Operating Costs of Mixed Feed Mills in the Pacific Coast States

by

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The mill manager is particularly interested in two general relationships enumerated in this study: (1) How do operating costs compare in different size mills? (2) How do operating costs compare for competitive mills in a specific area?

Mixed feed mils are more noted for their differences than for their similarities. Machinery, flow of materials, and products are different in each mill in some way. No two locations are really the same, and mill location is an extremely important factor. These differences cannot be described in detail because the description would reveal the identity of the cooperating firms. This is a limitation which unfortunately tends to over-simplify the problem and the presentation, and it could result in misconceptions. Industry personnel is very much aware of the importance of this limitation. Description of the sample, definitions of cost used, and the method of computing volume for this analysis are in the appendix. /1

Average total operating costs per ton of feed mixed

Two types of average costs are used in this analysis: First, the weighted average cost in which each ton of feed is given equal weight; second, the simple average cost in which the average costs of all mills are given equal weight.

Table 1 presents a summary of the weighted and simple average costs and the variation between mills.

Table 1. Simple and Weighted Average Costs for 35 Pacific Coast Mills, 1952-1953

Cost item	Weighted average cost per ton /2	Simple average cost per ton /3	Range for 67% of the average costs	Extent of variation between mills /4
Total operating	$8.19	$10.16	$5.56-$14.76	45%
Production labor	3.31	3.51	2.21- 4.81	37%
Administrative labor	2.36	3.42	.97- 5.87	72%
Depreciation and maintenance and repair	1.00	1.14	.50- 1.78	56%
Heat, light, and power	.26	.35	.13- .57	63%
Taxes and licenses	.36	.38	.14- .62	63%
Insurance	.25	.42	.14- .72	76%
All other	.65	.94	.10- 1.78	89%

/1 This report is a description of a sample of mills and does not necessarily describe the entire industry in this region. This study was done under a contract with the U.S. Department of Agriculture, administered by the Marketing Research Division, Agricultural Marketing Service. Appreciation is hereby extended to Dr. V. John Brensike who organized and guided the study. A report covering the operation of 126 feed mills located in the Pacific, Midwestern, Southern, and Mid-Atlantic areas is being published by the U.S. Department of Agriculture.

/2 Computed by dividing the sum of costs for all mills by sum of computed tonnages of all mills.

/3 Computed by dividing the sum of the average costs by the number of mills.

/4 The higher the percentage figure, the less tendency there is for the individual firms to be similar.

Production labor cost was the largest single cost item and showed the least variation between mills. The administrative labor cost was approximately as large as production labor cost and showed twice the variation between mills. This high variation in administrative costs is partially explained by differences in executive salaries (particularly owner-managers and partners), and by differences in advertising, legal, and auditing costs. Also, larger volume mills exert a greater influence on reducing the weighted average administrative cost item than they do in reducing the production labor cost item.

The factor which causes the "All other" item to show such great variation is the charge for internal hauling of ingredients in some mills.

Costs in different size mills

Mill size in this report was determined by the computed annual tonnage of feed mixed. This determination of size can be misleading. Some firms achieve a large volume by operating 16 to 24 hours a day while other mills with comparable physical capacity operate only 8 hours a day. There are many questions unanswered by this definition, but it seemed the best alternative available.

Larger volume mills showed lower weighted average costs per ton of feed mixed (Table 2). This apparent economy is not necessarily due to volume alone; other factors are involved. For example, the only continuous-line mixers were in the larger mills. This could be a factor, but it was not determined conclusively in this study. Also, larger mills reported operating at an average of over 80% of capacity while smaller mills were operating at less than 50% of capacity.

Several general observations can be made regarding costs in these size groups:

(1) Administrative costs per ton tend, in the small sample analyzed in this area, to be a larger portion of the total unit cost in smaller mills. This is contrary to the belief expressed by many managers of small mills. /1 They seemed to feel that larger operations might lose efficiency because of high executive expenses.

(2) The larger mills report 25% less labor time per ton of feed mixed than the smaller mills.

(3) The smallest mills reported paying an hourly wage which was 20% below that of larger mills. This seemed to be related to location and possibly allows a few small mills to gain some competitive advantage not due entirely to efficiency.

