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INVENTORY MANAGEMENT IN  
COOPERATIVE OIL ASSOCIATIONS

by

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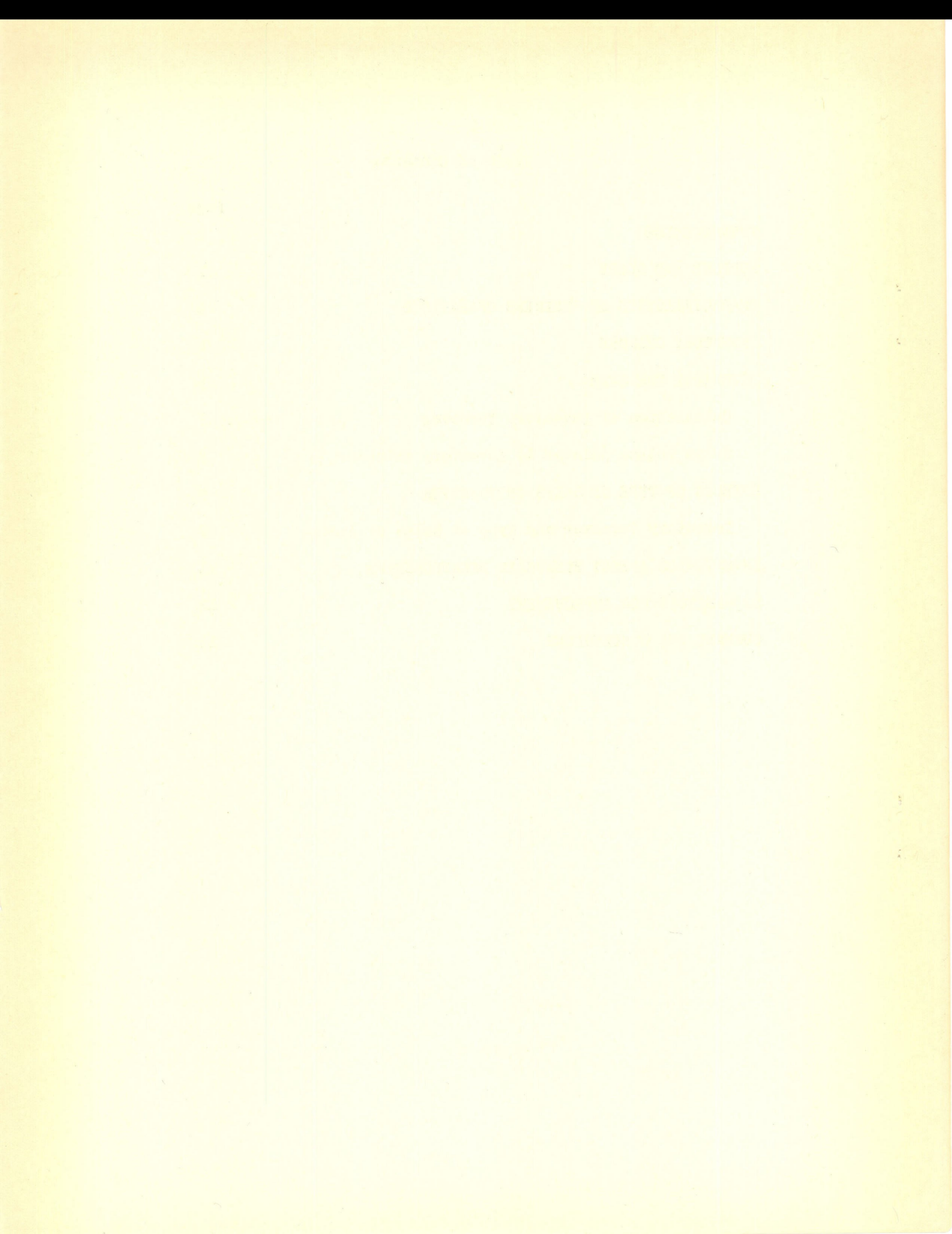
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# INVENTORY MANAGEMENT IN COOPERATIVE OIL ASSOCIATIONS

Arvid C. Knudtson and E. Fred Koller

## INTRODUCTION

Skillful management of merchandise inventories is an important factor in the successful operation of retail business organizations. Management problems involving merchandise inventories are numerous. Farm supply cooperatives are faced with inventory problems no different than those of most other retail organizations. They must constantly make decisions regarding the size and composition of their inventories.

