03		.00	
Hauling trucks				
Depreciation	118.50		.03	
Interest	82.50		.02	
Insurance	106.00		.03	
Taxes	17.03		.00	
Elevator				
Depreciation	90.00		.02	
Interest	55.00		.01	
Insurance	2.50		.00	
Taxes	25.88		.01	
Pick-up truck				
Depreciation	300.00		.08	
Interest	76.00		.02	
Insurance	27.50		.01	
Taxes	12.70		.00	
Total Fixed Costs	$11,242.11		$ 2.87	
Total Cost		$92,753.11		$23.83
Net Returns		10,278.89		2.67

TABLE B-15 Costs and Returns for Alfalfa Cubing Operation Number 4, Arizona, 1968 4,250 Tons Harvested

Item	Dollars Annually	Dollars per Ton
Returns:		
Price of cubed hay		$32.00
Total Returns	$136,000.00	$32.00
Variable Costs:		
Labor costs	$ 3,693.00	.87
Swathing		
Fuel	315.00	.07
Repairs	1,500.00	.35
Rakes		
Repairs	150.00	.04
Tractors		
Fuel	52.50	.01
Repairs	80.00	.02
Cubers		
Fuel	780.00	.18
Repairs	6,000.00	1.41
Water truck		
Fuel	27.00	.01
Repairs	250.00	.06
Hauling trucks		
Fuel	161.00	.04
Repairs	1,000.00	.24
Elevator		
Repairs	100.00	.02
Pick-up truck		
Fuel	200.00	.05
Repairs	40.00	.01
Uncut alfalfa	76,500.00	18.00
Total Variable Cost	90,848.50	21.38
Fixed Costs:		
Swather		
Depreciation	2,100.00	.49
Interest	466.67	.11
Insurance	50.96	.01
Taxes	90.56	.02
Rakes		
Depreciation	96.00	.02
Interest	37.50	.01
Insurance	5.30	.00
Taxes	6.90	.00

TABLE B-15 Continued

Item	Dollars Annually		Dollars per Ton	
Tractors				
Depreciation	$ 40.00		$ .01	
Interest	27.50		.01	
Insurance	1.66		.00	
Taxes	5.75		.00	
Cubers				
Depreciation	6,120.00		1.44	
Interest	2,040.00		.48	
Insurance	226.30		.05	
Taxes	439.88		.10	
Water truck				
Depreciation	1,500.00		.35	
Interest	450.00		.11	
Insurance	41.00		.01	
Taxes	43.12		.01	
Hauling trucks				
Depreciation	1,800.00		.42	
Interest	750.00		.18	
Insurance	106.00		.02	
Taxes	103.50		.02	
Elevator				
Depreciation	450.00		.11	
Interest	150.00		.04	
Insurance	7.50		.00	
Taxes	64.69		.02	
Pick-up truck				
Depreciation	300.00		.07	
Interest	76.00		.02	
Insurance	27.50		.01	
Taxes	12.70		.00	
Total Fixed Cost	$17,636.99		$ 4.14	
Total Cost		$108,485.49		$25.52
Net Returns		27,514.51		6.48

TABLE B-16 Costs and Returns for Alfalfa Cubing Operation Number 3, Arizona, 1968 6,750 Tons Harvested

Item	Dollars Annually	Dollars per Ton
Returns:		
Price of cubed hay		$27.00
Total returns	$182,250.00	$27.00
Variable Costs:		
Labor Costs	$ 7,785.00	1.15
Swathing		
Fuel	420.00	.06
Repairs	2,400.00	.36
Rakes	(No Raking)	
Tractors	(No Tractor)	
Cubers		
Fuel	3,144.96	.47
Repairs	21,300.00	3.16
Water truck		
Fuel	120.00	.02
Repairs	125.00	.02
Hauling trucks	(No Hauling)	
Elevator	(No Handling)	
Pick-up truck		
Fuel	200.00	.03
Repairs	40.00	.01
Uncut alfalfa	121,500.00	18.00
Total Variable Cost	157,034.96	23.28
Fixed Costs:		
Swather		
Depreciation	3,300.00	.49
Interest	733.34	.11
Insurance	80.08	.01
Taxes	142.32	.02
Rakes	(No Raking)	
Tractors	(No Tractor)	
Cubers		
Depreciation	18,900.00	2.80
Interest	6,300.00	.93
Insurance	628.98	.09
Taxes	1,358.43	.20

TABLE B-16 Continued

Item	Dollars Annually		Dollars per Ton	
Water truck				
Depreciation	$ 118.50		$ .02	
Interest	82.50		.01	
Insurance	41.00		.01	
Taxes	11.73		.00	
Hauling trucks	(No Hauling)			
Elevator	(No Handling)			
Pick-up truck				
Depreciation	300.00		.04	
Interest	76.00		.01	
Insurance	27.50		.00	
Taxes	12.70		.00	
Total Fixed Cost	$32,113.08		$ 4.74	
Total Cost		$189,148.04		$28.02
Net Returns		- 6,898.04		-1.02

