

DEVELOPMENTS IN FOOD SCIENCE 2

PROCEEDINGS OF THE FIFTH INTERNATIONAL CONGRESS OF

**FOOD SCIENCE AND
TECHNOLOGY**

Edited by

Hideo Chiba*Department of Food Science and Technology, Faculty of Agriculture,
Kyoto University, Kyoto***Masao Fujimaki***Department of Food Science and Nutrition, Ochanomizu University,
Tokyo***Kazuo Iwai***Department of Food Science and Technology, Faculty of Agriculture,
Kyoto University, Kyoto***Hisateru Mitsuda***Laboratory of Food Science and Technology, Research Institute for
Production Development, Kyoto***Yuhei Morita***The Research Institute for Food Science, Kyoto University, Kyoto*

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DEVELOPMENTS IN FOOD SCIENCE

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Aflatoxins: chemical and biological aspects

Preface

The Fifth International Congress of Food Science and Technology took place at the Kyoto International Conference Hall in Kyoto, Japan from September 17–22, 1978. The Congress was sponsored by the International Union of Food Science and Technology (IUFoST) with preceding Congresses having taken place in London (1962), Warsaw (1966), Washington, D. C. (1970) and Madrid (1974). The Congresses were designed with the purpose of: 1) promoting the international exchange of ideas in scientific disciplines relating to the production, processing, distribution, conservation and utilization of food, 2) assimilating and calling attention to major progress made in the field of food science and technology since the previous Congress and 3) obtaining stimulation for and increasing world-wide collaboration on topics of great importance.

The host organization for the 1978 Congress was the Union of International Food Science and Technology of Japan, a member of the IUFoST and representative of the following national organizations: the Institute of Food Technologists—Japan Section, the Japanese Society of Food Science and Technology, the Agricultural Chemical Society of Japan, the Japanese Society of Food and Nutrition, and the Food Hygienic Society of Japan. The Ministry of Education, Science and Culture of Japan, the Science Council of Japan and the Japan Association for the Promotion of Science also supported the Congress in conjunction with the IUFoST.

The theme of the 1978 Congress was "Food Availability and Quality through Technology and Science—FAQTS—". The program consisted of plenary sessions, subplenary sessions, contributed paper sessions, and round table meetings.

Plenary Sessions

The opening and closing sessions were dedicated to a comprehensive assessment of the present and future roles of food science and technology in solving world food problems. Two internationally recognized authorities addressed the plenary sessions with respect to this most urgent matter. The opening plenary lecture was given by Professor Emil M. Mrak, Chancellor Emeritus of the University of California, Davis (U.S.A.), with the title of "The World Food Problem and Meeting the Challenge". Professor John Hawthorn of the University of Strathclyde (UK), immediate past president of the IUFoST, gave the closing plenary lecture entitled "Every man and Food Science".

Subplenary Sessions

Four subplenary sessions were held in the mornings from Monday, September 18th through Thursday, September 21st. These sessions were designed to focus in on the topical areas outlined below. More than fifty papers were presented by invited speakers selected by the Scientific Program Committee of Japan.

- Main Topic I. Resources of Food
 - 1. Exploitation of Food Protein Resources
 - 2. Efficient Utilization of Conventional Food Resources
 - 3. Utilization of Rice
- Main Topic II. Safety and Nutritional Aspects of Food
 - 1. Food Safety
 - 2. Nutritional Aspects of Food Processing
- Main Topic III. Preservation and Processing of Food
 - 1. Food Preservation
 - 2. Enzymes in Food Processing
 - 3. Fermentation
- Main Topic IV. Physical, Chemical and Sensory Properties of Food
 - 1. Physical Properties of Food
 - 2. Chemical Aspects of Food Quality
 - 3. Taste and Chemical Structure

Contributed Paper Sessions

The contributed paper sessions were open to original research papers on any aspect of food science and technology. The contributed papers were selected by the Scientific Program Committee of Japan which accepted about 350 papers and classified them into the eleven sections listed below with regard to relevance to the program and variety of subject matter. All papers were allotted time for oral presentation during the regular sessions from Monday, September 18th through Thursday, September 21st.

