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ENVIRONMENTAL WARFARE

Mr. NELSON. Mr. President, in 1962, with no idea of what the consequences would be, the United States began a new form of warfare on the environment of Vietnam that is likely to have future disastrous reactions on all forms of life in that small Southeast Asian nation.

In a little more than 8 years, the United States has sprayed more than 100 million pounds of assorted herbicide chemicals over more than 5 1/2 million acres of Vietnam to defoliate forests and kill food crops allegedly grown to supply enemy forces. The United States has sprayed enough chemicals to amount to 8 pounds for every man, woman and child in that country.

Never in history has any nation ever declared war on the environment of a nation, and the United States has embarked on this unprecedented ecological experiment without adequately investigating the chemicals used to see if they would have any dangerous consequences to humans and all other forms of plant and animal life.

This Nation may well have set an ecologic time fuse in Vietnam that will reverberate down the life chain causing widespread destruction by wiping out forms of plant, animal, and aquatic life that can never be replaced, with implications for the people who live there that cannot be evaluated until some time in the future.

Distinguished scientists the world over are becoming increasingly alarmed over man's massive environmental intrusions which are disrupting life systems on a global scale. If for another 50 years we pursue the present course of unabated accelerating pollution of the land, the air, and the water, it spells disaster of unmeasurable proportions. Neither conventional nor nuclear war poses a threat as certain, or as serious.

Among the critical environmental pollutants is a class of chemicals called herbicides, now being widely used as defoliants and plant killers. The immediate question is whether we will have the foresight at this point in history to eliminate this chemical as an instrument of war.

Several questions require urgent consideration:

If our role is to defend Vietnam, how can we risk destroying the environment in which they must survive when we leave?

Do we intend to be the only country in the world that defends these chemicals as valid military weapons?

By our continued use do we intend to put our stamp of legality on it?

If we claim the right to destroy agricultural crops with it on the theory that it denies food to the enemy, what real limits are there to its use? Will it not then provide justification for any country in the future to engage in starvation warfare by spraying all crops on the ground that it is necessary in order to deny food to the fighting troops?

If in World War II these chemicals had been available and used by all countries in the same density as we have used it in Vietnam—6 pounds per person—what would be the worldwide consequences?

This is a cheap weapon, and it does not take much sophistication to use it.

Do we endorse the proliferation of this weapon into the hands of all nations, developed and developing alike, so that they can engage in anticrop and environmental warfare?

Measured in the long view and, in fact, in the short view, is it not in the best interest of our Nation and the world that we now renounce its use in a worldwide agreement to eliminate it as an instrument of warfare?

Independent scientists have only recently begun to study the cancer-causing, mutation-inducing and fetal-deforming effects of the chemicals used to remove the leaves from plants and destroy food crops.

Dr. Arthur W. Galston, a Yale University biologist and a distinguished authority on herbicides, warned in a recent Washington, D.C., conference that the environmental warfare the United States is conducting in Vietnam may "so alter the ecology of a large region that permanent scars will be left."

In a transcript of his remarks that will appear in the forthcoming book, "War Crimes and the American Conscience," edited by Erwin Knoll and Judith Nies McFadden, Galston charged:

It seems to me that the willful and permanent destruction of environment to which a people can live in a manner of their own choosing ought similarly to be designated by the term ecocide. . . . At the present time, the United States stands alone as possibly having committed ecocide against another country, Vietnam, through its massive use of chemical defoliants and herbicides.

Mr. President, we will be voting on this amendment which I introduced on July 16, 1970, for myself and Senator CHARLES GOODELL and nine cosponsors. It is the environmental warfare amendment to the military authorization bill for procurement, H.R. 17123.

The amendment would terminate the use of herbicides by the United States as an instrument of war in Vietnam and elsewhere. Specifically, it would prohibit the United States from using antiplant chemicals for military application, would prevent the transfer of such weapons and the equipment necessary to spread the chemicals to another country for it to use, and would provide for the elimination of the present stockpile of the chemical compounds and all herbicidal equipment related to such use—directing the equipment be used for other purposes.

The chairman of the Senate Armed Services Committee is to be commended for taking the initial step in attempting to find out what the effects of the environmental warfare program have been in Vietnam. Section 508(c) of the military authorization bill for procurement calls for the Secretary of Defense to enter into appropriate arrangements with the National Academy of Sciences for the purpose of conducting a comprehensive study and investigation to determine the ecological and physiological dangers inherent in the use of herbicides and the ecological and physiological effects of the defoliation program carried out by the Department of Defense in South Vietnam. The report is to be transmitted by the Secretary of Defense to the President and the Congress by March, 1972.

