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Marketing Practices and Costs Of Texas Egg Producer-Wholesalers

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summary

Table egg production can be a profitable enterprise on Texas farms. The growth of population and purchasing power and the current standing of Texas as a deficit state in egg production all favor the Texas egg producer. To take advantage of opportunities in the state market, Texas egg producers will need to be efficient in production and marketing. Although a large volume of eggs per producer is not the only condition necessary for efficiency in production, processing and distribution, certain minimum levels of output are desirable in order to take advantage of both labor specialization in egg processing and market outlets which require large volumes. Producers who processed their own eggs for sale to retail outlets at wholesale prices and/or directly to consumers at retail prices were examined as to size of operation, labor used in processing and delivery and the effect of route characteristics on delivery labor efficiency. Estimated costs for labor, packaging and truck use were utilized to develop a cost per case for all marketing activities. Cost per case was compared with estimated margins existing between wholesale and retailer-consumer outlets.

The number of layers per producer among the producer-wholesalers interviewed ranged from 1,000 layers (the lower limit) to over 150,000 layers. The marketing activities of these producers were examined in two phases: (1) washing, grading and packing (processing) and (2) delivery. Estimates of man-hours used in each phase and the number of cases processed and delivered during 1962 were obtained from producers. Labor costs were obtained where wages were paid. Wages of $1 an hour were imputed where family labor was utilized.

The sample of producer-wholesalers was selected to include a disproportionately large number of large producer-wholesalers. It was not a random sample of the producer-wholesaler population of Texas.

Labor efficiency in the processing phase was directly associated with the weekly volume of eggs handled. Man-hours per case declined steadily until the weekly volume processed was over 200 cases per week (about 17,000 layers at a 60 percent rate of lay). There was considerable variation in labor efficiency among producers in all size groups, although the volume-efficiency relationship appeared to be fairly well established.

The number of cases delivered per hour was influenced by volume, number of outlets, miles traveled and the percentage of eggs delivered on door-to-door consumer routes. Estimated processing labor costs per case varied from $1.90 to 37 cents between groups A and E; delivery labor costs varied from 77 cents to 15 cents per case between groups A and G, respectively.

Total estimated costs per dozen for all marketing activities ranged from 18 cents for group A to 7.2 cents for group E. Groups D, E, F and G had estimated total marketing costs per dozen of less than 10 cents, which was less than the estimated margin between the ungraded, loose packed wholesale alternative and the graded, cartoned retailer-consumer alternative. Groups A, B and C's presence in the market may be explained in part by their accepting low returns for their labor and investment and/or the receipt of higher prices than indicated by the survey. The analysis involving the estimated total cost per case and the margin comparison was general. Detailed examination of the market and price alternatives would be desirable before reaching strong conclusions.

As weekly volume increased, the proportion of workers paid also increased and labor efficiency improved. Large volume makes possible the specialization of labor and therefore increases labor efficiency. Direct wage expenses increase the owner's motivation to use labor efficiently. Several levels of labor efficiency existed among operations producing approximately the same volume of eggs. The greatest variation in labor efficiency was found among the small producers.

The small-volume operations because of their part-time nature usually cannot develop the degree of labor efficiency necessary to compete on a cost per case basis with large-scale egg processing operations. Small producers may be able to hold markets such as door-to-door routes, cafes and schools but they will not be able to compete for the large retailer outlets. The small producers generally have higher costs per case and insufficient volume to adequately service these outlets.

The maintenance of sufficient records on both physical inputs and outputs and costs is necessary for good management and profitable egg production and marketing. Rate of lay, percentage grade-out and the amount of seasonal variation in egg production were apparently unknown to many of the producers interviewed. Thus, optimum layer replacement patterns were not being used in many instances because the necessary decision-making information was not available.

Marketing Practices and Costs of Texas Egg Producer-Wholesalers

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POTENTIAL POPULATION GROWTH and below average per capita production of table eggs in Texas can help provide a favorable economic environment for Texas egg producers. This environment also provides an attractive market for out-of-state eggs. To compete with out-of-state eggs, Texas producers will need to be efficient in production and marketing (1). Sufficient volume to utilize fully the labor and equipment available and to permit labor specialization in the egg processing phase appears to be one of the necessary requirements for competing on a cost per unit basis in egg marketing.

The egg producer has various marketing alternatives which may be divided into two broad categories: selling ungraded eggs to a dealer-wholesaler and/or by-passing the wholesaler, and selling directly to retailers or consumers. This latter activity will be defined as that of the producer-wholesaler. (Producers whose total egg sales consisted of more than half of their own eggs which they had washed, graded, cartoned and sold to retailers or consumers.) The specific objectives of this study were: to describe the operations of producer-wholesalers; to estimate relative labor efficiency in both the processing and delivery phases among producer-wholesalers with differing numbers of layers; and to estimate costs per case for (a) labor in processing and delivery, (b) packaging and (c) truck use in delivery. The cost estimation involved synthesizing some costs.

CONTENTS

PROCEDURE

Sample Selection

In order to have a representative group of egg producer-wholesalers for the survey, Texas county agricultural agents were asked to list all known egg producers (and approximate number of layers on hand) in their respective counties who were grading, packing and selling their own eggs directly to consumers and/or retail food stores. The study was limited to those producers having 1,000 or more layers. This procedure was carried out during the summer of 1962. Data were available for 251 counties and 178 counties reported producers with 1,000 layers or more on hand in 1962; 684 producers met this requirement.

The final sample was selected on a basis of size stratification in order to include a greater number of those producers with large numbers of layers. A disproportionately large number of large producers were selected because of the trend toward larger egg producing units.

