PROBLEMS OF WESTERN COOPERATIVES IN OBTAINING and DISTRIBUTING FERTILIZER

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JOSEPH G. KNAPP, ADMINISTRATOR

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The Farmer Cooperative Service conducts research studies and service activities of assistance to farmers in connection with cooperatives engaged in marketing farm products, purchasing farm supplies, and supplying business services. The work of the Service relates to problems of management, organization, policies, financing, merchandising, quality, costs, efficiency, and membership.

The Service publishes the results of such studies; confers and advises with officials of farmers' cooperatives; and works with educational agencies, cooperatives, and others in the dissemination of information relating to cooperative principles and practices.

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CONTENTS

SUMMARY

This report provides management of farmers cooperatives in the Western States with information on problems in the development of their fertilizer manufacturing and distributing programs. Such information also can be useful in forming transportation policies.

The study upon which this report is based showed that trends in usage, sources of ingredients, differences between points of manufacture and places of consumption, and technological changes all have a direct bearing on transportation costs of fertilizer. Fertilizer is becoming an increasingly important item in farming in this area as farmers in the Western States increased their use of fertilizer nearly eight times from the period 1935-1939 to 1953, or to about 10 percent of the national demand. During this time, in contrast, fertilizer use for the country as a whole increased about three times.

Fertilizer manufacturing is a highly seasonal industry. Nearly one-third of all ingredients for manufacturing were obtained in April and three-fourths of the finished products were delivered during the 4-month period February through May.

Problems of fertilizer manufacture in the West are further complicated by the large number of components used in many mixtures. About 90 percent of all mixtures contain 5 components or more.

Cooperative mixing plants had an estimated capacity of 71,500 tons or around 5 percent of the total mixed capacity in the two regions. In 1952, this total was reported at 1.3 million tons for the Pacific States and 274,000 tons for the Mountain States.

Farmer cooperatives accounted for $11.4 million of the fertilizer business in this Western area, in 1951-52 compared with $95.4 million for other business firms. In 1952, 313 local associations, 70 in the Mountain and 243 in the Pacific States, retailed $9.3 million worth of fertilizer. Eighty-one of these were farm supply cooperatives with an annual business of $3.8 million, while 232 were marketing cooperatives with an annual business of $5.5 million.

Twenty-four regional cooperatives, 17 of them farm supply and 7 marketing associations, handled fertilizer with a gross value of $9.6 million in 1951-52. They retailed the great majority of this to other associations, although $1.6 million represented retail sales direct to farmers.

Approximately 80 and 85 percent, respectively, of all fertilizer distributed in the Mountain and Pacific States was separate materials. The Pacific region accounted for 85 percent and California for 73 percent of the total for all Western States. In 1953 this total was reported at 1.7 million tons.

Fertilizer consumption in the Pacific States was between five and six times that of the Mountain States in 1952. Cooperatives in the Western region retailed about 11 percent of all fertilizer used by farmers, the proportion ranging from 14 percent in the Mountain States to 10 percent in the Pacific States.

Farmer cooperatives in the Western States have been pace setters in distributing high analysis fertilizer. In the Pacific and Mountain regions these associations averaged 36 and 35 units of plant nutrients per ton, respectively, compared with 26 and 30 for other manufacturers.

In an effort to develop an integrated fertilizer service for farmers, cooperatives in the Western States have organized the Western Fertilizer Association as a procurement and manufacturing agency. This association has a contract with the Tennessee Valley Authority to get ammonium nitrate and concentrated superphosphate for distribution to its members for selected uses in an educational sales program. Some Western associations also obtain fertilizer from Associated Cooperatives, Sheffield, Ala., the first national wholesale fertilizer cooperative in the United States.

The ability of fertilizer cooperatives in the West to improve service to farmers largely will depend upon: (1) the nature of cooperative development, (2) problems of obtaining sources of supply, and (3) changes and impacts on transportation of manufacturing technology.

PROBLEMS OF WESTERN COOPERATIVES IN OBTAINING AND DISTRIBUTING FERTILIZER

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Use of fertilizer by farmers in the Western States increased nearly eight times from 1935-1939 to 1953.[2] This compares with a three-fold increase for the country as a whole and represents a greater relative expansion than for any other area. While usage in this region is small compared with national demand, accounting for only 10 percent of the total, it is an important expense item to farmers, amounting to an estimated $105 million in 1951-52.

To meet the growing need farmers in the Western States have made fertilizer mixing and distributing an important part of their regional and local cooperative operations. By 1951-52 an estimated 313 local associations and 24 regional cooperatives distributed about $11.4 million of fertilizer. This is equal to about 6 percent of the total business of the 3,376 American cooperatives engaged in retail distribution of fertilizer.

Increased recognition of the importance of fertilizer to develop sound agriculture has led to considerable interest in forming long range plans, especially on the development of phosphate deposits in Idaho. To appraise and evaluate effectively their interests in building a completely integrated fertilizer program, farmers need to obtain economic information on its many interrelated and complicated transportation aspects. A farmers' fertilizer manufacturing and distributing program in the Western States is dependent among other things upon freight rates

NOTE: The writers wish to express appreciation to officials of cooperatives in the Western States for furnishing information reported in this study and to Leonard N. Conyers, Chief, Transportation Branch, and Joseph G. Knapp, Administrator, Farmer Cooperative Service for helpful suggestions. Valuable assistance also was provided by John N. Mahan, Head, Distribution Economics Section, Fertilizer Distribution Branch, Tennessee Valley Authority; by Kenneth D. Jacob and J. R. Adams of the Soil and Water Conservation Research Branch of the Agricultural Research Service; and by staff members of some of the Land Grant Colleges in the Western States.

[1] Formerly with the Farm Supplies Branch, Farmer Cooperative Service.
[2] In this report the term, Western States, is used to include the three Pacific States: Washington, Oregon, and California, and the eight Mountain States: Montana, Idaho, Wyoming, Nevada, Utah, Colorado, Arizona, and New Mexico.

and other transportation information basic to the development of sound policies in initiating such a venture.[3]

OBJECTIVES

This report is designed to furnish information to management of farmers' cooperatives for use in appraising economic aspects of transportation costs in developing a fertilizer manufacturing program. In general, it provides basic data on long range problems relating to fertilizer manufacturing and distributing programs. In this way it furnishes background information useful to management.

Specifically the objectives of this report are to:

1. Describe general fertilizer operations of regional cooperatives in the Western States, giving special attention to manufacturing and distributing;

2. Present economic data showing the role of cooperatives in the fertilizer industry of the region; and

3. Provide statistical information useful in appraising transportation problems encountered in procuring raw materials for manufacturing fertilizer, and useful in developing a long range program for coordinating the efforts of the agencies serving farmers.

METHOD OF STUDY

To obtain information for this study, personal interviews were held with officials of cooperatives in the Western States that manufactured or distributed, or both, either mixed or straight fertilizer materials. Transportation, economic, and agronomic information was obtained from a number of agencies. These included Land Grant Colleges, Banks for Cooperatives, State cooperative councils, general farm organizations, and State departments of agriculture.

In addition, statistical data on fertilizer usage, both on an industry-wide and a cooperative basis, were obtained from the Soil and Water

[3]Previous studies made by Farmer Cooperative Service with funds provided by the Agricultural Marketing Act have dealt with some of the fertilizer transportation problems of farmers in the North Central States, problems that in part are interrelated with the Western region because of common aims in the development of phosphate deposits as well as similar goals in providing plant food at cost for farmer members. These studies include:

(1) Abrahamsen, Martin A. Manufacturing Costs as Reported for Cooperative Fertilizer Plants in the North Central States, 1949. Feb. 1951. U.S. Farm Credit Adm. Spec. Rpt. 218.

(2) Scroggs, Claud L. Economic Aspects of Transportation Affecting a Cooperative Fertilizer Program in the North Central States. U.S. Farm Credit Adm. Misc. Rpt. 149. May 1951.

(3) Grab, Eugene G., Hurst, Wilbur M., and Scroggs, Claud L. Cooperative Fertilizer Plants. U.S. Farm Credit Adm. Cir. C-145. May 1952.

(4) Conyers, Leonard N. Comparative Carload Rail and Inland Water Rates and Distances on Fertilizer Raw Materials. U.S. Farm Credit Adm. Spec. Rpt. 237 (Revised). Jan. 1952.

Conservation Research Branch, Agricultural Research Service, and from the History and Statistics Branch of the Farmer Cooperative Service. The report places special emphasis on graphic presentation as the most effective way of showing cooperative management the interrelationships of basic data.

Data included in this report on fertilizer manufacturing emphasize mixing operations since farmer cooperatives carried on no superphosphate acidulating. Neither did these cooperatives ammoniate. Therefore, nitrogen for mixing was provided entirely by dry solids.

Farmer Cooperative Service had data on fertilizer distribution for 337 cooperatives -- 313 of them local associations and 24 regional cooperatives. Of this number 239 were classified as marketing, and 98 as farm supply associations.

COOPERATIVE FERTILIZER MIXING

This section describes: (1) the place of cooperatives in fertilizer mixing, and (2) seasonal patterns in the procurement of ingredient materials.

The Place of Cooperatives

Greater demand for fertilizer, coupled with shortages growing out of conditions precipitated by World War II, were among the important developments that contributed to an increase in the number of cooperative fertilizer plants in the Pacific and Mountain States.

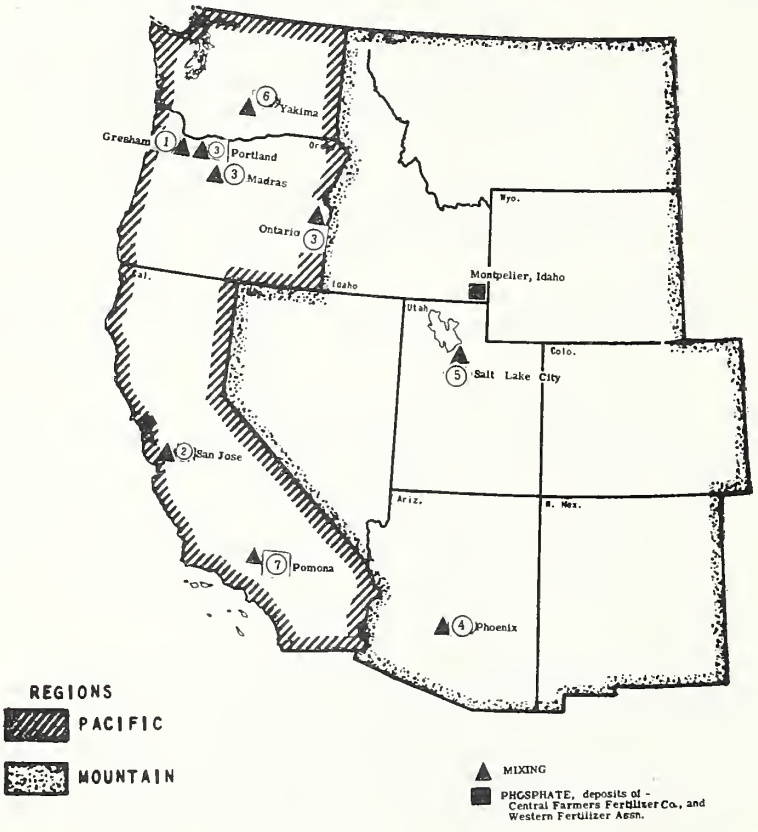
This trend started with the establishment of small mixing plants in the early and mid-1930's by the Gresham Berry Growers, Gresham, Oreg., and the Pomona Fertilizer Company, Pomona, Calif. It continued until in 1953 seven associations operated nine mixing plants.[4] Three of these organizations, however, mixed only occasionally or "on order" for members and cannot be considered as regular operations. Seven of the plants were in the Pacific States and two in the Mountain States (Figure 1).

Cooperatives operating these plants were plagued by ingredient shortages during most of the 1940's and production developed slowly. In 1951-52 they reported mixing approximately 3,500 tons of fertilizer valued at about $225,000. Total shipments from these plants, including straight materials, were estimated at approximately 50,000 tons for 1951-52. This represented about two-thirds of all fertilizer retailed by cooperatives in the region.

[4]Other mixing plants were either built or acquired one each, in the years 1939, 1941, 1945, 1946, 1947, 1949, and 1952.

