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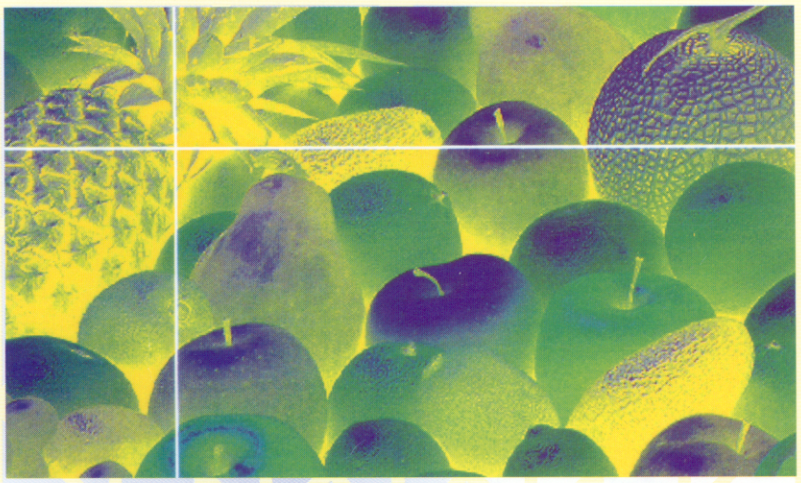

Eurofoods recommendations for food composition database management and data interchange

Working Group
on Food Data Management and Interchange

COST Action 99

Research action on food consumption and composition data

EUR 19538

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COST Action 99
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Eurofoods recommendations for food composition database management and data interchange

Working Group
on Food Data Management and Interchange

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Introduction to COST Action 99

COST {Cooperation in Science and Technology) is a research programme to facilitate scientific and technical co-operation at European level, complementing in particular the EU framework programmes and EUREKA. COST co-operation takes the form of concerted Actions, which involve the co-ordination of national research projects. The Actions focus on specific themes, which are targeted by participating countries according ta their research priorities. The co-ordination avoids unnecessary duplication of research, at botti European and national level, and helps build larger, more effettive scientific communities. At present, COST offers the possibility to co-operate between scientists from up to 32 member countries, and participants from other countries may be admitted on a case by case basis. COST is funding projects involved in pre-competitive and basic research as well as other activities of public utility. The scientific quality of COST projects is well recognised and contributes to a coherent structure for European research.

In the field of Food Science and Technology, COST is mainly concerned with improving food safety, food quality and nutrition. Taking iato account these main topics, COST Action 99 (1994-1999) is specifically devoted to "Food Consumption and Composition Data". Twenty- seven countries have actively participated in this COST Action: Austria Belgium, Croatia, Czech Republic, Cyprus, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Iceland, Italy, Lithuania, Luxembourg, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, The Netherlands, Turkey and United Kingdom. The Action has been supported by the European Commission, Directorate General for Research and in particular by the Unit AP2: Political Co-ordination and Strategy, responsible for COST support and its Scientific Secretariat.

The primary objective of the COST 99 Action was to merge knowledge and expertise of experts in COST countries in order to:

1.To construct and establish a network of compatible food composition databases with the quality required for interpretation, description and exchange of high quality food consumption and food consumption data.

2.To ensure the continuity of collection and improve the quality and harmonisation of food consumption data as available from food balance sheets and household budget surveys.

3.To continue to improve the quality and compatibility af data for inclusion in tables and databases of food composition. 4.To maintain and improve existing food coding systems in order to exchange data efficiently.

The secondary objective was to provide information on food supplies, dietary patterns and the intake of nutrients and of non-nutrients.

Marija Skerlj
Scientific Secretary

Abstract

The EU COST Action 99 – EUROFOODS "Food Consumption and Food Composition Data" is a research project sponsored by COST (European Cooperation in the field of Scientific and Technical Research). It started in 1995 and ended in 1999. Within this framework a special working group addresses issues of food composition data management and interchange. The main objective of this working group is to promote and encourage interchange of food composition data within Europe. To achieve this goal, the working group proposes a set of recommendations for food composition data interchange using electronic media. The recommendations are firmly founded on previous work done internationally by INFOODS and by national agencies and institutes as well as international standards. The recommendations include the description of food, component, value and data source. The intention has been to create a food composition data interchange model that is sufficiently generic to handle food composition data at the various levels of aggregation and with various levels of additional descriptive information. The recommendations also include technical issues such as file formats. Recent developments of software tools to support the recommendations are briefly described.

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Internet Ressources

Several WWW homepages were built and maintained during the project. Additional material supporting this report is available at the following sites:

http://food.ethz.ch/cost99/datax/	COST 99 working group on data management and interch.
http://www.langual.org/	Homepage of the food description system LanguaL
http://www.eurofir.org/eurocode/	Homepage of the food classification system Eurocode 2

Since these pages might not be maintained further in the future or even removed for organisational reasons, it is worth mentioning the INFOODS homepage at http://www.fao.org/infoods/.

INFOODS (International Network of Food Data Systems) is a far more stable initiative. The material presented in this report will be forwarded to INFOODS and hopefully picked up by other groups for further developments.

Contents

Part I: Overview

1 Introduction

1.1 Motivation

The COST Action 99 – EUROFOODS working group on Food Data Interchange and Management compiled an Inventory of European Food Composition Databases [35]. Two major conclusions can be drawn from the results of the questionnaire which was send out to the 25 COST Action 99 member countries.

- Almost all countries think that *systematic electronic interchange of food composition data is important*, because data compilers depend on data from different sources or like to share experience and resources.
- Data interchange among data compilers is most wanted at earlier stages of data production (i.e. levels one and two according to the four level production framework in the Greenfield-Southgate book p. 7, [17]; also see 3.1). The questionnaire used the notion of *validated data* (i.e. thoroughly documented, calibrated raw analysis data that has been filtered through quality assurance procedures).

Despite this need, data are currently not interchanged systematically on the international level due to the following problems [34]:

- Interchange is mostly done ad hoc or on a bilateral basis only (*organisational aspect*).
- Interchange is not or seldom formalised: different software and file formats are used; data are not sufficiently described and therefore often hard to interpret correctly and unambiguously (*logical aspect*)
- Interchange is often done on paper only or on computer media that cannot be read by the person receiving the data (*physical aspect*).
- Interchange is hindered by copyright constraints [33] (*legal aspect*).

1.2 Objectives

Consequently, it was decided to develop a set of recommendations and tools to promote data interchange at the various levels (intra-agency, local, national, regional, international). This report focuses on recommendations that address the logical and physical aspects of data interchange. If an interchange system supports these aspects, organisational networks and copyright policies can evolve.

The current situation leads to the first general objective:

- To promote and encourage *active electronic* interchange of *food composition data* among data producers (i.e. laboratories), compilers and users in Europe and beyond.

By *food composition data*, we understand compositional as well as qualitative information about foods.

Often, the most reliable data sources for food composition data compilers are laboratory-reports or scientific publications *on paper*. Transcription of *all* the information in a printed publication into a computerised form (database or file) is tedious, error susceptible and sometimes not possi-

ble (e.g. information cannot be modelled in an existing database). This leads to our second objective:

- To recommend the use of electronic files containing comprehensive information at an *early stage* in the data processing chain and to interchange these to avoid multiple manual transcriptions or repeated computer input.

Plain figures are meaningless as such. Food composition data must be sufficiently documented for proper interpretation and usage. The additional information needed to describe the actual data, its nature and production state, are referred to as *metadata* (see 1.3). It includes *source-, food-, component-* and compositional *value*-description and can be found in carefully prepared scientific papers and laboratory reports. Therefore the third objective:

- To encourage the collection and electronic storage and interchange of metadata that are sufficient enough to describe and identify food composition data.

These three objectives imply the following demands and actions respectively:

- Tools: Software tools must be provided to facilitate and ease data interchange and management. The tools should allow the transfer of data between the interchange system and locally used food composition database management systems or any other widely used software package (e.g. spreadsheets, statistical software, etc.) with reasonable effort and skills.
- Generality: The system should be generic enough to cope with data at *any* stage of the compilation process, i.e. with both primary (from laboratory, literature or manufacturer) and aggregated data.
- Open structure and standards: to avoid incompatibility, data and metadata must be represented in a consistent way, both in terms of its structure and the content within that structure. The structure should be open in the sense that it must be possible to store and interchange all metadata available for a given data source, even if some types of metadata are not standardised today but might be relevant for future applications.

This report proposes a reference model for food composition data. This model serves as a rationale for the proposed technical recommendations. The recommendations list possible attributes for food data description and suggest standard vocabulary to be used for some of these attributes. Both the list of attributes and the standard vocabulary are open for future extensions. Finally, this report presents software tools for implementation of the recommendations.

1.3 Data Quality and Metadata

The limitations of food composition tables or databases are often not sufficiently understood by many users. Foods, being biological materials, exhibit variations in composition; therefore a database cannot precisely predict the composition of any given sample of a food. Hence, although food composition tables can be used to devise a diet, meal, or supplement, the levels of nutrients and other components are essentially estimates.

However, according to Greenfield and Southgate [17 p.128], data quality can and must be controlled during its production process. Data quality is defined as *"the summation of the features that make the values appropriate to the intended use"*. From the end-user's or the data compiler's perspective the quality of a particular compositional value can be determined by how well the food item in question reflects the food item it is supposed to represent (i.e. relevant sampling, sufficient number of samples, etc.) that the food item is described in a sufficient and unambiguous way, and that the underlying analytical procedures are accurate and reliable.

A more general definition of data quality is proposed by Wang et al. [45]. Based on a comprehensive survey of the use of the term *data quality* in various fields of application, they define

data quality through a number of quality dimensions[1] which in turn can be further specialised in sub-dimensions: data should be accessible, useful, interpretable and credible. To be useful, data need to be timely and relevant. Relevance must be judged by the user, for each specific application. In order to be credible, data need to be complete, consistent and accurate.

To improve overall data quality, each quality dimension must be addressed appropriately. Accessibility and timeliness can be improved using new media like the internet [34]. Credibility of food composition data can be improved with quality control and quality assurance procedure as described by Greenfield and Southgate [17]. In order to mediate quality control and quality assurance to the data user, to increase interpretability and to allow the user to determine the relevance of data in the context of a given application, data must be documented and annotated with further descriptive information. We refer to this as *metadata*. A main objective of this report is to suggest formal procedures for the management and interchange of metadata in the field of food composition data production.

In the field of food composition data, metadata can be categorised in source-, food-, component-, and value-description:

Source-description: source description includes all information needed to track the source from which food composition data were obtained (laboratory, literature, etc.) [23], [42].

Food-description: food items must be adequately described to enable comparisons to be made. Food description includes sampling procedures, food classification, naming and information about such properties as food source, agricultural production and storage conditions, preservation and cooking methods, food additives etc. More than 50 properties that influence the nutritional value of a food have been identified [31], [39]. Pictures are also a possible means to describe foods [2].

Component-description: component description includes information on the type of component, the methods used to obtain compositional values, the accuracy of the methods and the units used to express the values [22], [23], [42].

Value-description: value description documents the expected variability of a compositional value and includes data on the statistical distribution of analytical measurements and indication of values that are missing, below detection limit, trace, etc. [23], [24].

The type of metadata and their degree of detail varies depending on the stage of compilation and the user's needs. If metadata are to be used in an international context and in data interchange, standards must be developed that define the most relevant properties in each of the categories described above. Also standard vocabulary must be provided to prevent misunderstandings that often occur, especially in a multilingual context, if free text is used.

Several initiatives proposed to rank the quality of data according to a well defined set of rules and criteria. Thus, a quality index is assigned to each compositional value [20], [17]. The COST Action 99 – EUROFOODS recommendations don't propose a new schema of that kind. However, they allow to use and to document quality indices. The recommendations contribute to data quality threefold: they promote formal consistency of the data, they allow the description of data with metadata, and they demand a minimum set of such metadata. It is left to the users of data to assess its quality according to their needs.

