SELECTED RURAL KANSAS SCHOOL BOARD MEMBER ATTITUDES TOWARD ECOLOGY

by

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CHAPTER I

BACKGROUND

I. Introduction

Some millions of years (or thousands would be more accurate if the Biblical seven days is accepted) a very special planet was formed by some supreme being. This planet's amount of rainfall, atmospheric composition and pressure, temperature, soil composition and texture, plus many other features, produced conditions which were favorable for growth, development, and evolution of organisms. Tremendous upheavals caused land of an uneven terrain to appear above the surface of the seas. In and at the edge of the sea life began to form. Soon, in a matter of X million years, there were multi-cellular plants in the water and on the land. Then reptiles, fishes, birds, and warm blooded quadrupeds began to roam this vast expanse in search of food. Now the planet Earth was ready to receive that organism who would eventually control the environment of this planet (31).

This new organism, homo sapiens, was granted the dubious distinction of being the only occupant of the planet earth who could reproduce himself at a greater than zero population ratio for an extended period of time. At first this seemed to present no serious problem; it took an estimated one million years for the human population to go from 2,500,000 to 5,000,000. The process of natural selection, culture, and man's swollen head had just begun (11). The next doubling took 1,000 years, then 200, then 80, and it is estimated that the next doubling will take 37 years.

The process of natural selection was primarily responsible for the original slow growth of the species. The bigger, healthier, more aggressive, and more sexual specimens survived. At a much later date the cultural revolution occurred. Culture may be defined as the body of nongenetic information which is passed from generation to generation (11). As the volume of this culture increased, a larger brain was needed to store this information. This indirectly led to man's becoming a tiller of soil. A large head could not be pushed through a woman's pelvis so a very immature child must be born. The helplessness of the offspring necessitated the immobility of the mother for a long period of time, so a family unit where father, mother and child remained rather static in physical location was needed.

When the agricultural revolution commenced about 8,000 years ago, the world environment began to deteriorate. The natural environmental plan was a multi-cultural one where many types of flora and fauna grew together in a state of mutual helpfulness. In place of this, man has substituted a monoculture where acre after acre of one type of plant exists. All other species are carefully exterminated (14). Also, when man became agrarian in culture a more secure existence resulted and the human population grew rapidly. This rate of increase remained rather static until the industrial revolution in the early 1800's dramatically improved the living standards in the developed countries. This in turn gave rise to a further acceleration in population growth. The potential death of the planet earth was sounded in the 20th century when the development of medical science drastically reduced the death rate. A zero population growth results when the death rate and the birth rate of a society are the same. Either raising the birth rate or lowering the death rate will increase the population.

Modern science and its resulting technology have produced awe-inspiring and devastating results. Men have been placed on the moon; motion pictures in color have been transmitted from the lunar surface; unmanned spacecraft have sent back recorded data from the adjoining planets; the mystery of the atom has been partially solved; and man has it nearly in his power to destroy his place of habitation. He has built computers whose electronic brains can perform mathematical miracles and he has been able to produce life in a test tube. Conversely, he has produced synthetic materials that cannot be recycled, internal combustion engines which pollute entire continents, pesticides which threaten the life cycle of penguins ten thousand miles from the point of origin, and chemicals which can destroy the mind. Man has become the "master of his destiny" and quite probably his own executioner.

The threatening vision of pollution is a multi-headed monster. Air pollution is visible above and around all of the large cities. The Corps of Engineers has swept twenty million feet of floating debris from New York Harbor at a cost of ten million dollars (7). The Hudson River is in a more deplorable condition. Noise pollution is above the safety zone of 85 decibels in most major cities. There is evidence that noise can alter endocrine, cardiovascular and neurological functions (6). Dr. E. D. Eckhoff, Department of Nuclear Physics, Kansas State University, and other environmental authorities agree that overpopulation is the most critical factor in the battle for survival. Estimates of maximum population vary widely from 2.8 billion, already surpassed, to Harrison Brown's figure of 50 billion, which could be reached within 50 years (28). At the present time two billion people are undernourished. Even within the United States there is hunger. Dr. Arnold Schaefer's survey showed that "20% of 12,000 poor people in

Texas, Louisiana, New York, and Kentucky were so malnourished that they deserved immediate medical attention" (20). It seems very improbable that we can more than double our food production. There is a reason for most untilled soil: lack of water, bad soil, or bad climate. All flat land can not be farmed. Soils in most tropical areas are extremely poor. Also, the notion that we can get vast amounts of food from the sea is erroneous (11, p. 40).

Until the last decade only a few dedicated conservationists and naturalists were aware of our impending danger. Even during the sixties, man pursued his road to destruction. There continued to be more cars, more pesticides, more noise, and more people. A few concerned, dedicated, and informed people tried to alert the general public but with little success. Philip Appleton's The Silent Explosion, Rachel Carson's Silent Spring, Arthur Hopcraft's Born to Hunger, Fairfield Osborn's Our Plundered Planet, Robert Reinow's Moment in the Sun, and Robert L. Rudd's Pesticides and the Living Landscape were a few of the publications that sought to warn us. Arthur Godfrey admonished his listening public daily over his CBS morning variety show; many universities were collecting, recording and reporting data; but the average citizen paid scant heed to the warnings.

Many of our concerned and informed environmentalists are warning us that the tide of environmental deterioration must be turned in this decade or it will be too late. It is recognized as a general truth that trends cannot be reversed once that have reached a certain point. The exact point of no return is unknown. Even the most educated opinions are only calculated guesses.

The situation has improved during the past five years. The automotive

industry has made definite progress in lowering the rate of pollution and Charles M. Heiman, Chrysler's pollution control expert, states that by 1980 the air quality will be comparable to the 1940's. The average cost to the consumer will run about $300 per car (34). The Census Bureau has released figures that show that American wives expect to have smaller families. In a survey taken in June of 1970, wives of childbearing age, 18 to 39 years, expected to have an average of 2.8 children; this compared favorably with a 3.1 figure on a similar report taken in 1967 (37, p. 1). Lear Corporation has finally produced a usable steam motor. DDT and other chlorinated hydrocarbons have been banned in some states. A U. C. L. A. professor in engineering has developed a new kind of slate and tile for home use by combining two proliferating waste products--old glass bottles and sludge from human wastes (8). Machines for compressing garbage are now on the market. Some of them can compress at a ratio of 5:1 or better (35). The housewife is getting washroom products which have a much lower phosphate percentage.

But the battle is far from won. Every country where data was taken had more people at the end of 1971 than they did at the end of 1970 (31). India, which is offering rewards for small families, free sterilization and government instruction on the use of contraceptives, is still losing the population battle. Valid tests show that both air and water pollution are constantly becoming worse. The "have" countries continue to deplete their natural resources at an alarming rate, while in the "have not" countries more children die of malnutrition every year. Starvation-1975 could become a reality!

Dictatorships and absolute monarchies could order sterilization if necessary; they could decree a ban on internal combustion engines; and they could issue a mandate against non-biodegradable pesticides and herbicides.

They could keep citizens from driving their cars to work. But in a representative form of government the people must be educated to preserve their birthrights. The United States has attempted to legislate morals (note the 18th Amendment), but with little success. The desire of the people for survival must be made strong.

II. Statement of the Problem

It is generally agreed that in a democracy several things must happen before the people will take definite and positive action. First, they must be made aware that a problem exists. This may be done in several ways: by personal observation, by the mass media, and by either formal or informal instruction. Schools are the ideal instruction centers, but several conditions must be met before they may be used to project new or unusual information. Next, the people must be made aware of their part in solving the problem, and they must be willing to make the adjustments necessary to accomplish this end. For the crises to be successfully met, all areas and all peoples must become involved even if their immediate environment does not seem endangered. Rural Northeast Kansas may be complacent because serious signs of pollution are not readily apparent. This research will determine if the conditions for reversing environmental deterioration exist in Northeast Kansas at this time. The specific goals of this survey were the following:

1. To determine if rural school board members of Northeast Kansas schools are aware of the various factors that are contributing to the environmental deterioration of the planet earth.
2. To discover the extent to which rural school board members of this area are personally reacting to those environmental factors

over which they have some degree of immediate control.

3. To survey the desires of some rural school board members concerning the introduction of ecological material, either as a separate subject or as an enrichment to existing subject areas, into curricula at either the elementary, secondary, or college levels.
4. To determine if the amount of education possessed is related to the response to any or all of the above sections.

III. Definition of Terms

Ecology: is defined as the relationship of an organism to its environment. For the purpose of this study, man will be considered the relating organism. Although homo sapiens is one of the last organisms to enter this planet, he has altered the environmental picture more than all other plants and animals.

