

ARE PESTICIDES NECESSARY?

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I am pleased to participate in this 55th Annual Convention of the National Pest Control Association. I am, moreover, especially delighted to participate with Dr. Elizabeth Whelan in this session: Are Pesticides Necessary? Dr. Whelan is a scientist with outstanding credentials in the broad inter-related fields of: nutrition, food, and public health. For more than a decade she has spent her great talents and energies attempting to bring some reason and common sense into the highly charged emotional issues of the use of chemicals in the food system and in the environment in the U.S.A. Her ability both as a writer and as an effective spokeswoman at conventions, on radio and television has already done much to correct misinformation and deflate exaggeration in some of the "gloom and doom" food-health-environmental issues.

In my presentation I will attempt to focus my remarks from two different points of view. First, as one of the oldest participants (in age) in this Convention, I will try to convey to you what life was like in rural U.S.A. during "the good old days" -- some six to seven decades ago -- before the improvements in medicine and the introduction of modern public health programs and before the availability and use of agricultural chemicals, whose collective benefits are taken for granted by most Americans at present. Second, I will attempt to convey to you some of my experiences during 44 years of living and working in food deficit developing nations in Latin America, Asia, and Africa. Most of these countries are still largely living in "the

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good old days of pre-genetics, pre-plant breeding and pre-agricultural chemicals" with either rachitic or non-existent medical and public health programs, resulting in low crop yields where food shortages, hunger, malnutrition, widespread human diseases, poverty and human misery are the norm.

I am convinced that much of the heated debate that beclouds the basic problems that confront the future progress of mankind in health, agriculture and food, energy and environmental areas are based more on emotionalism and fear of change, rather than on differences in the interpretation of the scientific information available now or at any given point in time. The emotional debates result largely from the fact that for many, maintaining status quo -- with it's accompanying comfort of the known -- is preferred to change with the associated risks of the unknown. Nevertheless, in the real biological world, when the scientific evidence justifies, we must accept certain risk associated with the changes in technology which are required to produce the goods required for a large and rapidly growing world population. It should be self-evident, although it is ignored by many, that the technological methods of the pre-chemical 1930's, which were adequate to produce the goods for a world population of 2 billion, are completely inadequate to meet the needs of the present world population of 5.1 billion. Nor will current production technology be adequate to meet the needs of the year 2010, when world population will be approximately 7 billion. Change we must or human progress will cease and world civilization will collapse.

I believe that reluctance to change -- the fear of the unknown -- and a pact with continuation of status quo mode of life is a common human phenomena. Surprisingly, however, I have found that the peasant third-world subsistence farmer, who is generally accused of being ultra-conservative and unwilling to

change his production methods, is very receptive to accepting new production technology. But he will not accept technology until it has been demonstrated on his or a neighbors farm, as being capable of increasing yield by 100 to 200 percent with reasonable levels of risk, and providing the production inputs such as fertilizer and improved seed are available, as well as credit to buy them before planting and pay for them at harvest. Moreover, before he will change, the government must announce before time of planting that he will receive at harvest a price for his grain approximately that of the international market price, rather than half that price as has been customary under most third-world government "cheap food" price policies. When these conditions have been met I have seen millions of small farmers cast aside the old methods, enthusiastically adopt the new so as to increase their family income and in the process greatly increase their nations food supply.

What is more difficult for me to comprehend and accept is how the apparently small group of anti-science and anti-technology activists in the U.S.A., who are enjoying a high standard of living, in a large part, because of the contributions of chemistry and agriculture, have gained such power. With their propaganda programs of "gloom and doom", they provoke fear among the general public and some political leaders and by so doing are attempting to turn back the technological time clock fifty years to the detriment of the nation. What is worse is that their anti-science, anti-chemistry tirades all too often frighten leaders in third-world nations and make them reluctant to accept improved agricultural production technology -- including the proper use of chemical fertilizer and pesticides -- which is essential to revolutionize food production and mitigate hunger for their people.

The Beginning

At a time such as the present when the values, methods and contributions of science and technology are being questioned it may be well to briefly reflect on the rate of human progress before and after the advent of science.

