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United States Census of Agriculture: 1954

Volume III
Special Reports

Part 10
Use of Fertilizer and Lime

(A Cooperative Report)

Prepared under the supervision of
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CROPS and ACREAGE IRRIGATED•
QUANTITY USED • EXPENDITURES•

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PREFACE

Volume III, Special Reports, comprises a group of special compilations and summaries of data from the 1954 Census of Agriculture and related surveys. The purpose of Part 10, "Use of Fertilizer and Lime" is to present in one publication most of the detailed data compiled for the 1954 Census of Agriculture regarding the use of fertilizer and lime. The report presents data for counties, State economic areas, and generalized type-of-farming areas regarding the quantity used, acreage on which used, and expenditures for fertilizer and lime.

This report has been prepared cooperatively by the Bureau of the Census of the U. S. Department of Commerce and the Agricultural Research Service of the U. S. Department of Agriculture. This cooperative report was prepared under the direction of Ray Hurley, Chief of the Agriculture Division of the Bureau of the Census. The report was outlined and the text was written by Donald B. Ibach, Agricultural Economist, and by J. Richards Adams, Senior Chemist, Agricultural Research Service of the U. S. Department of Agriculture. Gladys L. Eagle, Lois Miller, and Julia H. Moring of the Bureau of the Census aided in the preparation of the report.

December 1956

UNITED STATES CENSUS OF AGRICULTURE: 1954

REPORTS

Volume I.—Counties and State Economic Areas. Statistics for counties include number of farms, acreage, value, and farm operators; farms by color and tenure of operator; facilities and equipment; use of commercial fertilizer; farm labor; farm expenditures; livestock and livestock products; specified crops harvested; farms classified by type of farm and by economic class; and value of products sold by source.

Data for State economic areas include farms and farm characteristics by tenure of operator, by type of farm, and by economic class.

Volume I is published in 33 parts as follows:

Part	State or States	Part	State or States	Part	State or States
1	New England States:		West North Central:		East South Central—Continued
	Maine.	8	Minnesota.	21	Alabama.
	New Hampshire.	9	Iowa.	22	Mississippi.
	Vermont.	10	Missouri.		West South Central:
	Massachusetts.	11	North Dakota and South Dakota.	23	Arkansas.
	Rhode Island.			24	Louisiana.
	Connecticut.	12	Nebraska.	25	Oklahoma.
2	Middle Atlantic States:	13	Kansas.	26	Texas.
	New York.		South Atlantic:		Mountain:
	New Jersey.	14	Delaware and Maryland.	27	Montana.
	Pennsylvania.	15	Virginia and West Virginia.	28	Idaho.
	East North Central:	16	North Carolina and South Carolina.	29	Wyoming and Colorado.
3	Ohio.			30	New Mexico and Arizona.
4	Indiana.	17	Georgia.	31	Utah and Nevada.
5	Illinois.	18	Florida.		Pacific:
6	Michigan.		East South Central:	32	Washington and Oregon.
7	Wisconsin.	19	Kentucky.	33	California.
		20	Tennessee.		

Volume II.—General Report. Statistics by Subjects, United States Census of Agriculture, 1954. Summary data and analyses of the data for States, for Geographic Divisions, and for the United States by subjects as illustrated by the chapter titles listed below:

Chapter	Title	Chapter	Title
I	Farms and Land in Farms.	VII	Field Crops and Vegetables.
II	Age, Residence, Years on Farm, Work Off Farm.	VIII	Fruits and Nuts, Horticultural Specialties, Forest Products.
III	Farm Facilities, Farm Equipment.	IX	Value of Farm Products.
IV	Farm Labor, Use of Fertilizer, Farm Expenditures, and Cash Rent.	X	Color, Race, and Tenure of Farm Operator.
V	Size of Farm.	XI	Economic Class of Farm.
VI	Livestock and Livestock Products.	XII	Type of Farm.