- Section 1. Exploitation of Food Resources
- Section 2. Food Safety
- Section 3. Food Engineering and Technology
- Section 4. Organoleptic Properties
- Section 5. Basic Problems on Food Constituents
- Section 6. Biochemical Techniques in Food Science
- Section 7. Food Analysis and Standard

- Section 8. Microorganism
- Section 9. Food and Nutrition
- Section 10. Food Additives and Adventitious Constituents
- Section 11. Traditional Local Foods

Round Table Meetings

The round table meetings were designed to permit the exchange of thoughts and ideas on any subject of food science and technology that was not covered in the Subplenary Sessions. Seven round table meetings were held.

These Proceedings include the full texts of the plenary lectures and abridged versions of the papers submitted for the subplenary sessions. It is regrettable that, due to financial limitation, the presentations of the contributed paper sessions and round table meetings are not included. Readers are kindly requested to refer to the "Abstracts of the Congress" for these papers. The credit for the quality and the success of the Congress must go to the participants. We owe much to them.

April, 1979
The Editors

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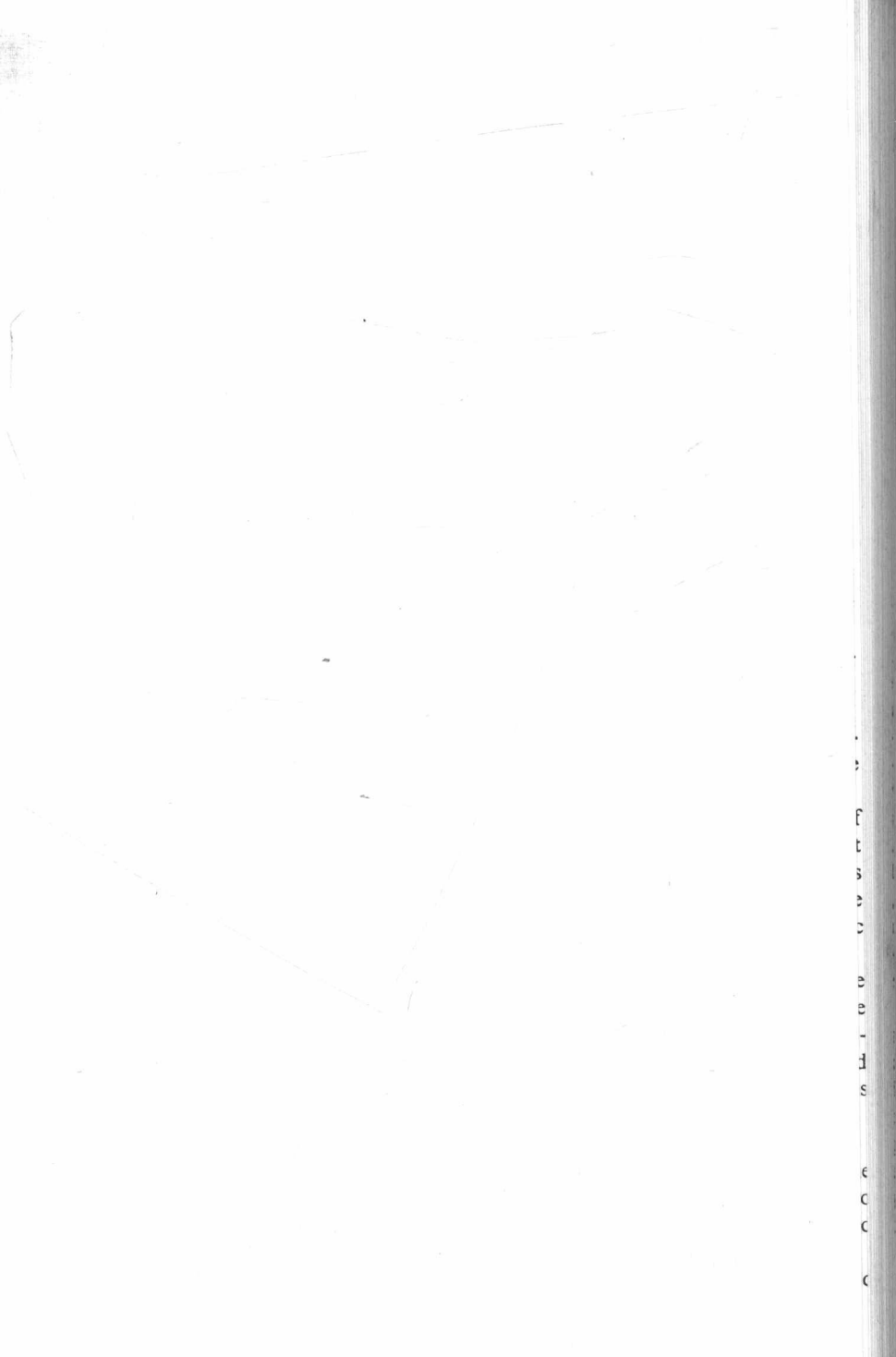
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Plenary Sessions



