Vegetables and the Quality of Life in the Year 2000

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Future Food Requirements

In the next five years world population is likely to reach 5 billion. Between 1970 and 1980 population increased 22% in Asia, 32% in Africa, and 30% in Latin America and the Middle East. During the same period, Europe recorded an increase of only 5%, and the population of the United States rose a mere 0.8%[2].

In 1981, world population stood at 4.5 billion. Of this number, a total of 2.6 billion lived in Asia. A third of the earth's inhabitants were younger than 15, while only 6% were over 65. If current growth rates are left unchecked, world population figures in the year 2000 may resemble those shown in Table 1. Indeed, by the end of the century 80% of the world's population will live in developing countries, and a significant number of those countries will have large food deficits. Even if the best family welfare and planning programs are adopted, India, for example, will have a population of over a billion, and will require 225 million tons of grain per year. Although the country experienced remarkable breakthroughs in food production during the 1970's, production over the past five years has remained stagnant at approximately 130 million tons per year.

A recent FAO report points out that in more than half of the developing countries increases in food production are not keeping pace with population growth, and that Third World food imports have increased from 42 million tons in 1970-71 to 105 million tons in 1982-83. Just to keep pace, the farm output of Third World countries must increase by 50% before the year 2000.

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[1] Head, Division of Vegetable Crops, Indian Agricultural Research Institute

[2] Source: Population Reference Bureau

Table 1. World population in 1970 and 1980 and projections for 1990 and 2000 (x1 million).

Country	1970	1980	1990	2000
Africa	354	469	621	823
Asia	2091	2557	3126	3822
Bangladesh	68	88	115	149
India	551	693	873	1099
Indonesia	119	151	193	245
Philippines	37	50	68	92
Sri Lanka	12	14	17	20
Thailand	35	47	63	84
Europe	459	484	510	537
Middle East	165	217	285	375
North and Central America	318	369	428	497
South America	282	368	480	625
World	3676	4414	5300	6364

Source: FAO Production year book

The Problem of Malnutrition

In 1974, the World Food Congress recommended that all countries accept the following goals: "...that by 1984 no child will go to bed hungry, that no family will fear for it next day's bread, and that no human being's future and capacities will be stunted by malnutrition." Sadly, not only have we failed to reach this goal, but the world food situation is at least as bad as it was in 1974, if not worse.

Prospects on the food front are grim to say the least. Available food supplies remain low, and millions of children in developing countries die each year from malnutrition. The World Bank estimated that in 1980 about 800 million people suffered from malnutrition.

The United Nations International Children's Emergency Fund reports that 15% of the children born each year will not live to see their first birthday. Modern medical care will be available to only 11% of those who survive. Of these, one-fourth will suffer from malnutrition during the weaning period, when their chances of survival will be 30 to 40 times less than those of a child born in Europe or North America.

Malnutrition is undoubtedly the single greatest problem affecting public health in developing countries. The most severely affected groups are pregnant women and children under five. Malnourished or under-nourished children often have a lower birth weight and a higher rate of neonatal mortality, and suffer from a lack of calories and protein. Anemia due to iron deficiency is also common in both children and expectant mothers, and vitamin A deficiency can lead to xerophthalmia, a disease that causes blindness in an estimated 250,000 Asian pre-school children each year.

Strategy for Increased Vegetable Production

Food problems will undoubtedly increase in the future. To meet the challenge, developing countries must diversify their cropping strategies, paying special attention to vegetable crops. Agricultural planners, however, rarely consider vegetables in their projections, even though vegetables comprise 30 to 40% of the diet in many countries. Sir Stanley Davidson and R. Passmore noted in their book Human Nutrition and Dietetics that:

> "In many tropical countries, it is impossible to over emphasize (sic) the improvement in health that is likely to arise from even a small increase in the vegetable supply. A poor woman with insufficient iron, vitamin A, and ascorbic acid in her diet may find great improvement in her health as a result of taking a good helping of garden vegetables a day."[1]

In comparison with the agriculturally advanced countries, the daily net per capita supply of vegetables in most developing countries is extremely low. The figures for Australia, Japan, Italy, and Canada are 595, 523, 428, and 346 g, respectively, compared with 58 g for India, 167 g for the Phillipines, and 163 g for Thailand.