Environmental deterioration: is the sum composite of all the adverse changes that have affected the development of the organisms on the planet earth since the dawn of recorded history, and would specifically include air, water, and noise pollution as well as the depletion of the natural resources including not only mineral but also plant and animal.

Power: is the capacity to exert physical force or energy. This force or energy is needed to move automobiles, heat buildings, and place space stations in orbit. Total power is the composite of the forces needed to make our complex modern society function.

Biodegradable: indicates that a substance is capable of being

readily decomposed by biological means into chemically inert substances which are unharmful to plants, animals, and minerals. For the purposes of this study, a substance is biodegradable if it reaches the above conditions within one year.

Scarce predators: includes all members of the animal kingdom who depend upon hunting and killing other animals for their source of food and who have suffered a minus zero population growth for an extended period of time. These animals are in danger of becoming extinct.

Organic farming: is defined as the business of operating an agricultural venture where some member or members of the vegetable kingdom are produced without the use of commercial chemicals. This would include primarily fertilizers, herbicides, and pesticides.

Clean power source: is one which does not pollute in any manner directly or indirectly. Water power is the only source currently available in quantity which fulfills the above requirement.

IV. Limitation of the Study

While a complete environmental analysis of all rural persons would be of value to the students of ecology, time, money and resources have made such an ambitious survey impossible. Therefore the survey was limited by geographical area, classification of persons interviewed, and specifically by community involvement:

a. Occupation: only persons whose families were currently actively engaged in agricultural pursuits were asked to answer the questionnaire.

b. Residence: only persons actually living on farms were considered.

c. Area: no farmers living further than 60 miles from Frankfort, Kansas, were asked to cooperate.

d. Community involvement: school board members were used as a sampling. This yielded from two to five interested and involved persons from each immediate area.

CHAPTER II

REVIEW OF THE LITERATURE

Since 1960 much has been said and written about ecological aspects of the environment. Unfortunately many of the most widely read works on the subject have been written from a biased viewpoint. They have been supported by research but often little was reported that did not agree with the author's viewpoints. Within the past five years there has been valid research reported.

The problem of environmental deterioration resolves itself into three general fields: first, the part that population increase plays in the ecological picture and the demand that more people place on the potential productivity of the world; second, the need to reduce the rate and total volume of pollution of all kinds. There has been excessive and often unnecessary pollution of the air, water, and soil. This has been caused in part by industrial wastes, agri-related chemicals, and power by-products. Finally, the present and future needs and sources of power must be considered.

A review of literature can give a more intelligent and accurate conception of what has been done, is being accomplished, and may be done to resolve the problem. All aspects of the issue should be carefully considered.

I. The Population Explosion and its Relation to Production

The population of the United States increased from 179 million in 1960 to 203 million in 1970. During this period the life expectancy has increased from 69.7 to 70.2 years for the total population. The average family size has dropped from 3.61 to 3.54 children in white families and from 4.39 to 4.32 in blacks (3, p. 11-20). The Bureau of the Census further notes that women with less than eight years schooling have 2.6 children, while women with college degrees have less than 1.5 per person. Negro women are still more fertile than whites; there are still more babies per family born in non-metropolitan areas than in cities; and the North-Central is now the most fertile section of the country (12, p. 1-3). There are 3,000 white, 3,800 Negro and 4,600 Mexican children per thousand. Only Negroes report a significant inverse relationship between income and births (13, cover). In 1970 there were 3,718,000 births (18.2 per 1,000). This was 4% more than for 1969, and was due to more women of childbearing age. The death rate was 9.4 per 1,000 which resulted in a natural increase of 8.8 per 1,000 (25, p. 1). It is encouraging to note that younger wives expect to have significantly fewer children than do older women. The 14 to 24 age group expect to have 2.8 children, while the 30-39 year olds plan on 3.3 children per family. The younger Negro wife expects to have about the same size family as does her white counterpart (33, p. 38-39). But despite this the United States Department of Commerce predicts that there will be between 307 and 447 million people in the United States by the year 2020. The smaller figure is based on a birthrate of 2.11, while the maximum would be achieved by a birthrate of 3.1 (29, p. 1).

These figures and TABLES 1 and 2 in the appendix show that statis-

ticians see no indication that the population of the United States will level off in the near future. This despite the fact that the U. S. population is increasing at less than 1% per year, while in some predominantly Catholic countries the annual rate of increase exceeds 3% per annum. In some high-increase Asiatic countries population has already outdistanced production. "The only possible solution for such countries as India appears to be a thorough education program and the development of a contraceptive that requires little motivation for the control of family size" (38, p. 145). Some of the Latin American countries also have a high starvation quotient. The world's population problem must be recognized as a world responsibility (24, p. 4).

The indecisiveness of the Catholic Church makes it possible for the conservative Bishops to put obstacles in the way of government progress. Some Latin American countries need to make birth control a public issue so that public spirited citizens will take political and social action (46, p. 276). Things that make family planning acceptable are the very things that make it ineffective for population control. Under the most carefully controlled conditions the rhythm method, the only contraceptive device officially approved by Catholicism, has an annual failure rate of 15%. The failure rate for the "pill" is less than 1% (10).

Many financiers feel that population growth is essential to a favorable gross national product. They would have the concerned public believe that the production of food can be increased almost without limit. They cite the fact that there is much untilled land and that the potential production of the sea is almost infinite. The area of potentially arable land is 24% of the total ice-free area and is more than twice the amount that has

ever been cultivated at any one time. More than half of this area lies in the tropics and over a third of this in the humid tropics. Another 20% of this land is in the subhumid tropics where seasons of abundant rainfall alternate with relatively dry seasons. A considerable amount of this land lies in temperate sections of North America and Australia (40, p. 83). The rest of the picture is not this favorable. The continent of Asia where millions of persons are already starving has little, if any, tillable land not in production. In the tropics, crops must be grown on soils which are severely leached of nutrients and with high infestation of pests whose depredations are not interrupted by winter, and cultivated by tradition-bound peasants who are unfamiliar and unconcerned with progressive farming methods (40, p. 84). Technology and cropping methods must be devised for each developing nation. Procedures which are productive in South America may not prove effective in Africa. Some particularly important areas of investigation would include mineral deficiencies, high-temperature, physiology and biochemistry, weeds, diseases, insects, and adaptation of temperate zone plants to provide proteins (40, p. 85). Vast amounts of insecticides, fungicides, herbicides, nematicides, and rodenticides would be needed to produce significant crops in the tropics. "If food production is to be doubled, 700 thousand metric tons will be required. To provide this quantity of pesticides will require $1.2 billion in capital for manufacturing plants and $670 million for formulation and distribution facilities." It is estimated that the annual cost to farmers of improved input-fertilizers, seeds, pesticides, and machinery will amount to $14 billion by 1985 (40, p. 86-87). It is probable that the production of the sea can be at least doubled. Most of the continental shelf, a plateau three to twelve miles wide, in the temperate

zone could be made productive if pollution of the sea is stopped. The main area of the sea is relatively unproductive even of marine animal life (39, p. 14-21).

Although much of the increased need for protein must of necessity be derived from vegetable, primarily nut and bean, sources, animal proteins must also be considered. Livestock and fowl can consume many foods which cannot be eaten by man. During the period 1953 to 1963, the world increase in the production of meat, milk, and eggs was as rapid as was the human population growth. Projections indicate that production of animal protein can be expected to increase until about 1990. After this, per capita supply will decline. In Africa and to a lesser extent in South America, wild animals offer a great potential for the future. Much research in wild animal biology and disease will be required to reach this potential. Disease has been a major limiting factor in animal production in the developing countries. Based on FAO estimates, a 50% reduction of losses from animal disease in the developing countries would result in a 25% increase in animal protein (39, p. 90-91).

Maximum amounts of education and research are a necessity if protein calorie requirements are to meet population increases in the next two decades. "If fertility does not change and mortality continues to decline, the population of the world will increase to 5.03 billion in 1985." This will represent an increase of 52%. Caloric and protein needs vary according to weight, age and degree of activity. It is recommended by Office of the Surgeon General that a moderately active male weighing 150 pounds should have a caloric intake of 3,200. He would need about 70 gms. of protein. Children need proportionately more protein to develop properly. The animal protein

intake in many developing countries does not exceed 7 gms. per day. This contrasts unfavorably with the average intake in the developed countries of 42 gms. per day. The increased world need for both calories and protein will approximate 50% by 1985. The needs for thiamine, riboflavin, and niacin will increase correspondingly (39, p. 46-51).

