AN ECONOMIC ANALYSIS OF BULK PETROLEUM OPERATIONS IN SELECTED KANSAS COOPERATIVES

by 884

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

The farmer of today in the role of manager of his farm is operating a highly complicated business. Farmers are turning to the use of more and more "purchased" inputs in farm operations. Development of new technology has provided many alternative types and combinations of inputs available to the farmer. His task of deciding which, if any, of the many inputs he should use has become more difficult as the number of alternatives has increased.

For many years cooperatives have been providing their members with supplies and services required in farming operations. The cooperative, through its development of new and improved products, has aided the farmer. New product development and research by regional cooperatives have been strong factors in helping local cooperatives serve patrons better.

Petroleum products have been increasing in use and importance to farmers over the past decades. As farms became more mechanized, the need for fuels and lubricants increased proportionately. Manuel[1] found that petroleum, feeds, and fertilizer all increased in sales during the fifties. By the end of the decade, petroleum products constituted about half of all farm supplies sold by cooperatives in Kansas. He also indicated the sales increase for petroleum products was uniform over the ten year period.

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[1]Milton L. Manuel, A Decade of Farmer Cooperatives in Kansas, Kansas State Agricultural Experiment Station, Bulletin 450, December, 1962, p. 9.

Bulk fuels represent an unusual type of product in regard to physical handling. Fuels must be delivered to the farm with specially equipped trucks. A farmer cannot pick up bulk fuel at the cooperative as he might fertilizer or feed. Bulk purchases usually are in such large quantities that a special truck is the only way of handling them. The bulk truck (tankwagon), unlike many other kinds, cannot be used for backhauling other products.

Fuel, especially gasoline, is a dangerous product to handle. However, if safety procedures are followed, the danger is minimized. A spark always is a hazard. Even a static spark may cause an explosion. Road accidents are yet another hazard since explosions and fire are likely to occur.

PURPOSE OF STUDY

The overall purpose of this study was to determine the profitability of bulk petroleum operations and to examine factors which caused variations in profit levels. Data were collected from local associations in order to take an objective look at economic factors involved.

The overall objective was to determine, evaluate, and compare the economic factors involved in bulk petroleum delivery for certain selected cooperatives in Northeastern Kansas.

The first specific objective was to determine the profitability of bulk delivery operations and to determine levels of profit or loss.

A second objective was to determine efficiency of delivery in terms of various cost ratios.

A third objective was to determine the economic effect of various combinations of factors:

1. Effect of different types of delivery policies.
2. Effect of two-way radios.
3. Effects of various credit policies.

A fourth objective was to determine the nature and type of competition.

A fifth objective was to compare financial ratios of cooperative operation and against published standards.

A final objective was to provide data for use in recommendations to improve operating efficiency and profits.

REVIEW OF LITERATURE

For any organization to function properly, final responsibility for efficiency is in the hands of the employee. J. Warren Mather in the opening statement of a publication concerning pay plans for cooperative tank truck personnel, made the following statement:

> The success of petroleum cooperatives depends largely on the kind of job the tank truck salesmen or servicemen turn in. Their performance greatly affects over-all volume, the number of new patrons and members obtained, delivery costs, credit control, and membership relations.[2]

Others have stressed the importance of employees, especially in the case of cooperatives, to be loyal and maintain a favorable attitude. Manuel stated:

> . . . the prospective employee should have the potential of representing the cooperative favorably. Cooperative employees must recognize the membership interest of those they serve. Most patrons are owners and, therefore, ordinarily tend to have greater interest in the business. Consequently, a special obligation is placed upon employees.[3]

Over the years there have been many changes in the petroleum industry. The volume of fuels and gasolines has increased rapidly over the years. In the farm sector, this is basically due to increased mechanization of methods of farming. Fuels are responsible for an ever greater percent of power used on farms today. As volume increased, methods of handling fuels have changed. Most fuel moves from refinery

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[2]J. Warren Mather, Pay Plans for Co-op Tank Truck Salesmen, Farmer Cooperative Service, United States Department of Agriculture General Report 46, June 1958, p. 1.

[3]Milton L. Manuel, Improving Management of Farmer Cooperatives, Farmer Cooperative Service, United States Department of Agriculture General Report 120, June 1964, p. 35.

to distributor via truck-transport rather than by rail as was the case years ago. Modern, high volume pumping systems have speeded loading and unloading fuels to and from the delivery truck. All these changes have changed the workload and importance of the petroleum department to the cooperative as a whole. In view of these changes, methods of compensation have also been under study. Mather stated:

> Contributing to the interest in methods of compensation have been the increased use of petroleum products by farmers and the changes and improvements in roads and delivery equipment. As farmers used more petroleum fuels, they enlarged their farm storage. In turn, salesmen purchased much larger tank trucks with mechanical unloading equipment. These changes enabled them to increase their volume each year. Thus standards of performance and rates of pay accepted 10 years ago have been outmoded.[4]

Manuel and Epard[5] worked with 1963 data concerning Kansas grain cooperatives. They cited ratio analysis as a common method of analyzing firms accounting data. The data were easily obtained from accounting records and can be compared to other published data.

Phillips[6] indicated there are two general types of ratios used. The first is efficiency ratios which represent some measure of output divided by an input. These are also referred to as input-output ratios. The second ratio is a percentage ratio in which one figure is expressed as a percentage of another.

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[4]Mather, op. cit., p. 1.

[5]Milton L. Manuel and Richard L. Epard, An Economic Analysis and Recommendations for Improving the Management of Kansas Grain Cooperatives, Kansas State Agricultural Experiment Station, Bulletin 497, May 1967, p. 8.

[6]Richard Phillips, Managing for Greater Returns in Grain, Feed, and Other Retail Businesses Serving Agriculture, Rev. Ed., Agri Research, Inc., p. 174.

Manuel[7] stated that much can be learned from analyzing operating statements. He said such items as gross margins in relation to sales and gross margins received from services can be observed. Expenses for services can also be studied from the operating statement.

The gross margin ratio is an important figure used in studying the operation of any firm. Larzelere and King made the following statements.

> The over-all gross margin ratio of an individual organization may vary according to the type of farm supply handled and the relative importance of that item in the total volume. For example, the sale of petroleum products generally reflects a higher gross margin than many other farm supplies probably for competitive reasons and because of merchandising services included in the price.[8]

Manuel[9] reported average gross margins of petroleum sales by Kansas grain cooperatives using 1955-56 data. He found twenty associations averaged 15.1 percent gross margin on gasoline sales. Fourteen associations reported 19.2 percent gross margin on tractor fuel sales and seventeen associations had 25.1 percent gross margin on lubricating oil sales.

The petroleum associations reported slightly different percentages of gross margin. Forty-eight associations had a gross margin of 17.6 percent on gasoline and forty-one associations 21.7 percent gross margin on tractor fuel. Lubricating oil gross margin was 25.3 percent reported

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[7]Manuel, op. cit., p. 20.

[8]H. E. Larzelere and R. M. King, Ratios as Measuring Sticks for Elevator and Farm Supply Organizations, Michigan State Agricultural Experiment Station, Special Bulletin 380, August 1952, p. 16.

[9]Milton L. Manuel, Financial Summaries and Analyses for 192 Kansas Grain and 50 Petroleum Cooperatives for 1955-56, Kansas State Agricultural Experiment Station, Circular 361, July 1958, p. 14.

by forty-six associations. Five associations reported grease gross margin of 22.1 percent.[10]

In another study, Manuel and Epard[11] working with sixty-four Kansas grain cooperatives and 1963 data also indicated petroleum gross margins. Gasoline gross margin was 16.6 percent and tractor fuel (diesel) averaged 25.2 percent gross margin. Kerosene - fuel oil averaged 21.4 percent gross margin with lubricating oil at 26.7 percent and grease averaging 27.5 percent gross margin.

Schaars[12], working with 640 cooperatives, found 96 percent showed a net savings and four percent a net loss in 1963. The net savings was about 5.1 percent of sales for the medium association.

Scott[13] worked with 1964 TBA data and found an average gross margin of 24.0 on sales by eighteen associations. The net margin was 2.3 percent of sales with eight of the associations showing a loss. When he divided the associations in half according to volume, the small group averaged 25.1 percent gross margin and a net margin of -4.6 percent. The large volume group averaged 23.8 percent gross margin and 4.0 percent net margin.

Costs of operation must be accounted for in a study such as this.