A comprehensive study should, of course, be made, but even the Depart-

ment of Defense has said such a comprehensive study could not be completed in any meaningful way in the next 18 months because it will take much longer to accurately know what the consequences will be from our extensive use of herbicides. A further complication is that most of the defoliated area is still under enemy control and it will not be possible to get into those areas with a scientific investigating team until the war has ended.

The Department of Defense failed in its responsibility to carefully study the long-range effects of the use of herbicides on man, his environment and the vast array of creatures living there before engaging in this intolerable kind of chemical warfare that may cause irreversible and disastrous future damage.

In 1969, the General Assembly of the United Nations passed by a vote of 80 to 3 a resolution that declared the use of military herbicides a form of chemical warfare which is forbidden under the Geneva Protocol. The United States, Australia, and Portugal were the only dissenters.

The United States has pledged itself to uphold the Geneva Protocol ban against the first use of chemical weapons, but has never officially ratified the agreement. Instead, the United States has been actively using antiplant chemicals in unprecedented amounts in Vietnam and has the questionable distinction of setting the precedent in this kind of warfare.

Just last week the President sent the 1925 Geneva Protocol agreement to Congress to approve its ratification, but argued that the use of tear gas and chemical herbicides were not to be considered as part of the 45-year-old ban. The President's action is to be applauded especially since this country is the only major military power in the world not to have signed the agreement. Environmental warfare through the use of herbicides, however, is irresponsible, and we have now learned enough about the dangerous implications of environmental warfare to join the other responsible nations of the world who have prudently agreed it is a dangerous activity that must be stopped.

Even before the Geneva Protocol agreement, the United States was party to the "Hague Regulations With Respect to the Law and Customs of War and Land" annexed to the Hague Convention of 1907. Article 23, paragraph (a) of those regulations specifically states:

It is especially forbidden to employ poison or poisoned weapons.

The Army has interpreted this restriction in its Field Manual, Law of Land Warfare, FM 27-10, page 18, which states:

Relevant treaty position is that it is especially forbidden to employ poisoned weapons.

The foregoing rule does not prohibit measures being taken to destroy through chemical or bacterial agents harmless to man, crops intended solely for consumption by the Armed Forces (if that fact can be determined).

In light of these policy positions, two major points are raised. First, are we sure that we are not employing a poisonous chemical harmful to man to destroy crops? Have there been any tests conducted in Vietnam to confirm conclusively that agent blue, which contains

② cacodylic acid, has not poisoned North Vietnamese, Vietcong or South Vietnamese? The areas sprayed, by the Department of Defense's own admission, are remote and controlled by the guerrillas. So it is virtually impossible to know whether we are or are not violating the Hague Convention until the war is over.

How do we know that the only crops destroyed are "intended solely for consumption by the Armed Forces—if that fact can be determined?" Some 500,000 acres of rice and other food crops have been destroyed since 1962. Up until 1967 or 1968, agent blue rained down on rice paddies in areas controlled by the guerrillas.

It is well proven that a substantial percentage of the food crops killed were grown by civilians for civilians. There have been studies conducted by and for the Department of Defense that differ greatly over the military effectiveness of the anti-crop program, including the point about whether and to what extent civilian crops are affected.

The Army steadfastly maintains that 100 percent of crops destroyed by chemicals are grown by or for the Vietcong. Even that stand can be challenged by a glaring gap in its logic. The Army is obviously assuming that any rice crop grown for guerrillas is for them exclusively, with no part of the crop intended for consumption by non-Communist farmers.

The weakness of that assumption was evident in hearings of the House Subcommittee on National Security Policy and Scientific Developments, chaired by Representative Clement Zablocki, (Democrat of Wisconsin), entitled "Chemical-Biological Warfare: U.S. Policies and International Effects," in November and December 1969. Those important hearings dealt at length with the use of herbicides and tear gases in Vietnam. One of the witnesses, Rear Adm. William E. Lemos, Director, Policy Plans and National Security Council Affairs, Office of the Assistant Secretary of Defense for International Security Affairs was questioned on the anticrop program.

A dialog between Congressman Fraser, (Democrat of Minnesota), and Admiral Lemos follows:

Mr. FRASER. Your statement on crop destruction on page 13 says that crops in areas remote from friendly populations and known to belong to enemy that cannot be captured by the ground operations are sometimes sprayed.

Admiral LEMOS. We are really talking about very isolated crops in areas of known Vietcong and North Vietnamese army units, and which are clearly a part of that complex and being grown by them, or by people forced by them to grow for them.

Mr. FRASER. How can you determine whether or not the crops are being grown by direction of the VC?