1 Wang et al. use the term dimension although the term criteria would be clearer.

1.4 Strategy and Further Action

The chosen strategy for the definition and implementation of the COST Action 99 – EUROFOODS recommendations on food composition data interchange follows a two-step approach. In a first step the general data structure and the types of data are defined and implemented using a straightforward relational database approach. This report covers these basic recommendations. In a second step, the recommendations should be migrated to an XML based application. This issue will be dealt within an eventual new project on food composition data interchange.

The first step is a proposal for a minimum set of requirements for food composition data interchange. The requirements are based on the work and experiences in the Nordic Countries [26], New Zealand [3], USA [44], INFOODS Data Interchange Format [23] and others. The requirements outline the main categories of data and their description with further data (metadata). Also a text based interchange format and media for data transfer are described. This scheme allows for immediate application. It can be implemented with reasonable effort using existing software tools such as relational database management systems or spreadsheet applications. The basic recommendations also incorporate the use of thesauri as a means to implement authorised metadata. The recommendations are open in the sense that additional metadata can be added in the future. By using this approach it will be possible to gradually define schemes of metadata and to develop further thesauri if necessary.

The second step could be based on the concepts of SGML [19], [ISO 8879] or more precisely XML [13], [47]. New interchange formats and software tools should be developed for browsing and editing of data as well as data import and export between the interchange system and other kinds of software (e.g. spreadsheets, statistical analysis packages, database management systems). Future experiences in food composition data interchange will determine the kind of metadata that will form the core requirements for world-wide interchange of these data.

Using this framework, people can gradually define schemes of metadata with corresponding vocabularies. The market and future experience will decide what types of metadata will form the core requirements for international food composition data interchange. Beside these core requirements, the system always allows the transfer of additional metadata.

1.5 Purpose of Recommendations

This report presents a set of recommendations for data management as well as data interchange. The focus, however, will be on data interchange issues, as it is outside the scope of these recommendations to interfere with the compiler's data handling procedures. However, the data management procedures are requested to ensure that metadata produced for an interchange file provide an accurate description of the data.

The recommendations are to be considered as guidelines to ease and harmonise food composition data interchange at the national as well as at international level. It is the hope that the recommendations prove to be a successful tool for this purpose.

The recommendations do not serve as a fixed set of rules. Therefore, when applying the recommendations the user is free to:

- extend the recommendations with new rules addressing issues not yet covered by the recommendations. Such extensions should not affect the interpretability of those parts that follow the recommendations. Any extension must be documented and the documentation must be accessible for the data receiver.
- implement only part of the recommendations, in which case the invention of new solutions for issues already covered by the recommendations should be avoided. In any case, the rec-

ommendations suggest a minimum set of information that must be provided in data interchange (see Part II:1).

Finally, it should be noted that implementing the recommendations does not in itself imply any degree of quality assurance of the data. Quality assurance is part of the data description, the metadata. On the other hand, the recommendations allow the receiver or user to interpret the data in a regular and standardised manner and to judge the data quality based on their intended use.

2 State of the Art in Food Composition Data Interchange

2.1 National Level

By tradition, the compilation and publication of food composition data have mostly been a national affair, and these activities are in many cases based on a national legal foundation or other local alternatives. Therefore, in most countries the procedures and means of distribution of food composition tables and data are based on local conditions, which often exclude direct compatibility of data collections or sets between countries. The primary outcome of work on national and international food composition data has traditionally been the publication of national or regional printed food composition tables with limited space for a thorough description of data. Therefore, the level of detail given in these printed tables is generally not sufficiently specific to be used as input for compilers in other countries. The format and content of the tables has primarily been designed for end-users [1], [3], [13], [16], [27], [44].

Likewise, most databases employ methods of identifying foods. The choice of a specific classification or description scheme depends on the actual use of the data.

The LanguaL thesaurus [18], [28], [29], [30] is used in food composition (nutrients and contaminants) and consumption databases in 3 European countries (Denmark, France and Hungary).

The INFOODS System is a facetted, free-text food description system [39]. It is used in some countries in the South Pacific, Asia, Africa and Latin America, but not in Europe.

The Food Categorisation System developed by the CIAA (Confederation of the Food and Drink Industries of the EEC) [4] is used in two countries (Denmark and France). The CIAA system classifies food according to food additive use (based on definitions in the four European food additive directives) and forms the basis of the Codex Food Identification System in the Proposed Draft Codex General Standard on Food Additives [8].

The Codex Alimentarius Commission Classification of Foods and Feeds [7] is used when foods must be classified into groups on the basis of the commodities' similar potential for pesticide residues. It is the basis of the food categorisation system of the Codex Alimentarius General Standard for Contaminants and Toxins in Foods [11]

Eurocode 2 [25], [41], designed for classifying foods in dietary surveys, is implemented in 5 countries (Denmark, Germany, Greece, Netherlands, and Spain).

A food classification scheme based on the European Combined Nomenclature [15] transformed by Eurostat is used in household budget surveys in all the EU member countries and in the EU DAFNE Project on Household Budget Surveys [38].

Similar to the European Combined Nomenclature is the World Trade Organisation's food classification [46], but as far as known, neither classification scheme have been used in the context of food composition data.

In addition to these international food description and classification systems, national databases (e.g. Denmark, Finland, Germany, Greece, Italy, Netherlands, Portugal, Switzerland, Turkey and United Kingdom) use country specific systems, presumably based on national criteria, national legal aspects and traditions.

Concerning components, most countries use national definitions, sometimes with INFOODS tagnames [22] attached (Denmark, Finland, France, Hungary and Italy).

2.2 European Level

The NORFOODS Computer Working Group discussed and practised data interchange among the Nordic Countries from 1985 on [26]. Although a lot has changed in computer technology (e.g. networks) since then, this work has shown that data interchange is possible with only a few, straightforward rules that are easy to implement in respect to finance and skills involved:

"*Conclusion: The project has shown that, with a minimum of restrictions, it is possible to carry out data interchange, which makes it possible for the receiver to recognise and manage data*" [26]

But the group also mentioned: "*That data interchange would be easier if data files would be more alike*". Harmonisation, especially of metadata, is needed. This issue was not addressed by the NORFOODS group, as data interchange between the Nordic Countries was only concerned with data in existing databases, where metadata were not included at that time.

EuroNIMS (European Nutrition Information Management System) was a joint effort of several European countries to develop a NIMS under contract with a commercial software developer. The project was stopped in 1995 because of the contractor's inability to continue the project. EuroNIMS focused on data management but also addressed some aspects of data interchange. Actual procedures of data interchange, however, were not implemented in the specifications. Interchange would only have been possible between the partners using the EuroNIMS system. The EuroNIMS experiences, among these the specifications during the project, are still valuable and have influenced the development of the COST Action 99 – EUROFOODS recommendations.

The ongoing project, Food Table Viewer software by Ian Unwin, United Kingdom [43], has provided further experience with data management and a mechanism for practical and open interchange, especially at the level of data from published food composition tables. This project also addresses the question of metadata and their harmonisation. The project continues with the opportunity for wider collaboration and contribution.

2.3 International level

The INFOODS organisation always considered international food data interchange as one of their primary goals. Between 1986 and 1992 this group developed three systems (sets of recommendations):

- a system for food component description, the so-called *Tag-Names* [22]
- a framework for food description [39]
- a data interchange format [23]

Up to now, only the tag-name system has been implemented and is used by a number of agencies world-wide. For a more detailed discussion of the tag-name system see chapter 2.6.

The INFOODS data interchange system, has not yet had much success. The main reasons are *the lack of software tools* that support this format and a conceptual problem of the format that makes it hard to write these software tools in practice. These problems are discussed in detail by Unwin [40].

The INFOODS food description system proposes a set of food properties (facets) that should be used to describe foods. But only few of these facets are supported by a standardised vocabulary (thesaurus), and the system uses free text to describe a given food with respect to a given facet. For a more detailed discussion see chapter 2.5.

2.4 Source Description

Source description of complete data files has been formalised within the INFOODS data interchange system [23]. It includes information about the institution and/or person responsible for the content of an interchange file (i.e. the *source*) as well as information about the person acting as the *sender* of the file. The INFOODS system also introduced the concept that each interchange file must have exactly one source authority attached to it. This does not imply that all the data must come originally out of the same laboratory, or even the same country. Instead, it recognises that the activity of putting together a database involves editorial and scientific judgement rather than mechanical concatenation of values.

Source information for individual values is covered in the Component Aspect Identifier System (CAId) [42]: A source type indicates the general category of a source such as food table, journal article, laboratory report etc. Depending on the type of source, different types of reference information are given (e.g. bibliographic references).

In the final work on the EuroNIMS requirements for values, it was suggested to keep source information of all values contributing to a new derived result. Even if this aggregated data is interchanged, the original source information should be kept together with information on the compilation process within a single data object representing the new value.

All the above contributions serve as a basis for the recommendations proposed in this report.

2.5 Food Description

Food description is a precondition for data interchange. Food description is part of the metadata needed to understand the content of an interchange file. An overview of the field can be found in Pennington [32] and Ireland-Ripert [21]. The COST Action 99 – EUROFOODS initiative also addresses issues in food description in its working group on food description, terminology and nomenclature.

Besides plain textual description (food names), there are basically three techniques used for food description:

1. monohierarchical classification systems like the Eurocode 2 [25], [41] or the CIAA Food Categorisation [4]. Although single classification systems are powerful tools within specific application domains, they cannot cover all relevant descriptive information needed in food composition data assessment. Such classifications organise foods according to only one property (e.g. biological origin or nutrient content). In most cases more than one property needs to be described in order to get a sufficiently detailed picture of a given food (for a detailed discussion see Truswell et al. [39]). Another problem with monohierarchical classification systems is that for each food (or type of food) a distinct slot within the hierarchy needs to be defined and fixed forever at design time. This can lead to inflexible and huge classifications. A practical problem arises when designing classifications for international use: In different cultures people see relationships between foods in different ways. A consensus on a fixed classification is often hard to achieve.

2. faceted description systems using a standardised vocabulary (thesaurus): To overcome the inflexibility of monohierarchical classification systems, multifaceted food description systems have been developed. A given food is described with respect to several facets (i.e. viewpoints, properties or attributes). An example is the LanguaL system, originally proposed by the United States Food and Drug Administration (FDA), with its 14 facets [18], [28], [29], [30]. For each facet a standardised vocabulary (i.e. a set of possible terms or descriptors that may be applied) is defined in a thesaurus. A unique alphanumeric code is assigned to each descriptor. These codes

can be used for international data interchange. LanguaL is currently maintained and extended under the COST Action 99 – EUROFOODS initiative.

*3. faceted description systems using free text***:** This approach was proposed by the INFOODS working group on food description, terminology and nomenclature [39]. This system differs from LanguaL in the sense that far more facets are proposed (about 50) and that no *systematic* vocabulary with unique codes are defined. Only few facets are supported by a standardised thesaurus. Generally free text can be applied to describe a given food in respect to a given facet.

It is not worthwhile arguing which of these systems is 'best'. Each system has its specific purpose, and it has advantages or disadvantages under different conditions. As a result, features from the different systems can be implemented together: For example Eurocode 2, the German BLS-code and the Slovakian faceted food code mix the concept of a hierarchical classification with the faceted approach. The strength of classifications and LanguaL is their strict definition of vocabulary and usage of codes, which makes these systems language independent (but not necessarily culturally independent) and suitable for systematic computer processing. The INFOODS system on the other hand, is much more flexible but with the price of being less formalised, which can lead to misunderstandings in data interchange and imposes difficulties on computer based data handling. As a conclusion, all three techniques, and others like the description of foods using pictures [2], should be used to complement each other. Such a combination of approaches was proposed by an FDA initiative called International Interface Standard [31] and will also be applied within the development of LanguaL towards an open framework for food description.

