

In defence of DDT and other pesticides

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ONCE again the "Naked Ape" — homo sapiens — stands at a crossroad. Before deciding along which road to proceed, he hesitates and glances behind at the long road he has trod.

He is both amazed and proud of the tremendous progress he has achieved as he manoeuvred and advanced along the pitfall-laden trail of human survival during the brief period he has inhabited the planet Earth. Within the last second — representing a short 5 million years as measured on the geologic clock — he remembers emerging from the bush somewhere in south-east Africa, standing upright on his back legs and beginning to assume the role of Desmond Morris's so-called "Naked Ape".

With a club in one hand and a rock in the other, he stalked animals and became a carnivore. For a long time he struggled for survival as a hunter and food gatherer under the hostile environmental pressures dispensed by a fickle mother nature. More than once he barely averted extinction. He remembers having seen certain other species perish, because of their inability to adjust to the capriciousness of the environment. They have left for posterity only a fragmented history of their existence recorded in the book of fossil rocks.

During his long early period as a hunter, social progress was negligible. Survival itself was man's only sense of achievement. Then his helpmate, neolithic woman, only about 9,000 years ago, invented agriculture and animal husbandry. This brought new hope. It ensured his food supply and lightened his load. Survival became less of a problem. The quality of human life improved. It gave him time for pleasure and time to think. There was time to develop his intellect, a society and, subsequently, a culture.

He made many worthwhile scientific discoveries that made life more comfortable, gratifying and enjoyable. Among these were the discoveries of control for many diseases that had plagued and scourged him from the beginning of time.

With the control of diseases and the resultant drop in death rates, combined with a reliable food supply, human population growth soared. The population monster looms ahead and now threatens to obstruct further progress, and even to erode progress already achieved, unless tamed.

All these events that have taken place along the tortuous road of human progress over which the Naked Ape has travelled, flash back to him now, as he hesi-

tates and reflects before turning forward again to make the necessary decision as to which road to choose, at this, the most complex series of crossroads and intersections that he has ever encountered along the highway of social evolution.

He realises, as he now meditates his decision, that the world civilisation has split into two factions — the privileged world of the developed nations and the impoverished world of the developing nations. One is living a life of luxury never before experienced by man outside the proverbial Garden of Eden; the other still leads a life of misery built on poverty. Discordant voices cry out to counsel him now concerning his choice at the next crossroad.

One of the siren songs is that of the so-called establishment which counsels continuing on the road that has brought the high standard of living to the developed or privileged nations. This infers that these benefits can be extended to those in the underdeveloped world by following the same path.

A second tone cries out against the establishment and the materialistic world, even while they themselves are living as social drop-outs, social parasites in reality.

The third, and most seductive voice, is that of those extreme environmentalists who discredit science and advocate a back to nature movement. They demand the discontinuation of the use of chemical compounds — even though they are absolutely essential for protecting man against diseases, and for restoring fertility to the worn out soil so man can produce his food, and protect his crops against the ravages of weeds, diseases and insects.

Civilization as it is known today could not have evolved, nor can it survive, without an adequate food supply. Yet, food is something that is taken for granted by most world leaders, despite the fact that more than half of the population of the world is hungry and an even larger proportion malnourished.

With the help of our science we must not only increase our food supplies, but also ensure them against biological and physical catastrophes, through international efforts involving both developed and developing nations.

International granaries for food reserves financed by all nations should be established for use in case of need. These granaries should be strategically located in different geographical areas so as to simplify logis-

tics in time of emergencies. And these food reserves must be made available to all who need them — and before famine strikes, not afterwards.

Man can and must prevent the tragedy of famine in the future instead of merely trying with pious regret to salvage the human wreckage of the famine, as he has so often done in the past. We will be guilty of criminal negligence, without extenuation, if we permit future famines. Humanity cannot any longer tolerate that guilt.

The destiny of world civilization depends upon providing a decent standard of living for all mankind. It has been said that "Universal and lasting peace can be established only if it is based upon social justice. If you desire peace, cultivate justice". Almost certainly, however, the first essential component of social justice is adequate food for all mankind.