Admiral LEMOS. By the proximity of the main force VC and North Vietnamese units and by information derived from the people in the surrounding area.

Mr. FRASER. As I understand it, we are under an injunction under the Hague Convention not to destroy crops which may be in part for the use of the population, is that right?

Admiral LEMOS. Yes, sir.

Mr. FRASER. How are we able to verify adequately whether or not the crops are in fact aimed just for the fighting units of men, not in fact, be intended for noncombatants—I know this is a difficult problem in this kind of war.

Admiral LEMOS. It is very difficult.

Mr. FRASER. How do we determine that under these circumstances?

Admiral LEMOS. As I indicated, we take extensive aerial photographs of every area where such a proposal is made and those aerial photographs are very carefully analyzed by a broad spectrum of people and if the crops are close to populated areas, they are not subjected to herbicides.

Mr. FRASER. What do you mean by "populated areas?"

Admiral LEMOS. I can't give you the specific cutoff, but the crop destruction program is associated with enemy camp areas and not the villages and hamlets.

Mr. FRASER. How can you be sure (that you are destroying only guerrilla crops)?

Admiral LEMOS. All you can do is the best possible.

Admiral LEMOS (continuing). There has to be substantial evidence that the crops are being grown specifically for the use of Vietcong troops and North Vietnamese troops.

During the same hearings, Thomas R. Pickering, Deputy Director, Bureau of Political Military Affairs, Department of

State, commented on the degree of proof in an anti-crop mission. He said agent blue was used where it is believed that the food crops involved are for the use of the Vietcong and North Vietnamese military forces in the area. Without getting into a discussion on what degree of certainty each of these Government officials had in mind and without revealing testimony discussed during executive session to demonstrate the counterproductive aspects of this policy. Admiral Lemos' comments are very revealing. Lemos said that crops are sprayed only in areas that cannot be captured by ground action.

The admiral admitted that in making the "yes" and "no" decision "all you can do is the best you can." If, as some sources have indicated, a substantial percentage of all crops destroyed—500,000 acres, or 781 square miles—were to be consumed at least in part by friendly South Vietnamese, then the "our best" is incredibly poor or else the product of gross negligence.

The antiplant program in Vietnam and the anticrop program in particular are having adverse effects on the noncombatant South Vietnamese. The report of the Student Task Force for Washington Research on Chemical-Biological Warfare, prepared by a group of Princeton students on June 1, 1970, is a well-documented analysis of the herbicide program. The report states:

The main result of the food denial program seems to have been the creation of thousands of refugees. When their crops turn yellow and die, peasants are forced to leave their homes and travel to the cities or to refugee camps maintained by the Saigon government at American expense. Food may be available here, but the living conditions are less than desirable. Abhorrent though the thought is to American civilians, the creation of refugees seems to have been and may still be the ultimate goal of the program. Representative Richard C. McCarthy (in his book, *The Ultimate Folly*) quotes ex-President Science Advisor, Donald P. Hornig, as saying that the program is designed to force farmers outside of American/South Vietnamese held areas to abandon their farms and move into our sphere of influence. The Department of Defense denies that this is their goal, but even they cannot deny that this is a result of a program they insist on continuing.

The ad hoc international scientific commission composed of four scientists—Drs. A. H. Westing, plant physiologist, and E. W. Pfeiffer, animal physiologist, both of the United States; and Dr. Jean Lavorel, plant biophysicist, and Leon Matarasso, lawyer, both of France—in their "Report on Herbicidal Damage by the United States in Southeastern Cambodia," presented a graphic example of the effects of herbicidal warfare on the civilian population:

A large variety of garden crops (both agricultural and horticultural) were devastated in the seemingly endless number of small villages scattered throughout the affected area. Virtually all of the ca. 30,000 local inhabitants are subsistence farmers that depend for their well-being upon their own local produce. These people saw their crops, then growing, literally wither before their eyes. Indeed, it was the widespread death of the vegetables that heralded the rest of the damage to the area. Their then current crops of vegetables of numerous kinds, pineapples, of jackfruit, of papayas, and of many more were simply destroyed.

The stated policy of the military is to use herbicides in remote areas of low population "not exceeding eight persons per square kilometer" or 21 persons per square mile. Yet, evidence has indicated that crops have been destroyed in areas where the population density is as great as 1,000 persons per square mile.

Even more damaging is the Department of Defense's public admission:

Approval (for anti-crop mission) includes arrangement for indemnification, if later necessary, as well as plans for supplying food to the South Vietnamese who might thereby be denied food sources.

