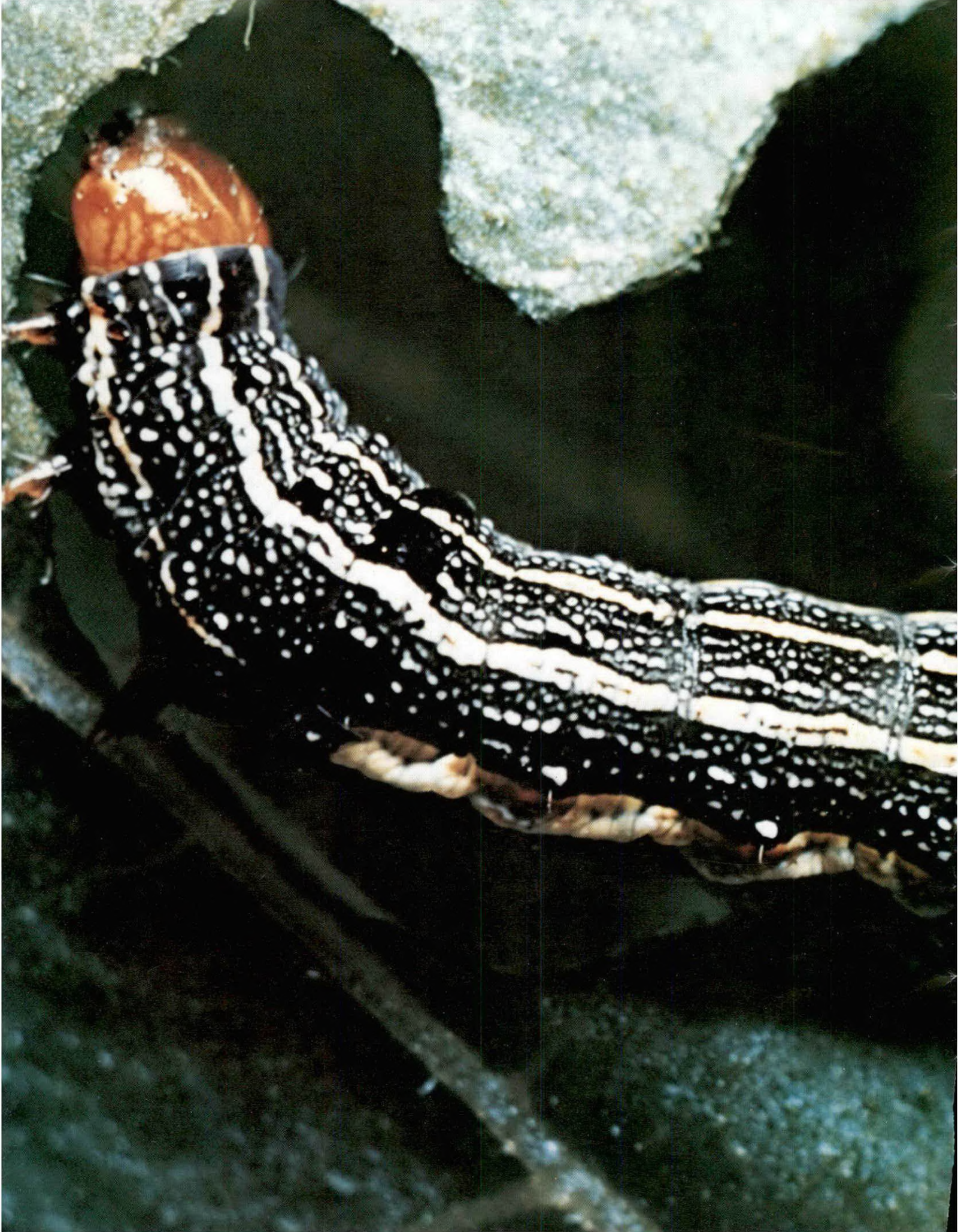


A photograph of a person fishing in a river. The person is standing on the right bank, holding a fishing rod. The river is filled with rocks and has a large log in the background. The scene is set in a forest with tall trees. The text is in the top right corner.

**A Closer Look At The
Pesticide Question
For Those Who
Want The
Facts**

We want future generations to share our natural heritage.





Our crops must be protected to help feed a hungry world.





A Closer Look At The Pesticide Question

In the minds of pesticide users — the farmer, the forester, the home gardener — there is no question about the utility of pesticidal products. We need them in America if we are to continue to feed our own expanding population, let alone millions of less fortunate people in developing nations where starvation is still a frightening reality. We need insecticides to protect our forests from destructive beetles and caterpillars, our homes from ants and termites, our stored foods from a myriad of pests. We need herbicides to reduce the cost of agricultural crops, to renew grass cover on our prairies, to restore the flow of water in once-dry creek beds, to improve the shrinking habitat of our nation's wildlife — to enhance the quality of our environment. ?

Like many other useful products, pesticides can be hazardous. Fortunately the hazards created by their use can be quantified and evaluated; unfortunately, our lawmakers and the general public, depending on newspapers, magazines and television for most information on current problems, are seldom given quantitative data on many essential applications of pesticides.

The media are expected to keep us informed on subjects involving the public welfare, and we believe they try to do just that. But good news makes bad copy and cold statistics have little news value. In a matter as serious as human survival, however, it can be dangerous to misinform the public and the lawmakers by repeating unsubstantiated claims or by distributing the unsubstantial fruits of wishful thinking.

This booklet attempts to publicize some of the less-known facts about pesticides and their uses — not with bare claims, but with quantitative data from respected impartial sources.

It must not be assumed that the use of quotations from writings of leading environmentalists implies their endorsement of our principal theme. We sincerely hope, however, that all readers, even those presently opposed to the use of pesticides, will give the data presented here their thoughtful consideration.



*"We know that the white man does not understand our ways.
One portion of the land is the same to him as the next,
for he is a stranger who comes in the night
and takes from the land whatever he needs.
The earth is not his brother but his enemy,
and when he has conquered it he moves on."*

Chief Seattle addressing President Pierce,
as quoted by John Strohm in *National Wildlife*.

The chief was right of course. In our relatively brief residence in the New World, we have changed the face of the land: we have leveled hills, drained wetlands, straightened wild rivers, removed vast tracts of virgin timber, creating conditions that have led to soil erosion, drought, and even dust storms. The growth of industry and new technologies have provided weapons to accelerate the attack. Over the years, careless exploitation of the land, prodigal waste of its natural resources, together with the pressures of a burgeoning population, have contributed to the current environmental crisis.

Now we are all learning to accept the earth as our brother. We no longer speak of "taming the wilderness" or "conquering nature." And technological man knows that he must be his brother's keeper. In the words of Senator Henry Jackson writing in 1973, "A new age is dawning.... It is the Age of Environment which has pricked America's collective conscience and triggered far-reaching action on many fronts."

It is too late, however, to let nature take its course. The mass application of modern technology without sufficient knowledge and coordinated planning has visibly wounded the natural systems. But the wounds are too deep to mend themselves. We are committed to the continued use of the best remedies science and technology can devise, and we must use them wisely, with adequate understanding of the possible consequences.



Is It Safe To Eat Or Drink Anything?

The world is becoming so overcrowded it is already hard to find clean air to breathe and pure water to drink. The Clean Air Act of 1970 has done some good, but the program is behind schedule. Water cleanup has begun, but we still have a long way to go. According to the National Wildlife Federation, "Conceivably, nothing less than an effort comparable to the space program will turn the situation around."

At the same time, human encroachment continues to reduce wildlife habitat to such an extent that nearly 24,000 species of plants and animals may soon be placed on the endangered species list for lack of adequate cover, water and food. We hear or read almost daily of the dangers of cancer, species mutations and birth defects caused by food additives and farm chemicals — especially insecticides and herbicides.

We Americans are deeply concerned about these reports and worried about the future. Assailed as we are by dire predictions of a dismal future or even of the imminent destruction of our great water planet, many Americans may be convinced that the good life we have known is doomed. We tend to worry about whether we and our children will be able to survive in the artificial environment

science and technology have been creating.

What has happened to science and technology? Have they lost the ability to protect us from disease and ward off threats to our environment? We think not. Chemicals, properly used, are our most valuable tools for water purification and many methods of pollution abatement.

Toxic substances released purposely or inadvertently into lakes and streams, or belched into the atmosphere from chimneys and smokestacks have done fearsome damage to our surroundings and to animal and human health, and only in the past few years have environmental stewards begun to succeed in checking or even reversing the decay.

Like many other chemical products, pesticides are toxic, but they are applied sparingly to specific targets under precisely controlled conditions, usually by experienced workers and almost invariably in compliance with government-approved specifications. Thus the American public is protected.

If you thoughtfully examine the evidence provided here, we believe you will agree that Americans risk greater dangers from the possible reduction of our arsenal of pesticides than we do from their continued use.

! LIKE THE
MILLICOMA RIVER
LAST SUMMER



Cancer—For Some Types, The Rate Is Declining

First of all, let us state a significant fact about cancer — it is predominantly a disease of old age. If people or animals are kept alive long enough, their chances of succumbing to this disease are significantly increased.

The American public's preoccupation with cancer is maintained by constant reminders in the press, on the radio, and on television, of the dangers involved in eating or drinking common items of diet—not only those containing synthetic dyes or sweeteners, but even such good old favorites as red meats, bacon, and our morning coffee.

The most current thorough study of the relation of cancer to the environment is to be found in *The Sixth Annual Report of the Council on Environmental Quality*, published in December, 1975 and available from the U. S. Government Printing Office. According to this publication, "Both mortality data and surveys on incidence conducted by the National Cancer Institute point up three trends within the overall increase—a rise in cancer for white and black males, an approximately steady rate for black females, and a decline for white females. As indicated... cancer incidence has remained relatively uniform for some body sites since 1930 but has changed markedly for

others. The most dramatic changes are the nearly twenty-fold increase in lung cancer for males, and a *two-thirds decrease of stomach cancer in both males and females*" (emphasis added).

"The increase in lung cancer for males is primarily attributed to heavier smoking, coupled with impacts from other environmental pollutants; the stomach cancer decline is understood less, but it may be linked to diet."

Thus we find that our diet, which consists largely of pesticide-protected foods, may be linked to a *decrease in cancer* over the past forty-odd years.