I feel that the aforementioned guiding principle must be modified to read: "If your desire peace, cultivate justice, but at the same time cultivate the fields efficiently to produce more bread; otherwise there will be no peace."

During the past five years, spectacular progress has been made in increasing wheat, rice and maize production in several of the most populous developing countries of southern Asia, where widespread famine appeared inevitable only six years ago. Most of the increase in production has resulted from increased yields of grain per hectare, a particularly important development because there is little possibility of expanding the cultivated area in the densely populated areas of Asia.

The term "Green Revolution" has been used by the popular press to describe the spectacular increase in cereal grain production during the past five years. Perhaps the term Green Revolution, as commonly used, is premature, too optimistic, or too broad in scope. Too often it seems to convey the impression of a general revolution in yields per hectare and in total production of all crops throughout vast areas comprising many countries.

These implications both oversimplify and distort the facts. The only crops which have been appreciably affected up to the present time are wheat, rice and maize. Yields of other important cereals, such as sorghums, millets and barley, have been only slightly affected; nor has there been any appreciable increase in yield or production of the pulse or legume grain crops, which are essential in the diets of cereal-consuming populations. Moreover, it must be emphasized that thus far the great increase in production has been in irrigated areas.

Nevertheless, the number of farmers, small as well as large, who are adopting the new seeds and new technology is increasing very rapidly, and the increase in numbers during the past four years has been pheno-

menal. Cereal production in the rainfed areas still remains relatively unaffected by the impact of the Green Revolution, but significant change has been made in several countries during the past three years.

Despite these qualifications, however, tremendous progress has been made in increasing cereal production in India, Pakistan and the Philippines during the past three years. Other countries that are beginning to show significant increases in production include Afghanistan, Algeria, Brazil, Ceylon, Indonesia, Israel, Iran, Kenya, Malaysia, Morocco, Thailand, Tunisia and Turkey.

Before attempting to evaluate the significance of the Green Revolution one must establish the point of view of the appraiser. The Green Revolution has entirely different meanings to most people in the affluent nations of the "privileged world" than to those in the developing nations of the "forgotten world".

Most people in industrialized societies have difficulty in comprehending and appreciating the vital significance of providing high-yielding strains of wheat, rice, maize, sorghum and millet for the people of the developing nations.

There are no miracles in agricultural production. Nor is there such a thing as a miracle variety of wheat, rice or maize which can serve as an elixir to cure all ills of a stagnant, traditional agriculture. Nevertheless, it is the Mexican dwarf wheat varieties and their newer derivatives that have been the principal catalyst which triggered off the Green Revolution.

If the high-yielding dwarf wheat and rice varieties were the catalysts that ignited the Green Revolution, then chemical fertilizer was the fuel that powered its forward thrust. The responsiveness of the high-yielding varieties has greatly increased fertilizer consumption. The new varieties not only respond to much heavier dosages of fertilizer than the old ones but are also much more efficient in its use.

The continued success of the Green Revolution will hinge, however, upon whether agriculture will be permitted to use the inputs — agricultural chemicals — including chemical fertilizers and pesticides, both absolutely necessary to cope with hunger. If agriculture is denied their use because of unwise legislation that is now being promoted by a powerful lobby group of hysterical environmentalists — who are provoking fear by predicting doom for the world through chemical poisoning — then the world will be doomed but not by chemical poisoning, but from starvation.

The current vicious, hysterical propaganda campaign against the use of agricultural chemicals, being promoted today by fear-provoking, irresponsible environmentalists, had its genesis in the best-selling "half-science, half-fiction novel" *Silent Spring*, published in 1962.

This poignant, powerful book — written by the talented scientist Rachel Carson — sowed the seeds for the propaganda whirlwind and the press, radio and television circuses that are being sponsored in the name of conservation today.

It is both sad and unfortunate that *Silent Spring* was the last book which was written by this gentle, great scientist and authoress. She had previously contributed so much to the understanding of the beauties of nature in the best-sellers *Under the Wind* and *The Sea Around Us*.

