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GEOGRAPHY OF FOOD AND POPULATION[1]

by

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A 12-year-old boy describes "mixed emotions." It is like hearing the morning siren telling you that school is closed because of a blizzard — and you are in bed with a flu.

I feel that I have "mixed emotions" about food and population. It is just like mixed pickles. You cannot discuss food without involving population or discuss population without involving food.

If man must be concerned with food and population or with population and food for the next century, there should be a new direction in meeting the problems of overpopulation and the production of food to feed the teeming billions of human beings of planet earth. Vested interests together with physical scientists and economists on one hand and agricultural scientists and research biologists on the other should sit together and agree on how many people and how much food there should be from year to year in planet earth. Then the United Nations provide the necessary incentives and mechanisms for the implementation of the program.

We in this assembly should, likewise, think hard and be rational in meeting the same problems for the Republic of the Philippines. The agricultural scientists, economists, and research biologists and that new group of people called demographers should present a proposal leading to the establishment of a research institution called Food and Popu'ation Research Institute under the National Science Development Board.

POPULATION

Present Status of World Population. — As of December, 1968, each day there were 191,000 more people to feed. This growth is a little more than 2 births per second. According to reports of the Population Reference Bureau, each day sees an average of 324,000 births and 133,000 deaths (324,000 — 133,000 = 191,000). Malnutrition is responsible for about 10,000 of these deaths. At the current rate of growth the world population should exceed 3,500,000,000 by January 1, 1969. It should double in the next 31 years. This means 7 billion people by the year 2000. This should make things real chummy, shouldn't it?(1).

[1] Paper read at the NSTW Symposium on Food, Population, and Science on July 14, 1969. NSDB, Manila.

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The fastest rates of population increase are in the southern areas of the earth, particularly in Asia, Africa, and Latin America where more than two thirds of the world population live. The leading countries in population (1965) in this area were (a) Mainland China — 730 million, (b) India — 482.5 million, (c) Pakistan — 115 million, (d) Indonesia — 104.6 million, (e) Brazil — 81.3 million, (f) Nigeria — 57.2 million, (g) Mexico — 40.0 million, and (h) Philippines — 32.3 million(2).

It has been reported that a study group of prominent Americans recommended that the United Nations name a commissioner for population and collect 100 million dollars a year to promote birth control so as to help the world's population from hitting 7.5 billion by the year 2000. A national policy panel of the UN Association of the USA made the recommendation in a report titled "World Population." Millionaire John D. Rockefeller III said at a news conference the day before the report was issued, "this effort for resolving the world's population problem could be the UN's greatest achievement. The report complained of unbalanced pregnancies, and that no woman should conceive an unwanted child. High fertility and high rates of population contribute to pollution, congestion, urban sprawl and a host of psychological ailments in developed countries and might mean widespread famine, increased illiteracy, unemployment, squalor and unrest threatening the very foundation of public order in developing countries(3).

High Population Growth in Underdeveloped Countries. — Most of the people in the world are poor and these lived in countries sometimes called "underdeveloped" or "developing" or "emerging countries." Roger Revelle of the Harvard Center for Population Studies(4) has indicated that 56 countries, with a total population of more than 2 billion peoples have a per capita national product equivalent in monetary term to less than $300 per year. Another 28 countries, with nearly a billion peoples have a per capita product of more than $600 and most of these are above $1200. But in the range between $300 and $600, there are only 15 countries with a total population of 147 million, less than 5 percent of the human beings on earth. The two peaks in the bimodal distribution curve lie in the ranges of from $75 to $149 and from $1200 to $2399. More than half of all human beings eke out their existence on an income of less than $0.40 a day; more than 20 percent have incomes averaging ten times as high.

On the basis of these facts Revelle defines an underdeveloped country economically as having a per capita Gross National Product of less than about $400, while a developed country usually has more than $480. The data further show that underdeveloped countries can be distinguished equally well by their birth rates which are, in almost all cases, more than 34 per 1000 of population per year. Birth rates in developed countries are always less than 30, ranging downward to 13.

Although over-all death rates are low in both developed and underdeveloped countries, there is a marked reduction on mortality rates in underdeveloped countries, due to the technological advances especially in medical science. This rapid increase in human numbers is, perhaps the most significant characteristic of most underdeveloped

countries. Such growth rate serve not only to distinguish the underdeveloped countries from the developed ones but they are commonly believed to be one of the basic causes of the growing economic gap between the two parts of the world.