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[10] Ibid., p. 11.

[11] Manuel and Epard, op. cit., p. 17.

[12] Marvin A. Schaars, Local Cooperative Farm Supply Association: Their Volume and Net Savings, University of Wisconsin Department of Agricultural Economics, Ag. Ec. 42, January 1965, p. 3.

[13] Dale W. Scott, "Economic Performance Analysis of Kansas Cooperative Farm Supply Sales Exemplified by TBA Items," (Unpublished Master's thesis, Department of Economics, Kansas State University, 1966), p. 101-102.

There are various methods and criteria by which costs can be allocated. A study of feed delivery costs used the following definitions:

> Cost associated with the delivery operation as defined consist of labor costs and truck costs: Drivers' wages, lodging, meals and other labor costs, and insurance, repairs, fuel, license fees, depreciation, interest on investment and other similar costs. Of course, these do not include all the costs in operating a feed delivery service. Omitted are administrative costs such as dispatching, accounting, supervising and overhead as well as costs of land, garage space and other building space. No attempt was made to allocate such omitted costs.[14]

Anderson[15] in his study of bulk petroleum sales in Nebraska discussed at length the allocation of costs between the "fixed" and "variable" categories. He concluded that in common usage of the factors involved in his study that most costs associated with investment outlays were fixed. He qualified his conclusion by comparison of investment outlays being more fixed than truck operating costs.

While most costs can be variable, especially as time periods become longer, one must consider the special circumstances involved in individual analyses.

Anderson further argues that varying plant size does not really make investment costs variable. He contends that the costs are not varying in response to output, but rather to a man-made response which is not an automatic result of output change. The following lists were presented by Anderson as the basis for his cost allocations.

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[14]Leonard W. Schruben and Ruth E. Clifton, Truck Delivery Costs of Manufactured Feeds, Kansas State Agricultural Experiment Station, Circular 393, October 1965, p. 2.

[15]Dale Gene Anderson, "Structural Changes in Farm Petroleum Distribution: Efficiency of Tank Wagon Delivery," (Unpublished Ph. D. dissertation, University of Nebraska, 1966), p. 159.

Fixed Costs	Variable Costs[16]
1. Truck driver-manager	1. Labor
2. Depreciation	2. Truck operating costs
3. Interest on investment	3. Inventory losses
4. Property taxes on investment	4. Accounts receivable
5. Truck license fees	5. Sale promotion and education
6. Bulk plant repairs	6. Interest on working capital
7. Fixed insurance	7. Property taxes on working capital
8. Rent	8. Variable insurance
9. Administrative	9. Electricity for pumps

Camp[17] in studying feed truck costs found drivers' expenses to be the largest expense amounting to 47 percent of all costs. The second largest item to be fuel, oil and grease which accounted for slightly more than 18 percent of the direct costs or 14 percent of all costs. Repairs amounted to 14 percent of all costs.

Truck depreciation was calculated by Camp[18] to be 12 percent of total costs and taxes, licenses, and permits at five percent, insurance at two percent, and interest on truck investment at two percent.

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[16] Ibid., p. 160.

[17] Thomas H. Camp, Costs and Practices of Selected Cooperatives in Operating Bulk-Feed Trucks, Farmers' Cooperative Service, United States Department of Agriculture General Report 132, October 1965, p. 4.

[18] Ibid., p. 5.

Milner[19] worked with 1956-57 data and listed the seven largest expense items that accounted for 88 percent of all expenses in Ohio elevators. He listed labor and salaries as 54 percent of expenses as the largest item. Second largest was depreciation at 11 percent and truck expenses were third at six percent. Other expenses were taxes, five percent; supplies and repairs, four percent; and insurance, four percent.

Anderson[20] stated the central issue of his report was to determine how and why costs of fuel delivery deviate from conditions of economic optima. He found excessive costs were a result of over-capacity of bulk plants (low annual volume), small deliveries (inadequate farm storage) and unfavorable density situations (cross hauling).

Koller and Jesness[21] in a study of Minnesota petroleum cooperatives suggested increasing volume to reduce per unit operating costs. They suggested volume could be increased (1) by avoiding duplications of service by the establishment of associations in a given area, and (2) by more effective merchandising methods. The latter suggestion might be obtained (a) by more intensive sales coverage, (b) better personnel, (c) use of more attractive display and better service, (d) by adding new supplies within limits, and (e) by coordinating sales programs under leadership of cooperative wholesalers.

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[19]Ross Milner, How to Control Expenses at Country Elevators, Ohio State University, Agricultural Extension Service, EM-166, n.d., p.2.

[20]Anderson, op. cit., p. 231.

[21]E. Fred Koller and O. B. Jesness, Minnesota Cooperative Oil Associations, Minnesota Agricultural Experiment Station, Bulletin 361, April 1941, p. 56.

Anderson[22] described the "typical" Nebraska petroleum delivery operation association as hauling 500,000 to 750,000 gallons of fuel annually. The typical plant had 66,000 gallons storage capacity which he considered to be a large overinvestment. He estimated the same plant could handle about 2,000,000 gallons a year if additional trucks and labor were provided. He found the average plant operated one 1200 gallon truck.

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[22]Anderson, op. cit., p. 227.

SCOPE

Bulk sales were defined as any sale attributed to the tankwagon. Bulk sales, or tankwagon sales, were those which the tankwagon actually delivered to a customer. This definition of bulk sales covers most of the products sold in bulk. Exceptions noted were a few cases where gasoline or fuel was sold by commercial bids and delivered by the transport load. This fuel, was not handled by the tankwagon or the tankwagon driver and was not included in the study. Another exception was oil and grease picked up by the customer from the cooperative. Thus, bulk sales as defined in this study do not exactly equal figures which could be calculated under different definitions.

Products involved in this study were those sold in bulk and delivered by tankwagon. The products included: regular and ethyl gasoline, number 1 and number 2 diesel fuel, all purpose or "pink" diesel fuel, kerosene, tractor fuel or "power fuel," white gas, solvent, oil and grease. The majority of sales involved were regular gasoline and pink diesel.

By defining bulk sales as tankwagon sales, expenses could be allocated on a tankwagon basis. Expenses were included that were attributed directly to the driver, trucks, tanks, two-way radios and bulk storage facilities.

Administrative expenses were not included. The author recognizes these expenses must be accounted for, and the bulk petroleum operation must pay its share. For the purpose of this study, it was felt that a clearer picture of the operation might be shown if only those expenses directly involved be considered.

METHOD AND DATA

The sample for this study was taken from a 39 county area in northeastern Kansas. This area allowed driving time from Manhattan to be two hours or less, which was necessary for interview scheduling.

It was determined from volume reports furnished by the regional cooperative that 56 local cooperatives in the area were selling fuel on a bulk basis. Fifty percent were chosen on a random basis by using a table of random numbers. The fifty percent figure was chosen because the author felt it would provide an adequate size sample while allowing time required for interviews with personnel of each association.

Although 28 associations were selected, 25 were finally used in the analysis. Two associations were eliminated. Because of recent mergers, they could not provide adequate data for the study. A third one was discovered to be a branch of another association due to recent merger action. Records had been kept for the whole operation so the data were collected as one association.

Nineteen hundred sixty-six data were used in the study. In order to collect data from local association's records, it was necessary to use data for the fiscal year of each association. These time periods were not identical as shown in Table 1, but it was assumed that those minor differences in time would not affect the analysis. It was noted that eleven of the twenty-five associations operated on a calendar-year basis.

Analysis of sales was based on three classifications. The first was "gasoline" which consisted of ethyl and regular grades. The second class was "fuels" which consisted of all other fuel items sold. The

majority of fuel sales was number two diesel and all-purpose diesel. The third class was "oil and grease." These classifications were used so sales and margins could be more easily calculated. While different products such as regular and ethyl gasolines sold for different prices, their purchase price was also different. Various grades of fuels or gasolines would be represented as a blend price of all products involved. It was assumed blends did not vary greatly among associations.

Table 1. Distribution of accounting year dates

Period	Number of Associations
September 1 through August 31	2
November 1 through October 31	4
December 1 through November 30	1
January 1 through December 31	11
March 1 through February 28	4
April 1 through March 31	2
June 1 through May 31	1

Gasoline and fuel data were collected on a dollar sales and gallon sales basis. Oil was sold by gallons and grease by pounds, therefore the units could not be combined. Dollar values for the oil and grease group were used. Also there was a lack of volume data concerning oil and grease.

