James G. Kendrick and Everett E. Patterson

> My interest is in the future because I'm going to spend the rest of my life there.

Charles F. Kettering

Abstract

The world's population, now estimated at 4 billion, is predicted to double in the next 25 to 35 years. Can the world's resources and institutions provide food and other essential products and services for that many people? Or will millions experience famine, disease, and war? Population will eventually be controlled, one way or another. The basic issue is whether this control is to be accomplished logically and humanely or irrationally and disastrously. Recognizing the problem, its magnitude and consequences, provides the basis for formulating sound national and international policies to stabilize or reduce population and to "feed them also and lift them up."

People and More People

The History of Population Growth

Population explosion is a fairly recent phenomenon in terms of man's history on earth. The world's population was estimated at 5 million in 8000 B.C. The growth rate was so slow that 1,500 years passed before there were 10 million people. At the time of Christ there were about 250 million. War, disease, and famine held down the growth rate for the next 16 centuries so that the world population in 1650 has been estimated at only 500 million. After 1650, it took 200 years for the population to double, reaching about one billion for the first time in 1850 — just 125 years ago. Approximately another billion people were added in the next 80 years, making 2 billion in 1930. By 1975, only 45 years later, the world's population doubled again, reaching 4 billion.

The reasons for the population explosion of the last 150 years in the developed countries are doubtless well known: there was greater control over the environment, to produce more food; death rates were dramatically reduced; and there was little or no reduction in birth rate until after 1950. Mass migration to the western hemisphere and to African and Asian colonies relieved population pressure in Europe during the nineteenth century.

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The idea that a growing population is not only inevitable but a desirable and necessary component of economic development is a holdover from this era. Such intercontinental migration is no longer possible because of national restrictions on immigration and lack of economic opportunity.

In the twentieth century the migration has been mostly internal, from rural to urban areas, as economies of the industrialized nations were transformed from predominantly agricultural societies to those emphasizing manufacturing, transportation, communication, and services. Currently, about 40 percent of the world's population lives in cities. In the developed countries the percentage ranges from 45 to 85 percent, while in the less developed countries the range is from nearly zero in African nations to about 100 percent in Hong Kong and Singapore. These areas of urban concentration are growing much faster than their respective overall national populations. In some countries the annual increase in urban population is 5 percent or greater, a rate that doubles the population in less than 14 years.

Population Projections

Population growth is currently following a geometric progression; the faster a population is growing, the shorter the time required for it to double. The rate of growth was very slow during 99 percent of man's million-year history. It accelerated after the introduction of farming about 10,000 years ago and quadrupled in the next 8,000 years. About 200,000 humans are now being added to the world's population each day. At this rate, current projections indicate that by A.D. 2000 the population will be 6.5 to 7.5 billion, with most of the increase occurring in poor, hungry nations. Continued growth for 1,000 years would mean a population at the absurd level of a billion billion people by A.D. 3000, or 1,700 persons per square vard of the earth's entire surface.

In industrialized countries the population increase has declined to less than one percent a year, but population will still expand by approximately 25 percent by A.D. 2000 because of lower mortality rates. Population in the underdeveloped countries, which currently account for approximately three-fourths of the human race, will continue rapid growth into the next century. Latin America has a growth rate of 35 per 1,000; Africa and India, 25 per 1,000 people.

An important characteristic of the population of the underdeveloped countries is the high percentage in younger age groups, and therefore the potential for rapid population growth in the future. Currently the momentum for population growth is 2½ times greater in these countries than in the developed nations.

The world's population will continue to crowd into urban areas, intensifying the problems of providing employment, health services, schools, housing, electricity and other energy sources, transportation, sanitation, police and fire protection, and recreational and cultural facilities. These problems will be more serious in the underdeveloped countries, many of which lack the necessary means for economic growth.

Demands on Resources

Until recently, population growth was regarded as a problem mainly confined to the underdeveloped countries. Since 1969, however, people of urban, industralized societies have realized that they also have serious problems. As the Pogo comic strip's author. Walt Kelly, expressed it so well, "We have met the enemy and he is us."