Factors that must be considered in making sound decisions in handling inventories include: (1) potential sales, (2) competition, (3) available storage space, (4) available financing, (5) interest, insurance and other costs, (6) risks of price declines, and (7) risks of physical loss such as loss of quality or obsolescence. If the cooperative supply organization is to be successful in fulfilling its purpose it must develop sound inventory control methods and policies.

## PURPOSE AND SCOPE

It was the purpose of this study to analyze the efficiency of inventory management in Minnesota cooperative oil associations. One aspect of the study included an analysis of the changes in inventory turnover in recent years. Another purpose was to determine the effect of inventory position on the financial structure and the operating results of these associations. The analysis presents information that will be useful to management in dealing with inventory problems.

For the purpose of this study a sample of 42 oil associations was selected at random from the files of auditors located in the Twin Cities. While the sample is not statistically designed these 42 oil associations are located in all parts of the state. They include associations with a wide range of annual sales volumes and handling a wide variety of products. It is believed that these associations have inventory problems representative of oil associations found throughout the state.

In terms of area distribution 13 of the associations are located in the Southeast part of the state, 13 in the Southwest, 12 in the Northeast and North Central, and 4 in the Northwest.

For the purposes of comparison data were obtained for the fiscal year 1953-54 and four preceding years. In the remainder of this report all fiscal years will be designated by the last year of the fiscal year.

Although these 42 associations handled a wide range of farm supplies in 1954 they had an average of 73.3 per cent of total sales in petroleum products. The other supplies handled included tires, batteries, automobile accessories, farm machinery, appliances, feed, seed, fertilizer and other items.

The 42 associations were distributed according to sales volume as follows: 14 had annual sales under \$150,000; 19 had sales in the \$150,000 to \$300,000 range; and 9 had sales of more than \$300,000.

#### CHARACTERISTICS OF BUSINESS OPERATIONS

The annual sales volume of these associations averaged \$252,767 in 1954 (Table 1). This was an increase of 4.2 per cent over the 1950 sales of these identical associations. Associations with sales of less than \$300,000 had increased sales while the larger associations showed a decrease in sales for the period.

Table 1. Average Total Sales in 42 Minnesota Cooperative Oil Associations According to Volume of Business, 1950-1954.

Annual volume of business	Number of associations	Average Sales				
		1950	1951	1952	1953	1954
		dollars				
Less than \$150,000	14	99,949	99,648	108,202	112,103	117,025
150,000-300,000	19	208,200	213,046	224,075	231,865	237,643
300,000 and over	9	537,065	496,588	502,001	511,588	495,849
Totals	42	242,587	236,006	245,006	251,885	252,767

The composition of sales in these associations changed somewhat during the 5 years covered in the study. There was a marked decrease in the importance of farm machinery and appliance sales relative to total sales. Machinery and appliances accounted for 10.7 per cent of total sales for the 42 cooperatives in 1950 compared with 4.7 per cent in 1954 (Table 2). Gasoline and light oil sales increased from 69.4 per cent to 73.3 per cent of total sales during the 4 years.

Table 2. Proportion Commodity Sales Were of Total Sales in 42 Minnesota Oil Associations, 1950 and 1954

Year	Number of associations	Type of commodity						Total
		Gasoline light oils*	Tires, tubes, batteries	Accessories	Machinery and appliances	Feed, seed, fertilizers	Misc. **	
per cent of sales								
1950	42	69.4	3.0	3.6	10.7	3.1	10.2	100.0
1954	42	73.3	4.2	4.8	4.7	2.3	10.7	100.0

\* Light oils includes tractor fuels and kerosene.

\*\* Miscellaneous includes lubricating oils, greases, antifreeze, hardware, and groceries.

Changes made over time in the types of sales partially accounts for changes in the inventory position of the associations.

The cooperatives with annual sales of less than \$150,000 showed a slight decrease in gasoline sales (Table 3). This group of small associations showed a sizeable decrease in machinery and appliance sales, from 6.2 per cent of total sales in 1950 to 2.4 per cent in 1954.

The important change in commodity sales among the cooperatives in the \$150,000 to \$300,000 sales volume group was the decrease that occurred in machinery and appliance sales.

The machinery and appliance sales decreased from 7.5 per cent of total sales in 1950 to 3.7 per cent in 1954.

The largest sales volume group, those with over \$300,000 annual sales, showed a sizeable increase in gasoline and fuel sales over the period. These large associations experienced decreases in the category of feed, seed, fertilizer and also in the category of machinery and appliance sales.

Table 3. Proportion Commodity Sales were of Total Sales by Volume Groups in 42 Minnesota Oil Associations, 1950-1954.