Homo sapiens and his near relatives were "latecomers" to the planet. Relating the date of his appearance on an imaginary 24 hour dial of the five-billion-year geological clock of the planet Earth, he seems to have appeared at somewhere between 1 to 2 minutes before midnight, a mere 3 to 6 million years ago. For our purposes, let us also accept the opinion of those archaeologists and anthropologists who say that man has roamed the earth as a hunter and gathers for at least 3 million years. Until very recently, he was undoubtedly a marginal or weak secondary species. Some of the dominant species that were present when man appeared had seen many more formidable species flourish briefly and then succumb to nature's demanding imperative, "Evolve and adapt, or perish". More perished than adapted. Untold millions of species had flunked the biological imperative before the appearance of man, and many since. Some of the extinct have left their direct imprint to posterity in the book of fossil rocks which is read and interpreted by, geologists, archaeologists and anthropologists. Indirectly, but more importantly, some of them have also left their imprint in the deoxyribonucleic acid (DNA) in the gene pool of related surviving species.

Early man must have looked like another of the species that would soon become extinct. He was physically unsuited to survive in a hostile environment. He was unprepared to protect himself from the adversities of climate and from the stronger, better equipped predators. He survived as a hunter, gatherer and fisherman with little control over his food supply. He had no protection against diseases and parasites except for the innate. And,

finally, he was helpless, or nearly helpless, against the onslaught of stronger predators for about one-third of his life span. He would have been a deserving candidate, at that time, for inclusion on the endangered species list of modern environmentalists and neocologists.

The one characteristic that undoubtedly saved man from extinction was his brain power -- his ability to reason, invent and learn -- which set him apart from all other species. Nevertheless, because of his weaknesses, and the many hazards to survival, infant mortality must have been staggering. Man must have hovered on the brink of extinction many times during the first million years. Is there any wonder, then, that he heeded the biological commandment "Be fruitful and multiply", which was essential for survival during most of the first 3 million years. That survival creed, subsequently, became incorporated much later into all of the world's major religions, and persists to an exaggerated degree today, resulting in the explosive population growth which is adversely affecting the standards of living of many countries of the world.

It was not until some 10,000 to 12,000 years ago that agriculture and the domestication of animals came into being. A more stable and abundant food supply permitted man to change to a sedentary way of life in villages. This way of life was conducive to the development of specialized talents and so crafts, and arts and trade developed; more opportunity for training and teaching the young also resulted. Villages grew to towns and towns to cities and trade between towns and cities flourished. But there were negative effects of village and city life as well. Storage of grain brought rodents-- rats and mice -- and their parasites which were sometimes vectors of serious human epidemic diseases. Since there were no rodenticides then, man countered by domesticating cats to keep the rodents in check. In Egypt their

contributions to the well-being of the society was so great that they were deified. But concentrations of people in towns and cities under poor sanitary conditions (pollution from garbage, human and animal waste, flies, mosquitoes, cockroaches, rats and mice, etc.) gave rise to repeated disease epidemics, some of which were vector transmitted, e.g. bubonic plague and typhus -- and heavy loss of life; but there was neither knowledge of the true cause of the diseases nor, in those early times, was there effective medicines or "pesticides" to control the epidemics. As indicated in the Old Testament, there were sometimes severe locust plagues, and outbreaks of mildew and rust that destroyed the crops -- and the only hope of protection against losses was by supplication for assistance from the benevolent Almighty.

It was not until the middle of the 1800's that mankind began to understand the many causes of human, animal and crop diseases. Considerably later he began to get some insight into the nature of genetic variation and how it might be used to reduce the vulnerability of his crops to diseases. By the middle of 1800's man had at last created several pesticides, to protect his crops, among them sulfur and bordeaux mixture (copper) to mitigate losses from diseases of grapes and late blight of the potato.

Progress in developing better controls for human, animal and plant diseases made slow but steady progress, much of it based on better sanitation, during the last two decades of the nineteenth century and the first two decades of the twentieth century.

The big improvement in control of human, animal and plant diseases and pests has taken place since World War II. It is the result of the development of improved vaccines for many human and animal viral diseases, and antibiotics and other highly effective drugs (medicines) to bring under control many

bacterial and Rickettsial caused diseases, combined with better public health programs.

The effect of the rapid improvements in control of infectious human diseases since 1940 combined with better nutrition, and sanitation has drastically reduced death rate, greatly extended life expectancy at birth in many nations, resulting in explosive increase in world population growth, much of it in third-world food deficit developing nations.