The people of the western world, about one billion, consume 85 percent of all goods now being produced, leaving only 15 percent for the remaining 3 billion people of the underdeveloped countries. With present production of all goods and services, equitable distribution would leave everyone in a state of poverty. Expressed in terms of "Indian equivalents," the U.S. population is now 5 billion, with each person consuming as much as 25 people in India. For all people on earth to enjoy the same level of living as the average American today, the world's population would have to be reduced to one-eighth its present size, or 500 million — back to what it was in A.D. 1650. If all the food in the world were distributed so that a few would eat as well as the average American, two-thirds of the world's population would starve.

Too Many for Too Few

Thus, the major problem in the world today — and in the years ahead — is too many people vying for too few resources. In marked contrast to the less developed countries, the advanced nations no longer have the problem of "Give us this day our daily bread," but rather there has been the demand for more goods and services, which has led to pollution of soil, air, and water, depletion of non-replenishable resources, urban concentration with noise, tension, crime, and soaring costs in time and money. The people of advanced nations, with higher incomes, draw upon the resources of the rest of the world to maintain and "upgrade" their levels of living. However, the "oil crisis" has jolted all people into realizing that the supply of basic resources is limited and access to them is problematical.

In the underdeveloped countries the problem has three parts, all serious and difficult to solve: rapid population growth: insufficient food and poor nutrition; and poor quality of life.

Need for Population Policy

Population policy has been defined by the United Nations Population Commission:

Population policy may . . . be defined as measures and programmes designed to contribute to the achievement of economic, social, demographic, political and other collective goals through affecting critical demographic variables, namely, the size and growth of the population, its geographic distribution (national and international) and its demographic characteristics.

The commission classified population policies as:

Population-responsive policies that will ameliorate or overcome the effects of unprecedented increases in population size and density, high birth rates and high population growth rates, and

Population-influencing policies that will bring about a reduction in fertility and mortality and in growth rates, or will beneficially influence internal migration.

Programs to influence demographic variables remain in the early stages of development and implementation. Thirty-five underdeveloped countries have stated that they now have policies to reduce fertility rates and decelerate population growth. These countries have nearly 2 billion people or 80 percent of the population of all the underdeveloped countries. But implementation and effectiveness of these population policies are much less impressive than the percentage of population in countries with nominal programs. These countries still have annual population growth rates of 2.5 to 3.0 percent — hardly effective population control.

Most of the industrialized nations have already made the transition from high to low birth and death rates, with annual growth rates of less than 1 percent even though income tax rules and other policies still encourage large families. These countries provide mass education for their people. Economic and social institutions permit upward mobility in incomes and social status. Methods of fertility control are legal and easily accessible. Family planning services are becoming more readily available. Their people are aware of the depletion of natural resources and are developing a national concern for these problems. The status of women has improved through equal rights to education and employment and recognition of their right to determine what happens to their bodies.

The need for public policies to stabilize, and possibly to reduce, the world's population is not yet universally recognized and accepted. Wide differences exist among individuals, organizations, and nations as to the urgency of the so-called "world population problem."

Those who advocate immediate and drastic action to control population believe that: humanity is already threatened with global castastrophe; rapid, unrestricted population growth is the main cause of ignorance, poverty, malnutrition, disease, environmental deterioration, and social unrest; the fertility-reducing effects of economic development cannot be realized in areas with rapid

population growth; and children should be born into families and societies that want them.

Others argue that: family planning and population control are being overemphasized; population growth is needed for economic development and political and military strength; wealthy industrialized nations are trying to protect their favored position of over-consumption by retarding development of areas that are being exploited for their natural resources; white people favor population control as a subtle form of genocide among nonwhite races; the problem is one of population and income distribution rather than numbers of people; contraception and abortion are morally wrong; and improvements in agricultural and industrial technology will prove Malthus wrong again and permit the world to accommodate 15 to 25 billion people.