In determining selling price of gasolines, it was assumed that the nine cents state and Federal taxes would be passed on to the consumer by the seller and prices for gasoline would contain this tax. The selling price per gallon of gasoline and fuels was determined by obtaining a total sales figure in dollars from the local association. With this was a gallon figure furnished by the local association for

the fiscal year. Gallons were divided into dollars to obtain a price per gallon figure for gasoline and another price per gallon for fuels. A sales figure was determined for oil and grease but no attempt was made to put this on a per unit basis as previously explained.

Cost data were more difficult to obtain than were sales data. Most associations had other outlets for gasoline and fuels such as service stations. Any cost data they had were for the total operation and often were not broken down into gasoline and fuels as was needed for this analysis. Therefore, cost data were obtained from the regional cooperative who supplied the petroleum to locals. The regional, Farmland Industries, kept a record of dollar value and units of each product sold to every local association. Cost figures were determined by combining the various products into the classification of gasoline, fuels, and oil and grease. The purchase price or cost of the petroleum products was determined for the proper fiscal year of each association. The purchase price of each classification differed for each association. This was due to several factors. The first factor was that each association did not purchase the same quantities of the different grades of fuels. Each fuel was a different price so this caused some difference. Another factor was price changes during the period for different fuels. A third factor was freight rates. The fuels and gasolines were considered at a delivered price. There was a difference in delivery rates with the charge becoming higher as the distance between an association and refinery increased.

Data were obtained from Farmland Industries concerning payments made to local associations in gas war support and commercial bid support.

The regional cooperative has a policy of maintaining a three and one-fourth cent gross margin per gallon on gasoline in the event of a price war. They also offer some support to the local association on bids of commercial accounts such as school districts, highway departments, and contractors. If the gallonage involved was hauled by a tankwagon, the price support was included as part of total revenue in this study.

Data were collected from local associations concerning number of miles driven by their trucks, size of their trade area, and number of trucks operated. Data were also obtained about age of trucks and their capacity. Two-way radio data were collected. Managers were asked to state their most serious problem concerning their bulk operation. Information about type of competition was collected. All of these data were useful in explaining the operations of a bulk delivery system.

Expense data were obtained from local associations concerning trucks, drivers, and bulk plants. These data were found in ledgers, annual audits, or special records such as tax assessments, insurance policies, volume reports, etc. of the local associations.

Much of the analysis was made on a per gallon basis. Expenses were broken down into a per gallon or 100 gallon unit of delivered product. It was determined by interviewing managers that special deliveries usually were not made for oil and grease. Normally they were delivered in connection with other products such as gasoline or when the truck was routed past the delivery point. On this basis, oil and grease were somewhat free from direct delivery expenses. Revenue from oil and grease was included in total revenue while volume

was not added to gasoline and fuel volume in part of the analysis.

It might be noted here that no data were collected on inventory costs. It was impossible to determine what inventory was due to bulk operations and what should be attributed to service station sales. Often bulk plants were used to store products for both kinds of sales operations. Records tended to list only total inventories.

Regression analysis was used to some extent in this study. A simple regression was computed concerning the effect of sales levels upon net margin. Also a multiple regression was computed on three variables effecting net margins.

Break-even analysis was done showing the volume required for break-even operation of high and low volume associations.

Much of the analysis was done with the twenty-five associations divided into two groups. They were divided into two groups based upon gross revenue. Twelve associations were classified into the larger group with over $150,000 annual revenue. Thirteen under the $150,000 mark were in the smaller group.

As noted earlier, associations were divided into two groups: large and small. This division was based on total revenue figures including sales of gasoline, fuels, oil and grease, and any price support payment by Farmland Industries. Table 2 shows a frequency distribution of revenue.

Table 2. Frequency distribution of total revenue for all associations

Revenue in Thousands of Dollars	Number of Associations
350.0 to 399.9	1
300.0 to 349.9	0
250.0 to 299.9	1
200.0 to 249.9	2
150.0 to 199.9	8
100.0 to 149.9	4
50.0 to 99.9	8
0.0 to 49.9	1

There was a distinctive break in total revenue at the $150,000 level. One association was at $151,196, another at $150,952, but the next largest dropped down to $125,144. This left more than $25,000 gap with the associations on either side closely grouped. It was fortunate this break occurred in the middle of the range of associations. The range of revenue was quite wide. The largest association had revenue of $356,471 while the smallest had $49,666. Large associations averaged $206,467 while the small ones averaged $76,668. In other words, the average large association had revenue 2.7 times as large as the average small association. All associations averaged $136,898.

A frequency distribution of sales in gallons was determined (Table 3). The largest volume was 1,109,544 gallons while the smallest was 197,986 gallons. The average large association sold 819,434 gallons of gasoline and fuel while the average small association had 321,141 gallons. This was 2.6 times greater volume by the average large as compared to the average small association.

Table 3. Frequency distribution of gallons of gasoline and fuel sold

Volume in thousands of Gallons	Number of Associations
1,000 to 1,199	3
800 to 999	1
600 to 799	8
400 to 599	4
200 to 399	8
0 to 199	1

Gross margin in this study was defined as sales minus cost of goods sold. Gross margin was calculated in two ways. The first was gross margin as a result of net sales minus cost of goods sold. The second was sales plus the gas war and commercial price support paid to the association minus cost of goods sold. In most of the analysis, the latter gross figure was used because it was felt that a clearer picture of the operation could be ascertained by its use.

Gross margins as well as most other figures were calculated on a percent of sales basis and also on a per gallon sold basis. Gross margins (including price support) for all associations on gasolines was 13.4 percent. The small associations averaged 12.4 percent while the large associations averaged 13.8 percent. Large associations received 1.4 percent more gross margin per dollar sales than did the

small group. This was a result of large associations pricing fuel higher as the purchase price for each individual grade of gas is the same disregarding transportation charges. Large associations averaged receiving .58 of a cent more per gallon of gasoline while paying.14 of a cent more for gasoline. This gave the large association .44 of a cent per gallon more gross margin. All gross margin per dollar sales (including support payments) can be noted in Table 4.

Table 4. Gross margins per dollar sales of gasoline, fuel, oil and grease

	Gasoline	Fuel	Oil and Grease	All Products
	%	%	%	%
Large Assns.	13.8	23.0	19.9	15.8
Small Assns.	12.4	23.8	15.8	14.3
All Assns.	13.4	23.2	18.9	15.4

Fuel gross margins were considerably higher than those of gasolines. This was due to several factors. One reason was that less volume of fuel was sold than that of gasoline and there were more grades and types of fuels to keep in inventory. Another reason was the value of fuel was less than gasoline on a per gallon basis. However, it costs the same to deliver a gallon of fuel as compared to gasoline. The large associations averaged 23.0 percent gross margin per dollar sold and the small received 23.8 percent. All associations averaged 23.2 percent.

Oil and grease sales were not a large part of total bulk sales. For all associations, they averaged 8.1 percent of the total revenue. However, under the assumption they were delivered with the fuels and gasoline, gross margin becomes net margin and can be quite important in the final net margin analysis. Gross margin for small associations

was 15.8 percent while large associations had 19.9 percent. All associations averaged 18.9 percent. Large associations accounted for 75.7 percent of the oil and grease sales.

Gross margin for all products combined averaged 15.4 percent for all associations. Large associations had a somewhat higher gross margin at 15.8 percent. The small associations averaged 14.3 percent. This was due to the majority of sales being gasolines where large associations received higher gross margins.

Gross margin was also computed on a per gallon basis. The figures reflect the same relationships as did gross margin as a percent of sales. Large associations had 3.6 cents per gallon gross margin which was .5 of a cent more than the small associations. Fuel margins were higher but the spread of gross margins was not as great as in the case of gasoline.

Net margin was computed on the total sales of the associations. All expenses were deducted from the gross margin. The expenses, which will be described later in the expense analysis section, included driver wages and benefits, truck and tank expenses, depreciation, and interest and bulk plant expenses. Net margin as a percent of sales was 6.0 percent for all associations. Large associations, however, had a net margin of 7.1 percent. Small associations were much lower at 3.5 percent of sales. The difference between small and large associations was 3.6 percent or more than double the small associations net margin. Recalling gross margins for all sales of larger associations was 15.8 percent and the small group 14.3 percent of sales, this leaves a difference of only 1.5 percent. This would indicate there was considerable

proportionate reduction in expenses for the large sales group. An economy of scale advantage must have been present along with the higher gross margin observed in the large association group.