TABLE B-17 Costs and Returns for Alfalfa Cubing Operation Number 2, Arizona, 1968 21,000 Tons Harvested

Item	Dollars Annually		Dollars per Ton	
Returns:				
Price of cubed hay			$25.00	
Total returns		$525,000.00		$25.00
Variable Costs:				
Labor Costs	$15,420.00		.73	
Swathing				
Fuel	840.00		.04	
Repairs	6,800.00		.32	
Rakes	(No Raking)			
Tractors	(No Tractor)			
Cubers				
Fuel	5,720.00		.27	
Repairs	57,500.00		2.74	
Water truck				
Fuel	240.00		.01	
Repairs	280.00		.01	
Hauling trucks				
Fuel	912.00		.04	
Repairs	1,350.00		.06	
Elevator	(No Handling)			
Pick-up truck				
Fuel	200.00		.01	
Repairs	40.00		.00	
Uncut alfalfa	378,000.00		18.00	
Total Variable Cost	467,302.00		22.23	
Fixed Costs:				
Swather				
Depreciation	7,200.00		.34	
Interest	1,600.00		.08	
Insurance	285.60		.01	
Taxes	310.48		.01	
Rakes	(No Raking)			
Tractors	(No Tractor)			

TABLE B-17 Continued

Item	Dollars Annually		Dollars per Ton
Cubers			
Depreciation	$28,800.00		$ 1.37
Interest	9,600.00		.46
Insurance	1,740.80		.08
Taxes	2,141.90		.10
Water truck			
Depreciation	520.00		.02
Interest	200.00		.01
Insurance	82.00		.00
Taxes	37.37		.00
Hauling trucks			
Depreciation	2,795.00		.13
Interest	1,075.00		.05
Insurance	318.00		.02
Taxes	200.89		.01
Elevator	(No Handling)		
Pick-up truck			
Depreciation	300.00		.01
Interest	76.00		.00
Insurance	27.50		.00
Taxes	12.70		.00
Total Fixed Cost	$57,323.24		$ 2.70
Total Cost		$524,625,24	$24.93
Net Returns		374.76	.07

TABLE B-18 Costs and Returns for Alfalfa Cubing Operation Number 1, Arizona, 1968 20,500 Tons Harvested

Item	Dollars Annually	Dollars per Ton
Returns:		
Price of cubed hay		$28.00
Total returns	$574,000.00	$28.00
Variable Costs:		
Labor Costs	$35,280.00	1.72
Swathing		
Fuel	1,612.00	.08
Repairs	5,800.00	.28
Rakes		
Repairs	840.00	.04
Tractors		
Fuel	1,075.20	.05
Repairs	320.00	.02
Cubers		
Fuel	6,656.00	.32
Repairs	16,800.00	.82
Water truck		
Fuel	120.00	.01
Repairs	125.00	.01
Hauling trucks		
Fuel	1,472.00	.07
Repairs	600.00	.03
Elevator	(No Handling)	
Pick-up truck		
Fuel	200.00	.01
Repairs	40.00	.00
Uncut alfalfa	369,000.00	18.00
Total Variable Cost	439,940.20	21.44
Fixed Costs:		
Swather		
Depreciation	9,600.00	.47
Interest	2,133.32	.10
Insurance	232.96	.01
Taxes	414.00	.02
Rakes		
Depreciation	408.00	.02
Interest	160.00	.01
Insurance	22.68	.00
Taxes	29.44	.00

TABLE B-18 Continued

Item	Dollars Annually		Dollars per Ton	
Tractors				
Depreciation	$ 160.00		$ .01	
Interest	110.00		.01	
Insurance	6.64		.00	
Taxes	23.00		.00	
Cubers				
Depreciation	21,600.00		1.05	
Interest	7,200.00		.35	
Insurance	678.92		.03	
Taxes	1,552.48		.08	
Water truck				
Depreciation	130.00		.01	
Interest	50.00		.00	
Insurance	41.00		.00	
Taxes	17.03		.00	
Hauling trucks				
Depreciation	1,738.00		.08	
Interest	1,210.00		.06	
Insurance	212.00		.01	
Taxes	249.84		.01	
Elevator	(No Handling)			
Pick-up truck				
Depreciation	300.00		.01	
Interest	76.00		.00	
Insurance	27.50		.00	
Taxes	12.70		.00	
Total Fixed Cost	$48,395.51		$ 2.34	
Total Cost		$488,335.71		$23.78
Net Returns		85,664.29		4.22

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