The World Population Conference of 135 nations held at Bucharest in August 1974 included spokesmen for these differing viewpoints. The World Population Plan of Action developed at this conference has been described as wordy and hesitant, but could accommodate effective family planning programs and population control policies at national and international levels. Among its aims and principles, the plan:

- Declares as its "primary aim . . . to expand and deepen the capacities of countries to deal effectively with their national and sub-national population problems."
- 2. Declares (for the first time) that governments, in exercising their sovereign right to set their own population policies, should do so while "taking into account universal solidarity in order to improve the quality of life of the people of the world."
- Recognizes that "All couples and individuals have the basic human right to decide freely and responsibly the number and spacing of their children and to have the information, education and means to do so."
- 4. Declares (for the first time) "The responsibility of couples and individuals in the exercise of this right takes into account the needs of their living and future children, and their responsibilities toward the community."
- Declares "Women have the right to complete integration in the development process particularly by means of an equal participation in educational, social, economic, cultural and political life."

Important recommendations of the plan are:

- Countries that believe their population growth hampers attainment of their goals should consider adopting population policies — through a low level of birth and death rates.
- Developed countries are urged to adopt appropriate policies in population, consumption, and investment, bearing in mind the need for fundamental improvement in international equity.
- Highest priority should be given to reduction in mortality and morbidity and increase of life expectancy; and programs for this purpose should reach rural areas and underprivileged groups.
- Countries should encourage appropriate education concerning responsible parenthood and make available, to persons who desire it, advice and means of achieving it.
- Countries wishing to affect fertility levels should give priority to development programs and health and education strategies that have a decisive effect upon demographic

- trends, including fertility. International cooperation should give priority to assisting such national efforts.
- Research should be intensified to develop knowledge concerning all aspects of population and family planning.
- Policies and programs should be undertaken to reduce the undesirable consequences of excessively rapid urbanization and to develop opportunities in rural areas and small towns.

Public Policy Choices for Population Control

The ultimate goal of population policies is to improve the general welfare of all people. For many nations, realization of this goal will be very difficult, even impossible, with unrestrained population growth. They are caught in a vicious circle — high population growth in the current world setting retards economic development which, if attainable, would reduce human fertility.

The United States and other developed nations have three main policy choices in regard to world population:

- Set an example for less developed countries by revising existing pronatalist policies (e.g., income tax exemptions) and reducing wasteful consumption of scarce resources.
- Encourage nations with rapidly growing populations to adopt effective control programs as a condition for receiving economic developmental assistance and food aid except in emergency situations.
- Withdraw into a shell of isolationism and self-interest, relying upon economic strength and military power to maintain this position in world affairs.

Probable consequences of these policies are:

- 1. Lower levels of living in the developed nations.
- Higher public expenditures for foreign assistance programs or national defense.
- Criticism for interfering in the internal affairs of other nations.
- 4. Internal and external censorship for contributing to famine, disease, and political upheaval.

If an underdeveloped country decides to reduce its population growth rate, the main public policy choices available are:

- Persuasion use of propaganda campaigns and education to inform people of the consequences of rapid population growth, benefits of family planning, and methods of birth control.
- Providing health, family planning, and birth control services general public access to medically, morally, and politically acceptable services through government agencies or public support of private facilities.
- 3. Financial incentives to limit family size programs to supplement family incomes or increase living costs, such as payments for voluntary sterilization and abortion, elimination of tax benefits, imposition of tax penalties, lower maternity and child-care benefits after two children, free public education to delay marriages, and improved security in old age.
- Coercion strict enforcement of parliamentary laws or autocratic decrees providing for compulsory sterilization and abortion, withholding of food ration cards, infanticide and geronticide.

Probable consequences of these policies are:

 The first three alternatives involve mostly voluntary population control programs. Under these, the final decision to number of children would remain with the family. family. These programs would be morally and politically more acceptable than coercion, but would be more effective in the long run than in the near future. In the meantime, rapid population growth with associated problems would continue. Greater public expenditures for health, education, nutrition, and general economic development would be required in both advanced and underdeveloped nations. Moral, religious, and political opposition, even to voluntary population control programs, exists in many countries and might become stronger when expanded programs are proposed.