General Blanchard, in his official statement in a briefing with Senator THOMAS McINTYRE, said:

Such targets (anti-crop targets) are carefully selected so as to attack only those crops known to be grown by or for the Viet Cong or North Vietnamese.

If, as Admiral Lemos admits, it is difficult to make that determination, and if we only attack Vietcong or North Vietnamese crops as General Blanchard so

categorically states, then why do we not articulate a policy of paying those South Vietnamese citizens who are deprived of their food source? It would seem clear that this is an obvious violation of the Hague Convention of 1907.

Alarming reports from official Government sources and independent scientists are beginning to show that the careless use of antiplant chemicals may be endangering a vast variety of plant and animal life and in some places destroying vital soil organisms. Distinguished scientists fear, for example, that vast timber areas sprayed as suspected Vietcong hiding places may not recover, or may take a number of years returning to normal growth. No one can accurately predict what some of the chemicals used will do to other organisms and plant and animal life, but recent research is proving that it is not enough to study whether a chemical is toxic to animals.

Until the past 5 or 10 years, researchers testing a new chemical were satisfied if the agent fed to a laboratory animal did not kill him. They know now that that is not enough. Some chemicals which are harmless in a toxicity test, will later turn out to be carcinogenic—cancer-inducing, mutagenic—mutation inducing, or teratogenic—inducing abnormalities in developing embryos. The thalidomide disaster of a few years ago and other recent findings linking cancer with seemingly "safe" chemicals and food additives, points to the need to test new compounds in more sophisticated ways to determine that they will not be harmful to humans and other forms of life.

This kind of careful, sophisticated testing was not conducted on the herbicidal compounds before the United States began using them in Vietnam.

The U.S. environmental warfare program moved from limited testing in 1961-62 to the reduction of foliage along roads and waterways in 1963. In 1964, the military began destroying crops allegedly grown by or for the enemy forces and then began spraying large tracts of swamp and forests in 1965-66. By 1967-68, more than 2,000 square miles a year were sprayed at an annual expenditure of some 2 million gallons of the chemicals. By 1970, 5 1/2 million acres, or 12 percent of Vietnam was defoliated, an area about the size of the State of Massachusetts.

The three herbicide compounds used in Vietnam are known by the code names—agents orange, white, and blue. Orange and white are defoliants and agent blue is used to destroy crops.

Agent orange is a mixture of 2,4-D and 2,4,5-T and was the most common herbicide used in Vietnam. White is a mixture of 2,4-D and picloram in a water base. It is less volatile than orange and hence is used where drift damage to friendly crops is feared. Blue is a water solution of cacodylic acid and is used to destroy rice and other food crops.

Of the four chemicals used in the three herbicides, two have been tested extensively. The chemical 2,4,5-T was shown to cause fetal deformities in chicken embryos, mice, and rats. Because of these findings, the U.S. Surgeon General restricted the domestic use of the chemical. The following day, April 15, 1970, the Deputy Secretary of Defense banned the use of Agent Orange in Vietnam. Up to that point, the United States had sprayed 40 million pounds of 2,4,5-T over the Vietnam landscape.

The chemical 2,4-D has also been shown to cause fetal deformities in tests on chicken embryos and hamsters. Comprehensive testing of this chemical is continuing at Food and Drug Administration laboratories and the National Institute of Environmental Health Sciences. The Surgeon General has not imposed restrictions on 2,4-D because he said the tests were still not conclusive enough.

While some tests are underway, the attention the Federal Government gave 2,4,5-T and 2,4-D has not been given picloram and cacodylic acid.

Picloram is a highly persistent chemical that some scientists maintain is the herbicidal equivalent of DDT. Like DDT, picloram has been used extensively both domestically and internationally without any comprehensive studies to determine what long-term effect it has on the nat-

nural environment. After some 26 years of extensive and widespread usage, it was not until Rachel Carson published her dramatic volume, "Silent Spring," that extensive studies finally showed that DDT was a persistent, long-lasting chemical compound that had spread throughout the environment, endangering many species of life and causing serious future consequences no one can predict. Government experts have admitted that they do not know how long-lasting or persistent picloram is.

With the discontinuation of Agent Orange containing 2,4,5-T, picloram was given greater usage in Vietnam because it appeared to be innocuous. In feeding tests with laboratory animals it showed up quite nonpoisonous.

Recent tests, however, presently being performed by W. T. Jackson and O. R. McIntyre at Dartmouth University have shown that the chemical causes an inhibition of protein synthesis in human white blood cells tested outside the body in test vessels and an inhibition of normal cell division patterns. Preliminary research at the Food and Drug Administration is finding some malformation in development induced by this compound.

