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DDT USED IN FARM PRODUCTION

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CONTENTS

	<u>Page</u>
Summary.....	iii
Introduction.....	1
Background.....	1
Production and Use.....	2
Farm Use of DDT.....	2
Use on Crops.....	2
Use of DDT and other insecticides on cotton.....	3
Application rates and cost of DDT and other insecticides used on cotton.....	4
Livestock and Other Use.....	5
Tables.....	5

SUMMARY

DDT, the first widely used synthetic organic insecticide, is highly effective and economical in controlling a vast array of insects.

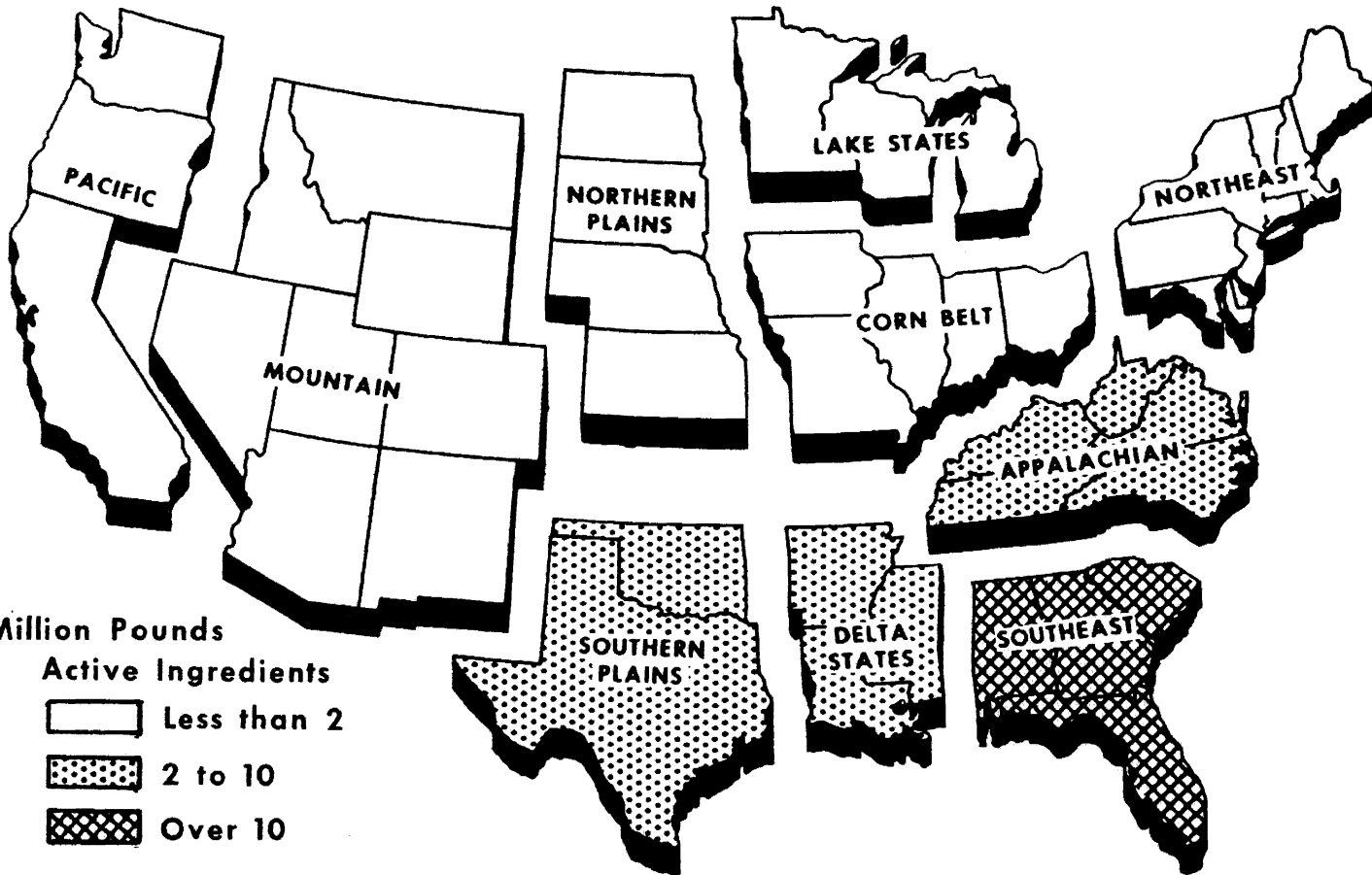
Although still produced in large quantities, U.S. output of DDT is about 40 percent less than the peak reached in the 1962-63 crop year. Exports claimed an increasing share--about 70 percent--of total production in 1966-67. Quantities available for domestic use were down nearly 50 percent--from 79 million pounds in 1958-59 to 40 million pounds in 1966-67.