II. The Battle Against Pollution

More positive progress has been made in the area of pollution prevention and eradication than in population stabilization or resolution of power needs. Spotted but encouraging progress has been made in controlling water, air and waste pollution. Chemical residues constitute a major distress area.

Many commercial processes pollute streams and bays. The Washington State Enforcement Project conducted field research from April, 1962, to June, 1966, on pulp mills' waste and found them to be toxic in many ways. The SWL (liquid waste) is carbohydrate (lignin and sugars) which place a high oxygen demand on the water, thus injuring young salmon, oyster larva, English sole eggs and other marine life. The fiber particles go out of suspension and coat the bottom of water ways, thus suffocating benthic life (14, p. 31-36). The paper pulp industry is trying to clean its house. In 1970 they spent $113 million for pollution control, and it is estimated that in 1972 $177 million will be spent. Much of this is for liquid waste disposal. New plants being constructed generally have adequate control devices (22, p. 861-864). The addition of nuclear power to our industrial sources brings another pollutant to the scene. One of the waste products emitted by commercial nuclear fuel reprocession plants is T-129, a radioactive form of iodine which has a half-life of 17 million years. Because of the relatively

low radiation rate much of this product is discharged into local water and air. Deer killed in the area of the West Valley, New York, installation show an equivalent 58% of recommended maximum exposure (26, p. 42-47). Streams may be polluted even in non-commercial areas. The study of a stream in St. John's, Newfoundland, over a three-year period indicated that pollution became progressively worse as the stream passed through residential districts of the city. Leaches and non-diptern insects (mayflies and stoneflies), normally a part of the fauna of a stream, were in small numbers in stations one, two, and three. They were absent completely in stations four and five. There were no specific sources of pollution (27, p. 264-267).

The average citizen is subject to much pollution of which he is not aware. Prolonged exposure to noise above 85 decibels can cause permanent damage to hearing. Heavy diesel tractors often go over 90 decibels, garbage trucks generate 100 decibels, and rock bands push a noise meter up to 130. Medical research has shown that noise can alter endocrine, cardiovascular and neurological functions (6, p. 277-281). High air pollution is a known killer. In a January, 1966, study made in Chicago by Dr. Carnow and associates, it was found that during periods of high pollution, 0.17 to 0.29 part per million of sulfur dioxide, deaths rose from 38 to 39 per day to an average of 52 per day. Men above 55 years of age were the primary targets. The high pollution rate did not seem to adversely affect females (5, p. 22-24). It has been estimated that the total cost saved by a 50% reduction in air pollution levels in major urban areas in terms of decreased morbidity and mortality would approximate 2,080 million annually (21, p. 723-733).

Common garden pesticides and herbicides may constitute a definite health hazard.

> Alderin, dieldrin, DDT, endrin, and heptachlor have a long residual life and never should be used by the home gardener. Some biodegradable insecticides are carbaryl, malathion, pyrethrum, rotenone, decofol, and tetradifon. Systemics, disulfoton is a common one, having a life span of six weeks and should be used only with great care. Some fungicides which have a short residual life are captan, folpet, dinocap, zineb, ziran, and ferban. (17, p. 44)

A study made in 1970 by the Bionetics Research Laboratory found that samples of 2,4,5 T and possibly 2,4 D caused abnormalities in both rats and mice. At doses of 100 mg/kg body weight up to 70% of all litter members were abnormal in some way (16, p. 891-892). Mercurial pollution has received much attention in print. Mercury does not sink into the mud harmlessly. It inters into the food chain. Fish induct the poison along with other water floor products. It stockpiles in their tissues and remains there. Animals and birds of prey eat the fish and suffer mercurial poisoning. Bald eagles are among the first victims (24, p. 82-86). The direct human health hazard of environmental mercury is for those people for whom fish is a dominant part of the diet (23, p. 22). Two fungicides, Captan and Folpet, considered relatively non-toxic when taken orally, are allowed in harvested food crops in rather large amounts (50 to 100 parts per million). Laboratory tests have shown that their injestion causes deformed fetuses in certain test animals. The deformity danger of thalidomide has definitely been established by laboratory tests conducted by J. W. Miller and G. F. Soneis on rabbits and non-human primates (36, p. 22-31).

One of the many problems of our affluent society is waste disposal. Many large cities are already running out of garbage dumps. The market trend tends to be away from the use of returnables. One way bottles spurted from 6.2% in 1959 to 21% in 1969. Worse than this, cans account for half of all beer sales (42, p. 25-26). There is some consolation in the fact that

general waste products can be compacted by a 5:1 ratio and sometimes even more. Even more encouraging are the reports of usable materials being made from waste products. Two common waste materials, glass bottles and cow dung, have been combined by U. C. L. A. engineering professor John D. MacKenzie to produce a ceramic material highly useful for home construction. It can be used for roofing, wall insulation, water pipes, cork, light-weight containers, and wall partitions. The professor used 5-10% cow dung as a foaming agent, and 90-95% finely powdered glass. The density can be controlled from 0.1 to 2.0 gm/cc and the most dense form is competitive in cost to ordinary brick and weighs one-fifth as much. Of even more interest while working on a treatment process for cow dung, he found that he could extract roughly 15 pounds of crude oil from every 100 pounds of the raw manure. Chemically, the man-made oil closely resembles the natural kind (9, p. 1-3). Also of commercial importance, the United States Department of Agriculture Forest Products Laboratory is developing new technologies for reclaiming paper. It can be made into boxes, corrugated board and tissue paper. Each ton of garbage yields 400 pounds of paper fiber. New York City spends $13 million annually to dispose of the Sunday editions of the New York Times and the Daily News. This paper could be recycled, thus changing a loss into a profit (15, p. 17). Further, human and animal organic waste can be converted by anaerobic digestion into methane gas. The gas evolved from the fermentation unit is 70% methane and 30% CO_2 with trace amounts of other gases. The product of 100,000 cattle, 150 thousand tons of dry organic matter, will produce three billion cubic feet of methane which will currently meet the fuel needs of 30,000 people. The primary expense would be fermentation vats. The solid residue could be used for fertilizers (4, p. 4-9). The internal combustion

engine, which is accused of contributing 70% to the total air pollution, may be a minor contributor to pollution in less than a decade. Charles M. Heimen, Chrysler's pollution expert states, "by 1980 we will have air quality nearly comparable to the 1940's." He predicts that cost to the consumer may run $300.00 per car (34, p. 21-26). These are but a few of the many contributions that American technology has already made toward saving the environment.

III. Future Power Needs and Sources

During the 20th century the United States and many of the other developed countries have used power sources as though they were limitless and unending. As our power source demands have skyrocketed the past decade, it has finally become evident that our sources of natural gas, petroleum, and anthracite coal are being rapidly depleted. Late estimates indicate that supply of natural gas may exceed the supply as soon as 1975.

The Pacific Northwest Laboratories of Battelle Memorial Institute have compiled selected energy forecasts for the President's Office of Science and Technology. The use of natural gas as an energy source will continue to grow, but the overall rate of increase will decline. The National Fuels and Energy Study Group forecasts a need for 22,770 trillion BTU's for 1980. The different study groups vary greatly in their estimates of nuclear power use. The National Fuels and Energy Study Group's 1985 use expectations range from 21.9% of the total to as low as 1.4%. The target nuclear production for the year 2000 is 33,012 trillion BTU's of total power source (32, p. 17-19). Hydro electricity will play a decreasingly significant roll in future power use (32, p. 20). Petroleum requirements, according to EMUS (Energy Model for the United States) forecasts will increase from 27,275 trillion BTU's, 42.4%

of the total requirement, to 56,600 trillion BTU's in the year 2000, which will represent 34.2% of the total requirements (32, p. 14). All forecasters see a continuing decline in the use of coal as a power source due to consumer preference, transportation costs, and changes in technology. It currently furnishes between 21-22% of the energy total; by 2000, EMUS believes that it will contribute only 13.3% of the United States' requirement (32, p. 16). EMUS forecasts the following United States requirements in trillions of BTU's by the year 2000: Industrial--32,594, United States household and commercial--21,066, transportation--42,749, and electrical utilities--35,040. Some forecasting agencies estimates run even higher than these (32, p. 23-26). Several of the groups stated that our per capita energy use may run as high as 524 million BTU's by the year 2000.

The National Power Survey conducted by the Federal Power Commission in 1964 found that in 1962 the United States had about 6% of the world's population and used almost 40% of the electrical energy produced in the world; in 1920 electricity used was about 11% of the energy used in 1960 when utility systems produced 753.4 billion Kwh of electric energy. By 1980 electrical requirements will be more than triple the amount generated in 1960 (32, p. 53).

