FAO and Food Databases for Developing Countries.

G.P.Sevenhuysen, Foods and Nutrition, University of Manitoba, Winnipeg, Canada.

Many laboratories, agencies and institutions in industrialised and developing countries are generating food composition data, but international coordination of this work has been limited. FAO contributed substantially to the knowledge and dissemination of food composition data during the 1960's and 1970's, but has not maintained that contribution. In recent years INFOODS has promoted international data bases and developed tools to help in coordinating activities in several regional centres.

The United Nations is well placed to assist such coordination. Hence, the initiative from FAO to arrange an informal 2-day meeting in February 1993 among representatives from INFOODS, Eurofoods and USDA to discuss the future role of FAO in new work on food composition databases for developing countries.

My comments will deal with the main issues considered during this meeting and conclude with plans for future activities.

Need for international food composition data:

- national food supplies incorporate increasing amounts of imported foods.
- allow cross-cultural comparisons of food and health relationships.
- reduce national efforts in updating food composition data.

Currently one of the most important needs for compositional data stems from the extensive import and export of foods. Foods that were previously common in only one region or country are now eaten in many others.

In addition, to compare the effects of diet on health in multi-national studies we need data of comparable reliability in many countries. Also, new composition data is required on fatty acid contents, fibre components, and vitamin activity for foods that were previously not important in the diet.

Lastly, international sharing of compositional data on commonly used foods will save time and effort compared to exclusively separate, national work. Being able to use reliable data about imported food items from other countries will avoid duplication of chemical analysis.

Let us now review the major issues that must be tackled in developing an international database.

The first major issue is food identification.

Major issues:

- food identification and description
- reliability of compositional data
- providing access to data for the largest range of users
- standardising management procedures

A number of systems of identification have been developed. Specific systems are usually culturally related and difficult to adapt to other cultures while the broad systems are not specific

enough for most uses. No system has been adopted universally and none is likely to be adopted in the near future

There was agreement in the meeting on a minimum amount of description in food names, such as:

Minimum food description:

- local name
- scientific name
- English name where available
- part of plant or animal
- maturity
- number of samples
- recipes | mixed dishes
- description of ingredients | mixed dishes
- origin of the sample

The origin of the sample is a qualifier or descriptor in the food name.

Such descriptions are particularly useful to identify raw or single food items. Difficulties arise in identifying mixed dishes or processed foods. Guidelines have been developed by Prof. A. S. Truswell for INFOODS on food nomenclature, to facilitate international exchange of food composition data. (J.Food Comp.Anal. 1991 4:18-38).

The coding systems for international use allow us to identify many characteristics of food related to storage, processing conditions or additive use.

Coding systems:

Facetted food codes

- Eurocode 2
- Langual
- Harmonised system

Facetted food codes and Eurocode 2 use a system of categories, such as food types used to group foods for dietary studies. Langual on the other hand uses a system to group foods by unique characteristics, such as type of food, maturity, packaging materials, storage conditions and others. Though all systems use a hierarchical code structure, the Langual system uses more than one hierarchy simultaneously, which allows more precise identification and retrieval of foods by many user groups, including those concerned with food intake studies. Using Langual requires a great deal of preparation, but it can potentially provide a system for universal use.

An alternative may be the 'Harmonised Commodity Description and Coding System', used for international trade, which includes food descriptions. The system is used by many national governments to generate trade statistics and provides a basis for foods that are traded.

All systems of food identification require software to be practical. The sophistication of current software applications vary, but future development offers the potential of databases that are local in nature, yet comparable with databases in other areas.

The second major issue is ensuring the reliability of compositional data.

Major issues:
- food identification and description
- **reliability of compositional data**
- providing access to data for the largest range of users
- standardising management procedures

Nutrient values in different food composition databases are not equally reliable. When comparing such data the user needs to take data quality into account.

Deciding on comparable data quality:
- professional judgement
- criteria list
- expert system

Judgements on data quality are made on the basis of a number of criteria, such as the method of analysis, sample choice, handling, preparation, and food description. Unfortunately, this information is not recorded for much of the compositional data used in developing countries. Without documentation the user relies on the professional judgements made by others, which are known to show bias.