FIGURE 1

COOPERATIVE FERTILIZER PLANTS IN THE PACIFIC AND MOUNTAIN REGIONS, SEPTEMBER, 1953



1 GRESHAM BERRY GROWERS, (GRESHAM, OREG.)

2 ORCHARD SUPPLY COMPANY, (SAN JOSE, CALIF.)

3 PACIFIC SUPPLY COOPERATIVE, (WALLA WALLA, WASH.)

4 SOUTHWEST COOPERATIVE WHOLESALE, (PHOENIX, ARIZ.)

5 UTAH COOPERATIVE ASSN. (A FARMERS UNION AFFILIATE, SALT LAKE CITY, UTAH)

6 YAKIMA VALLEY SPRAY COMPANY, (YAKIMA FRUIT GROWERS ASSN., YAKIMA, WASH.)

7 POMONA FERTILIZER COMPANY, (POMONA, CALIF.)

NUMBER OF COOPERATIVE ASSOCIATION HEADQUARTERS 7

NUMBER OF COOPERATIVE FERTILIZER PLANTS 9

Figure 2 shows the relative importance of cooperatives in the fertilizer industry of the Mountain and Pacific States. Only in the States of Washington and Oregon does the mixing of fertilizer by cooperatives account for a sizeable portion of the entire industry. Five of the nine plants included in this study also are located in these two States. In contrast, six of the eight Mountain States have no cooperative fertilizer mixing plants whatsoever. Moreover, data reported in Figure 2 relate to fertilizer shipped by mixers only and should not be confused with the amount of fertilizer distributed in various States by cooperatives in these regions -- a matter considered in a subsequent section of this report.

Data reported in Figure 3 show the tonnages of fertilizer mixtures manufactured by cooperatives and other businesses in the Pacific and Mountain regions for the year ended June 30, 1952. These data show that of the 326,000 tons of commercial fertilizer manufactured, cooperatives accounted for only an estimated 3,500 tons or just over 1 percent of the total.

The capacity of cooperative plants in the Pacific and Mountain regions was estimated at 71,500 tons. This was around 5 percent of the total mixing capacity of the two regions, which in 1952 was reported at 1,295,900 tons for the Pacific and 274,600 tons for the Mountain States. Neither cooperatives nor other plants, therefore, operated at anywhere near capacity, the former reaching only 4 percent and the latter 20 percent capacity.

Material Useage

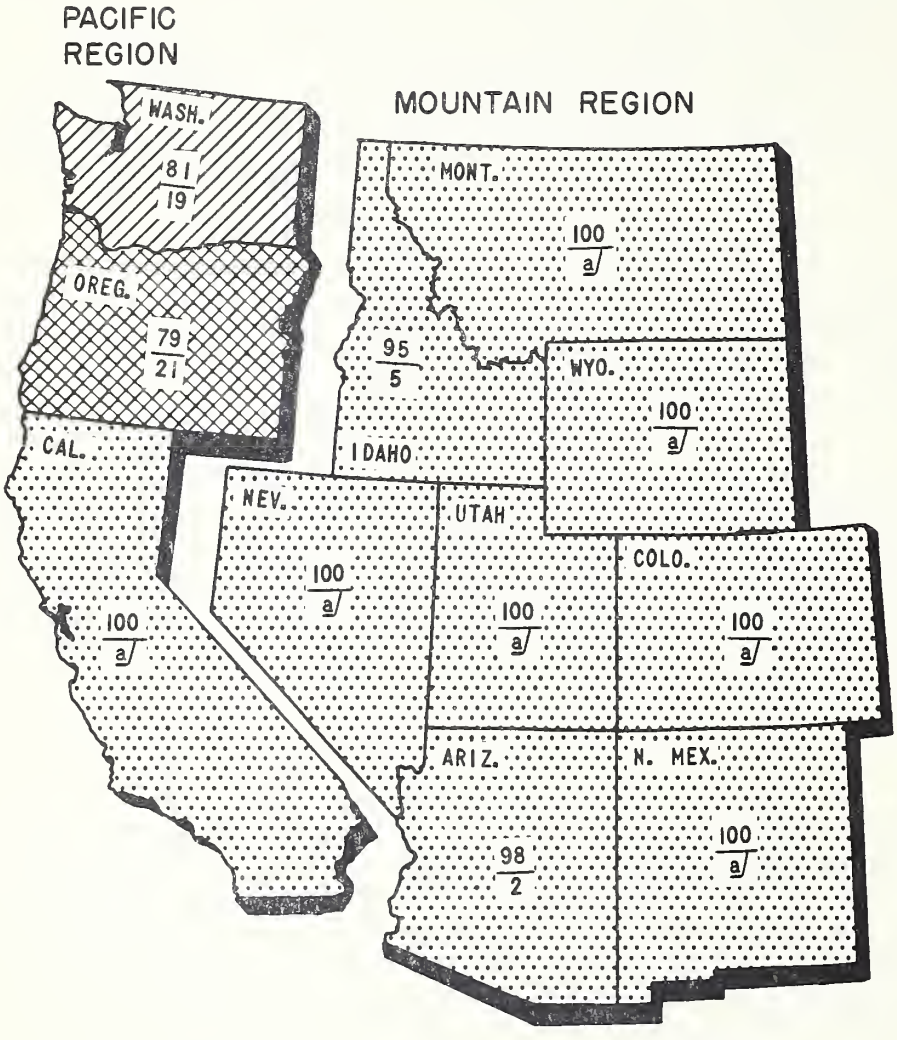
Information furnished by three cooperative plants in the Pacific States in 1951 shows not only the seasonal pattern of ingredient usage but also the relative proportions of these ingredients (Figure 4). These data give the monthly quantity of materials obtained for mixing and emphasize the distinctly seasonal nature of these operations. Nearly one-third of all ingredients were obtained in the month of April and about three-fourths were delivered during the 4-months' period, February through May. This situation suggests the need for closer coordination of manufacturing activities with distribution practices, including pricing plans, if greater efficiency in operation is to be realized.

Expressed on a tonnage basis, the ingredients used at three cooperative plants in the Pacific region were as follows:

Ingredients	Tons	Percentage of total
Phosphate	1,293	44.7
Potash	444	15.3
Nitrogen	650	22.5
Conditioners and other material	505	17.5
Total	2,892	100.0

FIGURE 2

PERCENTAGES OF COMMERCIAL FERTILIZER SHIPMENTS FROM MANUFACTURERS, PACIFIC AND MOUNTAIN REGIONS 1951-52



PERCENTAGES FOR COOPERATIVE PLANTS:

20.0 - 29.9

10.0 - 19.9

0 - 9.9

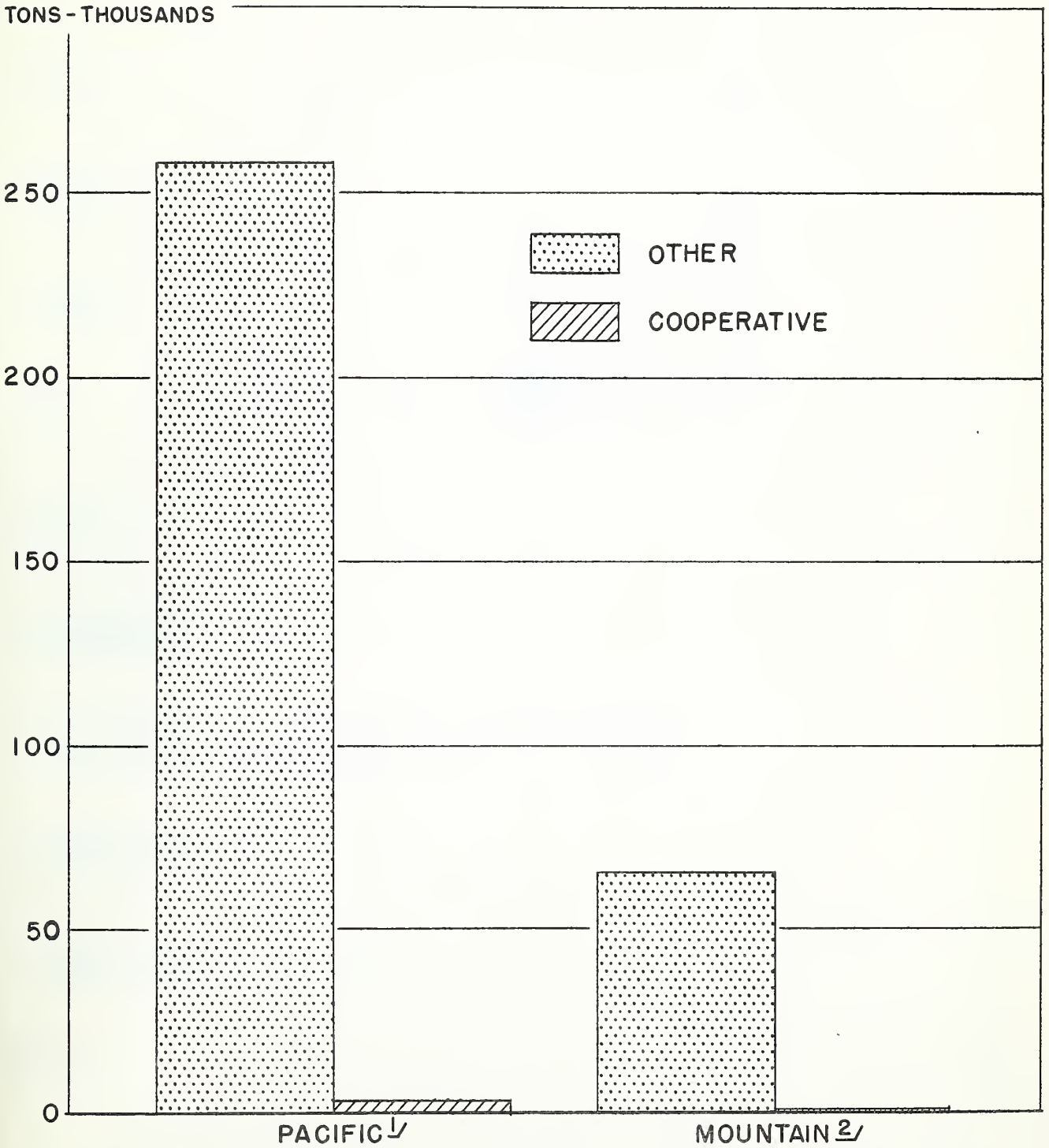
TOP FIGURE - OTHER

BOTTOM FIGURE - COOPERATIVE

a/ LESS THAN 0.5 PERCENT

FIGURE 3

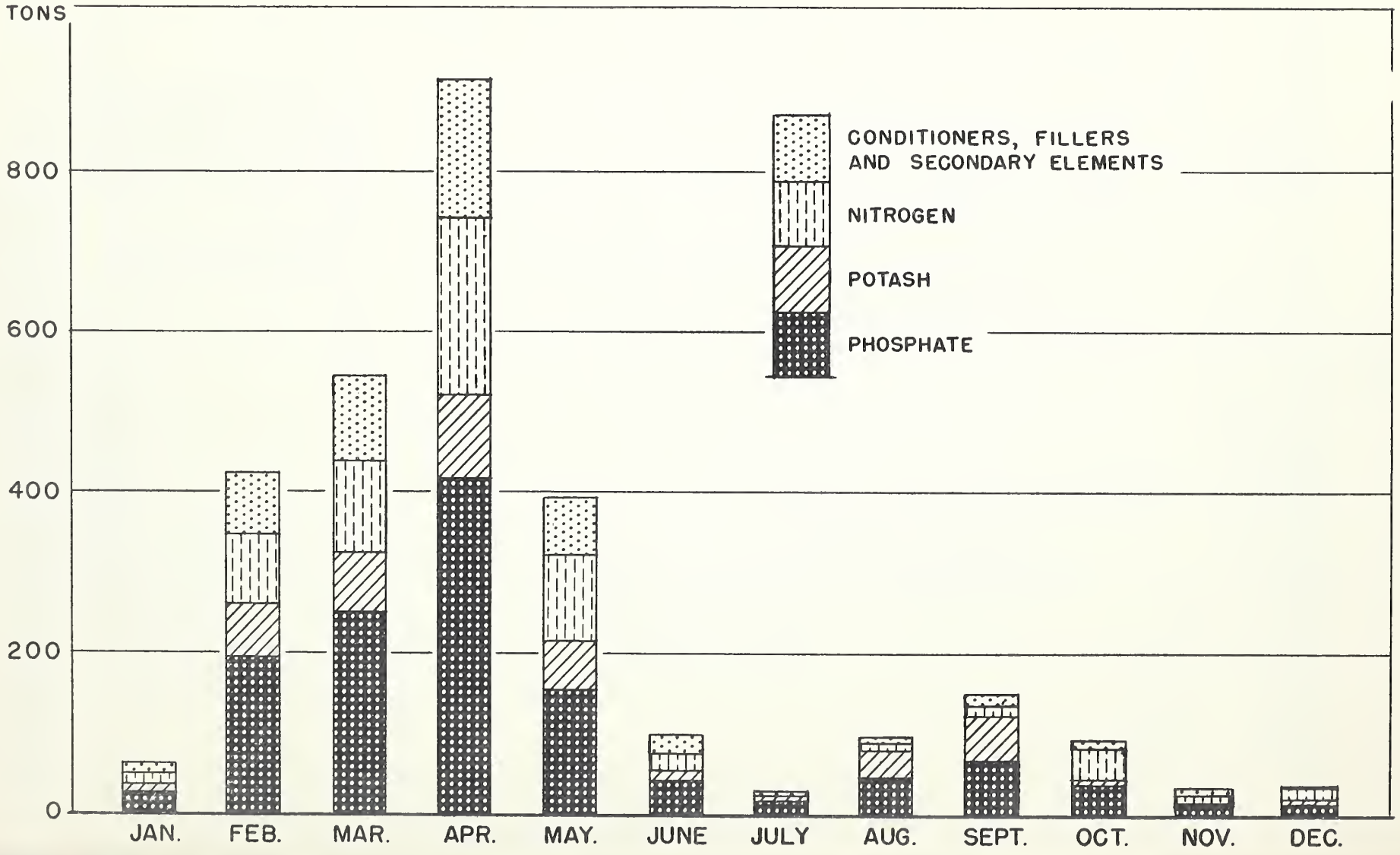
TONNAGES OF FERTILIZER MIXTURES BY COOPERATIVE AND OTHER MANUFACTURERS, PACIFIC AND MOUNTAIN REGIONS YEAR ENDED JUNE 30, 1952



