Special Article

# Report of a planning conference concerning an international network of food data systems (INFOODS)[1,2]

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ABSTRACT A small international planning conference on the topic of "An International Network of Food Data Systems" was held on January 30 to February 5, 1983, at the Rockefeller Conference and Study Center, in Bellagio, Italy. It was sponsored through the Food, Nutrition and Poverty Subprogramme of the United Nations University and supported by various US government agencies, private foundations, and the food industry. Participants included representatives from FAO, WHO, IUNS, and IUFoST. The purpose was to explore the needs for, and current limitations of, food composition data bases, especially in the international context, and to propose what was needed.

The conference focused on the design and scope of an organization to be called INFOODS (International Network of Food Data Systems) which would promote international participation and cooperation in the acquisition and interchange of quality data on the nutrient composition of foods, beverages, and their ingredients in forms appropriate to meet the needs of government agencies; nutrition scientists; health and agriculture professionals; policy makers and planners; food producers, processors, and retailers; consumers.

The conference identified the more important aspects of INFOODS to include: *1*) a network of regional data centers; *2*) an organizational/administrative framework for various expert task forces; *3*) the generator and repository of special international data bases; *4*) the stimulator of national data base programs; *5*) a general and specific resource for persons and organizations interested in food composition data on a worldwide basis.

Moreover, the conference agreed that INFOODS should take the responsibility of initiating, directing and coordinating efforts in the following areas: *1*) development of international criteria for judging the quality of data on food composition; *2*) codification of existing sources of useful data on food composition; *3*) promotion of the generation and dissemination of new data on the composition of foods, beverages and their ingredients; and *4*) facilitation of the access, retrieval, interchange of food composition data on a worldwide basis. *Am J Clin Nutr* 1984;39:144–151.

## Introduction

From January 30 to February 5, 1983, a group of individuals (see Appendix 1) met at the Rockefeller Study and Conference Center, Bellagio, Italy, to discuss the broad topic of food composition data. The goal was to explore and develop relevant topic areas, and to identify approaches that might be taken within each area, with a view to defining an overall strategy and course of action that would promote establishment of a standardized, high quality, readily accessible international food data system. This planning conference was organized by the Food, Nutrition and Poverty Subprogram of the United Nations University (UNU) and

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financially sponsored by various US government agencies, private industry, and the Rockefeller Foundation (see Appendix 2).

The format of the conference consisted of the presentation of commissioned, background working papers, their extensive discussion, and the drafting of reports by five conference working groups summarizing the issues and proposing concrete plans to begin to resolve these issues. A summary of their discussions and recommendations forms a major part of the present report. A purpose of this document is to inform those concerned with generating, compiling and using food composition data of the proposals made by, and plans emerging from, this small international planning conference.

## The creation of INFOODS

The conference formulated the following mission: promotion of international participation and cooperation in the acquisition and dissemination of complete and accurate data on the composition of foods, beverages, and their ingredients, in forms appropriate to meet the needs of the various users: government agencies; nutrition scientists and educators; health and agriculture professionals; policy makers and planners; food producers, processors and retailers; consumers. It was agreed by the participants that this mission could best be carried out through creation of an organization, to be called INFOODS, that would work in the following areas: the development of international criteria for judging the quality of data on food composition; identification of existing sources of useful data on food composition; promotion of the generation, acquisition, and dissemination of new data on the composition of foods, beverages, and their ingredients that meet the criteria developed; facilitating, on a worldwide basis, the access, retrieval, interchange, and general harmonization of food composition data.

The conference examined five aspects of food composition data: *1*) users and needs, *2*) data base content, *3*) sources of data, *4*) data base organization and operation, and *5*) general implementation. Working groups examined each of these topics and made recommendations by which the work could be carried out. These are described as follows.

## Findings of working groups

### *Users and needs*

The first conference working group considered the users of food composition data, the needs of these users, and whether these needs were being satisfactorily met by the currently available food composition data.