2.6 Component Description

Component description is part of the INFOODS interchange system [23] and the CAId [42]. INFOODS developed a list of standard abbreviations for components to be used in data interchange. This list of so called tag-names evolved out of a survey of components found in major food composition tables world-wide. Information on component description (component name, unit, mode of expression and in some cases method of analysis or derivation) is part of the *definition* of each tag-name. Components found in different food composition tables but using the same tag-name can therefore considered to be compatible. The INFOODS tag-names are used at an increasing number of agencies throughout the world and help users to compare data from published *food composition tables*.

This approach, however, has several disadvantages when used at earlier stages of data compilation:

- A food database compiler often needs more information than is covered by the INFOODS tag-names (e.g. accuracy of the method used or number of relevant decimals).
- The tag-name is inflexible especially when dealing with components whose definitions depend on various methods used for analysis (e.g. folates). Each new combination of the various aspects needs a new tag-name to be registered. It is easier to manage several more stable collections of standardised terms for the various aspects, than one list of tag-names representing many combinations of the basic terms.
- A more practical problem is that not all tag-names are described with a method (and mode of expression). It is argued that these components are *rational* in the sense that the compositional value is independent from the (presumed) analytical method used. In this respect, the tag-name system implies a preliminary judgement whether two components are compatible. This might be useful for the lay user but not for the expert compiler who is interested in more ‘raw’ data.

Compared to the INFOODS approach, we follow the principle of the standardising vocabulary which is more stable and easier to manage. There should be standard terms for *each* aspect of component description. It is then up to the user to decide which combination of terms is appropriate for a given component. This strategy is quite similar to the LanguaL approach in food description and allows the interchange of more precise data in a standardised way.

2.7 Value Description

Value description includes data on the statistical distribution of analytical measurements and indication of values that are missing, below detection limit, trace, etc. Value description is discussed in the INFOODS data interchange handbook [23]. In practice, however, this information is seldom managed systematically, if at all. Especially the statistical aspect of nutrient composition has not had much attention in data interchange in the past [24]. For other component groups (e.g. contaminants), however, statistical information has been an important issue for example to report median and percentiles.

The description and meaning of the terms *trace*, *zero* and *missing value* is not used uniformly in literature [23], [36]. *Trace* for example is either defined from an analyst's point of view as "present, but not accurately measurable" or from a nutritionist's point of view as "present, but nutritionally insignificant". In the INFOODS data interchange handbook it is recommended to give preference to values that actually have been analysed and to give additional information on the accuracy and precision of the method used. A proposal for standard codes to indicate the type of missing value can be found in the work of NORFOODS [26].

There is also some confusion which information should be modelled as value description and which as component description, since they sometimes overlap [42]. More conceptual work and clarification is needed in this field.

2.8 Conclusion

Today, no standardised and comprehensive international system for food composition data interchange is in use. Until now, the proposed solutions only solve parts of the data interchange requirements and generally focus on the distribution of published food table data to end-users. At an earlier stage of the compilation process, where more detailed information is needed, these solutions are often too restrictive.

3 A Reference Model for Food Composition Data

This chapter gives the conceptual background to the actual technical recommendations given in Part II of this report. We propose a reference model for food composition data which serves as a framework for both data management and data interchange.

The model consists of two parts: an organisational framework and a reference data structure. The data structure is static to some extent, but allows flexible extensions for individual use. It is a logical structure and does not imply any specific file format or database implementation. It serves, however, as a common ground of discussion for the development of specific implementations.

3.1 Organisational Framework: Data Management and Interchange

Data management and interchange are closely related: both tasks handle the same information and interact with each other. The operations and technical constraints, however, are different. Figure 1 outlines the different parties involved in the production chain of food composition data and typical interactions between these parties.

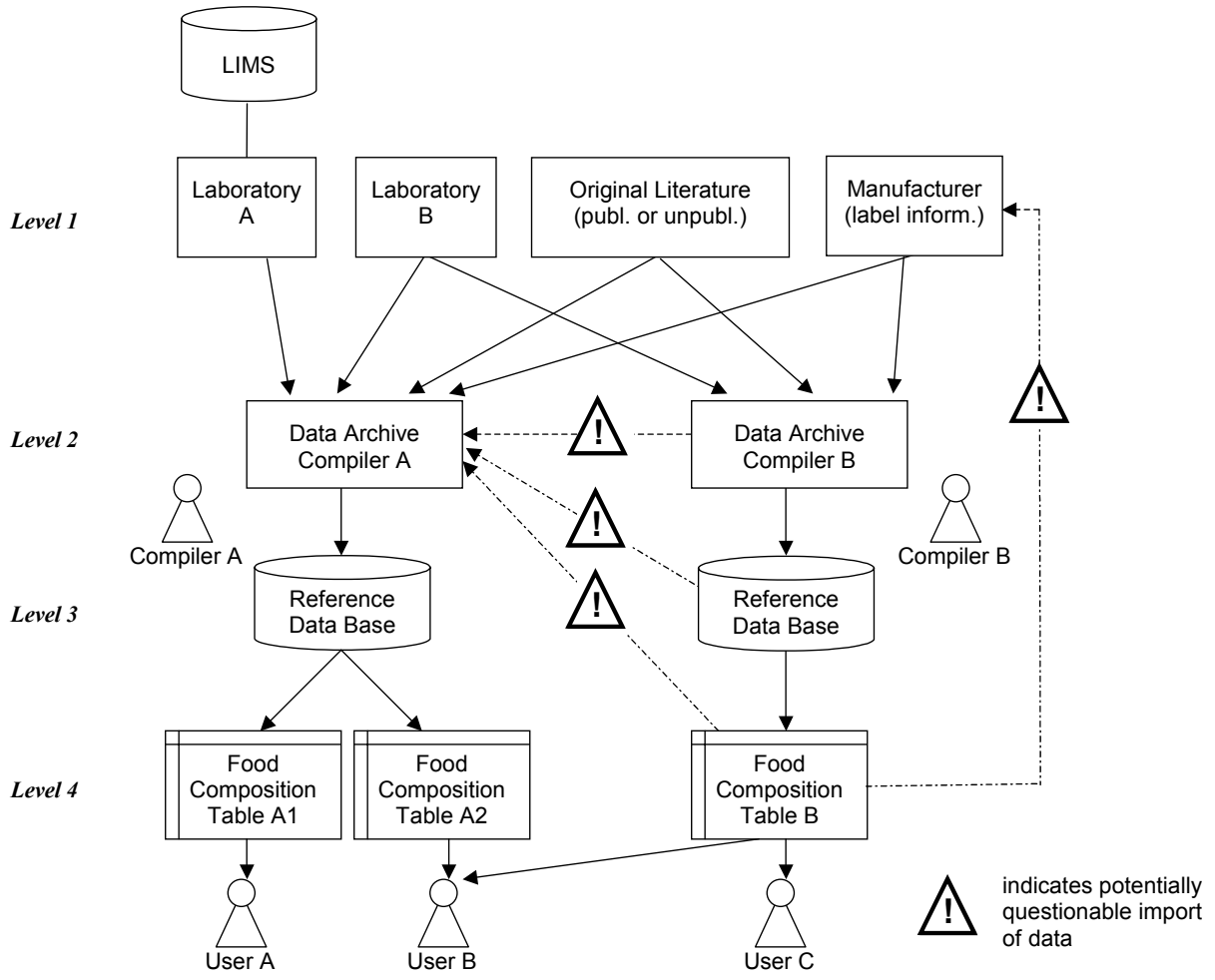

Fig. 1: Data interchange and management at various levels.

Based on Greenfield & Southgate [17], food composition data is managed at different levels during the compilation process (also see Fig. 1):

Level 1. Data sources: published and unpublished research papers and laboratory reports containing analytical data. Data might be systematically managed within a Laboratory Information Management System (LIMS).

Level 2. Archival data: written, printed, microfiche or computer files that hold all original data expressed as they were originally published or recorded, scrutinised only for consistency in data format. This editing process might include translation of information into standard coding or naming schemes. Such files should contain enough background information (metadata, see 1.3) so that it is unnecessary to refer back to the original sources. Archival data are kept by the compiler for backup purposes.

Level 3. Reference database: the complete pool of rigorously scrutinised data in which all values have been converted into standard units and components are expressed uniformly, but in which data for individual analyses are held separately. This database includes all foods and components for which data are available, and is linked to auxiliary records which indicate methods, sampling procedures, bibliographic references, laboratory of origin, date of insertion and other information relevant to the compilation process. This database can be part of a computerised food composition database management system (FDBMS). It is from this database and its programmes that the user databases and tables can be prepared.

Level 4. User databases and tables: the public resources which hold evaluated food composition data that, in some cases, have been weighted or averaged to ensure that the values are representative of the foods in terms of the use intended. User databases are subsets or derivations of the reference database, specially designed to meet the needs in terms of form and content of different user groups. These databases include as many foods and components as possible, with preference being given to completed data sets. Data may be completed by calculation or estimation.

Note: There is a risk that compiler A uses data from compiler B that originates from sources already used by compiler A. Since it is often hard or even impossible to trace the history of data at levels 2 to 4, Data from these levels must be carefully evaluated when used as input by an archival database compiler. A similar risk lies in manufacturer- or labelling-data of food products since this data may also have been derived from published food composition tables. Therefore the data interchange system must allow to include the contributing values and their description within the metadata of a derived value.

Based on this framework, the following definitions can be given:

Definition of Data Management

Any systematic form of organising food composition data at a distinct place, e.g. laboratory, food table compiler, food table user.

Definition of Data Interchange

Transfer of data between a sending party and one or many receiving parties without loss of information, i.e. the receiver should be able to interpret the data in the same way as was intended by the sender.

Definition of Interchange Package

Data are always interchanged within a self-contained *interchange package* holding all the information needed to asses the scientific quality of the data. The term *interchange package* is used in a general sense without implying specific implementation techniques such as single mark-up files, databases, or a collections of several files of various types. Specific recommendations for implementation are given in Part II:2.

Summary

The contribution and limitations of the recommendations covered in this report are:

- Recommendations are given to enable consistent *data interchange* between and among parties on levels 1 to 4. Data compilers must implement these recommendations in order to be part of the overall interchange system. The recommendations are especially useful to interchange national food composition tables.
- The recommendations will influence *data management* procedures for archival databases (level 2) and reference databases (level 3). However, each data compiler is free to choose their way to implement data manage and publication.
- The recommendations do not explicitly interfere with, or cover, internal laboratory management procedures.

3.2 General Data Structure

As part of the reference model a data structure is presented that defines the main entities *food*, *component*, compositional *value* and data *source*. The relationships between these entities are also discussed. The structure is static in the sense that the main entities do not need to be changed to capture food composition data at the various levels of compilation. It is flexible because it provides an open framework for an arbitrary amount of metadata to further describe foods, components, values, data sources, and methods. A list of mandatory and optional types of metadata to be used in interchange packages is given in Part II.

Rationale Behind the Data Structure

People are used to publishing and reading food composition data in tabular form. Data are typically presented with foods in the rows and components in the columns (see Fig. 2). The upper left quadrant of the table may be used to hold the information that describes the table as a whole, e.g. information about the body that is responsible for the content of the table. The Food-, Component- and Value-quadrants also hold additional descriptive information on these items.

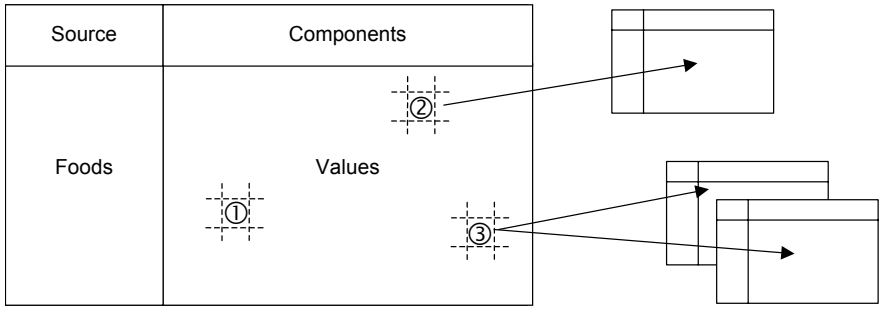

Fig. 2: The table metaphor

Figure 3 depicts a translation of the general data structure resulting from the table metaphor into the Entity Relationship Model (ERM). A data *source* (i.e. a food composition table/study) consists of several *foods* and several *components*. Each food-component pair may yield a compositional *value*. There are three basic types of values (also see Fig. 2):

1. A value may be an original analytical, calculated, or estimated value of this particular data source.
2. A value might be drawn from a third party source.