Table 1 contains both the total number of producer-wholesalers reported by county agents and the selected sample separated into the seven size groups used throughout the study. The size groups reflect the number of layers on hand during the summer of 1962 and the summer of 1963 for the total and sample producers, respectively. Although 69 producers were interviewed, the information necessary for some analyses was available on fewer than 69.

Data

The same interviewer obtained the required information from each of the selected producer-wholesalers. In many cases, complete records were either not available or not in a form usable for this type survey. In most cases, specific production records were not available.

Where recorded information was available, it was copied. Most data were related verbally by the operator based on his experience and observations. Information regarding the time spent in grading and packing, delivery and ad-

TABLE 1. DISTRIBUTION OF TOTAL PRODUCERS REPORTED AND SAMPLE PRODUCERS BY NUMBER OF LAYERS ON HAND, SUMMER, 1962

Size group	Layers on hand summer 1962	Producers	
		Total[1]	Sample[2]
		Number	
A	1,000- 2,249	302	15
B	2,250- 3,749	123	7
C	3,750- 7,499	136	14
D	7,500-14,999	67	12
E	15,000-29,999	31	10
F	30,000-49,999	12	6
G	50,000 and over	13	5
Total		684	69

[1]Reported for 251 counties.
[2]Layers on hand, summer 1963 for sample.

ministration were "best estimates" of the operator and should not be considered as actual measured times; miles traveled and the number and types of outlets were also based on producer estimates. Since most production records for 1962 (monthly) were not available in a usable form, estimates were utilized.

Limitations of Study

Cost analyses for production and marketing firms have been accomplished by various methods: (1) examining a fairly large number of sample of firms, (2) using a few selected "representative" firms or (3) developing model firms where selected variables can be held constant. Method 1 is generally the most expensive and method 3 the most inexpensive for obtaining data to examine selected variables. This study incorporates both a survey of a large number of firms and some synthetic techniques in estimating selected costs associated with egg processing and delivery. Thus, this study has the advantages of having examined actual egg producer-wholesaler operations while being limited in that some of the costs were estimated by a standardized method and do not necessarily represent actual costs incurred by the producers surveyed.

GENERAL CHARACTERISTICS OF PRODUCER-WHOLESALERS

Egg production was only one of two or more sources of income reported by most of the producer-wholesalers surveyed. Fifty-three of 69 producers (75 percent) had sources of income other than eggs; 33 had other farm activities, 26 had non-farm incomes and seven had both other farm and non-farm sources of income, Table 2. A higher proportion of the producers in the smaller groups had other sources of income, indicating the part-time nature of their egg enterprise. Small scale egg production and marketing is a complicating factor in terms of attaining an efficient egg marketing system for Texas. The small operations are either unable or unwilling to expand their size to permit a more economical use of labor and equipment as well as making them ineligible for volume discounts on packing and processing supplies. The level of overall efficiency attained in Texas egg marketing will depend to some extent on the size of the production and marketing units. Eggs are a national product and move in commerce from coast to coast. Texas markets are and will be increasingly more subject to out-of-state competition from areas where egg production is specialized and, therefore, generally efficient. Although lacking large volume, many smaller producers will be able to operate profitably on specialty markets.

Producers were questioned as to contractual arrangements with feed companies or others who might supply feed and birds while the producer supplied labor and buildings. Only 2 of the 69 producers reported arrangements of this type.

Based on the average "layers on hand" figure by size groups, the large producers had increased the scale of their operations significantly between 1960 and estimated 1964, Table 3. The percent change in the average number of layers on hand by size groups between January 1960 and estimated 1964 was as follows:

Size group	Percent change in layers on hand, January 1960—estimate January 1964
A	— 1.7
B	+ 9.7
C	+18.8
D	+54.9
E	+50.1
F	+72.6
G	+43.1
Texas	— 7.3
United States	— 3.6

The percentage rate of change varies directly with number of layers, the smaller producers tended to remain small while the large producers had increased their laying flocks significantly over this period. In comparison, the overall rate of drop in the number of layers on hand January 1 over the 5-year period was greater in Texas

TABLE 2. SOURCES OF INCOME IN ADDITION TO EGG SALES, BY SIZE GROUPS, 1962

Size[1] group	Producers		Number of producers by income sources in addition to egg sales		
	Total	With other income	Farm	Non-farm	Both
			Number		
A	15	15	11	6	2
B	7	6	3	5	2
C	14	9	4	6	1
D	12	10	7	3	0
E	10	8	4	4	0
F	6	3	2	1	1
G	5	2	2	1	1
Total	69	53	33	26	7
Percent	100.0	75.4	34.8	36.2	10.1

[1]See Table 1.

than in the U. S. mainly because of the decline in the number of small flocks.

It was originally hypothesized that producer-wholesalers would attempt to keep a fairly stable monthly production pattern in order to more fully utilize their grading and packing operation throughout the year; however, sufficient data were not available to answer this question. (The terms "grading and packing" and "processing" are used interchangeably in this study.) Most of the records were kept on a cash basis; that is, the cash value of sales was known but the number of dozens or cases associated with the cash records was not readily available. The main point here is that most of the producers' record keeping systems were far from adequate. Rate of lay, grade-out percentage and the amount of seasonal variation in egg production, all items of which the producer should be aware, were apparently unknown to many producers.