Fortunately, the evolution of the animal and plant sciences and the development of improved production technologies in both of these fields has more than kept pace since 1940 with population growth and demand for food on a worldwide basis. There have been worsening deficits in food production in some third-world countries, especially in Africa. On the other hand, there have been spectacular increases in wheat, rice and maize production in a number of countries in Asia, such as China, India, Indonesia, Pakistan, Philippines, Thailand, and Turkey, where two decades ago some world recognized authorities predicted disaster. Similarly, there have been impressive increases in production of cereals in Argentina, Brazil, Chile and Mexico, and spectacular increases in soybean production in Argentina and Brazil. I have had the good fortune and wonderful experience of being involved: in developing the research and package of production technology; in demonstrating its value on thousands of farms; and in encouraging the linkage of the new production technology with changes in government economic policies which has permitted millions of small farmers to adopt the new technology. The results have given rise to the So-called Green Revolution in which I have had the pleasure of seeing a number of food deficit countries double, triple or quadruple wheat (and rice) production and become self sufficient in cereal

production. This could not have been achieved without the judicious use of agricultural chemicals -- fertilizers, herbicides, and insecticides.

Taking the Benefits of Agricultural Science and Technology for Granted.

Five years ago when I returned home to reside in the U.S.A. for part of an academic year, after living and working abroad in low-income, food deficit developing nations for forty years, I experienced a severe cultural shock in reverse.

It appeared to me then, as it still does now, that our nation was experiencing a curious case of schizophrenia when relating the contributions of science and technology which have resulted in extraordinary improvements in health, agriculture, food, energy, clothing, housing, transportation, communications, recreation and industrial development -- all of which contribute to the high standard of living enjoyed by most Americans today.

On one side, well-organized, noisy consumer activist groups, aided by a few self-serving cassandra-type scientists, reinforced by extremists in the environmentalist movement, appear to be surprisingly effective at preaching a gospel of "toxic terrorism" predicting the forthcoming "gloom and doom" of a global apocalypse.

Through fear they are convincing many people and indeed some political leaders, that American is on the verge of being poisoned out of existence. Our current predicament, according to these activists is the direct result of the reckless production and distribution of thousands of new unnecessary toxic, carcinogenic, mutagenic and teratogenic chemical compounds that are being synthesized, manufactured, and sold each year by an irresponsible chemical industry -- an industry that is only concerned with economic profit with no regard for public health. According to these alarmists, our water,

food and air are being poisoned, slowly but certainly and our health, well-being and very existence is in jeopardy.

The promoters of toxic terrorism seem to imply that we must go back to the farming and food production methods of "the good old days" of the early 1930s, before the use of chemical fertilizers, pesticides, plastics, and synthetic fibers came into being. In "those good old days", world population was 2 billion, whereas today is 5.1 billion, and growing at the rate of 84 million more per year. One hears little or nothing constructive from these groups about what is to be done to provide for the basic needs of the 3.1 billion additional people in the world population since 1930. It should be obvious to all Americans that the U.S.A. is today, like it or not, but one of about 165 independent but increasingly interdependent nations of the planet earth. What happen economically, socially and politically in other countries has direct repercussions in the U.S.A. and vice versa, as our economies become ever more intertwined.

Now let us look at the other side of these issues. It appears to me that most Americans are relatively well-satisfied with the substantial -- if not truly impressive -- improvements in the standard of living that have occurred in the U.S.A. over the past three to four decades; improvements which in large part are attributable to the sound, rational use of applied science and improved technology. Certainly the condition of health, productivity of its agriculture and standard of living of people of the Mid-West -- despite depressed agricultural prices for the past four years and despite last years severe drought -- is far superior to what I knew in rural Iowa and Minnesota in the 1920's and 1930's.

The U.S.A. is today largely an industrial, commercial, financial, and professional society with only about 2-percent of the active labor force

engaged in agricultural production. Consequently, at present, most Americans have lost contact with the soil and since we are notoriously neglectful and weak in history they fail to realize the important role that science and technology played in transforming and increasing food and fiber production in the U.S.A. over the last fifty-five years. If they fail to understand what has made American agriculture the most productive in the world it is not surprising that they are bewildered by the reasons for the lack of agricultural productivity and economic progress and the resulting famines in the food-deficit nations in Africa at present. Even worse, their lack of knowledge of the contributions of chemicals to the revolution in American agricultural production over the last four decades makes them vulnerable to the anti-chemical propoganda of the consumer and environmental activists. The ignorance of the general public of the contributions of chemistry to the American economy and standard of living is appalling. Something must be wrong with the curriculum of study in high school and the first two years of college that permits this ignorance to persist.