Net margin was calculated on a per gallon basis for all sales including oil and grease. All associations had a net margin of 1.5 cents per gallon sales. The large association had a net figure of 1.8 cents while the small had .9 cents per gallon. As shown in Tables 5 and 6, the gross margin difference between large and small associations was not nearly as great as is shown by the net margin.

Table 5. Gross margin expressed as cents per gallon of gasoline and fuel

	Gasoline	Fuel
Large Assns.	3.6	3.8
Small Assns.	3.1	3.4
All Assns.	3.4	3.7

Table 6. Net margin expressed as cents per gallon for gasoline and fuels and for all sales

	Gasoline and Fuels	All Sales
Large Assns.	1.4	1.8
Small Assns.	.8	.9
All Assns.	1.2	1.5

Net margin on a per gallon basis for gasoline and fuels was figured. This excludes the oil and grease which was not figured in the volume so the net margin level is naturally low. They are, however, more representative on a per gallon basis. All associations averaged 1.2 cents per gallon net margin on the sales of gasoline and fuel. The large group was somewhat higher at 1.4 cents per gallon while the small

group was much lower at .8 of a cent per gallon. This was a difference of .6 of a cent between the large and small group. Taken as a whole, large associations received higher net margins per gallon than did small volume associations.

Total net margins ranged from $50,287 to a loss of $1,884. Only one association showed a loss for the year. The second lowest net margin was $572. Table 7 shows a frequency distribution of total net margins. It can be noted that the majority of the associations had less than $10,000 net savings. The net margin for all associations averaged $8,520. Large associations averaged $15,189 and small ones averaged $2,363.

Table 7. Frequency distribution of total net margin

Net Margin in Thousands of Dollars	Number of Associations
30.0 - 34.9	1
25.0 - 29.9	0
20.0 - 24.9	3
15.0 - 19.9	2
10.0 - 14.9	1
5.0 - 9.9	7
0.0 - 4.9	10
-5.0 - 0.0	1

Net margin per gallon on all products ranged from 3.0 cents per gallon to a loss of -.95 of a cent per gallon (Table 8). Again, only one association had a loss. The association which was second from the bottom had a net savings of .24 cents per gallon.

Net margin was computed for gasoline and fuel sales, excluding the sales of oil and grease. Price support for gasoline and fuel was included. The biggest net margin for those products was $22,029 with

the smallest being a loss of $2,399. Three associations showed a loss without the benefit of oil and grease sales. All associations averaged $6,626 while the large group averaged $12,196 and the small group at $1,463.

On a per gallon basis, net margin from gasoline and fuel ranged from 2.7 cents per gallon to a loss of 1.2 cents per gallon. The figures can be observed in a frequency distribution in Table 8.

Table 8. Frequency distribution of net margin per gallon

Net Margin in Cents Per Gallon	All Sales	Gasoline and fuel only
	Number of Associations	Number of Associations
3.00 - 3.49	1	0
2.50 - 2.99	2	1
2.00 - 2.49	3	1
1.50 - 1.99	3	5
1.00 - 1.49	4	4
.50 - .99	7	4
0 - .49	4	6
-.50 - 0	0	2
-1.0 - -.51	1	0
-1.5 - -1.01	0	1

Expenses and Expense Ratios

Expenses are always a very important factor in determining the level of net margins. If a manager needs more net savings, often expenses are checked first to see if any expenditures can be reduced or eliminated.

Expenses in this study were limited to those directly involved in the bulk petroleum operation. Administrative expenses were not included nor were inventory expenses as noted earlier.

Salary and wages. The major portion of expenses was made up of salaries and wages. Figures were collected for basic salary pay and any other benefits the employee received which are paid by the association. Included in the extra benefits were social security, unemployment insurance, health insurance, life insurance, salary continuation programs, retirement programs, and uniform allowances. Table 9 indicates the number of associations offering the various benefits.

Table 9. Number of associations offering benefits

Benefits	Number of Associations
Social securities	25
Unemployment	25
Health insurance	6
Life insurance	13
Salary continuation	5
Retirement	7
Uniforms	12

Twenty-one of the twenty-five associations' employees were on a salary basis of payment. Managers were asked to estimate the percent of an employee's time spent with bulk operations for those who were not considered full time employees of that department. Only that percent assigned to him was used in figuring wages and benefits for this study.

Four associations paid bulk petroleum employees on a commission basis. In three of these four, the drivers owned their own truck chassis with the cooperative furnishing the tank and pumps. In this case the commission was for both the driver and his truck. Excluding the three associations with driver owned trucks, the average full time salary including all benefits was $5,143 per year. Just the basic

salary averaged $4,726. The benefits averaged $417 for the year, per man, per 22 associations. As stated earlier, salary and wages make up a large portion of the bulk petroleum operation expenses. In this study, wages accounted for 70.4 percent of total delivery costs. This included all expenses except those involving the bulk plant. In comparing wages with sales, salaries and wages were 6.5 percent of sales for the study. The high volume group had 6.1 percent human expense as a percent of sales while the low volume group averaged 7.6 percent. Thus, there appeared to be some savings in human expenses as the volume increased.

Expressing human expenses in terms of gross margin, human expenses required a major portion of the margin. For all associations, human expenses averaged 47.4 percent of gross margin. Large associations were able to cut this figure slightly with an average of 44.7 percent of gross margin. Small associations had a figher figure; they averaged 53.8 percent.

With salaries and wages accounting for such a large portion of the expenses, it would certainly be advantageous for managers to look closely at this expense. However, it should be recognized that the tank truck driver is the key to the success of the operation. While his salary is a major portion of total expenses, his contribution to success could be worth much more than his salary.

Truck expenses. The second largest expense is the truck and its operation. The number of trucks ranged from one per association up to four. The average was just under two trucks per association. Two associations operated four trucks, three operated three trucks per association, ten associations operated two trucks and ten operated

one truck. Expense averages were calculated for 22 associations excluding those with driver owned trucks because of lack of data concerning operating costs.

Truck expenses were divided into several classifications. One of the largest expenses was for gasoline, oil, repairs and tires which were all classified together. The second largest truck expense was depreciation. Depreciation was taken from audits of the local association and was usually figured at 25 percent or a four year schedule. The tank was also included in the depreciation total and was usually depreciated at a 10 percent per year rate. Another expense was interest which was calculated at 5 percent on the undepreciated value of the equipment. Other expenses included taxes, insurance and licenses.

Considering total delivery expenses of which wages accounted for 70.4 percent, gasoline, oil, repairs and tires averaged 14.3 percent. On a per truck basis, the category averaged $945. Each association averaged $1,714 expense for gasoline, oil, repairs and tires. These expenses varied according to number of miles driven and age of the truck.

Depreciation accounted for 9.8 percent of the total delivery expense. Each association averaged $1,168 depreciation on their trucks, tanks, pumps, and two-way radio equipment. Expressed on a per truck basis, each truck had an average depreciation of $642.

The remaining four areas of expense accounted for only 5.5 percent of total delivery cost. Insurance was the largest of the four averaging 1.8 percent of the cost involved in delivery. This averaged $226 per association and $124 per truck. Most trucks were insured in

a group policy covering all the vehicles owned by an association. As a result, most were on a fleet or group discount making the insurance rates somewhat less than an individual policy premium.

Interest on investment averaged 1.6 percent of delivery costs. This was calculated at a 5 percent rate and was charged against the undepreciated value. Interest expense averaged $193 per association and $106 per truck. This included interest on the chassis, tank, pumps, and radios. Taxes on the trucks (but not the bulk plant) averaged 1.2 percent of expenses. Each truck averaged $81 per year while each association averaged $148.

The last expense item was licenses for trucks. These amounted to only 0.9 of a percent of delivery expenses. Each association paid $105 on the average for truck licenses while each truck averaged $58.

Truck expenses were considered alone. This excluded wages, radio expense, and bulk plant expense. Expressed as a percent of total sales, all associations averaged 2.2 percent. Large associations had a slightly better average with 2.2 percent and the small group averaged 2.4 percent of truck expenses as a percent of sales.

As a percent of gross margin, all associations averaged 16.3 percent truck expenses. The large associations again having a better percentage of 16.0. The small associations averaged 17.0 percent truck expenses as a percent of gross margin.