3. A value might be an aggregate of multiple other values, which in turn may point to third party data sources.

The various attributes, properties, and objects to describe the four main entity-sets in more detail are subject of part II of this report. Since many of these attributes and properties depend on standardised terminology, a central database, serving as a repository for standardised terminology, is part of the general data structure.

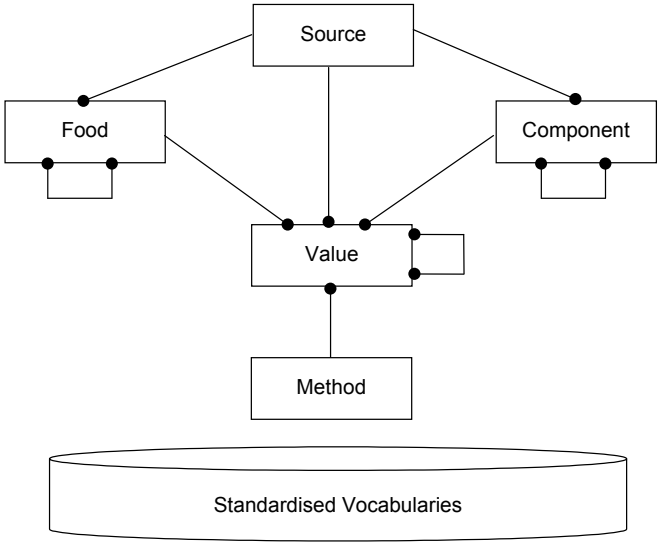

Fig. 3: Basic data structure. For further information see Part II:1.1

Definition of Source, Primary Source, and Secondary Source

A data *source* is a set of compositional values reported by a single person, group of authors or organisation. This authorship takes the responsibility for the content of a *source*. Besides the authorship, a single person, group or organisation acts as the sender of a *source*. The sender is responsible for the formal correctness and electronic transcription of a data source. Examples of *sources* are laboratory reports, scientific papers on specific studies, compiled analytical data of specific food groups and/or components, comprehensive food composition tables, manufacturer and labelling data, etc. A *source* may be available in various forms: published or unpublished reports, journal papers, articles in books, labels, etc. A *source* must be described with sufficient bibliographic reference information in order to be uniquely identified.

Within the context of data interchange, the *primary source* within an *interchange package* is the *source* to be interchanged with that package. Please note that this terminology is used differently compared to library science.

Secondary, tertiary, etc. sources are *sources* on which the *primary source* is directly or indirectly based. Thus in case of original work, no secondary sources can be specified.

Definition of Food

Within the proposed food composition data interchange system, we consider every food reported in a *source* a single entity *food*, since no two foods or food-samples reported are exactly the same. This also applies to generic foods (i.e. a representation of a class of foods that can be considered the same under a given context, e.g. “apple” in a national food composition table), since we cannot assume that any two compilers of such generic foods intend to express the same thing.

Examples of *foods* as entities are specific samples analysed in a laboratory, food products from a specific producer, generic foods and products, mixed foods and dishes.

Within a data *source*, each *food* must be assigned a unique ID (e.g. a number).

Even though two reported foods (e.g. two samples) might be described using identical descriptors, they are treated as two individual entities. Whether two reported *foods* are comparable and might be aggregated at a later time is a decision of the data user and depends on the application and its constraints regarding data quality. The more metadata that are available to describe the food, the more precise the decision of the user (e.g. a national data compiler).

Definition of Component

We apply the same philosophy to *components* as we did for *foods*. Each *component* reported in a data *source* is unique and must be evaluated according to the available metadata. In that sense every distinct set of values for the attributes component-name, unit and mode of expression (see Part II:1.12) must be considered a *component*.

Components include all properties of food that are subject of scientific measurements to determine the amount of property per some amount of food (e.g. per 100g food). Particularly, *components* are not restricted to nutritionaly significant properties of foods.

Examples of *components* are nutrients such as fats, proteins, carbohydrates, vitamins, minerals, and also contaminants or other measures and properties such as density, per cent edible portion, or pH. Food specific factors to be used in calculations may also be modelled as components (e.g. nitrogen conversion factors for protein calculation).

All other properties of food that are not included in this definition are treated as part of food description.

Definition of Value

A numerical result and its statistical properties determined by an analytical process, computation or estimation of the amount of a *component* within a *food*.

Definition of Method

Chemical, physical, numerical or other methods used to select or determine *values* of *components* within *foods* as reported in *sources*.

Definition of Standardised Vocabulary

Standardised vocabularies are sets of agreed or standardised terms. Each standardised vocabulary is maintained and published by some authoritative body. The terms of a standardised vocabulary my be organised in a hierarchy.

Examples are names of countries and languages, classifications (e.g. food groups), units, methods, etc. Authoritative bodies may be ISO, CODEX, INFOODS, EUROFOODS, LanguaL, etc.

4 Summary of Recommendations

Each food composition study to be interchanged is stored in a relational database, consisting of a collection of text-files each holding one table of the database. This database may be accompanied with further multi-media files.

Recommendation 1 describes the complete schema, i.e. all possible attributes and their domains, the relationships between the entity-sets and all additional tables needed for implementation. It is also defined which attributes are considered mandatory within the EUROFOODS data exchange framework and which ones are optional but recommended as further metadata.

Recommendation 2 specifies constraints on the file formats to be used for data interchange and also describes procedures for data compression.

Recommendation 3 specifies constraints on the media to be used for data interchange.

Recommendation 4 lists and describes all sets of standardised vocabularies (thesauri) to be used in food composition data interchange. Some of the thesauri were developed from scratch, others were adopted from various international bodies. The actual content of the thesauri is subject of part IV of this report.

5 Discussion and Future Directions

The present recommendations for food composition database management and data interchange have been designed in a straightforward fashion. The underlying data schema is expressed using the entity relationship model (ERM). ERM-schemas can be implemented using relational databases. Thus we are able to build on existing and widely used technology.

The relational database approach, however, has some drawbacks, especially when used in data interchange. Although the following aspects can be treated in a relational way, the handling gets cumbersome:

- The information is spread over several tables. To interchange a database, several files must be interchanged.
- Isa-type relationships[2] yields either extra tables or tables with many attributes and many NULL (i.e. absent) values.
- Set types are not allowed in relational databases. Instead, additional tables must be introduced. For example, if a compositional value represents a statistical distribution and all *n* values of the statistic should be reported, one needs an extra table (incl. an extra key attribute) just to store these values.

It is therefore planned to translate the data structure presented in this report into an XML (Extensible Markup Language [12], [47]) application once this Internet standard has been established. XML offers conceptual and technical solutions for the problems mentioned above because data can be treated in a more object-oriented way.

XML is a meta-language for the design of markup languages such as HTML. A regular markup language defines a way to describe information in a certain class of documents (e.g. HTML). XML allows to define customised markup languages for many classes of document. It can do this because it is written in SGML, the international standard meta-language for markup languages [19].

XML is designed to make it easy and straightforward to use SGML on the Web: easy to define document types, easy to author and manage SGML-defined documents, and easy to transmit and share them across the Web. XML therefore defines a simple dialect of SGML.

[2] i.e. a modelling technique to describe a specialisation, e.g. a *book is a* specialisation of a *publication*. Such relationships are useful when describing food composition data – see part II

6 Software Tools Supporting the Recommendations

It is one of our main objectives to design the recommendations in a way that allows for implementation with reasonable effort. The food composition data group in Switzerland is developing the following software tools based on the recommendations presented in this report. Parts of this work will be available on the internet at http://food.ethz.ch/cost99/datax/ or via the "Technical Projects" section on the INFOODS homepage at http://www.fao.org/infoods/.

6.1 Food Editor

Based on Microsoft Excel an application is built to edit and browse interchange packages using a graphical user interface. The tool allows to choose from the various data items presented in Part II of this report. It also offers a browser to navigate through classification systems and thesauri if such systems are used in food, component, value or method description. The software stores interchange packages in either a single Microsoft Access database file or in multiple text files as described in Part II:2.

6.2 Thesaurus Manager

Thesaurus Manager is a PC/Windows-tool to create, edit and translate thesauri. The current implementation (Version 1.01, Feb. 1998) stores each thesaurus in a unique dBASE IV database. An extension is planned to allow to manage several thesauri in a single Microsoft Access database. All thesauri mentioned within this report will be available as Thesaurus Manager databases.

6.3 Food Database Manager

The aim of this tool is to provide a framework to store and integrate multiple food composition data packages in one single database. The management tool can import and export interchange packages adhering to the recommendations in this report. A WWW interface allows to browse and search such a repository of interchange packages. The database can also be accessed using the Food Editor software or a software for the compilation of food composition tables.

Part II: Recommendations

1 Conceptual Database Schema

1.1 General Comments

Each food composition study to be interchanged (interchange package) is stored as a relational database. The relational approach was chosen because of the popularity of relational database systems and not because this data model is especially useful for our task. A translation into more elegant data models such as object oriented databases or XML interchange files is always possible and left to local data managers. Work should be done in this direction in the future.

1.2 Database Schema Overview

The entity relationship schema depicted in figure 4 is a refinement of the schema presented in figure 3. The additional entity sets are necessary to store metadata to further describe *Source*, *Food*, *Component*, *Value* and *Method* entities. The highlighted entity sets will be implemented in a special way described in chapter 1.3. Further information on each entity set is given in chapters 1.5 through 1.18.

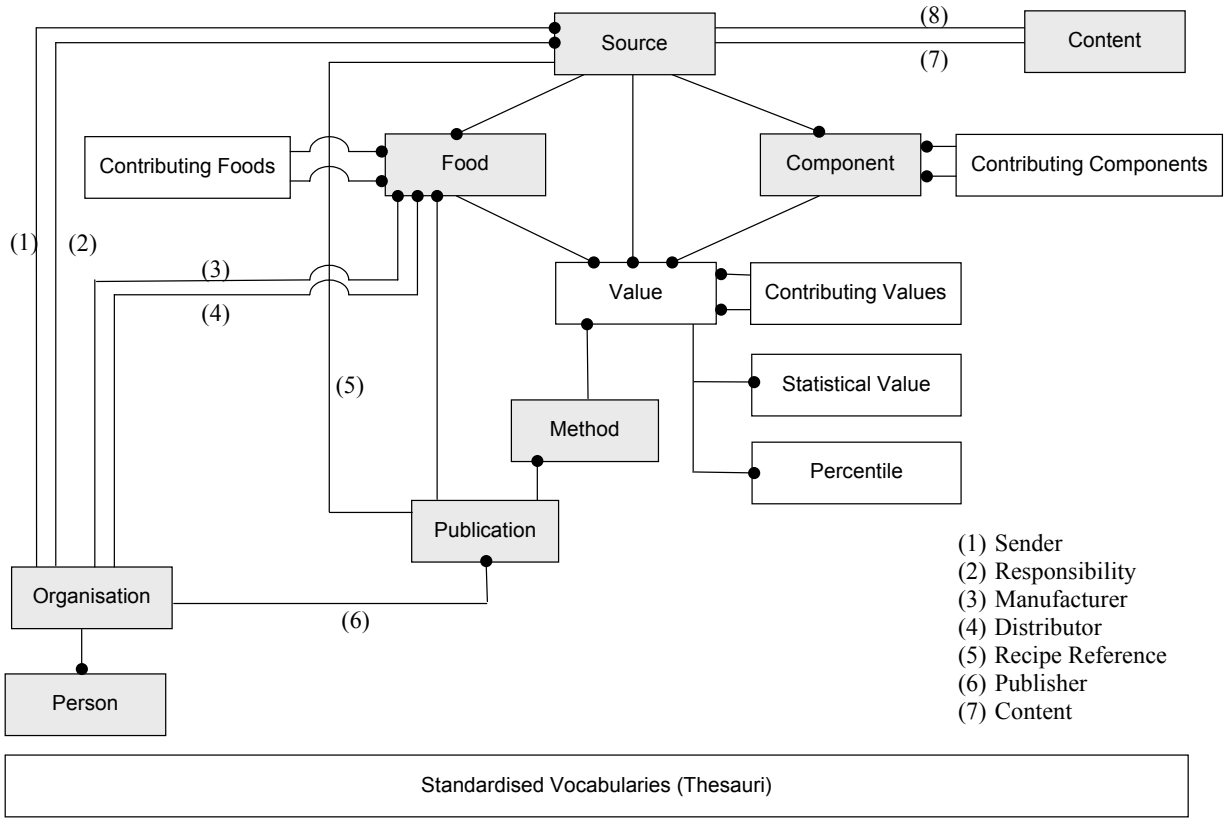

Fig. 4: Interchange data schema. —• stands for a one-to-many relationship

All relationships between entity sets are conditional, i.e. an entity in one set (in one table) does not necessarily have to be related to an entity in the related set. At the attribute level, however, we will classify some attributes as mandatory in order to guarantee a certain level of documentation and uniformity of EUROFOODS interchange packages.

