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Relationships of MARKETING methods to costs of ASSEMBLING, GRADING, and PACKAGING table EGGS

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Relationships of MARKETING methods to costs of ASSEMBLING, GRADING, and PACKAGING table EGGS*

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EGG PRODUCTION has maintained a steady increase in Alabama during the past decade. A period of rapid industrial expansion and of declining average prices for other major farm products has contributed to an expansion in production and marketing opportunities for eggs.

A favorable climate, an increase in population, and relatively cheap feed supplies have contributed to the ability of farmers in Alabama and other Southern States to effectively compete in egg production. In the past, two weaknesses in marketing southern eggs have been seasonality of production and a lack of sufficient concentration to obtain advantages of size in assembly and distribution.

OBJECTIVES OF THE STUDY

The general purpose of the study was to obtain information that would aid in the development of a commercial egg industry by providing time and cost data on assembling, grading, and packaging eggs. Specific objectives were:

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1. To determine costs of operating egg pickup routes in relation to—
   a. Volume of eggs picked up at individual farms,
   b. distances between supplying farms, and
   c. volume of eggs picked up and number of trucks operated by individual collecting firms.
2. To determine costs of grading and packaging eggs in relation to—
   a. Volume of eggs handled,
   b. alternative locations of grading and packaging operations at farms, central stations, and wholesale distribution center, and
   c. alternative methods of performing grading and packaging operations.

METHOD OF STUDY

Names of Alabama egg route operators and of producers who were assembling, grading, and packaging eggs were obtained from personnel of the Auburn University Cooperative Extension Service, commercial egg buyers, feed dealers, and others. Data were obtained from operators of 15 assembly routes, 25 producers who were packaging eggs, and 7 central grading stations during the summer of 1959.

For pickup routes, data were obtained by traveling with route men, and recording jobs and time required as they were performed. Also, information pertaining to the overall operations, such as overhead costs, was obtained from the operator.

Producers were selected at random within counties to provide a range in volume of eggs graded, variety of operations performed, and representation from various areas of the State. Operating costs and time data were obtained through observations of actual operations. Non-operating costs were taken from records where available.

The seven central grading stations from which data were obtained represented about three-fifths of such stations in the State in 1959. Data were obtained by observing actual operation and from records of the firms.

ASSEMBLY COSTS ON EGG PICKUP ROUTES

Larger and fewer commercial flocks contribute to lower assembly costs for eggs. Cost of assembling eggs from two producers with flocks of 10,000 hens each, for example, is much less than from 40 producers with 500 hens each.

Assembly costs do not fluctuate with retail egg prices. Assemblers must perform all operations necessary for maintenance of quality at

TABLE 1. COSTS PER CASE FOR ASSEMBLING EGGS RELATED TO VARIOUS FACTORS, 13 EGG PICKUP ROUTES, ALABAMA, 1959

Route	Cost per case	Cases picked up	Length of route	Cases per mile	Time on route	Cases per hour
Number	*Cents*	*Number*	*Miles*	*Number*	*Hours*	*Number*
10	0.03	189.0	39.1	4.8	2.5	75.6
9	.06	45.0	13.8	3.3	1.3	34.6
6	.08	57.3	43.0	1.3	2.9	19.8
11	.12	285.0	126.7	2.2	10.6	26.9
5	.12	30.0	42.5	.7	1.8	16.7
2	.14	110.0	130.0	.8	6.0	18.3
8	.21	115.0	211.9	.5	8.2	14.0
15	.28	15.0	47.6	.3	1.6	9.4
13	.34	38.9	76.1	.5	5.8	6.7
14	.46	6.1	18.3	.3	1.4	4.4
3	.64	20.0	116.0	.2	3.6	5.6
12	.95	14.6	72.1	.2	4.2	3.5
1	1.42	15.5	160.0	.1	9.8	1.6
Weighted average	0.17	72.4	84.4	0.9	4.6	15.8

all times. These operations require the same amount of time, labor, and equipment per case when eggs are retailing for 40 cents as when eggs are retailing for 60 cents per dozen.

Routes on which data were obtained varied from 13.8 to 211.9 miles in length. Costs per case, however, were not closely related to length of route, but were related negatively to the number of cases picked up per mile and the number of cases picked up per hour, Table 1.