The lengthy life picloram has in the soil was reported in an article in the Dow Chemical Co. house organ, "Down to Earth." The magazine of the company that produces the chemical compound said that in certain soils less than 3.5 percent of picloram disappears after 487 days; in other soils as much as 20 percent disappears.

Those are remarkably low levels of disappearance and if picloram is applied to soils year after year, scientists predict that a gradual build-up is inevitable. The fact that picloram apparently has an effect on cell division together with the fact that no single microorganism is known which will degrade picloram, graphically shows that in some respects this herbicide is as dangerous as DDT and is so persistent that it should not be used as a herbicide in any indiscriminate manner.

The fourth herbicide used in Vietnam, cacodylic acid, is 54 percent arsenic. It is alleged in the usual feeding toxicity tests to be no more toxic than aspirin. Research scientists report that cacodylic acid in an organic state is generally not considered harmful. They warn, however, that no one knows if some microorganism in the soil or water might react with the relatively stable arsenic atoms and transform the chemical into a deadly compound that could cause catastrophic ecological consequences.

Scientists have warned that there are several other possible long-term ecological dangers from the military application of chemical defoliants in Vietnam. They include *laterization*, or irreversible hardening of soil no longer protected from the sun by foliage; permanent destruction of mangrove swamp forests; poisoning of aquatic life by runoff into the water system, elimination of many forms of animal life and opening up vast areas to the permanent invasion of fast-spreading undesirable plants like bamboo, forcing out the future growth of normal plant life.

The implications of herbicidal warfare in Vietnam were discussed in part recently at hearings before the Senate Committee on Foreign Relations. In response to questions from the committee chairman Donald G. MacDonald, the Director, U.S. Agency for International Development, Vietnam, since 1966 said:

The damage done to the economy on a permanent basis is a subject of great interest obviously to me as the head of the AID program in South Vietnam, and I have studied it rather closely. There is, I suppose one could say, an enormous physical loss of forests as a result of defoliation.

Hardwood forests cover about two-thirds of Vietnam and formally employed about 80,000 persons in the timber industry. About 2,500,000 acres have been sprayed with one treatment of agent orange, causing a 10 to 20 percent permanent kill. Another 1,200,000 acres have been sprayed two or more times with a 50 to 100 percent permanent kill.

Without even considering the incalculable ecological implications of such ex-

tensive killing of trees and plants, the destruction of so much timber could be a very serious economic blow to Vietnam since timber is potentially the greatest export of the country.

The long-term effect of massive spraying upon the forest and its life systems is anybody's guess—and it is a matter too important to guess about.

Two zoologists, Gordon H. Orians and E. W. Pfeiffer, in a recent article on the "Ecological Effects of the War in Vietnam" in *Science* magazine found that the almost complete destruction of all the vegetation on the mangrove areas that had been sprayed had a severe effect upon the animals living there:

During our tour of the defoliated areas, we did not see a single species of insectivorous (insect eating) or frugivorous (fruit eating) birds with the exception of barn swallows . . . which are migrants from the north.

An international scientific investigative team, assessing the damages to the unexplained defoliation of some 173,000 acres in Cambodia which occurred in late April and early May 1969, said in their December 1969 report:

It is interesting to note that eastern Cambodia in general has experienced quite a substantial increase in a variety of wildlife, apparently driven out of Vietnam by the defoliation and other ravages of war. Included are muntjacs, and other species of deer, wild cattle, (Gaur, Banteng and some Koupreys) elephants, a number of monkeys species and wild pigs.

Dr. J. E. Neillands, a University of California biochemist, has listed some of the animal species of Vietnam which are known to be in danger of extinction. The douc langur and the Indochinese gibbon, both on the verge of extinction, it is feared, will be wiped out completely since these creatures exist exclusively on a variety of plants growing in the heavily defoliated areas.

It can be supposed that some will argue that the destruction of some animal and plant species is relatively unimportant in relation to the war effort. But if the wildlife is being destroyed, what then is happening to the delicate tropical ecosystems comprising the complex relationship of all plant and animal life? An even more pressing question is what effect, direct and indirect, does the herbicide program have on the people of South Vietnam? And finally, what exactly are the limits, if any, to a military program such as this and what are the moral implications?

The poisoning of aquatic life by runoff into the water system is a real problem in Vietnam. Marine fauna are known to be injured and killed by 2,4-D and 2,4,5-T, the major defoliant chemicals. Tests of the effect of from one to two parts per million of 2,4-D showed it had a deleterious effect on mayfly nymphs, leeches, clams, and snails.