1.3 Special Modelling and Implementation

The following requirements especially apply to the entity sets highlighted in figure 4: *Source*, *Content*, *Food*, *Component*, *Method*, *Publication*, *Organisation*, and *Person*.

It should be possible ...

… to add further attributes in the future without much extra programming
… to interchange only those attribute values within a table that are actually used
… to use set valued attributes, i.e. attributes that hold more than one value
… to use several languages (translations) for textual data description
… to indicate preferred terms and multiple synonyms for a textual description
… to allow for free text- and thesaurus-based descriptions in parallel
… to annotate every single value if necessary
… to process the data with standard relational database management systems.

To meet these requirements using relational database technology, the corresponding entity sets are implemented using the following schema:

AttributeName	ShortName	Data Type[3]	Description
EntityID	ENTITYID	NUM	a unique number identifying the food, component, method, etc. see 1.4 for further information (Generic IDs)
PropertyID	PROPID	STR8	max. 8 character property identification (see lists of properties in chapters 1.5 through 1.14)
Value	VALUE	STR255	The property value in text format. Properties of type MEM must be stored in the MemoValue field.
MemoValue	MEMO	MEM	The property value in text format. Should be used for values of type *memo* (memo = longer than 255 characters) and for alternative free text values of properties of type *thesaurus*.
Language	LANG	STR5	according to ISO 639:1988: a 2 character standard ISO language code plus an optional 2 character standard ISO country code separated by a blank character, e.g. “en” for English or “en UK” for British English.
Preferred	PREF	BLN	True (1) indicates preferred terms, false (0) indicates synonyms. In case of blank values (NULL), True is considered the default value.
Remarks	REMARKS	MEM	free text annotations of the value

This technique allows to describe an entity (a food, component, method etc.) with an arbitrary amount of property/value pairs in multiple languages, with multiple synonyms and to attach annotations to every single value if necessary. Within such a table, each combination of [EntityID, PropertyID, Value/MemoValue, Preferred, Language] must be unique. Thus, these attributes form the key of the table.

Attributes and Properties

Please note that the term *attribute* is used for attributes in the sense of column headers in relational tables, whereas the term *property* is used for names of properties in the property/value pairs described above.

[3] see table Data Types in Part II:1.4

The following example shows part of an entity set *Food:*

ENTITYID	PROPID	VALUE	MEMO	LANG	PREF	REMARKS
...						
336	SOURCEID	1			1	
336	ORIGFDCD	11008			1	
336	ORIGGPCD	26			1	
336	FOODNAME	Ketchup		fr	1	
336	FOODNAME	Tomato ketchup		en	1	
336	PRODTYPE	A0286			1	
336	FOODSRC	B1276			1	
336	IMAGE	KETCHUP.JPG			1	
336	PARTPLAN	C0138			1	
336	PHYSTATE	E0135			1	
336	HEATREAT	F14			1	
336	TREATAPP	H0136			1	
336	TREATAPP	H0151			1	
336	TREATAPP	H0227			1	
336	COOKMETH	G0001			1	
336	PRESMETH	J0001			1	
336	PACKMED	K0003			1	
336	FDCTSRFC	N0001			1	
336	CONTWRPG	M0001			1	
336	LBLCLAIM	P0024			1	
337	SOURCEID	1			1	
337	ORIGFDCD	11009			1	
337	ORIGGPCD	26			1	
337	FOODNAME	Levure alimentaire		fr	1	
337	FOODNAME	Yeast, brewer's		en	1	
...						

1.4 Formal Conventions

This chapter defines some formal conventions used for the schema description in chapters 1.5 through 1.14.

Generic IDs

A *generic ID* is assigned to each entity (e.g. food, component, method etc.) in each of the entity sets in the schema. IDs are implemented as positive integer values. It is left to the receiver of an interchange package to resolve the IDs to whatever system he or she uses to store multiple interchange packages within an integrated archival or reference database.

IDs must be unique, i.e. no two entities can have the same ID within an entity set (i.e. a table). Further, IDs must be consistent within an interchange package, i.e. references to other entity sets must point to existing entities and all entities must be reachable through the primary source.

Isa-Type Relationships

Even though *isa-type relationships* are not directly supported by the relational data model, they often occur in real life applications. As an example consider bibliographic reference data (see chapter 1.9). Books, reports or journal articles are data sources ("a book *is a* source"). Different properties are needed to describe a publication, depending on its type (e.g. a book has an ISBN whereas a journal article does not).

For data interchange through relational databases we propose a straightforward approach: e.g. all data on all sources are stored in a single table SOURCE. Each source is assigned a property *publication type* which triggers other applicable properties.

Properties

For each entity set in the database schema, a list of all possible properties is provided. Each property is given a name, a unique property-id to be used in interchange packages (max. 8-characters long), a data type and a priority. Further notes and explanations are provided for each property under *scope note*. The list of properties also show the isa-type relationships in hierarchical form.

Some properties are grouped for ease of discussion. Group headers are printed bold-italics and might be of interest for implementation in future editing or browsing software.

As a default rule, a property *Remark* of type memo is assigned to each table within the database schema. This allows to store all additional information not covered elsewhere in the schema.

Priorities

The working group agreed that priorities of properties should be based on the level of operation. The lower the level, according to the four-level structure presented in Part I:3.1, the more metadata is expected because the data reported is closer to its original source.

The priorities given in the following chapters should be interpreted as seen from a food composition data compiler's point of view. There are three priorities:

1. *Mandatory* (M) properties build the core set of data that is needed to be able to capture the basic idea of a given food composition study.
2. *Recommended* (R) properties should be considered the goal for everyone participating in data interchange.

3. *Optional* (O) properties only apply to special circumstances and serve as a guideline to possibly important data.

Priorities are also given for whole entity sets (i.e. tables). If a recommended or optional entity set is used, the priorities for its properties apply as indicated in that entity set.

Data Types

The following basic data types are used for attributes (also see 2.3 for further technical specifications):

Abbreviation	Data Type
STR*nnn*	Text String with a maximum of *nnn* characters where *nnn* stands for a number between 0 and 255. 255 applies if no length is specified.
MEM	Memo: text strings larger than 255 characters
DAT	Date: generally in the form CCYY-MM-DD with leading zeros according to ISO 8601:1988; In case of reduced precision, days (DD), months (MM) or years (YY) may be omitted starting from the extreme right-hand side, e.g. 1999-07 or 1985. If time is also relevant use CCYY-MM-DD/hh:mm:ss
INT	Integer: in the range of +/- 2147483648 (= +/- 2^{31})
NUM	Decimal Numbers: All given decimals must be significant. Trailing zeros are not cut, i.e. trailing zeros should be used to indicate significant decimals.
FRC	Fraction: a decimal number between 0 and 1 (0 and 1 inclusive)
BLN	Boolean: 1 = true, 0 = false
THS	Thesaurus Entry: valid interchange codes of thesaurus concepts. In the context of relational databases, thesauri are also known as *look-up tables*. Which thesaurus is used for a property is specified in the corresponding explanations.
FIL	Additional (multimedia) Files: Generally files are referred to as URLs. If a leading “http://” or “ftp://” is omitted, “file://MMFILES/” is the default, i.e. a simple filename refers to a file in the directory MMFILES which is part of the interchange package. Files must use 8 character long filenames with an up to 3 character long file extension (also see chapter 2.6). Future versions of the recommendations will allow for longer filenames.
KEY	Generic ID used as key: positive integers > 0 as described in chapter 1.4
FKY	Foreign Key: Generic ID used as key in another table. Foreign keys implement relationships between entities according to relational database principles.

Complementary Use of Thesaurus Based Values and Free Text

Properties that use THS as their data type, only allow values that are part of the corresponding thesaurus. If for some reason the given thesaurus is not adequate, if a certain term is missing in the thesaurus, or if free text description is preferred over standardised vocabulary, the MEMO attribute should be used instead of the VALUE attribute. Further remarks should be placed in the REMARKS attribute.

This mechanism allows to use both systems in parallel or to introduce new terms that might become standard terms in the thesaurus at a later time.

Set Valued Properties

Data types of properties that allow more than one value are printed in brackets: e.g. **{**THS**}.** Data of type String (STR) and Memo (MEM) is always considered to be set valued in order to allow multiple translations of the text.

1.5 Source

The *Source* table is mandatory and holds data on the source to be interchanged (the primary source) as well as information on other sources on which the primary source is based (secondary, tertiary, etc. sources).

Depending on the level where source description is used, different priority settings apply.

Properties for Source Description

Property Name	Property ID	Data Type	Prio (prim.)	Prio (second.)	Scope Note
Source Name	SRCENAME	{STR}	R	R	The Source Name should be kept short and should include important parts of the responsible organisation and/or the bibliographic reference.
Primary Source	PRIMSRCE	BLN	M	n.a.	True (1) if the data source is the primary source within the interchange package.
Compilation Language	COMPLANG	THS	M	M	Language, originally used for free text description within all data of a source (incl. food, component and value description). According to ISO 639: a 2 character standard ISO language code plus an optional 2 character standard ISO country code separated by a blank character, e.g. “en” for English or “en UK” for British English.
Acquisition Type	ACQTYPE	THS	M	M	Use thesaurus described in chapter 4.3.
Responsibility	RSPONSIB	FKY	M	M	Link to the Organisation table (and thereby to the Person). The ID of the organisation that is responsible for the content of the data source.
Sender	SENDER	FKY	R	O	Link to the Organisation table (and thereby to the person). The ID of the organisation that sent the interchange package.
Sent Date	SENTDATE	DAT	M	M	The date the interchange package is sent.
Legal Restrictions	LEGLREST	{MEM}	R	R	Note any legal (copyright) or scientific restrictions imposed on the data. Such information is also known as *disclaimer*.
Content Summary	CONTSUMM	FKY	R	R	Link to the Content table (Content ID). Briefly describes the content of an interchange package.
Excluded Content Summary	EXCONSUM	FKY	O	O	Link to the Content table (Content ID). Briefly describes what data has been omitted compared to the original data source. Use this attribute when an interchange package represents just a part of a more comprehensive data source. This information might help people to localise further data.
Bibliographic Reference	BIBREF	FKY	M	M	Link to the Publication table (Publication ID).

Properties for Source Description (continued)

Property Name	Property ID	Data Type	Prio (prim.)	Prio (second.)	Scope Note
Original Food Groups	ORIGFDGP	FIL	R	O	A file listing the original food groups and their codes. Preference should be given to a plain text file. There is currently no further specification on the format of this file.
Quality Assessment	QUALASSM	FIL	R	O	Link to a file describing the meaning of quality indices, scores, criteria used, expert systems used, etc. for the assessment and documentation of the quality of each compositional value (see Attribute QI in value description).
Remarks	REMARKS	{MEM}	O	O	Any further remarks.