1/ WASHINGTON, OREGON, CALIFORNIA
2/ MONTANA, IDAHO, WYOMING, COLORADO, NEW MEXICO, ARIZONA, UTAH, NEVADA

FIGURE 4

TONS OF MATERIAL USED FOR MANUFACTURE OF FERTILIZER MIXTURES BY THREE PLANTS IN THE PACIFIC STATES, 1951



The number of components used in fertilizer mixtures has a bearing on mixing efficiency. Data in Table 1 give the pounds of fertilizer mixture according to the number of components for one plant. About 90 percent of all the mixtures contain 5 components or more. Approximately 70 percent consists of 6 components or more and 45 percent is made up of 7 components or more.

From the standpoint of cooperative operations, the implications of such a situation are clear. Fertilizer containing a large number of components, while reflecting the needs of specialized farmers, also accounts for the high costs involved in manufacturing fertilizers to meet such needs.

Table 1. - *Pounds of fertilizer mixture according to number of components (one plant) 1951*

Number of components in mixtures	Pounds of fertilizer mixture	Percentage of total
2----------	2,000	0.1
3----------	310,829	6.6
4----------	189,882	4.0
5----------	947,752	20.1
6----------	1,148,500	24.3
7----------	471,100	10.0
8----------	1,509,000	32.0
9----------	118,660	2.5
10----------	20,000	0.4
Total----------	4,717,723	100.0

COOPERATIVE FERTILIZER DISTRIBUTION

Farmers' cooperatives in the Western States are active in retail distribution of both straight material and mixed fertilizers. As soon as their managements recognized the importance of fertilizers for various types of specialized agricultural production, many Western farmers turned to their cooperatives as sources of supply. Consequently, before World War II a number of local marketing cooperatives, especially those serving specialized fruit and vegetable growers, started distributing fertilizer on a sideline basis. Fertilizer distribution has become an important part of the operations of these associations. During the same period, a number of regional cooperatives, in addition to their fertilizer mixing operations, also developed active distribution programs on both a wholesale and retail basis.

This section of the report gives special consideration to: (1) industry-wide comparisons, (2) the place of cooperatives in fertilizer distribution, and (3) joint procurement.

Industrywide Comparisons

Industry-wide comparisons cover: (a) regional usage, (b) proportion of mixtures and separate materials distributed, and (c) seasonal distribution pattern.

Regional Usage -- Figure 5 gives the relative importance of fertilizer usage in both the Pacific and Mountain States compared to the rest of the country. Combined volume for the Mountain and Pacific States amounted to nearly 10 percent of total fertilizer distributed in the entire country. Between five and six times as much was distributed in the Mountain as in the Pacific States.

The percentage distribution of total fertilizer in these and other States from 1948 through 1952 was as follows:

Year ending June 30	Percentage of total		
	Pacific States	Mountain States	Other States
1948	7.8	1.3	90.9
1949	6.7	1.0	92.3
1950	6.8	1.1	92.1
1951	8.1	1.4	90.5
1952	8.3	1.5	90.2

Figure 6 shows the relative year-to-year changes in fertilizer shipments for the Mountain and Pacific regions as well as for the United States. Except for declines in 1948-49 when Western shipments are compared with those of the preceding year, marked increases occurred. Further details as to trends in primary plant food nutrients are given in Appendix Summary A.

Proportion of Mixtures and Separate Materials -- To better understand the nature of cooperative fertilizer distribution in the Western States, it will be helpful to briefly examine the extent to which mixtures and separate fertilizer materials are used in this region. It has already been pointed out that the specialized nature of agricultural production in many parts of the West has contributed to the use of a large proportion of separate materials.

FIGURE 5

SHIPMENTS OF COMMERCIAL FERTILIZER MIXTURES AND SEPARATE MATERIALS IN PACIFIC AND MOUNTAIN REGIONS, AS PERCENT OF CONTINENTAL UNITED STATES FALL, 1947 THROUGH SPRING, 1952

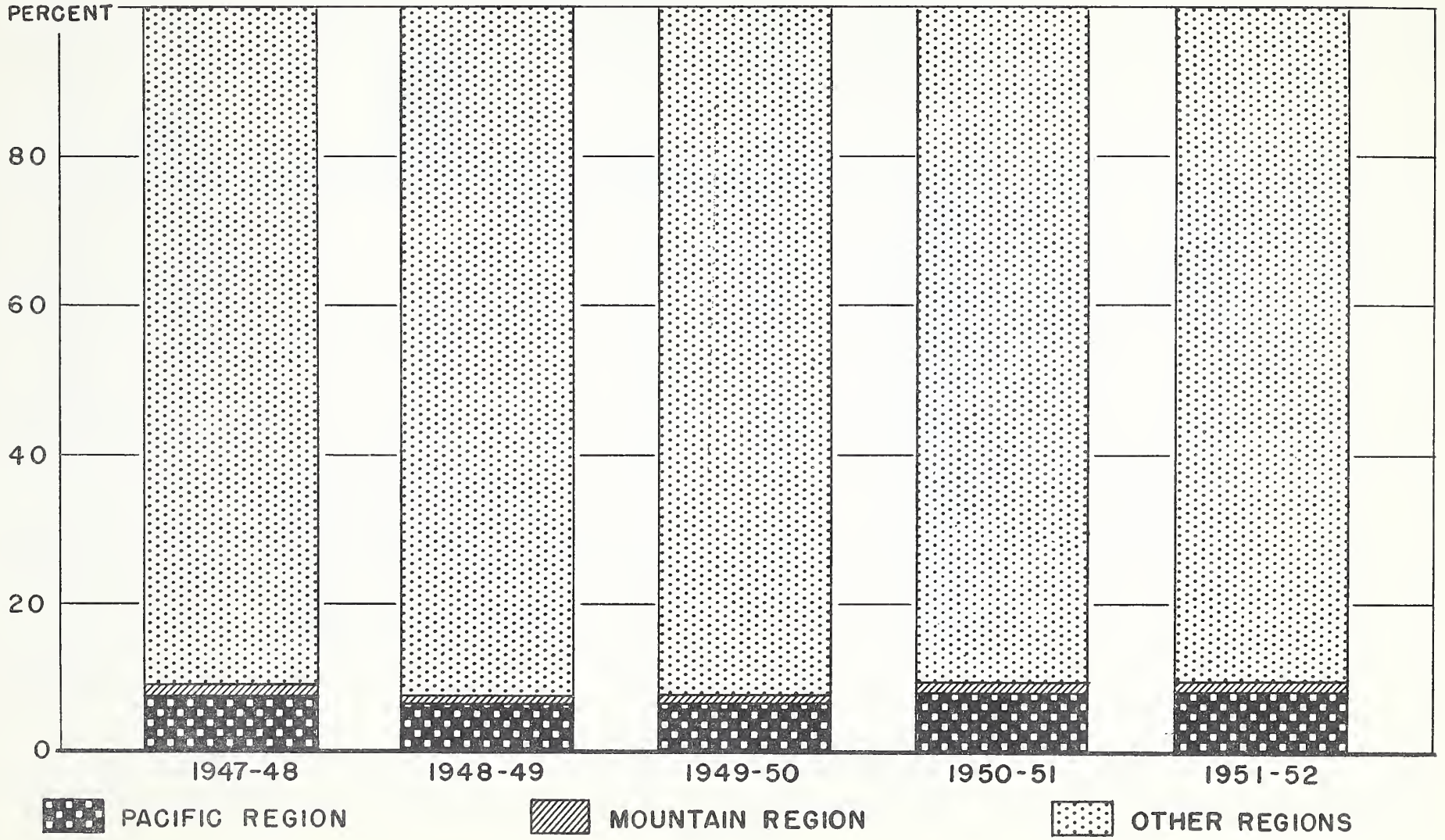
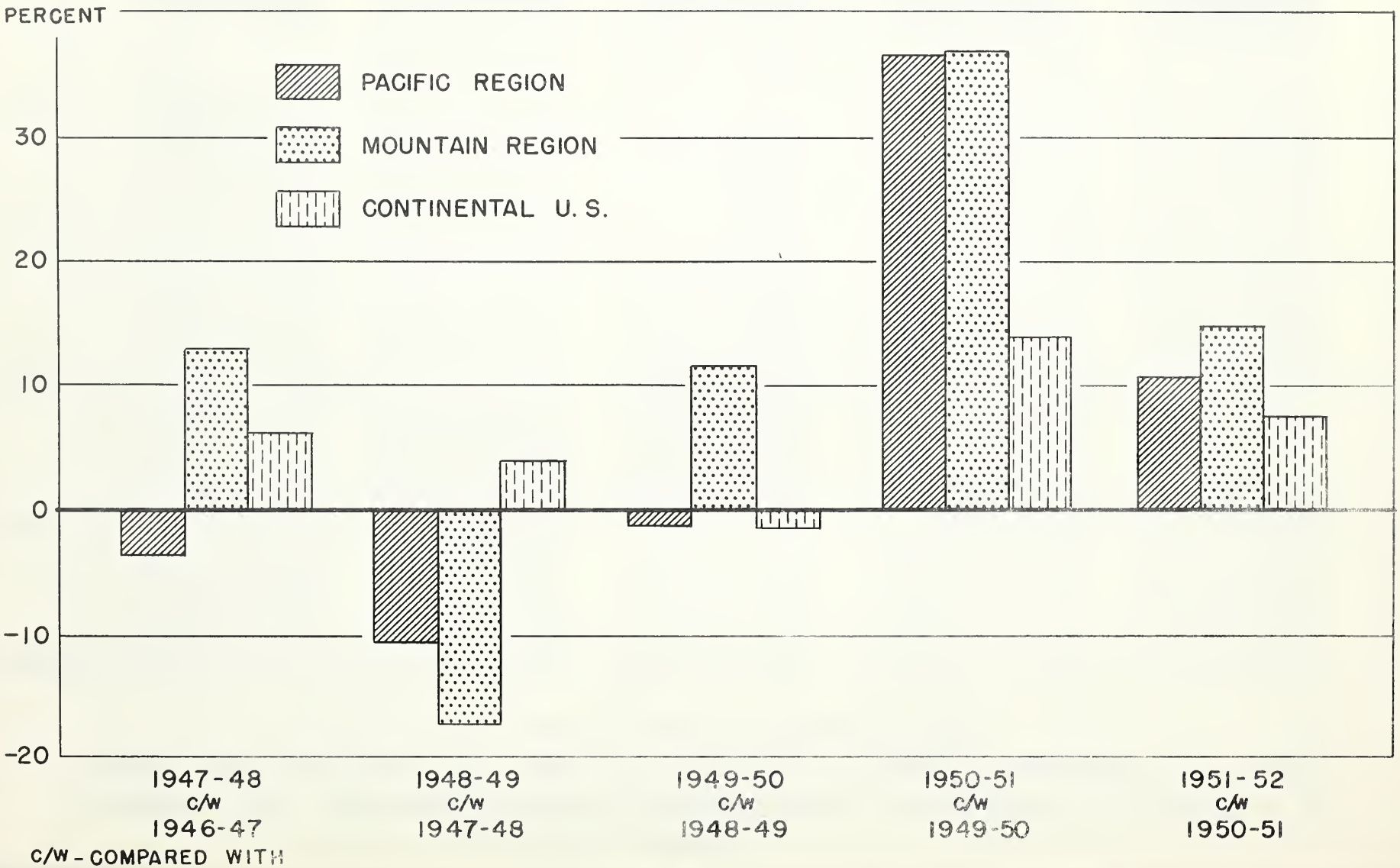