The gravest defect of *Silent Spring* was that it presented a very incomplete, inaccurate and oversimplified picture of the needs of the interrelated, worldwide, complex problems of health, food, fibre, wildlife, recreation and human population. It made no mention of the importance of chemicals such as fertilizers and pesticides for producing and protecting our food and fibre crops. Nor did it mention that by producing more food per unit of cultivated area more land would be available for other uses, including recreation and wildlife.

Certainly the greatest inexcusable error of omission was that of neglecting to mention the valuable role DDT has played in bringing malaria under control in many countries.

Silent Spring convinced the general public that the use of pesticides — and especially DDT — was upsetting the "balance of nature" and was doing great damage to wildlife, especially birds and fishes. It implied that a number of species were facing extinction because of its use.

Moreover, it left the impression that agriculture really did not need insecticides if it changed its methods. It indicated that farmers by adopting a system of extensive mono-culture, have made their crops more vulnerable to pests than necessary.

According to this expert, farmers have compounded their errors more by applying insecticides in attempting to kill insect pests and in the process have generally only killed off the predators, parasites and pathogens that normally kept the insect under control, and thereby only further upset the "balance of nature."

Moreover, according to the author, insects have invariably soon developed resistance to the insecticide. It implied that, by shifting to other suitable insect control measures already available, the losses from insects could be kept under control without chemicals.

I am in complete agreement that we should try to preserve all forms of wildlife as part of our heritage, as far as it is possible to do so. On the other hand, let us not become egotistical to the point of assuming supernatural powers. A glance at the book of rocks tells us of the impotency of many species, including man against the forces of nature. Yet it is incredible that only a few, if any, of the leaders of the current

environmentalist movement have studied palaeontology and the "parade of the species," in the geologic past.

Spencer estimates that 99 per cent of all the species that have lived, since the candle of life was first lit on the planet earth about 3.2 billion years ago, have flunked the adaptation imperative: "evolve or perish," and consequently have now become extinct.

The implied command: "evolve or perish" has been an unwritten natural law from the beginning of time. It is equally evident in the physical and biological world.

The multitude of changes in the physical features of the earth, as well as in our solar system itself, have repeatedly greatly modified the environment of the earth. Climates have changed time and again in many parts of our world. Vast areas that once possessed tropical climates have subsequently been covered by continental ice sheets. Areas that once were blessed with heavy rainfall have become deserts and vice versa. These changes in environments have, in turn, exerted strong selection pressure on the evolution of all forms of life.

There are undoubtedly many subtle changes being exerted on the environment of the planet today that are beyond the influence and control of man. Man too, however, is exerting strong influence on the environment. The composite effect of the present day selection pressure of the environment, affected both by natural and human influences, will undoubtedly continue to take its toll of some species that are poorly adapted to the current world environment.

Rhodes, Zim and Shaffer estimate that there are at present approximately 1,100,000 species of animals, many of them very simple forms, and 350,000 species of plants that currently inhabit the planet earth. Of these, the United States Fish and Wildlife Service in 1966 listed 33 species of mammals, 49 species of birds and 9 species of reptiles and amphibians, and 38 species of fish in the U.S.A., which were either rare or endangered.

In discussing the causes for reduction in numbers and possible disappearance of these 129 species, the destruction of the habitat and disturbances resulting from man's activities were paramount. Pesticides were mentioned as possible contributing factors in only two cases. In the past three or four years there has been much propaganda, but little convincing scientific evidence, put forward by environmentalists indicating that DDT has contributed to the decline of the Bald Eagle, Peregrine Falcon, American Osprey and Californian Condor.

One does not need a thin egg shell hypothesis due to DDT to explain the reduction in the population of these species. The truth of the matter is that many ornithologists had reported on the reduction in populations of these large birds of prey as far back as the

1880s and 1890s, long before the time of DDT. It is almost a foregone conclusion, for anyone who uses some common sense, that one or more of these species is about to flunk the imperative "evolve or perish." Their habitats are being destroyed by the encroachment of man.

Protective legislation alone will not, in most cases, be adequate to save them. Dynamic research, propagation and good sound game management might do so, providing human population pressures on their habitat are not too great.