Farmers are the major domestic users of DDT in the United States, accounting for more than two-thirds of the total used. Most of the DDT used on farms, about 95 percent, is applied to crops. Cotton is the major recipient. The use of DDT on crops in 1966 was below that for 1964. Most of this difference was due to a 30-percent reduction in cotton acreage in 1966. However, the rate of use per acre of cotton was somewhat higher in 1966 primarily because more applications were made.

DDT has been very popular because it controls a large number of pests at moderate costs. In addition it is relatively safe to handle; however, its persistence and broad-range effectiveness create some undesirable side effects. Currently several alternative insecticides are being used. They include ethyl and methyl parathion, malathion, toxaphene, and others. The use of these alternatives affects the spectrum and duration of control and also the costs. Some of these are less safe to handle and apply, but they may present fewer residual problems than DDT.

Changes in the spray programs used on cotton between 1964 and 1966 indicate a greater increase in the use of toxaphene than of DDT. They also show an increased use of DDT in combination with other insecticides. The overall effect of these changes was to lower the average cost of spraying cotton for any given infestation.

DDT USED IN FARM PRODUCTION, 1966



DDT USED IN FARM PRODUCTION

by

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INTRODUCTION

One of the most widely used insecticides in the United States and in the world is DDT.^{1/} It is effective against a large number of pests whose control is important to assure adequate supplies of food and fiber. Its broad spectrum insecticidal properties, combined with long residual life and relative safety in handling, make it desirable for many control purposes. DDT is a recommended control for at least 150 pests which can damage economic crops.

DDT decomposes very slowly under certain conditions, is almost insoluble in water, and has a tendency to accumulate in the fatty tissue of warm-blooded animals including man. There is some concern that certain types of wildlife may be adversely affected by this tendency.

This report shows recent use of DDT in U.S. farm production and indicates trends in total U.S. production of DDT and its overall use.

BACKGROUND

DDT was first synthesized in 1874, but it was not until 1939 that a scientist in Switzerland discovered its insecticidal properties. Because malaria was a serious problem during World War II for the U.S. Armed Forces, especially in the South Pacific, DDT was brought to the United States in 1942 for testing on mosquitoes that carried the disease organisms. It was found to be very effective and was imported in substantial quantities until domestic production for military use could be started in 1944.

After the war, DDT became important in the control of many agricultural and forest pests because it was superior to any control method available previously. For some time DDT was the only insecticide that permitted economical control of many agricultural pests. Researchers have since found other effective insecticides for most of the insect pests and some can even be controlled by nonchemical means.

^{1/} The primary component of the commercial DDT that farmers use is: 1, 1, 1-trichloro-2, 2-bis (p-chlorophenyl)ethane.

In 1968, five companies manufactured DDT in the United States, eight less than 15 years ago. Production, domestic use, and exports of DDT generally increased throughout the 1950's and early 1960's (table 1). Production of DDT reached a peak of 188 million pounds in the 1962-63 season and declined to 114 million pounds in 1966-67. Although both domestic production and exports declined in recent years, domestic use has been declining more rapidly than exports. As a percentage of total production of DDT, exports remain close to their alltime high.

Exports now claim around 70 percent of U.S. total production. Shipments to India and nearby countries account for a large share of the exports. Much of the exported DDT was purchased by the Agency for International Development (AID) and the United Nations, primarily for malaria eradication.

FARM USE OF DDT^{2/}

DDT has been, and still is, of great value to American farmers and consumers in controlling insects, especially on cotton, fruits, and vegetables.