Volume and year	Type of Commodity						Total
	Gasoline and light oils	Tires, tubes, batteries	Accessories	Machinery and appliances	Feed, seed, fertilizer	Misc.	
	per cent of sales						
Under \$150,000							
1950	78.5	3.2	5.0	6.2	.6	6.5	100.0
1951	77.4	4.1	4.8	6.4	.7	6.6	100.0
1952	77.5	4.7	4.9	3.7	2.0	7.2	100.0
1953	79.4	4.6	5.9	2.2	.9	7.0	100.0
1954	77.5	4.7	6.6	2.4	1.3	7.5	100.0
\$150,000-300,000							
1950	71.1	3.7	6.2	7.5	3.0	8.5	100.0
1951	73.3	5.0	5.4	5.1	3.0	8.2	100.0
1952	72.5	4.7	6.3	6.1	2.8	7.6	100.0
1953	71.9	4.6	5.2	5.4	2.7	10.2	100.0
1954	73.4	4.8	6.5	3.7	3.2	8.4	100.0
\$300,000 and over							
1950	65.3	2.6	1.0	14.7	3.8	12.6	100.0
1951	70.1	3.1	1.2	9.2	1.8	14.6	100.0
1952	70.9	3.0	2.6	7.4	1.2	14.9	100.0
1953	72.3	3.0	.8	7.1	1.2	15.6	100.0
1954	72.2	3.4	2.2	6.4	1.6	14.2	100.0

#### INVENTORY CHANGES

Merchandise inventories of the 42 associations average \$32,846 in 1954 (Table 4). This amounted to an increase of 6.5 per cent over the 1950 level.

The 33 associations that had an annual sales volume of less than \$300,000 showed increases in the average size of inventories held over the period. The 9 associations with annual sales greater than \$300,000 per year showed a decrease in average inventories held during the same period. They held an average of \$71,890 in inventories in 1950 compared with \$64,242 in 1954 (Table 4).



Table 4. Average Total Inventories in 42 Cooperative Oil Associations According to Sales Volume, 1950-1954.

Sales volume	Number	Average Inventories				
		1950	1951	1952	1953	1954
		dollars				
Under \$150,000	14	13,409	15,607	15,722	16,281	16,629
\$150,000-\$300,000	19	23,952	28,395	29,888	29,499	29,923
\$300,000-and over	9	71,890	72,335	78,162	71,658	64,242
All Associations	42	30,710	33,548	35,508	34,127	32,846

From data in Table 1 it is found that sales increased 17.1 per cent from 1950 to 1954 among the associations with less than \$150,000 sales. At the same time this group showed an increase of 24.0 per cent in inventories (Figure 1). The large oil cooperatives experienced a 7.7 per cent decrease in sales from 1950 to 1954. At the same time the inventories of these large associations decreased more rapidly than their sales. Their inventories were 10.6 per cent lower in 1954 than was the case in 1950.

The more rapid decrease in inventories relative to sales in the larger associations can be explained in part by their movement away from certain large supply items such as farm machinery and appliances which require large inventories relative to sales.

There are at least three possible explanations for the situation in the smaller associations which showed inventories increasing faster than sales. First, over-optimism on the part of management may have resulted in more rapid purchasing than was justified. This is indicative of poor inventory control. Secondly, it may have been the result of an attempt to take advantage of an anticipated price rise. Cooperative management should devote its efforts principally to increasing efficiency and improve the merchandising program, but should not speculate on price changes. Another possible explanation for inventories rising relative to sales is that with rising competition for sales many associations tried to stock more lines of merchandise and more brands in order to attract and hold patrons.

#### INVENTORY TURNOVER

An inventory turnover ratio is a measure of the skill in managing merchandise inventories. The inventory turnover ratio shows how many times a year the average inventory is sold. The more rapidly inventories are revolved the more intensive is the use made of capital and the larger the net margins are likely to be.