Volume III.—Special Reports

Part 1.—Multiple-unit Operations. This report will be similar to Part 2 of Volume V of the reports for the 1950 Census of Agriculture. It will present statistics for approximately 900 counties and State economic areas in 12 Southern States and Missouri for the number and characteristics of multiple-unit operations and farms in multiple units.

Part 2.—Ranking Agricultural Counties. This special report will present statistics for selected items of inventory and agricultural production for the leading counties in the United States.

Part 3.—Alaska, Hawaii, Puerto Rico, District of Columbia, and U. S. Possessions. These areas were not included in the 1954 Census of Agriculture. The available current data from various Government sources will be compiled and published in this report.

Part 4.—Agriculture, 1954, a Graphic Summary. This report will present graphically some of the significant facts regarding agriculture and agricultural production as revealed by the 1954 Census of Agriculture.

Part 5.—Farm-mortgage Debt. This will be a cooperative study by the Agricultural Research Service of the U. S. Department of Agriculture and the Bureau of the Census. It will present, by States, data based on the 1954 Census of Agriculture and a special mail survey to be conducted in January 1956, on the number of mortgaged farms, the amount of mortgage debt, and the amount of debt held by principal lending agencies.

Part 6.—Irrigation in Humid Areas. This cooperative report by the Agricultural Research Service of the U. S. Department of Agriculture and the Bureau of the Census will present data obtained by a mail survey of operators of irrigated farms in 28 States on the source of water, method of applying water, number of pumps used, acres of crops irrigated in 1954 and 1955, the number of times each crop was irrigated, and the cost of irrigation equipment and the irrigation system.

Part 7.—Popular Report of the 1954 Census of Agriculture. This report is planned to be a general, easy-to-read publication for the general public on the status and broad characteristics of United States agriculture. It will seek to delineate such aspects of agriculture as the geographic distribution and differences by size of farm for such items as farm acreage, principal crops, and important kinds of livestock, farm facilities, farm equipment, use of fertilizer, soil conservation practices, farm tenure, and farm income.

Part 8.—Size of Operation by Type of Farm. This will be a cooperative special report to be prepared in cooperation with the Agricultural Research Service of the U. S. Department of Agriculture. This report will contain data for 119 economic subregions, (essentially general type-of-farming areas) showing the general characteristics for each type of farm by economic class. It will provide data for a current analysis of the differences that exist among groups of farms of the same type. It will furnish statistical basis for a realistic examination of production of such commodities as wheat, cotton, and dairy products in connection with actual or proposed governmental policies and programs.

CONTENTS

INTRODUCTION

The purpose of this report is to present in one publication most of the detailed data compiled for the 1954 Census of Agriculture, on the use of fertilizer and lime. The increased use of fertilizer has been one of the striking developments on our farms during the last few decades. The increased use of fertilizer plus the increased use of insecticides and chemicals to control plant insects and diseases, the use of improved varieties of crops, the more timely and economical performance of farm operations because of greater farm mechanization and better farm management, and the increased use of irrigation have resulted in an increase of one-fifth in crop production per acre during the last 15 years.

The Censuses of Agriculture since 1879 have obtained some information on the use of fertilizer and lime. The kinds of data obtained at each Census were as follows:

1879--expenditures for fertilizer.

1889--expenditures for fertilizer.

1899--expenditures for fertilizer.

1909--expenditures for fertilizer and manure.

1919--expenditures for fertilizer and manure.

1924--expenditures for fertilizer, manure, and lime.

1929--expenditures for fertilizer, manure, and lime; tons of commercial fertilizer purchased.

1939--expenditures for commercial fertilizer and for lime, separately; quantity of commercial fertilizer purchased; and tons of liming materials purchased.

1944--expenditures for commercial fertilizer and for lime, separately.

1954--expenditures for commercial fertilizer and for lime, separately; quantity and acres on which used for fertilizer and lime, separately; and for fertilizer, the acres fertilized and amount of fertilizer used for selected crops or groups of crops.