 Strong popular resistance to coercive programs could be expected in many countries. This approach is unlikely to be a feasible choice except in nations with strong central governments. It would, however, stabilize population within a relatively short period of time.

Pragmatically, effective multinational worldwide population control policies have little chance of adoption and implementation within the next 10 years or longer. More regional, national, and international conferences will be held, but will result in much talk and little action because of differing viewpoints among and within the world's community of nations. Efforts to obtain more agreement on population problems and control policies should be intensively continued.

Since population will increase into the next century, especially in the underdeveloped countries, food production must be expanded to feed them and feed them better. Twice as many people in A.D. 2010 will require twice as much food just to allow them to eat as well as the population of 1975 — hardly a nutritional millenium! More and different foods will be needed to improve nutrition.

The possibilities and problems of providing more and better food for more people are considered next.

Food and More Food?

Plan ahead — it wasn't raining when Noah built the Ark.

- General Forbes Corporation

Food Quantity

Mankind has not yet been forced to engage in true long-term planning of its food supply. As population expansion occurred, two general strategies were followed in matching food supplies to population: (1) people migrated to where more food could be produced, and (2) food production was increased where the people were located.

The matching of people to food supply was not always exact, from a short-range viewpoint. Hunger and other hardships usually preceded mass migrations to virgin soils and major efforts to increase production on existing agricultural lands.

Those individuals currently concerned with the imbalance in the people-food equation can be divided into three philosophical camps which believe that the current imbalance is:

 Fundamental, not temporary; relatively equal expansion of people-food over time will never resume; planning on a massive scale is required to reduce the world's present population levels, if famine is to be averted.

- Solvable by temporary food aid and massive injections of food production technology, funded largely by the developed nations on a long-term basis.
- Another example of a short-run situation which will be corrected by natural forces; and soon the historical expansion in population and food production will once again resume.

What are the facts? No one or no agency knows the exact population of the world, or how fast it is increasing. No one knows the true level of malnutrition, or the true quantity of food production and food reserves. However, most people agree that during the past few years population has increased faster than food production, and world food reserves have been significantly reduced.

But which philosophical camp appears to have the more logical position?

The supply of virgin lands easily adaptable to agricultural production had been exhausted. True, there are vast unpopulated areas in many parts of the world the arid areas of the western United States, and the savannas and rain forests of South America come quickly to mind. These lands can produce food — vast quantities of it — providing massive capital investments are made to "condition" the inherently hostile environment to one in which production of food can be continually produced and efficiently distributed. These virgin lands often require land shaping, soil conditioning, and vast investments in fertilizers, insecticides, and herbicides. Transportation and storage networks also need to be developed in order to utilize the food produced. Simply stated, the lands that are capable of producing food with little or no "conditioning" are presently in production.

The seas and oceans have been suggested as substitutes for the once plentiful virgin lands. Unfortunately, while the oceans and seas may cover a vast area, they are relatively sterile. Only in a few areas — the fishing grounds — do upswelling currents bring nutrients in contact with solar energy, thus permitting life to exist and multiply. Capital investments could increase the food production of these "fishing grounds," but the seas are not vast reservoirs of untapped food production resources.

Consequently, the efforts to increase food production have been concentrated on lands that are currently producing food. "Make two blades of grass grow where but one grew before" has been the task of technology; and it has worked. Yields have been increased by an infusion of genetic engineering, improved management practices, and supplemental inputs of specialized machinery, fertilizers, insecticides, and herbicides.

Technology can continue to increase food production — at least for a time. However, mankind must face the reality that even the marvels of modern science will not permit the production of the world's food needs in a flower pot. Thus, even those who expect technology to increase food production must realize that eventually population will have to stabilize.

The pragmatic issue is not what technology can theoretically do to increase food production, but rather,

what are the costs of employing that technology, and what priorities will nations of the world place on food production relative to other expenditures such as education, health, transportation, national defense, and so on?