Each producer processed practically all of his own egg production. There were a few instances where producer-wholesalers sold ungraded eggs to other producers and/or wholesalers. Similarly, the total supply of eggs graded and packed by the producer-wholesalers surveyed came almost entirely from their own flocks. In some cases outside sources such as other producers or dealer-wholesalers supplied a small volume of eggs.

GRADING AND PACKING PHASE

Costs incurred in the grading and packing phase included labor, equipment, packaging supplies, utilities, building, inspection, taxes, insurance and interest on investment. In this study, the use of labor and the resulting labor cost per case were of primary importance. Labor utilization is one of the major areas in which efficiencies may be obtained. Labor costs and packaging costs accounted for 73 percent of the average costs per case of cartoned eggs (distribution costs excluded) for five Georgia farm grading plants; labor, 23.2 percent and packaging supplies, 49.7 percent (2).

The labor cost per case is influenced by the wage rate, skill of labor, amount of automatic egg processing equipment, volume handled, egg quality, percent requiring cleaning and the skill of the supervisor. The survey of producer-wholesalers did not attempt to hold constant any of these items in order to examine the effect of the others. Volume was the main causal variable under investigation. Generally, large volumes permit a higher degree of labor productivity and reduce labor costs per case. The economic question was, how did labor costs per case vary among the small, medium and large producer-wholesalers? Other studies have suggested that once sufficient volumes are attained, increases in labor productivity are slight, although total costs per case would continue to decrease with added volume because of the decline in fixed and overhead costs per unit. The only processing costs examined directly in this study were those associated with labor and packaging.

Labor Use

Producer-wholesaler labor use in marketing activities was separated into three general categories: (1) administration or supervisory, (2) washing, grading and packing and (3) delivery. The amount of time allotted to each activity was estimated by the manager of the producer-wholesaler operation. Administration time is treated as a residual since several functions were often performed by one individual. Among the smaller producers in particular, one man may have been keeping the books, making sales, grading and

TABLE 3. AVERAGE NUMBER AND RANGE IN NUMBER OF LAYERS ON HAND PER PRODUCER, BY SIZE GROUPS, JANUARY 1, 1960-64 AND SUMMER, 1963

Producers		Measure	Average number and range in number of layers on hand per producer by time period				
			1960	1962	1963		1964[1]
Size group	Number				January 1	Summer	
			— — — — — — — — — Number — — — — — — — — —				
A	15	Average	1,373	1,570	1,463	1,317	1,364
		Range	200-3,000	800-2,800	750-2,800	400-2,200	495-2,500
B	7	Average	2,886	2,986	2,986	2,984	3,167
		Range	1,500-4,000	2,200-4,000	1,500-4,000	2,590-3,500	2,500-3,500
C	14	Average	4,864	5,674	5,803	5,642	5,777
		Range	2,500-10,000	3,700-14,000	4,000-12,000	5,000-7,500	3,000-9,000
D	12	Average	10,100	12,091	12,650	10,500	15,642
		Range	5,000-22,000	5,000-22,000	9,000-22,000	7,800-14,600	10,000-29,000
E	10	Average	15,812	19,500	20,689	21,370	23,730
		Range	6,000-33,000	15,000-25,000	15,000-25,000	15,600-26,000	15,500-30,000
F	6	Average	24,666	33,417	38,750	39,283	42,583
		Range	15,000-40,000	24,000-40,000	28,000-46,000	33,000-46,000	38,500-55,000
G	5	Average	69,200	86,000	81,400	93,300	99,000
		Range	25,000-140,000	35,000-150,000	45,000-150,000	63,000-160,000	60,000-160,000

[1]Estimated by producers.

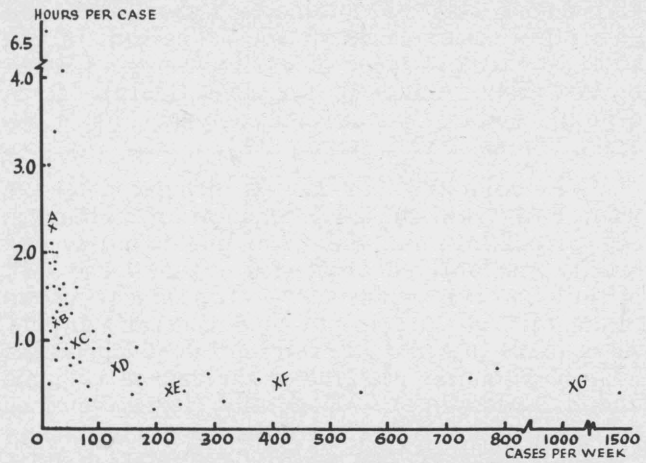

Figure 1. Average hours per case handled in processing by average number of cases processed per week, 53 producer-wholesalers, 1962. (X = seven size group averages)

packing as well as delivering the eggs, making it difficult to allocate his time among specific work tasks.

Significant differences in labor utilization and payment existed among the seven size groups. The 14 producers in group A had a total of 32 workers or roughly 2.28 workers per operation compared to the largest group, G, where three producers had 45 workers or an average of 15 workers per operation. As weekly volume processed increased, workers were more fully utilized in the processing and delivery phases; in group A the average weekly hours per worker in processing was 20.4 while in group G the workers average 45.4 hours per week. In some cases, particularly among the smaller producers, workers did several jobs around the farm in addition to working in the processing and/or delivery phases. Thus, the workers were not necessarily specialized egg handlers in that this activity took only part of their work day.

The use of hired labor should motivate the producer-wholesaler to maintain a high level of labor efficiency. The use of family labor may remove the labor cost motivation toward labor efficiency. For groups A, B, and C, only 29 percent of the workers were hired while 83 percent of the workers in group D, E, F and G were on the payroll.