*Current status.* Information on the nutrient and nonnutrient composition of foods, beverages, and their ingredients contribute significantly to a variety of activities. These range from the assessment of population intake of nutrients and nonnutrient food constituents to the formulation of food production and nutrition policies and programs, and to institutional meal planning and calculation of therapeutic diets. Furthermore, increasing interest in and concern for the relationships among diet, food habits, and degenerative diseases, including coronary heart disease, diabetes, hypertension, stroke, and cancers, has stimulated a current interest in detailed chemical data on foods.

While there are a number of food composition data bases in the world today, they contain data of varying reliability, much of which is out of date, and all data bases are incomplete in terms of either items listed or components described. Further, these data bases tend to be incompatible with one another, and are often difficult to access even when their existence is known. Moreover, these problems are becoming more and more acute as new foods and new methods of production and storage are continually being developed, as international trade in foods continues to grow, and as the number of components of foods that are of interest enlarges. Although specialized data sets are being produced to meet special needs, there is little or no concern with insuring uniform reliability and overall compatibility.

Another fact of the problem is that, while most of the information on the components of foods is currently disseminated in the conventional, printed-page format (and this is likely to continue as an important mode of communication for many users), modern information-processing technology is increasingly becoming used by those involved in all areas of the production and use of food composition data. Differences, incompatibilities, and errors can now be generated and

transmitted at electronic speeds. Thus, given a potential for an "information" explosion, it is important that the whole area of food composition data be critically examined. The problems that can arise from nonstandardized, nonevaluated data collection, storage, and dissemination affect all those in the scientific and technical community involved with food composition data.

*Needs for food composition data.* In general, information on food composition is used by researchers, educators, public health and clinical nutritionists, government agencies, and many industries for the purposes of evaluating and enhancing the nutritional health status of populations and individuals. Knowledge of food composition enables policy makers to develop rational food aid programs to improve the health status of populations. Industry has developed new foods, and agriculture has expanded its research on new strains of plants and animals, based firmly on a knowledge of the composition of foods.

The field has now reached the stage where the standardization of methods for sampling and analysis of foods and international compatibility of the data are essential to further the collaboration among groups of individuals and countries in research, education, regulation, and food production and processing.

The following illustrate some of the needs for food composition data.

*Food Industry.* Interest in food composition by industry has evolved primarily as a consequence of food labeling regulations, the search for economically advantageous alternative food product composition, and the desire to anticipate consumer concerns for components of foods that have nutritional and health significance.

*Research.* Prospective, as well as retrospective epidemiological studies, metabolic balance studies, intervention studies, and clinical trials all require accurate information on the nutrient and nonnutrient components of foods.

*Clinical Practice.* Physicians and dietitians use information on food composition in treating a broad range of patients, including those with genetic and metabolic diseases.

*Nutrition and Public Health Surveys.* Food composition data are used to estimate nutrient and nonnutrient consumption from surveys of food disappearance, household food purchases, and records of individual dietary intake.

*Nutrition Education—Dietary Guidance.* Nutrition education programs and dietary guidance materials are directed toward improving the nutritional quality of diets through appropriate selection of foods and use food composition data extensively.

*Agriculture.* Currently, many institutional organizations and centers for agriculture research develop their own tables on food composition in conjunction with their programs to develop new strains of plants and in the study of animal and crop husbandry practices.

*Consumers.* The public has developed an interest in nutrition information that has led to various developments in the commercial sector, including production and marketing of aids to determine calorie expenditures, assess dietary intakes, and facilitate choice of foods for specific purposes.

*Food Regulation.* Food composition tables are essential for the design and implementation of regulations to maintain the safety and quality of the food supply and are used to establish food identities, to control substitution of ingredients, to check the validity of advertising, and to formulate labeling regulations.

*Developing Countries.* Resolution of most of the food problems in developing countries requires reliable data on the nutritional value of both local and imported foods.