Although the above questions are difficult to answer with certainty, the following observations seem logical:

- The real costs of producing food will rise in the years ahead. Much of the total world's food supply comes from "conditioned" lands — those lands that maintain production only with continuous heavy investments.
- Those nations and areas where population expansion is pressuring the available food supply are the poorer nations of the world, unable to afford either the massive technological investments for conditioning the land for increased food production, or large-scale buying from already conditioned and producing nations.
- Those nations of the world who could afford the technological investments for massive further conditioning of the land, either in developing or developed areas, are not pressured by rapidly expanding populations.

One may thus conclude that the poor nations will be incapable of increasing food production to match population growth unless the developed nations help; and the developed nations are not presently motivated to expand food production greatly, either at home or abroad.

Food Quality

When problems of world food supplies are discussed, too often the word "food" is used synonymously with "calories." Adequate caloric intake is required for life; but balanced nutrition is necessary for a population to be alert and progressive.

An emerging problem, perhaps of much greater significance than any world caloric shortage, is the lack of quality protein in the diets of those nations that are also pressured by rapidly expanding population. A short excerpt from The Lipton Magazine dramatically summarizes the issue.

In a report on its long-term research recommendations, the Unilever Nutrition Working Party pointed out that "there are a number of sensitive periods in the life of an individual during which the development of an organ or tissue can be adversely affected, often irreversibly, by inadequate diet. For example, the period from six months' gestation to two years is the sensitive period for brain development. Poor nutrition during this period affects brain development irreversibly since after two years of age no new human brain cells are formed.

Evidence in support of this finding is growing. Malnourished babies have smaller brains with fewer cells than those of well-nourished children. They lag behind in intellectual performance and, unfortunately, studies suggest that they will never catch up no matter how much their diets may improve after two or three. The contribution of poor nutrition to decreased learning ability is illustrated by the extraordinary student dropout rates in such impoverished regions as Pakistan and Central America where, according to nutritionist Alan Berg in his book, The Nutrition Factor, 60 percent fail to complete the first grade. Fewer than 40 percent of the pupils entering Indian primary schools reach the fourth grade, a level which is necessary to achieve lasting literacy. Berg adds.

Protein Alternatives

Assuming that the lack of quality proteins is at least as serious a problem as the shortage in total food production, the following alternatives are available:

- 1. Paraphrasing Marie Antionette, "Let them eat meat"—
 60 grams of protein a day, of which 20 grams are from animal sources, is the generally accepted requirement for adequate nutrition. The production of quality proteins requires a movement upward on the food chain. To produce a pound of edible beef, perhaps 10 to 15 pounds of grains must be consumed. If a nation is short of grains, the admonition "let them eat meat" requires either importation of the grains to produce animal products, importation of animal products directly, or designation of a group of the population that is to starve so that others can eat greater quantities of quality protein.
- Reduce the quantities of animal proteins consumed by the developed nations of the world to release grains for donation to the underdeveloped countries for increased animal production (remember — by definition, the poor nations cannot afford to buy these grains).
- Lower protein consumption in the developed nations, but continue to produce the same (or expanded) quantities of animal proteins and give the poor nations the food necessary for improved nutrition.
- Improve the quality of plant proteins by genetic breeding, or by blending combinations of plant proteins to more closely approximate the quality of proteins found in animal products.

The political mood of the developed nations seems to suggest that voluntary reduction in meat consumption to raise the level of animal proteins consumed by the world's poor is unlikely. Further, it is unlikely that many underdeveloped countries will be able to designate a section of the population that is to be eliminated to improve the lot of the remainder. Thus, the most probable course of action will be to continue with programs that improve the quality and availability of plant proteins.

Removal of Disincentives

If the hungry nations of the world want greater quantities of quality foods, those foods must be either produced where the hungry people are located or purchased from other nations. Changes in agricultural policy must occur within many of the hungry nations, if rapid expansion in food production is to take place. The farmers in the underdeveloped countries must be given incentives to increase production. In some countries it may be the removal of disincentives. For example, if the world price of a food product increases, the governments of some nations keep the profits and farmers receive no increase in price. Often the landlord places the tenant in a precarious situation, in that the tenant's "rights" are only for a year at a time. Inheritance and tax laws in some countries result in rigid land ownership and land use patterns. Land tenure systems that retard increased food production need reform to provide greater stability. and thus increase long-term investments.