TABLE 4. ESTIMATED NUMBER OF MAN-HOURS REQUIRED PER CASE IN PROCESSING AND DELIVERY PHASES BASED ON WEEKLY WORK SCHEDULES, BY SIZE GROUPS, 1962

Producers		Average weekly cases per producer	Estimated number of man-hours per case required in processing and delivery	
Size group	Number		Processing	Delivery[1]
		Cases	Hours	Hours
A	14	16.33	2.04	.79
B	7	29.10	1.29	.71
C	12	62.23	1.00	.35
D	8	122.72	.70	.24
E	6	219.00	.48	.18
F	3	408.10	.51	.23
G	3	1,009.80	.52	.10

[1]For cases actually delivered.

Source: Interviews with producers. Total labor allotted to the particular activity divided by the total weekly cases sold by the size group.

Estimated Labor Productivity

Labor productivity in terms of man-hours per case handled was estimated for the processing and delivery phases. The hours per case figure was derived by dividing the total average weekly hours worked in processing and delivery by the total number of cases associated with the particular phase, processing or delivery, by size groups, Table 4.

The number of man-hours per case processed showed a generally steady decrease as volume increased, Table 4 and Figure 1. Comparing group A and E, respectively, the man-hours per case in processing dropped from 2.04 to .48 or by roughly 75 percent. Group E had the lowest average man-hours per case figure among the seven size groups. Groups F and G were slightly above the E group even though E group producer's average weekly volume was only 219 cases compared with 408 cases and 1,009 cases for F and G, respectively.

One partial explanation for the relatively high labor efficiency found in group E could be the low percentage of eggs cartoned by that group, Table 5. Fewer hours of labor are required when eggs are packed loose in cases rather than in cartons (3). The average percentage of the weekly egg output cartoned for the seven groups was 79, while group E cartoned only about 54 percent. Groups F and G cartoned 97 and 92 percent, respectively.

The number of cases processed per man-hour would be expected to remain relatively constant once a certain volume per hour was attained. Peeler and King's model plant analysis assumed a cases-processed-per-man-hour figure of about 3.2 which was used in each of their model plants (4). In their study, the model plant capacities were multiples of 20 case-per-hour equipment lines and processing labor efficiency was assumed constant. An Oklahoma model egg processing plant study using hand operation processing methods indicated an increase in the number of cases processed per man-hour from 2.0 to 3.4 as plant capacity increased from six cases per hour to 96 cases per hour (5). The Oklahoma study reported that an attainable standard in processing eggs (candling and case handling) is 3.3 cases per man-hour. The 2.0 cases processed per man-hour (including washing) by the most efficient selected Texas producer-wholesalers is considerably below the 3.3 cases per man-hour standard (excluding washing). The producer-wholesalers in group A processed only about one-half case per man-hour, Table 4.

In Figure 1, it is apparent that the variation in man-hours per case around the group aver-

ages is considerable, particularly at average weekly volumes of less than 80 cases. Such factors as quality, percent requiring washing, percent cartoned, the type of processing equipment in the egg room and the skill and motivation of the workers would all affect labor efficiency. Producer processing facilities were not necessarily comparable in these attributes.

In summary, it appears that the increase in labor productivity was significant as the average number of cases processed weekly per producer increased from 16 to 219. Further, there were considerable differences in the labor productivity estimates among the low-volume producers, and it was apparent that many of these operations were not using their labor as efficiently as possible in the processing phase.

Labor Costs

Labor costs per case are determined by the wage rate and the number cases handled per worker during the pay period.

In order to estimate labor costs for processing and delivery, wages were imputed at one dollar an hour where no wages were actually paid; only 140 of the total 227 workers associated with the 53 producers were hired labor. The fact that many of the smaller producers paid no direct labor costs could account for their remaining in business with a relatively high cost per case situation; they were allotting themselves low returns for their labor. In several instances, money wages were considerably below one dollar per hour; however, on occasion low money wages were supplemented with food and housing provisions, making it difficult to determine the precise labor cost. The imputed dollar an hour rate actually raised the average in most instances, only the producers in groups E and F had average wages of over one dollar per hour. In practically all cases, delivery labor was paid at a considerably higher rate than was processing labor. Only men performed the route duties while women tended to be in the majority in the processing phase and received a lower wage than men. Higher delivery wages are explained to a large extent in that the work load is heavier and the responsibility for the vehicle and egg sales and collections is greater than that associated with the supervised processing phase.

Table 6 treats all units on a hired labor basis using the actual wages paid and one dollar per hour where wages were not paid as such. As noted previously, favorable labor efficiencies appeared to be reached at around 200 to 250 cases per week and processing labor costs per case did not decline for larger volumes. Estimated labor costs per case processed decreased from $1.90 for group A to 37 cents for group E.

Equipment Costs

The average annual equipment cost per case would depend on the amount of automatic egg handling equipment used relative to the volume processed. Technically, automatic egg processing equipment is a substitute for hand operation labor and vice versa. In an area with relatively low wages, hand operation labor may be economical while in relatively high wage areas automatic egg processing equipment should be considered. Because of the small number of large producers and the general method in which the equipment cost data were taken, no specific conclusions were made regarding equipment use and labor productivity.