FIGURE 6

PERCENT CHANGE IN SHIPMENT OF FERTILIZER MIXTURES AND SEPARATE MATERIALS, PACIFIC AND MOUNTAIN REGIONS AND CONTINENTAL UNITED STATES FALL, 1947 THROUGH SPRING, 1952



C/W - COMPARED WITH

The tonnage of mixtures and separate materials distributed by regions for the year ended June 30, 1953, was as follows:

Region	Tons of fertilizer distributed		
	Mixtures	Separate materials	Total
Mountain	71,311	291,723	363,034
Pacific	299,267	1,724,820	2,024,087
Total	370,578	2,016,543	2,387,121

These data indicate that approximately 80 and 85 percent, respectively, of the fertilizer tonnage distributed in the Mountain and Pacific region were separate materials. Moreover, the Pacific region accounted for about 85 percent of all the fertilizer used in two regions. California, in turn, with a reported usage of 1,751,744 tons made up 73 percent of the total for all Western States.

Figure 7 shows that the relative proportion of separate materials has been maintained during the past 5 years in both the Pacific and Mountain regions.

Expressed on a percentage basis for both groups of States for the period 1947-48 through 1951-52 the percentage of tons of mixtures and separate materials was as follows:

Year	Percent in Pacific States		Percent in Mountain States	
	Mixtures	Separate materials	Mixtures	Separate materials
1947-48	20.5	79.5	19.4	80.6
1948-49	20.0	80.0	28.8	71.2
1949-50	17.8	82.2	23.9	76.1
1950-51	16.5	83.5	22.1	77.9
1951-52	14.2	85.8	20.1	79.9

Seasonal Distribution Pattern -- Figure 8 gives information on trends in seasonal shipment of separate materials and mixed fertilizer for the 5-year period 1947-48 through 1951-52 for both the Pacific and Mountain States. While these data show a rather uniform distribution of spring and fall shipments, spring shipments have tended to increase in the recent years. Moreover, spring shipments are of relatively greater importance in the Mountain than in the Pacific region.

FIGURE 7

YEARLY SHIPMENTS OF COMMERCIAL FERTILIZER

FALL, 1947 THROUGH SPRING, 1952

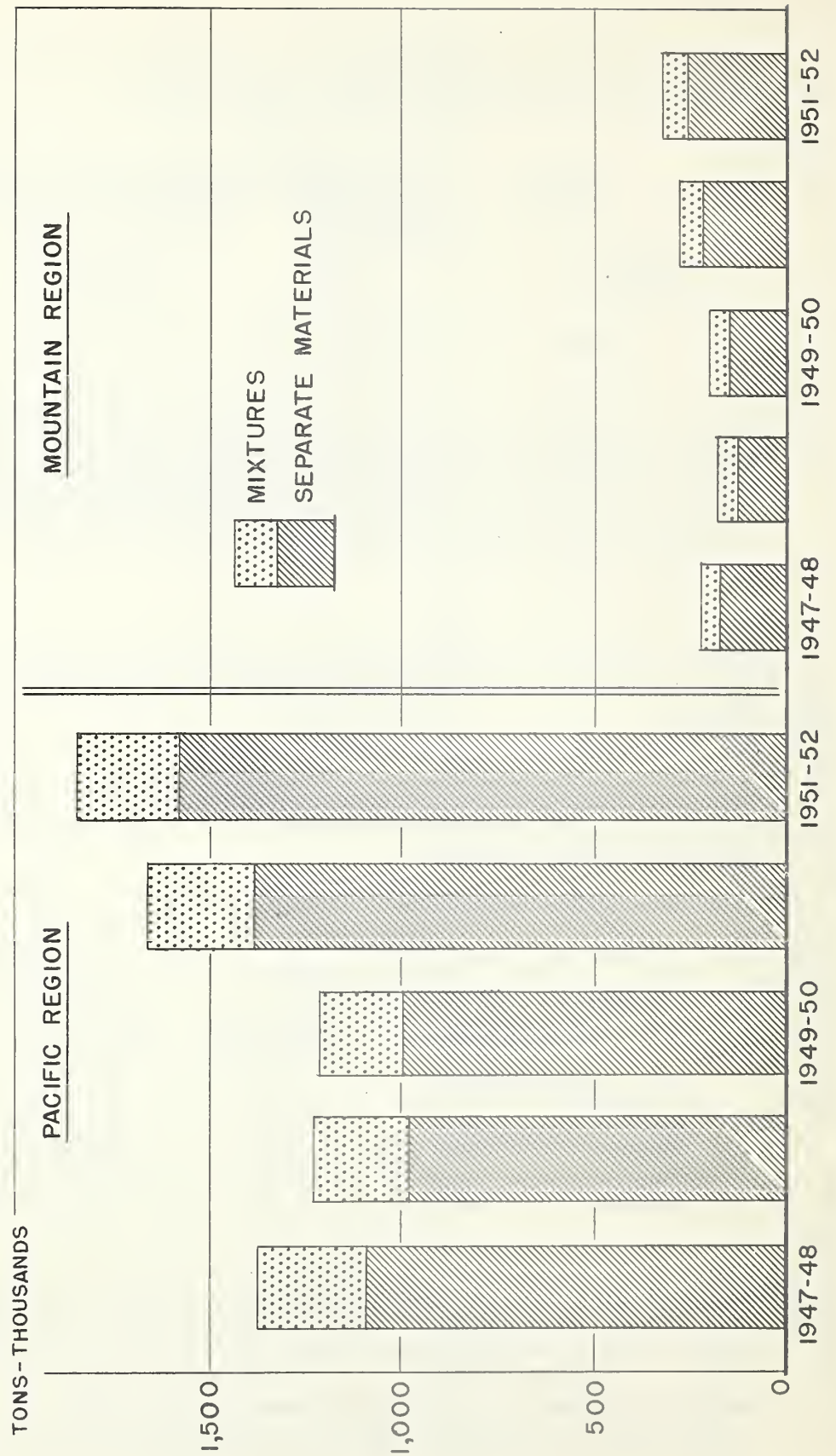
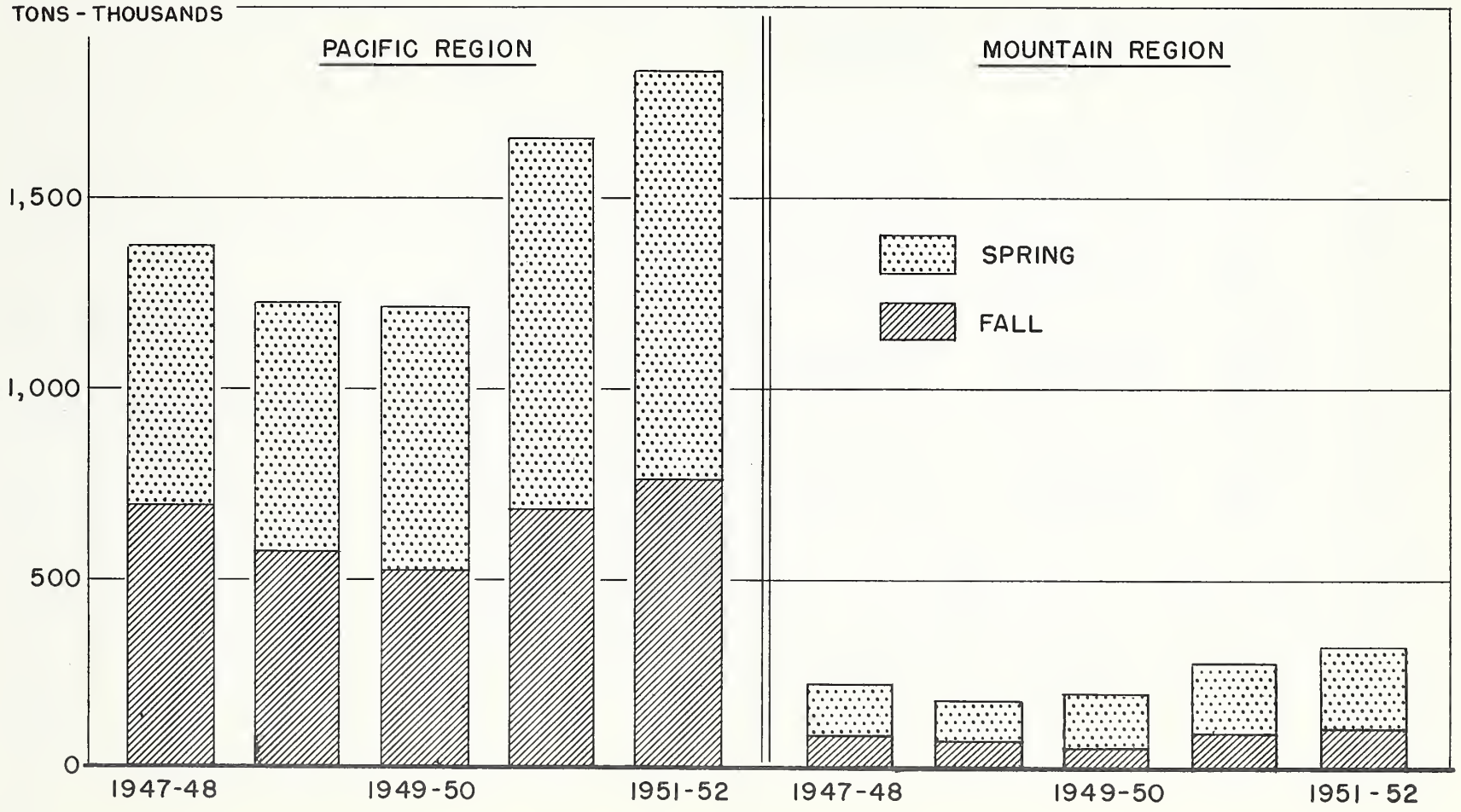


FIGURE 8

YEARLY SHIPMENTS OF COMMERCIAL FERTILIZER IN PACIFIC AND MOUNTAIN REGIONS, BY SEASONS FALL, 1947 THROUGH SPRING, 1952



Total spring and fall tonnages as well as the percentages of total tonnages moving during spring and fall seasons for both the Pacific and Mountain States for the 5-year period 1947-48 through 1951-52 were as follows:

Year ending June 30	Tons (1,000)			Percentage of total		
	Fall	Spring	Total	Fall	Spring	Total
Pacific States:						
1947-48	697	675	1,372	50.8	49.2	100.0
1948-49	572	656	1,228	46.6	53.4	100.0
1949-50	523	692	1,215	43.0	57.0	100.0
1950-51	684	975	1,659	41.2	58.8	100.0
1951-52	761	1,078	1,839	41.4	58.6	100.0
Mountain States:						
1947-48	88	134	222	39.6	60.4	100.0
1948-49	74	110	184	40.2	59.8	100.0
1949-50	59	146	205	28.8	71.2	100.0
1950-51	92	189	281	32.7	67.3	100.0
1951-52	102	221	323	31.6	68.4	100.0

Data in Table 2 present further information on seasonal distribution of mixed goods and selected separate materials.