Five of the seven most populous regions of the underdeveloped world outside of Mainland China are India, Pakistan, Indonesia, Brazil, and Nigeria. They show average annual rate of increase of 2.6 to 3.8 percent, two to three times higher than those in even the most rapidly growing and sparsely inhabited developed regions and nearly five times higher than the European average.

Philippine Population Outruns Wealth. — The Republic of the Philippines with estimated population of 35 million people has an annual increase of about 1.2 million people. This averages about 3.4 percent. Considered the highest in Southeast Asia it is second only to Costa Rica's record of 4.3 percent, (12) in 1967.

The report of Robert H. Nooter, Acting AID Assistant Administrator for East Asia said that the benefits of economic growth in the Philippines have been greatly reduced by one of the world's highest rate of population increase. A wide gap between the rich and the poor tends to diminish the favorable impact of economic growth on the bulk of Philippine population. It was noted that the Philippines has the advantage of rich natural resources, favorable climate and largerly literate population with an economic growth at 6 percent in recent years(4).

However, in the Sunday Times Editorial, June 8, 1969, it was indicated that the government is indecisive on population issue. It seems that no one has seriously challenged the conclusion that, given this rate of growth, population here will double within the short span of 23 years. Nor has there been any question that the addition of 1.2 million Filipinos every year will impose tremendous strains on the economic and social fabrics of the country (5).

FOOD

A very disturbing paradox of this age is hunger in many countries and burdensome food surpluses in others. This is not an easy problem to solve as is often suggested by bringing surpluses in others to deficit areas, altho this is no doubt part of the solution. The whole problem is complex; it involves land resource productivity, modern agricultural technolcgy, population trends, economic development, cold war strategy and many other related factors.

The United States Department of Agriculture has indicated the sharpness of the contrasts between the food - deficit and food - surplus countries. It showed that the diets were nutritionally inadequate in most of 70 less developed countries in tropical and semi - tropical southern area including Latin America, Africa, West Asia, the Far East, and Communist Asia which now contain more than 2.208 billion people. The diets of about 1.2 billion people in the 30 industrialized nations in the temperate northern area are nutritionally adequate. Because they can readily produce food or things they can trade for food, these countries are assured an adequate food supply for the foreseable future (6).

One of the key factors in the solution of the world's food imbalance is land. As William Vogt author of the book *Road to Survival* said (7) "we must — all of us men, women and children — reorient ourselves with relation to the world in which we live. We must learn to weigh the daily news in terms of man's subsistence. We must come to understand our past, our history in terms of the soil and water and forests and grasses that have made it what it is. We must see the years to come in the frame that makes space and time one — that will keep us strong only as, like Antaeus we draw our strength from the earth."

Planet Earth Has Small Arable Land.— Planet earth consists roughly of 71 percent water and 29 percent solid land of approximately 56 million square miles. The land use pattern of this area consisted of approximately 30 percent forests, 20 percent grasses, 18 percent mountains and 32 percent deserts. But the sum total of the world's arable land is surprisingly small (6). Data from the Food and Agriculture Organization of the United Nations showed that there are only 1.4 billion hectares or 3.5. billion acres of arable land. This means that there are 1.2 acres of arable land for each man, woman, and child in the world today. But world averages do not tell the whole story. In the southern area, data, further show, the amount of arable land averages only one acre per person as compared to 1.7 acres per capita in the northern area. But even area averages cover up wide variation in land availability; for example, in Communist Asia there is only 0.4 of an acre of arable per person, while in the United States and Canada there are 3 acres per capita. The fact that there is more arable land per person in the northern area than in the southern area helps to explain differences in food availability.

Ther too, "arable" is a word that includes a very broad range of soil productivity. Many countries are blessed with large section of fertile soils and with good climatic conditions while others have neither climate nor soils that will enable them to produce the quantity of food they need. In general, the lands of the northern area are more fertile than those of the sou'hern area, but almost all arable land can be made more productive through the use of good management practices and the application of advanced technological innovations.

