Fertilizer Consumption in Texas, 1947-53
Figure 1. Nutrient status of virgin upland soils.
Fertilizer Consumption in Texas, 1947-53

J. F. FUDGE, STATE CHEMIST

FERTILIZER CONSUMPTION IN TEXAS increased greatly during the 6-year period, July 1, 1947 through June 30, 1953. Some areas in which little or no fertilizer was used in 1947-48 are now among the largest users, and other areas have changed places in relative tonnages used. New materials have appeared on the market. Changes in the relative importance of various grades reflect the impact of advancing fertilizer technology in modern plants and the vigorous fertilizer research program of the Texas Agricultural Experiment Station.

Graphs are used in this bulletin to present these important changes in a simple form. The data used in making the graphs are presented in detail in 12 progress reports issued over the 6-year period. Each progress report gives the tonnages of different fertilizer grades and materials sold by counties during a 6-month period. These detailed reports may be obtained by writing to the State Chemist of Texas, College Station, Texas.

NUTRIENT STATUS OF VIRGIN UPLAND SOILS

Fertilizers are chemicals which are added to soils to raise their content of plant nutrient elements, particularly nitrogen, phosphorus and potassium, to levels necessary for the satisfactory growth of plants. The average content of nitrogen, easily-soluble phosphoric acid (phosphorus pentoxide) and potash (potassium oxide) in the virgin soils of Texas is shown in a general way in Figure 1. Lime also is shown because of its effect on phosphorus availability, and the fact that the calcareous soils of Texas usually are heavy soils well provided with plenty of available potassium.

Nitrogen often is deficient in the soils of East Texas and in the sandy soils of West Texas. It sometimes is deficient in the soils along the Gulf Coast, particularly in the sandier types. In general, the virgin soils of the Blackland Prairies and the Grand Prairie, here combined into one area and designated as North-Central Texas, usually are provided with sufficient nitrogen. The nitrogen content of cultivated soils is not nearly as favorable as in the virgin soils, because all of the nitrogen is contained in the organic matter fraction of the soil and it decreases rapidly when the soils are cultivated.

Phosphorus is deficient over most of the State, particularly in the sandy soils in the eastern part and in the West Cross Timbers.

Potash is deficient in many of the sandier soils of the eastern part, and certain crops may respond to application of materials carrying potash in other sections of Texas.

Figure 1 presents only a general idea of the nutrient status of general soils areas. A soil analysis provides a more accurate basis for fertilizer recommendations for a particular crop on a definite piece of land. Such analysis may be obtained by writing to the Soil Testing Laboratory, College Station, Texas.

FERTILIZER CONSUMPTION IN TEXAS

Figure 2 gives fertilizer data for the entire State. Each graph presents different handling of the same basic information.

The amount of fertilizers sold annually increased from about 450,000 tons in 1948-49 to about 600,000 tons during the last 3 years of the period. Fall movements decreased appreciably during the last 2 years. This decrease is reflected in the total tonnage sold during 1952-53.

Nitrogen consumption increased markedly over the whole period, from about 17,000 in 1947-48 to almost 60,000 tons in 1952-53. The greatest increase occurred in nitrogen materials sold during the spring season. Materials provided less than half of the total nitrogen used in 1947-48, as compared with over three-fourths during 1952-53. About one-third of the nitrogen used

---

**CONTENTS**

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutrient Status of Virgin Upland Soils</td>
</tr>
<tr>
<td>Fertilizer Consumption in Texas</td>
</tr>
<tr>
<td>Trends in the Consumption of Mixed Goods</td>
</tr>
<tr>
<td>Trends in the Consumption of Materials</td>
</tr>
<tr>
<td>Fertilizer Consumption by Areas</td>
</tr>
<tr>
<td>East Texas</td>
</tr>
<tr>
<td>Gulf Coast</td>
</tr>
<tr>
<td>North-Central Texas</td>
</tr>
<tr>
<td>South Texas</td>
</tr>
<tr>
<td>Rolling Plains</td>
</tr>
<tr>
<td>West Texas</td>
</tr>
<tr>
<td>Comparisons among Areas</td>
</tr>
<tr>
<td>Consumption of Unacidulated Phosphates</td>
</tr>
</tbody>
</table>
Graph A concerns the actual tonnage data, without regard to the nature of the fertilizers. The four curves shown present the data for materials and for mixed goods, for fall and spring consumption, as follows: The bottom curve, MF, presents the tonnages of materials sold in the fall (July through December) of each year. The curve MT presents the tonnages of materials sold during the entire year; consequently, the vertical distance between curves MF and MT represents the tonnages of materials sold during the spring season (January through June) of each year. The vertical distance between the curve MT and the curve GF represents the tonnages of mixed goods sold during the fall season. The top curve, Total, gives the total tonnages of fertilizers moved during each of the 6 years covered by this report; the upper interval, between curves GF and Total represents the tonnages of mixed goods moved during the spring season.