A brief glance at what has happened to production in American agriculture over the last five decades is relevant to the issue of hunger, poverty, famine -- and toxic terrorism. The development and widespread use of improved production technology in the United States -- including the use of high-yielding crop varieties, chemical fertilizers, herbicides, insecticides and fungicides -- combines with stimulatory economic policy which encouraged the widespread adoption of the new technology, has revolutionized agricultural yields and production in America. For example, in the U.S.A., as a result of the widespread use of improved production technology and good management, the combined output of the seventeen most important food, feed, and fiber crops, which averaged 252 million metric tons in the 1938-40 period, reached 610

million metric tons in 1978-80, with an increase of only 3 percent in cultivated area. Had our country tried to achieve the 1980 production employing the yield and technology of 1940 it would have required the cultivation of an additional 437 million acres of land. This additional area corresponds to the land area of all of the states east of the Mississippi minus that of the states of Michigan, Wisconsin and Illinois. It becomes clear from this data that improved technology resulting in higher yields is a substitute for land area.

Agricultural chemicals played a dominant role in increasing yield and production. Had the yields of 1938-40 persisted, in order to have produced the 1978-80 harvest, it would have been necessary either to have plowed up approximately 73 percent of America's permanent pasture and grazing lands or to have converted 61 percent of the forest and woodland to cropland. In actuality, since many of these lands have much lower productive potential than the land now under cultivation -- and are also more vulnerable to erosion-- it really would have been necessary to convert a much larger percentage of the pasture land, or forest and woodland, to crop land than is indicated. Were this to have happened, land for many other uses -- including recreation, wildlife habitat, forestry and urbanization, -- would have been lost.

These data serve as a clear rebuttal to those anti-science, anti-chemical, and anti-technology, activists who, understandably, want to enjoy the good life -- including having access to vast areas for recreation, including wilderness and areas for wildlife habitat. More over as a result of the development and widespread use of high-yield production technology the United States has become the largest producer and largest exporter of food in the world. Domestically, as a result of the combined effort of farmers, ranchers, food processors and the entire food system, the American consumers,

including the anti-chemical activists, have at their disposal the most diverse, best quality, most inexpensive food supply the world has ever known.

As an agricultural scientist I know that this abundance is in large part the result of skillful management involving the proper use of agricultural chemicals, high-yielding crop varieties, and sound agronomic practices. Without the availability and proper use of chemical fertilizers, herbicides, insecticides, and fungicides the worldwide growing demands for food cannot be met, and devastating social, economic and political chaos is inevitable. And the U.S.A. will be unable to isolate itself, for long, from this pending chaos because of its dependence on imports of vast amounts of petroleum and minerals from abroad to keep its factories running, and vast quantities of tropical agricultural products to satisfy domestic consumer demands.

For the past decade, Americans have been in the grip of a virulent strain of "chemical-phobia". Many people seem convinced that an array of sinister, industrially-produced chemicals have invaded their air, water, home and even their muffin mix. Anxiety-provoking stories abound on everything from pesticides such as ethylene dibromide (EDB), or lead arsenate in grapefruit, chlorinated hydrocarbons, to industrial chemicals like formaldehyde and PSCs. Self-appointed representatives of the public have demanded bannings or severe restrictions on agricultural and industrial chemicals -- all out of concern that our health is in jeopardy. The insanity of the infamous California Proposition 65 is a classic example of the result when such fears are allowed to run wild.

Ironically, self-styled health activists foment fear about industrial chemicals which appear in trace amounts around us, and cause no known hazard to health, while ignoring some of the real health risks of today. For instance, some 500,000 Americans die each year as a direct result of cigarette

smoking. Some 125,000 Americans die from an inadequate control of elevated blood pressure and an additional 30,000 will die as a result of reckless driving, including not wearing seatbelts. Moreover, we as a nation have become the largest consumer of illegal drugs -- ranging from marijuana to cocaine to crack. Apparently many are bored with the monotony of "the good life" and seek escape to the "dream world" by the use of drugs, without concern for the danger of poisoning or carcinogenic, mutagenic or teratogenic effects.

Yet curiously, our nation's toxic terrorists seem unconcerned about these real health risks and instead wish to focus our attention on those insignificant and hypothetical risks. They never mention that many of our foods -- vegetables, fruits, fibers and grains -- which have been consumed by mankind from the dawn of civilization, contain a large number of naturally-occurring compounds, which when evaluated at high dosages in rodents are also found to be toxic, carcinogenic, mutagenic, or teratogenic. Forty years ago we were unaware of their existence in our natural foods, but greatly improved and more sensitive analytical procedures now available which can measure a fraction of a part per billion have established their presence. They are, however, present at such low levels that no serious health hazard results.