Costs per case varied from a low of 3 cents on a 39-mile route to a high of $1.42 on a 160-mile route. The weighted average cost for assembling eggs on the 13 routes was 17 cents per case. Labor, the most expensive item, comprised 40 per cent of total costs. Other variable costs amounted to 38 per cent of the total and fixed costs 22 per cent. When separated according to variable and fixed costs, the average for all routes per mile was as follows:

Expense item	*Average cost per mile*
Wages	$0.056
Other variable costs	.054
Fixed costs	.032
Total	$0.142

For those routes on which costs per case were less than 20 cents, route men picked up an average of 1.8 cases per mile or 28.5 cases

TABLE 2. ASSEMBLY COSTS RELATED TO PROPORTION OF TRUCK CAPACITY UTILIZED, 13 EGG PICKUP ROUTES, ALABAMA, 1959

Cost group	Weighted average cost per case	Proportion of truck capacity used
	Cents	*Percentage*
Low	0.09	79.6
Medium	.25	45.3
High	.92	24.4
All groups	0.17	62.6

per hour. These same route men traveled 11.6 miles between stops and picked up 21.1 cases per stop. Approximately 13 minutes were spent per stop. For routes on which costs per case were greater than 20 cents, an average of 0.3 case per mile or 6.4 cases per hour were picked up.

Total time spent on routes varied between 1.3 and 10.6 hours, or an average of 4.6. Routes that required the most time were relatively long and generally involved more stops. Route men spent 55 per cent of their time driving, 30 per cent at stops to pick up eggs, and 15 per cent at stops for other purposes.

Only one route operator used more than one truck in the egg assembly operation. Operators of seven routes owned more than one truck, but the additional trucks were used in the operation of other enterprises.

Assembly costs per case were associated with the proportion of truck capacity used, Table 2.

Approximately 63 per cent of the combined capacities of all trucks was being utilized. This proportion was less during seasons of low egg production. Only two operators — one in the low- and one in the medium-cost groups — hauled feed on assembly trucks. In both of these instances, the quantity of feed hauled was negligible.

GRADING AND PACKAGING EGGS

Producers

Information was obtained from 25 flock owners who were cleaning, candling, casing and/or cartoning eggs for fresh-egg markets[1]. Slightly over half of these owners were engaged in general farming operations from which they received more than half of their income.

[1] Because two or more operations were combined by some flock owners, all 25 are not represented in all specific operations.

TABLE 3. NUMBERS OF HENS, CASES OF EGGS PREPARED, AND PRODUCTION CASES PREPARED WERE OF THE MAXIMUM NUMBER POSSIBLE, ONE WEEK, BY GROUPS, 24 FLOCK OWNER[1], ALABAMA, 1959

Range in cases of eggs prepared	Laying hens, average	Cases prepared, average	Per cent dozens prepared were of dozens possible
	No.	*No.*	*Pct.*
Less than 13	527	5.6	55
13 to 26	1,720	18.1	54
27 and above	7,421	89.2	62
Average	3,035	35.2	60

[1] One owner was omitted from this table because he was preparing eggs from a neighboring flock.

Approximately a third received more than half their income from the sale of eggs. Three were employed off the farm 100 days or more during the year.

Numbers of laying hens in flocks varied from 200 to 17,800. Three out of five owners had flocks with less than 2,000 hens; one out of four had flocks with 3,000 or more hens. Twelve per cent had flocks of 10,000 or more.

Since numbers of hens in a flock should be associated with numbers or dozens of eggs produced by the flock, and since dozens of eggs prepared for market were of primary interest, data were arrayed on the basis of dozens of eggs prepared for market. This analysis was based on the volume prepared for market during the week prior to the time questionnaires were taken.

Arrayed data indicated a grouping as follows: Owners preparing less than 13 cases, those preparing 13 to 26 cases, and those preparing 27 or more cases.

Flocks belonging to owners preparing less than 13 cases and to those preparing between 13 and 26 cases had approximately the same rate of lay, Table 3. Flocks belonging to owners preparing more than 26 cases, which were the larger flocks, had the highest rate of lay.