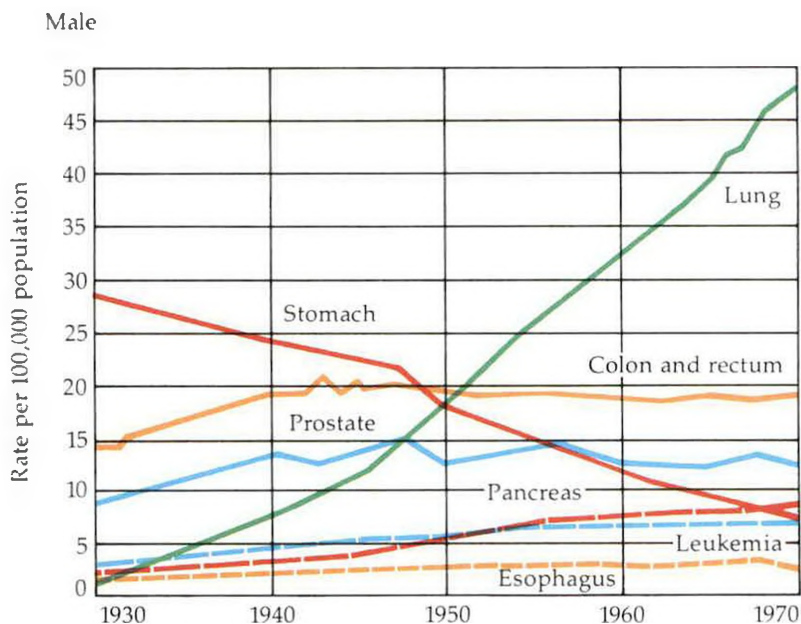
Let us look a bit further. If pesticides were a cancer threat, we should expect to see the greatest incidence of the disease down on the farm, where pesticide users are regularly exposed and where runoff from fields might enter the waterways. This is not the case.

What does the U. S. Government report tell us about geographical factors? "Analysis county by county," it says, "reveals that a majority of the areas of high mortality are located in the large cities. For example, the high mortality in Illinois reflects rates in the Chicago area."

Often, expert opinion is abused. For example, in October, 1975, a major television network

! clear, rational thinking!!?!.

Cancer Mortality Rates, by Site and Sex, 1930-70
(age-adjusted to U.S. 1940 population)



Source: David L. Levin, et al., *Cancer Rates and Risks*, DHEW Publications, U.S. Government Printing Office, 1974, as quoted in Sixth Annual Report.

broadcast a special program titled "The American Way of Cancer." The participants were for the most part knowledgeable scientists, and official sanction was implied by the presence of an expert on additives from the EPA. From such a group one might have expected an objective analysis of the problem; unfortunately, they chose to overlook basic data. Only once, for example, was it mentioned in passing that the chances of getting cancer are reduced if one stops smoking. The major thrust of the attack was against (a) pesticides, (b) DES, a synthetic hormone used to increase beef production, (c) sodium nitrite, a food preservative, (d) Red Dye No. 2, a food coloring, (e) PVC, a plastic, (f) asbestos, and (g) various chemicals, including poisons such as arsenic. It was implied that cancer is an increasing problem and that these are major sources of that disease. It was also claimed that the United States is number one in cancer, when in fact this country stands about midway among the industrialized nations in cancer incidence.

Our present discussion is confined to pesticides and it is not our intention to discuss hazards arising from any other possible sources of cancer. We certainly agree that the public should be protected against exposure to any dangerous chemical, toxic emission or industrial waste.

The TV documentary, however, was seriously flawed. For instance, the overall rate for many kinds of cancer has been declining for the past 20 years. Lung cancer

Why the last paragraph then?

continues to become a more significant threat, yet most of the alleged carcinogens discussed in "The American Way of Cancer" have not been implicated as causative agents of that type of cancer. It would have been more enlightening to reveal that lung cancer has accounted for most of the increase.

In late 1975, Accuracy in Media, Inc. received a letter from the American Cancer Society confirming that there has probably been a leveling off, if not a decline, in cancer in the United States if we exclude lung cancer from the picture. Omission of lung cancer from our present discussion is justifiable inasmuch as about 80 percent of such cancers

are attributed to smoking by the American Cancer Society; items of diet are not considered a major factor in such cancer.

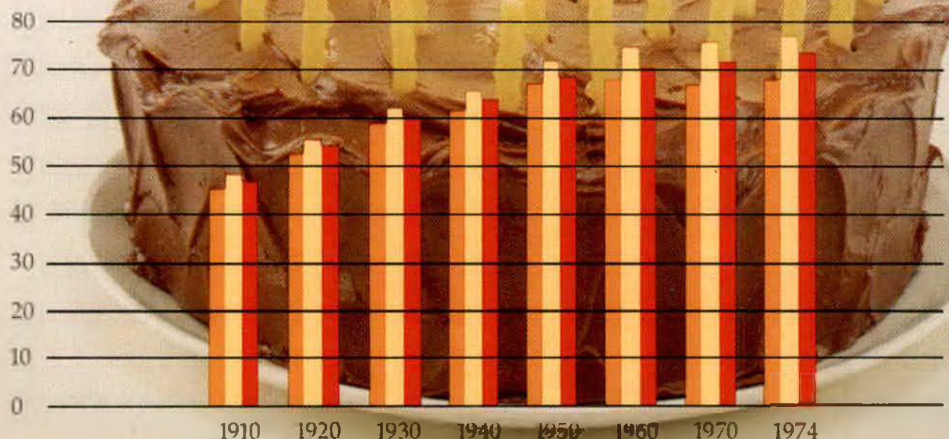
The use of pesticides has had its greatest increase within the past 25 years. During the same period, the life expectancy of Americans has increased.

In this older population we would naturally expect an increase in stomach cancer if the increased use of pesticides on crops were implicated. We might also expect a significant increase in female cancer, cancers of the esophagus, and cancers of the abdominal area and colon, yet the U.S. Government statistics show no such trend.

I fail to see any connection.

Years Of Life
Expected
At Birth

MALE
FEMALE
TOTAL



Based on Death Registration States 1900-1925, and United States 1930-1974, (1) Provisional.
Source: Division of Vital Statistics, National Center for Health Statistics, 1974 Data.

Of Mice And Men

An important function of the kidneys and liver is to detoxify and eliminate body wastes and foreign materials. These organs are primary defenses against the intrusion of toxic substances and, for this reason, among the first organs to show signs of fatigue when called upon to resist repeated stress from the ingestion, inhalation or skin absorption of poisons. In fact, when they are called upon to eliminate excessive quantities of any substance for extended periods of time, they eventually lose their capacity to resist oncogenic (tumor-producing) processes. Many chemicals can be shown to be carcinogenic, mutagenic or teratogenic (that is, they can cause cancer, hereditary changes or birth defects) in prolonged animal experiments. The actual effect depends in part on the species used for the tests and their life expectancy. Strains of mice and rats used in laboratory experiments are generally chosen for susceptibility to the condition under study, and appear to be more subject to the effects of many chemicals than we are. Being short-lived animals, with a life expectancy of about 2½ years, they can be exposed constantly in the laboratory to relatively large quantities of toxic materials most of their lives and into relatively old age, when their organs, particularly the kidneys and liver, are least resistant to such insult. Under such conditions, some substances normally considered harmless to people can act as carcinogens (cancer producers) or teratogens (producers of birth defects), possibly even such common foods as table salt.

In the hearings conducted in 1963 by Senator Abraham Ribicoff of Connecticut and a Senate subcommittee, Dr. Wayland J. Hayes, Jr., Chief of the Toxicology Section, Technology Branch, of the Communicable Disease Center in Atlanta, testified that one form of cancer, leukemia, has been produced in rats by use of a pure feed. In his own words: "We can synthetically produce leukemia in rats by a special purified diet, which we had wished to use for certain experimental reasons. The leukemia was transmissible from rat to rat...."

The appearance of tumors in rodents that are subjected to large amounts of irritants over a major part of their lives is not surprising. Naturally, such tests can indicate the possibility of producing cancer or birth defects in rodents under extreme conditions; they do not prove that the amounts of such chemicals encountered in the human environment will or can produce cancer or birth defects in people or in other animals.

An Exercise In Futility—Zero Tolerance

The *toxic threshold* may be defined as the dose level of a test material below which toxic effects are not observed. This is a useful concept. It has an important practical application when scientists are called upon to assess the risks involved in the use of chemical tools that are considered indispensable for protecting our forests, our water resources and our food and fiber supplies. This practical concept, which has been used in the discussion of teratogens by the World Health Organization and the U. S. Food and Drug Administration, has been seriously challenged by the opposing concept of *zero tolerance*, which was given legal status in 1958 by the "Delaney clause" of the U.S. Food and Drug Law.

The proof of zero risk is patently impossible, both logically and scientifically, and strict application of the principle would impoverish the store of chemical tools now used in the control of dangerous pests and in environmental improvement. As our discussion progresses, we shall have more to say about the practical limits of testing and the validity of the threshold concept.

It is no exaggeration to state that any substance may be toxic at some concentration or in some volume, and that laws requiring proof of absolute freedom from

toxicity are pointless. Chemists are now able to detect quantities of toxic materials so minute that their findings may be of little more than academic interest. One part per billion, for example, is equivalent to one minute in 1901 years and one part per trillion to about one minute in 1,901,000 years.

James G. Wilson, Children's Hospital Research Foundation and Department of Pediatrics and Anatomy of the University of Cincinnati College, states that all chemicals will produce birth defects when applied at a high enough rate at the proper stage of development, if they do not kill the mother.

The important message is this—if you eat and drink sensibly, quit smoking, avoid non-prescribed drugs, and exercise moderately, you will be doing just about everything the normal person can do to protect your health. Home-grown, tree- or vine-ripened fruits and vegetables, when available, usually look and taste better than those that are mass-produced, picked green, and shipped from distant sources, but there is no special virtue to foods grown without pesticides and with manure rather than with synthetic fertilizers: those offered by your own grocer are as safe as any in the world.

*dangerous
improvement?*



If zero risk were required in the products of all industries, every company manufacturing motor vehicles would be shut down immediately and permanently, all physicians and surgeons would inevitably be deprived of their tools, and most other tools, machinery and chemical agents would be banned.

Does this logically follow?



Accidental Poisonings Attributed To Pesticides.

The hazards involved in the use of pesticides are well recognized and documented. Like all tools, they must be handled properly to prevent injury to production workers and to farmers, foresters and other users. Pesticides, as commercial poisons, might be expected to represent a major source of injury. Assuming this to be the case, the U. S. Environmental Protection Agency (EPA) actually established a pesticide "hotline," with a toll-free number in Washington to receive reports of pesticide misuse or accidents. According to the EPA, "misuse of pesticides annually injures hundreds of thousands of farm workers and hundreds of these workers die."