Using a checklist of criteria for accepting nutrient values into the database makes decisions more consistent. Ideally a comprehensive set of criteria for judgements is developed for each nutrient estimation. However, the process of making assessments is time consuming and appropriate software is needed to save time and ensure consistent application in different laboratories and countries.

USDA-NCL has in fact developed computer based expert systems for five carotenoids, selenium, and copper, which will be extended to other components.

An important change has recently been made in defining acceptable analytical methods. Until recently the AOAC (Association of Official Analytical Chemists) specified a single method to determine a given food component. Now the result of the process determines its acceptability. This result may be achieved by more than one method. This change in policy is important for developing countries where the latest equipment and associated training may not be available.

An important aspect of new analytical work concerns sampling procedures. Though sampling is part of the reliability assessment of data, the steps taken to obtain and document the food item need to receive more attention.

In addition, more interchange of samples between laboratories is needed to improve the quality of analyses. Previous inter-laboratory tests among reputable laboratories in the U.S. have shown very large discrepancies. Inter-laboratory tests are limited by the fact that reference materials are not available for all nutrients and food components. In particular reference materials for organic components (lipids, vitamins, etc.) are not available.

Users of food composition data should have clear information about the reliability of the nutrient values in the database.

Data quality scores:

- decisions on reliability should be recorded using non-consecutive letters.
- scores should reflect high and low reliability for different users.

However, opinions differ as to the use of letters or numbers to represent data quality decisions. It is assumed that number codes are seen as decisions of equal rank, while letter codes would convey only differences not rank. In addition, not all analysts agree whether the score should have a range of 3, 4 or 5 points. The INFOODS supported system in New Zealand uses codes that reflect both quality and source of data.

We should recognise that the various components of the quality score may be given different weights from country to country. For example, analysts in the U.K. for example, give a higher weight to sampling procedures that make the analytical data more representative of the national food supply.

The third major issue concerns making the data available to users.

Major issues:

- food identification and description
- reliability of compositional data
- **providing access to data for the largest range of users**
- standardising management procedures

The criteria for chosing which foods to enter in the compositional database depend on the user group expected to make use of the data.

Criteria for including foods:

- Major foods in diets of people in regions of interest
- Important contributors of components of interest
- Foods largely consumed by vulnerable groups (eg. specific age groups)

Aggregated data is acceptable to some users, such as those processing dietary data, because survey respondents generally know little about the food they eat. For example, subjects usually can not identify the original source of the food, or its precise variety/species. However other users require highly detailed descriptions, such as those conforming to regulations governing the sale or transport of food. Here the item needs to be specified in fine detail to avoid legal confusion over the product in question.

Criteria for selection of nutrients to be included in a database will differ between groups of users within each country. Important nutrients include those associated with:

1. Dietary factors in acute and chronic disease(s), including emerging important public health problems; **2.** Dietary surveys; **3.** Menu/diet formulation; **4.** Regulatory activity.

Criteria for including nutrients:

- Dietary factors in acute and chronic disease(s)
- Dietary surveys
- Menu/diet formulation
- Regulatory activity

The ideal situation is to have the largest range of nutrient information on the largest number of foods. For most purposes food composition databases should include all original and reliable data, for all foods, regardless of the amount or frequency eaten. Computer managed databases make it possible to store and maintain all data, while providing specific user groups with the service they require. In principle there is no limit to the number of nutrients that can be included in the database provided it is well designed.

Frequently food composition data is generated by University or independent research laboratories, outside Government department activities. In some countries these separate work environments prevent the new data being used in government published national food tables so that it is unavailable to most users. In many institutions or government departments few staff are assigned to food composition work, particularly when the new computerised management systems are being introduced.

A few comments about food balance sheets, which provide many planners with basic statistics about the food supply. Estimates of national nutrient availability are based on estimates of food composition. However, many of the nutrient values used are considered unreliable for most purposes and little of the data have documented or suggested origins. Not only are nutrient content values a problem, but so are the extraction rates used for various commodities. Incorrect ones are used for some foods and major improvements are needed in the factors applied to food amounts available after processing. A restructuring of food balance sheets is required to minimise the use of imputed data.