Example

ENTITYID	PROPID	VALUE	MEMO	LANG	PREF	REMARKS
...						
1	SRCNAME	CIQUAL98		en	1	
1	PRIMSRCE	1			1	
1	COMPLANG	fr			1	
1	ACQTYPE	F			1	
1	RSPONSIB	1			1	
1	SENDER	1			1	
1	SENTDATE	1998-08-31			1	
1	LEGAREST		This food composition table is copyright protected. Please contact the sender for further information and licence agreement.	en	1	
1	CONTSUMM	1			1	
1	EXCONSUM	2			1	
1	BIBREF	214			1	
...						

1.6 Organisation

The *Organisation* table is mandatory. Data about organisations are used at various places within source- and food-description.

Properties for Organisation Description

Property Name	Property ID	Data Type	Prio	Scope Note
Organisation Name	ORGNAM	{STR}	M	The official name of the organisation.
Super Organisation Name	SPORGNAM	{STR}	O	If applicable, give the name of the umbrella organisation
Postal Address	POSTADDR	{MEM}	R	Postal address as would be put on a letter, i.e. PO box, address, ZIP-code, city, country, etc.
Country	COUNTRY	THS	M	Use ISO 3166-1. A country subdivision code as described in ISO 3166-2 can be added after the country code separated by a hyphen, e.g. CH-ZH.
Telephone	PHONE	{STR}	R	Telephone and Fax numbers should be formatted from an international point of view. Use the form +country-code area-code sub area-code phone-number. The various blocks should be separated with a space character or hyphen.
Fax	FAX	{STR}	R	Should be formatted from an international point of view. Use the form +country-code area-code sub area-code phone-number. The various blocks should be separated with a space character or hyphen.
E-mail	EMAIL	{STR}	R	Internet e-mail address.
WWW	WWW	{STR}	R	Always give complete URLs. Example: http://www.fao.org/infoods/
Remarks	REMARKS	{MEM}	O	Any further remarks.

Example

ENTITYID	PROPID	VALUE	MEMO	LANG	PREF	REMARKS
...						
12	ORGNAM	Institute of Scientific Computing		en	1	
12	SPORGNAM	ETH Zurich		en	1	i.e. Swiss Federal Institute of Technology, Zurich
12	POSTADDR		8092 Zürich Switzerland	de	1	
12	COUNTRY	CH			1	
12	PHONE	+41-1-6327471			1	
12	FAX	+41-1-6321374			1	
12	EMAIL	sekwr@inf.ethz.ch			1	
12	WWW	http://www.inf.ethz.ch/department/WR/			1	
...						

1.7 Person

The *Person* table is recommended. It is used for data about contact persons in an organisation.

Properties for Person Description

Property Name	Property ID	Data Type	Prio	Scope Note
Organisation	ORGID	FKY	M	Link to Organisation table. Gives the ID of the organisation to which the person is affiliated.
Title	TITLE	{STR}	R	The title used to address a person, e.g. Prof., or Dr., etc. If there is no title or in case of doubt, use Mr. or Mrs.
First Names	FRSTNAME	{STR}	R	Separate multiple names with space characters. Abbreviations are allowed.
Last Name	LASTNAME	{STR}	M	Family name of the person.
Position	POSITION	{STR}	R	The current working position of the person, e.g. laboratory director, nutritionist, IT manager, etc.
Postal Address	POSTADDR	{MEM}	R	Complete postal address as would be put on a letter.
Country	COUNTRY	THS	M	Use ISO 3166-1. A country subdivision code as described in ISO 3166-2 can be added after the country code separated by a hyphen, e.g. CH-ZH.
Telephone	PHONE	{STR}	R	Should be formatted from an international point of view. Use the form +country-code area-code sub area-code phone-number. The various blocks should be separated with a space character or hyphen.
Fax	FAX	{STR}	R	Should be formatted from an international point of view. Use the form +country-code area-code sub area-code phone-number. The various blocks should be separated with a space character or hyphen.
E-mail	EMAIL	{STR}	R	Internet e-mail address.
WWW	WWW	{STR}	R	Always give complete URLs. Example: http://www.fao.org/infoods/
Remarks	REMARKS	{MEM}	O	Any further remarks.

Example

ENTITYID	PROPID	VALUE	MEMO	LANG	PREF	REMARKS
...						
5	ORGID	12			1	
5	TITLE	Mr.		en	1	
5	FRSTNAME	Florian		de	1	
5	LASTNAME	Schlotke		de	1	
5	POSITION	Research Assistant		en	1	
5	PHONE	+41-1-6327458			1	
5	PHONE	+41-1-6327436			0	Use in case of absence
5	FAX	+41-1-6321374			1	
5	EMAIL	schlotke@iaeth.ch			1	

1.8 Content

The *Content* table is optional. Content data gives a brief overview of the data within an interchange package. The development of the content schema was influenced by the questionnaire of the EUROFOODS inventory of European food composition databases [34]. The Content table may be referenced twice by the Source table: first to describe the actual content; second to describe what part of the original source has been excluded from the interchange package.

Properties for Content Description

Property Name	Property ID	Data Type	Prio	Scope Note
Food Description	FOODDESC	{MEM}	O	Free text describing what techniques are used to describe foods.
Number of Foods	NRFOODS	INT	M	The total number of foods in the data source.
Food Types				
Basic Foods	BASICFDS	FRC	R	Percentage of basic or generic raw and processed foods in the data source, e.g. meat, fish, fruits, vegetables, etc. and -products.
Brand Named Food Products	BDFDPRODS	FRC	R	Percentage of raw or processed foods of specific brands.
Dishes	DISHES	FRC	R	Percentage of dishes, i.e. meals and recipees that can be produced in home kitchens using basic foods and food products.
Main Food Groups	FOODGRPS	{THS}	R	List the food groups of the foods in the interchange package. Use the codes given in chapter 4.5.
Component Description	COMPDESC	{MEM}	O	Free text describing what techniques are used to describe components.
Number of Components	NRCOMPS	INT	M	The total number of components in the data source.
Component Groups	COMPGRPS	{THS}	R	List component groups covered by the data source.
Value Description	VALDESC	{MEM}	O	Free text describing what techniques are used to describe values.
Value Sources				
Own Analysis	OWNANALY	FRC	R	Percentage of values obtained by own analysis, i.e. all data that has been analysed by the data compiler's own or affiliated lab.
Other Analysis	FORANALY	FRC	R	Percentage of values obtained by other analysis, i.e. Use other analysis for all data sources that weren't produced under the compiler's initiative or supervision, i.e. data someone else published before.
Calculation	CALCUL	FRC	R	Percentage of values obtained by calculation
Estimation	ESTIMAT	FRC	R	Percentage of values obtained by estimation
General Use	GENRLUSE	{MEM}	O	Free text description of the data's target user group and scientific restrictions. It might also be useful to indicate countries or regions where the data is applicable or not.
Remarks	REMARKS	{MEM}	O	Any further remarks.

Example

ENTITYID	PROPID	VALUE	MEMO	LANG	PREF	REMARKS
...						
	FOODDESC		Foodnames in French and English, Scientific Names, and LanguaL coding are provided systematically.	en	1	
	NRFOODS	2036			1	
	BASICFDS	0.64			1	
	FDPRODS	0.33			1	
	DISHES	0.03			1	
	FOODGRPS	All			1	
	COMPDESC		INFOODS Tagnames as secondary identifier as some components do not have tagnames	en	1	
	VALDESC		Evaluation of incoming data.; Min., max, std. dev.	en	1	
	USAGE		This food composition table is mainly designed to be used in France.	en	1	
...						

1.9 Publication

The *Publication* table is mandatory and holds bibliographical information of various publication types, including that for the interchange package itself. It is referenced by the source and the method table.

Properties for Publication Description

Property Name	Property ID	Data Type	Prio	Scope Note
Title	TITLE	{STR}	M	The title of the publication. Use this property multiple times to provide the title in the original language, in English, and any other language if possible.
Authors	AUTHORS	{STR}	M	Separate all multiple authors by semi-colon (;). For personal names, write the forename or initials after the last name, separated by comma. The attribute may be used for the name of an organisation where this is considered a corporate author, for example "AOAC", or for the abbreviation "Anon." where the authorship is anonymous.
Publisher	PUBLISHR	FKY	M	Link to the Organisation table. The ID of the organisation that published the publication.
Publication Date	PUBDATE	DAT	M	The year or exact date, the publication was issued.
Version	VERSION	{STR}	O	Use this attribute for any versioning system other than publication date or edition number. This attribute is helpful for frequent updates.
Original Language	ORIGLANG	THS	M	The language that the publication was originally written in. According to ISO 639: a 2 character standard ISO language code plus an optional 2 character standard ISO country code separated by a blank character, e.g. “en” for English or “en UK” for British English.
Languages	LANGS	{THS}	R	Language codes of all other languages, that major parts of the publication have been translated to. According to ISO 639: a 2 character standard ISO language code plus an optional 2 character standard ISO country code separated by a blank character, e.g. “en” for English or “en UK” for British English.
Publication Type	PUBTYPE	THS	M	The publication type triggers further metadata (see below). Use the standard publication types presented in chapter 4.4.
Is a Book				
ISBN	ISBN	{STR}	R	International Standard Book Number
First Edition Date	FSTEDDAT	DAT	O	When was the first edition published?
Edition Number	EDNR	INT	R	What is the current edition?
Number of Pages	NRPAGES	{STR}	O	Total number of pages
Is a Article in Book				
Book Title	BKTITLE	{STR}	M	The title of the book in which the article appears. The title of the article is given in the TITLE property.
Editors	EDITORS	{STR}	M	The names of the editors of the book.
ISBN	ISBN	{STR}	R	International Standard Book Number of the book.
Pages	PAGES	{STR}	O	The book pages covered by the article, e.g. 45-67

Properties for Publication Description (continued)

Property Name	Property ID	Data Type	Prio	Scope Note
Is a Journal (Issue)				
Long Journal Name	LGJRNAME	{STR}	O	
Abbreviated Journal Name	ABJRNAME	{STR}	M	
ISSN	ISSN	{STR}	O	
Volume	VOLUME	{STR}	M	
Issue	ISSUE	{STR}	M	
Is a Journal Article				
Long Journal Name	LGJRNAME	{STR}	O	
Abbreviated Journal Name	ABJRNAME	{STR}	M	
ISSN	ISSN	{STR}	M	
Pages	PAGES	{STR}	R	The pages covered by the article, e.g. 375-383
Volume	VOLUME	{STR}	M	
Issue	ISSUE	{STR}	M	
Is a Report				
Series Name	SERINAME	{STR}	O	Use this property if the report is published within a series of other reports.
Series Number	SERINR	{STR}	O	The number of the report within the series.
ISBN	ISBN	{STR}	O	
Is a Article in Report				
Editors	EDITORS	{STR}	M	The names of the editors of the report.
Report Title	RPRTITLE	{STR}	M	The title of the report. The title of the article is given in the TITLE property.
Series Name	SERINAME	{STR}	O	
Series Number	SERINR	{STR}	O	
ISBN	ISBN	{STR}	O	
Pages	PAGES	{STR}	R	The pages of the report covered by the article, e.g. 45-67
Is a File or Database				
File Format	FILEFRMT	{STR}	M	Give information about the platform or computer system, the file is compatible to. Also mention the software needed to interpret the file.
WWW	WWW	{STR}	O	The internet address (URL) of the file (WWW or FTP)
Publication Medium	MEDIUM	{STR}	R	How is the file distributed: e.g. diskette, CD-ROM, tape, internet, etc.
Is a Software				
Operating System	OS	{STR}	M	Under which operating system (including version number) does the software run?
Primary Publication Media	MEDIA	{STR}	R	On what media is the software published, e.g. CD-ROM?