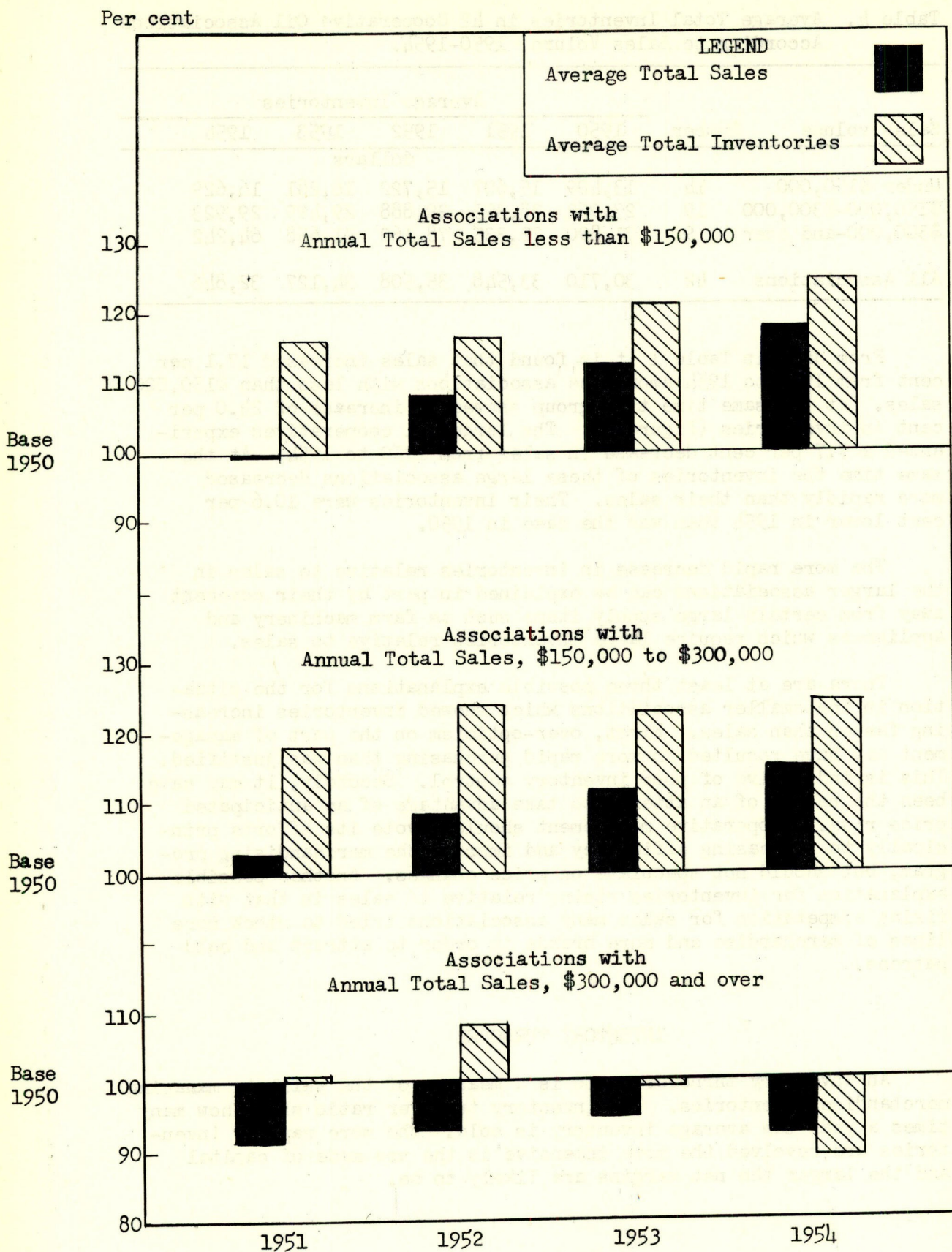


Figure 1. Changes in Total Sales and Total Inventories of 42 Cooperative Oil Associations for 4 Years Shown as a Percentage of 1950

Efficient merchandising firms such as chain store organizations carefully watch the inventory turnover ratio of every item in order to avoid a slow down in the turnover of inventory investment. When certain items are moving too slowly and considered unprofitable these firms will engage in an active pricing campaign to move the items, recover the funds and reinvest them in more profitable merchandise.

It is very important to keep inventory turning over at a high rate in order to: (1) increase gross margins (2) hold down per unit costs of carrying inventories, and (3) minimize losses caused by deterioration and obsolescence of merchandise.

#### Calculation of Inventory Turnover

The rate of inventory turnover is determined by dividing the cost of goods sold by the average inventory. For example, if the annual cost of goods sold was \$500,000 and the average inventory was \$50,000, the average inventory was turned over 10 times during the year.

$$\frac{\$500,000 \text{ cost of goods sold}}{50,000 \text{ average inventory}} = 10 \text{ times a year}$$

Cost of goods sold is the total of all goods sold in terms of cost instead of selling price. The cost of goods sold is used instead of sales because inventories are normally carried at cost; therefore, both the numerator (cost of goods sold) and the denominator (inventory) are on a cost basis. An alternative method of calculating inventory turnover includes sales in the numerator when cost of goods sold is not available. This method is less accurate because the sales figure includes markup and it will overstate the ratio somewhat.