Graphs B, C and D show the tonnages of nitrogen, available phosphoric acid and potash in materials and mixed goods sold during the fall and spring seasons in each of the 6 years covered by this bulletin. These tonnages were calculated from the tonnages of the several materials and mixed goods grades multiplied by the guarantee analysis of each product.

Graph E presents the average percentages of nitrogen and available phosphoric acid in materials, curves N-Mat and P-Mat, and the average percentages of nitrogen (N-All), available phosphoric acid, P-All, and potash, P-All), in the total tonnage moved during the year.

Graph F presents the tonnage of materials, nitrogen from materials, N, and available phosphoric acid, P, from materials expressed as percentages of the total tonnage used.

Graph G presents the tonnages of materials and mixed goods, and of each of the three primary components, moved during the fall expressed as percentages of total tonnages of these several categories moved during the entire year.

In these, and in succeeding graphs for individual materials, a given vertical distance represents different tonnages or percentages, while the horizontal distances between points are constant and represent the different years, each ending on June 30, the end of the fertilizer year.

Only very small quantities of materials carrying potash were used. Potash in mixed goods increased markedly from 1949-50 to 1951-52, particularly in the goods sold during the spring.

**TRENDS IN THE CONSUMPTION OF MIXED GOODS**

Important trends for mixed goods are shown in Figure 3. Graph A shows the strong trend to higher analysis. In this graph, the actual percentages of available phosphoric acid have been divided by 2, because the approximate ratio of the mixed goods has been 1-2-1. The percentage of available phosphoric acid increased significantly, but the relative increase has not been as great as with nitrogen and potash. The reason for this difference in trends is given in graph B, which shows highly significant increases in the consumption of goods of the 1-2-1, 1-1-1 and 0-2-1 ratio, and a marked decrease in consumption of...
Figure 3. Consumption of mixed goods.

The 1-3-1 ratio. Goods of the 1-2-1 ratio accounted for nearly half of the mixed goods tonnage (graph C), over half of the mixed goods nitrogen (graph D), an increase from about one-third to over a half of the available phosphoric acid in mixed goods (graph E), and a fluctuating portion of the mixed goods potash (graph F) over the period. Goods of the 0-2-1 and 1-1-1 ratios contributed an insignificant part of the tonnages in 1947-48, but increased in importance over the 6-year period until each contributed about 15 percent of the available phosphoric acid and potash used in mixed goods during 1952-53. The strong trend toward goods of higher analysis is shown in graph G. This is particularly striking for the 1-2-0 ratio; during the first 2 years, the only grade of this ratio on the Texas market was 6-12-0, whereas the 10-20-0 grade accounted for practically all of the tonnage of the 1-2-0 ratio sold during 1952-53. While the 5-10-5 grade is by far the most popular of the 1-2-1 ratio, the tonnages of higher grades of this ratio, particularly 10-20-10 and 12-24-12, have increased markedly.

Over the 6-year period, a narrowing of the N-P-K ratio and an increase in the use of grades of higher analysis have been particularly important.

TRENDS IN THE CONSUMPTION OF MATERIALS

Trends in the purchase of materials for their nitrogen and available phosphoric acid contents are shown in Figure 4. The marked increase in the use of nitrogen materials and a decrease in the use of available phosphoric acid materials
Figure 5. Areas for which county fertilizer data were summarized.

have been mentioned; this is shown more clearly in graph A. The tonnages of all nitrogen materials (graph B) have increased markedly during the 6 years, particularly ammonium sulfate, which was of little importance in 1947-48, and anhydrous ammonia, which came on the Texas market for the first time in 1949-50, but contributed about one-fifth of the nitrogen material tonnage in 1952-53. During the latter year, anhydrous ammonia provided much more nitrogen than any other nitrogen material (graphs C and D). The use of normal superphosphate (graphs E and F) increased slightly for 2 years and then decreased sharply the rest of the period, whereas there was a marked increase in the use of concentrated superphosphates and ammonium phosphates for 4 years, after which consumption was limited by the production capacities of the fertilizer plants. Normal superphosphate provided practically all of the available phosphoric acid in materials during 1947-48 (graph G), but only slightly more than ammonium phosphates in 1952-53.