Properties for Publication Description (continued)

Property Name	Property ID	Data Type	Prio	Scope Note
Is a Authoritative Document				
ISBN	ISBN	{STR}	O	
ISSN	ISSN	{STR}	O	
Valid from	VALID	DAT	O	Since when is the document valid
Is a Product Lable				
Remarks	REMARKS	{MEM}	O	Any further remarks.

Example 1

ENTITYID	PROPID	VALUE	MEMO	LANG	PREF	REMARKS
…						
1005	TITLE	Banca Dati di Composizione degli Alimenti per Studi Epidemiologici in Italia		it	1	
1005	TITLE	Food Composition Database for Epidemiological Studies in Italy		en	1	
1005	AUTHORS	Salvini, S., Parpinel, M., Gnagnarella, P., Maison-neuve, P., Turrini, A.			1	
1005	PUBLISHR	35			1	
1005	PUBDATE	1998-04			1	
1005	ORIGLANG	it			1	
1005	LANGS	en			1	
1005	PUBTYPE	B			1	
1005	ISBN	88-900271-0-X			1	
1005	FSTEDDAT	1998-04			1	
1005	EDNR	1			1	
1005	NRPAGES	958			1	
…						

Example 2

ENTITYID	PROPID	VALUE	MEMO	LANG	PREF	REMARKS
…						
100	TITLE	Répertoire général des aliments, 800 aliments, 34 nutriments		fr		
100	TITLE	Food Composition Database for Epidemiological Studies in France		en		
100	PUBLISHR	1				
100	PUBDATE	1995				
100	ORIGLANG	fr				
100	LANGS	en				
100	PUBTYPE	F				
100	FILEFRMT	ASCII delimited files				
100	MEDIA	Diskette				
…						

1.10 Food

The *Food* table is mandatory and used to describe the foods in an interchange package.

Properties for Food Description

Property Name	Property ID	Data Type	Prio	Scope Note
Source	SOURCEID	FKY	M	Link to the data source reporting the food.
Food Name and Identification				
Food Name	FOODNAME	{STR}	M	The preferred food name and additional synonyms in various languages. Food names should start with an upper case first character in the first word, e.g. Grapefruit, Spanish lime etc. Scientific Names must use Latin (la) as language flag and should adhere to the following format: Genus species Author[, Year] e.g. Gadus morhua Linnaeus, 1758.
Abbreviated Food Name	ABBREV	{STR32}	O	Used for applications with limited screen/paper space.
Original Food Code	ORIGFDCD	{STR}	R	The food code, ID, or abbreviation used to identify the food in the original publication.
Original Food Group Code	ORIGGPCD	{STR}	R	The proprietary classification code used in the original publication. The proprietary classification system should be provided separately under ORIGFDGP within the primary source description.
Standard Classifications			M	At least one of the standard classification systems is mandatory.
Product Type	PRODTYPE	{THS}	R	FDA product type thesaurus of LanguaL facet A [29].
CODEX Food Standards	CDXFDSTD	THS	O	Codex Alimentarius Food Standards code [5].
CODEX Food Categorization System for the General Standards for Food Additives	CDXFDADD	{THS}	O	According to [9].
CODEX Classification of Foods and Feeds	CDXFDFD	THS	O	According to [6].
CODEX Food Categorization System for Contaminants	CDXCONT	THS	O	According to [11].
FAO Food Balance Sheet Classification	FAOFBS	THS	O	According to [38].
CIAA Food Categorization	CIAA	{THS}	R	According to [4].
Eurocode2	EC2	{THS}	R	According to [41].
European Article Number	EAN	{STR}	R	For European articles only.
Universal Product Code	UPC	{STR}	R	
E-Number	ENR	THS	R	If food is food additive, code according to the European E-Number system for additive standardisation.
INS-Code	INS	THS	R	If the food is a food additive, code according to the International Numbering System for food additives accord-

Properties for Food Description (continued)

Property Name	Property ID	Data Type	Prio	Scope Note
Genera IDescription				
Manufacturer	MANUFACT	{FKY}	R	Link to Organisation table (Organisation ID). Describes the direct manufacturer or producer of the food. e.g. a farmer is considered a manufacturer.
Distributor	DISTRIB	{FKY}	R	Between producer and retailer. Link to Organisation table (Organisation ID).
Food Source	FOODSRCE	THS	R	Langual facet B [29].
Genetically Modified	GENMANIP	BLN	O	
Agricultural Production Conditions	AGRICOND	{MEM}	O	Brief description of soil conditions, watering schemes, feeding, harvesting, slaughtering, ripeness, etc.
Colour	COLOR	{STR}	O	Colour values are currently not further specified. More detailed recommendations are planned for further versions.
Generic Image	GENIMAGE	{FIL}	R	The file names of generic images showing foods similar to the food or sample in question.
Specific Image	SPCIMAGE	{FIL}	R	The file names of specific images of the food sample, i.e. the food that was actually analysed.
Part of Plant or Animal	PARTPLAN	THS	R	Langual facet C [29].
Percentage Edible Portion	EDPORT	FRC	R	May also be considered a component
Nature of Edible Portion	NATEDPOR	{STR}	R	Which parts of the food are edible, e.g. flesh, root, leaf, etc.?
Nature of Waste	NATWASTE	{STR}	R	Which parts of the food are not edible, e.g. rind, bone, stone, peel, etc.?
Physical State Shape or Form	PHYSTATE	{THS}	R	Langual facet E [29].
Extent of Heat Treatment	HEATREAT	THS	R	Langual facet F [29].
Treatment Applied	TREATAPP	{THS}	R	Langual facet H [29].
Cooking Method	COOKMETH	{THS}	R	Langual facet G [29].
Recipe Procedure	RECPROC	{MEM}	R	If food is a recipe
Recipe Bibliographic Reference	RECREF	FKY	R	Link to Publication table (Publication ID). Describes the publication holding the recipe.
Final Preparation	FINLPREP	{STR}	R	Final preparation of food before consumption, e.g. heating a frozen dinner or canned food
Preservation Method	PRESMETH	{THS}	R	Langual facet J [29].
Packing Medium	PACKMED	THS	R	Langual facet K [29].
Food Contact Surface	FDCTSRFC	{THS}	R	Langual facet N [29].
Container or Wrapping	CONTWRPG	{THS}	R	Langual facet M [29].
Storage Conditions	STORCOND	{MEM}	O	Storage conditions and duration before arrival at lab.

Properties for Food Description (continued)

Property Name	Property ID	Data Type	Prio	Scope Note
Area of Origin	AREAORIG	{THS}	R	Origin of main raw material or area where food was produced if food is a mixed product. Langual facet R
Area of Processing	AREAPROC	{THS}	R	Use if different from AREAORIG. Langual facet R [29].
Area of Consumption	AREACONS	{THS}	R	Langual facet R [29].
Customary Uses of Food				
Consumer Group Label Claim	LBLCLAIM	{THS}	R	Langual facet P [29].
Specific Gravity	SPECGRAV	NUM	O	May also be considered a component. It is the density of the food divided by the density of water at the same temperature. Specific Gravity is used to convert to and from standard volumetric or household measures.
Typical Serving Size	SERVSIZE	NUM	R	in grams
Typical Package Weight	PACKWGHT	NUM	R	in grams
Typical Weight per Piece	PIECWGHT	NUM	R	in grams
Frequency and Season	FREQSEAS	{STR}	O	How often and in which season is the food preferably consumed?
Place of Food in Diet	PLACDIET	{STR}	O	How does the food relate to other foods in the diet? Is it a major source of some nutrient?
Cuisine	CUISINE	{STR}	O	Possible future LanguaL facet Q. The special diet a food belongs to (e.g. Mediterranean cuisine) [31].
Sampling And Laboratory Handling				
Date of Sampling	DATSAMPL	DAT	R	When was the sample obtained, purchased, harvested, etc.?
Sampling Strategy	SAMPSRAT	{MEM}	R	Brief description of the sampling strategy.
Weights of Samples	SPLEWGHT	NUM	R	in grams
Place of Sampling	PLCECOLL	{STR}	R	Where was the sample obtained, purchased, harvested, etc.?
Number of Samples	NRSAMPLE	INT	R	In case of compound sample
Sample Handling	SPLEHAND	{STR}	R	General handling of sample before arrival at laboratory, e.g. sample transport.
Supplier Laboratory of Sample	SUPPLAB	FKY	R	Link to Organisation table (Organisation ID)
Date of Arrival at Laboratory	ARRIVAL	DAT	R	
Laboratory Storage	LABSTORE	{STR}	R	Storage conditions in the laboratory before the start of the analytical process.
Reason For Analysis	REASON	{STR}	R	context of investigation e.g. for clinical, comprehensive, control, or contamination study
Remarks	REMARKS	{MEM}	O	Any further remarks.

Example

ENTITYID	PROPID	VALUE	MEMO	LANG	PREF	REMARKS
...						
336	SOURCEID	1			1	
336	ORIGFDCD	11008			1	
336	ORIGGPCD	26			1	
336	FOODNAME	Ketchup		fr	1	
336	FOODNAME	Tomato ketchup		en	1	
336	PRODTYPE	A0286			1	
336	FOODSRC	B1276			1	
336	IMAGE	KETCHUP.JPG			1	
336	PARTPLAN	C0138			1	
336	PHYSTATE	E0135			1	
336	HEATREAT	F0014			1	
336	TREATAPP	H0136			1	
336	TREATAPP	H0151			1	
336	TREATAPP	H0227			1	
336	COOKMETH	G0001			1	
336	PRESMETH	J0001			1	
336	PACKMED	K0003			1	
336	FDCTSRFC	N0001			1	
336	CONTWRPG	M0001			1	
336	LBLCLAIM	P0024			1	
...						

1.11 Contributing Foods

The *Contributing Foods* table is optional and can be used to link a derived or aggregated food, food label information, or a compound sample to all its contributing foods and their description. Describing ingredients the same way as foods is referred to as *full ingredient coding*. Only simple recipes without preparation can use this format because it does not take into account common recipe measures, nutrient losses and gains, or yields (fat/water). See also the fields concerning Recipe Procedure (RECPROC) and Recipe Bibliographic Reference (RECREF) in the Food Description file.

Attributes for Contributing Foods Description

Attribute Name	Attribute ID	Data Type	Prio	Scope Note
Food ID	FOODID	FKY	M	Link to the Food table, i.e. the aggregate food of the food-food relationship.
Contributing Food ID	CONFDID	FKY	M	Link to the Food table, i.e. the contributing food of the food-food relationship.
Amount of Ingredient	AMOUNT	FRC	R	The amount of an ingredient (i.e. a contributing food) may be given as a fraction of the aggregate food.
Rank	RANK	INT	R	Often, the amount of ingredients is not known, only their order. In this case, the rank of each ingredient should be given, starting with the most significant ingredient by weight (i.e. 1,2,3,...).
Remarks	REMARKS	{MEM}	O	Any further remarks.

Example

FOODID	CONFDID	AMOUNT	RANK	REMARKS
...	...	...	...	...
336	401	.76	1	
336	402	.24	2	
336	403	.187	3	
...	...	...	...	...

1.12 Component

The *Component* table is mandatory.

Properties for Component Description

Property Name	Property ID	Data Type	Prio	Scope Note
Source	SOURCEID	FKY	M	Link to the Source table, i.e. the data source where this component is reported.
Original Component Code	ORIGCPCD	{STR}	R	The component code, ID, or abbreviation used to identify the component in the original publication.
Component Name	COMPNAME	{STR}	M	The component name in the language given in the attribute Language.
Abbreviated Component Name	ABBREV	{STR32}	O	Maximal 32 characters. Used for applications with limited screen/paper space.
Standard Classifications				
INFOODS Tag Name	INFDSTAG	THS	R	see http://www.fao.org/infoods/
EUROFOODS Component Name	EUFDSNAM	THS	R	According to the list given in chapter 4.10.
CAS Registry-Number	CASNR	{STR}	O	As found in the CAS registry file maintained by Chemical Abstract Services.
Unit	UNIT	THS	M	According to the list given in chapter 4.6.
Mode of Expression	MOEX	THS	M	According to the list given in chapter 4.7.
Remarks	REMARKS	{MEM}	O	Any further remarks.