Fourteen of these 42 oil associations turned over inventories less than 5 times a year (Table 5). Six other associations made much better use of their inventory investment capital in that they rotated their inventory 15 times or more during the year.

Table 5. Distribution of 42 Cooperative Oil Associations According to the Inventory Turnover Ratio, 1954.

<u>Inventory turnover ratio</u>	<u>Number of Associations</u>
Less than 5	14
5.0 - 9.9	15
10.0 - 14.9	7
15.0 and over	6
Total	42

Supply cooperatives should make full use of this inventory turnover measure, and couple it with an active merchandising program that will move aging merchandise. There is a definite need for supply associations to adopt a sound inventory control program in order to reduce costs and assure more efficient use of working capital.

According to Table 6 the inventory turnover ratio for all commodities combined showed a decrease from 7.0 in 1950 to 5.7 in 1951. From 1951 there was a further small decrease and then an upward trend to 5.7 in 1954.

The general trend in inventory turnover ratios was downward for all sales volume groups from 1950 to 1954. However, the size of the ratios was quite different for the different volume groups. The ratio averaged highest among the group of associations with annual sales between \$150,000 and \$300,000, and lowest among the largest sales volume group. In 1954 the inventory turnover ratios were 5.6, 6.3, and 5.2 for the 3 sales volume groups arranged from smallest to largest.

Table 6. Inventory Turnover Ratio For All Commodities Combined According to Sales Volume, 1950-1954.

Volume group	Number of Associations	Inventory turnover ratio				
		1950	1951	1952	1953	1954
		times per year				
Under \$150,000	14	6.1	5.4	5.6	5.6	5.6
\$150,000-\$300,000	19	7.0	5.9	6.0	6.2	6.3
\$300,000 and over	9	6.0	5.5	5.2	5.7	5.2
Totals	42	7.0	5.7	5.5	5.9	5.7

#### Sales Volume Related to Inventory Turnover

The two smallest groups, all those with less than \$300,000 annual sales, were quite similar in the types of sales they made. Since there is considerable similarity in the type of sales made by these two groups the difference in the level of the inventory turnover ratios over the period can be partially explained by the volume of sales. It is necessary to maintain some minimum level of inventories in order to conduct business. However, as the volume of business grows it is not necessary to increase the inventories in the same proportion. In other words increased size of business, with similar sales, allows a firm to carry a lower inventory per dollar of sales which results in a more efficient use of inventory dollars. From Tables 1 and 4 it was determined that the group of associations with less than \$150,000 sales held inventories of 14.2 cents per dollar of sales while the associations in the \$150,000 to \$300,000 sales range held inventories of 12.5 cents per dollar of sales.

The large volume group, over \$300,000 sales, had the lowest level of inventory turnover ratios over the period. This may be partially explained by the different type of sales made by these associations. The large cooperatives showed a higher proportion of farm machinery and appliance sales, which are slow moving items, and also a higher proportion of miscellaneous sales (see Table 3). Miscellaneous sales include such things as sales of: grease and lubricating oils, antifreeze, groceries and meats, hardware, automobile sales and service, and machinery repair service.

### EFFECTS OF TYPE OF SALES ON TURNOVER

Sales arrangements for various commodities differ widely. Some types of equipment sales, such as a tractor sale, may be made to a patron only once in 10 to 15 years. The turnover of inventory of merchandise of this type tends to be very slow.

In the case of tractor fuels the farm storage tank typically holds a small supply and purchases are frequent -- likewise storage is costly for the association and this necessitates relatively frequent small purchases. Therefore, in the case of tractor fuels, inventories are small relative to sales, and inventory turnover ratios are high. The numerous other commodities handled by these associations have sales and inventory conditions that result in turnover ratios somewhere between the extremes of tractor fuels and farm machinery.

Table 7 shows the average inventory turnover ratios by commodity groups. Among these 42 associations the turnover of gasoline and light oils averaged 24.1 times per year in 1954 while machinery and appliances had a rate of turnover of 1.7 times.

Table 7. Average Commodity Inventory Turnover Ratios of 42 Minnesota Cooperative Oil Associations, 1954.

Commodities	Number of associations handling	Inventory turnover ratio times per year
Gasoline, and light oils	42	24.1
Tires, tubes, and batteries	40	2.4
Accessories	38	1.9
Machinery, and appliances	24	1.7
Feed, seed, and fertilizer	16	5.6

Thirteen of the 42 associations sold feed, seed, and fertilizer in 1950 compared with 19 in 1954. The six associations that started in the feed, seed, and fertilizer business since 1950, had an inventory turnover ratio of only 3.8 times for that line of merchandise. In order to add a new line of merchandise a basic inventory must be carried while sales are being increased. This results in a low turnover ratio.