Farmers are the major domestic users of DDT. They accounted for nearly two-thirds of all that was used in the United States in 1964 and 1966. Most of the DDT is used in the South. The three regions, Southeast, Delta States, and Southern Plains, accounted for about 75 percent of all the DDT used by farmers in the United States in both 1964 and 1966 (table 2).

DDT is gradually being replaced for many uses because some insects are becoming resistant to it and other insecticides cost less for certain control purposes.

Use on Crops

Over 95 percent of the DDT used by farmers in both 1964 and 1966 was applied to crops. It is used on more farm crop acres than any other insecticide except aldrin, and it is used in larger quantities than any other insecticide except toxaphene.

Year-to-year use of insecticides on most crops varies because of infestation changes that are often associated with weather conditions or cropping practices. Use over long periods of time also varies because of a gradual shift in crops grown or because of large acreage changes between years associated with Government programs.

^{2/} Data on farm use of DDT are estimates based on two nationwide enumerative surveys of about 10,000 farmers. Farm use of DDT in 1964 is from Quantities of Pesticides Used by Farmers in 1964, U.S. Dept. Agr., Agr. Econ. Rpt. No. 131, Jan. 1968. Data for 1966 are preliminary estimates from the ERS Pesticide and General Farm Survey, 1966.

In recent years there has been a downward trend in the farm use of DDT. The changes between 1964 and 1966 overstate this trend because there was a large reduction in cotton acreage grown. For crops other than cotton, the amount of DDT used declined about 3 percent a year from 1964 to 1966 and the acreages treated were down almost 10 percent a year.

Cotton growers use most of the DDT that farmers buy. They use DDT to control more than a dozen insects, including the bollworm, pink bollworm, cotton fleahopper, and thrips.

In 1964 and 1966, about three-fourths of the DDT used by farmers was applied to cotton (table 3). Most of it was used in the Southeast, Delta States, and Southern Plains. Very little was used in California.

The proportion of cotton acres treated remained the same from 1964 to 1966--38 percent. Both the acreage of cotton grown and that treated were down about 30 percent. However, the amount of DDT used was down only 20 percent. Thus, cotton farmers had higher annual average rates of use primarily because they applied DDT more times in 1966 than in 1964.

For tobacco both acres treated and quantities of DDT were down about a third between 1964 and 1966. In 1964, 46 percent of the tobacco acreage was treated with DDT, by 1966 this had dropped to 31 percent.

Significant but decreasing amounts of DDT are used on fruits and vegetables. Sixteen percent of the fruit acres were treated with DDT in 1964 and a somewhat smaller share in 1966. The use of DDT on fruits dropped from 1.9 million pounds to 1.5 million pounds (about 20 percent) and from 0.7 million acres to 0.5 million acres (30 percent) in the 2-year period 1964 to 1966. In 1964, 1.7 million pounds of DDT were used on 0.7 million acres of vegetables; in 1966, 1.4 million pounds were used on 0.8 million acres.

The amount of DDT used on soybeans went up from 0.5 million pounds in 1964 to 0.7 million pounds in 1966. However, the acreage treated was down slightly. This difference is largely accounted for by a reduction in the acres treated in the Corn Belt where applications are generally at a relatively low rate--and an increase in the acreage treated in the Southeast where rates were generally higher.

There was also a divergent trend in the amount of DDT used on other field crops (primarily peanuts, corn, wheat, and hay) and acres treated. This was largely related to an increase in acres of peanuts treated with DDT and a decrease in the acres of other crops treated. Peanuts generally were treated at a higher rate than the others. The net result was that although total acreage of other field crops was down, the amount of DDT used was up.

Use of DDT and other insecticides on cotton - The total amount of insecticides used on cotton was less in 1966 than in 1964, primarily because of a reduction in cotton acreage. The amount of DDT used was down more than the average for all other insecticides. DDT was down 19 percent compared with an average of 12 percent for all other insecticides (table 4).

Toxaphene was the other major insecticide used on cotton. These two products (toxaphene and DDT) accounted for two-thirds or more of all insecticides used on cotton. Somewhat more toxaphene than DDT was used on cotton in 1964 and considerably more was used in 1966.