Table 2. - *Seasonal shipment of fertilizer mixtures and separate materials, Pacific and Mountain regions, for year ending June 30, 1952*

Kind of fertilizer	Percent by region			
	Pacific		Mountain	
	Fall 1951	Spring 1952	Fall 1951	Spring 1952
Mixed goods	34	66	13	87
Separate materials				
Ammonium nitrate	49	51	40	60
Rock phosphate	56	44	31	69
Super-phosphate (18-33 percent)	47	53	21	79
Super-phosphate (40-49 percent)	61	39	38	62
Other separate materials	41	59	39	61
Total	43	57	36	64
All fertilizer	41	59	31	69

Data in Figure 9 show the shipment of separate fertilizer materials for the Pacific and Mountain regions for the fall of 1951 and spring of 1952. These data emphasize that for both seasons and for regions around 75 percent of all materials are nitrogen. In the Pacific States ordinary superphosphate is next in importance, while in the Mountain States triple superphosphate ranks second in importance. In both regions, particularly during spring seasons, the proportion of secondary elements is high, approximating 10 percent of the total.

The Place of Cooperatives

This section discusses: (a) proportion of mixtures and separate material distributed by cooperatives, (b) the roles of local and regional cooperatives, and (c) cooperatives as pace setters in fertilizer formulation.

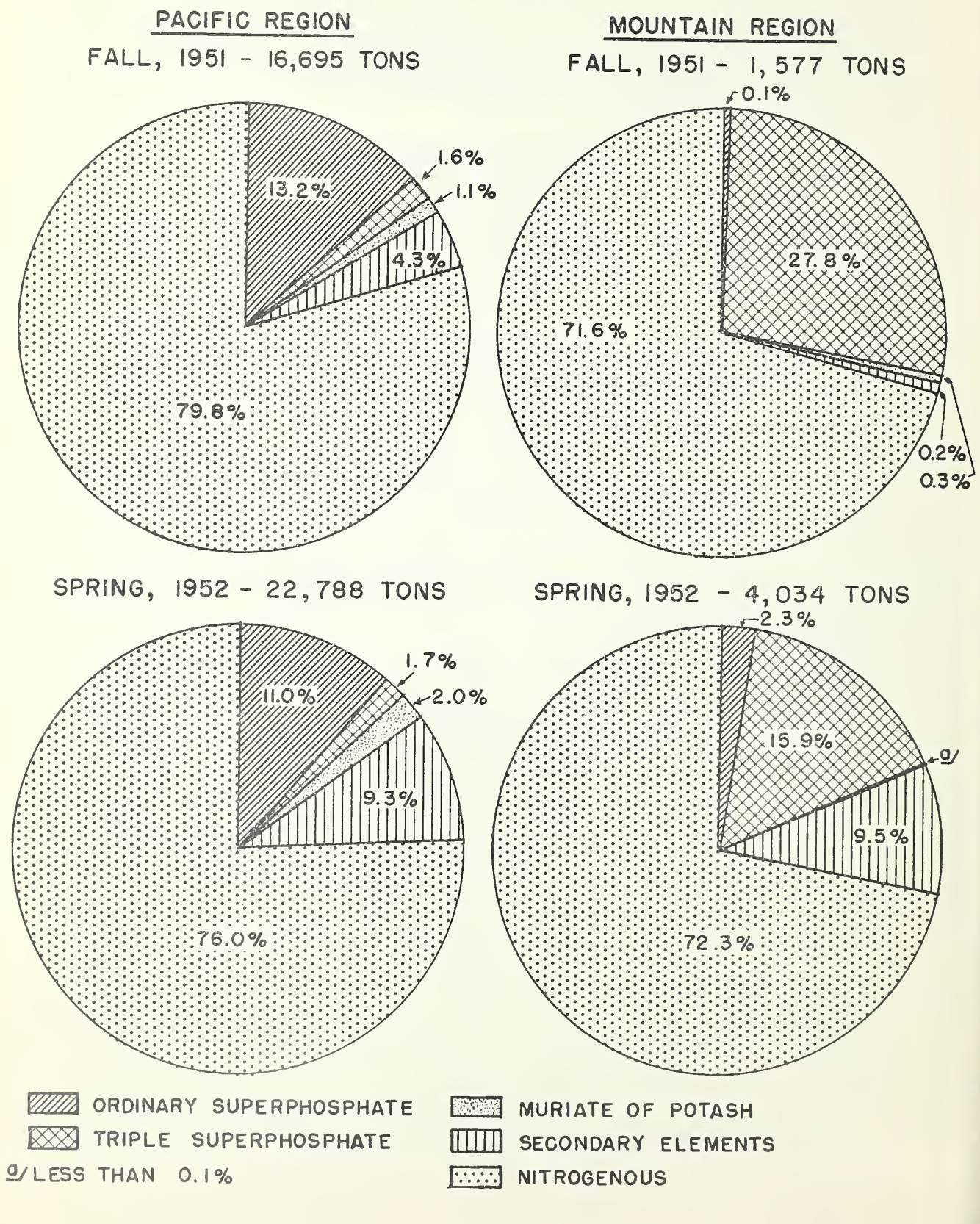
Materials Distributed -- Data in Table 3 give percentages for different separate materials distributed by cooperatives. Nearly one-half of the nitrogen materials, were ammonium nitrate with the rest evenly divided between ammonium sulphate and ammonium phosphate.

Table 3. - *Percentage distribution of separate materials by cooperatives in the Pacific and Mountain States, grouped according to type of material, 1951-52*

Type of material	Percent by geographic region		Percent in both regions
	Pacific	Mountain	
Nitrogen			
Ammonium nitrate	43.5	69.0	46.4
Ammonium sulphate	27.7	14.6	26.2
Ammonium phosphate	22.3	16.3	21.7
Other	6.5	0.1	5.7
Total	100.0	100.0	100.0
Phosphate			
Ordinary (18 and 19%)	87.7	8.0	73.4
Triple (45, 46 and 47%)	12.3	92.0	26.6
Total	100.0	100.0	100.0
Potash			
Muriate of potash	93.5	100.0	93.6
Sulphate of potash	6.5	-	6.4
Total	100.0	100.0	100.0
Secondary elements			
Gypsum	88.5	84.0	88.0
Sulphur	6.1	11.6	6.7
Borax	4.4	4.4	4.4
Other	1.0	-	0.9
Total	100.0	100.0	100.0

FIGURE 9

WHOLESALE SHIPMENTS OF SEPARATE FERTILIZER MATERIALS BY REGIONAL COOPERATIVES, PACIFIC AND MOUNTAIN REGIONS 1951 AND 1952



Approximately three-fourths of the phosphate distributed was ordinary superphosphate. In the Mountain States, however, 92 percent was triple superphosphate of either the 45, 46, or 47 percent concentrations. Muriate of potash accounted for nearly all of the potash sold. Gypsum was the most important of the secondary elements, contributing 88 percent of the total. Sulphur and borax were the other important elements included in this classification.

As closely as can be determined, cooperatives distributed at retail approximately 11 percent of the fertilizer used by Western farmers. The amount varied from 14.3 percent in the Mountain States to 10 percent in the Pacific States. Since these associations mixed only about 1 percent of the total manufactured requirements of farmers, it is obvious that they relied on other manufacturers and distributors for the larger proportion of the fertilizer they handled. For instance, many regionals and local associations have become franchise outlets for anhydrous ammonia and other specialty fertilizer products such as 16:20:0 and 11:48:0, imported from Canadian manufacturers because of closeness to sources of supply.

While the distribution of fertilizer became an important responsibility of cooperatives with the beginning of World War II, it is difficult to obtain accurate information on trends. Shortages of supplies created a situation which forced farmers to purchase those materials available. The seriousness of this situation was highlighted by the purchase of a shipload of ammonium sulphate from Japan as late as 1953 by the Pacific Supply Cooperative, Walla Walla, Wash. This material was moved up river from Portland, Oreg., 200 miles and then shipped by truck to various outlets.

The relative importance of cooperatives in fertilizer distribution in the Mountain and Pacific region is further indicated by a comparison of the net value of the fertilizer distributed, which for the year 1951-52 shows the following:

Geographic region	Net value of fertilizer distributed			
	Cooperative	Other	All sources	
Mountain	$2,349,362	$14,055,638	$16,405,000	15.3%
Pacific	9,085,126	81,387,874	90,473,000	84.7
Total	$11,434,488	$95,443,512	$106,878,000	100.0%

These data reflect the recent rather small-scale entry of cooperatives into fertilizer operations of the region.

Local Cooperatives -- The extent to which local cooperatives in the West were active in the distribution of fertilizer is indicated by the following summary showing the number of associations and the value of

fertilizer distributed in 1951-52, classified according to both farm supply and marketing cooperatives:

Comparison	Type of cooperatives: Farm supply	Type of cooperatives: Marketing	Total both types
Number of associations			
Mountain	23	47	70
Pacific	58	185	243
Total	81	232	313
Value of fertilizer distributed			
Mountain	$993,354	$868,414	$1,861,768
Pacific	2,777,404	4,665,371	7,442,775
Total	$3,770,758	$5,533,785	$9,304,543

All cooperatives distributed $11.4 million of fertilizer in these two regions, this comparison therefore shows that most of the fertilizer handled by cooperatives is retailed by local associations, since their total was $9.3 million.

Regional Cooperatives -- Regional cooperatives also distributed fertilizer on both a wholesale and retail basis. Comparisons showing the number of associations and the gross and net value of fertilizer distributed in 1951-52 by these associations are as follows:

Comparisons	Type of associations: Farm supply	Type of associations: Marketing	Total both types
Number of associations			
Mountain	9	3	12
Pacific	12	5	17
Total	[5] 17	[5] 7	[5] 24
Gross value of fertilizer distributed			
Mountain	$1,645,529	$423,002	$2,068,531
Pacific	7,002,247	577,654	7,579,901
Total	$8,647,776	$1,000,656	$9,648,432
Net value of fertilizer distributed			
Mountain	$115,164	$372,430	$487,594
Pacific	512,742	129,609	642,351
Total	$627,906	$502,039	$1,129,945

[5] Four regional farm supply cooperatives and one regional marketing association operated in both the Mountain and Pacific regions and consequently the total number serving farmers was less than the combined total for both regions.

The net value of fertilizer handled by regional cooperatives suggests that the proportion distributed direct to farmers is small compared with their total operations. Further information regarding fertilizer operations of regional cooperatives is shown by the following tabulation. It summarizes the business of these associations in 1951-52 by type of distribution and geographic regions.

Type of distribution	Geographic regions		Total - both regional
	Pacific	Mountain	
Retail sales	$1,260,934	$345,977	$1,606,911
Wholesale to:			
Cooperatives	5,937,550	1,580,937	7,518,487
Dealer agents	95,726	65,326	161,052
Other	285,691	76,291	361,982
Total	6,318,967	1,722,554	8,041,521
Total all items	$7,579,901	$2,068,531	$9,648,432

Cooperative Pace Setting in Formulation -- Figure 10 shows data on formulation of fertilizer manufactured at cooperatives and other plants. These data emphasize the same situation occurring in other States; namely, that farmers' cooperatives serve as pace setters in manufacturing and distributing high analysis mixed fertilizer. Units of plant food nutrients per ton of fertilizer for cooperatives averaged 36 and 35, respectively, in the Pacific and Mountain regions as contrasted with 26 and 30 for other manufacturers. This indicates that cooperatives have taken the lead in two respects: namely, the elimination of filler and the reduction of transportation costs per unit of plant nutrients distributed.

Joint Procurement

The discussion on joint procurement is included in the distribution part of this report since by far the greater proportion of the fertilizers obtained by or through these agencies are applied as separate materials and are not used in mixed goods.