### *Data base content*

Given a preliminary enumeration of user needs, the next set of considerations is related to the problems of what data would be required to fulfill the needs. Thus, the second working group considered what the data base should contain.

The current situation results in part from the fact that the various user groups have needs for different subsets of foods and of different components of foods. While this is natural, it makes it difficult, if not impossible, to use information from more than one data base at the same time. A partial solution

to this problem requires internationally agreed upon definitions of foods and their components. Without such guidelines, it is expected that food composition data bases will become less and less compatible, further limiting the use of food component data as a resource for international cooperation and investigation.

*Food items.* Food items are defined to include foods, beverages, and their ingredients, including herbs and spices, additives that contribute meaningful amounts of nutrients, and other constituents as well as substances that are major components of foods but are not necessarily essential nutrients, such as unavailable carbohydrates. For every food item an unambiguous name and description is required. The questions of nomenclature and classification are central to any linking of the data bases.

*Food components.* For the purposes of designing data files, the compositional data for each food item fall into two general categories: record data and the archival data. The record data describe the nutrients and the other usually reported constituents while the archival data are values for those constituents only occasionally measured or found in foods.

*Record Data.* The designation of specific nutrients and other substances as record data is based on availability of reliable data and on the needs for the information by user groups. Thus it is essential that data, traditionally referred to as proximate analysis, be included in order to calculate energy values and provide certain information about carbohydrates, lipids, and protein.

Other nutrients should include not only commonly reported minerals [Ca, Fe (total and nonheme), P, Na, Mg, K, Zn, Cu, Mn] for which the analytical methodology has been well established and the difficulty for acquiring reliable data is considered to be modest, but also data for occasionally reported minerals (Cl, Cr, I, S, Se, Co, Ni, Sn, Mo, F, Si, V, As). Although these latter data are less available and values for many items not likely to exist for some time, such data are required by many users. With advances in analytic methodology, the availability and reliability of data for these elements should improve. Record data might also include the so-called heavy metals (Hq, Cd, Pb) that are of interest to various users in relation to their public health significance.

All of the vitamins, as recognized by the International Union of Nutrition Sciences, should be included, with separate values being reported for different vitamers and provitamins where such compounds contribute significantly to the overall biological activity of the vitamin. Such information is critical for many user needs, for example, in relation to establishing safe dietary intakes or recommended allowances, or assessing the stability of nutrients during food processing.

For the lipid components of food, information is now required on all individual fatty acids found in foods; totals for saturated monoenes, polyenes, and *trans*-fatty acids, and individual sterols should be recorded. For protein components knowledge of levels of the nutritionally indispensable and dispensable amino acids is needed.

*Archival Data.* Much compositional data, especially those on nonnutrients and contaminants, are not appropriate for routine inclusion, being either too infrequently reported (which applies to most nonnutritive constitutents) or too sporadic in occurrence to justify generalizations about these constituents in the food. Such items included nonnutrient additives, toxicologically and biologically active constituents and compounds arising during processing of foods. Also to be included in the archival record are detailed descriptors of the sample on which the measurements were made.

*Data qualifiers.* Certain descriptors of the data are a necessary part of the data file. Among these are the number of observations, descriptive statistics, quality codes, and regional and seasonal information. Detailed information on analytical methodology is essential, especially in reference to quality control procedures.

## *Sources of food composition data*

The third working group considered the question of how to gather the needed data to insure their accuracy and completeness. It was believed that the reliability of the data was the most important problem faced by users of food composition data. With respect

to the entire sequence from initial sampling through sample preparation to chemical assay, each laboratory uses at least slighty different procedures, and there is often little information in the data bases themselves to indicate the reliability of the data and how they were obtained. This greatly hampers the work of users of the data, especially those interested in using data from different data bases.

As food composition data continue to be generated, new sampling and analytic techniques are developed, and as new data bases are set up, more and more problems will arise that will adversely affect the users of the data. An internationally coordinated effort is necessary to begin to resolve the many facets of these problems.