Time required. All owners followed the general procedure of cleaning, candling and grading, and putting eggs in either cases or cartons or both.

More time was devoted to candling and grading than was devoted to other practices, Table 4. For all owners, time spent on candling and grading was about a third more than that on casing and cartoning, and twice that in the cleaning operation.

Time required per dozen for all practices was related to the quantity prepared, Table 4. Per-dozen time requirements were greatest

TABLE 4. TIME DEVOTED TO PREPARATION OF EGGS, BY VOLUME PREPARED PER WEEK, 25 FLOCK OWNERS, ALABAMA, 1959

Cases of eggs prepared per week	Average cases prepared per week	Time per case			Total time for cleaning, casing, and/or cartoning
		Cleaning	Candling	Casing and/or cartoning	
	No.	*Hr.*	*Hr.*	*Hr.*	*Hr.*
Under 13	5.6	0.327	0.618	0.498	1.095
13 to 26	18.1	.309	.513	.387	.837
27 and over	89.2	.216	.348	.213	.543
Average	35.2	0.267	0.498	0.372	0.804

for the group preparing the fewest number of dozens, and was least for the group preparing the greatest number of dozens. The rate at which owners who had less than 13 cases per week prepared eggs was equal to approximately three-fourths that for owners who had 13 to 26 cases per week, and half that for owners who had above 26 cases or more per week, Table 5.

Seven owners employed some hired labor. Output for hired labor was approximately 1.5 times that for family labor.

Cost of labor. Labor costs were calculated for each of the operations performed. Family labor was valued at 60 cents per hour, and actual wage rates paid hired labor by owners were used. The average rate paid hired labor was 57 cents per hour.

Labor cost for the three operations (cleaning, candling and grading, and casing and cartoning) amounted to approximately 48 cents per case, Table 6. Candling and grading comprised 42 per cent, casing and cartoning 32 per cent, and cleaning 26 per cent.

TABLE 5. RATE OF OUTPUT IN PREPARING EGGS FOR MARKET, BY VOLUME PREPARED PER WEEK, 25 FLOCK OWNERS, ALABAMA, 1959

Cases of eggs prepared per week	Average cases prepared per week	Cases per hour			
		Cleaning	Candling	Casing and/or cartoning	Total all operations
	No.	*No.*	*No.*	*No.*	*No.*
Under 13	5.6	3.06	1.62	2.01	.91
13 to 26	18.1	3.24	1.95	2.58	1.19
27 and over	89.2	4.63	2.87	4.69	1.84
Average	35.2	3.75	2.01	2.69	1.24

TABLE 6. LABOR COST FOR PREPARING EGGS FOR MARKET, BY VOLUME PREPARED PER WEEK, 25 FLOCK OWNERS, ALABAMA, 1959

Cases of eggs prepared per week	Average cases prepared per week	Cost per case			
		Cleaning	Candling	Casing and/or cartoning	Total all operations
	No.	*Cents*	*Cents*	*Cents*	*Cents*
Under 13	5.6	19.26	36.99	28.68	84.93
13 to 26	18.1	18.55	30.60	22.68	72.01
27 and over	89.2	11.04	17.64	13.44	42.12
Average	35.2	12.48	20.40	15.51	48.39

Cost of each of the operations was lowest for those owners who prepared over 26 cases per week. The cost for this group was equal to approximately half the cost for owners who prepared less than 13 cases per week, and three-fifths the cost for those who prepared between 13 and 26 cases per week. This difference in labor cost resulted principally from the use of mechanical equipment, although better labor utilization was also a factor. Only one owner preparing less than 13 cases per week, and only half those preparing between 13 and 26 cases per week used mechanical equipment.

Cost of supplies and equipment. Investment in cleaning supplies was very low. A third of the owners reported that they bought no cleaning supplies. Forty-eight per cent of the owners had some type of cleaning equipment with an initial investment of $86 per owner. Approximately two out of three owners possessed grading equipment. This equipment varied from a simple set of scales costing approximately $2, to a machine costing $1,500. Costs per case for supplies and equipment are shown in Table 7.

Two out of three owners reported buying no cases; they either swapped, or cases were replaced or furnished. Those buying cases paid an average price of 48 cents per case.

