The Effect Of Herbicide Damage On Private Farming Interests

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Certain herbicides including 2,4-D formulations will kill *your* growing hyacinths.

Certain herbicides including 2,4-D formulations will kill *your neighbor's* growing vegetable crops.

When a herbicide is applied, a certain amount of it will drift.

The drift of herbicides cannot be controlled.

If your herbicide damages your neighbor's crops, you should be and probably will be held liable for such damage.

Therefore, the possibility of causing damage to your neighbor's crop and the effect of such damage on him and you should be considered in determining whether or not to spray these herbicides.

Many of you will consider the foregoing elementary. However, a brief discussion will not only serve to validate the statements as axioms, but may also emphasize the disastrous effects on private farming interests that are likely to occur from the use of these herbicides.

The first and second points that 2,4-D will kill hyacinths and certain vegetable crops need no discussion if we assume proper application of correct formulations under ideal conditions.

This discussion will deal primarily with herbicides containing those substances which are inherently dangerous to growing crops, as 2,4-D and reference to 2,4-D will include like substances.

The third point, that a portion of the herbicide will drift when released into the air, is well established. Many states have recognized this in adopting laws regulating the use of 2,4-D and like herbicides. The State of Texas prohibits

spraying of 2,4-D from ground equipment when the wind is blowing more than 10 miles per hour or by aircraft when the wind is blowing more than 6 miles per hour. The Texas Department of Agriculture(2) specifies that at the following wind velocities spray is likely to drift the following distances:

Wind Velocity	Downwind	Upwind
0-3 m.p.h.	1 mile	1/2 mile
4-6 m.p.h.	2 miles	1/8 mile
7-10 m.p.h.	4 miles	250 feet

The fourth point that it is impossible to control the drift of 2,4-D after it is released is true because of such variable and uncontrollable factors as particle sizes, atmospheric conditions, wind velocities and directions, temperatures, convex currents, etc., as well as the disturbances of atmospheric conditions by outside forces such as aircraft. Ideally, you would have uniform droplets, but in practice the sprayer does not deliver uniform droplets and the larger ones are often shattered before reaching the ground. The smaller the particle, the slower the rate of fall and the further it will drift. For example: One table(2) shows the drift factor at various droplet sizes falling 10 feet through air movement at 3 miles per hour as follows:

Drop Diameter Microns	Drift
10	5280 feet
20	1000 feet
40	300 feet
100	50 feet
200	17 feet
500	5 feet

The distance of travel increases in direct proportion to the wind velocity. For Example: If there was a 12 mile per hour wind, the 10 micron drop would then travel 4 miles while settling 10 feet.

Likewise the height from which the drop has to fall is a factor, as it would take the particle twice as long to drop from 20 feet or three times as long to drop from 30 feet as it would from 10 feet. Therefore, the distance that the 10 micron drop would travel in a wind velocity of 12 miles per hour from a distance of 20 feet, would be 8 miles, or from 30 feet it would travel 12 miles if undisturbed by outside forces.

We speak of wind velocity at so many miles per hour, but we all know that the wind seldom blows at a sustained rate of speed, but blows in gusts and may change direction within a matter of minutes. So that while it might appear to be reasonably safe to spray when the operation is started, it may be unsafe to spray a few minutes later.

The effect of aircraft, as for instance a helicopter, on atmospheric conditions is likewise an important factor, as the air currents may shatter the drops into smaller particles and may force them downward until they hit an updraft and then rise many feet higher than when they were originally discharged. This movement is depicted in a chart put out by a helicopter company(1), which graphically shows how smoke is diffused in these three pictures. Certainly it must be accepted that the drift of 2,4-D cannot be controlled.

The fifth point that minute quantities of 2,4-D will injure crops has been repeatedly proven. One gram, which is about a teaspoonful, will produce symptoms in 5 to 10 acres of susceptible crops(6). If further authority is needed, we refer you to the manufacturer's labels on the containers(3), one of which reads as follows:

"WARNING—BE CAREFUL WHEN YOU SPRAY. Never apply FIELD-CLEAN except as recommended on this label, because use in any other way may result in damage or injury to persons, animals, or crops, or other unintended consequences. Crop such as tomatoes, cotton, vegetables, grapes, fruit trees, soybeans, peas, tobacco or beans, and flowers or ornamentals are very susceptible to 2,4-D weed killers, and should never be treated with FIELD-CLEAN. Do not allow spray mist to drift onto desirable crops or plants—even minute quantities of the spray may cause severe injury. Use low pressures to form coarse sprays that are less likely to drift. Although FIELD-CLEAN is formulated with a low volatile ester of 2,4-Dichlorophenoxyacetic acid, it may still release vapors after application that can injure sensitive plants nearby."