Dr. Gaistoun points out that—

The estuarine environment in which the mangroves grow is tremendously important to shellfish and migratory fish, which deplete a portion of their life cycle in the ecosystem enveloped by the mangrove roots. With these plants killed, the fish will probably go elsewhere. This will lead to a decline in the fish and shellfish catch, which constitutes an important source of protein and essential amino acids.

In 1968, aware that there was little data on the ecological effects of the military use of herbicides in Vietnam, the State Department sent P. H. Tschirley of the Department of Agriculture to make a 30-day study. Tschirley's report indicated the military defoliation program "is having a profound effect on plant life in Vietnam."

One of the long-range effects that Tschirley found was in the massive destruction of mangrove forests. He declared that mangroves are extremely susceptible to defoliants and that one application was sufficient to kill most trees. He reported visiting the Rung Sat Peninsula that was still completely barren, even though it had been sprayed years earlier. He estimated it would take about 20 years for the reestablishment of a mangrove forest.

Zoologists Gordon H. Orians and E. W. Pfeiffer, in their recent *Science* magazine article argued, however, that Tschirley's estimate was conservative because it was based on the assumption of the immediate redistribution of

seeds to the defoliated areas and the presence of suitable germination conditions when they arrive.

Emphasizing the lack of knowledge on the use of defoliants, the zoologists contended that there is reason to believe that the time-table for mangrove regrowth may well be longer than 20 years.

There are areas of sprayed mangrove forests in Vietnam defoliated in 1961 that still have shown no significant recovery.

Most of the defoliation has occurred along a strip extending from the northern boundary of South Vietnam through the center of the country halfway to the southern tip and also along the Ho Chi Minh Trail from Laos as it leads into South Vietnam. Defoliation on a smaller scale is being conducted in Thailand. The ecology of tropical forests is discussed in "A Legacy of Our Presence: The Destruction of Vietnam," prepared by the Stanford biology study group. The report states:

Tropical forests and soils are very different from those in the temperate zone. Thus to understand the long-term effects of the war in Southeast Asia it is necessary to describe certain characteristics of tropical forests and soils.

One such feature is the intricate interdependence of the plants and animals. For instance, the trees of tropical forests depend entirely upon insects, birds and bats (rather than wind) for pollination. Birds, bats and ground dwelling mammals are responsible for dispersing seeds from the parent plants to new clearings. These complex plant-animal relations have reached their greatest intricacy in tropical forests because of the mild and predictable climate. Animals can be active the year around because many flowering and fruiting trees provide food continuously. Massive defoliation means an end to this reliable food supply and death for those animals that are most important to the survival of the forest plants.

The U.S. defoliation program has set the stage for irreversible environmental damage. The flora and fauna depend on one another. If you destroy one, you almost inevitably destroy the other.

The study group also discussed the unique problem of laterization, or the irreversible hardening of soil no longer protected from the sun by foliage. The report stated:

From 30 to 50 percent of Vietnamese soils are of a type which have the potential to turn into a brick-like substance, known as laterite, if they are deprived of the organic covering which protects them from exposure to severe weathering. The potential for laterization is greatest in areas which were already disturbed before herbicide application. Cropland, as well as bombed and bulldozed areas along roadways, fall into this category. The permanence of laterite is well illustrated by the Khmer ruins around Angkor Wat in Cambodia where many of the temples were constructed primarily of this rock nearly ten centuries ago. Obviously, interred land is useless for agriculture.

More incredible than Operation Ranchhand where the popular slogan is "Remember, only you can prevent forests," the military dreamed up Operation Sherwood Forest and Operation Pink Rose. The rationale was that after defoliating a forest, fire raids similar to the fire bomb attacks on Dresden and Tokyo in World War II would completely decimate jungle areas of South Vietnam. As Thomas Whiteside wrote in his book "Defoliation":

The ultimate folly in our defoliation operations in Vietnam was possibly achieved during 1965 and 1966, when the military made large scale efforts in two defoliated areas to create fire storms—that is, fires so huge that all the oxygen in those areas would be exhausted. The apparent intention was to render the soil barren. (A fire storm would also, of course, have the result of burning or suffocating any living being in the area.) Operation Sherwood Forest, conducted in 1965, was an attempt to burn a defoliated section of the Boi Loi Woods. In October, 1966, the military began Operation Pink Rose, a similar project. Neither of the projects, in which tons of napalm were thrown down on top of the residue of tons of sprayed 2,4,5-T succeeded in creating the desired effect . . .

Before the U.S. Surgeon General banned the use of 2,4,5-T, the military took a hard line on the chemical's dangerous effects and maintained there was no correlation between the use of this defoliant and any hazards to human health.