^{1&}quot;World Nutrition II: Children Without Protein Could Mean a Nation Without a Future." Reprinted in The Lipton Magazine, Fall, 1974, p. 4. Thomas J. Lipton, Inc. Englewood Cliffs, N.J.

Alternatives and Consequences for the United States

Should the United States try to feed the world's hungry? Will our aid help or hurt the underdeveloped countries? Who is going to pay the bill? The following are possible alternatives:

No assistance of any kind — the United States would announce to the world that unless a country has the means of eventually making full payments, there would be no aid to help alleviate even an emergency situation.

Probable consequences of this policy are:

- a. Famine and starvation in some areas of the world.
- b. Plenty of food for the U.S. population.
- e. Because of the reduction in food aid (1) a build-up of food stocks with the taxpayer paying the storage bill; (2) greater instability in food prices, both internally and externally;
- d. Small chance for the underdeveloped countries to develop their own food producing capacity.
- 2. Emergency assistance only under this policy the United States would announce that it will release free food and technical aid only to divert mass starvation caused by acts of God or man. The United States would not give any aid in products or money to countries suffering from a chronic people-food imbalance.

Probable consequences are:

- a. Plenty of food in the United States.
- The American taxpayer would not be supporting chronic imbalances in population and food production capacity.
- Underdeveloped countries would face a severe development problem.
- Political and economic instability would exist in those nations that have these chronic people-food imbalances;
- e. Countries in this people-food "crunch" would be pressured to act quickly and decisively to try and relieve their problem, or face famine.
- 3. Emergency relief coupled with a long-term commitment to agricultural development the United States would offer emergency help to relieve suffering and starvation to countries that have experienced disaster. It would cut off long-term food aid to countries who have not taken dramatic actions to balance the people-food equation. The United States would commit itself to aiding all underdeveloped countries in improving their food production capacity, including those with a chronic situation provided that these nations are willing to engage in the internal planning that offers the hope of eventual improvement in the quality of life for their citizens.

Probable consequences are:

- a. Underdeveloped countries would reach a self-sufficient production level sooner than without help.
- b. It would "buy time" while population expansion is brought under control.
- The American taxpayer would pay a large portion of the bill.
- 4. A policy of all-out moral obligations under this policy, the United States would try to feed the world no matter what the cost. The United States would try to guarantee everyone in the underdeveloped countries a sufficient diet. U.S. farmers would be guaranteed markets with high target prices to encourage all-out food production. This alternative seems unrealistic, for the world cannot adequately feed itself now; and it would seem impossible to expand the production in the United States to keep up with uncontrolled world population growth.

Probable consequences are:

- a. Great sacrifices would be required on the part of the American people: (1) increasing amounts of energy resources diverted to food production and distribution activities; (2) increased taxes; (3) emphasis on cereal and vegetable protein in the U.S. diet.
- Underdeveloped countries would not develop policies that would eventually reduce the necessity for "gifts" from the United States or other developed nations.
- 5. Use food as a political weapon to achieve U.S. political objectives the United States would hold food until it received its asking price in dollars or actions (e.g., farm products for oil).

Probable consequences are:

- a. Widespread famine;
- b. Political and economic world instability;
- Greater effectiveness than military threats and excursions.

Conclusion

Why more people? Feed them for what — idleness, poverty, and disease? What kind of community, state, nation, and world do we want for ourselves and our children and their children? The answers we come up with now will determine quality of life in the future, even the very existence of human life. The developed nations must assume the leadership, control their own population, become responsible citizens with worldwide concerns, and conserve resources instead of engaging in unrestricted exploitation and pollution. Otherwise, a new and perhaps final chapter will be written to the history of man on earth.

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