DEFINITIONS AND EXPLANATIONS

The definitions and explanations presented here are limited to those necessary for understanding the data presented in the statistical tables. More detailed and complete definitions will be found in the Introduction to Volume II of the reports of the 1954 Census of Agriculture.

A farm.--For the 1954 Census of Agriculture, places of 3 or more acres were counted as farms if the annual value of agricultural products, exclusive of home-garden products, amounted to $150 or more. The agricultural products could have been either for home use or for sale. Places of less than 3 acres were counted as farms only if the annual value of sales of agricultural products amounted to $150 or more. Places for which the value of agricultural products for 1954 was less than these minima because of crop failure or other unusual conditions, and places operated at the time of the Census for the first time were counted as farms if normally they could be expected to produce these minimum quantities of agricultural products.

For the 1945 and earlier Censuses of Agriculture, the definition of a farm was somewhat more inclusive. From 1925 to 1945, farms, for Census purposes, included places of 3 or more acres on which there were agricultural operations, and places of less than 3 acres if the agricultural products for home use or for sale were valued at $250 or more. For places of 3 or more acres, no minimum quantity of agricultural production was required for purposes of enumeration; for places of under 3 acres, all the agricultural products valued at $250 or more may have been for home use and not for sale. The only reports excluded from the tabulations were those taken in error and those with very limited agricultural production, such as only a small home garden, a few fruit trees, a very small flock of chickens, etc. In 1945, reports for places of 3 acres or more with limited agricultural operations were retained if there were 3 or more acres of cropland and pasture, or if the value of products in 1944 amounted to $150 or more when there were less than 3 acres of cropland and pasture.

Farms reporting.--Farms reporting represents the number of farms for which the kind of expenditure or use of fertilizer or liming materials was reported.

Irrigated farms.--Irrigated farms are farms on which water was applied to pastureland and/or to land from which crops were harvested in 1954. Data are given for irrigated farms for only 17 Western States, and Arkansas, Louisiana, and Florida.

Farms by economic class.--The classification of farms by economic class was based upon 3 criteria: (1) Total value of farm products sold, (2) number of days the farm operator worked off the farm, and (3) the relationship of the income received from nonfarm sources by the farm operator and members of his family to the value of all farm products sold. Farms were classified into two major economic groups, namely, "commercial farms" and "other farms." Farms in each of these two major groups were further classified.

The "commercial farms" were classified into six groups--Classes I through V, solely on the basis of the value of farm products sold; and in the case of Class VI, on the additional basis of the days of off-farm work and the relationship of income of the operator and members of his family from nonfarm sources to the value of all agricultural products sold. "Other farms" include part-time farms, all farms with a value of farm products sold of less than $250, and abnormal farms (institutional farms, experimental farms etc.). The accompanying table gives the criteria for farms in each economic class.

Farms classified by type.--Commercial farms have been classified by type on the basis of the relationship of the value of sales from a particular source, or sources, to the total value of all farm products sold from the farm. In some cases, the type of farm was determined on the basis of the sales of an individual farm product, such as cotton, or on the basis of the sales of a broader group of products, such as corn, grain sorghums, all small grains, field peas, field beans, cowpeas, and soybeans. In order to be classified as a particular type, sales or anticipated sales of a product or a group of products had to represent 50 percent or more of the total value of all farm products sold.

Data are presented for the following type-of-farm groups.

All crop farms comprise cotton, cash-grain, vegetable, fruit-and-nut farms, and other field-crop farms (peanuts, Irish potatoes, sweetpotatoes, tobacco, sugarcane, and sugar beets) on which the value of one of these groups of crops sold accounted for 50 percent or more of the value of all farm products sold.