On October 30, 1969, the Department

of Defense stated in a press release:

The policy of the Department of Defense always has been to use Orange (a liquid solution of 2,4,5-T and 2,4-D) in remote areas away from the population. This policy is being reiterated and emphasized; additional precautions are being taken to insure that Orange is not used in populated areas.

This policy statement raises one crucial point. What does the phrase "away from population" mean? A recent column by Daniel Deluce of the Associated Press reports that in areas of the Mekong Delta where Americans fought "there are empty fields, cratered by bombs, growing only weeds, coconut palms killed by defoliants lean crazily. The farm houses have vanished." The most highly populated rural area in South Vietnam has been defoliated.

However, it is interesting to note that the Department of Defense planned to conduct a survey by going through Vietnamese hospital records to determine if there is a correlation between herbicides and the rate of miscarriages, still births, and fetal deformities. The study group concluded before they began that the study could not be conducted. The conducted a general survey that proved nothing. The report of the study is unclassified, but the Department of Defense refused to make it public, ostensibly on the basis of an agreement with South Vietnam. Nobody is to see the study until it is published. Yet in talking to Department of Defense officials, no one was sure even who in Defense could see it.

In spite of the Saigon and Hanoi newspaper allegations to the contrary, the military has steadfastly maintained that there have been no claims on South Vietnam or the United States for any health hazards caused by defoliants. At the same time, over \$3 million in claims to properly damage have been honored by the Government of South Vietnam and paid through counterpart funds by the United States.

Bionetics Laboratory conducted a study of the teratogenic or birth deforming effects of 2,4,5-T and 2,4-D in 1968. The results showed that both chemicals, the major defoliants in Vietnam, possibly have teratogenic effects. That study was not released until late 1969. The Federal Government took action only after a number of articles by Thomas Whiteside appeared in the New Yorker and only after the Senate hearings, "Effects of 2,4,5-T on Man and the Environment."

The International scientific commission that went into Cambodia in late 1969 to study the effects of defoliation on the environment that occurred earlier that year discussed in their report the health hazards defoliants have on animals. The study declared:

All of the interviews with the local inhabitants consistently disclosed that village livestock became ill for a period of several days soon after spraying. Whereas the larger animals (water buffaloes, cattle and mature pigs and sheep) became only mildly ill and all recovered, some of the smaller ones (chicken, ducks and young pigs) suffered more severely and in some cases were reported to have died. The domestic mammals were described as having digestive problems, whereas the domestic birds became partially paralyzed. Apparently many wild birds became similarly debilitated and could be captured easily. There were also a number of small dead birds found at the time in the woods and fields.

An article in an April issue of the London Times stated that the British Forestry Service had also seen many paralyzed birds when they sprayed 2,4,5-T. This was in addition to the dizziness and nauseous feeling the people spraying had experienced themselves.

On ABC-TV, July 27, 1970, a program entitled "The Poisoned Planet," which depicted the serious state of affairs in the world since the wide-spread use of pesticides and herbicides, showed several vivid shots of birds trembling helplessly in reaction to herbicide spray.

Dr. Jacqueline Verret, who was instrumental in determining conclusively for the Food and Drug Administration that 2,4,5-T was teratogenic, has tested samples of orange and white and found that they both produced fetal deformities in her laboratory experiments. The State Department has admitted that agent orange and white were used in the mysterious herbicidal attack on Cambodia last year.

The ad hoc independent scientific com-

mission, when in Cambodia, interviewed many of the local inhabitants about human health effects from the mysterious spraying.

Many (people) spoke of widespread temporary diarrhea and vomiting, particularly among infants and to a lesser extent among the general adult population. At one location (Chilpaeng) water was trucked in for a time following spraying to provide uncontaminated water for the children. In those instances where the people depended largely upon deep wells for their water supply we received no report of human digestive problems.

The New York Times reported on June 8, 1969:

Many residents of the area (Fish Hook) reported to have been affected by the defoliant suffered from diarrhea, vomiting and colitis.

Keeping these factors in mind, the anticrop program is particularly worthy of discussion.

The World Health Organization in its report, "Health Aspects of Chemical and Biological Weapons," published in 1970, defined chemical agents of warfare to include all substances employed for their toxic effects on man, animals and plants. They later added:

Very little is known about the chronic toxicity or long-term effects of anti-plant agents, for example, their teratogenicity or carcinogenicity. In this connection it must be borne in mind that the military employment of anti-plant chemicals may lead to their intake, by humans in water and food, in dosages far higher than those experienced when the same chemicals are used for agricultural and other purposes. While it may be untrue to say that the possibility of chronic toxicity has been entirely ignored, it cannot be said that it has received anything approaching adequate study.