(4) Smaller mills in rural locations enjoy lower taxes than the larger metropolitan mills. This is often lost in higher insurance costs.

Some apparent differences in large and small operations

Smaller mills do more custom mixing. Of the fourteen smaller mills, only three did no custom work. Custom mixing in the other eleven averaged 28% of their volume. Only three of the fourteen larger mills did any custom mixing, and it represented only 15% of the volume in the mill doing the most custom work.

/1 It also appears to contradict the findings of similar surveys made simultaneously by the Agricultural Marketing Service, U.S.D.A., in other areas of the country.

Table 2. Weighted Average Operating Costs Per Ton for 35 Pacific Coast Mills, 1952-1953, by Mill Size Group

Cost item	Mills with less than 5,000 ton annual volume	Mills with 5,000 to 10,000 ton annual volume	Mills with 10,000 to 20,000 ton annual volume	Mills with 20,000 to 40,000 ton annual volume	Mills with over 40,000 ton annual volume	Weighted average per ton for all plants
Total cost	$ 11.05	$ 11.40	$ 10.41	$ 9.49	$ 6.75	$ 8.19
Labor cost	3.08	4.48	3.94	3.57	2.92	3.31
Administrative salaries	4.08	3.17	3.39	3.19	1.68	2.36
Depreciation and maintenance and repair	1.27	1.05	1.08	1.08	.94	1.00
Heat, light and power	.42	.41	.32	.31	.20	.26
Taxes and licenses	.27	.45	.51	.32	.34	.36
Insurance	.55	.56	.42	.25	.17	.25
All other	1.38	1.28	.75	.77	.50	.65

Table 3. Weighted Average Operating Costs Per Ton of 35 Pacific Coast Mills, 1952-1953, by Geographic Area

Cost item	Washington-Oregon mills (less than 5,000 tons)	Washington-Oregon mills (over 5,000 tons)	Northern and Central California mills	Southern California mills	Weighted average per ton all plants
Total cost	$ 11.05	$ 7.54	$ 9.11	$ 7.81	$ 8.19
Labor cost	3.08	2.96	3.79	3.17	3.31
Administrative salaries	4.08	2.20	2.61	2.21	2.36
Depreciation and maintenance and repair	1.27	1.05	.99	.99	1.00
Heat, light, and power	.42	.24	.26	.27	.26
Taxes and licenses	.27	.25	.58	.30	.36
Insurance	.55	.12	.37	.24	.25
All other	1.38	.72	.51	.63	.65

Smaller mills do more hauling of ingredients in their own equipment. The smaller mills hauled 48% of total ingredients to their plants in their own trucks. The larger mills hauled only 10% of their ingredients and much of this was ideally done in bulk trucks returning from delivery of mixed feed.

Smaller mills handle more sacked ingredients. The smaller mills buy 86% of their grains and none of their meals and minor ingredients in bulk. The larger mills buy 97% of their grains and 75% of their meals and minor ingredients in bulk.

Smaller mills do less pelleting. Eight of the fourteen smaller mills did not have pelleting machines, and the other six pelleted less than 17% of their volume. Only one of the fourteen larger mills did not have a pelleting machine. Over 30% of the volume of the larger mills was pelleted.

Smaller mills are less specialized. All four mills who mix less than 50% of their volume in one type of feed mix less than 10,000 tons. None of the smaller mills mixes over 80% of its volume in one feed type. The volume of five of the seven largest mills is over 90% in one type of feed.

Smaller mills are basically retail mixers. The smaller mills sell 99% of their volume direct to the consumer. The larger mills sell only 68% direct to the consumer. They all deliver about the same percentage of their volume to customers, but larger mills loading carload lots of feeds have advantages in this regard.

Larger mills are more mechanized. Most of the larger mills use mechanical conveyors for both bulk and bagged feeds. None of the smaller mills used conveyors for bagged feeds, and many used hand carts for moving ingredients. Specific economies may result where machinery replaces labor in these operations.

Costs in different market areas

The weighted average costs for the three areas are presented in Table 3. The average costs of individual mills are presented by geographic area in Tables 4, 5, 6, and 7. Mills are placed in these tables with the smallest mill of the area to the left.