Projections of population, GNP (Gross National Product), and natural gas use are shown in TABLE 3 (37, p. 44), while TABLE 4 shows the demand for energy by source, projected every ten years (32, p. 63).

Numerous conditions are assumed by Battelle Institute in preparing their forecasts. The growth rate will continue at approximately the same level as during the base period 1960-1965. Population estimates were obtained from U. S. Bureau of the Census data. Transportation power plants

will remain fairly similar. By the year 2000 there will be a labor force of 142 million, and there will be a 2% annual increase in productivity; there will be no general war, and the possibility of a deep depression is excluded. The GNP will grow at a rate of 3.5% per year, while population will grow at a rate of 1.6% per year. The average fuel degree days are assumed to decline at the rate of 1/3 of 1% per year. Most important, adequate supplies of energy sources, either domestic or imported, will be available to meet the forecast demand (32, p. 58, 62, 63, 64, and 67).

The President's Energy Message of June 15, 1971, gives suggested methods of meeting the forecast power demands. Recommendations are also made for producing cleaner energy. Sulfur dioxide controls and means of conserving power receive considerable attention. Eleven ways to reduce energy consumption and increase comfort in housing are discussed: (1) better insulation and sun shading, (2) prevention of excessive entry of outdoor air, (3) shade windows from the direct sun, (4) insulate ceilings, walls, and ducts, (5) reduce heat gain from the attic by better ventilation, (6) limit internal heat generation, (7) select the type and size of cooling unit that meets your needs, (8) use good operating practices, (9) keep system clean and in good functioning condition, (10) shade exterior surfaces from the sun, and (11) insulate, ventilate and take advantage of nature (30, p. 213-234).

The control of sulfur oxide emissions from industrial operations is receiving much attention from all sources for very obvious reasons. The only raw source of electrical energy in ample supply is soft coal. It is estimated that there is a 500 year supply of this mineral at present industrial consumption rates available in currently known coal fields (21, p. 726-728). When soft coal is burned large amounts of sulfur oxide are

emitted. The high school chemist knows that sulfur oxide combined with water forms sulfuric acid. Plant modifications will be necessary to burn different types of bituminous coal because of the difference in ash fusion temperatures which range from 2800° F. in West Virginia coal to only 2100° F. in the average Montana product (30, p. 250). The Department of Health, Education, and Welfare estimated that sulfur oxide control costs of reducing the SO_2 emission level from 6,860 tons to 2,500 tons annually in one hundred urban areas would exceed $630 million for steam-electric power plants. This plan would change the raw energy source from coal to residual fuel oil. A test case run on eight major companies indicates that the HEW estimate may be far too low (30, p. 248). It appears that it will take from five to ten years to establish industry-wide desulfurization of combusion products. Four processes now under study are the furnace-injection wet limestone process at an estimated cost of $10 per kilowatt, the Monsanto catalytic oxidation process installed by the Illinois Power Company at a cost of $68 per kilowatt, the limestone-slurry scrubbing system installed at the Will County Station at a $45 per kilowatt cost, and a regenerative scrubbing system which has an investment cost of almost $300 per kilowatt (30, p. 254). Research is currently underway in the area of fuel desulfurization also, but at present no method has been discovered which is both effective and economically feasible (30, p. 255). If full commercial use can be made of the industrial by-products of "scrubbing" fuels and combustion products, the change-over can possibly be made financially feasible.

President Nixon reported to Congress in June, 1971, that research for clean power is being carried out in many areas. In addition to the areas covered in the preceding paragraph, work is being done on controlled thermo-

nuclear fusion, nuclear reactor safety and its supporting technology as well as with advanced reactor concepts; and last, but far from least, the National Aeronautics and Space Administration in conjuction with the National Science Foundation is examining the field of solar energy. The sun offers an unlimited supply of completely clean energy if our technology can devise economically feasible methods of putting it to man's use (30, p. 264-265). There are other potentially usable sources of clean power besides solar energy. The Office of Science and Technology has recommended Magnetohydrodynamics as a promising source of energy. MHD is presently being used in other countries. The pollution problems of MHD appear to be minimal, and the cost may be much less than expected. Geothermal power is being used in Mexico. Professor Rex and other geologists believe that two-thirds of the electric power needed by California could be supplied by this means. Tidal power may be feasibly used in some cases. If problems of nuclear waste storage can be solved, this too may become a pollution free source of energy.

The President also noted that much of our available energy resources are located on federal land. The outer continental shelf is a prolific source of oil and gas, but means must be devised to eliminate or at least control oil spills which have too often occurred in recent years. An orderly program for the development of shale oil resources must be initiated. Eighty billion barrels of very low sulfur oil are located in the Rocky Mountain area. At present there is no commercial production of shale oil due to environmental, technical, and economic problems. If environmental concerns can be satisfied, work involving the states of Wyoming, Colorado and Utah will begin in 1972. Natural gas, the cleanest fossil energy source, is in short supply. If the supply is to keep up with demand, accelerated

leasing on federal lands, projects to gasify coal, and greater imports from Canada and other nations must be speedily accomplished (30, p. 265-268).

IV. Summary

A study of available literature would indicate that progress is being made along most fronts in the battle to save the environment. Probably the most effective program has been instigated by the automotive industry, which was one of the primary offenders during the past decade. By 1975 all new automobiles will be equipped with exhaust filtration systems which will be above 90% effective. It will take several years, however, to phase out all cars built prior to this date. Pilot projects are being carried out in many phases of industrial pollution. Many industrial plants have voluntarily installed "scrubbing" systems. More research is necessary to find the most efficient and economical methods. Then there is usually a ten year lag between research and implementation. Clean energy sources are now being investigated. Some of the most promising would include geothermal, magneto-hydrodynamic, and solar; the time lag between science and action is considerable. Only in the area of population stabilization has progress been minimal. No studies indicate a short range abatement of this problem. Projected unit family size is declining, but a continued increase in marriages plus a steadily decreasing death rate make an increased world population inevitable. Should no more children be born to women in the United States who currently have two or more children, the population would continue to increase until 2037 when the population of the country would level off at over 347 million (19).

CHAPTER III

METHODS OF RESEARCH

I. Description of the Sample

The questionnaire survey used in this research report was sent to forty-nine school board members in northeast Kansas. These men and women were members of fifteen school boards, whose main offices were located within a radius of sixty miles from Frankfort, Kansas. These school districts, their superintendents, and the location of their central offices are given in the appendix of this paper. Only active board members who lived on and actively participated in agricultural ventures were used in this survey. Female members of rural families were considered to be active participants in school board activities and in agriculture. A copy of the questionnaire is included in the appendix.

II. Description of the Measure

The measure employed for research was the questionnaire survey. The content of the questionnaire was determined by the objectives given in Section IV, Chapter I of this study. Fifty questions were asked. All but five questions (1, 7, 10, 11, and 46) were asked in the closed end form so that they could be analyzed by a computer. These five were left in open end form to solicit diverse answers.

The first twenty-two questions (see TABLE 5) concerned the personal awareness of rural people in north-eastern Kansas with some factors which may contribute to environmental deterioration. Questions one, seven, ten

and eleven were constructed to select a wide range of responses. The remainder of this group were "yes-no" answers. Questions twelve through seventeen were compared to see if the interviewee's religious preferences were related to the answers given (see TABLE 11).

Questions twenty-three through forty-one (see TABLE 6) specifically queried these selected farmers on their agricultural practices. An attempt was made to discover if knowledge of good environmental practices significantly affects actual reported practice methods, also, if additional education and good environmental practices are positively correlated.

Questions forty-two through fifty attempted to measure if rural Kansans desired the inclusion of environmental sciences in grade, high school, or college curriculums. This section (see TABLE 7) also probes the feeling concerning the inclusion of controversial material in courses of study. Questions forty-nine and fifty reflect religious influence in the selection of science subject matter.

After a rough draft of the questions had been prepared, they were presented to Dr. Richard G. Hause, College of Education, and Dr. E. D. Eckhoff, Department of Nuclear Physics, for suggestions and evaluation. A panel of four past school board members of the area also reviewed the questionnaire for interest, relevance and good taste. Several question changes, deletions, and additions were made as a result of their suggestions.