Examining all truck operating expenses except driver expense, associations averaged approximately $1,954 to operate a truck for one year. It cost the large association $2,138 to operate a truck while the small associations averaged $1,647. This difference was due to the

fact that large associations' trucks averaged 18,320 miles a year while small associations averaged 11,200 miles. It might be noted again that truck expenses were for 22 associations and not all 25. Average mileage for all trucks from all 25 associations averaged 15,931 miles. All twelve large associations averaged 17,896 miles and the thirteen small associations averaged 12,125 miles per truck.

Considering truck costs of the twenty-two associations on a per mile basis gave a different picture of expenses. All associations average 12.5 cents a mile costs. The large associations, however, averaged 11.7 cents per mile while the small group averaged 14.7 cents per mile driven. This showed a substantially lower cost per mile by the large associations over the small (Table 10).

Table 10. Truck expenses per mile and per gallon

	All Assns.	Large Assns.	Small Assns.
Truck Expenses; Miles Driven in Cents	12.5	11.7	14.7
Truck Expenses; Gallons Delivered in Cents	0.680	0.681	0.678

Comparing truck expenses on a per gallon basis reveals little difference between groups. All the associations averaged .680 of a cent truck expense per gallon of gasoline and fuel delivered. The large associations averaged .681 of a cent per gallon and the small group averaged .678 of a cent per gallon truck expenses as expressed in Table 10.

Two-way radio. One of the objectives of this study was to determine the value of the use of two-way radio equipment. It was extremely difficult to obtain data on effects due to radios because so many other factors were involved. It was noted that nine of the 12 large volume associations were using radio equipment. It was also noted that eight of the 12 highest net margin per gallon sales associations used radios. Thirteen of the 25 associations in the study used radios. Another indicator was that those associations with radios averaged 25.5 gallons of gasoline and fuel delivered for every mile driven. Those associations without radios averaged only 20.0 gallons per mile. It is hard to determine if radios were the cause of these apparent savings. Most of the managers interviewed whose operation included radios, were quick to point out instances of mileage savings and improved customer service. Many managers felt radios permitted them to offer improved service, especially when products were needed on short notice. Improved customer satisfaction seemed as important to them as any savings on miles driven.

Radio expenses were computed as a percent of sales and gross margin. These were quite small. They amounted to only .034 of one percent of sales for all associations. As a percent of gross margin these expenses averaged .268 of one percent.

Total delivery expenses. Viewing total delivery expenses which include drivers' wages, truck expenses, and radio expenses, the large associations seemed to show some savings over the small ones on a per gallon basis. The large associations averaged 2.1 cents expense per gallon delivered. The small associations averaged 2.5 cents per

gallon and all associations combined averaged 2.2 cents per gallon. (See Table 11.) The range was from 4.4 cents per gallon down to 1.7 cents.

Table 11. Delivery expenses expressed per gallon and per mile

	All Assns.	Large Assns.	Small Assns.
Delivery expenses/gallons delivered (in cents)	2.2	2.1	2.4
Delivery expenses/miles driven (in cents)	41.5	37.6	52.9

Total delivery expenses were also calculated on a cost per mile basis. This, as the above, includes all expenses except the bulk plant. All associations averaged 41.5 cents per mile driven. The large associations averaged 37.6 cents per mile while the small group averaged 52.9 cents per mile total delivery expenses. This is a difference of 15.3 cents between the high and low associations. This difference was due mainly to large associations driving so many more miles. The range was from 94.9 cents per mile to 30.3 cents as a low for an individual association.

In contrast to the big difference in costs per mile, figures were computed on gallons delivered per mile driven. In this case all associations averaged 18.7 gallons per mile driven while the large group averaged 17.7 gallons and the small group averaged 21.5 gallons per mile. This was a difference of 3.8 gallons per mile in favor of small associations. The range was from 42.8 gallons per mile to a low of 9.6 gallons. The difference between large and small volume gallonage per mile indicates the larger associations were driving farther,

having expanded their territory farther from the base plant, to make additional sales. This fact was quite evident when square miles of delivery area was considered for each group. All associations averaged 911 square miles of trade territory. Large associations averaged 1,500 square miles while the small ones averaged only 368 square miles of trade territory. These were estimates of managers, but such a wide difference indicates a wide difference in trade area size.

Cost and return on a per truck basis. Another way of looking at the efficiency of a petroleum operation was on a per truck basis. This approach gets away from the "association" as the unit for consideration and makes the "truck" the unit. This type of classification might be useful for managers who are considering a change in number of trucks in regard to expenses, costs per mile, etc.

Of the 25 associations in the study, ten operated one truck, ten operated two trucks, three operated three trucks and two operated four trucks. Mileage per truck per year increased as the number of trucks increased. (See Table 12.) Associations with one truck averaged 13,800 miles per year while the two truck operations averaged 1,100 more miles at an average of 14,900 miles. The three truck operations were at about 16,300 miles with the four truck group at a rate of 20,750 miles per truck per year.

When considering volume the trucks handled, a different picture was seen. Although the four truck associations averaged the most miles per truck, they averaged the least number of gallons delivered per truck per year with 267,133 gallons. Two truck associations hauled the most fuels per year (317,348) with the three truck group second and one truck

associations third. This seemed to indicate that large, four truck operations were driving more miles to cover a larger territory in order to achieve a high level of sales. As a result, their volume per truck was lower as compared to other truck operations.

Table 12. Volume and mileage per truck group

Classification of Assns. according to # of Trucks	No.	Miles per Truck/Year	Volume per Truck/(gals)	Gallons/ Mi/Truck
1	10	13,800	286,853	20.8
2	10	14,900	317,348	21.3
3	3	16,309	295,074	18.1
4	2	20,750	267,113	12.9

The same results appeared when gallons delivered per mile driven per truck figures were observed. Two truck operations had the highest average with 21.3 gallons delivered per mile driven. The one truck operations were second with 20.8 gallons per mile primarily because of the low mileage driven. Three truck operations were fairly high with and average of 18.1 gallons per mile. The four truck group dropped to 12.9 gallons per mile again indicating low volume per truck and high mileage.

Another factor was level of costs for the operation of different numbers of trucks. The one truck operation was the highest cost at $7,095 per truck per year. This figure included all truck, tank, radio, and driver expenses. Bulk plant expenses were not included. The second highest cost per truck was by the four truck group at about $6,700. The two truck associations had the second lowest cost of about $6,600 and the three truck group had the lowest cost at just over $6,000 per truck per year.

Expenses viewed on a per mile basis were different than the total expense figures in regard to ranking. The one truck operations had the highest cost per mile at about 51.4 cents per mile. The two truck operations were lower in cost at 44.4 cents a mile and the three truck still lower at about 37.0 cents. The lowest cost per mile operations were by the four truck associations with a cost of 32.3 cents.

Table 13. Costs and net margin per truck group

Classification of Assns. according to # of Trucks	Cost/Mile (in cents)	Cost/Truck (in dollars)	Net Margin per Truck
1	51.4	$7,095	$2,535
2	44.4	6,609	5,149
3	37.0	6,028	4,226
4	32.3	6,701	6,078

The final set of data which was considered was net margin received per truck in each group. It was interesting to note that although the large group drove the most miles and hauled the least gallons per truck, their net margin per truck was the highest of the groups. The four truck group averaged $6,078 net margin per truck while the two truck group was second with $5,149 net margin. The three truck group was third at about $4,200 and the one truck operation returned the least with just over $2,500 net margin.

Break-even points were calculated for each truck group. Results were on a per truck basis so figures provided some indication of the revenue required for additional units to break even. The one truck group had the highest fixed expenses and also the highest BEP. The two, three, and four truck groups were not far apart in break-even

figures, with the three truck group having the lowest BEP. Sales did not vary greatly except the three truck group had somewhat lower per truck sales with its lower BEP. These figures could be valuable for managers considering changing the number of trucks.

Table 14. Break-even point on a per truck basis

Classification of Assns. according to no. of Trucks	Variable expenses per truck	Fixed expenses per truck	BEP	Sales per Truck
1	$65,960	$7,137	$52,958	$76,234
2	78,511	6,060	42,890	78,619
3	57,745	5,364	37,663	67,335
4	67,691	5,736	38,598	79,505

Bulk plant expenses. The final expense item to be analyzed was the bulk plant. It was found that there is very little upkeep to bulk plants especially in such a short period as a year. Most work done on these plants seemed to take the form of major improvements which are set up on a depreciation schedule. There were many associations with more than one bulk plant. Ten of the twelve large associations had more than one facility. This was usually due to mergers with neighboring cooperatives which had existing facilities and were kept in use. The twelve large associations had 25 bulk plants and thirteen small associations had 15 plants.