Although it is generally the long-term continuing changes in the environment which exert their effects on the evolution and survival or the extinction of a species, there are many other changes in the environment that effect the more short-term "balance of nature," among the many species in a given habitat or ecosystem. These are the seasonal shifts we are concerned with in producing and protecting our crops or animals.

The cliché "in balance with nature," which is in common usage today by modern environmentalists is very misleading. It implies we would have a favourable "in balance with nature" to assure the protection of our crop species if the "balance of nature" were not upset by man. This, of course, is not true. Nor is there in existence a single "in balance with nature" ecosystem. Rather there is, within a given area, an infinite number of local and many more extensive merging ecosystems.

None of them are in static equilibrium. They are in a constant state of dynamic change, responding to the changes in the environment. At different times, the selection pressure provoking change is drought, floods, frosts, heat, insect or disease attacks, or invasion of the habitat by other species.

Early in my career as a forester working in a large primitive or wilderness area completely isolated from the influence of man, I learned of the fickleness of nature. I have seen 20 forest fires ignited by a single "dry thunder (electric) storm". Some of these fires started by lightning destroyed or damaged vast areas of several forest types (ecosystems).

In the same area I have seen tens of thousands of acres of lodgepole pine killed by *Dendroctonus* spp., infestation. The havoc done by the *Dendroctonus* beetle should not have happened according to some pseudo-ecologists, for it was, after all, a native insect pest with its entire army of natural predators, parasites and pathogens, and consequently should have been "in balance with nature".

Many times I have seen attempts made to grow cotton without the use of insecticides in the native home of the boll weevil in Mexico where all of the native predators of this insect were present. The results were disastrous.

In fact, it was difficult to tell from casual observation whether the cotton was being grown for the production of fibre to clothe man or for the production of feed for a native insect. Nevertheless, there should have been, according to our environmentalist jargon, an "in balance with nature" equilibrium.

I must also point out that modern agriculture — with 3,700 million people demanding food and fibre— has no choice but to grow extensive areas to a single crop in areas ecologically best suited to the culture of that crop. This was not true 5,000 years ago, when there was less population pressure, so that crops could be grown in small isolated fields.

It therefore becomes abundantly clear that we cannot rely on biological control alone to protect our food and fibre crops from the fickleness of nature. If we leave things to mother nature's whims, we will harvest only one third or one half of the yield per unit of cultivated area that can be harvested using a modern balanced technological package of practices.

Dr. Knipling has clearly indicated that we must, for the foreseeable future, continue to use an integrated approach to control the insect pests of man, of the crops and of the animals on which he depends. Insect control is a complex problem for there are more than 200 insects that are or have been important on our main crops, animals and forests. We will need to use an integrated approach to hold them in abeyance.

It is true that in the past few decades spectacular control of a few insect species have been obtained with biological, bio-environmental or other non-chemical methods i.e. cottony-cushion scale of citrus, the spotted alfalfa aphid and the screw-worm of livestock in Florida.

Some day it may be possible to use alternate non-chemical methods to control many of the insects responsible for the most severe crop and animal losses, but that day, if ever attainable, lies far in the future.

Today, however, conventional insecticides are needed to control 80 to 90 per cent of the insect problems affecting agriculture and public health. Meanwhile, research to find new techniques and methods, must be strengthened. Present control programmes must be designed to take advantage of the best materials and techniques available so as to reduce losses to an acceptable level.

The environmentalists would now like to have a legislative ban placed on DDT so as to prohibit it for any use in the U.S.A. Almost certainly as soon as this is achieved, these organizations will begin a worldwide propaganda barrage to have it banned everywhere. This must not be permitted to happen, until an even more effective and safer insecticide is available, for no chemical has ever done as much as DDT to improve the health, economic and social benefits of the people of the developing nations.

The World Health Organization (WHO), with the assistance of the Pan American Health Organization and the United Nations Children's Fund (UNICEF), in 1955 launched a worldwide campaign against malaria, based on spraying the interior of all houses with DDT, so as to kill the Anopheline vector and break the cycle.

Of the 124 countries and territories in the tropics where malaria has existed, the disease has been eradicated from 19. There are 48 other countries in which eradication programmes are in progress and an additional 37 where extensive control programmes are under way. There remain only 20 nations in malarial areas where no programmes have yet been initiated.