FERTILIZER CONSUMPTION BY AREAS

Soils, principal crops grown, climate and farming methods vary widely in different areas of Texas. The data for individual counties indicated that there also were wide differences in the fertilizer consumption pattern. Fertilizer data for the individual counties, were, therefore, sum-
The summary data for each area are presented in a number of graphs similar to those of Figure 2 for the entire State.

**East Texas**

The data for East Texas are presented in Figure 6. This area is covered by sandy soils which often are deficient in all of the primary components of fertilizers. Until recent years, practically all of the fertilizer sold in the State was used in this area. The greater part of the fertilizer used (graph A) is mixed goods sold during the spring season. Nitrogen consumption (graph B) increased from about 6,000 tons in 1947-48 to 15,000 tons in 1952-53. Available phosphoric acid consumption (graph C) increased from about 18,000 tons in 1947-48 to about 24,000 tons in 1949-52, and then decreased to about 18,000 tons in 1952-53. Potash use (graph D) increased from 5,000 to nearly 11,000 tons over the first 5 years of this period, then dropped to about 8,000 tons in 1952-53. Over the 6-year period, materials used (graph E) increased in average nitrogen content from 3 to 23 percent and decreased in available phosphoric acid from 18 to 8 percent. The average ratio of fertilizer used was about 4-12-4 in 1947-48 and 8-10-5 in 1952-53. The relative importance of nitrogen materials (graph F) increased sharply over the entire 6-year period whereas phosphate materials decreased considerably after 1949-50. The relative importance of the fall trade (graph G) in-
increased over the first 4 years of this period with respect to mixed goods, available phosphoric acid and potash. This was due largely to increases in the sales of the 0-14-7 and 0-12-12 grades in the program of the Agricultural Marketing Service (formerly the Production and Marketing Administration) of the U. S. Department of Agriculture.

Gulf Coast
The tonnage of fertilizer moving into the Gulf Coast area (Figure 7) nearly doubled during this period, going from about 70,000 tons to 135,000 tons, with most of the increase occurring during the first 4 years. Nitrogen consumption was almost five times as great in 1952-53 as it was in 1947-48, with the greatest part of this increase being accounted for by the increase in nitrogen materials moving during the spring season. The consumption of available phosphoric acid nearly doubled, increasing from about 10,000 to about 19,000 tons over the 6 years. The use of potash in mixed goods during the spring season nearly tripled. Materials averaged about 5-20-0 in 1947-48 and 12-16-0 in 1952-53, showing the strong trend toward a narrowing of the N-P ratio. Materials were of much greater relative importance on the Gulf Coast than they were in East Texas, and accounted for nearly two-thirds of the tonnage of fertilizers, of nitrogen, and of available phosphoric acid used in the area. Fall sales accounted for almost half of the materials and only one-fifth of the mixed goods sales each year.
North-Central Texas

This area is covered largely by highly calcareous soils of heavy texture. Superphosphates accounted for the greater part of the tonnage (Figure 8), but the importance of nitrogen increased fairly rapidly over the period, so that the average composition of all fertilizers changed from about 2-16-0 in 1947-48 to 10-15-2 in 1952-53. Materials provided only about 20 percent of the total nitrogen used at the beginning of the period and about 75 percent at the end; they provided slightly less than two-thirds of the available phosphoric acid during this time. Most of the small amount of potash used moved in mixed goods sold during the spring season. Fall sales accounted for about two-thirds of the tonnage of materials and of available phosphoric acid used, and one-fifth to one-fourth of the mixed goods, nitrogen and potash.

South Texas

The soils of this area may be classified as heavy and calcareous, and light and noncalcareous. Water is a limiting factor throughout South Texas, but irrigation is used in a number of local areas. Significant decreases occurred in the tonnage of fertilizers and of available phosphoric acid used (Figure 9). Nitrogen consumption increased during the period, but it was small in comparison with the increase in other areas. Very little potash was used. The average ratio of all fertilizers used was approximately 6-14-1 in 1947-48 and 11-16-2 in 1952-53. About three-fourths of the nitrogen and available phosphoric acid used was in materials. The relative importance of fall sales decreased throughout the 6-year period.
Figure 12. Nitrogen and available phosphoric acid in mixed goods and in materials used in different areas and during different years.
Figure 13. Relative importance of different areas and in different factors during 1947-48 and 1952-53.