What are the facts? First, what about the hundreds who allegedly die? According to statistics for the years 1971-73 published by the National Agricultural Chemicals Association, there were 13 fatalities from pesticides in 1971, 17 in 1972 and 10 in 1973. Of these, nine were from agricultural herbicides in 1971, five in 1972 and four in 1973.

Of course, not all poisonings result in death and not all are accidental. The following two tables prepared by the National Clearinghouse for Poison Control Centers show the incidence of poisonings from various causes.

According to the same source, children up to four years of age account for the greatest number of pesticide poisonings. In addition, most reports of ingestion of agricultural pesticides involve insecticides and rodenticides. Generally the hazard appears to be comparable to that of common household poisons. The greatest hazard is not to the user and not to the innocent bystander, but to children who should not be allowed access to the materials. To a large extent, the problem is to teach people to keep all poisons in their original containers in a safe place out of reach of children and to observe all label precautions. Most farm workers treat pesticides with respect, applying them as directed.

PRODUCT GROUP

Medicines

Cleaning & Polishing Agents

Petroleum Products

Cosmetics

Pesticides

Gases & Vapors

Plants

Turpentine, Paints, Etc.

Miscellaneous

Unknown

Total

PRODUCT GROUP

Medicines

Cleaning & Polishing Agents

Petroleum Products

Cosmetics

Pesticides

Gases & Vapors

Plants

Turpentine, Paints, Etc.

Miscellaneous

Unknown

Total

(1) Unknown intent; gesture; suicide intent.

TABLE 1—Poisonings—All Products By Year And Number Of Incidents

ACCIDENTAL			SELF POISONING (1)			OTHER (2)			TOTAL		
1971	1972	1973	1971	1972	1973	1971	1972	1973	1971	1972	1973
45,921	54,223	52,206	20,953	20,634	24,080	8,298	9,275	11,331	75,172	84,132	87,617
15,388	19,798	18,601	338	355	357	773	1,099	1,250	16,499	21,252	20,208
4,792	5,711	5,739	43	56	60	186	315	446	5,021	6,082	6,245
6,748	9,306	9,327	52	54	72	115	105	216	6,915	9,465	9,615
5,370	6,260	5,958	170	219	208	906	1,175	1,336	6,446	7,654	7,502
117	204	162	7	28	10	857	1,046	1,113	981	1,278	1,285
5,801	6,739	7,599	45	47	50	469	601	813	6,315	7,387	8,462
5,819	7,111	6,680	73	78	89	458	562	827	6,350	7,751	7,596
7,875	10,670	9,746	128	188	258	2,008	2,407	2,772	10,011	13,265	12,776
911	1,411	895	746	681	701	733	900	692	2,390	2,992	2,288
98,742	121,433	116,913	22,555	22,340	25,885	14,803	17,485	20,796	136,100	161,258	163,594

TABLE 2—Poisonings—All Products (Percent Of Annual Total Incidents)

ACCIDENTAL			SELF POISONING (1)			OTHER (2)			TOTAL		
1971	1972	1973	1971	1972	1973	1971	1972	1973	1971	1972	1973
46.5	44.8	44.7	92.9	92.3	93.0	56.1	53.3	54.6	55.1	52.3	53.5
15.6	16.5	15.9	1.5	1.7	1.5	5.2	6.2	5.9	12.2	13.3	12.4
4.9	4.7	4.9	0.1	0.3	0.2	1.3	1.8	2.2	3.7	3.8	3.8
6.8	7.8	8.0	0.2	0.2	0.3	0.8	0.6	1.0	5.2	6.0	5.9
5.4	5.2	5.1	0.8	1.0	0.8	6.0	6.7	6.4	4.7	4.7	4.6
0.1	0.1	0.1	<0.1	0.1	<0.1	5.8	6.0	5.4	0.7	0.8	0.8
5.9	6.4	6.5	0.2	0.2	0.1	3.2	3.4	3.9	4.6	4.6	5.2
5.9	5.5	5.7	0.3	0.3	0.3	3.1	3.1	4.0	4.6	4.8	4.6
8.0	8.3	8.3	0.6	0.8	1.0	13.5	13.8	13.3	7.5	8.2	7.8
0.9	0.7	0.8	3.4	3.1	2.8	5.0	5.1	3.3	1.7	1.5	1.4
100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

(2) Kick trips; inhalation; unknown; miscellaneous.

Source: National Clearinghouse for Poison Control Centers

The following table prepared by the Department of Health, Education and Welfare (HEW) gives the number of deaths by age due to accidental poisoning by pesticides, fertilizers and plant foods. The apparent discrepancies between the following data and those quoted earlier are to be attributed to the varying definitions of what constitutes a pesticide. As in the other charts, the category "pesticides" includes rodenticides.

AGE	1970	1971	1972	1973
Under 5	14	14	18	10
5 - 14	6	7	2	3
15 - 24	5	6	4	5
25 - 44	5	5	4	5
45 - 64	4	5	4	4
65 and over	10	6	6	5
Not Stated	—	—	—	—
Total	44	43	38	32

The number of deaths due to pesticide poisonings was relatively moderate even before the new generation of pesticides became available and arsenicals were still in common use. Carrying the data back to 1965, we find that the total at that time was 65. In 1946, it was 77. Thus there has been improvement, possibly due to better safety education.

It is to the credit of the EPA that the "hotline" was promptly discontinued and that the exaggerated report of deaths of farm workers was repudiated. The fact that the incident occurred, however, is an indication of how widespread the unreasoning fear of pesticides has become and how easily false information can affect the responses of government agencies.

The World Food Crisis

It is difficult for the average American to comprehend the magnitude of the world food crisis. Even in these times of high unemployment, poor Americans are far better fed than their counterparts in most of the world. The population of the United States accounts for no more than six percent of the world's human inhabitants, yet this relatively minor group controls roughly half the income and produces about 60 percent of the food supply.

According to *Food and Population: The Next Crisis*, by Douglas N. Ross, more than two billion people in the least industrialized regions of South Asia, Central Africa, and South America live at subsistence food levels, and "some beginnings of mass starvation are likely to appear before 1985 if there are any falterings in crop yields."

American agriculture, like that of other technologically advanced nations, has made great strides in productivity over the past 20 or 30 years. In the United States, millions of people have left the farm, yet those remaining have managed to raise enough food to nourish a rapidly growing population and export enormous quantities of wheat and other farm commodities to less productive areas.

The figure on page 17 clearly shows the enormous increase in

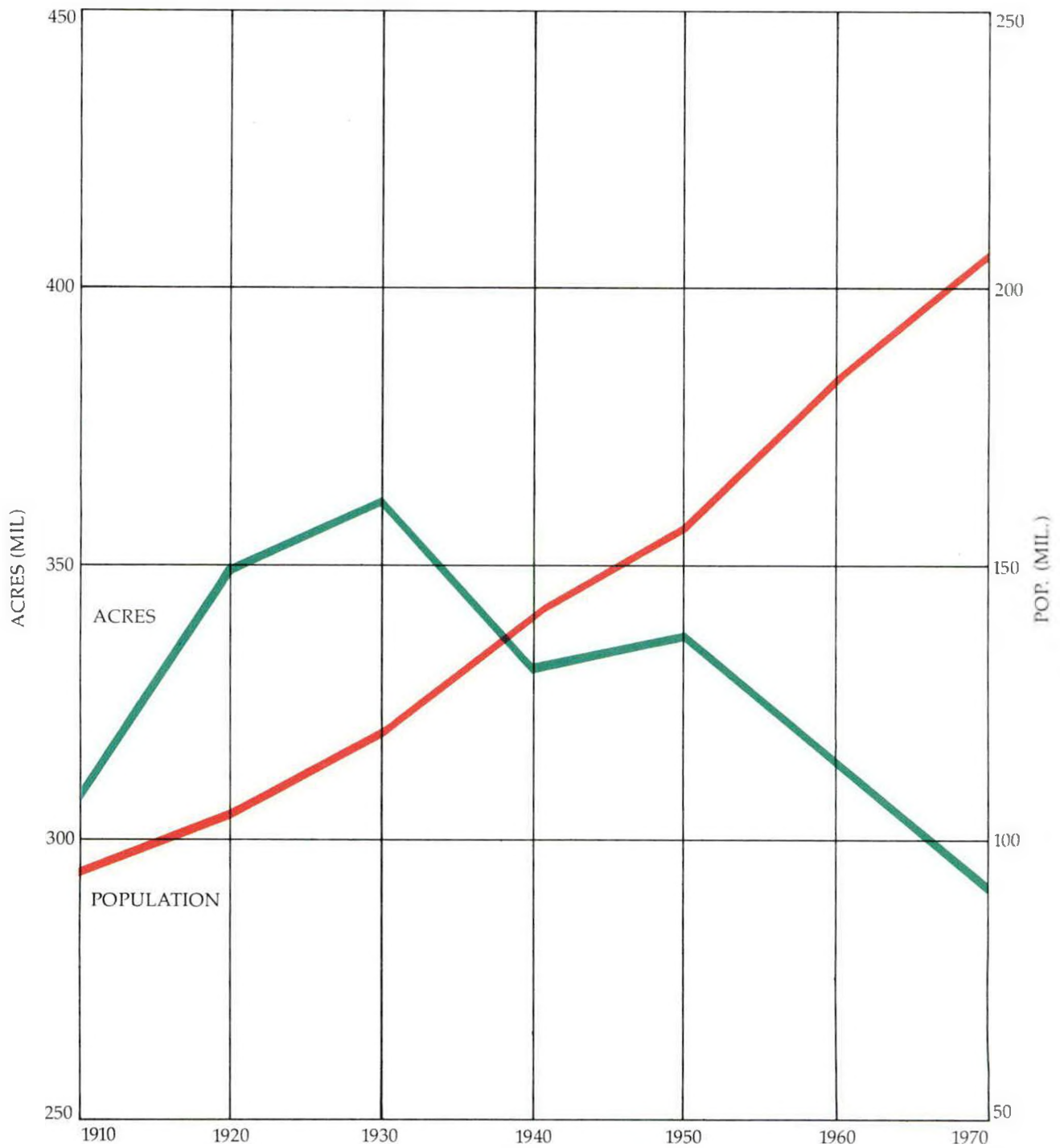
the American population since 1910, the increase in crop acreage between 1910 and 1930, and the subsequent significant decrease in crop acreage.