One test on eggplant made at my request satisfied us that minute amounts of 2,4-D will injure the plants and drastically reduce the marketable fruit. The results are shown on a graph which is not offered as a scientific fact as to the exact degree of damage, but only as the results of this one test. The results were as follows: Using 20 plants, the control plants produced 104 fruits of which 84 were marketable.

When 2,4-D was applied at the rate of 25/100 of one part per million, 86 fruits were produced of which only 50 were marketable.

When 2,4-D was applied at the rate of one part per million the yield was 80 fruits of which only 22 were marketable.

When 2,4-D was applied at the rate of 10 parts per million the yield was 66 fruits with only 8 fruits marketable.

When 2,4-D was applied at the rate of 25 parts per million the yield was 12 fruits with none of them marketable.

The results of many tests that have been published on tomatoes, peppers, cotton and other crops establish beyond question that rather minute quantities of 2,4-D will injure growing crops.

The sixth point that if your 2,4-D injures your neighbor's crop, you should be and probably will be held liable for the damage is a point about which I feel very strongly.

You have a right (unless expressly prohibited by law) to spray herbicides on your hyacinths, but you neighbor has a right to grow his crops without interference or damage from your herbicide.

For every privilege there is a corresponding duty and it is your duty, when you spray your hyacinths, to prevent damage to your neighbor's crops.

If you do not perform your duty in this respect, you will of course be in the wrong morally and what may be of greater concern, you will also be in the wrong legally.

Should this seem harsh to any of you, then it is suggested that you reverse the hypothesis and put yourself in the position of the farmer whose crops were damaged by another's herbicide and I guarantee that you will change your mind.

In the first place, why do you apply herbicide to fight your hyacinths instead of using mechanical means? The answer is obvious. Herbicides are more efficient and save you money. If you save one thousand dollars in this operation and in doing so you cause your neighbor to lose one thousand dollars through no fault of his own, was any saving accomplished? Of course not. You have merely shifted the cost and you have become unjustly enriched at your neighbor's expense. He has become unjustly poorer.

While we are on the subject of injustice, is is submitted that it is just as wrong for the United States Government, the State of Florida or any other governmental agency to damage a farmer's crops as it is for an individual to do so and the

governments or governmental agencies should be equally liable for such damage. It has been argued that governmental agencies in order to save the taxpayers money, should be permitted to fight hyacinths with 2,4-D with immunity from damage suits by farmers whose crops were damaged. This is faulty logic. No individual citizen should be damaged or put out of business by another, or even by his government acting in the public interest, without just compensation. The myth that the king can do no wrong has long since been exploded and forms no proper basis for sovereign immunity for torts.

When our government and governmental agencies are given the right to exercise their rights of eminent domain in taking the lands of an individual citizen for public purposes and for the public good, there is the corresponding duty which is absolute, to justly and fairly compensate the individual for the property taken.

There is no justification for not applying the same logic, the same rule and the same responsibility in requiring payment by the government for damages caused by its use of herbicides.

Indeed, the government should be most zealous in guaranteeing the rights of its citizens, first, last and always. It should refrain from harming its individual citizens and only when it is clearly in the public interest, should the property of individual citizens be taken or damaged. In such event, the individual citizen should not be made to suffer the loss alone, but should be adequately and reasonably compensated for his loss. He, in turn, contributing his share of such loss through the payment of taxes properly asessed. If the general public is benefited by the act of its government, then the general public through its government should pay for those benefits.

Under the laws of the State of Florida, as in every other state of the union, a person is liable for damages caused by his negligent act. This is true whether he is negligent in driving an automobile or in applying herbicides. Negligence is defined as "the failure to act as a reasonably prudent person would act under like circumstances." Whether the person acted reasonably in applying herbicides is the subject of proof in each case and many factors have been considered in determining the question of negligence.

In a number of states, the mere fact that a person applied a herbicide and that it caused damage to another's crops ,is sufficient to establish the negligence and render the applicator liable. Some states do not even refer to the negligence theory, but that liability is absolute. In either of these cases the result is the same, although the courts reached the result under different theories.

Other states hold the applicator liable under the trespass theory, holding that one handling an inherently dangerous substance as 2,4-D is bound to use it in such a way as not to damage his neighbor's crop.

Generally speaking, the landowner cannot relieve himself of liability by engaging another on a contract basis to apply an inherently dangerous substance. Both the landowner and the contractor actually putting out such substance are usually held liable for damages.