In contrast 10 associations which handled feed, seed, and fertilizer during the entire period had an inventory turnover ratio in these supplies of 7.4 times per year.

#### Inventory Turnover and Types of Sales by Areas

Among these 42 cooperative oil associations those located in the southwestern part of the state had the highest inventory turnover ratio,

7.9 times in 1954 (Table 8). The 13 associations in the southeastern part of the state showed an inventory turnover ratio of only 4.6 times for 1954.

Table 8. Inventory Turnover Ratios in 42 Cooperative Oil Associations According to Area, 1954.

Area	Number	Inventory Turnover
		times per year
Southeast	13	4.6
Southwest	13	7.9
Northeast	12	5.6
Northwest	4	5.9

The cooperatives in the Southwest had a higher proportion of gasoline and light oil sales than other areas--80.1 per cent in 1954 (Table 9). Gasoline and light oils had a very rapid turnover, 24.1 times in 1954. A higher proportion of these sales will increase the aggregate turnover ratio.

Machinery sales were more important relative to total sales in the northern part of the state than in the southern part.

Table 9. Per Cent Commodity Sales Are of Total Sales in 42 Cooperative Oil Associations by Area, 1954.

Area	Number of associations	Commodity						
		Gasoline and light oils	tires, tubes, batteries	Accessories	Machinery and appliances	Feed, seed, and fertilizer	Misc.	Total
		per cent						
Southeast	13	76.2	4.2	3.5	3.9	3.9	8.3	100.0
Southwest	13	80.1	4.5	3.8	2.9	1.2	7.5	100.0
Northeast	12	63.0	4.4	6.1	7.1	1.5	17.8	100.0
Northwest	4	71.4	1.8	11.7	6.3	2.0	6.8	100.0

The cooperatives in the Northeast area had over twice the amount of sales of miscellaneous items than any other area had--17.8 per cent of total sales in 1954. The associations in the Northeast included in the study were more diversified than the associations in other areas. Table 10 shows a breakdown of sales included as miscellaneous sales in the Northeast area.

Table 10. Major Commodities and Services Included in Miscellaneous Sales of 12 Northeast Minnesota Oil Associations, 1954.

Commodities and Services	Number of associations handling
Greases and lubricating oils	12
Hardware	6
Groceries	4
Dry goods	2
Dairy supplies	2
Automobile and machinery repair	2
Building materials	1
Locker service	1
Automobile sales	1

Hardware and grocery departments were the most common sidelines. Hardware sales were not uncommon in other areas, however, the sales of dry goods and automobiles were found only among the oil associations in the Northeast. Only one of the 30 associations outside of the Northeast area had a grocery department.

Every effort should be made to maintain a relatively high inventory turnover ratio. A high turnover ratio has the advantage of making better use of the capital involved in inventories. With lower inventories, storage, interest, and insurance costs on inventories are lower and the possible losses from deterioration and obsolescence are lessened.

However, an extremely high inventory turnover ratio caused by very low inventories may result in some disadvantages. First, too small an inventory may result in the loss of some sales. Maintaining a very small inventory may increase per unit purchasing costs. Small purchases in some cases will be made at higher prices than larger purchases, which enjoy quantity discounts. Also, transportation costs may be higher per unit on smaller purchases (i.e., less than carlot rates).

#### INVENTORIES AFFECT FINANCIAL RELATIONSHIPS

The size of these associations in terms of total assets increased from an average of \$118,995 in 1950 to \$148,827 in 1954. Inventories among the 42 cooperatives accounted for 22.0 per cent of total assets in 1954 compared with 25.8 per cent in 1950.

A sound inventory control program is important. When inventories increase relative to sales more and more of the associations' working capital becomes tied up in inventories. It was found that as the inventory turnover ratio decreases the proportion of working capital tied up in inventories increases. Table 11 shows that associations with an inventory turnover ratio of less than 10 times per year had a much higher proportion of working capital tied up in inventories than was true of associations with higher inventory turnover ratios.

In 1954 inventories equaled 104.8 per cent of net working capital among the associations with an inventory turnover ratio of less than 5 compared with 22.5 per cent among associations that had an inventory turnover ratio of 15.0 or more (see Table 11).

Table 11. Distribution of 42 Cooperative Oil Associations According to the Inventory Turnover Ratio and the Per Cent Inventories are of Net Working Capital, 1954.