The figure on page 18 shows the dramatic increase in yields per acre of several crops since approximately 1940 after many decades of almost constant productivity.



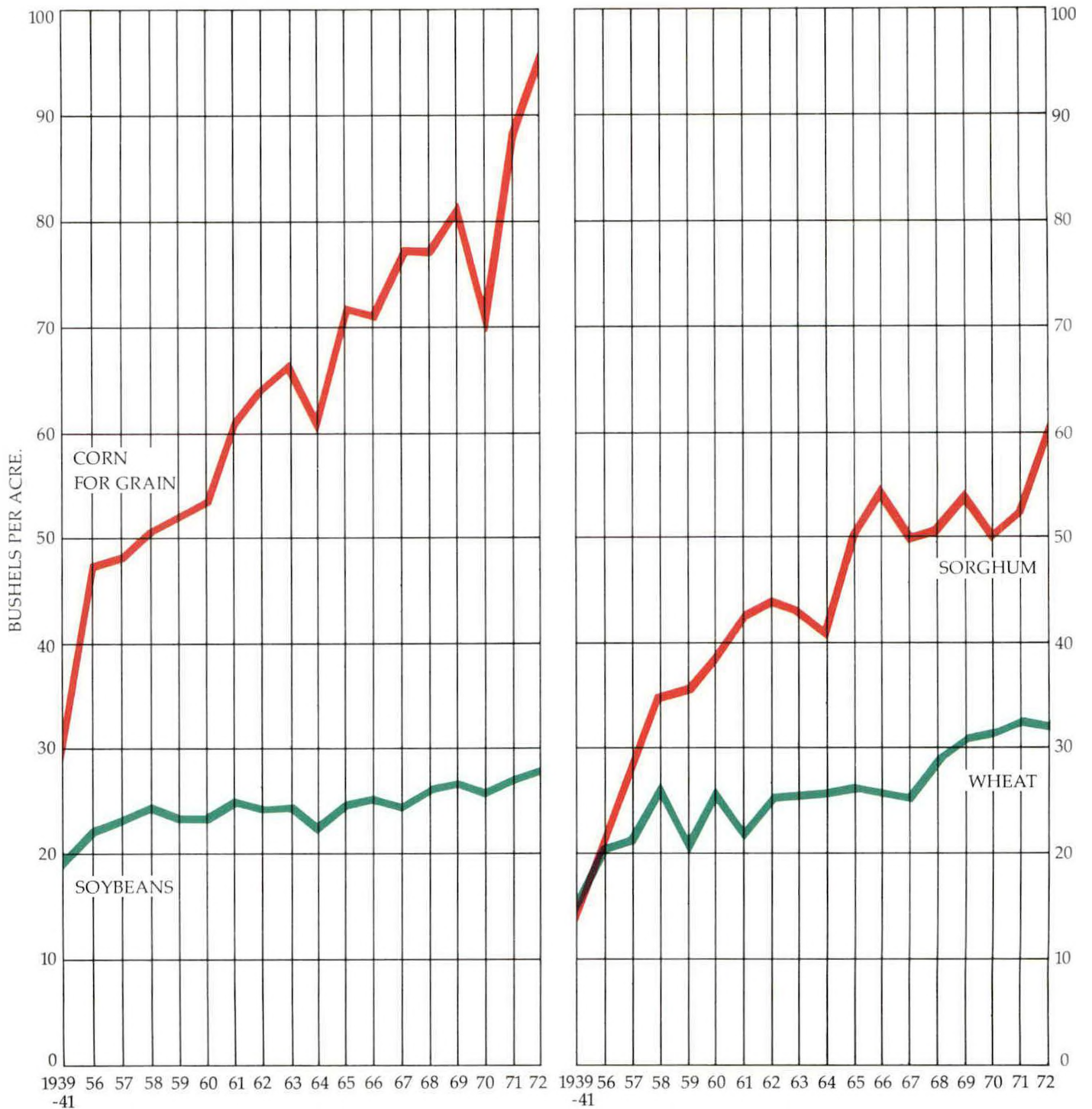
In Nairobi, during the third annual meeting of the United Nations Environmental Program, one of the delegates asked (perhaps rhetorically) whether pesticidal contamination through efforts to grow more food would be better or worse than malnutri-

Effect Of Increased Yields On Ratio Of Crop Acreage Harvested To Population: United States, 1910-70.



Source: *The Food In Your Future*, Keith C. Barrons, Van Nostrand Reinhold, 1975.

*Production Per Harvested Acre Of Select Crop By Year
In The United States (48 States)*



Source: U.S. Department of Agriculture. *Agricultural Statistics 1972*. United States Government Printing Office, 1972.

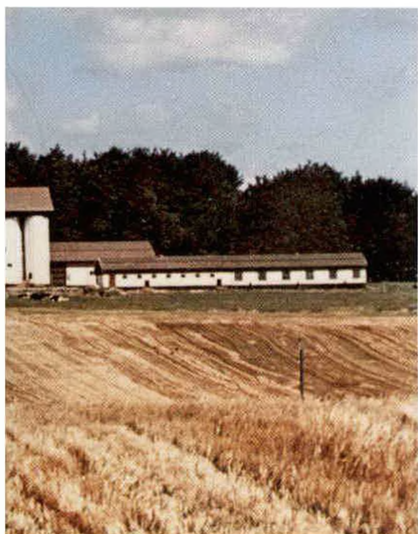
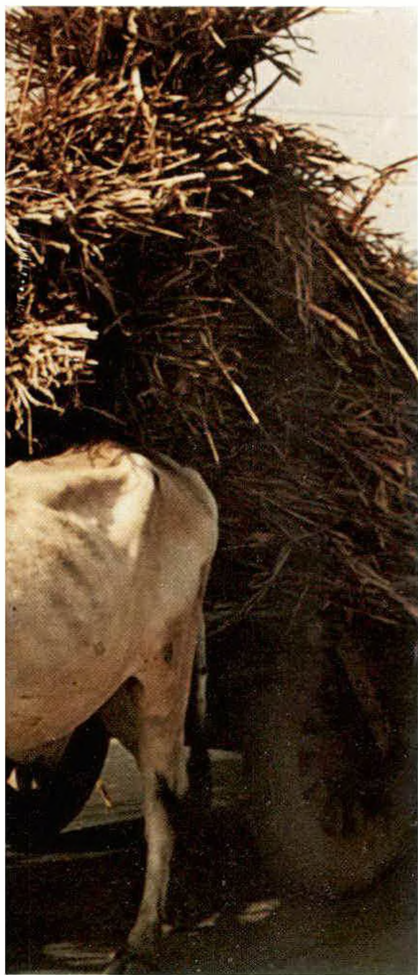
tion due to inadequate food. It is not certain whether his query was motivated by a wish to express traditional conservatism or by a genuine hunger for objective facts. His delegation was from India. Indira Gandhi, on the other hand, in the 1975 Book Of The Year of the *Encyclopaedia Britannica*, wrote: "The scarcity of pesticides may strike developing countries with even more severity than the fertilizer shortage."

Naturally the yield revolution in the United States cannot be attributed solely to the use of pesticides. Credit must also be given to better management practices, better fertilization, genetically improved crop varieties and increased mechanization. Pesticides, however, are essential to our continued success in increased food production, and probably account for about 20 percent of the increase since 1940.

An executive report to President Nixon in 1970 stated: "It is believed that one of the most economical and effective ways to further increase the food supply involves more intensive agriculture on lands already under cultivation. This course probably will necessitate greater use of agricultural chemicals. For example, it has been estimated that the world use of pesticides may need to increase from the 120 thousand metric tons used in 1966 to 700,000 metric tons to double food production."

Estimates based on current usage of phenoxies suggest that banning these herbicides alone might result in a loss of 290 mil-





lion dollars a year in farm production, even at 1970 prices. Labor requirements would possibly be increased by 20 million man-hours, and 5.7 million acres now in use for recreation or wildlife habitat might have to be put back into food production.

American farmers would certainly forego the sizeable outlay of funds for pesticides if they dared. They realize, however, that the output of their farms without pesticides would be reduced immediately by about 25 percent and the price of their products increased some 50 percent. It is estimated that American farmers spent nearly three billion dollars in 1974 for pesticides and their application—a tremendous sum, but a necessary expenditure.

In spite of an increase of some

42 percent in food prices in the United States between 1972 and 1975, the percentage of income spent on food has been estimated to be lower in 1975 than it was in 1930. Between 1960 and 1973, the percentage dropped from 20 percent to an estimated 16.4 percent.

Inflation has taken its toll during the past few years, but the overall record is a good one, made possible only by the efficiencies of modern agricultural methods. Increased materials costs due to overregulation and the depletion of the farmer's arsenal of agricultural tools, particularly pesticides, would certainly change that record drastically. Worse yet, the next food crisis could be our own. The question could well be: "Which 50 million Americans will suffer or die of malnutrition?"

Food Expenditures And Income Trends, 1960-73

YEAR	INDEX, 1960 = 100		Food Expenditures as Percentage of Income
	Disposable Personal Income	Food Expenditures ¹	
1960	100.0	100.0	20.0
1961	104.1	102.8	19.8
1962	110.1	106.1	19.3
1963	115.6	109.1	18.9
1964	125.2	114.9	18.4
1965	135.2	122.4	18.1
1966	146.2	131.2	18.0
1967	156.1	134.0	17.2
1968	168.8	142.3	16.9
1969	181.2	148.5	16.4
1970	197.6	159.9	16.2
1971	213.1	167.6	15.7
1972	227.7	178.3	15.7
1973 ²	251.1	205.0	16.4

¹ Excluding alcoholic beverages. Source: Handbook of Agricultural Charts.

² Estimated. Based on data of Department of Commerce.

The 2,4,5-T Rumble – What Is It All About?

Few herbicides have been as highly praised or thoroughly maligned as 2,4,5-T. The phenoxy herbicides, 2,4-D and 2,4,5-T, which have been widely used for some 25 years, are two of the most highly respected, trusted tools of the farmer and forester. Their use was never seriously challenged until the U. S. forces in Vietnam began defoliating the jungles with Agent Orange, a herbicidal mixture containing 2,4,5-T. Suddenly, in newspapers and magazines and on the air, the familiar farm chemical 2,4,5-T was being denounced as a war material, dangerous to man and beast—a destroyer of woodlands and a threat to humanity that probably caused abortions and birth defects, possibly even cancer.