For the findings of this survey to have relevance, they must be compared with a reference group. To create this group, five Kansas State University professors with a knowledge of ecology were asked to answer the same questionnaire. They answered section two, relating to actual farming practices, as good environmental techniques would dictate. Sections one and

three were answered as the individual members of the reference group initially reacted to the question. Dr. O. W. Bidwell, Acting Head of Agronomy; Dr. Robert J. Robel, Professor of Biology; Dr. Lloyd C. Hulbert, Assistant Professor of Biology; Dr. N. D. Eckhoff, Department of Nuclear Physics; and Dr. R. G. Hause, College of Education, served as the reference group. The test group was divided by years of education completed and the correlation between years of education completed and ecological awareness is shown in TABLES 8, 9 and 10.

III. Research Design and Procedures

After the questionnaire was finalized, letters were sent to the fifteen superintendents whose schools met the distance requirements. The letter gave the general design of the survey and requested assistance in placing the instrument in the hands of the qualifying board members.

The administrators' responses varied greatly. Three replied immediately, granting the researcher time at a board meeting to present the questionnaire for completion at that time. Two districts set up individual interview periods. It was necessary to contact the other ten districts by telephone. When this was done, it was found that two districts had no rural members. Three superintendents gave permission to present the survey at a board meeting for individual evaluation at home. These evaluees were given verbal instructions, a copy of the questionnaire, and a self-addressed stamped envelope, and asked to return the completed form at an early date. The other five school heads gave the researcher the names of their rural board members and permission to contact the board members.

Letters were sent to these board members requesting interviews at a specified time and place. Self addressed cards were enclosed for convenience

of reply. Introductory letters were given to administrators who scheduled group meetings. Eight members were sent their questionnaires by mail together with the letter of explanation and self-addressed stamped envelope for returning the document.

Even though attempts were made to personally place the form in the hands of each questionee, 100% cooperation was not obtained. Forty-nine questionnaires were sent out. Forty were returned completed. The most satisfactory, but time consuming, method was to visit the individual members at their homes. Much interesting and informative knowledge was obtained from these people. Nearly as effective and much less time consuming was to conduct interviews at a school board meeting. Very poor results were obtained by personally giving them the forms to answer at a later date. Examples of all letters sent and received will be found in the appendix. Each district which had rural members is represented in the survey.

CHAPTER IV

FINDINGS

I. Analysis Technique

Forty-five of the fifty questions appearing on the questionnaire were closed end (yes-no) and could have been analyzed by a computer programmed to produce point biserial coefficients or chi-square tests of goodness of fit. This survey was not programmed, but all questions were submitted to the chi-square test of goodness of fit. When chi-square was greater than 3.76 it indicated that there was a significant difference between the experimental group and the reference group. In some instances only one of the two cells yielded a specific answer. These were not recorded. The information which these questions yielded is found in the appendix under the appropriate tables.

II. Findings

Fifteen closed end questions were used to measure the experimental group's awareness of the problem. Both groups were at noticeable variance on five questions. The even division of yes-no answers on questions two, five, six, fifteen and sixteen would indicate that even well-informed persons do not agree on environmental generalities. The two groups paralleled closely on questions three, four, nine, seventeen and eighteen. These questions concerned environmental deterioration, the importance of power in our future, foreign aid to over-populated countries, and landscape beautification. Questions twelve, thirteen and fourteen yielded a definite cleavage.

These questions dealth with zero population growth and two of the many methods of achieving it. The farmers were not willing to face this issue. Only five of the forty board members felt that zero population growth was necessary in the United States. All eleven Roman Catholic members gave negative responses to these questions. The four Protestant college graduates favored them.

The more education the board members had completed, the closer their answers paralleled those of the reference group. The questions concerning mandatory sterilization of sub-mentals (15) and unwed relief recipients (16) divided both the professors and the farmers. However, education and favorable reception were parallel. Catholics were more opposed to sterilization of unwed mothers than to sub-mentals. Both groups agreed that we are not making sufficient effort to recycle our scarce products and that power is an important part of our future. More farmers than professors felt that our youth are making a serious contribution to our environment. Both groups believed that the environment has deteriorated further in urban than in rural areas. Less than one-third of the rural people believed, and over one-half of the college men agreed, that this part of the United States has suffered serious deterioration. The word serious was not defined, which may account for the indecision. The second group of questions (twenty-three to forty-one) endeavored to discover if farming practices performed in this part of Kansas are environmentally sound. The reference group answered these questions as their background in environmental studies would indicate was ecologically sound. None of the questions in this group had any religious connotation, and all of them could be answered yes-no. The panel of experts had little dissension in this section. Only the question of antipollution

devices on farm machinery, diethylstilbestrol injections to increase beef production, and the use of herbicides to prevent weeds caused disagreement. The herbicide question did not designate the type of herbicide and thus was ambiguous. The panel believed that biodegradable chemicals are often environmentally acceptable. The school board members' practices did not parallel closely the reference group's ideas of sound ecological practice. Only on four questions were the answers similar. Neither group had a unified feeling concerning the necessity of antipollution devices on farm machinery. They both agreed that rural water districts are a good thing, but the panel believed they should operate in conjunction with sewer districts. Neither felt that corporate farming is the right answer to our farming dilemma, but the panel admitted that the country is drifting in that direction. Both groups were divided on the advisability of using chemicals to increase beef production, and both agreed that chemicals may be used to control insects. The panel agreed that there should be rural zoning, that farmers should not be allowed to set fires without regulations, and that farm feed lots should be controlled. The farmers felt that feed lots of fewer than 300 animals should be unrestricted, that organic farming is feasible on a small scale, and that all farm chemicals should be biodegradable. The farm rate of compliance with these practices would approximate 50%. In this section the goodness of fit between the two groups did not significantly increase as education increased. Young farmers accepted change more readily than did the older men. Inadvertently, the reference group was not asked if they believed annual plowing of crop land to be beneficial. Kansas State University bulletins indicate that chiseling is far superior to plowing, but only six farmers reported using the chisel.

Questions forty-two through fifty tested the desire of rural Kansans to adapt to recommended curriculum development. The reference group had one dissenting vote on questions forty-two, forty-eight and forty-nine, which dealt with teaching ecology in Kansas schools. The board members did not agree with the panel on questions forty-five (use of farms for field trips), forty-nine (teaching sex education to boys and girls in the same class), and fifty (teaching birth control in schools). More school board members than professors (75% to 60%) felt that an environmental science course should be mandatory. The majority of the people questioned felt that it should be taught in high school, although nearly one-half believed that instruction should be started in grade school. The professional educators were inclined to feel that it should be included in an established curriculum. Eighty per cent of both groups believed that local sources of pollution should be brought to science students' attention and should be discussed. Most farmers were willing to be interviewed about environmental practices and to allow students to use their farms for field trips. The panel agreed that this was wise. Both groups believed that human models could be used for discussing sex in schools, but the farm group objected (nearly 50%) to teaching sex education. It should be noted that most of the objections came from Roman Catholics and older board members. The reference group favored teaching sex education in integrated classes.

Five open-end questions were asked concerning controversial issues in the hope that a wide variety of answers and comments would result. Question one (the most critical environmental factor) elicited seven different responses from the board members; the reference group countered with untested technology, waste disposal, and population (3). The farmers established no

definite trend on this issue. The professors gave the expected answers to question seven (which concerned housewife awareness of problems); these included radio, television, personal conferences, extension courses, and news media. This question seemed to confuse the board members; fewer than 50% gave a plausible answer. The university men believed that solar and nuclear sources are the powers of the twenty-first century; again, the farm vote was scattered. Solar and hydro power were the choices for a clean energy source, while soft coal was the nearly unanimous choice as the dirtiest. Both groups agreed that 4-H clubs were well qualified to present environmental materials. Scouts and church youth groups were also frequently mentioned. The reference group was solidly against bounties of all kinds; they believed them to be ineffective and expensive. Thirty per cent of the farmers, all over forty, favored a bounty on coyotes. Two panel members believed multi flora rose to be a poor cover because of its strong tendency to spread. One Kansas State University man considered the chemical questions irrelevant because they did not specify persistence of item in question. Land damage, basically in strip mining, was cited as another soft coal pollutant.

CHAPTER V

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

I. Summary

It has become evident that a considerable degree of environmental deterioration has occurred on a world wide basis during the twentieth century. There seems to be no immediate answer to the question of the imminence of danger. But it has become clear that certain corrective actions must be taken. To reverse the flow of environmental deterioration the public must become aware of the problems; they must be willing to cooperate in this effort, and competent instruction on the subject must be disseminated to both adults and children. It is essential to know if these conditions have been reached.