On both the political and military level, the anticrop program is a dangerous facet of environmental warfare because it can be directed in a punitive way and bring about starvation in a massive and indiscriminate manner. Who is to say when some nation will decide to use it for that purpose too?

During last April and early May 1969, 173,000 acres or 270 square miles of the Fish Hook area of Cambodia was sprayed with defoliants, confirmed to be agents orange and white. The Cambodian Government subsequently claimed \$8.7 million—now \$12.2 million—in compensation from the United States for heavy damage to 37,000 acres of rubber and fruit trees several miles inside the border. Because this was an international incident, the State Department sent a governmental team of technical experts to Cambodia to assess the damage.

The State Department unequivocally denied U.S. involvement in the incident and that no other party could be found at fault. One is entitled to wonder who else in that war has the planes and equipment to engage in this kind of warfare?

The report to the State Department of July 1969 concluded that—

Defoliation of rubber, fruit and forest trees farther north (of the Cambodian border) was probably caused by a direct spray application by an unknown party. . . .

Thomas Pickering, Deputy Director, Bureau of Political-Military Affairs, Department of State, submitted the following statement to the House Subcommittee on National Security Policy and Scientific Developments in December, 1969, that—

The greatest part of the damage was caused by a deliberate and direct overflight of the rubber plantations.

In contrast, the Department of Defense on May 22, 1970, asserted that—

The defoliation of Cambodia was neither punitive nor in preparation for military action.

How could the DOD maintain that it was "neither punitive nor in preparation for military attack," while Pickering, speaking for the State Department, asserted that the defoliation was "deliberate?" Since the official position is that the United States was not found culpable, it is, indeed, surprising that the State Department is still considering the claim. The State Department and the DOD could not determine the intent of the mission unless they know about the origin of the mission.

Finally, Mr. Speaker, I refer to the second part of the environmental warfare amendment, which states that the United States shall be prohibited from entering into or carrying out any contract or agreement to provide agents, delivery systems, dissemination equipment or instruction for the military application of anti-plant chemicals.

In other words, the amendment would not allow our country to turn over to the South Vietnamese or any other country this indiscriminate weapon of warfare.

The indiscriminate, extensive use of herbicides is further compounded by the fact that, even while a proposed study is underway to examine the effects of the antiplant chemicals, the U.S. Armed Forces are in the process of turning command and control of the herbicidal program over to the South Vietnamese as part of the administration's Vietnamization plan.

With such little scientific knowledge available on the environmental implications of the use of herbicides, this nation cannot be permitted to allow the proliferation of this dangerous kind of environmental warfare, especially proliferation into the hands of the South Vietnamese Government.

General Blanchard, in his Senate briefing of April 29, 1970, asserted that the United States was considering how to transfer the herbicidal program to the South Vietnamese. The DOD letter of May 23, 1970, to the committee on CBW, composed of Princeton University students, stated quite the contrary:

When the United States instituted a ban (April 15) on the use of 2,4,5-T in military operations, the South Vietnamese government instituted a similar ban. The United States will not supply 2,4,5-T to SVN or other governments until the problem of teratogenic effects has been resolved.

Clearly, before General Blanchard had made his presentation, the United States had been supplying herbicides for military application to South Vietnam. It appears from the DOD statement that we were providing agent orange to other governments, which raises even graver issues.

The forcing function of technology has allowed the introduction of a new form of warfare. A type that is of questionable military value, ecologically and biologically damaging and politically explosive. We have to develop new attitudes so that we will not automatically equate technology with progress and efficiency and will not see it as a panacea to cure the problems of the Nation and the world.

The entire planet is facing an environmental crisis because progress for the sake of progress became the standard for success. In the wake of this mad rush to accomplish and be successful, man has violated earth with his impatience.

Technology and science provided the short cuts to eliminate pests with pesticide compounds that were used indiscriminately and man irritated and surprised when he found that the chemicals were destroying and threatening to destroy other forms of life.

He dumped the wastes of his advanced civilization into the water systems and seas and was irritated and surprised to learn that the waters of the water planet had a saturation point.

He exhausted the fumes of his industries and his motors into the thin envelope of air surrounding the planet and was irritated and surprised when the air became clogged and choked many of his major cities.

Now there is a new advancement. Chemical compounds have been found that can destroy plants that man finds undesirable along his roads and highways. Science and technology have produced chemicals that efficiently and economically can be used militarily to destroy the foliage suspected to be hiding an enemy or kill the crops believed grown to feed him.

Unfortunately, like so many other of the rapid advancements of his society, man created another potential for disaster. By engaging in warfare on the environment this country has taken the leadership in conducting a long range warfare on man himself and future generations, friend and enemy alike.