For example, in September 1974, the Moscow correspondent of the Baltimore Sun, after interviewing a North Vietnamese doctor, wrote a scathing denunciation of the herbicide, which began: "While American authorities continue to debate whether the chemical herbicide 2,4,5-T is too deadly to use, hundreds of Vietnamese are developing liver cancer almost certainly as a result of the defoliant's widespread use in Indo-China for a decade." *Science* magazine reported that Vietnamese mothers were giving birth to monstrous babies and that many mothers had to be deliberately aborted of the "bundle-like" fetuses to avoid bleeding to death. Many newspapers have carried emotion-charged reports characterizing brush control with 2,4,5-T by the U. S. Forest Service as "biological warfare."

These charges against 2,4,5-T, and others too numerous to report here, have been given wide publicity. Less well-known are the results of investigations reported in 1975 by a task force created by the Council for Agricultural Science and Technology, a tax-exempt national organization composed of 15 scientific societies related to agriculture and forestry.

The report of this task force offered the following conclusions:

- ☐ *"The committee could find no conclusive evidence of association between exposure to herbicides and birth defects in humans.*
- ☐ *"Claims that the herbicides have rendered the soil permanently sterile; that is, unfit for any plant growth are not supported by chemical and biological studies of herbicide persistence in the soils of South Vietnam and are contrary to worldwide experience with the herbicides used.*

□ *"The safe and effective use of herbicides on agricultural forest and industrial lands in the United States has been amply demonstrated.*

□ *"The atypical military usage in South Vietnam has no relation to, and no bearing on, the peaceful uses of herbicides in the United States and throughout the world."*

The National Academy of Sciences, at the request of the Congress also conducted a study on the effect of herbicides in South Vietnam. The committee consisted of 17 scientists from six countries, representing a broad spectrum of disciplines. This committee found no damage to soils. There were herbicide traces in the soil, but not sufficient to retard plant growth. They estimated that cultivated areas on which crops had been destroyed could be replanted within one year. It was also concluded that the death of vegetation has not had lasting effects on plant nutrients within the ecosystem, with the possible exception of potassium. The NAS study group also found no evidence of soil hardening serious enough to render the areas barren. And, in their words, "The Committee could find no conclusive evidence of association between exposure to herbicides and birth defects in humans."

According to Dr. Boysie E. Day, Professor of Plant Physiology at the University of California, Berkeley, scientists are "in general agreement that 2,4,5-T is a plant killer, not an animal killer." According to Dr. Day, 2,4,5-T has less potential for causing birth defects than such everyday chemicals as aspirin, Vitamin A, Vitamin C, and common table salt. Speaking at the 27th annual California Weed Council, Dr. Day stated, "After five years of agonizing over 2,4,5-T, the EPA has withdrawn all proceedings against this compound. The EPA is right about this. They have seen the scientific evidence for this move, but they are taking terrific abuse from uninformed people."

According to Dr. R. G. Harvey, University of Wisconsin agronomist, there is an 8000-fold safety factor in normal use of 2,4,5-T over the amount necessary to cause embryonic effects in rats. If a 130-lb woman ate 3.3 lbs of food every day that contained 0.2 parts per million of 2,4,5-T, her total consumption would be 0.3 mg/day, which is more than 8000 times less than the levels shown to cause birth defects in six animal species, including rats, mice, sheep and monkeys. The average woman is not likely to encounter the herbicide in her diet in any amount, even occasionally. And if by some rare chance she came into contact with traces of 2,4,5-T, it is unlikely that they would amount to as much as 0.2 parts per million. A survey of food samples collected over a period of 13 years showed only three samples that contained any traces of the herbicide. In those three, the levels were 0.001, 0.008 and 0.19 parts per million. The 8000-fold safety factor is obviously conservative. Referring to silvex or 2,4,5-

TP, a relative of 2,4,5-T also containing dioxin, Dr. Harvey stated that the 130-lb woman would have to drink 48,000 gallons a day of the material as applied to get the minimal effect.

Actually 2,4,5-T itself is not a particularly hazardous herbicide. The great controversy rages over the presence of minute traces of a very toxic chemical, 2,3,7,8-tetrachlorodibenzo-p-dioxin, better known as TCDD, or simply dioxin, an impurity formed in the process of manufacturing the herbicide. The average amount of dioxin in Agent Orange, as used by the U. S. Air Force, was approximately 1.91 parts per million on a weight basis. By contrast, the dioxin content of the farm herbicide currently used is much lower. A 1975 survey of ten lots of a commercial formulation containing 2,4,5-T showed dioxin contents in 9 samples ranging from 0.01 to 0.02 parts per million. The content of the tenth was 0.04 parts per million. We have noted that Agent Orange, which was literally dumped on Vietnam, has not been implicated in any observed cases of cancer or birth defects by the scientific task force investigating its use. Unlike the Air Force chemical, the farm herbicide, 2,4,5-T, is used carefully in limited controlled quantities and in accordance with EPA-approved label instructions.

According to Dr. Philip C. Kearney, Laboratory Chief, Pesticide Degradation Laboratory, Agricultural Environmental Quality Institute at Beltsville, Maryland, whose laboratory received the USDA Superior Service Award in 1974 for dioxin research, science knows the following about dioxin in the environment:

- ☐ "TCDD does not leach vertically in soils."
- ☐ "Significant amounts of TCDD are not taken up by plants and none could be found in harvested grain or soybeans."
- ☐ "TCDD disappears slowly from soils and about half is lost after 1 year. It is less persistent than most chlorinated hydrocarbon insecticides, but more persistent than 2,4,5-T."
- ☐ "TCDD is not translocated from the point of application on the leaf surface to other parts of the plant. Some of it is washed off with rainwater."
- ☐ "TCDD destruction may be caused by sunlight in water, but not on soil surfaces."
- ☐ "TCDD is not made from the breakdown products of 2,4,5-T in soils or in sunlight."
- ☐ "Large amounts of TCDD fed in animals' diet can be eliminated in the urine and feces, although there are some residues in the liver."
- ☐ "TCDD was accumulated from water by fish in laboratory studies. Recent field monitoring data suggests this may not be a problem."

Stated briefly, TCDD (dioxin) is not likely to accumulate in the soil. Moreover, the herbicide, 2,4,5-T, does not create further quantities of dioxin as it decomposes. Most scientists believe (and Dr. Kearney is apparently one of that number) that 2,4,5-T can be used safely with dioxin contents as high as 0.1 part per million, a much higher rate than that found in commercial formulations as they are currently applied.



False Rumors Never Die – They Don't Even Fade Away

Despite the weight of evidence to the contrary, the shrillest opponents of 2,4,5-T still claim that it was developed as a weapon of war, that its impurities are building up in the environment and slowly poisoning the population, that it provokes cancer and birth defects, that it is little used by farmers, and that its social values are slight compared to its hazards. These charges are heard again and again at hearings, principally in the testimony of laymen. The attackers choose to ignore the herbicide's extensive use in agriculture and forestry for more than a quarter of a century; they misquote government reports to alarm the public about the increase in cancer, failing to acknowledge that the major increase is in lung cancer and that rural dwellers are generally less subject to cancer than city dwellers are. They also spread unfounded allegations of human poisonings and birth defects which, without evidence, they attribute to the use of 2,4,5-T. New horror stories appear from time to time, make the rounds of the newspapers and some magazines, achieve wide publicity and leave poisonous residues that build up and persist in the public's mind long after belated publication of the retractions and corrections.

For example, in late 1974, spectacular news stories appeared in many papers denouncing the herbicide 2,4,5-T as the source of dioxin which was implicated in human poisonings and in the deaths of 63 horses, 12 cats, 5 dogs, and hundreds of wild birds in eastern Missouri. Bold, strident headlines denounced the herbicide, and the most spectacular of the reports rehearsed many of the familiar but unjustified charges against 2,4,5-T. But it was eventually discovered, long after these inflammatory accusations had made their rounds, that the dioxin in question had been released in relatively high concentrations, not from the use of a herbicide, but as a contaminant in waste oil that had been spread on three horse arenas and one road in 1971 to control dust. Nor were herbicides even the original source of the poison: it had been created as an impurity in the production of hexachlorophene, a chemical formerly used as an antibacterial cleanser.

But one of the most damaging reports arose in 1975 from the premature publication of inaccurate test results by the EPA itself, although in the past that agency consistently resisted efforts by opponents of 2,4,5-T to ban the herbicide. This unfortunate announcement was prompted by a letter from 21 congressmen to the

EPA Administrator urging that use of 2,4,5-T be suspended or that hearings be resumed. In the words of the congressional group, "the risk to public health from the use of 2,4,5-T on rice is unequivocally greater than any social value derived from such use." The reference to rice is surprising, since water and fish from a reservoir in Arkansas, in which irrigation water is collected from rice fields protected for 20 years with 2,4,5-T, have been tested by use of the most refined and sensitive equipment currently available and found to contain no traces of dioxin, even though the average detection limit is below 10 parts per trillion.

The EPA responded to the congressmen by reporting incomplete results of residue tests on beef fat samples from cattle grazed on rangeland that had been treated with 2,4,5-T. The EPA noted that 34 of 100 beef fat samples had been analyzed and that about one-half of the 34 showed positive dioxin residues. In a memorandum to the Deputy Assistant Administrator for Pesticide Programs, the agency wrote that the dioxin residues in about one-half of the 34 samples "may be above the normal margin of safe dietary exposure." The memo further explained that "studies including teratogenic and other toxicity effects indicate" that these levels "may present a health hazard to man based on the application of normal margins of safety."

This message was promptly picked up and reported throughout the country: "EPA has found unsafe levels of TCDD in half of beef fat samples derived from cattle grazed on rangeland previously treated with the herbicide 2,4,5-T." Opponents of the pesticide naturally enlarged upon this damaging statement.

The truth is that the material was not properly identified, since the equipment used in these preliminary analyses was limited in its ability to discriminate among the various components being studied. In chemical analysis, such indefinite readings are commonly referred to as "noise" or "background." Subsequent studies using the technique of high-resolution mass spectrometry have disproved these erroneous allegations. At the present writing, 90 percent of the samples have been thoroughly studied without any finding of dioxin content. EPA scientists agree. The remaining ten percent cannot be proven to have a dioxin content. But, when all the facts are in, it will be difficult to undo the damage created by the erroneous reports.