TABLE 5. AVERAGE PROPORTION OF EGGS CARTONED WEEKLY, BY SIZE GROUPS, 1962

Producers		Average percentage of eggs cartoned
Size group	Number	
		Percent
A	13	91.72
B	7	79.37
C	11	63.23
D	7	70.78
E	6	54.41
F	2	97.07
G	2	91.72
Total or average	48	78.65

DELIVERY PHASE

The second major phase of the producer-wholesaler's marketing activities was the delivery of eggs among various market outlets. About 85 percent of the eggs processed by 52 of the producers were off-farm deliveries; the remainder were sold at the farm.

Information on the number and types of market outlets was available for 62 producers, Table 7. Retail food stores were the dominant outlet in terms of both number (70 percent) and volume of eggs. Detailed information on volume by type of outlet was not generally available. A high proportion of the smaller producers, 37 percent of the producers in groups A, B and C, sold

TABLE 6. AVERAGE NUMBER OF CASES PROCESSED WEEKLY AND AVERAGE LABOR COSTS PER CASE IN PROCESSING AND DELIVERY, BY SIZE GROUPS, 1962

Producers		Average cases processed per producer		Average labor costs per case[1]	
Size group	Number	Average	Low-high	Processing	Delivery[2]
		Cases		Dollars	
A	14	16.33	8-24	1.90	.77
B	7	29.10	18-36	1.23	.71
C	12	62.23	44-153	.92	.41
D	8	122.72	59-244	.60	.25
E	6	219.00	165-312	.37	.34
F	3	408.10	288-549	.47	.32
G	3	1,009.80	477-1,500	.44	.15

[1]Where family (non-paid) labor was involved, wages are imputed at $1.00 per hour.
[2]For delivered cases only.
Source: Producer's estimates and records where available.

TABLE 7. TYPES AND NUMBER OF MARKET OUTLETS UTILIZED BY PRODUCER-WHOLESALERS, BY SIZE GROUPS, 1962

Producers		Types and number of market outlets					
				Producers selling			
Size group	Number	Retail food stores	Wholesalers	On consumer routes	At farm	Cafes	Other[1]
				Number			
A	15	49	3	7	4	1	1
B	7	12	4	3	4	19	3
C	13	118	2	3	6	38	8
D	12	174	11	0	7	69	16
E	8	99	5	1	4	4	0
F	4	233	7	0	1	52	8
G	3	37	4	0	2	0	4

[1]Rest homes, hospitals, schools and military installations.

directly to consumers on door-to-door routes which tended to decrease the number of eggs delivered per hour.

Table 8 presents a more complete picture of the delivery phase. As producer size increased, the geographic marketing area and total milage tended to increase. The average distance for group B producers to the furthest delivery point was only 13.0 miles while that for the three plants in group G was 153.0 miles. The rather extreme increase in cases delivered per hour between groups F and G was due to the large number of outlets per producer in group F relative to those in group G, Table 7. The density of distribution (cases per mile of weekly travel) varied directly with volume delivered, indicating that the smaller producers were driving a disproportionately greater number of miles in order to sell their eggs. Although the number of outlets per producer did tend to increase as producer size increased, the volume per outlet increased at a faster rate which reduced the time required per case delivered. The range figures in Table 8 indicate that there were exceptions in the average number of cases delivered and cases per mile among the seven groups. For example, one producer in group A was delivering about .41 cases per mile which was almost as high a rate as one of the producers in group G with .43 cases per mile. For cases delivered per hour, one producer in group A was distributing an estimated 5.20 cases per hour which was greater than one producer in group F at 2.88 cases per hour. The overlap in distribution efficiency among producers in the seven size groups emphasizes the effects of number of outlets and total milage on distribution efficiency.

Labor Efficiency and Costs

Differences in costs per case for egg delivery were mainly associated with variations among total cases delivered, total mileage and the number of stops involved. For example, a large volume delivery over a short distance to a single outlet should be a low delivery cost per case situation; whereas, a small volume of eggs delivered to numerous outlets which are widely scattered would be a high cost situation. There are various combinations between these two extremes. The delivery labor efficiencies associated with large volume are evident in Table 8 where the producers in group A averaged delivering about 1.27 cases per hour, while the producers in group G delivered an average of 10.55 cases per hour.

In order to examine the effect of volume, mileage and number of outlets on labor use per case delivered, multiple regression analysis was employed. The estimating equation was:

$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4$$

where: Y = cases delivered per hour
X_1 = total delivery miles per week
X_2 = number of outlets
X_3 = percent of delivered eggs distributed on consumer routes
X_4 = total cases delivered per week

Outlets were separated into two categories—X_2 and X_3—that is, regular stops such as retail food stores, cafes, hospitals and schools and the general category of door-to-door consumer routes where small volumes were distributed among many stops, respectively. Number of outlets and cases per week were not combined into cases per outlet because specific volume per outlet information was not available.

Due to incomplete delivery information, only 47 producers were used in the regression analysis.

The resulting equation was: $Y = 4.94077 - .00724X_1 - .08733X_2 - .04451X_3 + .02658X_4$
(.00316) (.03598) (.02084) (.00767)

TABLE 8. AVERAGE MILEAGE AND TIME USED PER PRODUCER IN THE DELIVERY OF WEEKLY EGG SALES, BY SIZE GROUPS, 1962

Producers		Mileage per producer				Cases delivered per producer			
		Most distant outlet		Weekly mileage		Per mile		Per hour	
Size group	Number	Average	Range	Average	Range	Average	Range	Average	Range
		Miles				Cases			
A	14	17.4	2-43	92.3	25-292	.171	.07-.41	1.27	.67-5.20
B	7	13.0	1-34	130.1	14-210	.197	.14-1.35	1.41	.60-4.53
C	12	25.5	3-95	169.7	0-312	.299	0-.72	2.87	0-5.40
D	8	30.4	2-80	380.7	18-955	.232	.18-2.21	4.25	1.98-15.92
E	5	35.2	3-85	286.0	20-390	.647	.56-1.84	5.68	3.67-18.42
F	3	59.6	46-75	530.0	380-680	.799	.42-1.42	4.32	2.88-6.12
G	3	153.0	23-291	1,282.0	600-1,846	.691	.43-1.07	10.55	6.87-13.89