Phosphorus compounds (primarily methyl parathion and parathion) were down somewhat less than DDT--11 percent. Insecticides other than toxaphene, DDT, and phosphorus compounds were a small share of the total in both 1964 and 1966. However, the use of other insecticides, mostly endrin and carbaryl, was down more than DDT. Toxaphene therefore appears to have partially replaced not only DDT but also other products in 1966.

Application rates and cost of DDT and other insecticides used on cotton - The rate of agricultural pesticide use varies from one year to the next. Year-to-year variations reflect the intensity of infestation and weather conditions. Such differences cause large variations in the numbers and kinds of treatments and the resulting average annual rates of use per acre. Comparisons between 2 years also reflect any regional shifts in production and the general trend in the use of pesticides over time.

The DDT and the overall rate of insecticide use per acre on cotton was higher in 1966 than in 1964 (table 5). The higher rate seems to be due primarily to a large number of applications. The change in the use of DDT was proportionally less than for other commonly used insecticides.

In contrast to DDT, toxaphene use per acre increased more than that of others largely because of its low cost and continued effectiveness. The other chlorinated hydrocarbons in cotton insect sprays, primarily endrin, showed no change in rate of use between these years.

The differences in the use of phosphorus insecticides in 1964 and 1966 were similar to DDT. The phosphorus compounds, although chiefly methyl parathion, included quantities of malathion and ethyl parathion. Methyl parathion, at sufficiently high rates, is being used by some farmers to control the cotton bollworm, a major pest of the Delta States. It is sometimes used alone or with endrin, but more often it is used in combination with DDT and toxaphene.

Some other insecticides, primarily carbaryl, were used in cotton insect control. Considerably less was used in total and at lower rates in 1966 than in 1964.

The total cost of insecticides per acre was somewhat lower with the 1966 spray program, although the total amount of material used per acre was greater than in 1964. It averaged around \$10.00 per acre receiving any insecticides. The proportional increase in the per acre use of the relatively low-cost toxaphene tended to lower 1966 costs from what they would have been if the same proportion of each ingredient had been used in 1966 as in 1964. There was also a tendency to use more insecticides formulated as combinations of ingredients in 1966. Insecticides purchased in combination tend to cost somewhat less on an active ingredient

basis than single ingredient insecticides. Had these shifts not occurred, 1966 per acre costs would have been higher than in 1964.

Livestock and Other Use

The use of DDT in livestock production is only 2 percent of the total use. In 1964, farmers used about 0.6 million pounds on livestock and livestock buildings (table 3). The amount dropped to 0.5 million pounds in 1966. Most of the DDT used in livestock operations was on beef cattle enterprises.

TABLES

Table 1.--DDT: Production, exports, and apparent domestic use, by crop year ending September 30, United States, 1949-1967

Crop year	Production	Domestic use <u>1/</u>	Exports <u>1/</u>	Proportion of production exported
	1,000 pounds	1,000 pounds	1,000 pounds	Percent
1949-50.....	37,904	57,638	2/	2/
1950-51.....	78,150	72,688	2/	2/
1951-52.....	106,139	70,074	2/	2/
1952-53.....	99,929	52,748	32,288	32
1953-54.....	84,366	45,117	31,410	37
1954-55.....	97,698	61,800	42,329	43
1955-56.....	129,693	75,000	53,252	41
1956-57.....	137,659	71,000	56,914	41
1957-58.....	124,454	66,700	70,011	56
1958-59.....	156,150	78,682	76,369	49
1959-60.....	160,007	70,146	86,611	54
1960-61.....	175,657	64,068	103,696	59
1961-62.....	162,633	67,245	106,940	66
1962-63.....	187,782	61,165	113,757	61
1963-64.....	135,749	50,542	77,178	57
1964-65.....	130,755	52,986	98,987	76
1965-66.....	142,329	46,672	94,867	67
1966-67.....	114,428	40,257	80,208	70

1/ Domestic consumption and exports may come from current production or out of previous inventory accumulations.

2/ Comparable data not available.

Source: The Pesticide Review, 1968 and earlier years, U.S. Dept. Agr., Agr. Stabilization and Conserv. Serv.