*Data base organization and operation*

There is obviously considerable diversity of users and uses, and thus diversity of the data and data manipulations are required. Significant problems arise, therefore, with respect to the data base organization and operation, and a fourth working group considered these.

The important concerns relevant to organization of a general data system include: *1*) the data base, its elements (eg, size and limitations), and its organization (eg, design and structure); *2*) the mechanisms related to developing and delivering the data base to its "users" (eg, telecommunications, tapes or diskette, hard copy; *3*) the mechanisms for servicing the data base (eg, updating, annotating, and distributing).

To control and operate a general data base, a data base management system is required. Such a system is a series of computer programs that help to establish a data base, to maintain relationships between data items, and to add new data items into the data base after the initial design. It should build and maintain its own dictionaries that are required to provide flexible retrieval possibilities and also provide a query language to facilitate the retrieval of specific subsets of the data base.

The problems of managing data within a particular data base are much less serious than the problems of managing data among different data bases. Yet, in order to solve the many problems raised at this planning conference, diverse data sets must be used together. The merging of all existing data in the world into a single data base located at a specific geographic site is totally impractical, given the present and foreseeable realities of technology and politics. However, an alternative that appears likely to succeed and to be useful is that of designating regional centers to serve users within specific geographical areas and setting up a small international coordinating center that would link these regional centers and facilitate data and information exchange among them.

*Implementation and management*

A fifth group explored the organizational framework necessary to implement the recommendations made by the other working groups. The organizational framework proposed took into consideration the fact that the United Nations University Council has sponsored this planning conference as a project of its Hunger, Nutrition and Poverty Sub-Program.

Key to these considerations was the concept of INFOODS (for International Network of Food Data Systems) as an international organization with responsibility to carry out the mission developed by this conference. It was obvious that INFOODS needs to have several very different aspects. It needs to be *1*) a network of regional data centers; *2*) an organizational/administrative framework for various expert task forces; *3*) the generator (and commissioner) of special international data bases; *4*) a stimulator of national data base programs; and *5*) a general and specific resource for persons and organizations interested in food composition data on a worldwide basis.

It was agreed that the continuing development of INFOODS should be the responsibility of a Policy Committee that would formulate policies and approve the program and budget of INFOODS. The first Chairman should be nominated by an interim Policy Committee and appointed by UNU for an initial period of 3 yr.

Regional Liaison Committee Chairmen should be sought and appointed as members

of the Policy Committee. Additional members should be appointed by UNU for staggered 3-yr terms on the basis of the recommendations of the interim Policy Committee. Nominations should also be sought from other sources. It was anticipated that the permanent Policy Committee should meet within 1 yr. The Policy Committee should nominate an Executive Director, to be appointed by the UNU, and a secretariat established in a convenient location with UNU logistic support. The Executive Director should be responsible to the Policy Committee for the execution of its programs. An Executive Committee should guide a secretariat in implementing activities approved by the Policy Committee and act for the Policy Committee between its meetings.

Regional Liaison Committees should be established to provide regional liaison to assure regional input into the Policy Committee and to conduct regional activities. The Chairmen and members should initially be appointed for 2-yr terms by the UNU upon nomination by the Interim Policy Committee or the Policy Committee when it is established. Subsequent chairmen and new members will be nominated by the respective regional committees and appointed by UNU.

## *Executive summary*

At the final session an interim Policy Committee was elected, composed of R Bressani, A Bruce, A Campbell, H Haendler, W Trebeljahr, and V Young (chairman). They, in turn, nominated R Bressani, A Campbell, and V Young as the interim Executive Committee. It was further decided that a secretariat would be established with V Young as Executive Director and W Rand as Executive Secretary.

The secretariat was then charged with preparing a plan for proceeding with the recommendations of the conference.