The last major issue concerns management of data.

Major issues:

- food identification and description
- reliability of compositional data
- providing access to data for the largest range of users
- **standardising management procedures**

Great progress has been made in the handling of food composition data over the last decades, but particularly important improvements have been achieved by INFOODS and the Regional Centre for Oceania in New Zealand. For example, the INFOODS supported computerised data management system is particularly flexible and allows database developers to maintain files with several functions. Within one system both archival and processing files are managed, with variable descriptive choices, data values and colour images. The preparatory work by INFOODS on food and nutrient nomenclature, as well as data exchange protocols forms the basis for such systems.

Sustained funding for food analyses and nutrient database development at high levels of complexity is a problem in many countries. Such work is frequently funded on a project basis and therefore very intermittent, with little continuity of staff activities. As a result, the use of resulting data is often less extensive than the quality of data would allow.

Such work would likely have to be associated with other activities of commercial or public interest. Food composition work related to regulatory work would receive more continuous attention and allocation of resources. Whether resources are available for new foci on non-nutrients that may have biological activity, such as non-vitamin A active carotenoids is not yet clear.

Finally I want to relay some of the actions proposed at the meeting.

Future actions:

- FAO/UNU meeting to prepare action plan
- preparation of project proposal for international collaboration
- coordinating activities for staff and equipment
- coordinating activities for data generation

The discussions at the meeting re-evaluated many aspects of food composition data generation and use, with emphasis on the larger role of FAO.

Firstly, the convening of an FAO/UNU meeting to review progress and plan activities to advance food analysis and the development of food composition data bases. The intention is to provide a comprehensive review that will lead to specific action and the formulation of an advisory committee on international food composition work. UNU and FAO expect to create a forum for the exchange of information to benefit and promote future food composition work in all regions of the world.

Secondly, the preparation of a larger project proposal to consolidate the collaborative work between active centres and regional groups for the purpose of developing food composition databases and tables for international use.

Thirdly, possible activities to coordinate staff and equipment for work in food composition were discussed, for which the implementation needs to be arranged and funded:

1. **Set guidelines for laboratory environments** and standard environment specifications to improve planning for laboratory facilities.
2. **Support work on analytical quality through promotion of techniques and reference materials.** (Support for progress on analytical quality, through dissemination of standard techniques, including inter-laboratory tests and reference materials. Many developing countries do not have protocols for even simple procedures and their work can be supported by collecting unpublished information and disseminating comprehensive publication lists)
3. Continue the work of Codex Alimentarius, USDA and AOAC International in identifying protocols for similar analytical techniques, where experience points to cheaper, but suitable, methods.
4. **Support education and training for compositional work** related to sampling, analytical techniques, and data compilation, through publications and programmes at country level. Allow sandwich training to support analytical laboratories in-country at the same time as increasing capacity to maximise local resources and maintain locally available equipment.

Fourth, possible coordinating activities for generating food composition were discussed, again depending on opportunities for collaboration and funding:

5. Promote a review of the Bellagio pie chart as a whole. The costs for the work in relation to the results needs to be discussed in a wider forum, incorporating trade implications and issues of technology transfer.

6. **Endorse INFOODS food and nutrient identification systems and tag names**, so as to encourage more coherent development of compositional databases in different countries.

7. Support the coordination of current work, such as the proposed work of data evaluation by IUNS, as well as INFOODS initiatives, including the IFID food consumption database.

8. **Provide** assistance to the users of food composition data, by providing access to data and **publications on sampling, quality criteria**, together with software support for local applications.

9. **Provide documentation on the legal aspects** of food composition data and its use in various jurisdictions, which would assist the documentation required for food analysis and data quality.

10. Discuss food composition at the country level as part of the ICN follow-up. Not only existing regional action should be targeted, but also areas that have not participated before in activities, such as Eastern Europe. In addition, further discussions are required for action in Africa, where language and cultural divisions will determine effective regional work.

It is intended that information is used directly by active country committees and regional groups, instead of data flowing through a central institution. The concept of meeting and sharing should be applied at all levels of work. In this context, the contributions of FAO would use an existing network with strong links to government authorities. Hence FAO may be able to make important contributions to future food composition work.