Another false report was put into circulation in February and March 1976 in testimony before the Committee on Environment and Natural Resources of the Minnesota House of Representatives by supporters of a bill to ban the use of 2,4,5-T in that state, who stated that the herbicide is already banned in British Columbia. This statement has been contradicted by Dr. Alexander B. Morrison, Director of Health Protection in Canada. Dr. Morrison, who de-

scribed the hazard from 2,4,5-T as unbelievably low, stated that the production and sale of 2,4,5-T in Canada is permissible with a maximum dioxin content of 0.1 part per million, the same limit that is in effect in the United States.

"I believe," he said, "that there is not the slightest evidence that the dioxin content of 2,4,5-T preparations available for sale in this country has caused the slightest bit of harm. There's just not any evidence of that at all.

"If we were to go back and accept discredited American work, which we're not prepared to do, but if we did that and took the level of 20 parts per trillion in animal fat, as the Americans thought they had, we would find that in order to achieve a teratogenic dose you would have to eat a thousand pounds of fat a day.

"Now that represents in turn about 10 steers. So, if you can eat 10 steers a day you might get enough dioxin to give you a teratogenic dose. You'll die long before the teratogen gets to you if you try and eat 5,000 pounds of beef a day."

Enough said about 2,4,5-T. The story of this one herbicide has been given in some detail because it is under severe attack now. Loss of such herbicides to the farmer and the forester through misunderstanding of their value and their hazards, would be a great loss to the public.

Saving The Environment – Science Holds The Key

"We are today witnessing the inevitable impact of the tidal wave created by the scientific revolution more than a century old. It is simply too late to declare a moratorium on the progress of science.

"The real question is not whether we should use our new knowledge, but how to use it."

Barry Commoner,
Science In Survival

→ *Herbicides Help Reduce Erosion, Conserve Water, And Improve Wildlife Habitat* *Save the world with a spray can!*

Bulldozing and earthmoving can contribute to erosion. Brush that crowds in and takes over the open spaces is of little value since it has limited ability to anchor the soil; in fact, many species, such as mesquite, are almost as efficient as blotters in robbing the soil of moisture and nutrients. The best protection against erosion is a good thatch of grass, which can be established without difficulty when selective herbicides are used properly for brush control. In the southwest, vast areas have been returned to native grasses "as high as a horse's belly," where mesquite and other undesirable brush, seeded long ago in the manure of cattle and droppings of birds, or sprouted from fence posts, had formerly grown unwanted but unchecked. In the region between the Rocky Mountains and the Sierras, similar results have been obtained by eliminating sage and chaparral. In both areas the result has been to return the land to its original condition after long years of misuse.

In West Texas, a 20-mile-long stream, Rocky Creek, which had dried up early in the 1930's was recently restored to life by cutting brush and spraying 2,4,5-T herbicide. This is not surprising. People in various countries who are concerned with water conservation and water-

shed management have long appreciated the importance of chemical brush control in programs to increase available surface and ground waters.

Why is a large pine forest so quiet? Possibly because its carpet of needles and the overtopping shade provide too sterile an environment for many animals. Enlightened wildlife management people provide clearings in both pine and hardwood forests, where deer, rabbits and other animals can find browse. The least disruptive way to accomplish this is to use herbicides. Such clearings have been created successfully in northern Wisconsin, for example, by Department of Natural Resources crews using TORDON® brush killer.

Firebreaks must be maintained to control forest fires, and right-of-way areas must be kept cleared. Long experience has shown that chemical control of vegetation in right-of-way corridors and firebreaks is the most effective way to prevent regrowth. Chemical control also reduces the need for repeated mechanical disturbance of the soil: the result is far less erosion. By selective spraying, leaving low desirable shrubs such as rhododendron and berry bushes, right-of-way areas have been made attractive to deer and other wildlife.

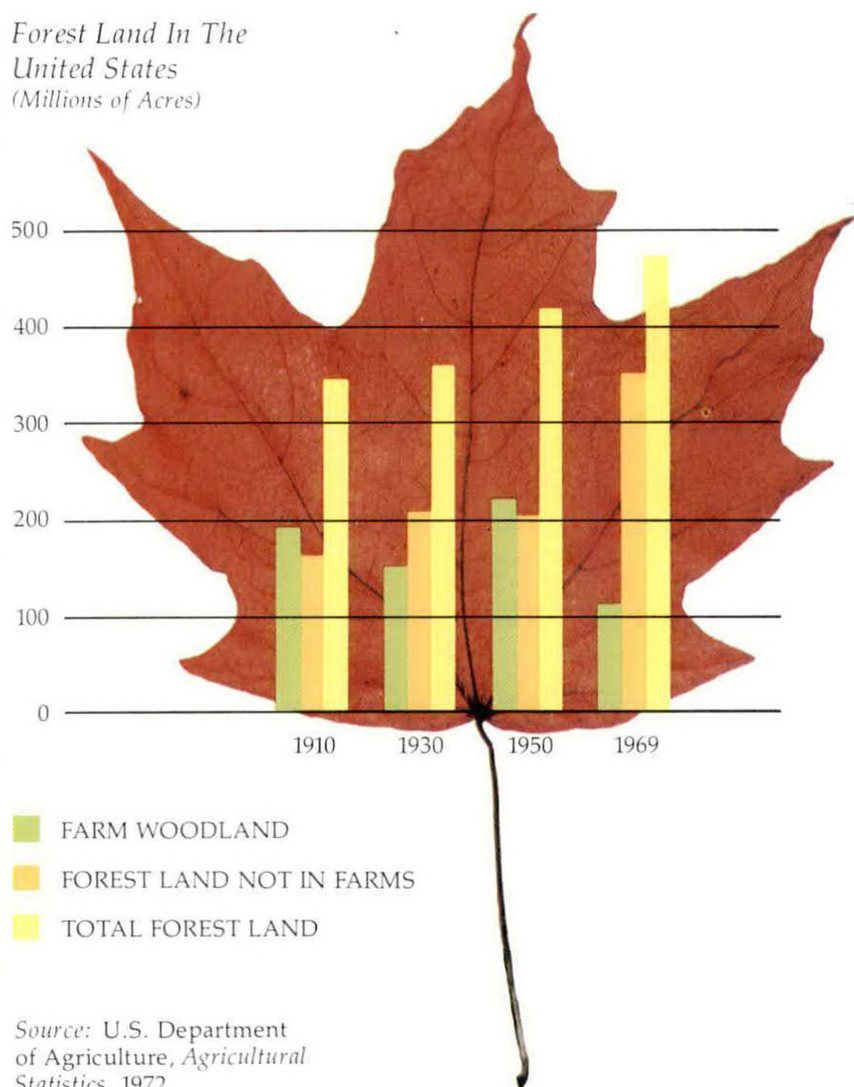


In Pennsylvania, a 15-year study on a utility right-of-way showed that the sprayed area was taken over by original ground cover plants such as bracken, sedges, herbs and blueberry. These studies, which were reported in 1967 in the Purdue University Agricultural Experiment Station Research Bulletin, also indicated that rabbits, grouse and wild turkeys actually preferred the sprayed corridor to the adjacent woods.

Summarizing five-year findings on stump control in which fenuron and 2,4,5-T were used following timber clearcutting, Dr. Robert Shipman of Pennsylvania State University reported that no harmful effects had been observed on non-target organisms such as insects, wildlife and man. The treatment improved tree reproduction and increased the availability of browse for deer. According to *Lancaster Farming*, January 25, 1975, "Soil organic matter, nitrogen, calcium and phosphorus increased during the five-year period. The findings indicated that nutrients are recycled rapidly in cutover mixed oak-hickory stands. Concern over deterioration of the forest ecosystem from a nutrient-loss standpoint was minimal under these soil and site conditions."

Properly used in forestry, herbicides can help restore America's natural resources. The increased food production resulting from their use on farms also permits reforestation of land that otherwise would be cultivated for food production in a hungry world.

*Forest Land In The
United States
(Millions of Acres)*



Source: U.S. Department of Agriculture, *Agricultural Statistics*, 1972.

Regulation And The Danger Of Overregulation

"Knowledge will forever govern ignorance, and a people that mean to be their own governors must arm themselves with the power that knowledge brings."

James Madison

It would appear obvious from the evidence just presented that insecticides and herbicides, properly used, are not among the most hazardous elements of our environment. Medicines, motor cars, machinery of every description, all present greater threats to our lives and well-being. This is not due to any virtue of the pesticides themselves, but rather to the care used in their production, distribution and use.

Environmental awareness in the 1960's produced a spate of new laws along with agencies committed to their enforcement. On the whole, the laws and agencies, including the Environmental Protection Agency, can serve the public well. It is doubtful whether further complications and red tape will improve performance. On the other hand, it can be demonstrated that revisions and restrictions requiring further expenditures of time and money would not only discourage the development of new, sorely needed products, but would increase the ultimate cost of pesticides to the farmer, forester and homeowner, and the prices of foods and other commodities in the marketplace.

A Brief History Of Regulation

Pesticides have been under government regulation since 1910, following enactment of the Federal Insecticide Act, which was administered by the United States Department of Agriculture (USDA). With the revised Federal Food, Drug and Cosmetic Act of 1938, accountability was shifted to the Food and Drug Administration, and that agency was made responsible for testing materials to prove them "poisonous or deleterious" to the satisfaction of the court when action was desired to remove them from the market. The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), enacted in 1947, extended the scope of the 1910 act to include rodenticides and herbicides. Premarketing registration was required for products to be shipped interstate, and a system of label claims and registration was established. The act was enforced by the USDA. In 1954, The Pesticide Chemicals Amendment to the Federal Food, Drug and Cosmetic Act provided for a system of fees to support the procedures involved and established better procedures for obtaining tolerances to be used in determining possible exemptions for pesticides. It was administered by the Department of Health, Education and Welfare (HEW). The Food Additive Amendment of 1958 expressly excluded pesticidal chemicals, pesticidal residues on crops and in processed foods when such residues had resulted from legal uses of pesticides on crops. This amendment included the "Delaney clause" on carcinogens, which stated that no additive shall be deemed safe if it is found to induce cancer when ingested by man or animals. The Federal Environmental Pesticide Control Act of 1972 significantly amended the FIFRA of 1947. It is administered by the EPA. This act does the following:

- ☐ *Requires all U.S. pesticides to be registered or approved by the Federal Government;*
- ☐ *Classifies pesticides for general or restricted use—those that are restricted to be applied only by or under the supervision of certified applicators due to hazard to the individual or to the environment;*
- ☐ *Establishes state applicator certification programs (in which farmers may be certified as private applicators) and cooperative enforcement programs;*

→ ☐ *Prohibits the misuse of pesticides (any use inconsistent with the label is a crime whether or not personal or crop injury results or residue exceeding the tolerance is found at harvest), adds civil to increased criminal penalties, and otherwise strengthens enforcement;*

☐ *Shortens administrative review procedures;*

☐ *Requires pesticide-producing establishments to be registered and to submit information regularly on production and sales volume;*

☐ *Authorizes indemnification of certain owners of pesticides that are suspended, then cancelled; and*

☐ *Authorizes the EPA Administrator to establish pesticide packaging standards, regulate pesticide and container disposal, issue experimental use permits, conduct research on pesticides and alternatives and monitor pesticide use and presence in the environment.*

It is obvious that the pesticide producers and users are already operating under regulations which can serve and have served to minimize the hazards of pesticide products. The requirements for testing and providing data for registration, re-registration and application of these products are stringent and costly. We feel that the pesticide industry and the public are both amply protected. The low number of poisonings attributed to these products and the overall good health enjoyed by farmers and rural dwellers testifies to the success of the current measures.