USE OF FERTILIZER AND LIME

CRITERIA FOR THE ECONOMIC CLASSES OF FARMS

Class	Criteria		
	Value of farm products sold	Other	Farms excluded
Commercial farms:			
Class I	$25,000 or more	None	Abnormal.
Class II	$10,000 to $24,999	None	Abnormal.
Class III	$5,000 to $9,999	None	Abnormal.
Class IV	$2,500 to $4,999	None	Abnormal.
Class V	$1,200 to $2,499	None	Abnormal.
Class VI	$250 to $1,199	Less than 100 days of off-farm work by operator, and income of operator and members of his family from nonfarm sources less than value of all farm products sold.	Abnormal.
Other farms		Farms with a value of products sold of $250 to $1,199 when the farm operator reported 100 days or more of off-farm work or income of farm operator and members of his family from nonfarm sources greater than value of all farm products sold. Includes also all farms with a value of farm products sold of less than $250 and institutional farms, experimental farms, grazing associations, community-project farms, etc., regardless of the value of farm products sold.	

All livestock farms comprise dairy, poultry, and other livestock farms (cattle, calves, hogs, sheep, goats, wool, and mohair) on which the value of one of these groups of livestock and livestock products accounted for 50 percent or more of the value of all farm products sold.

General crop and livestock farms comprise all farms on which the value of any crops and livestock sold accounted for 70 percent or more of the total value of farm products sold, provided the farms could not be classified as all crop farms or as all livestock farms.

All other farms include forest product farms, nursery and greenhouse farms, and horse farms.

Farms by tenure of farm operator.—Farms have been classified by tenure of operator on the basis of the arrangements under which the farm operator controls the land he operates. Data are shown for the following tenure of farm operator groups:

Owners, part owners, and managers are farm operators who own all or part of the land they operate or who operate farms for others and are paid a wage or salary for their services.

Tenants rent from others, or work on shares for others, all the land they operate.

Separate data are given for cash tenants, all share tenants, croppers (for Southern States only), and other tenants.

Cash tenants pay a cash rental, such as $10 per acre or $1,000 for the use of the whole farm.

All share tenants pay as rent a share of the crops or livestock or livestock products, or both.

Croppers are crop-share tenants whose landlords furnish all work power. The landlords either furnish all the work animals or furnish tractor power in lieu of work animals. Croppers usually work under the close supervision of the landlords, or their agents, and the land assigned them is often merely a part of a larger enterprise operated as a single unit.

Other tenants include tenants paying a fixed quantity of any product; those who pay taxes, keep up the land and buildings, or keep the landlord in exchange for the use of the land; those who have the use of the land free; and others who could not be included in one of the other specified subclasses, and tenants for whom the rental arrangement was not specified.

Crops fertilized in 1954.—Data were secured in the 1954 Census of Agriculture on the acres fertilized and the quantity of fertilizer used for six groups of crops in each State. Of the six groups of crops, three were the same for all States, namely:

(1) Hay and cropland pasture
(2) Other pasture (not cropland)
(3) Fruits, vegetables, and potatoes

The three crops or groups of crops comprising the other three groups varied by States as follows:

(1)	a. Corn b. Wheat c. Other crops	New York, Pennsylvania, New Jersey, Delaware, Maryland, West Virginia, Iowa, Illinois, Indiana, Ohio, North Dakota, South Dakota, Kansas, Nebraska, Missouri
(2)	a. Corn b. Cotton c. Other crops	South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Arkansas, Texas, Oklahoma, New Mexico
(3)	a. Corn b. Tobacco c. Other crops	Maine, New Hampshire, Vermont, Connecticut, Massachusetts, Rhode Island, Virginia, North Carolina, Kentucky, Tennessee
(4)	a. Corn b. Oats c. Other crops	Michigan, Wisconsin, Minnesota
(5)	a. Wheat b. Sugar beets c. Other crops	Montana, Idaho, Wyoming, Utah, Nevada
(6)	a. Wheat b. Oats c. Other crops	Oregon, Washington

(7) a. Cotton — Arizona, California
b. Rice
c. Other crops

(8) a. Corn — Colorado
b. Sugar beets
c. Other crops

Since data were not compiled for all States for each crop or group of crops listed above, the acreage fertilized cannot be related to the acreage of these crops in the United States. The proportion of the acreage of each crop in 1954 in the United States, harvested in the States for which separate data for the same crop fertilized were obtained, was as follows:

Crop	Percent
Corn	99.4
Wheat	75.5
Oats	24.6
Cotton	93.5
Tobacco	75.8
Rice	19.0
Sugar beets	37.2

Cropland pasture includes rotation pasture and all other cropland that was used only for pasture.