Ironically, while the doom-sayers decry the deterioration of our health from industrial chemicals, including pesticides, the official medical statistics indicate we are enjoying a longer, healthier life than any previous generations. In 1900, the U.S. life expectancy at birth for the total population was 47.3 years, with the male and female life expectancy at birth 46.3 and 48.3 years respectively. By 1940, life expectancy at birth had increased to 63.6 years for the total population with 60.8 and 65.2 years for male and female respectively. By 1985, life expectancy for the entire

populations had increased to 74.7 years with the male and female life expectancy reaching 70.8 and 78.2 respectively. It seems that some health activists are so imbrued with the present day "good life" that they appear to believe that man can become immortal, if we simply removed pollutants from the environment and have better health care. Oh, were it so simple. They do not want to recognize that there is a biologic time clock in all species, and in all individuals. Man is blessed with having one of the greatest life spans (longevity) of any animal species. The greatest age attained to date (based on reliable birth certificates) is 116 years. However, as the result of better nutrition, better medical care, adequate exercise and life styles more conducive to better health, more and more individuals are living out a greater proportion of the potential genetic hand of longevity that they were dealt at the second they were conceived when they received their genetic cards from their parents, grandparents and great-grandparents, etc.

As I look toward the future I become apprehensive about the rate of population growth and the worlds ability (or inability) to provide the basic necessities for a decent life to all who come on the stage of life. In 1930 world population reached 2 billion. It took until 1960 -- 30 years to add the 3rd billion. The 4th billion was added in 15 years, being reached in 1975. By early 1987 -- in 12 years -- the 5th billion had been added. In all probability the sixth billion will be added in 12 years -- or will be reached in 1999.

Those of use who work on the food production front, I believe, have the moral obligation to warn the political, religious and educational leaders of the world of magnitude and seriousness of the arable land, food and population problems that loom ahead. If we fail to do so in a forthright, unemotional manner, we will be negligent of our duty and inadvertently contribute to the

pending chaos of incalculable millions of deaths by starvation. The imminence of the disaster is before us. It is closer than most people realize, or are prepared to admit. The problem will not vanish automatically; to continue to ignore it will make its solution ultimately more difficult.

We must educate the public to realize that producing more food and fibre and protecting the environment can, at best, be only a holding operation while the population monster is being tamed. In recent years, the "human rights" issue has generated much interest and debate around the world. It is a utopian issue and a noble goal to work toward. Nevertheless, in the real world, the attainment of human rights in the fullest sense cannot be achieved as long as hundreds of millions of poverty stricken people lack the basic necessities for life. The right to dissent does not mean much to a person with an empty stomach, a shirtless back, a roofless dwelling, the frustrations and fear of unemployment and poverty, the lack of education and opportunity, and the pain, misery and loneliness of sickness without medical care. It is my belief that all who are born into the world have the moral right to the basic ingredients for a decent, human life. However, to speak glibly and sanctimoniously about the morality of the "right to life", while ignoring the morality of the "quality of human life", only adds confusion to this fundamental complex issue.

A solution to this complex problem is imperative. Why does mankind continue to inadvertently and irresponsibly try to see how many additional people can be "heaped" onto the planet earth? Why do we continue to apparently always believe that future, newer and better technologies will expand the carrying capacity of our planet, while at the same time assure an improving standard of living for all? It appears to me that we are behaving in a most irrational and irresponsible manner. Our behavior implies that when

we can no longer provide the good life for the ever-increasing number of people on the planet earth, we will always be able, at the appropriate time, to dispatch the excess numbers to colonize beautiful, hospitable virgin planets in other solar systems in outer space.

In Conclusion

Despite all of today's "gloom to doom", we live a longer and better life than all previous generations. I believe that constructive work is the best medicine God ever gave to man and that you can't win in any athletic game with negativism -- much less so in the most important game of all -- the game of life! Let us not become complacent! I am convinced that Thomas Jefferson was thinking of this as he reflected on the decadence of past civilizations when he said: "Ease and security, were these the drugs that abated the eternal challenge in the minds of men? And did nations, like men, grow sluggish and apathetic when they were well-fed and bodily comfortable?"

If we surrender leadership to the anti-science, anti-technology activist movement, the U.S.A. will soon be on its way to becoming a second class nation, to the detriment of people everywhere.

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