In order to discover if rural central America is reacting to the problem, questionnaires were sent to agri-involved school board members of this area. For purposes of this study it is assumed that rural people react to sociological change more slowly than do urban dwellers; that farm school board members are more informed, more concerned, and more involved than are their fellow tillers of the soil; and that board members' approval will be necessary before the curriculum developments relating to environment can be innovated. Ecology oriented Kansas State University professors were used as a reference group. There were forty-five closed form questions which could be programmed into a computer. There were five open end questions. The correlation between the experimental group and the reference group was

observed and recorded.

First Objective: To discover if rural Kansans are aware of environmental problems:

1. The experimental group correlated closely with the reference group on less than one-half of the items.
2. As the educational level of the experimental group increased, the per cent of positive correlation between the groups increased.
3. All eleven Roman Catholics were opposed to modern birth control methods.
4. Less than 15% of the experimental group felt that zero population growth is necessary in the United States.
5. The younger board members achieved a higher positive correlation with the criterian group than did the older (forty or more years of farm experience) men.

Second Objective: To discover if the rural board members were following approved environmental practices on their farms:

1. The experimental group correlated closely with reference group on only 27% of the questions in this section.
2. Amount of education did not greatly alter the pattern of farmer responses in this section.
3. Less than 50% of the experimental group let environmental concern affect their use of herbicides, pesticides and fertilizers.
4. The farm group showed little concern for wild life.

Third Objective: To discover if rural board members believe that environmental sciences should be taught in Kansas schools:

1. Seventy-five per cent of the experimental group believed that

environmental sciences should be taught in high school, while only one-half of them felt that this training should start in grade school. Few (eight) believed that it should be required in college.

2. Over 75% were willing to make their services available to student groups.
3. Less than 20% of the school board members objected to sex education being taught to high school students, but 40% objected to the teaching of birth control. Nine of eleven Roman Catholics objected to teaching birth control.
4. Most of the objections to teaching birth control and sex education came from the older and/or less educated members.
5. 4-H was the community youth organization selected to teach ecology outside the classroom.

II. Conclusions

Rural Americans are becoming aware of the environmental crisis. They have ideas, often vague and indecisive, about most aspects of the problem. The younger and better educated members are often acutely conscious of our dangers. Most of them, even the college graduates, have not read widely on the subject. No farmer had read over one of the four books mentioned in the questionnaire. Most of their knowledge appears to stem from mass media output and from farm organization information. Religion plays an important part in certain area viewpoints. There will be no rapid changes made as long as the old farmers outnumber the young men. The average age of the Marshall County farmer is 58.7 years.

Farmers will not accept environmentally slanted production practices

unless they can be shown that financial gains will be realized. Farmers admit to using Atrizene, Ramrod, and Hurban on their fields. These are known non-biodegradables. Widespread pesticide spraying still persists despite its known evils. Very few feeders have voluntarily controlled their feedlot runoff. They often remove the antipollution devices from their trucks as soon as the warranty has expired. As a group they are opposed to their activities being controlled in any way. Their average family size is larger than that of the urban dweller. The average farmer has not yet been educated sufficiently to make voluntary contributions to environmental protection. This report assumes that corrective action will be the result of education, not legislation.

Rural Americans are willing for the youth of the community to be taught environmental science. They do not believe that the population explosion is an immediate danger to the present way of life, and possibly because of this viewpoint they are not totally in favor of teaching birth control. The Roman Catholic communities actively oppose these and related teachings. If environmental sciences are to be added to the curriculum of rural central American school systems, it is strongly recommended that curriculum development committees make wide use of lay persons in developing the suggested content of these programs.

III. Implications

As respondents indicated only a minimal knowledge of ecological problems, it is indicated that some method of education must be assembled. The minimal reading done by these people indicates that teaching may be done best by some mass media. Many of the positive responses given by the school board members were the result of watching television specials. This media may be

most effective for adult education. The entire group's attitude on the need for zero population growth and the Roman Catholic aversion to mechanical and chemical birth control measures indicate the existence of problems which will require careful and detailed study.

The admitted reluctance of the respondents to give up long residual pesticides and herbicides in favor of more expensive and possibly less effective biodegradables indicated that further education and orientation are needed in this area. If our endangered species are to be preserved, the full cooperation of the agri-members must be enlisted. The rural populace must work together with biologists to protect wild plant and animal life from man-made perils. There is a great need for study and research in this area.

Results of the questionnaire indicate that the rural Kansas school board members desire the inclusion of environmental science in their secondary curriculum. Some needed areas, particularly those of sex education and birth control, must be approached discreetly. Summer college courses and institutes in this area should be made available to science teachers who will be responsible for these programs. Other sources of instruction might be received from vocational home economics classes, vocational agricultural classes, county agents, and special extension courses offered at local levels. Teachers qualified, or even knowledgeable, in this area are a rarity.

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APPENDIX

311 E. 6th Street
Frankfort, Kansas
October 31, 1971

Wayne D. Wilgers
U. D. #224
Clifton, Kansas 66937

Dear Mr. Wilgers:

I am a graduate student in the College of Education at Kansas State University. For my master paper I am making a study of the concern and involvement of rural America, specifically that of northeastern Kansas, in man's ecological problems. As a product of rural Kansas and a lifelong resident of rural and small town areas, I am deeply interested in our involvement in our deteriorating environment.

For a major portion of my study, I intend to interview a representative number of rural northeastern Kansas residents. School board members constitute an excellent cross section of rural Kansas. They are generally better informed and more interested in educational problems and theories than are other farm folk. It seems logical, therefore, to use these people who help determine our school policies as interview sources.

My advisor, Dr. Richard G. Hause, College of Education, and Dr. E. D. Eckhoff, Department of Nuclear Physics, Kansas State University, have assisted me in compiling fifty questions which we hope will indicate the degree of concern shown by our rural people, as well as their willingness to take restorative action. Of more direct concern to the teachers of this area, I hope to discover when, where, and if our communities want Ecology taught in our Kansas schools, and if they desire it to be taught as a separate course or as part of an established science course.

I would appreciate it greatly if you would arrange interviews for me with the rural members of Unified District No. 224. I would, of course, come to your community and could do so any week day or evening. I would hope that all the people involved could be contacted the same day. I believe that thirty minutes would be sufficient time for me to spend with any one individual. I will be contacting you by telephone after the first of November to resolve any details that may arise.

Sincerely yours,

CHARLES F. JONES

November 15, 1971

Mr. Charles F. Jones
311 E. 6th Street
Frankfort, Kansas

Dear Mr. Jones:

I received your letter regarding the teaching of ecology in our Kansas schools and we are happy that we can be a part of this research program you are working on.

If you could be in the Marysville Junior High School Board of Education room on Monday evening at 7 P. M. I will try to have our rural board members be here a little early and you can visit with them at that time. We have a special school board meeting scheduled for that Monday night at 8 P. M. and if you wish to visit with these three members during this evening's activities I am sure it would work out to the satisfaction of everyone concerned. The gentlemen on our Board of Education who live in the rural areas are Mr. Everett Carleen of Beattie, Mr. Phil Foust of Oketo, and Mr. Dave Pacha of rural Marysville.

If there are no conflicts in your schedule and this time is satisfactory with you, we will plan on seeing you on Monday, November 22nd, at 7 P. M.

Sincerely,

Ray L. Brown
Superintendent

RLBblh

November 3, 1971

Mr. Charles F. Jones
Frankfort, Kansas 66427

Dear Charles:

Your request does pose a problem since our Board Members are spread practically over the entire area of Washington County. We will have to meet during some evening. I am certain my Board will wish to help you. It is our responsibility to make this as convenient for them as possible.

We meet Tuesday, November 9. At that time I will discuss with them possible appointment times. I will then inform you of their wishes.

Sincerely,

M. Dale Carlson
Superintendent

MDC:s

311 East 6th Street
Frankfort, Kans. 66427
December 1, 1971

_____
_____
_____

Dear Sir:

Your Superintendent of Schools, Mr. _____ has given me permission to ask your assistance in obtaining information for a Master Paper I am writing. I am gathering information pertaining to rural northeastern Kansas' concern for and involvement in our environmental crisis. I also hope to discover if our communities want Ecology taught in their schools.

To compile this information, I am asking rural members of our school boards to answer fifty questions that Dr. Hause, my advisor; Dr. Eckhoff, my technical consultant, and I have prepared. We feel that school board members constitute a favorable cross section of rural Kansas. They are usually among the communities most interested and informed citizens.

I would like to visit with the rural members of Unified District No. _____ on December _____, 1971. I could come to your home anytime after 2:00 P. M. Set a time which would be convenient to you. I am enclosing a self-addressed card for your reply. Thirty minutes is usually sufficient time for a person to answer the questions.