Improved pasture includes only pasture, not cropland pasture and not woodland pasture, on which one or more of the following practices had been used: liming, fertilizing, seeding to grasses or legumes, irrigating, draining, or controlling weeds or brush.

Acres of hay.--The acres of hay represents the total acres of land from which hay was cut. Sorghum, soybean, cowpeas, and peanut hays were excluded from this total.

Source and Reliability of Data for 1954

The information on the expenditures for fertilizer and lime, the quantity of fertilizer and lime used, and the acreage on which used was collected for a sample of approximately 20 percent of all the farms. The data given in the tables in this report represent estimates for all farms, based upon data tabulated for the sample. (For a description of the sample, the method of compiling the data, and a statement of the reliability of estimates based on the sample, reference should be made to the Introduction to Volume II of the reports for the 1954 Census of Agriculture.) The data for counties are subject to considerable sampling error and this fact should be considered when comparing amounts of fertilizer used as reported by the Census and by other sources and when comparing the acres fertilized for each crop with the acres harvested.

The amount of fertilizer used relates to the quantity applied in 1954. In the case of winter wheat and other fall sown crops, the acres fertilized refer to the acres of the crop planted in the fall of 1954, and not to the acres harvested in 1954. In the drought areas, in the case of some crops, the acres fertilized includes the acres on which fertilizer was applied; the crop was not harvested from part of these acres because of crop failure. The total acres of other crops to which the acres of other crops fertilized have been related, was calculated by subtracting the acres of hay, fruits, vegetables, and potatoes, and two other selected crops from the acres of cropland harvested. In some cases, more than one crop was harvested from the same land in 1954, and since the acres of each of these crops fertilized were counted as acres fertilized, and the acres of cropland harvested, regardless of the number of crops harvested on the land in 1954, were counted only once, the acres of other crops fertilized may exceed the calculated acres of other crops.

For counties, the data on acres of crops fertilized are estimates based upon tabulations for a sample of approximately 20 percent of the farms, while the data for the acreage of the various crops harvested represent totals for all farms. Thus, the figures on acres fertilized may differ considerably from the acres harvested because of the use of a sample to obtain acres fertilized.

For 1954, fertilizer was to include only commercial fertilizer or fertilizing material. No specific mention was made of basic slag. In some areas, particularly in the East South Central States where considerable quantities of basic slag are used, basic slag was not considered a fertilizing material by some of the farm operators and hence was not reported. Lime and liming materials were to include ground limestone, hydrated and burnt lime, marl, oyster shells, and other forms of lime.

The United States total for tons of fertilizer used, as reported in the 1954 Census, was about 15 percent below the total shown by reports of the United States Department of Agriculture, based on data obtained from nearly all fertilizer manufacturers. The difference in data from these two sources is explained largely by the exclusion by the Bureau of the Census and the inclusion by the United States Department of Agriculture of dried manures, secondary and trace nutrient materials, and fertilizers for nonfarm purposes, such as for lawns, parks, golf courses, home gardens, etc., and the underreporting in the Census of the quantity of basic slag used.

The data presented by COUNTIES and those presented by State economic areas, subregions, and generalized type-of-farming areas were obtained from different tabulations and will differ slightly because adjustments were not made in the tabulations when the differences were not significant and did not affect the usefulness of the data. The differences are equal to less than one-half of one percent of the total for counties.