In most developing countries, vegetable production per unit area is also comparatively low. The average yield of tomato grown under field conditions in Denmark, for example, is 39 t/ha, compared with 9.4 t/ha in India. The world average is about 20 t/ha.

Between 1979 and 1981 world vegetable production grew by less than 1.3% per year, and in many countries this figure was actually far lower. During the same period world population increased 1.8%.

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[1] Vitamin A and C contents of selected vegetables and cereals are shown in Table 2.

Table 2. Vitamin A and C contents of selected vegetables and cereals

Crop	Vitamin A (IU/100 g fresh wt.)	Vitamin C (mg/100 g fresh wt.)
Leafy green vegetables (average)	5000	55
Yellow vegetable (average)	500	31
Snap beans	200	13
Red pepper (Capsicum)	1000	110
Tomato	750	25
Sweet potato	0 - 5000	20
Rice	0	0
Whole wheat	trace	trace

Source: Third Far East Symposium on Nutrition, 1967.

Priority must therefore be given to vegetable production in developing countries, with special emphasis placed on research and extension activities.

The Role of AVRDC and Other Research Centers

The Asian Vegetable Research and Development Center has done a remarkable job since it was inaugurated in 1973. The contribution it has made to tomato, Chinese cabbage, sweet potato, mungbean, and soybean research is commendable. Among its achievements are impressive germplasm collections for each of its mandate crops, and the high yielding lines it has developed for the conditions found in the tropics. Its impact could have been even greater, however, were it not for political reasons associated with the Center's location in Taiwan. It is encouraging to observe that in recent years good sense has prevailed, and that these political problems are now being resolved for the sake of science and humanity.

The need for vegetable crop research in Asia - and indeed in all developing regions - is far greater than can be fulfilled by only one international center, however. For this reason, the Consultative Group on International Agricultural Research (CGIAR), through its Technical Advisory Committee, conducted a study to assess the feasibility of establishing another international vegetable research institute for the tropics. Unfortunately, the project was deferred for lack of funds.

As an alternative, AVRDC should establish outreach stations in Africa and Latin America similar to those it already operates in Asia. The job of the stations would be to collect, evaluate, and maintain germplasm in cooperation with the International Board for Plant Genetic Resources, and also to serve as the primary vegetable production information and training centers in their respective regions. For such outreach stations to be successful, however, links must be strengthened with existing national research stations. If vegetable production is to be accelerated, inter- or intra-regional cooperation must be directed toward problems such as input requirements, the transfer of farm technology, and the establishment of institutions for financing vegetable development.

The development of an effective international vegetable crop research effort will not suffice, however, in the absence of complementary efforts at the national level. Government agriculturalists and policy makers must work to promote vegetable crop research at the national and provincial levels. Such programs, moreover, must be adequately financed, both internally and by international donor agencies. Equally important, formal links must be established to coordinate the work of the international centers with those working at the national level. This will require close coordination between neighboring governments and regular meetings at both the regional and international levels. The following sections outline a few of the many issues that should be considered.

Research Strategies

Information should be collected on the improved varieties already under cultivation in the humid tropics, and these improved materials should be tested in multi-locational trials. Furthermore, a system should be created that assures a free exchange of germplasm. Although the superiority of F_1 hybrids is clear, the hybrids now grown in tropical Asia are the monopoly of a few seed companies. Therefore, better combiners suited to specific purposes should be locally identified, and steps should be taken to reduce the cost of hybrid seed production through the use of male-sterility, self-incompatibility, and gynogenious mutants.

Emphasis must also be directed towards breeding nutritionally superior vegetables. If lines with special nutritive value are identified, judicious breeding can incorporate these characteristics into commercial varieties.

Because of the costs and health hazards associated with pesticides, greater emphasis must be placed upon breeding resistant varieties. Although a large number of vegetable varieties are disease resistant, resistance is often lost when a crop is grown in a different environment. Scientists have already located many sources of resistance, but it takes time to incorporate that resistance into cultivated varieties. Resistance breeding projects should thus be given top priority.