It is even conceivable that under certain circumstances the person applying 2,4-D or other inherently dangerous substance, would be liable for punitive damages which could amount to many times the actual damage. Punitive damages, when allowed, are by way of punishment to the wrongdoer where the wrongful act is deliberately done to injure another, is done with malice or done so recklessly that it would amount to a willful and wanton disregard of the rights of others.

When the invitation was extended to me to speak to this organization, excuse me, to deliver this paper to your society, it was suggested that the members would be interested in some personal observations as to the effect of improper application of herbicides including examples of the financial loss to agricultural interests and to the guilty applicator. I further surmise that it was expected that I would comment on fifteen cases recently pending in the United States District Court, in and for the Southern District of Florida.

On October 21, 1963, the Wildlife Service of the United States Government undertook to spray herbicides including 2,4-D formulations for the purpose of killing hyacinths in the canal along the Eastern boundary of the Loxahatchee Wildlife Area in Palm Beach County.

This section of a map prepared by the Central and Southern Florida Flood Control District shows the location of the Loxahatchee Wildlife Area in relation to roads, highways and other landmarks.

You all know that October is one of the months of the growing season in that area for tomatoes, peppers, eggplants and other vegetable crops susceptible to damage by 2,4-D. More important, the manager of the wildlife area knew it was the growing season and knew that such crops were growing as close as a half mile to the area being sprayed.

The spraying operations might have been done in the off-season, but the program was late in getting started and there were numerous delays on account of weather conditions, the availability of aircraft, etc. Finally the spraying operations by helicopter were begun and carried out.

Several farmers noticed the movements of the helicopter and at least one farmer reported that there was a strong odor of 2,4-D in his fields on the afternoon of October 21st.

Within a few days a number of the farmers whose lands were East and Southeast of the site of the spraying operations began to notice unhealthy symptoms in their crops. The leaves began to curl, the blossoms began to drop and later the leaves and fruit were malformed. There was a substantial loss in yield and in the quality produced. Most of the farmers were familiar with 2,4-D symptoms and made their own diagnosis.

One of the farmers went to the refuge manager and asked for and was granted permission to inspect the site of the spraying. He found the hyacinths in the canal, which had been intentionally sprayed, were dark brown in color and dead or dying. He also found that the willows growing between the canal and the farms to the East and Southeast were badly browned. Later inspections revealed that the tops of trees on the farms were also browned.

The widespread crop damage could not be kept secret for long and the farmers then began to get together and compare the symptoms and damages to their respective crops. It was about that time that they discussed this matter with us and engaged our firm to represent them in an attempt to collect for the damage to their crops.

We made personal inspections of the various fields, engaged experts to visit the farms, observe the damage, determine the cause of the damage and assess the extent of the damage.

Professional photographers were engaged to photograph the crops in color prints, slides and movies.

Engineers prepared aerial photographs showing the location and proximity of the farms to the canal that was sprayed. The acreage of each farm was established and later in order

to adopt uniform formulas, net planted acreages were established, which excluded roads, ditches, woods, etc.

Meteorologists examined the records of every weather station in the area to determine wind directions and velocities, temperatures and other atmospheric conditions and prepared charts graphically depicting these facts.

Aerodynamics and fluid dynamics engineers were engaged to determine droplet size, rates of fall, the drift and fall-out propensities of the herbicide and the effect of the helicopter's movements.

A soil chemist was engaged, as too was an expert on sprays to overcome the contention of the defendant that the spray and fertilization programs practiced by the plaintiffs were the villians in the case.

The manufacturer was consulted and results of lot tests were furnished us, leading us to the conclusion that the manufacturer was not at fault.

Marketing experts and economists were engaged to assist in determining the dollar value of the loss sustained.

We were most fortunate in being able to secure a number of outstanding experts locally and from the Miami area. However, we also brought in nationally known experts from as far away as Louisiana. A number of bookkeepers and accountants reviewed literally truck loads of the records of the farmers for the current year and previous years.

The Government, with our permission, sent load after load of these records to Washington where a staff of some 27 operators worked for several weeks with computers and data processing machinery to analyze these records. Incidentally, the results of the DPM analyses were, in our opinion, far from accurate, not because of the machines, which we concede are wonderful, but because of the unfamiliarity of the operators with farming facts and farming methods of sales and accounting. As a matter of fact, they were so far off in many cases that we came to refer to the read-out sheets as "idiot sheets." Altogether more than fifty witnesses testified, including seven Ph.D.'s and many engineers and other professional people.