Expenditures for 1954.--The expenditures for fertilizer and lime were to include the expenditures for the farm, including the purchases of both landlords and tenants. Fertilizer and lime used under the Agricultural Conservation Program were to be reported and the total expenditure was to represent the total cost, without any deductions of Agricultural Conservation Program payments. In some areas, farm operators may not have known the amount of payments made by the Agricultural Conservation Program and may have reported only the cost paid by the farm operator.

Areas for which data are presented.—Data are presented for States, generalized type-of-farming areas, subregions, economic areas, and counties.

The boundaries of the generalized type-of-farming areas are shown by the map on page XIV. These generalized type-of-farming areas are approximately the same as those outlined in 1949 by the Bureau of Agricultural Economics of the United States Department of Agriculture. However, much of the data for the 1954 Census of Agriculture were compiled by subregions, and it has been necessary to use the data for these subregions to provide data for the generalized type-of-farming areas. The boundaries of the subregions are indicated by the map on page XIII, and do not correspond exactly with the boundaries of the generalized type-of-farming areas. Table IV indicates the subregions that comprise each of the generalized type-of-farming areas and gives a brief description of subdivisions included in each generalized type-of-farming area.

The same generalized type-of-farming area may occur in widely distant parts of the country. For example, some parts of the Dairy area are found in the Pacific Northwest although most of them are in the Lake States and the Northeast. The General Farming area (VI) is concentrated mainly in the Appalachian region. The Fruit, Truck and Mixed Farming area (I) occurs in several small areas over the country, as for example on the Eastern Shore between Chesapeake Bay and Long Island, in Florida and in Central California. The Special Crops and General Farming area (IX) is also widely scattered and is characterized principally by production of rice, sugarcane, potatoes, peanuts, sugar beets, or dry beans. Other type-of-farming areas are identified with more or less definite regions such as Cotton area (VII) in the South, Feed Grains and Livestock area (V) in the Corn Belt, Wheat and Small Grains area (III) in the Central Plains States, and Range Livestock area (II) in the Western Mountain and Intermountain regions.

In presenting data by generalized type-of-farming areas, it has been necessary to combine entire subregions because Census data were tabulated only by subregions. For this reason some of the smaller parts of one generalized type-of-farming area may, for purposes of this presentation, be included in another more dominant type-of-farming area in the region. For example, the Maine potato area is included along with the Dairy area, as dairying is the dominant type-of-farming area in the Northeast. However, tables 1, 2, and 3 present data on fertilizer use by smaller areas--counties and State economic areas.

State economic areas represent groupings of counties within a State. Outside metropolitan areas, the State economic areas are, in general, the same as State type-of-farming areas. A map showing the boundaries of State economic areas is given on page XII. In table 1 presenting figures by counties, the counties have been arranged by State economic areas.

Expenditures for fertilizer 1879 to 1954.--Significant changes have occurred in the use of fertilizer during the last 75 years. In terms of cash outlays by farmers, the expenditures for commercial fertilizer were more than 35 times as large in 1954 as in 1879. While the change of price level has been a significant factor affecting the increase in dollar expenditures, the increase in the total quantity of fertilizer used on farms has been many fold.

Changes in use of fertilizer and lime.--Some striking regional changes in the use of fertilizer in the United States have occurred in the past 25 years. In 1929 very little fertilizer was being used in the Great Plains and Western States. Most of the fertilizer used a quarter of a century ago was used in the following States or areas: North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, New Jersey, Delaware, Maryland, southeastern Virginia, southeastern Pennsylvania, northeastern Maine, the Connecticut River Valley of Connecticut and Massachusetts, and the Los Angeles area of California.

In 1954 commercial fertilizer was used on 123 million acres of cropland and pasture. Lime was applied to 11 million acres. The accompanying map shows the distribution of fertilizer use in 1954. About half of the acreage fertilized in 1954 was in the Corn Belt, Great Plains, and Western States. In 1929 these areas accounted for only a sixth of the total expenditure made for commercial fertilizer used in the United States. About two-fifths of the expenditure for fertilizer in 1929 was concentrated in the Piedmont and Coastal Plain parts of North Carolina, South Carolina, Georgia, and Alabama.