All regression coefficients were significant at the 95 percent level.[1] As expected, mileage (X_1), number of outlets (X_2) and percent of eggs distributed on consumer routes (X_3) each had an adverse effect on cases delivered per hour while volume (X_4) had a positive effect. Interpreting the equation; if volume delivered per week increased by ten cases (mileage, outlets and percent distributed on routes remaining constant) then the increase in cases handled per hour would be .2658 or about ¼ of a case. In contrast, if the number of outlets served increased by ten (other variables remaining unchanged), the number of cases delivered per hour would decrease by .873 or almost 9/10 of a case. Although there was considerable variation among producers in the number of cases handled per hour and therefore the labor cost per case, the larger producers generally delivered eggs for less labor cost per case than the small producers. Table 6 shows the estimated labor costs per case delivered for the 53 producers in the seven groups. Labor costs per case varied from an average of 77.0 cents for group A to 15.0 cents for group G, indicating the importance of the effect of volume per stop on delivery labor productivity.

Delivery Equipment

Automobiles and ½-ton pickups were used extensively among the smaller producers and trucks (one ton and larger) were used in the F and G groups for egg delivery. The multipurpose use of vehicles throughout the seven size groups, but particularly among the smaller producers, made it impractical to determine the proportion of annual vehicle costs which should be attributed to egg delivery. Synthesized or representative truck costs will be incorported in a later section.

COSTS SYNTHESIZED

Costs per case for processing and delivery labor, packaging and truck expense were estimated by a synthetic procedure. Labor costs were estimated by aggregating the total wage costs, both actual wages paid and the one dollar an hour imputed cost, on a weekly basis and dividing those by the average total weekly cases processed by the particular size group. Delivery labor costs were computed similarly, using the cases delivered as the denominator. The determination of packaging costs and truck expenses is explained in a following section.

Processing Costs

Processing costs in this study include only processing labor and packaging materials. The remaining portion of total processing costs per case will be estimated in a following section. Processing labor costs are those presented in Table 6.

[1] The coefficient of multiple correlation was .5613; standard error of estimate, 3.2692.

Packaging costs are somewhat of a fixed cost per case and do not necessarily decline significantly with increases in volume although volume discounts were apparent in some instances. Packaging costs depend on what the producer has to pay for cartons, cases, filler flats and sealing tape. Some producers were in a position to reuse both cartons and cases which reduced their packaging costs per unit. Among the 69 producer-wholesalers contacted, numerous packaging costs situations were found. Some producers reused cartons and cases while others reused cases but used only new cartons. Other producers purchased used cases and flats while a few obtained them without cost. Carton costs vary depending on the size of egg to be packed and the carton design. The average carton cost among 56 producer-wholesalers was 2.57 cents per carton. In order to estimate the average per case packaging costs the following assumptions were made: (1) carton cost at 2.57 cents each; (2) delivery cases at 20.0 cents per case and (3) one-piece filler flats at 2.0 cents each; 14 filler flats are used per case where eggs are not cartoned. Total estimated packaging cost per case (no items reused, all cases hold 30 dozen) would be:

Unit	Cartoned	Loose
	Cents	*Cents*
Per case	97.1	48.0
Per dozen	3.24	1.6

The average total packaging cost per case for a producer's total weekly volume would depend on the percentage of his eggs cartoned, Table 5.

Delivery Costs

Labor and truck costs constitute delivery costs. Delivery labor costs per case are presented in Table 6. Vehicles of numerous types, sizes and ages were used to transport eggs from the farm to the various market outlets. Truck costs per case will vary considerably depending on the wear and tear on the truck as determined by driver practices, road conditions, weather, maintenance, vehicle age and other factors. Truck size and percent of capacity utilized would also affect per unit costs. Truck expenses were estimated by using standard costs and applying them to delivery routes with differing characteristics. Such routes are representative of those observed among the producers interviewed.

In order to estimate truck costs, two general types of chassis were used: a one-half ton pickup and a 2-ton truck with an insulated van; one-half ton trucks can haul up to 50 cases while the 2-ton truck is capable of hauling 250 cases.

The general assumptions regarding one-half ton truck use were 12,000 miles annual travel and straight-line depreciation over 7 years. Fixed costs were computed as follows: a one-half ton truck cost $2,180 delivered in Central Texas (salvage value of 10 percent, $218); 5 percent interest on investment (5 percent of one-half

TABLE 9. ESTIMATED OPERATING COSTS FOR ONE-HALF TON TRUCK; 12,000 MILES PER YEAR

Fixed costs	Annual Dollars	Per mile Cents
Depreciation[1]	248.54	2.071
Interest[2]	66.96	.558
Insurance (liability only)	47.00	.392
Registration	9.46	.079
Total	371.96	3.100
Variable costs	**Annual Dollars**	**Per mile Cents**
Gasoline	226.28	1.886
Oil and filter	12.94	.108
Lubrication	1.25[3]	.010
Tires	133.32	1.111
Repair and maintenance	180.00	1.500
Total	553.79	4.615
Total costs	925.75	7.715

[1]Seven years depreciation on original cost minus tires and salvage value.
[2]Five percent on one-half of depreciable balance plus salvage value.
[3]Wholesale grease cost; no labor charge.

of depreciable balance—original cost less tires—plus salvage value); liability insurance of $47 per year and registration costs of $9.46 per year.