The large associations totaled 854,525 gallons with an average of 71,210 gallons per association. The small group averaged 41,900 gallons with a total of 544,700 gallons capacity. As stated earlier, large associations usually had multiple facilities. On a per plant basis, the large group averaged 34,181 gallons per plant while the small

group averaged 36,313 gallons. This indicated the large associations were not actually using bigger plants but were using more than one location.

Bulk plant expenses were classified as depreciation, interest, insurance, and taxes. Depreciation accounted for 52.4 percent of the costs. Interest was second largest with 21.7 percent of the total. Insurance amounted to 13.5 percent and taxes 12.4 percent. These expenses averaged $995 for each large association and $502 for the small. All associations averaged $731.

Expressing expenses in terms of capacity, the following results were observed. (See Table 15.) All associations averaged 1.34 cents bulk plant expense per gallon of storage capacity. The large associations were slightly higher with an average of 1.40 cents. The small group averaged 1.20 cents per gallon capacity. This indicated a slightly higher cost for the large association. The reason for this difference stems from more improvements by the larger associations.

Table 15. Bulk plant expenses per gallon capacity; per gallon sold

	All Assns.	Large Assns.	Small Assns.
Bulk expense/gallon capacity (in cents)	1.3	1.40	1.20
Bulk expense/gallon sold (in cents)	00.13	00.12	00.16

Expenses were also compared to the gallons sold through storage facilities. In this light, the large associations showed a lower per gallon sold cost. The large group averaged 0.12 of a cent per gallon cost while the small group averaged 0.16 of a cent cost. All associa-

tions averaged 0.15 of a cent per gallon sold.

Total expenses. Total expenses which include the wages, the trucks, tanks and pumps, the radios and the bulk plants were combined to be compared to sales and gross margin. Table 16 shows the results.

Table 16. Total expenses as a percent of sales, gross margin

	All Assns.	Large Assns.	Small Assns.
	%	%	%
Total expenses/sales	9.3	8.7	10.7
Total expenses/gross margin	67.8	64.5	75.6

Total expenses as a percent of sales for all associations averaged 9.3 percent. This meant that for every $100 sales, there was $9.3 expense involved. The large associations averaged 8.7 percent expenses while the small group averaged 10.7 percent. This was a difference on the average of 2.0 percent expenses as a percent of sales between the large and small associations. This was a clear indication of relative savings in connection with the higher volume sales.

Total expenses as a percent of gross margin also indicated a relative savings in favor of the large sales group. The large group's expenses averaged 64.5 percent of the total gross margin. The small group averaged 75.6 percent expenses compared to their gross margin. This amounted to a 11.1 percent difference between the groups. The average for the entire number of associations was 67.8 percent expenses of gross margin. Here again, economies of scale show the larger associations paid less expenses per dollar received as margin.

Regression Analysis

Regression analysis was also applied to certain portions of the data. A simple regression was computed with one independent variable. The dependent variable (Y) was total net margin and the independent variable (X) was total gallons of gasoline and fuels sold. The formula was the following: $Y = -\$5,114.05 + .02453X$. Therefore, if $Y = 0$, then $X = 210,195$ gallons. The correlation coefficient was .89. This indicated that sales must be in excess of 210 thousand gallons before the net margin figure would be positive.

A multiple regression was also used on the data. The Y factor in this regression was net margin per gallon rather than just net margin as in the simple regression. The variables used are listed below.

Y = Net margin per gallon

X_1 = Truck and driver expenses per gallon

X_2 = Gross margin per gallon

X_3 = Total gallons delivered (in thousands of gallons)

The equation for the above variables was as follows:

$$Y = -.33 - .88993X_1 + .94873X_2 + .00018X_3$$

$$r^2 Y.X_1X_2X_3 = .946$$

The r^2 value indicates that 94.6 percent of the variation in net margin per gallon was "explained" by the three variables. There was 5.4 percent of the variation to be accounted for by factors not included in the variables used in the equation.

Standardized coefficients were calculated. These indicated that truck and driver expenses were the most important variable involved with gross margin being second and gallonage the least important variable.

The standardized coefficients were as follows:

$b'_1 = -1.92498$

$b'_2 = 1.55040$

$b'_3 = .0000006$

A t-test was applied to the X values to see if they were significantly different from zero at the .05 level. X_1 and X_2 were significantly different from zero, but X_3 was not at any level of testing. This meant the variation of net margins among the associations in the sample were great enough to cause gallonage to be non-significant. This also could have been partially due to the small sample size and the low degrees of freedom involved.

It might be recalled that the net margin per gallon when compared by the two groups as a whole, showed a positive difference in favor of the large volume group.

As a result of the regression analysis, it might be recommended that managers be aware of their expense and gross margins. While managers are usually aware of the factors affecting their operations, often it is difficult to determine which factors are more important. The truck and driver expenses cover a rather large area. Every effort should be made to reduce these expenses as much as possible consistent with good service to patrons.

Regression analysis also indicated gross margins should be observed closely. Gross margins should be considered before a manager tries to expand his volume by meeting lower priced competition. Losses due to reduced margins might well be greater than any advantage gained by increasing the volume.

Break-even Point Analysis

Break-even point analysis (known as BEP) was applied to the data of this study. BEP is a very useful tool for analyzing the operations of a department. It tells the manager how much product must be sold before fixed costs can be covered by the gross margin. At the BEP, total revenue equals total costs. The formula used in the study for BEP is as follows:

$$\text{BEP} = \text{Fixed costs} \div 1 - \left(\frac{\text{Variable costs}}{\text{Sales}}\right)$$

Fixed and variable costs must be separated before application of the formula. After consideration of the nature of expenses involved in bulk petroleum operations, it was decided to include gasoline, oil, tires, and repairs as a variable cost along with the cost-of-goods-sold. Over the period of a year the author felt that the other expenses would remain relatively fixed. For instance, it seemed unlikely that a normal year's sales growth would be sufficient to warrant the addition of another truck and driver. This was especially true since the associations averaged about two trucks per association. The addition of another unit would be a large percentage increase in capacity. They could vary their mileage to some extent during a year depending on the volume sold. It was decided that truck operating expenses were variable costs because they were directly related to the mileage and volume. Fixed expenses included those of truck depreciation, interest, insurance, taxes, driver expenses, bulk plant expenses, and any other expense except operating expenses of the trucks and the cost-of-goods-sold. The latter, as stated before, were considered as variable expenses.

Break-even points were figured on two levels of sales. The first

BEP was figured on gasoline and fuel sales only in order to indicate both dollar and gallon BEP figures. The second BEP was figured for all sales and yielded only a dollar BEP figure. The BEP figures were calculated on the basis of size division. Figure 1 indicates the BEP for the small associations. The average BEP for the small group occurred at a volume of 224,854 gallons of gasoline and fuels. The average sales for the small group was $72,360 at point D and 321,141 gallons (F). Total costs were $69,551 (C) for the small associations with $6,561 of the total cost being fixed costs (A). It was computed that the average small association reached its BEP at approximately 70 percent of their sales.

The BEP for the small associations was computed for all sales which included oil and grease. The sales level increased to $77,623 and the BEP increased to $50,081. The BEP was reached at 64.5 percent of sales compared to 70 percent of only gasoline and fuel sales. This was expected, however, because the only additional cost involved was the variable costs which was the cost-of-goods-sold.

Figure 2 indicates the BEP for the large associations. The large associations' average total sales (for gasoline and fuels) was $191,985 and 819,434 gallons. The total cost was $180,716 with the BEP occurring at $104,029 and 444,018 gallons. Fixed costs were $15,598 on the average for the large group. The BEP occurred at 54.2 percent of the sales.