From the legal standpoint, we had one man working exclusively on the law of this case for four solid months. Several others of us worked on it during a period of more than two years. We attempted to collect every major treatise on the subject and reviewed every important case from Federal and State Courts. Several excellent law review articles were very helpful in our research, including those from the Universities of Minnesota, Texas and Iowa. We were also most pleased to learn of a publication entitled "Manual of Pesticide Use and Application Laws" published by National Agricultural Chemicals Association, which sets forth the statutory laws and regulations of each state(5).

Briefly, what we found was that the spraying operations began about 7 a.m. and continued until 9:30, stopped for one hour, and resumed at 10:30 and continued until noon. They did have the grace to skip one section of the canal where crops were growing within one-half mile of the spraying. This aerial photograph shows the canal being sprayed and the proximity of the farms where damages were sustained, which were from one-half mile to four and one-half miles from the spraying.

The spraying was done by helicopter and during the morning the winds varied from 6 to 14 miles per hour.

The graph prepared by the meteorologist shows the wind velocity was blowing from the Northwest with the velocities during the morning as follows:

At 7 a.m. the velocity was 6 miles per hour.
At 8 a.m. the velocity was 6 miles per hour.
At 9 a.m. the velocity was 11 miles per hour.
At 10 a.m. the velocity was 11 miles per hour.
At 11 a.m. the velocity was 14 miles per hour.
At 12 noon the velocity was 14 miles per hour.

It also shows the dispersal area of the 2,4-D from given points along the canal being sprayed. The farms of the plaintiffs were directly in the path of the spray as it moved Southeastward and we came to refer to this area as"2,4-D Alley."

The formulation consisted of two-thirds of a gallon of the weed killer, which contained 94.5% active ingredients of isooctyl ester of 2,4-Dichlorophenoxyacetic acid and 5.5% inert ingredients, mixed with four and one-third gallons of diesel fuel. This was many times stronger than any concentration recommended by the manufacturer.

The rate of application was supposed to have been five gallons per acre, which contained four pounds of the active ingredient. It was our understanding that the pilot would fly South laying down a thirty foot swath and then would fly North laying down a thirty foot swarth. It was estimated that he averaged four or five swaths over the four mile area. According to our calculations it appeared that to put out five pounds per acre, he would have had to lay down thirteen and one-half thirty foot swaths over the entire four miles or he would have had to apply approximately fifteen pounds of active ingredient per acre if he had only averaged four to five swaths. In either event, some eight hundred pounds of 2,4-D active ingredient was released over a narrow strip along the four mile stretch of canal. It was estimated that approximately 20% of the 2,4-D drifted away from the sprayed area.

While the helicopter pilot for the most part was flying North and South, at one point he was flying East and West to treat hyacinths in a stub canal with the result that the helicopter was constantly disturbing the spray that was suspended in the air.

No anemometer, wind sock, smoke column or other device was used to determine the wind direction and velocity, nor did the person in charge of the spraying bother to call either of the nearby weather stations operated and maintained by the United States Weather Bureau. The only precautions taken, according to employees, were that prior to the commencement of the spraying operations one of them blew a puff of smoke from his cigarette and didn't observe any appreciable drift of the smoke. The wildlife manager during the morning from his desk observed the movement of the leaves and branches of a nearby ficus tree. Had he correctly related these movements to the "Beaufort Table," a copy of which he had in his desk, he would have determined that the wind velocities approximated those as shown by weather station data.

The foregoing were among the items of negligence complained of and proved in those cases. Is there any wonder that the crops in the area were damaged under those circumstances? We were able to acquaint the Court with this damage through the testimony of eye witnesses and through a series of color slides of injured crops of peppers, tomatoes and eggplant.

In the early stages of the case, we attempted to negotiate a settlement with the Government but the amount of the damages sustained exceeded the authority of the governmental agency to compromise. Therefore, we had to resort to litigation. After the suits were filed, we again tried to negotiate.

The government attorneys were reasonably sympathetic

toward four or five of the plaintiffs whose farms were closest to the spraying, but apparently thought in terms of arbitrary boundaries, as for instance one such boundary was Highway 441, another boundary was a ten foot ditch and barbed wire fence. We of course argued that there was no magic about a 24 foot asphalt pavement or a 10 foot ditch or a barbed wire fence that would stop the drift of the herbicide. We were not able to settle and in due course proceeded to trial. The fifteen cases were combined for trial on the question fo liability, which undoubtedly saved the Government and the plaintiffs a great deal of time and considerable costs.