Variable costs apply within the following assumptions: 14 miles per gallon at 26.4 cents per gallon; 6 quarts of oil at 22.25 cents per quart plus $1.90 filter each 3,000 miles; lubrication each 2,000 miles; tire cost at 1.11 cents per mile and repairs and maintenance at 1.5 cents per mile (6). The fixed and variable costs are presented in Table 9. Average total costs per mile of travel are 7.715 cents.

The 2-ton truck was assumed to travel 25,000 miles per year and depreciated over 6 years. Fixed costs were as follows: a 2-ton truck chassis delivered to Central Texas lists at $2,801 (salvage value $280.10) an aluminum-insulated van with capacity of 250 cases lists at $1466.76 installed; the van is depreciated over 10 years;

TABLE 10. ESTIMATED OPERATING COSTS FOR 2-TON TRUCK WITH 250 CASE INSULATED VAN; 25,000 MILES PER YEAR

Fixed costs	Annual Dollars	Per mile Cents
Depreciation[1]	444.42	1.778
Interest[2]	127.82	.511
Insurance (liability only)	47.00	.188
Registration	17.57	.070
Total	636.81	2.547
Variable costs	**Annual Dollars**	**Per mile Cents**
Gasoline	825.00	3.300
Oil and filter	26.94	.108
Lubrication	2.60[3]	.010
Tires	367.23	1.469
Repair and maintenance	500.00	2.000
Total	1,721.77	6.887
Total cost	2,358.55	9.434

[1]Depreciated over 5 years on original cost minus tires, tubes and salvage value; van depreciated over 10 years.
[2]Five percent on one-half of depreciable balance plus salvage value.
[3]Wholesale grease cost; no labor charge.

5 percent interest on investment; liability insurance of $47 annually and registration of $17.57.

Using the same prices as above, variable costs were computed on the basis of: 8 miles per gallon; 6 quarts of oil and filter every 3,000 miles; lubrication every 2,000 miles; tire costs at 1.469 cents per mile and repairs and maintenance at 2.0 cents per mile. Total costs per mile are 9.434 cents, Table 10.

Volume has already been shown to be an important variable in delivery labor efficiency. Using the data in Tables 4 and 8 delivery costs per case for various route situation can be estimated. Table 11 indicates that average total delivery costs per case declined steadily as average weekly volume delivered per producer increased, dropping from $1.22 to 29.0 cents per case between groups A and G. Of course, the amount of delivery costs per case is influenced not only by volume but also by cases per stop, distance and the proportion of the eggs delivered on door-to-door consumer routes. For example, using the same procedure by which the estimated costs in Table 11 were obtained, one producer in group A had an estimated delivery cost per case of 54.8 cents due to low mileage and few stops while one of the group F producers had an estimated cost of 61.2 cents per case due mostly to a large number of outlets and, consequently, both low volume and high cost per stop. Delivery costs, both labor and truck, must be recovered by the producer if his additional egg marketing activities are to be profitable.

Partial Costs: Labor, Packaging and Truck Use

Estimated labor costs per case, Table 6, for washing, grading and packing and for delivery can be combined with estimated packaging costs and truck expenses to obtain estimates of cost per case for these items.

Table 11 presents the estimated average costs per case for processing and delivery labor, packaging and truck use for the seven size groups. Although these three cost components constitute a majority of the cost per case (roughly 74.0 percent in the Georgia study) (2), they represent only a partial cost. Other costs such as utilities, repairs and maintenance, management and office cost, depreciation and interest on investment for building and equipment, insurance and taxes are not included.

The partial cost estimates in Table 11 are synthetic in that standardized truck costs and packaging costs were used in conjunction with the time and distance estimates reported by producers. Also, labor costs were assigned where none were actually paid to family labor. The costs in Table 11 can be used to examine the effect of volume on labor efficiency in both the processing and delivery phases and of route structure on delivery costs. Costs per case declined steadily

with increases in weekly volume. Group E had the lowest processing costs per case ($1.12) and the lowest partial cost per case ($1.61) although group G had nearly the same partial cost per case ($1.66) due to their particularly low delivery costs. Group E's low processing cost may be partially explained in that those plants, on the average, cartoned only 54 percent of their eggs while groups F and G cartoned 97 and 92 percent, respectively.

Figure 1 shows that, although the producers are not strictly comparable in terms of methods, equipment or egg quality, wide variations in labor productivity per case were present at small weekly output levels. Although most of the small producer-wholesalers were not incurring hired labor costs, their egg marketing activities were costly in the sense that the family labor was, in many instances, receiving a lower return than they might have earned in other employment.

PRICES AND COSTS

The main economic reason for a producer processing and delivering his eggs is that the difference between the price paid by the dealer-wholesalers and that paid by retailer and/or consumer outlets would be large enough to justify profitably the additional cost per dozen. The opportunities for selecting market outlets are probably quite varied. For example, it might be feasible for a small producer to process his eggs and market them door-to-door at retail prices as an alternative source of income, however, it may not be feasible for a large producer with paid labor to attempt to market his eggs door-to-door. The most profitable type of market outlet applicable would depend on the particular situation which the producer faces.