Most of the fertilizer used in 1929 was applied to the more intensively cultivated crops, especially to cotton, tobacco, fruit, truck, and potatoes. These crops have continued to absorb an important part of the fertilizer applied, but several other crops and pasture, which were not formerly fertilized to any great extent, are now widely fertilized.

In 1954 commercial fertilizer was applied to almost 123 million acres. About 4 million of these acres comprised improved pasture other than cropland pasture. The other 119 million acres comprised cropland and represented more than one-fourth of the total cropland in the United States. In 1954 commercial fertilizer was applied to more than 13 million acres of hay and cropland pasture, 46.5 million acres of corn, 11 million acres of wheat, 9.7 million acres of cotton, and 6.3 million acres of fruits, vegetables, and potatoes. This means that three-fifths of the corn; a fifth of the wheat acreage; about half the cotton; and two-thirds of the fruit, vegetables, and potatoes had some application of fertilizer in 1954.

Consumption of commercial fertilizer and liming materials in the United States.--The consumption of commercial fertilizers in the continental United States in 1954 was almost 19 million tons, an increase of 172 percent over the 7 million tons used in 1939. The most rapid regional increase was in the Northern Plains States. More than twenty times as much fertilizer was used in this area in 1954 as in 1939. However, this region used less fertilizer in 1954 than any other except the Mountain States. The greatest tonnage of fertilizer was used in the Corn Belt, followed by the Southeast and Appalachian Regions. These three regions include the only States using more than a million tons annually. North Carolina consumed 1.3 million tons in 1954, followed by Georgia with 1.2 million tons, Florida with 1.1 million tons, Illinois with 1 million tons, and Indiana with 1 million tons.

The use of liming materials in 1954 was more than double that of 1939. Consumption in the Northern Plains increased more than 10-fold during this period, followed by the Delta States with a 7-fold increase. The only area in which consumption dropped was the Mountain States, where there was a decrease of almost 75 percent. Of the 6 States using over a million tons in 1954, Illinois used the largest quantity, 2.5 million tons.

Trends in use of fertilizer and of liming materials since 1910 are shown by the chart on page XVII. Consumption of fertilizer, relative to the 1947-49 average, has risen each year since 1938. Currently, consumption in terms of available plant nutrients, is about one and two-thirds times that during the base period (1947-1949). Use of liming materials expanded markedly during the period 1936 to 1947 when this practice was encouraged through conservation programs. Following 1947, consumption of liming materials has declined substantially. Differences in recent trends in use of fertilizer compared with use of lime reflect farmers' relative evaluations of these practices. In the case of fertilizer, the returns to the farmer are quickly obtained. Liming materials are more generally regarded as capital investments and the returns occur at a much slower rate than for fertilizer. The decline in use of liming materials may be greater than is indicated by consumption data because the rising nutrient content of fertilizers means that less calcium or magnesium bearing materials are used in commercial fertilizers.

Use of fertilizer by generalized type-of-farming areas.--Variations in percentage of acreage fertilized, in quantity of fertilizer used, and in rates of application per fertilized acre among broad type-of-farming areas are indicated by data in table IV.

The quantity of fertilizer used was greatest in the Cotton type-of-farming area (VII), followed in order by Feed Grains and Livestock, (V), Dairy (IV), the Fruit, Truck, and Mixed Farming (I), and General Farming (VI) areas. These five areas account for more than 80 percent of all fertilizer used in the United States in 1954.

More than 30 percent of all fertilizer was used on corn in 1954, and about one-third of that used on corn was used in the Feed Grain and Livestock type-of-farming area (V). Even in the

Cotton area (VII) nearly as much fertilizer was used on corn as on cotton. About one-seventh of the total quantity of fertilizer was used on fruits, vegetables, and potatoes, and 57 percent of the fertilizer applied to these crops was used in the Fruit, Truck, and Mixed Farming area (I). About one-ninth of the tonnage of fertilizer was used on hay and cropland pasture, and one-tenth, on cotton. Nearly 45 percent of the fertilizer used on hay and cropland pasture was used in the Dairy (IV) and the Cotton (VII) areas.