Table 2.--Farm use of DDT by farm production regions,
United States, 1964 and 1966 ^{1/}

Region	Active ingredients	
	1964 ^{2/}	1966 ^{3/}
	Million pounds	Million pounds
Northeast.....	1.0	0.7
Appalachian.....	2.8	2.0
Southeast.....	12.6	10.9
Delta States.....	6.9	7.1
Corn Belt.....	.9	.6
Lake States.....	.5	.5
Northern Plains.....	.1	.1
Southern Plains.....	4.8	2.8
Mountain.....	.8	1.2
Pacific.....	1.6	1.1
48 States.....	32.0	27.0

^{1/} Does not include Alaska and Hawaii.

^{2/} Revised estimates based on Quantities of Pesticides Used by Farmers in 1964, U.S. Dept. Agr., Agr. Econ. Rpt. No. 131, Jan. 1968.

^{3/} Data from the ERS Pesticide and General Farm Survey, 1966.

Table 3.--Farm use of DDT, by type of use, United States, 1964 and 1966 ^{1/}

Use category	Active ingredients		Acres treated ^{2/}		Percentage of acres treated with DDT	
	1964 ^{3/}	1966 ^{4/}	1964 ^{3/}	1966 ^{4/}	1964	1966
	Million pounds	Million pounds	Million acres	Million acres	Percent	Percent
Cotton.....	23.6	19.2	5.7	4.0	38	38
Tobacco.....	1.2	.8	.5	.3	46	31
Soybeans.....	.5	.7	.6	.5	2	1
Vegetables (incl. potatoes).....	1.7	1.4	.7	.8	15	15
Fruits.....	1.9	1.5	.7	.5	16	11
Other crops ^{5/}	2.3	2.7	1.2	.9	<u>6/</u>	<u>6/</u>
Total crops ^{5/}	31.2	26.3	9.4	7.0	3	2
Livestock and live-stock buildings.....	.6	.5				
Other.....	.2	.2				
Total DDT.....	32.0	27.0				

^{1/} Does not include Alaska and Hawaii.

^{2/} Acres in this report are estimates of land area treated with DDT one or more times.

^{3/} Revised estimates based on Quantities of Pesticides Used by Farmers in 1964, U.S. Dept. Agr., Agr. Econ. Rpt. No. 131, Jan. 1968.

^{4/} Data from the ERS Pesticide and General Farm Survey, 1966.

^{5/} Does not include summer fallow, pasture or rangeland. If included, the percentage of acres treated would be less than half of that shown.

^{6/} Less than 1 percent.

Table 4.--Farm use of DDT and other insecticides for treatment of cotton, United States, 1964 and 1966 ^{1/}

Insecticide	Active ingredients		Percentage change
	1964 ^{2/}	1966 ^{3/}	
	Million pounds	Million pounds	Percent
DDT.....	23.6	19.2	-19
Toxaphene.....	26.9	27.3	+1
Other chlorinated hydrocarbons.....	5.3	3.2	-40
Phosphorus compounds.....	15.2	13.6	-11
Other insecticides.....	4.5	1.6	-64
All insecticides.....	75.5	64.9	-14
All insecticides (not including DDT).....	51.9	45.7	-12

^{1/} Does not include Alaska and Hawaii.

^{2/} Quantities of Pesticides Used by Farmers in 1964, U.S. Dept. Agr., Agr. Econ. Rpt. No. 131, Jan. 1968.

^{3/} Data from the ERS Pesticide and General Farm Survey, 1966.

Table 5.--Insecticide use per treated acre of cotton and relative importance, United States, 1964 and 1966 ^{1/}

Insecticide	Active ingredients ^{2/}		Percentage of total	
	1964	1966	1964	1966
	Pounds	Pounds	Percent	Percent
DDT.....	2.7	3.4	31	29
Toxaphene.....	3.1	4.9	35	42
Other chlorinated hydrocarbons.....	.6	.6	7	5
Phosphorus compounds.....	1.8	2.4	21	21
Other insecticides.....	.5	.3	6	3
All insecticides.....	8.7	11.6	100	100

^{1/} Does not include Alaska and Hawaii.

^{2/} Quantity of each material divided by the number of acres on which any insecticides were applied. Based on information from the ERS Pesticide Uses Survey in 1964 and the Pesticide and General Farm Survey, 1966.