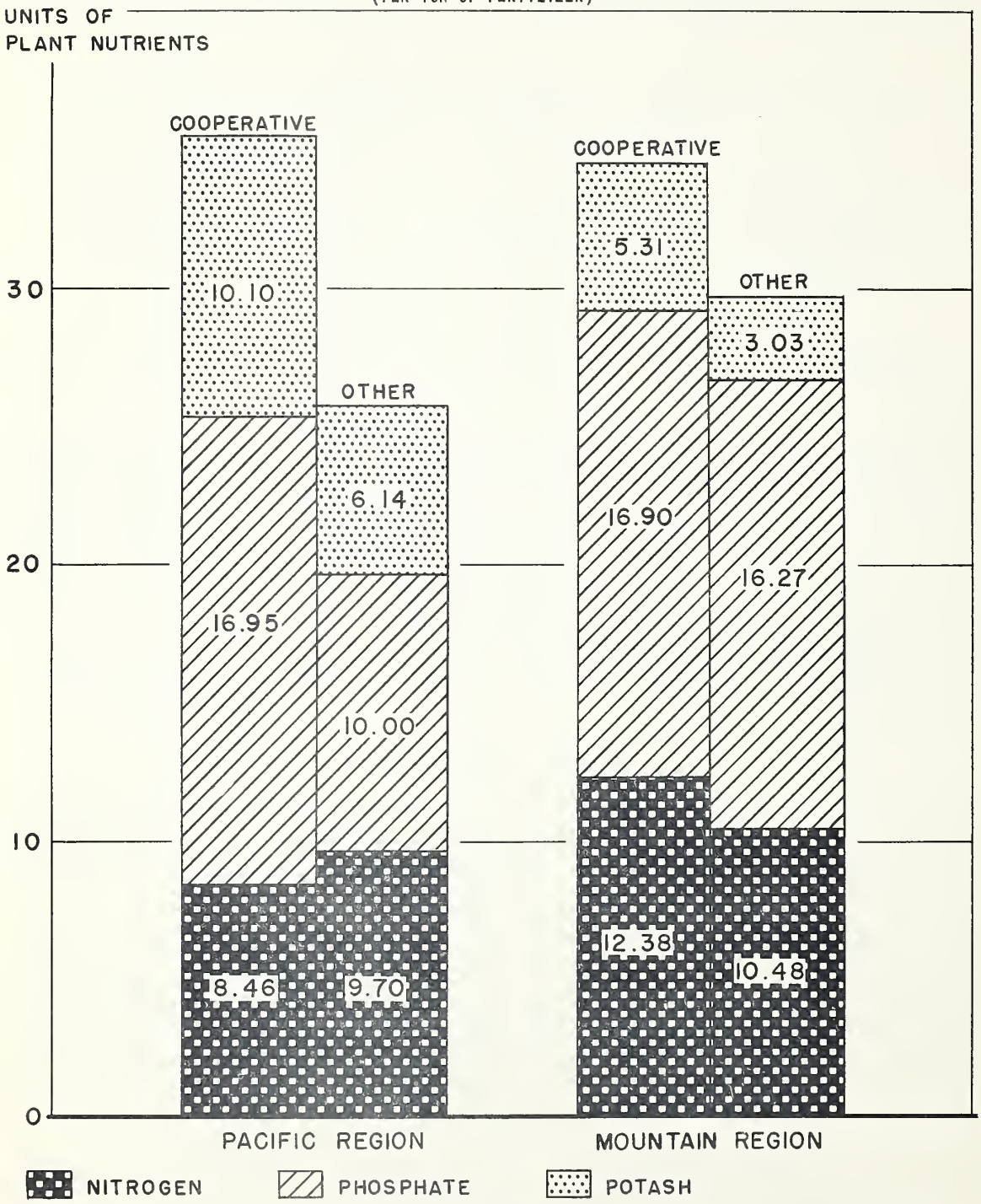
Two organizations have been active in enabling farmers to obtain fertilizer materials on a joint basis in the Western States. These are: (1) Western Fertilizer Association with headquarters at Seattle, Wash., and (2) Associated Cooperatives with headquarters at Sheffield, Ala. The Tennessee Valley Authority (TVA) has assisted these organizations by making materials available for an educational sales program that emphasizes selected uses of fertilizer.

Western Fertilizer Association -- Organized July 1, 1947, this association purchases and manufactures various types of fertilizer materials. It has a perpetual lease on 1,500 acres of Government land on Dry Ridge, Idaho, which contains an estimated 5 million tons of high grade rock phosphate. It serves nine associations and one general farm organization,

FIGURE 10

WEIGHTED AVERAGE ANALYSIS FOR TYPES OF FERTILIZER MIXTURES SHIPPED IN PACIFIC AND MOUNTAIN REGIONS COMPARED WITH SHIPMENTS OF REGIONAL COOPERATIVES YEAR ENDED JUNE 30, 1952

(PER TON OF FERTILIZER)



seven of them active members located in the States of Washington, Oregon, Idaho, and Utah. These organizations in turn have an estimated 100,000 farmer members.

In addition to serving as an agency for leasing phosphate deposits and mining such deposits, Western Fertilizer Association also functions as a wholesale agency in obtaining fertilizer for member associations. Such fertilizer consists of concentrated superphosphates and ammonium nitrate obtained from TVA and other sources. Total dollar volume of the association's business as reported for fiscal years 1949 to date was reported as follows:

Year	Annual sales
1949	$124,488
1950	250,788
1951	331,740
1952	392,114

Allocations are made each year on the basis of needs of member associations. As of 1951-52 these allocations, according to States, were as follows:

State	Percentage of total
Washington	26
Oregon	43
Idaho	4
Utah	27
Total	100

Associated Cooperatives -- This association has its headquarters at Sheffield, Ala. It was organized in 1943 and was the first national wholesale fertilizer association serving cooperatives in the United States. The association has had contractual relations with TVA since 1943 and with various other manufacturers from time to time. Associated has handled concentrated superphosphates and ammonium nitrates from TVA and commercial sources, including imports from abroad.

As this service was extended, Western membership in Associated included the following members which have now withdrawn -- Washington Cooperative Farmers Association, Seattle, and Northwest Cooperative Wholesale, Wenatchee, Wash. Its present members are: California Walnut Growers Association, Los Angeles; Fruit Growers Supply Company, Los Angeles; Southwest Cooperative Wholesale, Phoenix, Ariz.; Calavo Growers of California, Los Angeles, and Utah Poultry and Farmers Cooperative, Salt Lake City.

From June 30, 1945 to June 30, 1947, Associated supplied 28,903 tons of ammonium nitrate to its five member-associations in the Western region. From July 1, 1947, through June 30, 1954, Associated will have supplied

its patrons in the Western region 7,754 tons of concentrated superphosphates and 48,552 tons of ammonium nitrate, or a total of 56,306 tons.

Tennessee Valley Authority -- Reference already has been made to the fact that TVA has made materials available for an educational sales program of selected fertilizer uses to both Associated Cooperatives and the Western Fertilizer Association -- organizations that act as distributive outlets in the Western States. Starting in 1952 TVA also adopted the policy of setting aside a small proportion of its production for distribution through corporations other than cooperatives that were willing to participate in its educational sales programs on fertilizers. Table 4 shows tonnages of TVA materials sold for the fiscal year 1953 and total tonnages to July 1, 1953 for Western States.

Table 4. - *TVA fertilizer materials distributed at commercial prices, for the fiscal year ending June 30, 1953 and cumulated to that date, by Western States*

States	Tons of concentrated superphosphate		Tons of ammonium nitrate	
	Fiscal year 1953	Total to July 1953	Fiscal year 1953	Total to July 1953
Arizona	-	[1]640.3	-	5,326.0
California	643.9	[2]4,994.2	3,090.5	69,574.5
Colorado	[3]710.0	[3]1,090.0	-	70.0
Montana	-	40.0	-	-
New Mexico	-	2,376.0	-	527.0
Oregon	1,108.3	6,650.5	825.0	3,145.0
Utah	1,120.0	4,703.0	960.0	3,965.5
Washington	1,040.0	4,220.0	1,080.0	5,370.0
Wyoming	40.0	360.0	-	-
Total	4,662.2	25,074.0	5,955.5	87,978.0

[1]In addition 0.15 ton of calcium metaphosphate were sold in Arizona.
[2]In addition 283.7 tons of potash phosphate ash and 0.75 ton of nitric phosphate were sold in California.
[3]In addition 10 tons of calcium metaphosphate were sold in Colorado.

The uses of TVA fertilizers are determined in conferences in which the Land Grant Colleges, agencies of U. S. Department of Agriculture, distributors of TVA materials, and TVA participates in interpreting records and accounts as they relate to the educational sales program. Results

of findings, in turn, are made available to cooperatives and other manufacturers and distributors in the fertilizer industry.

SOME PROBLEMS IN IMPROVING SERVICE

The ability of cooperatives in the West to develop their fertilizer activities for more effective service to farmers will depend largely upon: (1) nature of cooperative development, (2) problems associated with sources of supply, and (3) change in fertilizer manufacturing technology.

Nature of Cooperative Development

The manner in which cooperatives have developed and the types of services they perform are important in explaining how far and fast these organizations are likely to go in supplying members with fertilizer. Those associations primarily performing a marketing service are more inclined to relegate fertilizer to a less important place in their operations than farm supply cooperatives. This often has meant that they have not been as quick as farm supply cooperatives to fully appreciate the service they can give farmers by obtaining and distributing fertilizer. Most marketing cooperatives that handle fertilizer have restricted operations to retail distribution.

Moreover, only two of the large-scale major regional farm supply purchasing cooperatives situated in the Western States handle fertilizer, and only one of these is engaged in manufacturing. However, most of the 10 smaller regional cooperatives in the region (those handling less than $5 million of farm supplies annually) distribute fertilizer.

Farmer cooperatives need large sums of capital to enter into fertilizer mixing operations on an efficient basis. The number of large-scale purchasing associations in the region is small and these have rather extensive commitments to develop feed, petroleum, farm machinery and equipment services for farmers. Both of these facts have served as a deterrent to some of these associations in entering the fertilizer business on a large-scale basis.

The business done by other firms in the field will govern in part the extent to which cooperatives should expand their fertilizer procurement and distribution services. Data in Table 5 show the location and capacity of fertilizer manufacturing plants by types in the Pacific, Mountain, and adjacent States as of 1953. A large number of plants are already in operation in the region. While they may not be effectively serving all agricultural areas, the comparatively limited consumption of fertilizer in large areas of the West indicates that, under present conditions, places where plants could be established on an efficient basis may be limited. This suggests that cooperatives entering the fertilizer business in the Western States, in most instances, will be faced with active competition from other firms.

Table 5. - *Location and capacities of fertilizer manufacturing plants, by type, in Pacific, Mountain, and adjacent States, 1953*

Area	Total number of:		Type of plant					1953 capacity (tons)
	Companies	Plants	Super-phosphate and mixing	Ammoniate and mixing	Dry mixing	Liquid mixing	Other	
Mountain States								
Arizona	5	6	-	-	4	-	2	83,000
Colorado	6	7	-	1	3	1	2	26,000
Idaho	7	13	2	-	8	2	3	262,000
Montana	1	1	1	-	-	-	-	108,000
Nevada	-	-	-	-	-	-	-	-
New Mexico	3	3	-	-	2	1	-	9,150
Utah	6	6	1	1	4	1	1	51,500
Wyoming	1	1	-	-	1	-	-	-
Total	[1]26	37	4	2	22	5	8	539,650
Pacific States								
California	83	91	3	3	74	17	1	877,650
Oregon	14	17	-	1	16	1	-	44,306
Washington	18	20	2	1	12	3	2	149,600
Total	[1]109	128	5	5	102	21	3	1,071,556
Total-Western States	[1]135	165	9	7	124	26	11	1,611,206
Adjacent States								
Kansas	11	14	1	7	4	1	1	118,500
Nebraska	10	12	-	4	6	2	-	73,000
North Dakota	2	2	-	2	-	-	-	35,000
Oklahoma	6	7	4	1	1	-	1	210,000
South Dakota	-	-	-	-	-	-	-	-
Texas	37	41	7	9	20	7	1	351,000
Total	[1]64	76	12	23	31	10	3	787,500
Grand Total	[1]199	[2]241	**21	30	155	36	[3]14	2,398,706

[1] Net Companies - deletions have been made where companies operated plants in more than one state - figures added by states will show actual number companies in each State before deletions.
[2] Individual plants will not add to total plants due to some plants having more than one type.
[3] Other includes - trace element mix, acqua ammonia, produce animal by-products, fertilizer, process poultry manure, dried manure, dehydrated cattle manure.

** Note 1: (6) of the above plants also have acid chambers - Idaho 1, Montana 1, California 1, Oklahoma 1, Texas 2.
Note 2: See appendix B and C for concentrated superphosphate and synthetic ammonia producers.

Source: Farm Chemicals Handbook - 1953 - Ware Brothers Co., Philadelphia, Pa., Section E, Pages 141-202.

Successful operation by cooperatives in large measure, therefore, will be determined by their efficiency of operation. This efficiency will be determined by the ability to manufacture and distribute fertilizer at a savings for farmers or by special services not now available that they can perform for members.

Sources of Supply

In considering possibilities for improving fertilizer service to farmers, cooperatives will need to know available sources of supply. Brief attention is here given to raw materials, location of manufacturers, and usage.

The relationships between reserves of raw rock phosphates as reported in 1949 and production as of 1952 are as follows:

States	Percentage of United States: Reserves	Production
Florida	38	81
Tennessee	1	11
Western States	61	8
Total	100	100

Data for 1946 report the distribution of United States reserves of potash as follows: New Mexico, 80 percent; California, 19 percent; and Utah, 1 percent.