*1*) Set up an organization to be called INFOODS: to be an international organization that will provide leadership for the development of standards and guidelines for collection, compilation, and reporting of food component data; that will serve as the focus for the development of special data bases which have international importance; and that will facilitate the linking of data bases worldwide, to the aim of coordinating a network of regional/national data centers directed toward the generation, compilation, and dissemination of accurate and complete data on food composition.

*2*) Make contact with relevant individuals and organizations around the world in order to involve them in the INFOODS initiative. The latter should be undertaken in cooperation and close consultation with FAO and WHO.

*3*) Investigate the feasibility of establishing an international journal devoted to food composition studies. Such a journal would facilitate adoption of guidelines by the scientific community, serve as an information source for any future revision of the guidelines, and would provide a means for dissemination of findings and critical reviews in all areas of food composition.

*4*) Set up, direct, and coordinate task forces for the following activities.

*a*) Detailing of the specific needs of the users, actual and potential, of food composition data.

*b*) Compiling a global survey of existing data bases and of ongoing and planned data collection efforts. Special attention should be directed toward assessing the coverage, completeness, and compatibility of such data bases.

*c*) Exploring what specific data bases and subsets or combinations of worldwide food composition data would be of value to the mission of INFOODS. Special attention should be paid to problems that arise in international trade and to those unique to developing regions in the world.

*d*) Examining the entire area of data gathering, with sampling, assay, and quality control of special interest. An important aspect of this activity should be examination of the problems of evaluating data in the literature and other sources as well as the critically important question of establishing criteria for accepting data into any food composition data base.

*e*) Detailing the specific content of an "ideal" data file. This activity should include as a major task the development of information interchange standards, a standard

format and set of conventions for the interchange of food data between regional centers and, if desired, between laboratory and regional centers. Such a format should be usable in communicating with both large and small systems and should be designed independently of the internal formats of any particular computer.

*f*) Establishing nomenclature and a system of coding to be used in INFOODS. This will include defining and recommending terms for identifying foods (including terms for origin, part, process, maturity, and others as required) and identifying components, units of expression, analytical methods, preferences, locations, environmental conditions, and others as necessary.

*g*) Exploring and planning the information system aspects of INFOODS. This should include *i*) development of a model system in terms of data flow, data organization and information services to be provided; *ii*) discussion with existing centers to identify those prepared to serve as INFOODS regional centers with a view to determining how they could be integrated into an overall system and how their current structure and modes of operation would influence the design of the necessary interfaces between various centers; *iii*) development of an implementation plan; *iv*) carrying out the detailed data analysis and function analysis of the proposed INFOODS: *v*) development and testing of a prototype system; *vi*) overview and the control system development; *vii*) coordination of various aspects of system development; and *viii*) evaluation of the system once operational.

Because this initiative is inherently international, the conference strongly supported UNUs role as the lead agency in the development of INFOODS. In addition, the conference recognized the continuing responsibility of FAO for the development and distribution of regional food tables and that INFOODS should cooperate with FAO in this task as desired by them. Similarly, FAO and WHO have responsibility for the Codex Alimentarius and thus INFOODS should not initiate any activities which infringe on it and should cooperate with FAO and WHO to extent that FAO and WHO consider appropriate.

## Appendix 1

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## Appendix 2

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*Administrative sponsor:*
United Nations University
Food, Nutrition and Poverty Subprogramme

*Financial support:*
National Cancer Institute, NIH, Bethesda, MD
US Department of Agriculture, Hyattsville, MD
Food and Drug Administration, US, DHHS, Washington, DC
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International Life Sciences Institute, Washington, DC
Mead Johnson Company, Evansville, IN
Hershey Foods Corporation, Hershey, PA
Quaker Oats Company, IL

*Host:*
The Rockefeller Foundation

*International organizations represented:*
United Nations University, Tokyo
World Health Organization, Geneva
Food and Agriculture Organization, Rome
International Union of Nutrition Sciences
International Union of Food Science and Technology