There is also dramatic evidence from Ceylon of what can happen if a programme is stopped before eradication is accomplished. When the campaign was initiated in the mid 1950s there were more than two million cases of malaria in Ceylon. By 1962 it had dropped to 31 cases and by 1963 to 17, at which point the spray programme was discontinued for budgetary reasons. By 1967 the number of cases had jumped to 3,000 and by 1968 to more than 16,000. Before the programme could be re-established, in late 1969, two million cases had reappeared.

In summarizing the progress in this world wide malaria campaign on February 2, 1971, officials of WHO made the following statement:

"More than 1,000 million people have been freed from the risk of malaria in the past 25 years, mostly thanks to DDT. This is an achievement unparalleled in the annals of public health. But even today 329 million people are being protected from malaria through DDT spraying operations for malaria control or total eradication.

"The improvement in health resulting from malaria campaigns has broken the vicious circle of poverty and disease resulting in ample economic benefits: increased production of rice (and wheat), because the labour force is able to work, and the opening up of vast areas for agricultural production.

"The safety record of DDT to man is truly remarkable. At the height of its production 400,000 tons a year were used for agriculture, forestry, public health, etc. Yet in spite of prolonged exposure by hundreds of millions of people, and the heavy occupational exposure of considerable numbers, the only confirmed cases of injury have been the result of massive accidental or suicidal swallowing of DDT. There is no evidence in man that DDT is causing cancer or genetic change."

Although more than 1,400 chemicals have been tested by WHO for use in malarial campaigns, only two have shown promise and both of these are far inferior to DDT.

As more and more scientific evidence accumulates, the charges against DDT become less and less convincing. There is evidence, of course, that man and

most species of birds, fish and animals that have been examined have small quantities of DDT and/or other related compounds such as polychlorinated bi-phenyls in their fat. But there is very little convincing evidence available to date which indicates that it is threatening the existence of any species, nor is it causing any discernible injury to man.

Part of the past confusion concerning pesticides in the environment derives from the tremendous improvements that have been made in recent years in chemical analysis. With gas chromatography it became possible to detect 1 or 2 parts per billion, or even a few parts per trillion, both of which, of course, would have gone unnoticed 20 years ago. But such sensitive methods can also detect contaminants and in the hands of inexperienced operators may lead to wrong conclusions.

A recent article by Dr. Thomas H. Jukes, a reputable biochemist, emphasizes this dilemma: "How reliable is the test? There has been a great hue and cry over alleged traces of DDT in the Antarctic penguins, amounts of the order of 1 or 2 parts per billion. I have not yet been convinced of the validity of these results."

A few months ago at the University of Wisconsin, some soil samples that had been sealed since 1910 were tested for synthetic organochlorine pesticides by the latest, most delicate gas chromatographic procedure. Several pesticides were detected in 32 of the 34 samples. The only flaw was that these pesticides not only were not used in 1910, they did not even exist until 1940.

Another complication is that the residues of a class of modern compound called polychlorinated bi-phenyls (P.C.B.'s) interfere with the DDT test. The P.C.B.'s are used in water-proofing compounds, asphalt, waxes, synthetic adhesives, hydraulic fluids, electrical apparatus and general plastics. They are widely distributed in the fat of wildlife species, in which they have originated as industrial wastes taken up by aquatic species. To sum up, P.C.B.'s are not used as pesticides, but they interfere with pesticides residue analysis and they are toxic.

Another complicating factor in identifying the origin of chlorinated hydrocarbons in human, animal, bird or fish tissue is that many thousands of tons of chemical wastes of all kinds have been and are still being dumped into the oceans. Do not some of these also get into the food chain, even if they still have not got into the "hysterical word chain"?

It is now obvious that the current aim is to ban DDT, first in the USA, and then in the world if possible. But DDT is only the first of the dominoes. But it is the toughest of all knock to out because of its excellent known contributions and safety record.

As soon as DDT is successfully banned, there will be a push for the banning of all chlorinated hydrocarbons, then in order, the organic phosphates and car-

bamate insecticides. Once the task is finished on insecticides, they will attack the weed-killers, and eventually the fungicides. As a matter of fact, by default, they have already been successful in having organic mercury seed disinfectants and slimeicides for paper-mills banned.