Important developments also are taking place with respect to nitrogen production. Of interest to cooperatives is the recent announcement of the building of a $12 million nitrogen plant at Attalia, Wash., by Columbia River Chemicals, Inc. Pacific Supply Cooperative has agreed to act as the fertilizer distributor for this firm. In the mountain area, Utah Chemical Company proposes to build a nitrogen plant at Mt. Peasant, Utah.

Appendix B gives the location of principal concentrated superphosphate producers in the United States. This information can be used to indicate suppliers, both those in the Western region and in other parts of the country. Similar information is available for the known synthetic ammonia producers in the United States.

Tables 6 and 7 show the total consumption of phosphates and tons of P_2O_5 used in all fertilizer for the year ending June 30, 1953 for Midwest and Western regions. Appendix C shows long time trends in usage. While it is rather difficult to determine the extent to which sufficient manufacturing capacity exists in each of the areas, there is considerable variation in the point of manufacture and the place of consumption.

Table 6. - *Consumption of phosphates, year ended June 30, 1953, in selected areas*

Area	Phosphate rock	Superphosphates		Other	Total	Total (less rock phosphate)
		18-20% grades	30-50% grades			
	Tons					
East North Central						
Ohio	11,690	20,172	3,494	646	36,002	24,312
Indiana	37,596	16,888	3,769	172	58,425	20,829
Illinois	700,835	64,846	7,325	6,394	779,400	78,565
Michigan	3,502	18,021	221	1,876	23,620	20,118
Wisconsin	16,906	2,639	78	111	19,734	2,828
Total	770,529	122,566	14,887	9,199	917,181	146,652
West North Central						
Minnesota	7,713	10,295	20,519	1,271	39,798	32,085
Iowa	24,772	58,986	6,883	20,302	110,943	86,171
Missouri	253,656	11,086	4,892	5,410	275,044	21,388
North Dakota	60	341	17,182	3,328	20,911	20,851
South Dakota	450	2,265	2,143	857	5,715	5,265
Nebraska	1,378	7,149	10,086	6,377	24,990	23,612
Kansas	9,446	10,238	29,638	32,288	81,610	72,164
Total	297,475	100,360	91,343	69,833	559,011	261,536
Total-North Central	1,068,004	222,926	106,230	79,032	1,476,192	408,188
Mountain						
Montana	-	130	12,649	1,200	13,979	13,979
Idaho	100	12,430	9,943	4,184	26,657	26,557
Wyoming	50	1,396	4,252	400	6,098	6,048
Colorado	206	4,184	11,719	1,819	17,928	17,722
New Mexico	-	1,762	8,996	5,529	16,287	16,287
Arizona	-	4,199	4,305	18,688	27,192	27,192
Utah	-	3,935	3,534	1,969	9,438	9,438
Nevada	40	283	616	1,140	2,079	2,039
Total	396	28,319	56,014	34,929	119,658	119,262
Pacific						
Washington	690	12,240	5,047	8,126	26,103	25,413
Oregon	580	19,797	2,336	15,387	38,100	37,520
California	2,259	71,293	14,295	80,722	168,569	166,310
Total	3,529	103,330	21,678	104,235	232,772	229,243
Total-Mountain and Pacific	3,925	131,649	77,692	139,164	352,430	348,505
Grand Total-North Central, Mountain, and Pacific States	1,071,929	354,575	183,922	218,196	1,828,622	756,693

Source: Commercial Fertilizers - 1952-53 - Consumption in the United States - Fertilizer and Agricultural Lime Section, Soil and Water Conservation Research Branch, Agricultural Research Service, U.S. Department of Agriculture.

Table 7. - *Consumption of (P_2O_5) in all fertilizers, year ended June 30, 1953, selected areas*

Area	In all P_2O_5 fertilizers	
	Available[1]	Total used[2]
	Tons	
East North Central		
Ohio	141,167	154,498
Indiana	139,099	158,897
Illinois	120,916	329,492
Michigan	83,863	90,182
Wisconsin	54,460	62,785
Total	539,505	795,854
West North Central		
Minnesota	52,891	57,641
Iowa	84,151	94,709
Missouri	86,095	164,889
North Dakota	14,088	14,696
South Dakota	3,362	3,658
Nebraska	17,803	18,494
Kansas	47,391	51,874
Total	305,781	405,961
Total-North Central	845,286	1,201,815
Mountain		
Montana	6,689	7,201
Idaho	9,863	12,983
Wyoming	2,969	3,082
Colorado	10,973	11,273
New Mexico	6,188	6,311
Arizona	11,608	11,869
Utah	3,341	3,440
Nevada	632	667
Total	52,263	56,826
Pacific		
Washington	10,827	11,428
Oregon	11,305	12,047
California	72,548	76,170
Total	94,680	99,645
Total-Mountain and Pacific	146,943	156,471
Grand Total-North Central, Mountain, and Pacific States	992,229	1,358,286

[1]Includes, as available P_2O_5, 2 percent of the colloidal phosphate and 3 percent of the phosphate rock marketed for direct application.
[2]Includes, as total P_2O_5, 22 percent of the colloidal phosphate and 32 percent of the phosphate rock marketed for direct application.

Source: Commercial Fertilizers, 1952-53 - Fertilizer and Agricultural Lime Section, Soil and Water Conservation Research Branch, Agricultural Research Service, U. S. Depart. of Agri.

This is a situation that has special application to concentrated superphosphate and other types of high analysis fertilizer. It would be well for plant operators, therefore, to compare data in Tables 6 and 7 with tabulations shown in Appendices A and B.

Those associations interested in establishing new fertilizer manufacturing operations first should determine if it is possible for them to serve farmers advantageously, in view of plants already in operation. Moreover, such a comparison would not be complete without taking into account the extent to which various grades of commercial fertilizer are imported from nearby sources of supply, particularly Canada.

Change in Fertilizer Manufacturing Technology

Continuous change in the chemical as well as the mechanical engineering aspects of fertilizer manufacturing presents many problems for associations contemplating entry in this field. Important technological changes constantly appearing need careful analysis before embarking on an extensive program of fertilizer manufacturing. Trends toward high analysis products are of special interest to cooperatives contemplating the development of extensive fertilizer service for patrons in the West.

Moreover, important transportation and economic considerations as well as long range problems growing out of the Nation's defense efforts may have important bearings on problems relating to the development of a fertilizer program for members.

Other studies of Farmer Cooperative Service have indicated that farmers stand to gain approximately $10 a ton when the number of units of plant nutrients are increased from 20 to 40. The importance of this factor is emphasized in the Report of the Federal Trade Commission on the Fertilizer Industry, 1950, which states:

> "In general it would appear that when fertilizer of varying grades is purchased from the same source and point of origin: (1) The cost of filler and the cost of transporting filler will be less per unit of plant food for a higher grade than for a lower grade of fertilizer. This is so because high-grade fertilizer contains less filler per ton than low-grade fertilizer. (2) The cost of bags and tax tags will be lower per unit of plant food for a higher grade fertilizer than for a lower grade. This is so because these costs accrue on a weight and not on a plant food unit basis, so that the cost of bag and tax per unit of plant food is less for a high grade than for a low grade mixture. (3) Administrative expenses, selling expenses, distributors' margins and mixers' profits may be either higher or lower per unit of plant food for a high-grade than for a low-grade fertilizer. Since, however, these costs amount to only about one-third of the total price of fertilizer to the farmer, they are of secondary importance as factors in the price per plant food unit paid by farmers. (4) The cost of active materials per unit of plant food will depend on the cost of each material taken separately, and on the amount of each of these in the formula in question. In

general, however, it would appear that if the percentage of any one plant food is increased in a mixture, while the percentages of the other two are held constant, three different cost situations may occur: (a) If the unit cost of the varying element is constant or is reduced, the plant food unit cost of the mixture will be reduced, since the cost of filler per unit of plant food is also lowered. (b) if the unit cost of the varying element is increased by less than the reduction in cost of filler per unit of plant food, the plant food unit cost of the mixture will also be reduced, although by less than in the first case. (c) Only if the unit cost of the varying element is increased by more than the reduction in cost of filler per unit of plant food, will the plant food unit cost of the mixture be increased."

The problems confronting cooperative management in developing a comprehensive fertilizer service for farmers have been summarized in an earlier report available from the Farmer Cooperative Service.[7] They include:

". . . cooperative management needs to consider such cost-influencing factors as: (1) The most advantageous location of producing plants from the standpoint of transportation costs for incoming and outgoing materials and from the standpoint of consuming areas, (2) the most economical and practical method of storage for fertilizer materials after manufacturing and before purchase by the farm user; (3) the form in which materials will be made available to farmers, i. e., separate materials of single components, granulated or ungranulated mixtures or both and, in the case of nitrogen, solid or liquid form or both; (4) the choice of the method for moving fertilizer materials to the farm, whether in bags or in bulk for direct field application, so as to minimize plant food cost, reduce handling, and conserve packaging supplies; (5) the selling of fertilizer mixtures on a basis of plant food units rather than a tonnage basis, whereby filler would be eliminated and ingredients other than N, P, and K would include only the amount necessary for conditioning the fertilizer to prevent caking, to supply secondary nutrients when needed, and to neutralize the acidity of the mixture."

TRANSPORTATION CONSIDERATIONS

Data and information in preceding sections of this report have a direct bearing on many transportation problems confronting cooperative officials as they seek to improve fertilizer services for Western farmers.

Such factors as trends in usage, the extent to which this usage takes the form of mixtures or separate materials, and the degree to which significant differences exist between points of manufacture and places of consumption are matters of concern to cooperative management.

[7]Scroggs, Claud L. "Economic Aspects of Transportation Affecting a Cooperative Fertilizer Program in the North Central States," U. S. Farm Credit Admin. Misc. Rpt. 149. May 1951.

Cooperative officials also have indicated that sources of raw material and available labor are items that should be considered in conjunction with transportation factors when analyzing possibilities for achieving an efficient mine-to-farm fertilizer service for members.

By keeping these background considerations in mind, cooperative management is in a better position to use freight rate information. Table 8 presents freight rates from the more important points of origin to destinations in the Western States for the major fertilizer materials.[8] These include superphosphate, ammonium nitrate, ammonium sulphate, anhydrous ammonia sulphate of ammonia, nitrogen solution, and borax. Rates are presented for these products from 19 selected points of origin in 13 States and British Columbia to 17 destinations in the States of California, Oregon, Washington, Idaho, and Utah. These rates are on a carload rail basis and are effective as of March 1, 1954.

Cooperative management can use these as a guide in any future plans for the further development of fertilizer facilities. Such information can be useful to management in matters of plant location as well as in developing the most efficient transportation service for obtaining separate materials.

OBSERVATIONS

Cooperatives in the Western States can improve fertilizer manufacturing and distribution practices and reduce transportation costs by:

1. Integrating operations with other organizations in the region that are interested in developing a mine-to-farm fertilizer distribution system.

2. Developing long range plans for lower costs, improved service, and a better quality of product for farmers.

3. Adapt operations to technological changes. Among these is the further trend toward high analysis fertilizer -- a development particularly important because of high freight rate costs.

These will all require careful attention if associations produce a fertilizer that will maintain satisfactory cost relationships throughout the wide range of conditions involved.

[8]For similar information for the North Central States see: Conyers, Leonard N., "Comparative Carload Rail and Inland Water Rates and Distances on Fertilizer Raw Materials." U. S. Farm Credit Admin. Sp. Rpt. 218. Jan. 1952. (Revised.)