As we have seen, despite frightening headlines and impassioned oratory against the use of herbicides and insecticides, Americans can eat freely of the bounty of their land without fear of being poisoned. They are already witnessing a slow but positive cleansing of the air and water. But not all the credit belongs to the enforcers. The producers of agricultural chemicals can boast of a long, but unpublicized history of concern for the consumers of their products. In fact, the most refined techniques of purification and testing were developed by industry, and industrial laboratories still perform most of the elaborate tests required to ensure the purity and safety of their products, often performing investigations for the United States Government, under contract.

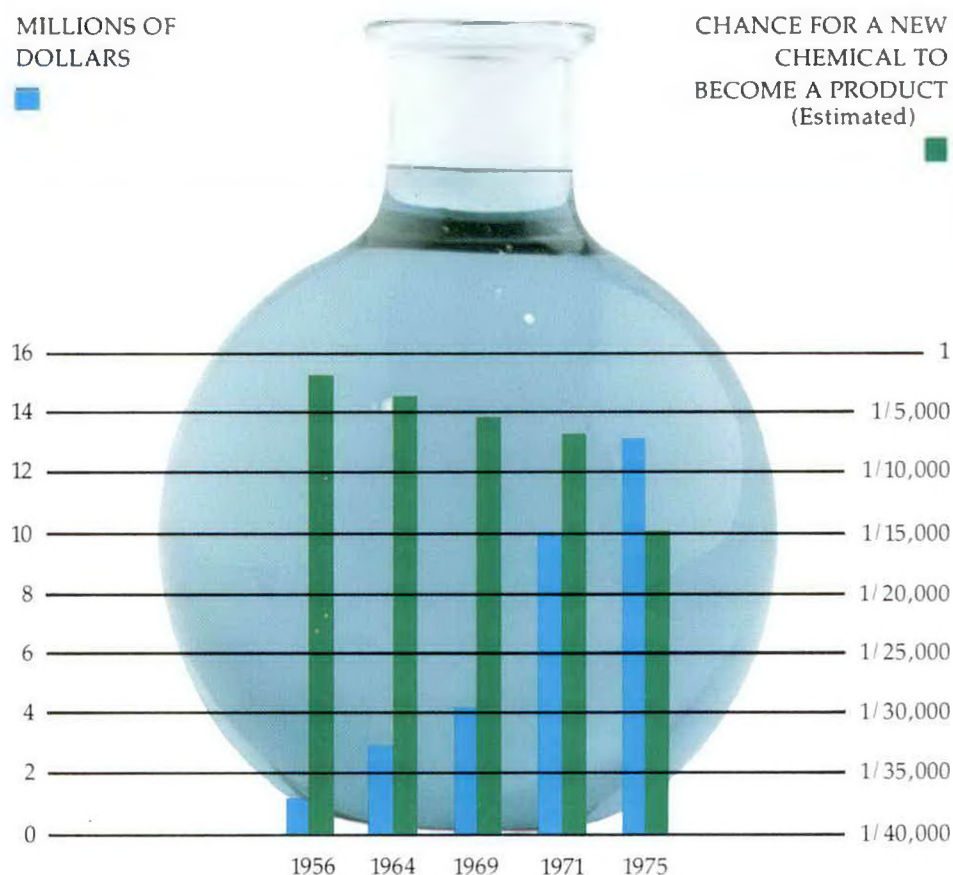
It should be kept in mind that all uses of pesticides and all methods of pesticide application that are now permitted in this country are registered with the U.S. Environmental Protection Agency. Any practice resulting in high residues or hazards to public health could result in withdrawal of the registration.

The Cost Of Developing Pesticides

Making a new agricultural chemical available is a costly, time-consuming process. After a new product is discovered, it is usually not ready for market for at least eight or ten years. The costs are enormous. Inflation has contrib-

uted greatly to the increase, but growing registration costs are also an important factor. Part of these costs result from the larger staff required for the increased registration activities. At The Dow Chemical Company, for instance,

Estimated Cost Of Developing An Agricultural Chemical



Source: Proceedings of the 30th North Central Weed Control Conference, Milwaukee, December 1975. From a paper presented by Dr. Wendell Mullison.

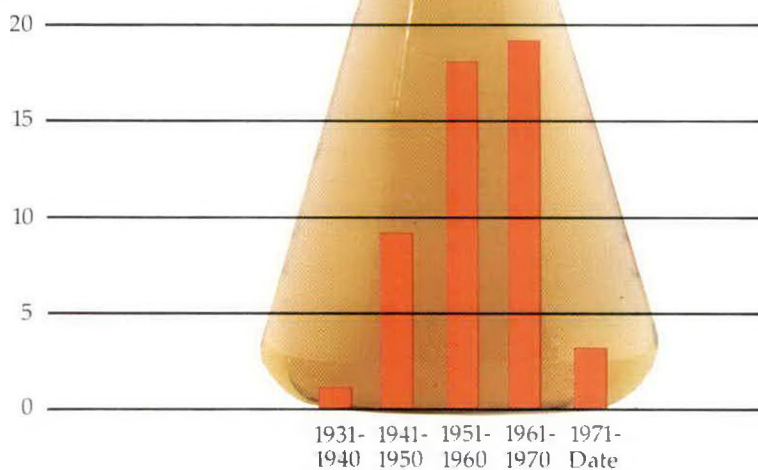
there was nobody engaged full-time in registration work in 1956. Today, Dow has 18 full-time professional and support people working on registration procedures, aided by personnel from other departments.

The increased cost, partly owing to increasing stringency of tests, has had an adverse effect on the number of major pesticides introduced within the past few years. Actually many unnecessary regulations are proposed by members of the legal staff of the agency, people who have only a minimal practical knowledge of agriculture. As a result, scientists are often unable to comply fully with the requirements. In such instances, industry must operate under doubtful rules which have the force of law but go far beyond the intent of the lawmakers. The next table indicates what has been happening to new developments since 1970, compared to similar activities in the years between 1941 and 1970.

The following table shows how our research dollars are being spent as a result of increased registration requirements:

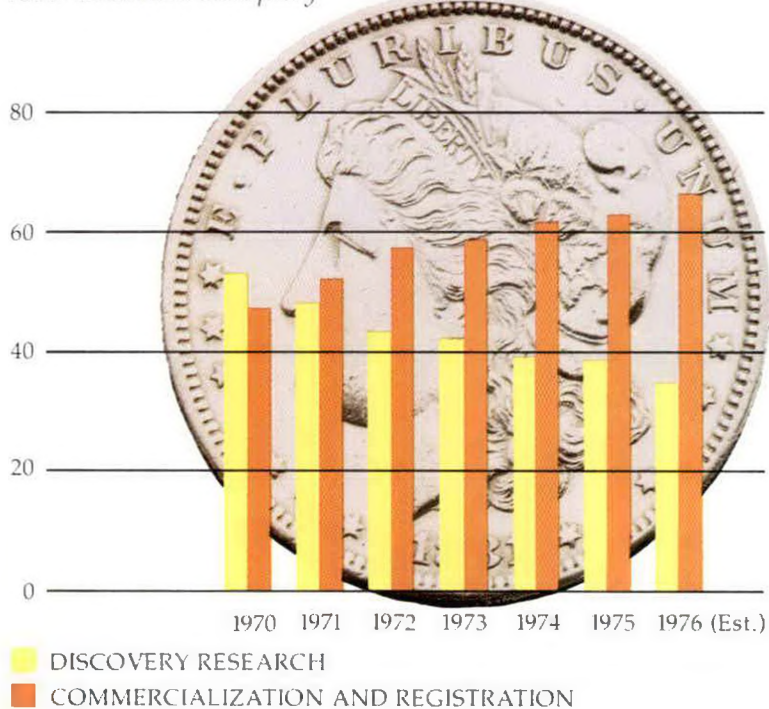
The present law has been costly, but it has provided a wide margin of safety to the public. New regulations, however, and excessively expansionist interpretations of existing legislation, would increase the bureaucracy almost beyond comprehension, drastically increasing the cost of producing pesticides and the ultimate cost to the consumer. These would grant broad discretionary banning powers to

Number Of Major Pesticides Introduced In The U.S.A. From 1931 To Date



Source: Proceedings of the 30th North Central Weed Control Conference, Milwaukee, Wisconsin, December 1975. From a paper presented by Dr. Wendell Mullison.

Recent Trend In Percentage Of Research Dollars For Discovering And Developing Pesticides At The Dow Chemical Company



Compiled by Dr. C. A. I. Goring, The Dow Chemical Company.

*Average Time Necessary For Dow To Obtain Pesticide Registration
Or Tolerances In The United States, 1970-1975*

TYPE OF REGULATORY ACTION	NUMBER OF APPLICATIONS	TIME IN WEEKS
Minor label or formulation change	175	18
New relatively minor use	61	51
Obtaining tolerances and registration of a new product or a major new use	40	131

Compiled by Dr. C. A. I. Goring, The Dow Chemical Company.

the EPA Administrator and establish banning as the primary policy for eliminating potential hazards, a measure that ought to be employed only when there is proof of imminent hazard to man or his environment. The Administrator could also restrict usage and establish production quotas, and he could arbitrarily force any pesticide producer to carry out prescribed testing to prove zero risk, an exercise we have already characterized as futile. Innovation would be further stifled at a time when we need every possible useful tool for feeding a crowded hungry world.