I hope that I will be able to see you on the _____.

Sincerely,

CHARLES F. JONES

November 8, 1971

Charles F. Jones
311 E. 6th Street
Frankfort, Kansas 66427

Dear Mr. Jones:

Your letter of October 31 requesting interviews with the rural members of my Board of Education is an interesting and appreciative request. Mr. Jones, with rural members it is very difficult to arrange special meetings and your request for personal interviews could be impossible.

However, not withstanding the above if you will travel to Alma and give me 24 to 36 hours notice I could try to get some interviews for you. We would have to travel to them I am sure.

Trusting the above is satisfactory, I remain

Respectfully

Cecil L. Smith, Superintendent

CLS/vm

ENVIRONMENTAL QUESTIONNAIRE

NOTE: For the purpose of this questionnaire the following words are thus defined:

a. *Ecology--the science which relates an organism (man in our case) to* his environment.
b. Environmental deterioration relates to the adverse changes which are affecting our surroundings. *(i.e.--air, water pollution)*
c. A biodegradable substance is one which returns to an inert, unharmful element or compound within a short space of time.
d. Power is the substance/substances which are/may be used to run the complex mechanisms of our modern society. (i.e.--gas, coal)
e. A sub-mental is a person mentally incapable of fulfilling a normal place in our society.

The following questions may be answered briefly (usually yes or no). Comments are encouraged and may be made on the back side of any page.

1. What *do you consider the most critical* factor in our environmental crisis? _____

2. *Do you feel that serious environmental deterioration has occurred in* central rural United States? _____

3. Is pollution a more critical problem in the inner city than in rural and suburban America? _____

4. Are we making sufficient effort to recycle our scarce materials? _____

5. Should more stringent anti-pollution laws be enacted? _____

6. *Do you believe that anti-pollution propaganda disseminated by our* radio and television stations is having an effect on environmental awareness? _____

7. How could the average homemaker be made aware of her part in fighting air and water pollution? _____

8. Are our youth making a positive approach to saving our environment? _____

9. Is power an important factor in the ecological picture? _____

10. What will be the principal power source of the 21st century? _____

11. What is the "cleanest" power source? _____
What is the "dirtiest" power source? _____

12. Do you believe that zero population growth is necessary in the United States? _____

All questions on this page may be answered either yes or no.

13. Should the "pill" or other contraceptive device be prescribed for single girls? _____

14. Do you favor Kansas' liberalized abortion laws? _____

15. a. Would you vote for mandatory sterilization of sub-mentals? _____
    b. Should law prohibit the marriage of sub-mentals? _____

16. Should unwed mothers (with over one child) be required to submit to sterilization to receive continued relief payments? _____

17. Would you favor continuing foreign aid to countries who are not attempting to control the population explosion? _____

18. Do you think that home and farm beautification should be stressed? _____

19. Should scarce predators be protected? _____

20. Should there be a bounty on: coyotes? _____; gophers? _____ or crows? _____

21. Have you read: Silent Spring? _____; Animals at Bay? _____; The Population Bomb? _____; or The Frail Ocean? _____.

22. Should we spend millions of dollars to save Lake Erie? _____

23. Should anti-pollution devices be mandatory on farm machinery? _____

24. Do you approve of county/district zoning? _____

25. Should farmers be allowed to burn pastures, brush piles, etc., without restrictions? _____

26. Do you favor rural water districts? _____

27. Should farm feed yards be controlled? _____
    Should commercial feed yards be controlled? _____

28. Do you consider organic farming and/or gardening feasible? _____

29. Is the corporation farm the answer? _____

30. Do you use commercial fertilizers on crop land? _____
    Do you use commercial fertilizers on pasture land? _____

31. a. Do you spread barnyard manure on fields? _____ pastures? _____
    b. Do you use alfalfa or soy beans to rebuild soils? _____

32. Do you normally plow farm ground each year? _____

33. Do you practice crop rotation? _____ Two crop? _____ Three crop? ____

34. Do you practice organic farming? _____ Do you know any farmers who do? _____

35. Is your farm (rolling farm land) terraced? _____

36. Do you use diethylstilbestrol injections to increase beef production? ___

37. a. Do you use herbicides instead of cultivation to control weeds? _____
b. Do you use herbicides in conjunction with cultivation to control weeds? _____

38. Do you use chemical pesticides to control insects? _____

39. Do you insure that all chemicals used on your farm are biodegradable? ____

40. Have you planted multiflora rose or other cover in your fence rows? _____

41. Do you leave a few rows of milo (or corn) for the birds? _____

42. Should an environmental science be required in Kansas grade schools? ____ high schools? _____ colleges? _____

43. Should local sources of pollution be brought to the attention of high school science students? _____ Should they be discussed? _____

44. Would you object to science students interviewing you about your environmental practices? _____

45. Could your farm be used for ecology field trips? _____

46. Outside the classroom, what youth organizations could best present environmental problems? _____

47. a. Do you object to teaching sex education in schools? _____
b. If not, at what academic level should it be taught? _____
c. Are all science teachers qualified to teach it? _____

48. In discussing sex in schools, should only animal models be used? _____

49. Should sex education be taught to boys and girls in separate classes? ____

50. Would you object to birth control being taught in schools? _____

I am a member of Unified School District No. _____. I have served as a school board member for _____ years. I have farmed for _____ years. I completed _____ years of formal schooling. My religious preference is _____.

TABLE 1

BIRTHS, DEATHS, MARRIAGES, AND DIVORCES PER 1,000

	1970	1969	1968	1967	1966	1965	1964	1962
Births	18.2	17.7	17.5	18.4	19.4	21.0	21.7	22.4
Deaths	9.4	9.5	9.7	9.4	9.5	9.5	9.4	9.5
Marriages	10.7	10.6	10.4	9.7	9.5	9.5	9.0	8.5
Divorces	3.5	3.2	2.9	2.6	2.5	2.5	2.4	2.2

TABLE 2

POPULATION EXTENSION ESTIMATES (IN THOUSANDS)

Year	Series B (3.1) children	Series C (2.78) per	Series D (2.45) family	Series E (2.11)
1980	236,725	233,798	230,855	227,765
1990	278,570	269,673	260,762	251,431
2000	322,277	305,111	288,293	271,802
2020	477,003	397,164	351,163	307,402

TABLE 3

PROJECTION OF POPULATION, GNP, AND NATURAL GAS USE

	1967	1970	1975	1980	1985
Population (millions)	197.9	206.3	222.8	242.3	263.6
GNP (billions of 1958 dollars)	666.3	752.9	916.0	1114.4	1355.9
Natural Gas Use (total billions BTU)	13.5	16.1	21.1	27.7	35.6

TABLE 4

DEMAND FOR ENERGY BY SOURCE
(TRILLIONS OF BTU'S)

	1970	1980	1990	2000
Petroleum	22,640	29,500	39,370	54,800
NGL	2,500	3,400	4,680	6,800
Gas	19,140	24,200	28,360	33,800
Coal	13,030	15,800	16,450	18,000
Hydro	2,520	2,600	2,770	2,800
Nuclear	360	3,700	10,280	19,000

TABLE 5

FOURTEEN ECOLOGICAL AWARENESS QUESTIONS

Question Number	Board Member Response				KSU Faculty Response		
	Yes	No	% Yes	Chi-Square	Yes	No	% Yes
2	13	20	32.5	6.22	3	2	60
3	35	0	87.5	8.78	4	1	80
4	7	31	17.5	1.28	0	5	0
5	17	14	42.5	.54	3	2	60
6	29	7	72.5	5.73	3	2	60
8	17	14	42.5	23.41	1	4	20
9	36	2	90.0	X	5	0	100
12	5	31	12.5	X	5	0	100
13	8	28	20.0	78.2	4	0	80
14	13	26	32.5	X	5	0	100
15 a	12	20	30.0	6.35	3	1	60
b	17	22	42.5	3.81	3	1	60
16	18	20	45.0	2.74	3	2	60
17	14	22	35.0	8.68	1	4	20
18	36	1	90.0	.03	5	0	100