The average amount of fertilizer used per acre fertilized was higher for tobacco than for any other selected crop for which data were obtained in the Census. The average amount applied per acre on corn ranged from nearly 400 pounds in the Fruit, Truck, and Mixed Farming area (I), to less than 100 pounds in the Wheat and Small Grains area (III). The average rate applied on cotton in the General Farming area (VI) was about 1.4 times as high as in the Cotton type-of-farming area (VII). The average amount used per acre on hay and cropland pasture and on improved permanent pasture approximated or exceeded 300 pounds per acre in the Fruit, Truck, and Mixed Farming (I), the Dairy (IV), the General Farming (VI), the Cotton (VII), the Tobacco and General Farming (VIII), and in the Special Crop and General Farming (IX) areas. Only in the Range Livestock (II) and Wheat and Small Grains (III) areas were average amounts used per acre on hay and cropland pasture below 200 pounds per acre.

Use of fertilizer and liming materials, by State economic areas.--Considerable variation in fertilizer practices occurs between type-of-farming areas (State economic areas) within a State. This variation usually reflects differences in soils, type of farming, etc. For example, table 2 indicates a wide difference in percentage of crop acreages fertilized and in average rates per acre between State economic area 7b and areas 8 and D in Alabama. Area 7b is in the Cotton generalized farming area (VII). State economic areas 8 and D are in the Fruit, Truck, and Mixed Farming area (I) on the Gulf Coast.

Table 3 shows fertilizer practice for each economic area in the 20 States for which data are available separately for irrigated and non-irrigated farms. For the 20 States as a whole, 7.5 percent of all crops and pasture land on irrigated farms was fertilized at an average rate of 349 pounds per acre. For non-irrigated farms, 4.8 percent of the crop and pasture land was fertilized at an average rate of 205 pounds. Similar comparisons are available for the other crops specified in table 3 for each of the 20 States.

Use of fertilizer and liming materials by economic class, tenure of operator and type of farm.--Data on use of fertilizer and liming materials by economic class of farm, tenure of operator, and type of farm are presented for each economic area, by States and for the United States in tables 4, 5, and 6.

Except in the South, farmers in the higher economic classes generally fertilized or limed a higher percentage of their acreage of crops and cropland pasture than those in the lower income classes.

A higher percentage of cropland was fertilized on the all crop farms than on the other types in most of the Northeastern, Appalachian, and Lake States. In some of the Corn Belt States and in the Southeast, the percentage of acreage fertilized varied very little by type of farm. In most of the humid areas, the amount of fertilizer and lime used per acre was higher on the all crop farms than on general crop and livestock types of farms. The quantity of liming materials applied per acre was substantially lower on all types of farms in the South than in the Central or Northern States.

Generally there appeared to be no consistent relationship between quantity of fertilizer or liming materials applied per acre or between percentage of cropland and improved permanent pasture fertilized or limed and tenure of operator. However, a large part of the acreage operated and, consequently, a large part of the fertilizer and liming material used and most of the acreage fertilized or limed was on farms of owners, part owners, and managers.

Fertilizer use by rate of use per acre.--Tables V and 7 present data for selected crops and selected State economic areas, for acres fertilized and quantity of fertilizer used for farms classified by rate of use per acre. The data given in table V are arranged by generalized type-of-farming areas. The distribution of farms, acres fertilized, and amount of fertilizer used by the rate of application differ significantly among areas for most of the selected crops. For example, the distribution of farms by rate of use of fertilizer for corn is significantly different for Dairy areas in New York and Wisconsin. Type of soil, climate, kind of crops grown, etc., have significant effects upon the rate of use of fertilizer by farmers.