If the risk-benefit concept as originally proposed by the Congress were adhered to, the American people would be more than adequately assured of safety and abundance. The intent of legislation currently in force is good, and

Congress is to be lauded for the enactment of needed pesticide legislation. However, the EPA has progressively expanded its authority. In fact, that agency has created for itself a combined legislative-judicial structure, and its actions go far beyond the authority Congress had proposed for it. Knowledge of this situation should be made more readily available. If such knowledge can be provided to enough of the American taxpayers, we are confident that they will reject further complications of the already costly pesticide regulations and will make their opinions known to Congress. At stake are the present fairly reasonable costs of food and the assurance that the food supply will continue to be adequately produced and protected by the development of technological improvements.

A Time For Activists

*"This land is ours to enjoy, ours to preserve, ours
to transmit."*

Abraham Lincoln

Recent efforts to preserve or restore the American environment have begun to yield visible results. We all want clean air, clean water, and uncluttered wholesome surroundings. We also want to preserve our land's natural beauty for our own enjoyment and that of the generations to come.

This is not the time to sit back and congratulate ourselves on our successes; we still must look for ways to conserve and increase our supplies of food and energy to keep pace with the growing demand, but we must learn to proceed carefully and deliberately so as to avoid the mistakes of the past and to preserve the delicate balance of our ecosystems. We need all our knowledge, all the resources of science, to avoid a conflict between these goals. And, it is not enough simply to preserve the balance of nature; the balance has to be tilted ever so gently in our favor if we plan to survive. We must remember that man has always been and will continue to be an integral part of nature.

Land conservation and preservation of wildlife habitat are usually not taken seriously in nonindustrial areas of the world, where the pressures of starvation often overshadow most other problems. But the most urgent need for land conservation is here in this most industrialized of all countries, where new highways constantly nibble away at available farm and forest lands, where housing developments are expanding in all directions, and where opulent vacationers flock by the millions to lakes, parks, and wilderness areas. We Americans must continue to protect our wildlife heritage for the sake of our children — constantly strive to increase and improve habitat for wild animals and birds. In many states, the populations of deer, game birds, and fish have increased dramatically — in most cases as a result of deliberate manipulation of the environment. This situation could be reversed if our agricultural efficiency were reduced and we were forced to return the new forests to food production.





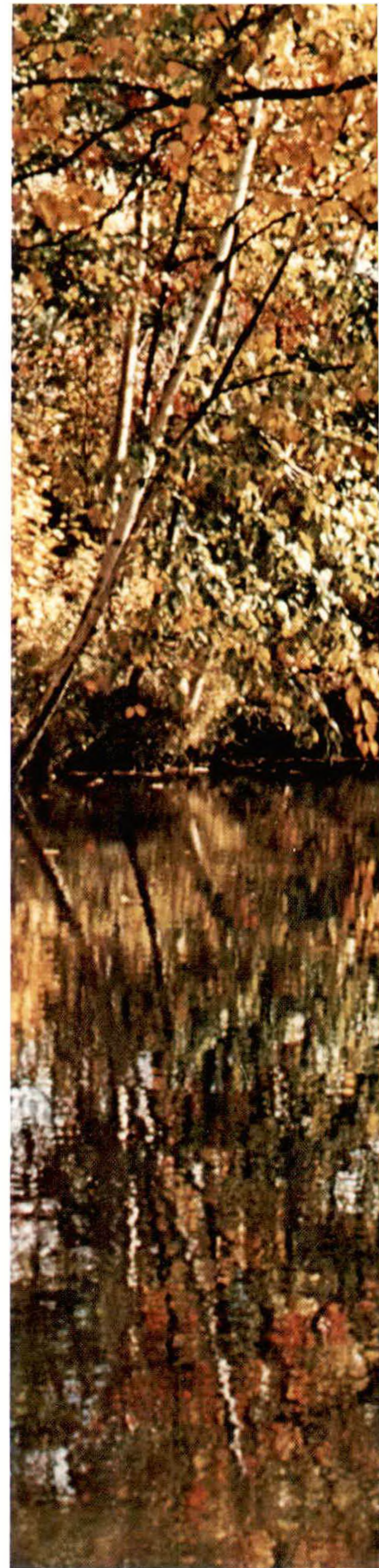
There are encouraging signs. For example, in a recent issue of *National Wildlife*, Paul R. Ehrlich, Professor of Biology, Stanford University, stated that population growth in the United States can possibly be brought to a halt within 50 years if we can hold the net reproductive rate about where it is and hold down immigration. If Professor Ehrlich's goal is achieved, our problem will be less acute, but before we reach equilibrium we may have to feed 40 or 50 million more people. To do that, the farmer will need every refinement in improved cultural practices and tools — including an adequate array of effective pesticides.

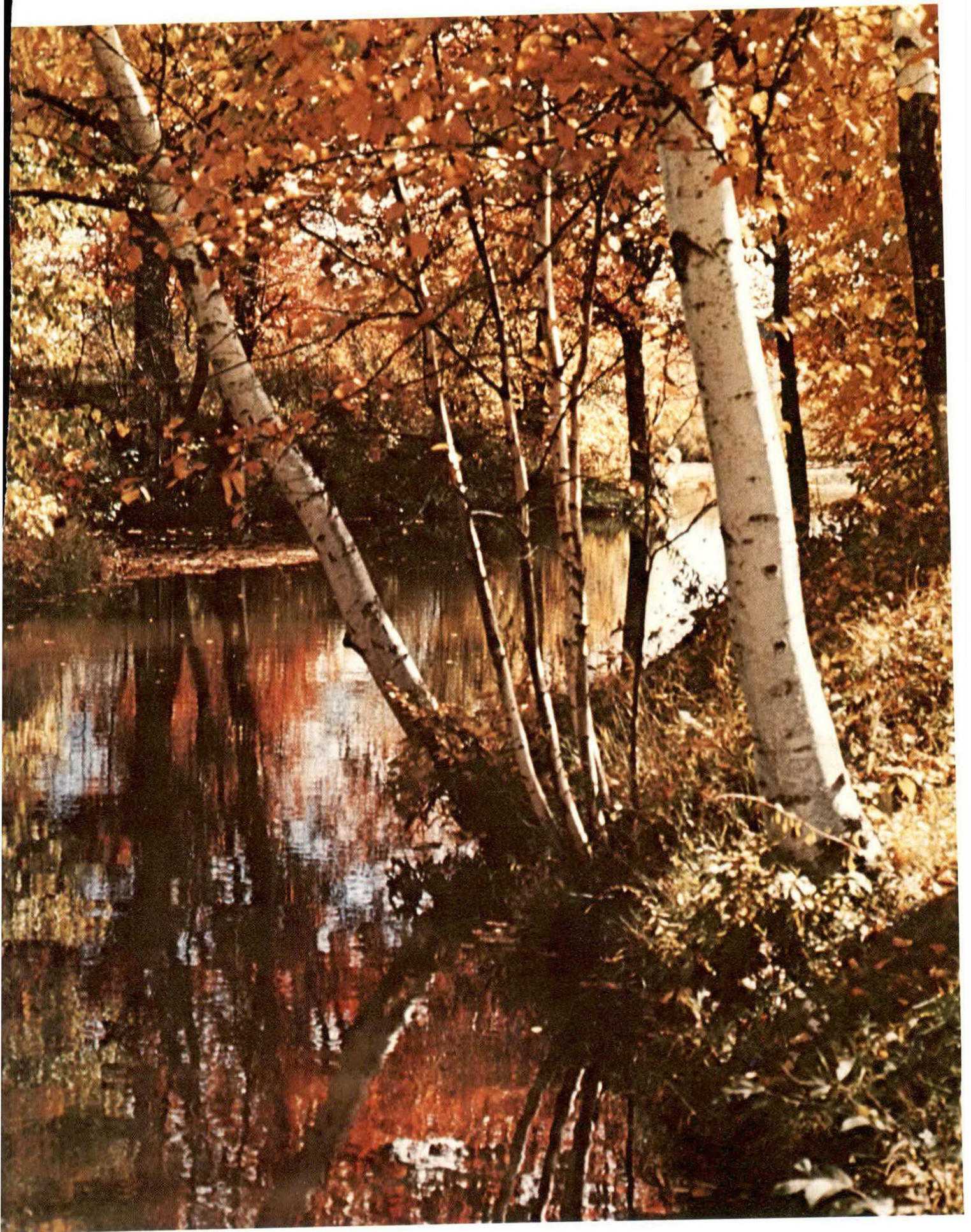
Our pollution control laws are gradually having their effect, and industry has been making great strides towards reducing contamination of the atmosphere and waterways. Industrial technology is busy devising new pollution controls and safer products. There are still glaring exceptions, but most industries are already significantly reducing and attempting to eliminate environmental pollution, a few, to be sure, somewhat reluctantly. Unsafe processes are being abandoned and safer substitutes are being developed for toxic substances. To meet government (OSHA) standards, new technologies are now being used to minimize toxic emissions. Flocculants and other new chemical treatments are being used more universally to purify industrial wastewaters. According to *National Wildlife*, February-March 1976, there has been progress in air cleanup since 1970 in many areas. For example, sulfur dioxide levels in the air have been reduced by some 25 percent. According to the same publication, the "EPA contends that motor vehicles are 'the primary source' of smog in urban areas."

Pollution and the dangers to our health are gradually being brought under control at their source—in the great industrial centers. Much has been done and much remains to be done. Now, more than ever, we need activists to see that the job is finished, but these activists (if they are to be constructively active) need essential tools, and their tools must come from science and technology.

Too many of the people who feel concern for the future of our environment think only in terms of blocking any new activity. Programs that may have profound effects on the environment need to be studied thoroughly. Sometimes they have to be blocked to protect the general welfare, but many tried and proven management practices deserve public approval and support.

The laboratory or field scientist who discovers ways to reduce erosion, selectively control dangerous insects and other disease-carrying pests, restore wildlife habitat or check the advance of plant pests introduced by man, is not fighting nature; he is doing his best to undo the damage created by decades of mismanagement, carelessness and ignorance. He is truly an environmental activist.





This booklet is the first in a series prepared by The Dow Chemical Company to acquaint the public with little known facts about subjects of paramount importance to everyone who eats to live or otherwise uses products of the farm and forest. The text was written and edited by Henry V. Lewert, Senior Technical Editor for Dow's Agricultural Products Department. Most of the nature photographs are the work of Eugene E. Kenaga, Associate Scientist, Health and Environmental Research, The Dow Chemical Company.