Research must also be directed towards improved crop management practices. Most vegetables have specific temperature tolerances, and require location-specific practices to ensure optimum yields. In many cases, farmers have successfully developed their own methods for dealing with temperature variations, and scientists should closely examine these techniques when searching for improved cultural practices.

Similarly, emphasis must be placed on developing new techniques for maintaining soil organic matter. Most vegetable farms are intensively cropped, and crop residues are usually unable to replace lost organic matter. Organic manures are becoming scarce, and the price of chemical fertilizer is rising beyond what farmers can afford to pay.

Further, water management research should concentrate on identifying the most critical stages of plant growth for irrigation. Applying too much water can be as harmful as applying too little, and the timing, frequency, quantity, and method of irrigation are all important factors.

Research, should also be directed towards developing systems that allow farmers to diversify their cropping patterns. Vegetables intercropped with cereals can help improve soil structure, minimize erosion, and improve soil fertility. The few experiments performed so far on vegetables intercropped with cereals have been very encouraging. The International Rice Research Institute in the Phillipines has initiated many of these studies, often using AVRDC cultivars.

Unfortunately, a large percentage of the vegetables produced in the tropics spoil before they reach the consumer. Studies should therefore be initiated to learn more about simple postharvest technologies that can be used in rural areas.

Greater emphasis must also be placed on producing adequate amounts of seed. Vegetable seed production requires special skills and facilities often unavailable in developing countries. Thus, vegetable farmers in the tropics often depend on high priced seeds imported from companies located in developed countries. There are, however, a few countries in the Third World where the infrastructure for quality seed production has already been established, and agreements should be made that will allow them to supply their neighbors with a reasonably priced alternative.

Extension and Training Services

Until now, extension agencies have attached greater importance to cereals than to vegetables, and the development of improved vegetable technology is often left to the initiative of the farmer. Extension staff should be trained in vegetable production technology, and training centers should be established at the national and regional levels to help keep teachers, researchers, and extension personnel up-to-date. Advances in science and technology are being made every day, and such training centers would need to develop information collection systems that could efficiently disseminate new research findings and technological developments.

Summary

Within the next five years world population is likely to reach five billion, and it is estimated that by the year 2000 79% of the population will live in developing countries. In more than half of those countries, food production is not keeping pace with population growth. Third world food imports have increased from 49 million tons in 1970 to 105 million in 1982, and just to keep pace with population growth farm output must increase 50% by the year 2000.

Malnutrition takes a terrible toll on the physical development of pre-school children, and can reduce mental ability by as much as 26%. Anemia due to iron deficiency, blindness due to xerophthalmia, and similar diseases caused by vitamin A and protein deficiencies all impose serious economic burdens on social welfare systems.

Vegetables are not a panacea for all of these ailments, but, given a fair chance, they can play a major role in meeting the vitamin, mineral, and protein requirements of the world's one billion malnourished people. Cereals will of course continue to serve as a basic food, but vegetables can act as an important dietary supplement.

Even a small increase in the supply of vegetables can result in a significant improvement in the health of the people of the Third World. Vegetable consumption in developed countries averages around 473 g capita/day, compared with 130 g in Asia. Vegetable consumption in India averages only 58 g capita/day - less than one-eighth the average for the world's developed countries.

The need for vegetable crop research, however, is far greater than a single international center can fulfill. Hence, AVRDC should establish outreach stations in Africa and Latin America to work side by

side with regional and national programs to accelerate vegetable production. Government agriculturalists must also establish programs and policies to promote vegetable crop research at the national and provincial levels.

Continued emphasis must be placed on varietal improvement, without neglecting such factors as soil and water management, soil fertility and conservation, and improved cropping systems. Efforts should also be directed toward reducing postharvest losses and developing seed production facilities.

In the past, extension personnel have concentrated on helping farmers increase cereal production, but additional personnel trained in vegetable production are needed to help farmers learn about the results of vegetable research.

If these goals are met, vegetables can play a major role in meeting the basic food requirements of the Third World, and, by sustained and devoted work, centers like AVRDC will help to ensure that one day "...no child will go to bed hungry, that no family will fear for its next day's bread, and that no human being's future and capacities will be stunted by malnutrition."