The operations in these areas are quite similar with the following exceptions:

(1) Southern California mills reported delivering 42% of their feed to customers in bulk; Northern and Central California mills delivered only 28% of their feed to customers in bulk; Washington-Oregon mills delivered only 13% of their feed to customers in bulk.

(2) Southern California mills reported receiving 30% more of their ingredients in bulk than mills in the other areas.

(3) Southern California mills pelleted 30% of their volume and the other areas pelleted only 15% of their volume.

(4) Wages are essentially the same in the three areas with the exception of the smallest mills. The average hourly rate in Southern California was $1.87 as compared to an average of $1.85 in the other areas. The smallest mills (Washington-Oregon) reported an average hourly wage of $1.50.

Table 4. Average Operating Costs Per Ton for Eight Mills in Washington and Oregon Mixing Less than 5,000 Tons Per Year, 1952-1953/1

Cost item	1	2	3	4	5	6	7	8	Weighted average per ton
Total cost	$22.93	$7.86	$27.83	$7.23	$4.84	$10.40	$8.90	$9.57	$11.05
Labor cost	6.01	1.62	4.98	2.23	2.67	3.07	2.63	3.06	3.08
Administrative salaries	11.82	2.12	10.88	3.51	.29	4.66	3.51	2.68	4.08
Depreciation and maintenance and repair	1.07	1.22	4.41	.45	.42	.51	1.29	1.35	1.27
Heat, light, and power	.69	.31	1.38	.37	.27	.22	.21	.36	.42
Taxes and licenses	.12	.22	.44	.04	.13	.21	.32	.46	.27
Insurance	1.16	.67	1.54	.07	.35	.36	.42	.48	.55
All other	2.06	1.70	4.20	.56	.71	1.37	.52	1.18	1.38

/1 Smallest to largest mill from left to right.

Table 5. Average Operating Costs Per Ton for Eight Mills in Washington and Oregon, 1952-1953/1

Cost item	1	2	3	4	5	6	7	8	Weighted average per ton
Total cost	$9.01	$9.93	$8.28	$12.52	$5.26	$12.91	$10.84	$5.04	$7.54
Labor cost	4.70	4.00	1.60	4.99	3.03	3.93	2.33	2.61	2.96
Administrative salaries	1.72	2.63	3.90	3.78	.68	4.48	6.14	.66	2.20
Depreciation and maintenance and repair	.36	1.18	1.44	.71	.58	1.94	.80	1.02	1.05
Heat, light, and power	.35	.25	.59	.22	.25	.18	.34	.17	.24
Taxes and licenses	.22	.85	.19	.11	.29	.54	.25	.14	.25
Insurance	.48	.57	.29	.17	.05	.13	.31	.02	.12
All other	1.18	.45	.27	2.54	.38	1.71	.67	.42	.72

/1 Smallest to largest mill from left to right.

Table 6. Average Operating Costs Per Ton for Ten Mills in Northern and Central California, 1952-1953/1

Cost item	1	2	3	4	5	6	7	8	9	10	Weighted average per ton
Total cost	$11.12	$12.83	$9.72	$11.68	$14.83	$12.35	$7.58	$7.90	$7.75	$8.44	$9.11
Labor cost	6.50	4.44	1.36	4.81	6.05	4.32	2.36	4.20	2.04	4.48	3.79
Administrative salaries	1.91	4.40	4.50	3.96	4.88	6.04	1.97	1.32	3.06	1.48	2.61
Depreciation and maintenance and repair	.93	1.49	1.18	1.57	1.34	.96	.76	.91	.88	.95	.99
Heat, light and power	.30	.38	.26	.27	.43	.26	.17	.26	.21	.27	.26
Taxes and licenses	.47	.46	.69	.68	1.05	.14	.89	.24	1.06	.33	.58
Insurance	.61	.75	.48	.30	.98	.34	.48	.24	.34	.28	.37
All other	.40	.91	1.25	.09	.10	.29	.95	.73	.16	.65	.51

/1 Smallest to largest mill from left to right.