In our complaints, we had charged the defendant with negligence and trespass, claiming also that our crops were damaged by an inherently dangerous substance of the defendant.

The Government denied these allegations and affirmatively pleaded that each of the plaintiffs were guilty of contributory negligence and that each of them had assumed the risk. We were rather amused by these defenses as the Government seemed to say, well you knew we were going to spray so you shouldn't have planted your crops. They could not justify these defenses and the Court found that the plaintiffs were not guilty of contributory negligence and did not assume the risk, and found the Government guilty of negligence and trespass in each of the fifteen cases, which entitled the plaintiffs to recover.

The attorneys argued that the Government was not liable at all, but if it was held to be liable, then a generous allowance for damages would be approximately $150,000. We contended that our damages were greatly in excess of this amount. The combined judgments were entered for over $450,000, plus costs.

Following the entry of the judgments, the Government filed Notice of Appeal contending that the judgments were excessive and we filed Notice of Appeal contending that they were insufficient. Subsequently, the Assistant United States Attorney called and said the Government was willing to call it quits if we were, so we stipulated to dismiss the Appeals and I am happy to report that recently the judgments for damages and costs were paid in full. Of course, we, as attorneys, were happy with the results and the clients were glad to recover even a portion of their losses.

The effect of this spraying on the defendant was the loss of approximately a half million dollars. The effect on the farmers was temporary economic disaster and permanent losses which were not recovered in the judgments. In addition to this were the frustrations, inconveniences and heartaches, and intereference with their plans of operation during the two and a half years that elapsed between the time of the spraying and the payment of the judgments. The farmers didn't even get interest on their money.

Some of you might ask how can an applicator avoid liability for damage from 2,4-D? The only absolutely safe way it to keep it in the can. However, if you must apply 2,4-D and other inherently dangerous substances, then it certainly would behoove you to exert every possible precaution not only for the benefit of your neighbors, but for your own benefit as well.

Specifically you can practice the following:

1. Apply 2,4-D only during the off-season.
2. Read the label and heed the warning of the manufacturers. The failure to read it may be evidence of negligence and the application contrary to the manufacturers' recommendations would certainly be evidence of negligence.
3. Use an anemometer or other device to accurately determine wind velocities and directions at all times during spraying operations.
4. Familiarize yourself with the drift propensities of herbicides and make sure that there are no crops within the range of the drift.
5. Before spraying ask yourself, can I afford to take the chance of injuring my neighbor and paying for his damage?
6. At least take the precautions as set forth in the United States Department of Agriculture Bulletin, "Using Phenoxy Herbicides Effectively"(4) at page 7 which provides:

"SPRAY DRIFT

Wind-carried droplets of phenoxy herbicides may kill susceptible crops near the area that is being treated.

To reduce the danger of damaging crops with spray drift—

Use nozzles that apply a coarse spray.

Use low pressures—no more than 35 pounds per square inch for boom sprayers, 100 pounds for spray guns.

Avoid spraying on windy days; do not spray with ground equipment when the wind velocity is more than 10 miles an hour, or from airplanes when the wind velocity is more than 6 miles an hour.

Spray when wind is blowing away from susceptible crops and toward the area being sprayed."

In this paper, we have only referred to damage to crops but applicators of 2,-D have been held liable for damage to their neighbor's birds and bees, his fish and fowl, his ox and his cow and his ass.

It has also been suggested that I express any personal thoughts I have concerning the revision of the statutes which control the use of herbicides. Actually, while Florida has a pesticides act, it does not regulate the application of agricultural herbicides. In view of the many instances of improper spraying and the resulting damage as typified by the foregoing examples, we conclude that the State of Florida should adopt a strong and comprehensive act regulating the application of herbicides; that the Commissioner of Agriculture of the State of Florida should be charged with the enforcement of these laws and regulations and that included in such laws should be the holding of absolute liability for damage caused by the application of inherently dangerous substances as 2,4-D and like products; that at the option of those interested, zones should be set up in which the spraying of such substances should be prohibited at all times or permitted only during certain specified seasons and under certain specified conditions. In general, the laws should be patterned on the laws in effect in the State of Mississippi, Texas, Louisiana and California, with modifications to fit our specific needs.

Above all, the applicators should not be permitted to operate without complying with strict financial responsibility provisions by the posting of bonds and/or maintaining in force at all times sufficient insurance with approved companies to pay claims for damages sustained because of the wrongful acts of those willing to unjustly enrich themselves at the expense and to the detriment of their neighbors.

The claim of sovereign immunity should be prohibited as

a defense in suits against governmental agencies for damages caused by their use of 2,4-D.

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