Inventory Turnover	Per Cent Inventories are of Net Working Capital						Total	Average
	Negative	Less than 25	25-50	50-75	75-100	100 and more		
	number of associations						per cent	
Less than 4.9	-	-	-	3	7	4	14	104.8
5.0 - 9.9	2	1	4	4	-	4	15	71.8
10.0 - 14.9	-	-	5	1	1	-	7	45.5
15.0 and more	-	3	2	-	1	-	6	22.5
Totals	2	4	11	8	9	8	42	74.0

An association with large inventories has need for larger amounts of capital. Operating efficiency is impaired when inventories account for a large proportion of working capital. In such a case cash may be short. This could restrict the association's ability to make savings by taking advantage of cash discounts.

Increased costs caused by a slow inventory turnover tend to reduce net returns. Figure 2 indicates that the proportion net margins are of sales are lower among associations with slower inventory turnover ratios. The 14 associations with an aggregate turnover ratio of less than 5.0 had average net margins of 3.1 per cent of sales in 1954 compared to 7.7 per cent among the 6 associations with a turnover ratio of 15.0 and over.

#### SUGGESTIONS FOR IMPROVING THE INVENTORY CONTROL PROGRAM

1. Keep accurate inventory records that show the quantity of each commodity in stock at any time.
2. Use these records to find the slow moving unprofitable items. Know the turnover ratio of all items.
3. Engage in an active campaign to move slow unprofitable items. They will move at a lower price. Inventory must be sold in order to make the most effective use of capital.
4. Do not speculate in inventory. Always keep purchases in line with current needs.
5. If possible, avoid stocking large slow turning items. Encourage an order business for these items. Pass the savings along to the customer by means of an attractive price.



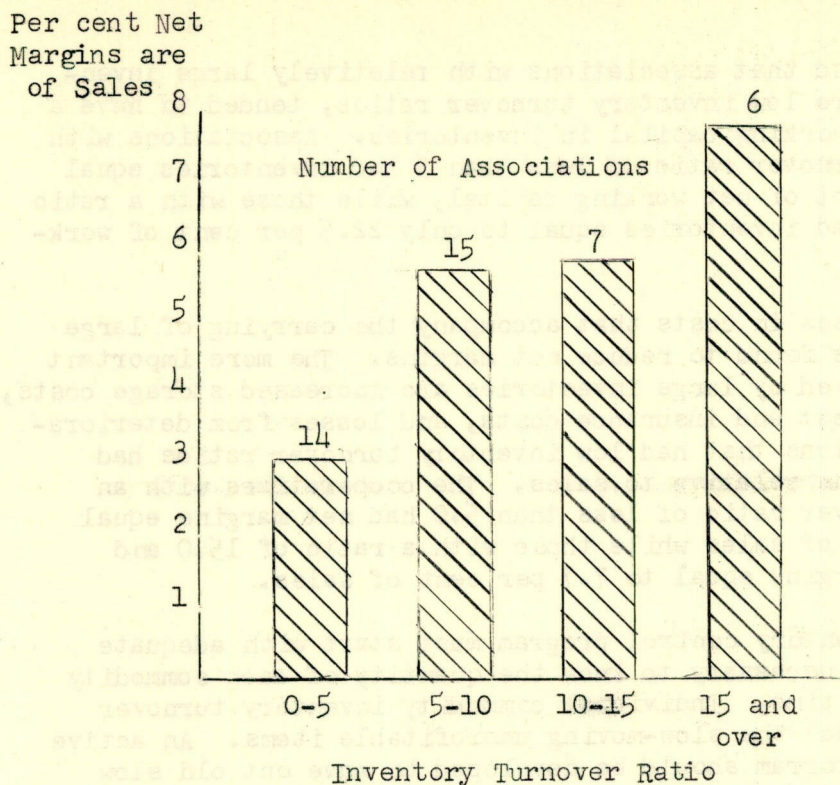


Figure 2. Relationship between Net Margins as a Percentage of Sales and Inventory Turnover Ratio in 42 Oil Associations, 1954

#### SUMMARY AND CONCLUSIONS

The 42 oil associations included in the study showed average sales of \$252,767 in 1954; at the same time their inventories averaged \$32,846. Sales in 1954 were 4.2 per cent higher than in 1950, while inventories were up 6.5 per cent over 1950.

The smallest associations, those with sales of less than \$150,000 showed a 17.1 per cent increase in sales and a 24 per cent increase in inventories from 1950 thru 1954. The largest cooperatives experienced a 7.7 per cent decrease in sales accompanied by a 10.6 per cent decrease in inventories during the 5-year period.