Table 7. Average Operating Costs Per Ton for Nine Mills in Southern California, 1952-1953/1

Cost item	1	2	3	4	5	6	7	8	9	Weighted average per ton
Total cost	$13.92	$9.27	$6.98	$10.26	$9.49	$9.62	$6.19	$4.99	$7.27	$7.81
Labor cost	5.93	5.42	2.28	3.98	4.18	2.00	2.79	1.81	3.93	3.17
Administrative salaries	3.01	1.27	1.43	3.50	2.43	4.78	1.30	1.80	1.00	2.21
Depreciation and maintenance and repair	1.14	.60	1.38	1.30	1.00	1.25	.88	.56	1.10	.99
Heat, light and power	.70	.41	.38	.40	.43	.22	.26	.17	.13	.27
Taxes and licenses	.39	.31	.42	.37	.28	.07	.52	.18	.32	.30
Insurance	.55	.32	.35	.40	.37	.19	.24	.21	.07	.24
All other	2.20	.94	.74	.31	.80	1.11	.20	.26	.72	.63

/1 Smallest to largest mill from left to right.

APPENDIX

The sample

Personal calls were made at 64 mills. Of these, 35 cooperated and provided usable and comparable information on costs of operation for their last complete fiscal year. In all cases, this year was either the 1952 calendar year or the 1952-53 fiscal year.

The sample includes a wide range of mill sizes. The largest mill produced 100 times as much as the smallest mill. The sample includes privately owned, corporate, and co-operative types of business organizations, but no attempt is made to compare these types. Some of the mills are members of chains, some mills are one department in a diversified business organization, and others represent the total business.

The 35 mills studied were located in three general areas: Washington and Oregon; Northern and Central California; and Southern California (Table 3). The Washington-Oregon mills were divided into two groups because all mills with volumes of less than 5,000 tons per year were in this area. Separating these increases the comparability of the other groups.

Table 8. Distribution of 35 Pacific Coast Mills and Feed Volume by Geographic Area, 1952-1953

	Washington-Oregon (less than 5,000 tons)	Washington-Oregon (over 5,000 tons)	Northern and Central California	Southern California
Number of mills	8	8	10	9
Average tonnage per mill .	2,600	39,000	28,000	35,000
Per cent of total tonnage of study..................	2.2%	33.5%	30.1%	34.2%

What volume figure does this study use for comparison?

Cost comparisons must be based on similar units of production to have meaning. In the mixed feed industry, the logical unit is the ton of mixed feed. This presents a complication because mills not only mix a variety of formula feeds, they also perform a variety of minor processing services. They do not, generally, maintain separate cost and tonnage records for these operations. Therefore, the best alternative for this analysis seemed to be the use of an index as a basis for computing tonnages which could be compared. This index cannot be accurate for all mills; it represents an estimated average relationship of specific milling operations in terms of labor and machinery costs. The following system was developed with the cooperation of mill managers and is used in this analysis:

Receiving, Cleaning, Screening, Grinding, Rolling, etc.	.2 computed ton
Mixing	.5 computed ton
Bagging	.2 computed ton
Warehousing	.1 computed ton
Pelleting	.2 computed ton
Scratch (bagged)	.5 computed ton
Scratch (bulk)	.3 computed ton

Using this index, a ton of ingredients received, cleaned, ground, mixed, and bagged equals a computed ton. A ton of ingredients processed, mixed, and handled in bulk equals eight-tenths of a computed ton. If either of the above is pelleted, the computed tonnage value is increased by two-tenths of a ton. Also scratch which is pelleted is allowed an additional two-tenths of a computed ton. Similarly, a ton of barley, for example, which is processed, rolled, and bagged would equal one-half a computed ton. Mill managers may desire to compute the tonnage for their current operation and compare costs to the time period reported in this study.

Which costs are included in this analysis?

Wages and salaries: This cost item was defined to include all wages and salaries paid as well as estimated wages for nonsalaried management. Gross cost figures were used, so this item includes payroll deductions such as unemployment insurance, group insurance, retirement, and withholding taxes. It includes payment for overtime, sick leave, and vacations taken during the pay period reported. An estimated charge is included in this item for all payment in kind, such as rent, fuel, meals, or housing.

This cost is separated into two categories: Production labor and administrative labor. Production labor cost includes all above wages paid to employees directly engaged in production, processing, and handling of feeds and ingredients. It also includes the cost of direct supervision of this work and the associated record keeping. The administrative labor includes executive salaries, accounting, personnel, sales, advertising, credit, professional, and all other general administrative wages.