In India, the problem of bringing about a better future balance between population and food supplies is being attacked in four broad fronts namely: (a) a vigorous campaign of human fertility control to reduce the rate of population growth; (b) expansion of the area of cultivated land and increase of cropping intensity to the maximum extent possible; (c) increase in crop yields per unit area of cultivated land; and (d) development of all economically feasible ways of increasing the amount of high-quality protein in the average Indian diet. These might include: genetic manipulation of cereals; protein extraction from cotton seeds, other oil seeds, and soybeans, production of fish protein concentrate, microbial protein production using hydrocarbons or organic wastes materials as a source of energy and greatly increased efficiency of animal and pond-fish production and better use of humanly inedible organic materials as animal feedstuffs (2). While these recommendations are directed to India they can be applied to other developing countries as well.

More Fertilizers For More Food. — Research and farmer experience in less - developed countries has shown that best returns are only obtained when fertilizers are used along with improved crop varieties, pest control, and adequate soil moisture. There is no question about the merits of a package of practices and the need for such a package to produce really high yields and it should be used when possible. Nevertheless, there is ample evidence that properly selected simple practices, good seed, fertilizer or other measures often give satisfactory physical and economic returns on a wide range of soils and crops in the less - developed countries. The following conclusions are drawn from the agronomic data that has been developed through technical assistance in the last fifteen years: (a) Plant nutrients are the major limiting factor in agricultural production in the less - developed countries. (b) A moderate rate of fertilization, 40 - 70 kg. per hectare, will usually increase the yield of crops about 50 percent. (c) The response of fertilizer may be increased at least 50 percent when it is used with improved varieties of crops, pest control, and good soil and water management practices. (d) High levels of fertilization, 100 - 300 kg. per hectare, and high yields are only possible when fertilizer is used on crops bred for the use of high levels of fertility and disease and insect resistance. (e) Fertilizers can be used as effectively in less - developed countries as in North America and Europe (8).

The relationship between fertilizers and food are as follows: one ton of plant nutrient will produce about 10 tons of cereals, 36 million calories enough to provide 2400 calories to 40 people a year. A fertilizer plant producing 1000 tons of nutrient per day would therefore provide 2400 calories per capita for about 15 million people for a year. This geographic relationship should be considered by the Republic of the Philippines in its food and population problems.

GEOGRAPHIC RELATIONSHIP OF FOOD AND POPULATION

The geography of food and population can also be discussed in terms of the geography of hunger. Dr. Josue de Castro, Instituto de Nutricao, Universidade de Brasil, Rio de Janeiro, Brasil, wrote a book entitled "The Geography of Hunger," published in 1952 (17 years ago) (9). Because of the relevance of most of the geographic presentations I took the liberty of lifting some of the observations and evaluations and used them in this part of the paper. These are mostly food, nutrition, and malnutrition in relation to population and vice versa that were gathered extensively by the author for so many years.

Hunger as the Cause of Overpopulation. — The word hunger has many meanings. Castro's conception of hunger, embraces everything from latent deficiencies commonly called conditions of undernourishment and malnutrition to absolute starvation. It is pointed out that overpopulation does not cause starvation in various parts of the world, but starvation is the cause of overpopulation. This idea sounds paradoxical, since hunger, an agent of deterioration, and death, seems unlikely to provoke an excessive increase in population. But in reality that is just what happens. Consider that the three countries of the world that are held to be absolutely overpopulated are China, India, and Japan; and yet

it appears that the more these places are assailed by starvation the more the number of their inhabitants grow.

Specific Hunger Causes Fertility Thus Overpopulation. — Specific hunger is the lack of particular minerals, vitamins or certain nutrient substance in the food. One of the most serious and widespread of dietary lack of specific hunger is protein deficiency.

"Hunger for proteins involving a deficit in certain important amino acids, increase significantly the fertility of animals." In the sensational experiments of J. R. Slonaker, he subjected groups of rats to diets which varied in protein content, and studied their reproductive indices for six generations. It was found that diets rich in proteins, when protein constituted more than 18 percent of the total calorie intake, were unfavorable in all counts to the reproduction of the species: they increased sterility, retarded the epoch of fertilization of the females and reduced the number of litters and the number of young in each litter. Slonaker further observed that when male rats receive a diet with only 10 percent of its total calories in proteins, 5 percent of them were sterile; when the protein content of the ration was increased to 18 percent and 22 percent, the sterility increased to 22 percent and 40 percent respectively with females, the same increase in protein in the diet lifted the sterility rate from 6 percent to 23 percent and 38 percent respectively. There were impressive differences in the average number of offspring of the various groups of rats. Eating 10 percent protein, each rat produced an average of 23.3 offspring; with 18 percent protein 17.4 and with 22 percent only 13.8 percent (10).