This ban was achieved during all of the confusion resulting from finding mercury in fish, first in fresh water species, in the Great Lakes, and rivers of the USA, and subsequently in both tuna and swordfish. The ridiculousness of some of this rhetoric came to light recently when someone analysed tuna caught 90 years ago and found it contained about the same level of mercury as those caught today.

Moreover, it has been shown that swordfish recently caught in ocean waters hundreds of miles from possible industrial contamination contained 1 to 2 p.p.m. of mercury. This indicates clearly that both tuna and swordfish are picking up the low levels of mercury from the ocean food chains, of which this metal has always been a part.

If the use of pesticides in the USA were to be completely banned, crop losses would probably soar to 50 per cent and food prices would increase 4 to 5 fold. Who then would provide for the food needs of the low income groups? Certainly not the privileged environmentalists.

Within the past decade, because of the improved technology and higher yields, it has been possible to remove 50 million acres from cultivation and still meet both the domestic and export needs for agricultural products. Were the USA still relying on the 1940 technology, however, not only would the 50 million acres now held in reserve be back under the plough, but an additional area of 241.9 million acres by necessity would have been opened to cultivation. In reality it would require considerably more than 241.9 million acres of additional land since the quality of the land would be poorer than that now in cultivation.

In order to bring under cultivation an additional 241.9 million acres (and perhaps considerably more because of the poorer land quality) it would be necessary to open to cultivation lands that were in large part rolling or semi-arid, and consequently vulnerable to erosion by water and wind.

It would also require clearing the forests from large areas so as to meet the food, oil and fibre needs of the nation. Now reflect on the additional havoc that this expansion of cultivated area would do to wildlife habitat, and especially on rare and endangered species of animals and birds that are already on the brink of extinction.

Looking at it from another angle 291.9 million acres of land, an area roughly equivalent to the total land area of the USA east of the Mississippi river and south of the Ohio river, is today available for other uses, because of the improvements in crop production

technology that have taken place in the past 30 years. These uses include recreation, wildlife and forestry.

It behoves all mankind to increase the efficiency of agriculture throughout the world if we wish to alleviate human suffering, conserve wildlife and improve recreational opportunities. Unless the food production of East Africa is expanded to meet the growing food needs, the large animals in the Game Reserves of East Africa will be poached out of existence within the next three decades. Similarly, the elephant, tiger, and peacock will perish from India because of population pressure.

It is hard to understand why the conservation organisations and environmentalists have taken a negative rather than positive view in trying to protect wildlife. Why have they not promoted research and fought for more funds for game management in general? Why have they not fought for more funds for research so that qualified scientists can be assigned to study the reasons why certain threatened species are on the verge of extinction, and whether it is feasible to try to save them?

Why do they not spend more of their energies and funds on educating the public on the adverse effects of population pressure and rampant population growth on wildlife and the environment? How many of the US public, for example, know that more than 100,000 deer are killed each year by automobiles, whereas everyone is informed in the press or television whenever a few birds or fish are found dead, presumably — but this is not necessarily proven — from a pesticides?

Imagine the rhetoric that would be produced if 100,000 deer were killed by a pesticide.

I have been a great admirer of the splendid work that has been done by game management experts in the USA in re-establishing species, such as the wild turkey, that were nearly extinct. Under wise management and protection many other species of wildlife have made spectacular comebacks. The tremendous success of the introduction of the Chinese ring-neck pheasant, the Hungarian and Chukkar partridge, are other tremendous accomplishments. The research that has brought under control the lamprey, that threatened the survival of the lake trout is another tremendous achievement; so is the introduction of Coho salmon into Lake Michigan and Lake Superior. The breeding of faster growing and more sturdy salmon is another tremendous step forward.

I repeat what I have said many times before: without thinking, conservationists and environmentalists and only partially-informed people in the communications media have embarked on a crusade designed to end the use of agricultural chemicals, such as pesticides and fertilisers. They give no thought to the end result of such action: the eventual starvation and political chaos that will plague the world.