Depreciation: This item includes all depreciation charges made for buildings, machinery, and equipment. Where the mixed feed represents only a portion of the total business, estimates were made to reduce this item to charges logically allocated to mixed feed.

Maintenance and repairs: This represents all costs incurred for maintenance and repair of the feed mixing machinery and buildings, but does not include major alterations and additions to the plant.

Note: In this analysis, Depreciation and Maintenance and repairs are handled as one cost item to increase the comparability of various accounting methods and objectives.

Taxes and licenses: This expense was defined to include all taxes and licenses paid except state and federal income taxes, and those taxes included in the Wage and salary item.

Heat, light, power, and water.

Insurance.

All other: This item includes all miscellaneous costs chargeable to the mixed feed operation. It also includes the cost of transporting and hauling ingredients in to the plant in company owned and operated equipment. It does not include costs of delivery to the customer or payments made to carriers for hauling either ingredients or finished products. Inclusion of this item is necessary to attain comparability of total operating costs because of differences in accounting procedures.

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A Portable Self-Propelled Plot Combine[1]

THREE methods of harvesting experimental plots of small grains and seed crops have been generally employed. The method in longest use is that of cutting the plants from definite lengths of rows or numbers of quadrats by hand, bagging or wrapping them to prevent shattering and loss of seed during transportation, and threshing with a small stationary plot thresher or other means. A second method is similar except that cutting is done with a small plot mower, having some type of catcher to collect the plants as they are cut. A third method is that of employing a commercial self-propelled combine to cut and thresh the crop simultaneously.

Each of these methods has disadvantages. The relatively large amount of hand labor involved in the first two methods limits the number of plots that may be handled by an experimenter and encourages reduction in plot and sample size. Combines have the advantage of completing the harvest in a single operation. However, present day commercial self-propelled combines are of such size (7-foot cut, or larger) that the experimental area required for plots to be harvested by them may be so large as to include undesirable site heterogeneity. Relatively large amounts of labor and materials are necessary for application of treatments to plots of the required size. The machines are difficult or impractical to clean between plots of different treatments or varieties. The sample removed from the combine at the end of a plot may be contaminated by significant amounts of seed from previously harvested plots of different treatments, and is usually not suitable as a sample for chemical analyses, baking trials, or determination of other than yield effects of treatments. Because of their weight, bulk, low road speed, and the difficulties involved in transporting them by truck under bridges and overpasses, power lines, telephone lines, and other obstructions along the highways, use of commercial self-propelled combines is usually limited to sites near their permanent location.

A self-propelled plot combine was described in 1951 by Liljedahl, Hancock, and Butler.[2] Their machine was a significant advance in plot-harvesting equipment for crops that may be combined. An Allis–Chalmers Model G tractor, with front end and rear wheels removed, was mounted above the combine body as source of motive power for the truck wheels upon which the front end of the machine was carried. A 6 hp. air-cooled engine powered the thresher.

Three portable self-propelled plot combines have been constructed and used at the Oregon Agricultural Experiment Station during the 1953 and 1954 seasons. The basic unit of these machines is an Allis–Chalmers Model 40 All-Crop Harvester, stripped of frame, wheels, clean grain elevator, and tailings elevator and streamlined inside essentially as recommended by Liljedahl, Hancock, and Butler.

The combine body is placed upon a frame supported at the front by an automobile rear axle and wheels (6.00 x 16 tires) and at the rear by an automobile front axle. Each axle is shortened by 12 inches. A 9 hp. Wisconsin air-cooled engine, mounted low on the left side of the machine, supplies motive power to the automobile rear axle through two automobile transmissions. The arrangement of these components is shown in figure 1. The combine has 6 forward speeds, ranging from about 1 to 7 miles per hour. There are 3 reverse speeds. A 9 hp. Wisconsin engine, mounted low and well forward on the right side of the machine, as shown in figure 2, operates the combine. Low mounting of the engines on opposite sides of the machine results in low over-all height, low center-of-gravity, and good stability. Driver's seat and combine and engine controls are mounted on a platform supported above the machine. A hand-operated hydraulic header lift is provided. Threshed seed is collected beneath the machine in a sliding bin, which has a funnel mouth for ease in transferring to bags. An air compressor may be mounted on the platform and powered from the thresher engine, if it desired to thoroughly clean the machine between varieties.