In comparing total sales which include oil and grease, the total sales figure increases to $209,779 on the average with the BEP reached at $107,573 sales. This is at 51.3 percent of sales compared to 54.2

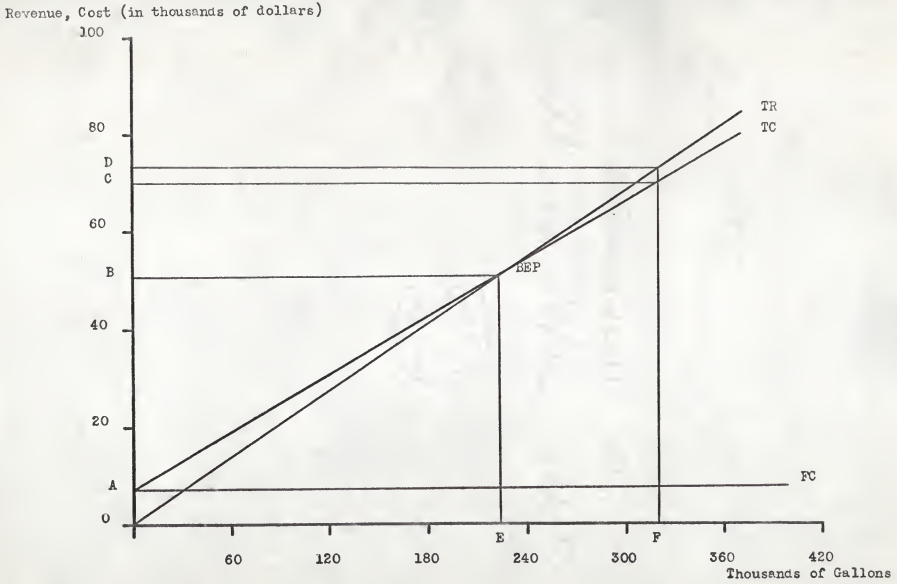

Figure 1. Gasoline and fuel: Average small volume association break-even point.

percent with gasoline and fuel only. It might be recalled that the BEP for all sales (including oil and grease) for the small group was reached at 64.5 percent of sales compared to 51.3 percent by the large group. This indicates larger associations tend to cover expenses sooner than small associations which indicates again the higher levels of returns by the large group.

It should be recalled that the figures used in the break-even analysis do not include administrative or inventory costs. It would be recommended that about 15 percent allowance be made by persons wishing to apply this data to their own situation.

It might also be remembered that just because an association reaches the break-even point it does not imply efficiency or profits of an adequate level to be beneficial to an enterprise. Persons should look beyond the break-even point and consider levels of margins that would be compatible with margins of other sectors of their operation.

Factors Affecting Operations

Information was collected in regard to age and capacity of trucks in the study. Three associations had purchased 1967 model trucks during their 1966 fiscal year. These 1967 model trucks were considered to be in their first year of operation. Similarly, 1966 trucks were considered to be in their second year of operation and so one. On the average, the trucks were in their fifth year of operation. The trucks ranged in age from 1967 models down to 1956 models. Tank capacity varied considerably among associations. Size ranged from 600 gallon capacity to 1800 gallons per truck. The average capacity was 1185 gallons. Table 17 shows the

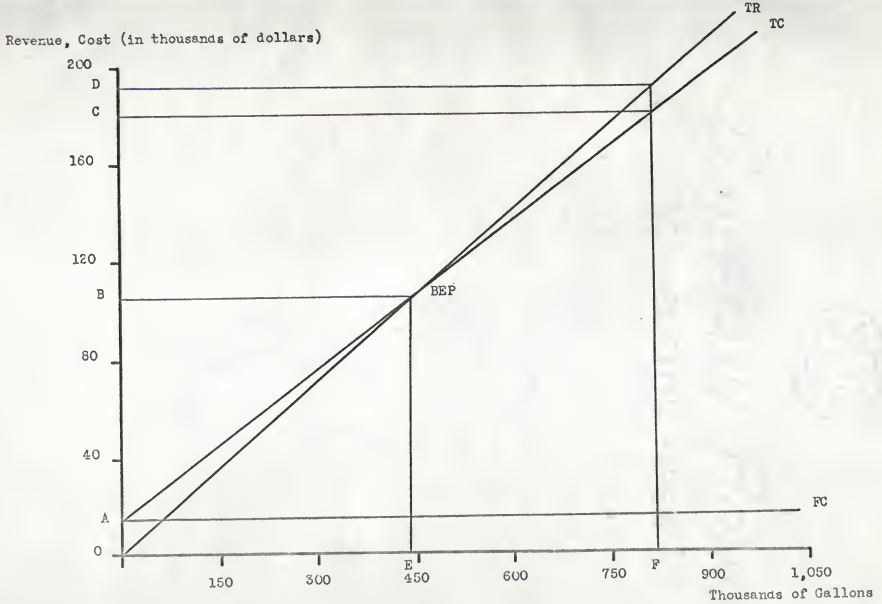

Figure 2. Gasoline and fuel: Average large volume association break-even point.

capacity and number of tanks in the study. Most of the newer trucks were equipped with 1500 gallon tanks and had duel pumping systems for gasolines and for fuels. Larger capacity was a very important factor mentioned by those who were purchasing new equipment.

Table 17. Delivery tank, capacity and numbers in use

Capacity in Gallons	No. in Use	Capacity in Gallons	No. in Use
1800	1	1000	8
1500	11	850	3
1400	1	800	4
1250	13	600	2
1200	4		

Delivery practices were considered in the collection of data for this study. One question asked of each manager was to estimate the percentage of the cooperative's customers which would allow unrequested delivery of gasoline and fuels. This is a system where the customer agrees to allow the driver to stop and fill his storage tanks any time. He is, of course, expected to make sure the customer does not run out of fuel. If enough of an association's customers will allow this practice, a route system can be established. In this study, only one association had an effective route plan in operation. The manager of this association estimated that about 90 percent of the customers were accepting unrequested delivery.

The advantages of routing deliveries are to be found in reducing delivery expenses. Retracking would be reduced considerably. It also allows the driver to spread his work load more uniformly. It reduces the problem of having several calls for delivery one day and none the next. Many associations have installed two-way radios in an effort to

reduce back tracking for deliveries in the same general area.

The range of percent of customers allowing unrequested deliveries was quite wide. Figures ranged from 90 percent to 8 percent. The average for all associations was 35 to 40 percent. One of the main problems which restricted delivery programs was gasoline price wars. Customers were reluctant to have their tanks kept full of gasoline if there was a possibility the price might fall several cents in the near future. They would much rather have their gasoline supply as low as possible in order to purchase large quantities of gasoline at the reduced gas war price. This also results in customers placing small orders for gasoline if they feel a price reduction may be coming in the near future, but they needed gasoline immediately. This situation causes extra expense. It costs about the same to deliver 100 gallons of gasoline as it would to deliver 300 gallons.

Each manager was asked to state what he considered to be the biggest problem concerning bulk operations. The responses fell into five categories as shown in Table 18.

Table 18. Problems concerning bulk operations

Problems	Number of Associations
Lack of volume	4
Accounts receivable	9
Price war	7
Retracking	1
Better credit offered by competition	4

Four associations listed a lack of volume as their main problem. Accounts receivable was the most often mentioned problem with price wars

being the second. Four associations listed better credit policies offered by their competition as their major problem. This was usually in terms of length of time credit was extended by the competition.

With accounts receivable listed most often as the biggest problem, data were collected concerning credit policies. The policies conditions were quite wide, ranging among associations. Table 19 shows the number of associations involved in each credit category.

Table 19. Credit policies and number of associations

Policies	Number of Associations
Credit period	
30 days	12
60 days	5
90 days	7
180 days	1
Cash discount	8
Service charges	15
Credit cutoff date specified	7

Twelve of the associations had a 30 day credit policy. In most cases this was followed by another 30 days grace period before any request for payment was made. Five associations offered 60 day credit extension and seven offered 90 days. One association had a six months credit policy. It might be noted that at the time of interview, several managers indicated their credit policies were under study, and changes were forthcoming. There seemed to be a general feeling that credit policies should be more strictly enforced to control the accounts receivable problem.

Cash discounts were offered by about one third of the associations.

These discounts ranged from one half of one percent to two percent. Fifteen associations had service charges imposed after the credit period. The majority of these were one percent per month. Seven associations indicated a time limit when credit would be refused and the customer would go on a cash basis. These time periods ranged from 30 days to 120 days. Other managers mentioned a rather flexible policy depending on the situation.

Each manager was asked to indicate his greatest competitor in his trade area in regard to tankwagon sales. He was also asked to state in what ways the competition were competing the strongest. See Table 20.