Fillers and flats were obtained in the same manner as cases. Only one owner reported purchasing fillers and flats.

Cartons were not used by nine of the owners. The price of cartons reported most often was 2.5 cents, while prices paid by all owners who used cartons averaged 2.44 cents.

Egg storage. At most locations, egg storage space was improvised in existing buildings. Nineteen owners had egg rooms and only three had an egg house. Others used either a porch or garage. Of those with an egg house or room, two out of three said the space had been built to facilitate making egg deliveries. Only a third had insulated

TABLE 7. COST OF CLEANING SUPPLIES, CLEANING EQUIPMENT, AND GRADING EQUIPMENT, BY VOLUMES PREPARED PER WEEK, 25 FLOCK OWNERS, ALABAMA, 1959

Cases of eggs prepared per week	Average cases prepared per week	Cost per case		
		Cleaning supplies	Cleaning equipment	Grading equipment
	No.	*Cents*	*Cents*	*Cents*
Under 13[1]	5.6	8.7	4.8	10.20
13 to 26[2]	18.1	2.7	2.4	3.3
27 and over[3]	89.2	1.8	2.4	3.6
Average	35.2	2.1	2.4	3.6

[1] Only one owner preparing less than 13 cases purchased cleaning supplies and equipment. Only five owners in this group had grading equipment.

[2] For this group, data for cleaning supplies, cleaning equipment, and grading equipment were supplied by 7, 5, and 8 owners, respectively.

[3] Data for cleaning and grading equipment supplied by 7 and 5 owners, respectively.

the house or room. Expenditures for egg storage space ranged from $25 to $3,000, and averaged approximately $550.

Egg deliveries. Seven out of ten owners preferred to deliver eggs and three out of five always did deliver all of their eggs. Three owners did not know whether they received a higher price for eggs at time of delivery, while 12 owners reported receiving a price increase of 4 cents per dozen when eggs were delivered.

Deliveries were usually made twice per week. Roundtrip distances to make deliveries were as great as 97 miles, and averaged 32 miles for those who always delivered eggs. Time required for loading was relatively small, but deliveries took as much as 11 hours per week. Loading time per case for those with the fewest number of cases was

TABLE 8. TIME REQUIRED AND LABOR COST FOR LOADING AND DELIVERY OF EGGS, BY VOLUME PREPARED PER WEEK, 25 FLOCK OWNERS, ALABAMA, 1959

Cases of eggs prepared per week	Average cases prepared per week	Time required			Costs			Rate of output in cases per hour		
		Loading	Delivery	Total	Loading	Delivery	Total	Loading	Delivery	Total
	No.	*Hr.*	*Hr.*	*Hr.*	*Cents*	*Cents*	*Cents*	*No.*	*No.*	*No.*
Under 13	5.6	0.021	0.648	0.669	1.29	38.88	40.17	47.6	1.5	1.5
13 to 26	18.1	.018	.291	.279	1.16	16.36	17.52	55.6	3.4	3.6
27 and over	89.2	.015	.060	.078	.99	3.87	4.85	66.7	16.7	12.8
Average	35.2	0.015	0.123	0.138	1.14	18.76	19.90	66.7	8.1	7.2

TABLE 9. VEHICLE COSTS FOR DELIVERING EGGS, BY VOLUME PRODUCED PER WEEK, 15 FLOCK OWNERS, ALABAMA, 1959

Cases of eggs prepared per week	Cost per case		
	Fixed costs	Operating costs	Total
	Cents	*Cents*	*Cents*
Under 13	24.8	29.4	54.2
13 to 26	9.4	12.3	21.7
27 and over	2.2	4.8	7.0
Average	4.6	6.6	11.2

equal to 1.4 times that for owners who sold the greatest number of cases, Table 8. The difference in delivery time between groups was much greater. The ratio was almost 11 to 1.

Although owner vehicles were used for various purposes, vehicle costs were prorated to obtain a cost for delivering eggs, Table 9. Fixed costs amounted to approximately 41 per cent of vehicle costs. A half-ton pickup was the vehicle used most often, although one 1½-ton and three ¾-ton trucks were used.

Central Grading Stations

Data were obtained from owners of seven egg grading stations. Data obtained included labor costs for operations at the plant, cost of materials, and both plant and nonplant indirect costs.