It is possible to get a general idea of the price situation which the producers faced in 1962 by comparing reported prices paid at stations for Grade A large eggs on a loose basis in six Texas areas with the prices received reported by the selected producer-wholesalers. Prices paid producers for Grade A large eggs on a loose basis during 1962 were estimated by averaging the midpoints of weekly (Tuesday) price ranges reported for the six areas; Lubbock, Dallas-Fort Worth, East Texas, Houston, South-South Central and Corpus Christi (7). This method provides a rough estimate of the producer's price for loose packed Grade A large eggs at the wholesale level in Texas. The annual averages of the price range midpoints for the six areas for Grade A large eggs during 1962 were as follows:

Area	Grade A large average price per dozen (midpoint) 1962
	Cents
Lubbock	33.42
Dallas-Fort Worth	30.98
East Texas	32.90
Houston	35.10
South-South Central	34.59
Corpus Christi	32.75
State	34.17

These above prices are averages of midpoints of price ranges in the six areas, not average or weighted average prices.

Because of the problems in obtaining the prices received by the selected producer-wholesalers by weeks or months, it was decided to get only the peak-winter price and the low-summer price for various market outlets. The producer-wholesalers' winter and summer prices for what were reported as generally Grade A large eggs sold to retail outlets in cartons were based on information from 44 producers. The average peak-winter price was 51.8 cents per dozen and the average low-summer price was 39.6 cents per dozen, Table 12. The peak-winter price average for the six state areas was 39.7 cents per dozen, and the low-summer price was 26.2 cents per dozen. Assuming that the Texas area prices and the producer-wholesaler prices are approxi-

TABLE 11. ESTIMATED AVERAGE COSTS PER CASE FOR PROCESSING AND DELIVERY LABOR, PACKAGING, TRUCK AND COMBINED COSTS PER CASE, BY SIZE GROUPS: BASED ON OPERATIONS OF 53 PRODUCERS-WHOLESALERS, 1962[1]

Size group	Costs per case						Total	Cost per dozen[2]
	Processing costs			Delivery costs				
	Labor	Packaging	Total	Labor	Truck	Total		
	Dollars							Cents
A	1.90	.93	2.83	.77	.45	1.22	4.05	13.5
B	1.23	.87	2.10	.71	.39	1.10	3.20	10.7
C	.92	.79	1.71	.41	.26	.67	2.38	07.9
D	.60	.83	1.43	.25	.33	.58	2.01	06.7
E	.37	.75	1.12	.34	.15[3]	.49	1.61	05.4
F	.47	.96	1.43	.32	.15	.47	1.90	06.3
G	.44	.93	1.37	.15	.14	.29	1.66	05.5
Weighted average	.56	.87	1.43	.28	.19	.47	1.90	06.3

[1]Time required in processing and delivering as estimated by producers interviewed. Wages are actual where paid and imputed at $1 an hour where family labor was used. Packaging costs were based on representative costs reported by producers and vary per case depending on proportion of eggs cartoned.

[2]Total cost does not include the following processing cost items; equipment, utilities, building, cooler, inspection, taxes, insurance and interest on investment.

[3]One-half ton trucks for groups A, B, C and D; two-ton trucks for groups E, F and G.

TABLE 12. COMPARSION OF ESTIMATED AVERAGE PRICES FOR EGGS SOLD LOOSE AT WHOLESALE IN SIX TEXAS AREAS AND PRICES RECEIVED FOR CARTONED EGGS SOLD AT RETAILER OUTLETS BY PRODUCER-WHOLESALERS DURING WINTER AND SUMMER PERIODS, 1962

Time period	Estimated average prices for Grade A large eggs: cents per dozen		Difference
	Wholesale loose basis[1]	Cartoned for retailers[2]	
	Cents		
Fall-winter	39.7	51.8	12.1
Spring-summer	26.2	39.6	13.4
Average	33.4		

[1]Determined by averaging midpoints of (weekly: Tuesday) price ranges reported for six Texas areas. Winter price is the high weekly price and the summer price is the low weekly price for 1962.
[2]Average of low-summer and peak-winter prices obtained from 44 producer-wholesalers.

mately representative of prices paid at alternative outlets, wholesale as compared with retailers, it appears that a 12 to 13 cent margin existed between these types of outlets.

The partial costs per dozen, Table 11, may be adjusted to an estimated total cost per dozen by dividing the partial costs by 74 percent, the average proportion of total costs per dozen which labor, packaging and truck expense were found to represent in the Georgia study.[2] Using this procedure, partial costs per dozen, Table 11, are raised from 13.5 cents to 18.0 cents in group A and from 5.4 cents to 7.2 cents in group E. Groups D, E, F and G's estimated total costs per dozen varied from 8.9 cents to 7.2 cents, suggesting that these groups were processing and delivering eggs for a cost within the approximate margin determined above.

Groups A and B with estimated total costs per dozen 18.0 cents and 14.3 cents, respectively, would not fall within the general margin limits, but their presence in the market could be explained by their acceptance of returns for their labor and capital of less than market value, and/or the receipt of higher prices than indicated in Table 12. Group C is a borderline case at 10.5 cents per dozen. Of course, an individual producer could develop a specialty market by selling a high quality egg with farm-fresh appeal and get a higher margin than 12.0 to 13.0 cents per dozen over wholesaler prices. On the other hand, some producers may have been getting smaller margins and very low returns on their labor and investment.

The number of assumptions upon which the information in Tables 11 and 12 is based must be emphasized and additional study of specific price and market alternatives would be necessary in order to draw firm conclusions regarding the most desirable market outlets for specific egg producers.

[2]This procedure assumes that costs other than labor, packaging and truck use varied proportionately among different sizes which is not fully justified.

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