TABLE I. INDICATING STERILITY AND OFFSPRING BY DOSES.

Protein/Percent of its total calorie	Sterility Rate		Average number of offspring
	Male rats	Female rats	
	percent	*percent*	
10	5	6	23.3
18	22	23	17.4
22	40	38	13.8

These figures clearly suggest that in proportion, as the diet increases in protein content, reproductive capacity drops. However, it is also true that larger protein rations bring about a better resistance to disease in the young and are increased in the percentage of those that survive. It appears, then, that, with percentage of protein high enough to guarantee a good survival index among the offspring, the number of the offspring falls off; and that when the diets are inadequate in protein, nature multiplies the number of offspring so as to guarantee the continuance of the species.

With human species, the case is the same. The groups with highest fertility are those who have the lowest percentage of complete proteins, animal proteins, in their regular diet. The highest birth rate in the world are registered by certain people in Southeast Asia, Africa and Latin America where the proportion of animal products in their habitual

rations does not reach 5 percent of the total food consumed. On the other hand the lowest birth rates exist among the peoples of Western Europe, United States, Australia, and New Zealand where proportion of foods of animal origin in the ration reaches, respectively, 17 percent in Western Europe; 25 percent in United States; and 30 percent in Australia and New Zealand.

Geographically, the countries of high birth rate (above 30) are all in tropical countries, whose geographic economic conditions are ill adapted to either the production or consumption of proteins of animal origin, the predominantly vegetable diet of these countries is certainly one of the decisive factor in their fertility. Comparing the birth rate with the consumption of animal protein throughout the world, we find a frank correlation between two factors, the fertility going down as the consumption of such protein rises. Table 2 shows clearly the lowering of birth rates of countries with high protein intake. While it does not show conclusively that protein is the controller of fertility, it points very significant correlation between fertility and protein consumption.

TABLE II. COUNTRIES WITH BIRTH RATES VARYING FROM HIGHEST TO LOWEST AS COMPARED TO PROTEIN INTAKE.[3]

Countries	Birth Rate	Daily consumption of animal protein
		grams
Formosa	45.6	4.7
Malay States	39.7	7.5
India	33.0	8.7
Japan	27.0	9.7
Yugoslavia	25.9	11.2
Greece	23.5	15.2
Italy	23.4	15.2
Bulgaria	22.2	16.8
Germany	20.0	37.3
Ireland	19.1	46.7
Denmark	18.3	59.1
Australia	18.0	59.9
United States	17.9	61.4
Sweden	15.0	62.6

[3] From de Castro — "Geography of Hunger," page 72.

Public Apathy to Biological Scientist. — It was Thomas Doubleday who wrote a treaty in London the year 1853 showing that the true law of population is connected with the food of the people. His theories, unfortunately did not become popular. Official Circles rejected them for various reasons, the most powerful was - "it offended the sentimental susceptibilities and moral judgments of the early Victorian middle and upper classes" (11).

Men of science can work only if they are paid. They eat, dress, and have families like common mortals. It so happens that these scientists get on a payroll only when their labor are of interest to somebody, whether it be an individual, an industry or a government.

Now governments, institutions, and employers during this century have been excessively absorbed in problems of economic exploitation, and have in general, shown no great interest in human problems as such. Man is treated as hardly more than an element of production, a cog in the economic machine. That is why there are great many more paying positions for physicists, electronic and mechanical engineers, chemists and management experts than biologists. Physical and chemical researches are of prime utility to the commerce and industry that finance them, while health, physiology and nutrition which is served by biological research, pays no direct dividends.

In one industrial research laboratory alone that of Imperial Chemical Industry, London, the number of technicians and researchers working out new advances in the field of chemistry was very much larger than the total number of research biologists in the whole British Empire. It is obvious that the Industrial chemists with their larger numbers, better pay and better equipment, are in a more favorable position to make discoveries and to hasten the progress of their science than the thin rank of biologists, who are left to their narrow personal enthusiasm and to their strange attachment to the study of problems that the leading elements of the world in general care little about.

Everybody scratches his head about food and population problems while the answer is only behind the house where the research biological and agricultural scientists live.

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