Table 8. - *Carload rail freight rates on fertilizer raw materials from principal producing points to important consuming areas in selected Western States. (Rates shown are per 100 pounds unless otherwise indicated, and are effective as of March 1, 1954)*

Materials and points of origin	DESTINATIONS								
	Los Angeles, Calif.	Oakland, Calif.	Pendleton, Oreg.	Gresham, Oreg.	Portland, Oreg.	Madras, Oreg.	Ontario, Oreg.	Yakima, Wash.	Wenatchee, Wash.
Superphosphate									
Sheffield, Ala.	111.5	111.5	111.5	111.5	111.5	111.5	111.5	111.5	111.5
Pocatello, (Don) Idaho	64.5	64.5	52	57.5	52	52	46	52	64.5
Anaconda, Mont.	64.5	64.5	58.5	57.5	58.5	58.5	55	58.5	58.5
Seattle, Wash.	69	63	43.5	33	37	48.5	55	30	35.5
Ammonium nitrate (Fertilizer compound)									
Sheffield, Ala.	111.5	111.5	111.5	111.5	111.5	111.5	111.5	111.5	111.5
Trail, B. C.	98	86	66.5	70	66.5	72.5	98	66.5	66.5
Ammonium phosphate									
Trail, B. C.	72.5	68	58.5	62	58.5	63	72.5	58.5	58.5
Sulphate of ammonia (Fertilizer compound)									
San Francisco, Calif.	-	-	73.5	61	61	61	79.5	66.5	66.5
Shell Point, Calif.	-	-	73.5	61	61	61	79.5	66.5	66.5
Trail, B. C.	72.5	68	58.5	62	58.5	63	72.5	58.5	58.5
Martinez, Calif.	-	-	73.5	61	61	61	79.5	66.5	66.5
Ogden, Utah	61	61	69	61	69	61	51.5	61	66.5
Pueblo, Colo.	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
Anhydrous ammonia (In tank cars)									
San Francisco, Calif.	-	-	133.5	-	106	133.5	133.5	133.5	133.5
Shell Point, Calif.	-	-	133.5	-	106	133.5	133.5	133.5	133.5
Nitrogen fertilizer solution (In tank cars)									
Warfield, B. C.	100.5	98	75	78	75	84	92	75	53
Potassium (Muriate of potash)									
Trona, Calif.	-	-	14.55 NT	69	68	68	80	14.55 NT	14.55 NT
Boron (Borax)									
Boron, Calif.	24	45	127	127	98	127	162	127	127
Trona, Calif.	-	-	127	127	98	127	162	127	127

Table 8 (Continued) - *Carload rail freight rates on fertilizer raw materials from principal producing points to important consuming areas in selected Western States. (Rates shown are per 100 pounds unless otherwise indicated, and are effective as of March 1, 1954)*

Materials and points of origin	DESTINATIONS							
	Seattle, Wash.	Spokane, Wash.	Caldwell, Idaho	Idaho Falls, Idaho	Twin Falls, Idaho	Pocatello, Idaho	Soda Springs, Idaho	Salt Lake City, Utah
Superphosphate								
Sheffield, Ala.	111.5	111.5	111.5	111.5	111.5	111.5	111.5	111.5
Pocatello, (Don) Idaho	52	52	35.5	19.5	27.5	-	20.5	32
Anaconda, Mont.	52	52	55	35.5	45	43.5	43.5	46
Seattle, Wash.	-	55	58.5	58.5	60	66.5	62	73.5
Ammonium nitrate (Fertilizer compound)								
Sheffield, Ala.	111.5	111.5	111.5	111.5	111.5	111.5	111.5	111.5
Trail, B. C.	66.5	58.5	98	98	98	98	98	98
Ammonium phosphate								
Trail, B. C.	58.5	51.5	72.5	72.5	72.5	72.5	72.5	72.5
Sulphate of ammonia (Fertilizer compound)								
San Francisco, Calif.	68	79.5	73.5	73.5	73.5	66.5	85	66.5
Shell Point, Calif.	68	79.5	73.5	73.5	73.5	66.5	85	66.5
Trail, B. C.	58.5	51.5	72.5	72.5	72.5	72.5	72.5	72.5
Martinez, Calif.	68	79.5	73.5	73.5	73.5	66.5	85	66.5
Ogden, Utah	73.5	69	47	38	42.5	35.5	34.5	21
Pueblo, Colo.	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
Anhydrous ammonia (In tank cars)								
San Francisco, Calif.	117.5	133.5	141.5	152	114	152	194.5	117.5
Shell Point, Calif.	117.5	133.5	141.5	152	114	152	194.5	117.5
Nitrogen fertilizer solution (In tank cars)								
Warfield, B. C.	75	65.5	89.5	87.5	78	84	92	79.5
Potassium (Muriate of potash)								
Trona, Calif.	68	14.55 NT	80	78	75	75	84	71
Boron (Borax)								
Boron, Calif.	109	127	162	146	160	146	164	133
Trona, Calif.	109	127	162	146	160	146	164	133

Increases under Ex Parte 175-B added to rates instead of to freight charges.

Freight charges subject to three percent Federal Transportation Tax.

Appendix A. - *Consumption of primary plant nutrients in all fertilizer, Mountain and Pacific regions, selected years ending June 30 (short tons)*

Year	Mountain region			Pacific region			Total Mountain and Pacific region		
	Nitrogen	Available P_2O_5	Potash	Nitrogen	Available P_2O_5	Potash	Nitrogen	Available P_2O_5	Potash
1935-1939---	1,083	8,159	249	28,541	18,499	8,373	29,624	26,658	8,622
1940-1944---	2,566	15,754	474	46,494	37,285	12,414	49,060	53,039	12,888
1945--------	6,410	26,219	1,218	77,094	62,097	23,044	83,504	88,316	24,262
1946--------	11,974	33,393	1,431	111,987	76,150	23,853	123,961	109,543	25,284
1947--------	14,972	33,381	1,745	116,138	83,846	20,912	131,110	117,227	22,657
1948--------	16,018	37,665	2,243	117,793	74,509	21,047	133,811	112,174	23,290
1949--------	14,007	33,444	2,340	104,857	74,161	21,949	118,864	107,605	24,289
1950--------	22,125	39,275	2,244	123,351	75,218	22,514	145,476	114,493	24,758
1951--------	41,068	47,688	2,408	171,255	89,227	25,247	212,323	136,915	27,655
1952--------	47,340	51,922	2,390	185,807	87,540	24,686	233,147	139,462	27,076
1953--------	58,346	52,263	2,261	207,382	94,680	27,841	265,728	146,943	30,102

Source: Bureau of Plant Industry, Soils, and Agricultural Engineering.

Appendix B. - *Concentrated superphosphate producers in the United States*

Name of producer	Location	Date of initial operation or completion	Capacity tons material	Process
Allied Chemical & Dye Corp.	LaPlatte, Nebr.		200,000	
Allied Chemical & Dye Corp.	Pasco, Wash.		200,000	
Allied Chemical & Dye Corp.	South Point, Ohio	1954		
Anaconda Copper Mining Co.	Anaconda, Mont.	1920	200,000	Wet
Armour Fertilizer Works	Bartow, Fla.	1949	150,000	Wet
Armour Fertilizer Works	Columbia, Tenn.			Wet
Associated Cooperatives, Inc.	Sheffield, Ala.		60,000	
Crescent Chemical Company	Houston, Tex.		280,000	Wet
Davison Chemical Company Div., W. R. Grace & Co.	Ridgewood, Fla.	1953	200,000	Wet
Gates Brothers[1]	Wendell, Idaho	1950	50,000	Wet
Gulf Improvement Corp.	Pascagoula, Miss.		24,500	
International Minerals & Chem. Co.	Bonnie, Fla.			
International Minerals & Chem.	Tuscola, Ill.			
Lang Brothers, Inc.	Audrian Co., Mo.			
Missouri Farmers Assn.	Joplin, Mo.		70,000	Wet
Northern Chemical Industries	Sandy Point, Maine			
Phillips Chemical Company	Pasadena, Tex.	1953	148,000	Wet
E. Rauh and Sons Fertilizer Co.	Tuscola, Ill.			
F. S. Royster Guano Co.	Mulberry, Fla.	1954	70,000	Wet
J. R. Simplot Company	Pocatello, Idaho	1953	90,000	Wet
Southeastern Chemical Co.	Lemont City, Ill.			
Swift and Company	Agricola, Fla.	1949		Wet
Tennessee Corporation (U.S. Phosphoric)	Tampa, Fla.	1924	500,000	Wet
Tennessee Valley Authority	Sheffield, Ala.	1934	158,000	Electric
Texas City Chemical Co.	Texas City, Texas			
I. P. Thomas and Son	Camden, N.J.	1940		Wet
Thurston Chemical Company	Atlas, Mo.			
Thurston Chemical Company	Joplin, Mo.	1953	17,500	Wet
Virginia-Carolina Chemical Corp.	Charleston, S.C.	1907		Wet
Virginia-Carolina Chemical Corp.	Nichols, Fla.			Wet
Western Phosphates, Inc.	Garfield, Utah	1953	60,000	Wet

[1]Inactive.

Sources: Commercial Fertilizer Year Book 1952, 1951-52 Farm Chemicals Handbook, and various trade journals.

Appendix C. - *Synthetic ammonia producers in the United States, in place or under construction, and major products and capacities*

Plants	Location	Date of initial operation	Capacity	Anhydrous ammonia	Ammonium nitrate	Ammonium sulfate	Nitrogen solutions	Nitrate of soda; urea; cal-nitro
			1,000 Tons nitrogen	1,000 Net Tons				
Allied Chemical & Dye Co.	Hopewell, Va.	1928	240	X	-	-	X	N S & C N
Allied Chemical & Dye Co.	LaPlatte, Neb.	-	62	7.5	-	-	-	110
Allied Chemical & Dye Co.	South Point, Ohio	1943	155	X	-	-	-	Urea
American Cyanamid Co.	Fortier, La.	1954	-	X	-	X	-	-
Atlantic Refining Co.	Point Breeze, Pa.	1953	-	X	-	-	-	-
Brea Chemicals, Inc. (Union Oil Co.)	Brea, Calif.	-	73	-	-	-	-	-
Columbia-Southern Chemical Corp.	Natrium, W. Va.	-	-	-	-	-	-	-
Cooperative Farm Chemical Assn.	Lawrence, Kansas	1955	58	13	83	-	13	-
Commercial Solvents Corp.	Sterlington, La.	1943	50	X	X	-	X	-
Deere & Co.	Pryor, Oklahoma	1954	58	66	-	-	26	100
Delta Chemical Co.	Buras, La.	1953	26	-	-	-	-	-
Dow Chemical Company	Freeport, Texas	1950	29	37	-	-	-	-
Dow Chemical Company	Pittsburgh, Calif.	1939	5	X	-	-	-	-
E. I. DuPont Co.	Belle, W. Va.	1926	180	X	-	-	X	Urea
E. I. DuPont Co.	Niagara Falls, N. Y.	1926	8	X	-	-	-	-
Grace Chemical Co.	Memphis, Tenn.	1954	72	91	-	-	-	X
Hercules Powder Company (Mo. Ordnance Works)	Louisiana, Mo.	-	-	-	-	-	-	-
Hercules Powder Co.	Hercules, Calif.	1939	23	X	15	-	-	-
Hooker Electrochemical Co.	Tacoma, Wash.	-	-	-	-	-	-	-
Lion Oil Company	El Dorado, Ark.	1943	208	198	159	138	X	-
Lion Oil Company	Luling, La.	1954	90	18	201	-	-	-
Mathieson Chemical Co.	Lake Charles, La.	1944	50	X	-	-	-	-
Mathieson Chemical Co.	Morganton, W. Va.	1952	180	200	-	-	-	-
Mathieson Chemical Co.	Niagara Falls, N. Y.	1925	5	X	-	-	-	-
Midland Ammonia Co. (Dow Chemical Co.)	Midland, Mich.	1930	20	X	-	-	-	-
Mississippi Chemical Co.	Yazoo City, Miss.	1951	45	45	-	-	X	-
National Distillers Products Corp.	Tuscola, Ill.	-	-	50	-	-	X	-
Northern Chemical Industrics	Searsport, Maine	-	-	-	-	-	-	-
Pennsylvania Salt Co.	Wyandotte, Mich.	1932	9	X	-	-	-	-
Phillips Chemical Co.	Etter, Texas	1946	125	X	100	-	X	-
Phillips Chemical Co.	Port Adams, Tex.	1953	128	146	-	292	-	-
San Jacinto Chemical Co.	Houston, Texas	1949	18	X	-	-	-	-
Shell Chemical Corp.	Pittsburgh, Calif.	1931	75	X	-	125	-	-
Shell Chemical Corp.	Ventura, Calif.	1953	43	55	-	-	-	-
Spencer Chemical Corp.	Henderson, Ky.	1942	56	68	-	-	X	-
Spencer Chemical Corp.	Military, Kansas	1943	140	X	150	-	X	-
Spencer Chemical Co.	Vicksburg, Miss.	1953	58	73	-	-	-	-
Tennessee Valley Authority	Sheffield, Ala.	1943	55	X	155	-	-	-

Source: 'Nitrogen Production Facilities in Relation to Present and Future Demand,' by George Taylor, August 21, 1950, and subsequent releases in various trade journals.