The World Food Problem and Meeting the Challenge

Emil M. Mrak*

We hear so much about feeding the world and how simple it should be to do so. Some say that all we need to do is to produce more food—but we are producing more food. The facts of the case are that population increase in the world is outstripping the increase in food production. In brief, it certainly looks as though we are losing the battle.

In the past few years there have been many symposia, books, pamphlets, articles, reports, discussions, political considerations, studies, and conferences on the world food situation. The large amount of oratorical material has, without doubt, caused the subject to be obscured by rhetorical overkill.

While there seems to be a unanimity of opinion on the seriousness of the situation, there doesn't seem to be a consensus on the ability of the world to cope with the problem or what to do about it.

Many reasons have been given for our failure to solve the problem, but most seem to concentrate on population increase and the lack of resources with which to purchase food.

As a result of my travels around the world, I have come to the conclusion that a considerable part of our problem relates to culture, food habits, education, the lack of training and information transfer and, above all, yes indeed above all, political and governmental interferences and constraints.

The seriousness of the situation was manifested at a conference held by the New York Academy of Sciences about a year ago on the world food gap. Several experts spoke, all of whom seemed to have a grim outlook, except one, and that was Dr. Jean Mayer, now president of Tufts University. Mayer opened the session by declaring that since the famines of 1974 and the World Food Conference held in Rome, there may have been a turning point. Mayer, however, did not state the basis for his optimism.

At the same meeting, Dr. Sol Chafkin, who oversees social development programs in developing countries for the Ford Foundation, indicated he

*Chancellor Emeritus, University of California, Davis

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saw little cause for optimism. He pointed out, for example, that one Latin American country increased the production of soybeans during the past few years, but unfortunately these are mostly exported, and the land now used for soybeans was previously used to produce food for home consumption.

At the same meeting, Dr. Peter Timmer, a food economist from Cornell University, indicated that the world now produces enough food to feed the entire human race, a nutritionally adequate diet of 65 grams of protein and 3,000 calories daily. He went on to say, however, that hunger and malnutrition afflict one-half billion people because the mechanisms for determining access to this food are inadequate. In other words, distribution, not production, is the problem. I am certain, from my firsthand observations in the hinterlands of Latin America and Africa, that changes in distribution to help these people will be slow in coming.

Other speakers, at the same conference, dealt with politics and generally pointed out that most national leaders in underdeveloped countries derive little power from rural populations that need food and, therefore, do little to improve the lot of these people.

I have mentioned this conference because it is an indication of the rhetoric that has been pouring forth without realities of accomplishment.

Many reasons have been given for the failure of crop production or adequacy of foods in various sections of the world and some of these are indeed obvious.

The matter of climate, according to Reid Bryson of the University of Wisconsin, for example, is not reassuring for the future. He indicates that climate is changing and we may be confronted with some very serious situations. The years since 1900 have had unusual warmth and reliable rains around the world in contrast with the cooler, drier and more erratic weather patterns of the previous millenium.

According to Bryson, it is only in the present unusual period of favorable weather that agriculture has blossomed into its present abundance and the human population began growing rapidly. New climate monitoring techniques indicate that the present unusual situation might be coming to an end with a return to a colder and drier climate. I can only hope that Bryson is wrong.

A most extreme point of view has been taken by Dr. Hardin of the University of California at Santa Barbara. He has raised the question as to whether or not Americans and perhaps Europeans and other advanced countries can continue to be well fed in a starving world.