The annual volume of eggs graded at these stations ranged between 5,200 and 41,600 cases. Candling and grading equipment was of a standard type in all stations. Apparent differences among stations were mainly location, capacity of machines, and arrangement within buildings.

Time required. The rate at which eggs were graded and packaged depended primarily upon capacity of machines, which varied between 6 and 20 cases per hour. However, only one station owner reported operating on a full-time basis. Other stations were operated at 94, 75, 51, 42, and 40 per cent of capacity. All stations were not employing sufficient amounts of labor to utilize machine capacity fully on days when eggs were being graded.

Because of the variability in type and size of machines, type of pack[2], practices, and labor utilization, a comparison of detailed operations among stations yielded little useful information. An attempt

[2] Types of packs included eggs loose in cases, eggs cartoned, and eggs cartoned and cartons placed in cases.

TABLE 10. PROPORTION OF TIME DEVOTED TO OPERATIONS PERFORMED, THREE GRADING STATIONS, ALABAMA, 1959

Station number	Machine capacity cases/hr.	Workers	Percentage of total time						
			Assemble cases and cartons	Move eggs to grader	Grading	Cartoning and casing	Move eggs to cooler	Idle	Other[1]
	No.	*No.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
1	6	2	20.6	3.1	32.5	33.9	2.2	1.5	6.2
2	12	2	8.9	2.8	18.9	32.2	4.3	9.4	23.5
3	18	5	3.6	16.6	17.5	56.3	1.6	1.5[2]	2.9

[1] Includes selling and recording sales, stamping cases, and cleaning eggs.
[2] Most of this time was for resting eyes of the grader.

was made to determine the proportion of total time required to perform major operations in stations having different capacities, Table 10. Station No. 1 did not have mechanical equipment for setting up cartons. Station No. 2 was packing eggs in cartons of different makes and bearing different color combinations. Switching the type of carton required extra time. Station No. 3 apparently had a well-balanced operation from the standpoint of labor utilization. One worker assembled cases and cartons, and supplied eggs to the grading machine; one was grading; and three were cartoning, casing, and moving cases to the cooler.

At several stations, workers utilized in egg grading operations performed other tasks for owners of the stations, and were therefore full-time employees. However, rearrangement of work routines in grading eggs could result in an improvement in labor utilization at the stations.

Costs. Variations in geographical locations and in operations performed indicated that total costs would not be a desirable means for making comparisons among stations, but that costs could be best summarized under three groupings. These were direct labor, packing material, and overhead[3].

There was a wide range in the relative importance of each of these among stations, Table 11.

[3] Operations for which costs were included were receiving, candling, cartoning, packing, coopering, stacking and holding, and loading out. The wage rate was $1.00 per hour. Packing material included cases, cartons, and labels. Overhead costs included expenditures for buildings, equipment, utilities, taxes, insurance, fees, industry meetings, and salaries for plant supervisors, watchmen, maintenance men, fieldmen, and salesmen.

TABLE 11. DIRECT LABOR, PACKING MATERIAL, AND OVERHEAD COSTS FOR PREPARING AND PACKING EGGS, SEVEN EGG-GRADING STATIONS, ALABAMA, 1959

Station	Proportion of total volume for all plants[1]	Cost per case			
		Direct labor	Packing material	Overhead	Total
	Pct.	*Cents*	*Cents*	*Cents*	*Cents*
A	25.9	42.70	64.40	40.20	147.3
B	22.4	32.46	60.75	28.35	121.6
C	17.8	31.16	47.00	37.40	115.6
D	12.4	30.00	60.00	____	122.0
E	10.4	24.90	53.50	49.80	128.2
F	7.9	84.80	62.00	20.10	166.9
G	3.2	75.00	27.00	19.07	121.1
Weighted average	100.0	41.76	57.04	35.15	134.0

[1] Actual volumes were not used because of possible station identification.

Packing material costs were the most uniform among stations and made up the greatest proportion of costs at all stations — an average of 43 per cent of the total. However, most station owners were purchasing packing materials in sufficient volume to receive allowable discounts, which meant that owners could do little more toward reducing this cost.