Rolling Plains

Water is the limiting factor in crop production on the Rolling Plains and very little irrigation is practiced. Fertilizer consumption was very small, and most of the fertilizer tonnage used was of superphosphate sold during the fall (Figure 13). The use of fertilizer declined steadily the last 3 years of the period covered by this report.

West Texas

Water is the limiting factor in crop production in this area, and the use of fertilizers is not recommended unless water is available through irrigation. Irrigation in the area increased enormously during the past several years, and fertilizers pay big dividends when sufficient water is provided. High yields often are necessary to pay...
for the cost of irrigation. The tonnage of fertilizers used, particularly of nitrogen materials (Figure 11), increased greatly from 1947-48 through 1952-53. Only small tonnages of mixed goods and of potash were used. The average ratio of the fertilizers used was about 8-16-0 in 1947-48, 12-24-0 in 1949-50 and 28-14-0 in 1952-53. More anhydrous ammonia was used in this area than in any other section of the State. The area also used a large part of the ammonium phosphates and concentrated superphosphate sold in Texas.

Comparisons among Areas

Annual data for consumption of nitrogen and available phosphoric acid in mixed goods and in materials in the several areas are compared in Figure 12. Comparable graphs were not developed for potash because almost all of it used was accounted for by mixed goods used in the eastern part of the State. The relative importance of these areas with respect to a number of factors at the beginning and end of the 6-year period is shown in another way in Figure 13.

East Texas (E) used about half of the mixed goods nitrogen sold in the State throughout the period. About the same quantities of mixed goods nitrogen were used in the Gulf Coast (G), North-Central area (N) and South Texas (S) throughout most of the period, with the Gulf Coast increasing its relative consumption in 1952-53 to about one-fourth of the State total. The tremendous increase in the use of nitrogen materials is illustrated by the second row of bar graphs in Figure 12. During 1947-48, South Texas used nearly half (44 percent) of the materials nitrogen sold in the State, and then decreased in relative importance over the rest of the period. By 1952-53, West Texas was using about one-third (32 percent) and the Gulf Coast about one-fourth (25 percent) of the total used, with East Texas, South Texas and the North-Central area each using a little less than one-sixth. The total quantities of nitrogen used during 1952-53 in East Texas (about 14,700 tons) the Gulf Coast (13,600 tons) and the West Texas (W) area (13,600) were about the same, but the patterns of distribution between mixed goods and materials differed widely. About half of the nitrogen used in East Texas came from mixed goods, nearly three-fourths of the nitrogen used in the Gulf Coast came from materials, and mixed goods provided only a very small part (4:136) of the nitrogen used in West Texas.

East Texas used about half of the State total of available phosphoric acid in mixed goods. The Gulf Coast, North-Central and South Texas areas used about the same tonnages. The graphs for available phosphoric acid from materials (bottom row of Figure 12) show the increase to 1949-50 and the successive decreases from that date which already have been discussed. This decrease was much greater in East Texas than in any other area. Thirty-nine percent of the 24,200 tons of available phosphoric acid used in East Texas in 1949-50 came from materials, while in 1952-53 less than 14 percent of the 19,200 tons used came from materials. In the Gulf Coast area in 1952-53, with about the same total tonnage of available phosphoric acid as that used in East Texas (18,100:19,200), 60 percent came from materials.

CONSUMPTION OF UNACIDULATED PHOSPHATES

Considerable quantities of unacidulated phosphates, particularly rock phosphate, were used during the period covered by this report. Almost all of this tonnage was used in the East Texas and Gulf Coast areas, Figure 14.

Very little rock phosphate was used in the year ending June 30, 1948, but the usage increased markedly for 3 years until a little over 20,000 tons were used in East Texas and 15,000 tons in the Gulf Coast area during 1950-51. Consumption in East Texas then declined rapidly the next 2 years: only about 5,000 tons were used in 1952-53. Sales in the Gulf Coast area remained high an additional year, then declined during 1952-53 to about 10,000 tons. A considerable part of this decline was due to changes in the program of the Agricultural Marketing Service.