Table 20. Competitors and types of competition

Competitors	No. of Assns.	Type of Competition	No. of Assns.
Major brand	18	Price cutting	13
Independent	5	Volume discount	3
Another co-op	2	Credit	14
		Other	2

The largest group of competitors mentioned was, of course, major brands. This classification covers a large group of companies; and naturally provides most of the competition for the local associations. Eighteen of the association managers indicated major brand competition as their biggest competitor. Five associations considered "independent" bulk dealers as their biggest competition. These are dealers who have no affiliation with one particular brand name or product line, but sell a variety of different brands. Two associations indicated other cooperatives in the area provided their strongest competition.

In regard to types of competition, some associations indicated

more than one type so the total exceeds twenty-five. Price cutting, which includes gasoline price wars, was often cited as a competitive problem. Price cutting to selective customers was cited as a problem apart from general price war price reductions.

Another major type of competition was credit extension by competitors. The competition was offering longer term credit to customers than was available by the local cooperative. With farmers being pressed for as much working capital as possible for their farm operations, this becomes a very important consideration from the customer's point of view. This credit consideration by the customer, when coupled with the fact that one of the major problems of the cooperatives was accounts receivable, indicates an area needing further study and evaluation. It was obvious that long term credit as a form of competition was causing a very real problem of the local managers.

Other types of competition mentioned included volume discounts, and a few long established dealers in a community had very high customer loyalty. Some of these customers purchased all other products from the cooperative but purchased their bulk petroleum from the competitor.

SUMMARY AND CONCLUSIONS

As petroleum usage has increased in agriculture over the decade, the importance of efficient handling of the products by the local cooperatives has become more important. Bulk fuels require special equipment and handling techniques. Bulk trucks cannot be used for hauling other products.

The overall objective of this study was to determine, evaluate, and compare economic factors involved in bulk petroleum delivery. Specific objectives were (1) to determine levels of profitability or loss by the cooperative's petroleum operations; (2) to determine efficiency of delivery; (3) to determine economic effects of factors such as delivery policies, two-way radios, and credit policies; (4) to determine nature and type of competition; (5) to compare financial ratios of cooperatives' operation against published standards; and (6) to provide data for use in recommendations to improve operating efficiency and profits.

This study involved twenty-five Kansas cooperatives which handled bulk petroleum. These associations were selected at random. For part of the analysis, associations were divided into two groups based on total revenue from bulk sales. This included gasoline, fuels, oil and grease. Revenue ranged from $357,000 to $50,000 with the overall average being $137,000.

It was observed the large group had a higher gross margin per unit on sales than did the small group (15.8% G.M. per dollar for the large compared to 14.3% for the small on all products). The same relation was true on a per gallon basis for gasoline and fuels. Net

margins were considerably higher for large associations. The large group averaged 1.4 cents per gallon of gasoline and fuels and 1.8 cents for all sales. The small group, however, averaged only .80 cents per gallon of gasoline and fuels and .85 on all sales. Net margin per gallon on gasoline and fuel ranged from 2.7 cents per gallon to a loss of 1.2 cents per gallon.

Salaries and wages averaged 6.5 percent of sales for all associations. The small group averaged 7.6 percent while the large group was 6.1 percent. These figures indicated some savings in human expenses as volume increased. Salaries and wages as a percent of gross margin again indicated savings for the large volume group compared to the small group with 44.7 percent and 53.8 percent of gross margin respectively. Salaries and wages accounted for 70.4 percent of total expenses excluding administrative and inventory costs.

A simple regression with the Y value being net margin and the X value gallons indicated sales must be in excess of 210 thousand gallons before the net margin would be positive.

A multiple regression indicated truck and driver expenses had the most important effect on net margin per gallon. Gross margin was the next most important and gallons delivered the least important.

Break-even points were calculated for each group. The small group reached the BEP at 224,854 gallons while the large associations reached it at 444,018 gallons.

Truck operating expenses accounted for 14.3 percent of total expenses. Expressed as a percent of gross margin, the large association averaged 16.0 percent compared to 17.0 for the small group. Again

some savings were shown for the large volume group. Each association averaged approximately $1,964 a year to operate a truck (excluding driver expense).

All associations averaged 15,931 miles per truck per year with the large group traveling 17,896 miles and the small 12,125 miles. Expenses on a per mile basis indicated a considerable saving for the large group (11.7 cents per mile expenses compared to 14.7 cents for the small). Truck expenses on a per gallon basis were about the same for both groups indicating the large associations were covering a wider territory to make the high volume sales.

Total expenses as a percent of sales and gross margin were both favorable toward the large group.

Analysis on a per truck basis indicated the associations with more trucks were driving farther per truck and were delivering less fuel. As a result, the gallons/mile/truck ratio was lower in the case of the three and four truck associations. The cost/mile/truck was lower as the number of trucks increased. This was a result of the greater mileage driven by the associations with three or four trucks. The net margin per truck figures indicated the four truck operations had the highest with $6,078. The two-truck group was second, the three-truck group was third, and the one truck group was lowest at $2,535.

Break-even points were calculated on a per truck basis. These figures indicated the three-truck group had the lowest BEP followed closely by the four-truck group. The two-truck group was third highest and the one-truck group had the highest BEP. This was due to some extent

to lower fixed costs per truck in the three-and-four-truck groups.

This study has shown that per unit gross margins and expenses have the most effect on the level of net profit. Gross margin levels were especially important in receiving an adequate net margin. While certain levels of expense are necessary, costs should be reduced as low as possible without endangering customer service. Additional volume should be considered only when adequate margins can be received on the additional sales.

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AN ECONOMIC ANALYSIS OF BULK PETROLEUM OPERATIONS IN SELECTED KANSAS COOPERATIVES

BY

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Petroleum products are a major product often purchased by farmers through their cooperatives. As a result, efficient operation of petroleum departments is vital to the success of local associations. Because of the importance of the petroleum operation to the financial soundness of the local association this study was undertaken.

The overall objective of the study was to determine, evaluate, and compare the economic factors involved in bulk petroleum in selected cooperatives in Northeastern Kansas. Specific objectives were: (1) to determine levels of profitability or loss by the cooperative's petroleum operations; (2) to determine efficiency of delivery; (3) to determine economic effects of factors such as delivery policies; (4) to determine the nature and type of competition; (5) to compare financial ratios of cooperatives operation against published standards; and (6) to provide data for use in recommendations to improve operating efficiency and profits.

This study involved twenty-five Kansas cooperatives which handled bulk petroleum. Random selection methods were used to determine which associations were to be considered. For part of the analysis, associations were divided into two groups based on total revenue from bulk sales. Products were grouped and classified as gasoline, fuels, oil and grease. Grouping of products allowed easier comparison among associations. Revenue ranged from $50,000 to $557,000 with the overall average being $137,000.

It was observed the large group had a higher gross margin per unit on all sales than did the small group. The same relation was true on a per gallon basis for gasolines and fuels. Net margins were consider-

ably higher for large associations. This was a result of higher gross margins and lower per unit expenses by the large associations.

Analysis of costs per association revealed some savings in expenses. Salary and wages in large associations averaged 6.0 percent of sales, while small associations averaged 7.6 percent. These figures indicated some savings in human expenses as volume increased. Similar differences in salary and wages were seen when expressed as a percent of gross margin. Salaries and wages accounted for 7.0 percent of the total expenses excluding administrative and inventory costs.

Multiple regression indicated truck and driver expenses had the most important effect on net margin per gallon. Gross margin was the second most important and gallons delivered the least important. These findings were quite useful in determining recommendations for operators.

Break-even point analysis indicated levels of sales associations must attain before costs would be covered. Break-even points were also calculated on a per truck basis for the associations using the same number of trucks. As the number of trucks increased, it was observed the BEP occurred at smaller volumes.

Analysis on a per truck basis provided valuable information for managers considering a change in number of units. Analysis indicated associations with more trucks drove farther per truck and delivered less fuel. This situation was the result of the wide trade territories causing the three and four truck associations to cover greater distances. The net margin per truck indicated the four truck operations were receiving the highest net return. The one truck group received the lowest net margin per truck.

This study has shown that per unit gross margins and expenses have the most effect on the level of net profit. Gross margin levels were especially important in receiving an adequate net margin. While certain levels of expenses are necessary, costs should be reduced as low as possible without endangering customer service. Additional volume should be considered only when adequate margins can be received on the additional sales.