The 42 cooperatives had an average inventory turnover ratio of 5.7 in 1954 compared with 7.0 in 1950. Fourteen of the 42 associations had an inventory turnover ratio of less than 5.

The inventory turnover ratio for gasoline and light oils was found to be 24.1 times in 1954; this was the highest turnover ratio for any line of merchandise. Machinery and appliances were handled by 24 of the associations; these 24 associations turned over their machinery and appliance inventories only 1.7 times in 1954. All other types of merchandise showed average inventory turnover ratios between the two extremes of gasoline, and machinery and appliances.

It was found that associations with relatively large inventories, therefore low inventory turnover ratios, tended to have a major share of working capital in inventories. Associations with an inventory turnover ratio of less than 5 had inventories equal to 104.8 per cent of net working capital, while those with a ratio of 15 or more had inventories equal to only 22.5 per cent of working capital.

The increases in costs that accompany the carrying of large inventories were found to reduce net margins. The more important added costs caused by large inventories are increased storage costs, increased interest and insurance costs, and losses from deterioration. Associations that had low inventory turnover ratios had lower net margins relative to sales. The cooperatives with an inventory turnover ratio of less than 5.0 had net margins equal to 3.1 per cent of sales while those with a ratio of 15.0 and over had net margins equal to 7.7 per cent of sales.

A good inventory control program must start with adequate records. It is necessary to know the quantity of each commodity in stock at any time. Individual commodity inventory turnover ratios will reveal the slow-moving unprofitable items. An active merchandising program should be developed to move out old slow turning items. Inventory speculation should be avoided. Speculation is not in line with the purpose for which the cooperative supply association was established. Whenever possible large supply items should be sold on an order basis. The savings made can be passed on to the customer.

The inventory problem periodically gives management a great deal of difficulty because of changing price levels. The best way to cope with the problem is to engage in a careful inventory control program that will keep inventory moving and in line with sales.

Efficient merchandising calls for more and more intensive use of capital. One way in which this may be achieved is by effecting a more rapid turnover of merchandise inventories. The most efficient merchandising organizations in the nation have effected high rates of inventory turnover. Cooperative oil associations need to take positive steps to develop similar efficient inventory management policies.

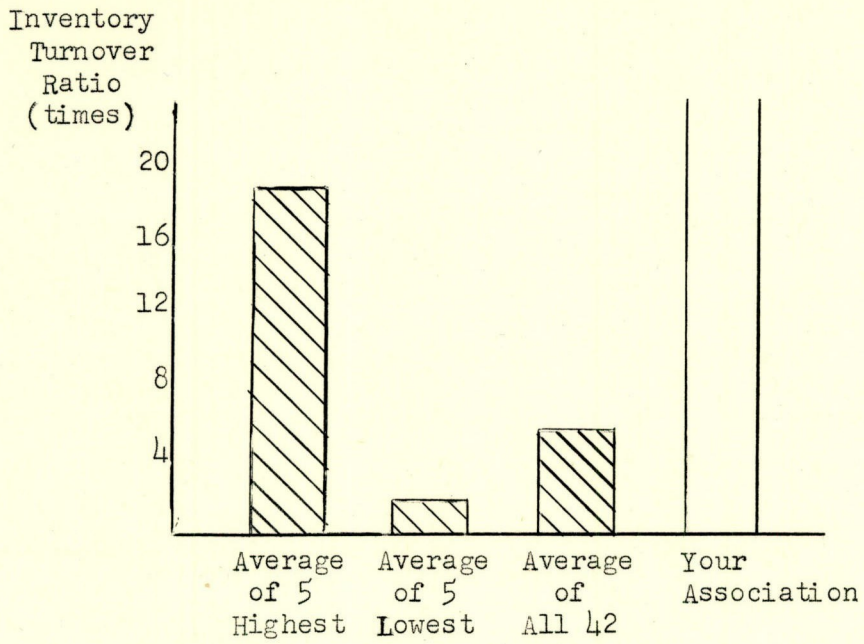


Figure 3. Inventory Turnover Ratios of the 5 Highest, 5 Lowest, and all 42 Cooperative Oil Associations, 1954

How does your inventory turnover ratio compare? Calculate the ratio for your association and enter the amount in the space provided in the figure above. For the method of calculating your ratio see page 7.



Figure 1. Comparison of the percentage of the total population of the United States in 1950 and 1960, by race and sex.

How does this compare with the percentage of the total population of the United States in 1950 and 1960, by race and sex, as shown in Figure 1? The percentage of the total population of the United States in 1950 and 1960, by race and sex, is shown in Figure 1.