TABLE 6

SEVERAL FARM PRACTICE QUESTIONS

Question Number	Board Member Response				KSU Faculty Response		
	Yes	No	% Yes	Chi-Square	Yes	No	% Yes
19	26	6	65	X	5	0	100
22	19	11	47.5	5.21	4	0	80
23	13	21	32.5	0	2	3	40
24	18	16	45	7.53	5	0	100
25	27	11	67.5	48.4	1	4	20
26	34	2	80.5	X	5	0	100
27 a	10	10	25	X	5	0	100
b	36	0	90	X	5	0	100
28	10	20	25	43.34	4	1	80
29	0	30	0	7.5	1	3	20
30 a	34	6	85	1.0	4	0	80
b	24	14	60	5.7	4	0	80
31 a	19	20	46.5	X	5	0	100
b	24	16	60	6.4	5	0	100
32	31	8	77.5	--	5	0	100
33	33	6	82.5	X	5	0	100
35	26	13	65	3.92	4	0	100
36	8	29	20	6.5	2	2	40
37 a	17	16	55	X	0	3	0
b	30	8	75	24.8	2	2	40
38	32	6	80	X	4	0	80
39	18	17	45	X	5	0	100
40	29	5	72.5	4.85	3	1	60
41	6	30	15	X	5	0	100

TABLE 7

NEEDS FOR ECOLOGY IN KANSAS SCHOOLS

Question Number	Board Member Response				KSU Faculty Response		
	Yes	No	% Yes	Chi-Square	Yes	No	% Yes
42	30	10	75	3.75	3	1	60
43 a	32	6	80	.63	4	0	80
b	34	5	85	1.415	4	0	80
44	1	38	2.5	X	0	5	0
45	28	7	70	X	5	0	100
47 a	6	29	15	1.03	0	5	100
b	0	37	0	0	0	5	0
48	7	32	17.5	.155	1	3	20
49	21	18	52.5	26.575	1	4	20
50	16	22	40	X	0	5	0

TABLE 8

EFFECT OF EDUCATION ON ECOLOGICAL AWARENESS

Question Number	Degree or more		High School +		High School		Grades 8-11		Seven or Less	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
2	3	3	2	2	7	10	1	5	0	3
3	5	0	3	0	16	0	6	0	3	0
4	0	6	0	4	5	15	1	5	1	1
5	5	0	3	1	8	8	1	3	0	2
6	4	2	3	1	16	2	4	1	2	1
8	2	2	1	2	10	7	3	2	1	1
9	6	0	4	0	18	2	6	0	2	0
12	2	4	1	3	2	17	0	4	0	3
13	4	1	2	1	2	18	0	5	0	3
14	4	2	2	2	6	13	1	6	0	3
15 a	4	2	2	2	5	10	1	4	0	2
b	4	2	2	2	7	11	2	4	0	3
16	4	2	2	2	8	10	3	4	1	2
17	1	4	1	2	8	10	3	4	1	2
18	5	0	4	0	19	1	6	0	2	0

TABLE 9

EFFECTS OF EDUCATION ON FARM PRACTICES

Question Number	Degree or more		High School +		High School		Grades 8-11		Seven or Less	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
19	6	0	4	0	10	4	4	1	2	1
22	4	1	4	0	6	8	3	2	2	0
23	2	4	1	3	7	10	2	4	1	0
24	4	2	3	1	9	7	2	4	0	2
25	5	1	3	1	14	6	2	3	3	0
26	5	0	4	0	17	0	5	1	2	1
27 a	2	3	1	2	6	5	1	0	0	0
b	6	0	4	0	19	0	6	0	1	0
28	2	1	2	1	3	4	1	3	0	1
29	0	5	0	3	0	18	0	4	0	2
30 a	5	1	3	1	18	2	6	1	2	1
b	6	0	4	0	11	8	3	3	0	3
31 a	5	1	3	1	8	11	2	5	1	2
b	6	0	4	0	11	9	3	4	0	3
32	3	2	3	1	17	3	5	2	3	0
33	4	1	3	1	18	2	6	1	2	1
35	3	2	2	2	14	6	5	2	2	1
36	2	4	1	3	4	13	1	6	0	3
37 a	3	2	1	2	9	8	3	3	1	1
b	4	2	3	1	15	3	6	1	2	1
38	5	1	3	0	18	2	5	2	1	1
39	4	2	2	2	10	7	2	4	0	2
40	4	1	3	0	14	4	5	0	3	0
41	0	5	0	4	2	16	2	4	2	1

TABLE 10

CORRELATION OF EDUCATION WITH DESIRE FOR SCHOOL ECOLOGY

Question Number	Degree or more		High School +		High School		Grades 8-11		Seven or Less	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
42	4	2	3	1	15	5	6	1	2	1
43 a	5	1	4	0	17	3	5	1	1	1
b	5	1	4	0	17	2	6	1	2	1
44	1	5	0	3	0	20	0	7	0	3
45	6	0	4	0	14	3	3	3	1	1
47 a	0	5	0	4	4	14	1	5	1	1
b	0	6	0	4	0	18	0	6	0	3
49	3	3	2	2	10	9	4	3	2	1
48	0	6	0	4	3	16	3	4	1	2
50	4	1	3	1	6	13	2	5	1	2

TABLE 11

RESPONSES BY RELIGIOUS PREFERENCE

Question	Experts Yes	Experts No	Chi-Square[1]	Roman Catholics Yes	Roman Catholics No	Chi-Square[2]	All Board Members Yes	All Board Members No	Lutheran Yes	Lutheran No
12	5	0	X	0	11	14.6	5	31	1	6
13	4	0	104	0	11	18.1	8	28	2	5
14	5	0	X	0	11	21.2	13	26	0	7
15 a	3	1	9.33	5	5	23.0	12	20	3	4
16	3	2	24.83	2	9	21.9	18	20	3	4
17	1	4	16.25	5	5	22.7	14	22	1	6
49	1	4	36.0	7	3	21.1	21	18	3	3
50	0	5	X	7	2	21.7	16	22	2	3

[1] Chi-square test of goodness of fit as applied to Roman Catholics and Experts.

[2] Chi-square test of goodness of fit as applied to Roman Catholics and the entire group of school board members.

TABLE 12

INITIAL INFORMATION SOURCES

Unified District Number	Superintendent	Location in Kansas
222	Wayne R. Elliot	Washington
223	Dale Carlson	Barnes
224	Wayne D. Wilgers	Clifton
320	C. V. Reed	Wamego
322	Arnold Bryson	Onaga
323	Lew Hitch	Westmorland
329	Cecil L. Smith	Alma
364	Ray L. Brown	Marysville
378	Keith B. Mueller	Riley
380	Charles B. Watkins	Vermillion
383	B. L. Chalender	Manhattan
442	Gerald J. Fencil	Seneca
451	Gerald Sheetz	Baileyville
488	James M. Jerome	Axtell
498	Milton E. Brooks	Waterville

SELECTED RURAL KANSAS SCHOOL BOARD MEMBER *ATTITUDES TOWARD ECOLOGY*

by

CHARLES F. JONES

B. S., Kansas State University, 1939

AN ABSTRACT OF A MASTER'S REPORT

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

College of Education

Human ecology and its ramifications are important issues before our modern day society. In the past decade much has been written about the environmental crisis, but few valid studies have been made on awareness of and concern for these problems. The purpose of this research was to reveal the knowledge, concern and interest of central rural Americans in the deteriorating environment. The response variances caused by educational background and religious preference were also observed. To obtain this information, questionnaires were sent to rural board members of fifteen unified districts in northeastern Kansas, which yielded from two to five replies from each school community. Forty-five of the questions were in closed form and were designed to be programmed into a computer. Five open end questions solicited diverse answers. Five Kansas State University professors who teach environmentally related courses were asked to serve as a reference group. The responses given by this group were considered to be ecologically sound. The results of the two groups were tabulated and recorded in frequency tables in which the responses of the two groups could be easily observed. The information recorded in four of the tables was subjected to the chi-square test of goodness of fit.

The major findings of this project which relate to each of the researcher's objectives are listed under the specific objectives.

First Objective: To discover if rural Kansans are aware of environmental problems:

1. The experimental group closely paralleled the reference group on less than one-half of the items.
2. As the educational level of the experimental group increased, their responses more closely paralleled those of the reference group.
3. Less than 15% of the experimental group felt that zero population

growth is necessary in the United States.

Second Objective: To discover if the rural board members were following approved environmental practices on their farms:

1. The experimental group closely paralleled the reference group on only 27% of the questions relating fo farm practices.
2. The level of education obtained did not greatly affect the pattern of environmental practices.
3. Less than 50% of the experimental group let environmental concern affect their use of herbicides, pesticides and fertilizers.

Third Objective: To discover if rural board members believe that environmental sciences should be taught in Kansas schools:

1. Thirty of the forty board members interviewed believed that an environmental science should be taught in high school.
2. Less than 20% of these school board members objected to sex education being taught in high school, but 40% were opposed to the teaching of birth control.
3. The experimental group selected 4-H as the community youth best qualified to teach ecology.