Direct labor costs varied between 20 and 62 per cent of total costs at individual stations, and averaged 31 per cent for all stations. Normally, the degree of control owners had over labor costs was greater than was their control over the other two groups of costs. However, an excessive amount of idle labor was noted at the time station "A" was visited, and this was reflected in a unit labor cost that was higher than for most other stations. Data indicated that unit direct labor cost was out of line at some stations. Improvement in labor utilization might have provided owners of those stations with their best opportunity for reducing overall costs.

Overhead costs appeared to be excessive. Overhead costs as a proportion of the total ranged between 12 and 39 per cent at individual stations and averaged 26 per cent for all stations. Items for which large expenditures were being made included rent, office furniture, and salaries for plant supervisors, fieldmen and salesmen. Volumes of eggs handled were not sufficient to support the type of organization some stations were attempting to operate. Also, as indicated earlier, some stations were operating at less than half, half, and three-fourths of their capacities. Plants requiring greater investments require higher rates of output to return profit to the operator.

SUMMARY

Objectives of this study were: (1) to determine costs of operating pickup routes in relation to various factors, and (2) to determine cost of grading and packaging eggs in relation to volume handled, location of grading and packaging operations, and methods of performing grading and packaging operations.

Information was obtained from operators of 15 egg assembly routes, and from 25 producers and 7 owners of central grading stations who were grading and packaging table eggs.

Cost per case for assembling eggs varied from a low of 3 cents on a 39-mile route to a high of $1.42 on a 160-mile route. The weighted average for all routes was 17 cents per case. Labor, other variable cost, and fixed costs comprised 40, 38, and 22 per cent of total costs, respectively. Factors most closely associated with costs were number of cases picked up per mile and number of cases picked up per hour. The average time spent on routes was 4.6 hours. Route men spent 55 per cent of their time driving, 30 per cent at stops to pick up eggs, and 15 per cent at other stops. Sixty-three per cent of the combined capacities of all trucks was used.

Producers owned flocks ranging in number from 200 to 17,800 hens. Flock owners prepared eggs at the rate of 1.24 cases per hour. Preparation time per case for owners preparing above 27 cases per week was equal to about half that for owners preparing less than 13 cases, and two-thirds that for owners preparing between 13 and 26 cases. Direct labor costs for flock owners amounted to approximately 48 cents per case. Expenditures per case for cleaning supplies was 2.1 cents, for cleaning equipment 2.4 cents, and for grading equipment 3.6 cents. Only 3 owners had an egg house, while 19 had egg rooms. Three out of five owners delivered eggs; total labor costs for delivery were 19.9 cents per case. Transportation costs for delivery were 11.2 cents per case.

The volume of eggs graded annually at central stations ranged from 5,200 to 41,600 cases. The per-hour rate for grading eggs depended upon the type of equipment and varied between 6 and 20 cases per hour. Capacities at most plants were not fully utilized. Direct labor cost was 42 cents per case, and was 31 per cent of all costs. Packing materials cost 57 cents and overhead cost 35 cents per case. These comprised 43 and 26 per cent of total costs, respectively.

IMPLICATIONS

Buyers for retail stores seek and purchase from dependable sources the quality of product that consumers want. Consumers seek clean, fresh eggs that are high in quality, and uniform in size and yolk color. Uniformity and quality of eggs can best be obtained from production units that are composed of one strain of hens, and cared for under a single system of management where feed and handling practices are uniform.

Development of automatic watering, feeding, and egg-handling equipment has contributed to the economies that can be obtained by increasing the size of production units. Additional economies will be sought in the future as the proportion of Alabama eggs sold outside the State increases.

A succession of related events appear to be transforming the methods of producing and marketing eggs into a more elaborate and complex system. Under the new system, egg routes as they have been operated recently will gradually disappear. Producing units will become large operations. Cleaning, candling, and casing or cartoning of eggs will be carried out in production areas or at central grading stations handling volumes that utilize plant facilities at or near full capacity. Except for situations where special markets exist, table eggs will be supplied by relatively large firms that control both production and marketing operations. Thus, with increased efficiencies and the attainment of greater economics in production and marketing, consumers should be able to more nearly obtain the uniformity and quality they seek in eggs.

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