The complete machine weighs approximately 3,000 pounds. It may easily be driven onto a tilting bed implement trailer under its own power. Loaded thus, it will pass under obstacles

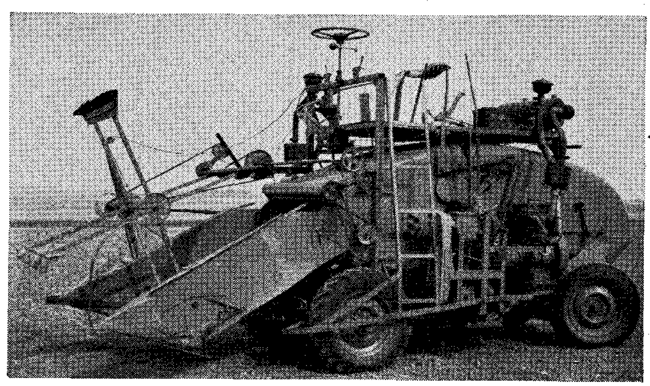

FIG. 1.—Propulsion engine side of combine. The engine and two transmissions are located in front of the rear wheels.

FIG. 2.—Thresher engine side of combine. The engine is located above and back of the front wheel. Threshed grain is collected in the bin which hangs beneath the machine.

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[1] Approved for publication as Miscellaneous Paper No. 9 by the Director of the Oregon Agr. Exp. Sta. and the Chief of the Soil and Water Conservation Research Branch, A.R.S., U.S.D.A. Contributions of the Department of Soils and the Department of Farm Crops of OAES and of the Western Section of Soil and Water Management of SWCRB. Rec. for publication Dec. 20, 1954.

[2] A self-propelled plot combine. John B. Liljedahl, N. I. Hancock, and James L. Butler. Agron. Jour. 43:516–517. 1951.

higher than about 9½ feet, and may be transplanted behind automobiles or pickup trucks at legal highways speeds.

The combine cuts a swath 40 inches wide. In fertilizer experiments at this station plots are usually made 8 feet wide and 50 feet long; an area 40 inches wide and 40 feet long (133 square feet) is harvested from the central portion of the plots. Where wheat yields 30 bushels per acre this provides a 5½ pound sample. The combine is employed for trimming the plot ends prior to harvesting plot samples.

During the past season, these combines have been used to harvest experimental plots of wheat, barley, beans, alta fescue, and vetch on approximately 80 farms in various portions of Oregon. Two men are sufficient to operate the combine, but it is convenient to have a third man to tie and label the bags containing threshed samples. Crews of 3 men have harvested 30 to 40 plots (50 feet long) per hour. Liljedahl, Hancock, and Butler estimated the combine resulted in 80% saving of manpower in comparison with hand harvesting. With the cleaning mechanism of the combine carefully adjusted to clean the grain, satisfactory weights for yield determinations may be obtained immediately. Where necessary, grain samples may be quickly cleaned of chaff and straw with a Vogel Re-cleaner.[3]

It is our opinion that portable self-propelled plot combines may be constructed from several other small commercial pull-type combines, but probably none is as compact and light weight as the Allis–Chalmers Model 40. Insofar as we are aware, no implement company is presently manufacturing a commercial combine of a size suitable for conversion into a small portable self-propelled plot combine. Combines of suitable size are only available on the used market. All repair parts are presently available. It is the policy of the larger manufacturers to maintain stocks of repair parts of machines no longer in production for as long as any considerable number of them are in use.

A list of needed materials, drawings, and further description of the Oregon plot combines are available from the authors on request.—ALBERT S. HUNTER and JAMES H. JOHNSON. *Soil Scientist, Oregon Agr. Exp. Sta., and Western Section, Soil and Water Management, SWCRB, ARS, USDA, Corvallis, Oreg., and Farm Foreman, Farm Crops Dept., Oregon Agr. Exp. Sta., Corvallis, Oreg.*

[3] Designed by Dr. Orval A. Vogel, Agronomist, Agricultural Research Service, Agronomy Department, State College of Washington, Pullman, Wash.