He even wonders about triage or "the lifeboat ethic." He has indicated

that as global food shortages become more intense, the advanced countries may not be able to give aid to others and, therefore, the world may experience more famines.

A fantastic number of suggestions have been made on how to solve the problem, and some of these I find interesting, amusing, and even unbelievable. Some very distinguished people, including one of our former senators, have suggested that we curtail our food consumption to help the rest of the world. The amount of food saved in this manner, however, would be far from doing much to solve the problem.

It has been suggested by some that we reduce the consumption of beef and even eliminate it from our diet in order to save grain, without realizing that much of the animal production is on range land that is not suitable for other agricultural uses.

Furthermore, marginally productive and often untillable land can be best utilized for human benefit by supporting livestock. In fact, the only way in which millions of acres of range land can be used for human benefit is by grazing livestock on it. I am afraid that those who have suggested giving up livestock are not familiar with the total and true situation.

A recent statement was made by a distinguished person to the effect that "isn't it wrong to feed grain to animals when many people are starving in the world today?" It is true that certain feeding practices involve the use of grains, but this is small when compared to the other advantages of raising livestock. I doubt if our culture or our food habits would permit such a drastic change, but more important is the fact that beef and sheep are ruminants, and can extract energy from forages that would otherwise be wasted. Their unique digestive systems enable them to transform huge quantities of waste and fibrous materials into high quality protein.

These animals, in fact, have utilized as much as 9.3 million metric tons of waste from milling, brewing and sugar industries in the United States in a single year. This is what we might call constructive recycling. Some have also suggested that we give up growing tobacco and use the land for the production of food materials. Likewise, I doubt if this is realistic.

About two years ago a very interesting suggestion for improving the world situation came out of Great Britain. There, the question was raised as to whether or not it is justifiable for that country to feed 700 million dollars worth of foodstuffs to cats and dogs each year when the richer countries distribute only a little over a billion dollars worth of foodstuffs to the hungry people of the world during the same period.

Excluding dogs from our friendship is something that is hardly realistic in any country. It must be realized that the dog was one of the first domesticated animals and has lived with man for perhaps 20 thousand years.

It will be difficult to induce a divorce of an association of such long standing, in spite of all the arguments against such a friendship, no matter what country it might be.

A more recent realistic suggestion has been that every effort be made to reduce food waste throughout the world. This is constructive and an area that deserves much attention and research. For one reason or another, it has not been given enough consideration.

It has been estimated that in some parts of the world as much as 50% of the food supply is lost between harvest and consumption. In humid tropical climates, the problem is acute since food deteriorates rapidly and methods of preservation are lacking, or insufficient and costly. We need to know more about the magnitude and nature of these losses and how to control them. Technology must be simple, relatively low in cost, and easily applicable in rural areas if it is to be effective.

Professor Mitsuda and colleagues have recently done some very interesting and original work on the storage of rice. They certainly recognize the problem and have come up with an imaginary approach to solving the problem.

Losses not only occur in less developed nations, but also to developed nations. In the United States, the losses between harvest and consumption are substantial.

According to Barrons, in his recent book, authorities on the scene have estimated that 15% of all the rice and other cereal crops raised in the Orient are destroyed by rats either in the field or in storage. Fifteen per cent of Asia's cereal crops must be equated with nearly 50 million acres of land, and area equal to the size of the entire state of Kansas. Barrons has also stressed the importance of storage insect pests.

Canby and Stanfield state that rats will destroy approximately a fifth of all the food crops planted, and that in India degradations by rats will deprive a hungry people of enough grain to fill a freight train stretching more than 3,000 miles.

I have often wondered why we have overlooked this very destructive animal. I have wondered on many occasions if we could find a way to control these pests sufficiently to minimize their destructiveness.

As already indicated, Professor Mitsuda and his colleagues have developed a new procedure to eliminate these destructive processes-not only from rodents but, also, by insects, mold, and chemical deterioration.

Now, I would like to go on to another suggestion and that is fish culture. It has been suggested that this offers great possibilities and perhaps they are substantial. A great deal of effort has been devoted to growing fish in