Example

ENTITYID	PROPID	VALUE	MEMO	LANG	PREF	REMARKS
...						
7	SOURCEID	1			1	
7	ORIGCPCD	311			1	
7	COMPNAME	Energie (coefficients d'Atwater), kJ/100g		fr	1	
7	INFDSTAG	ENERC/KJA			1	
7	COMPNAME	energy (Atwater, available carbohydrate), kJ/100g		en	1	
7	ABBREV	energy STD (kJ)		en	1	
7	ABBREV	Energie STD (kJ)		fr	1	
7	UNIT	kJ			1	
7	MOEX	W			1	
...						

1.13 Contributing Components

The *Contributing Component* table is optional and can be used to link a derived or aggregated component to all its original source components and their descriptions. For example, this can be used to link "total carbohydrates" to all carbohydrates that have been summed up. This feature is especially useful for compilers of food composition tables.

Attributes for Contributing Components Description

Attribute Name	Attribute ID	Data Type	Prio	Scope Note
Component ID	COMPID	FKY	M	Link to the component table, i.e. the super-component of the component-component relationship.
Contributing Component ID	CONCMPID	FKY	M	Link to the component table, i.e. the sub-component of the component-component relationship.
Weight	WEIGHT	NUM	O	In case of weighted aggregations, a weight or factor conversion can be stored for every sub-component.
Profile Name	PROFNAM	{STR}	O	
Remarks	REMARKS	{MEM}	O	Any further remarks.

Example

COMPID	CONCMPID	WEIGHT	REMARKS
...	...	...	...
7	10	.17	
7	16	.16	
7	27	.37	
7	9	.29	
...	...	...	...

1.14 Method

The *Method* table is mandatory and describes analytical or computational methods. Most of the analytical method properties have been taken from a CODEX committee report on criteria for evaluation of acceptable methods of analysis for CODEX purposes [10].

Properties for Method Description

Property Name	Property ID	Data Type	Prio	Scope Note
Method Headline	METHHDLN	THS	R	According to the list given in chapter 4.11.
Method Name	METHNAME	{STR}	M	
Scope and General Description	GENDESC	{MEM}	R	
Bibliographic Reference	BIBREF	FKY	R	Link to the Publication table (Publication ID), i.e. a publication describing the Method.
Method Type	METHTYPE	THS	M	According to the list given in chapter 4.9.
Isa Analytical Method				
Sample Handling	SAMPHAND	{MEM}	R	Includes description of sample preparation, extraction and clean-up at the laboratory.
Analytical Details	ANDETAIL	{MEM}	R	Detection procedure, quantification procedure, confirmation procedure, quality control, use of reference material and methods etc.
Accuracy	ACCURACY	{STR}	R	The closeness of the agreement between the result of a measurement and a true value of the measureand. It may be assessed by the use of reference materials.
Applicability	APPLICAB	{MEM}	R	Specify the matrix, concentration range and, for Codex purposes, the preference to be given to “general” methods.
Limit of Detection (LOD)	LOD	NUM	R	The detection limit is conventionally defined as field blank +3σ, where σ is the standard deviation of the field blank value signal.
Limit of Determination	LODET	NUM	R	As for detection limit except that 6σ or 10σ is required rather than 3σ.
Limit of Quantification (LOQ)	LOQ	NUM	R	As for detection limit except that typically at least 10σ is required.
Precision	PRECISIO	NUM	R	The closeness of the agreement between independent test results obtained under prescribed conditions. The values obtained normally encompass both repeatability intra-laboratory and reproducibility inter-laboratory.
Repeatability (intra-laboratory)	REPEAT	NUM	R	The value r below which the absolute difference between two single test results obtained under repeatability conditions (i.e. same sample, same operator, same apparatus, same laboratory, and short interval of time) may be expected to lie within a specific probability (typical 95% and hence r = 2.8 x sr, where sr = standard deviation, calculated from results generated under repeatability conditions.

Properties for Method Description (continued)

Property Name	Property ID	Data Type	Prio	Scope Note
Reproducibility (inter-laboratory)	REPRODUC	NUM	R	The value r below which the absolute difference between single test results obtained under reproducibility conditions (i.e. on identical material obtained by operators in different laboratories, using standardised test method) may be expected to lie within a specific probability (typical 95% and hence r = 2.8 x sr, where sr = standard deviation, calculated from results generated under reproducibility conditions.
Recovery	RECOVERY	NUM	R	Proportion of the amount of analyte present or added to the test material which is extracted and presented for measurement.
Selectivity	SELECTIV	NUM	R	
Sensitivity	SENSITIV	NUM	R	
Specificity	SPECIFIC	NUM	R	The freedom of the analytical procedure from interference effects. It reflects the ability of the instrumentation to measure only the signal of the determined element.
Remarks	REMARKS	{MEM}	O	Any further remarks.

1.15 Value

The *Value* table is mandatory.

The working group agreed that it would be a good starting point to focus on managing the following statistical parameters: *n*, mean, median, minimum, maximum and standard deviation. If possible the raw data itself should be interchanged (see chapter 1.17). A field called ”best location” is provided to store a single figure as the best representation of the statistic, based on the decision of a data compiler.

Please note that multiple values are allowed for a given food – component pair since each value is assigned a unique ID. This can be used to document multiple value clusters obtained during analysis.

Attributes for Value Description

Attribute Name	Attribute ID	Data Type	Prio	Scope Note
Value ID	VALUEID	KEY	M	These attributes link to food-, component-, and method description respectively. Such links are mandatory if the value is on the top level of the value hierarchy (see figure 3) and optional otherwise. This means that values provided by the responsible data source always need to be documented (primary data). Documentation of further data underlying the primary data, however, is optional.
Food	FOODID	FKY	M/O	
Component	COMPID	FKY	M/O	
Method	METHID	FKY	M/O	
Best Location	BESTLOC	NUM	R	According to Klensin [23]. The value that is considered the best representative according to the decision of the data compiler. Generally, this attribute is mandatory. In some cases, however, it might not be possible to assign a Best Location (e.g. the distribution shows to cluster of values). In this case Best Location may be left empty and the reader is referred to the raw data itself. Another possibility is to separate the two (or more) clusters as separate entries in the value table but with the same food and component reference. A third possibility is to consider extra food definitions of the various clusters.
Value Type	VALTYPE	THS	M	The Value Type is designed to further describe the figure in *Best Location* or to give a qualitative description of the value when no *Best Location* can be given. Choose one of the value types given in chapter 4.8.
Quality Index	QI	{STR}	R	Result of any systematic quality assessment applied by the data provider. A description of the quality assessment procedure should be given under primary source description.
Original Source	SOURCEID	FKY	R	Link to Source table to document the original source (secondary source) of a value in the case that a third party value is borrowed or otherwise used within an aggregation. This link is *not* used to document the source represented by the interchange package itself (i.e. the primary source). This is done via food and component description.
Date of Analysis	DATEANAL	DAT	O	The date when this particular value was analysed.

Attributes for Value Description (continued)

Attribute Name	Attribute ID	Data Type	Prio	Scope Note
Statistics				
n	N	INT	R	Number of values contributing to the statistic, e.g. analytical replicates, number of samples, number of values from different sources, etc. The other statistical parameters must be based on this number n.
Mean	MEAN	NUM	R	The mean value of the statistic.
Median	MEDIAN	NUM	R	The median value of the statistic.
Standard Deviation	STDV	NUM	R	Should be used for normal distributions only. Don't mix with standard error. Standard Deviation = $\sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x})^2}$
Standard Error	STERR	NUM	O	Standard Error = $\frac{Standard\,Deviation}{\sqrt{n}}$
Minimum	MIN	NUM	R	The minimal value within the statistic.
Maximum	MAX	NUM	R	The maximal value within the statistic.
Remarks	REMARKS	{MEM}	O	Any further remarks.

Example

VALUEID	FOODID	COMPID	METHID	BESTLOC	VALTYPE	QI	SOURCEID	N	STDV	...
...										
10256	356	17	66	3.298	MN	A		16	0.432	
10257	356	18	24	0.40	X	C	5	5		
10258	356	19	50		TR	B		9		
...										

1.16 Percentiles

The *Percentiles* table is optional and holds arbitrary percentiles of a statistic. If the values of a statistic are given explicitly (see chapter 1.17), percentiles are not necessary.

Attributes for Percentiles Description

Attribute Name	Attribute ID	Data Type	Prio	Scope Note
Value ID	VALUEID	FKY	M	Link to the Value table, i.e. the value the percentile belongs to.
Percentile	PERCENTL	NUM	M	must be >0 and <100
Value	VALUE	NUM	M	The actual value of the percentile
Remarks	REMARKS	{MEM}	O	Any further remarks.

Example:

VALUEID	PERCENTL	VALUE	REMARKS
...	...	...	...
10256	95	3.85	
10256	90	3.8	
10256	75	3.625	
...	...	...	...

1.17 Statistical Values

The *Statistical Values* table is optional and holds every single value of a statistic.

Attributes for Statistical Values Description

Attribute Name	Attribute ID	Data Type	Prio	Scope Note
Value ID	VALUEID	FKY	M	Link to the Value table, i.e. the value the percentile belongs to.
Value	VALUE	NUM	M	An actual single value
Weight	WEIGHT	FRC	O	In case of weighted aggregations, a weight can be stored for every single value.
Remarks	REMARKS	{MEM}	O	Any further remarks.

Example:

VALUEID	VALUE	WEIGHT	REMARKS
...	...	...	...
10256	3.51		
10256	3.12		
10256	3.8		
...	...	...	...

1.18 Contributing Value

The *Contributing Values* table is optional and can be used to link a derived or aggregated value to all its original source values. This option should be used when full documentation of the original values is available. Otherwise, the simpler table *Statistical Values* (see 1.17) should be used.

Attributes for Contributing Value Description

Attribute Name	Attribute ID	Data Type	Prio	Scope Note
Value ID	VALUEID	FKY	M	Link to the Value table, i.e. the super-value of the value-value relationship.
Contributing Value ID	CONVALID	FKY	M	Link to the Value table, i.e. the sub-value of the value-value relationship.
Weight	WEIGHT	FRC	O	In case of weighted aggregations, a weight can be stored for every single sub-value.
Remarks	REMARKS	{MEM}	O	Any further remarks.

Example

VALUEID	CONVALID	WEIGHT	REMARKS
...	...	...	...
10257	22536	0.5	
10257	568	0.25	
10257	9854	0.25	
...	...	...	...

2 File Formats For Data Interchange

Recommendation 2 covers technical aspects of data interchange. It describes how the tables of a relational database structured according to recommendation 1 should be formatted to be transmitted on disk or via Internet.

2.1 Text Encoding

All data must be transmitted in textual form in order to be interpreted on the widest range of computer platforms possible.

Text must be encoded using either:

- ISO/IEC 646:1991 Information technology -- ISO 7-bit coded character set for information interchange
- ISO/IEC 8859-1:1998 Information technology -- 8-bit single-byte coded graphic character sets -- Part 1: Latin alphabet No. 1

The use of *Unicode* [37] will be allowed, when this system is fully established on the market.

2.2 File Format

Each database table must be stored in one text-file with one data record per line. The names of the tables are listed in section 2.6.

Data fields should be delimited by semicolons (;) (; = ASCII 59). The delimited file format has two advantages compared to fixed length record files: reduced file size and easy handling of memo-fields (i.e. text fields larger than 255 characters). Text and memo fields must be enclosed in double quotes (" = ASCII 34)

Alternatively, the fixed length file format may be used to support a wider range of software on the various computer platforms Another advantage is better legibility if the file is viewed in a text editor. Memo fields, however, may vary and a maximum length must be computed for each field in advance.

In both cases the first line in the file must contain the standardised field names as given in recommendation 1. In case of fixed length files, the field name must be followed with its length in brackets (see example 2).

Example 1 (;-delimited):

```
FRSTNAME;LASTNAME;EMAIL
"Anders";"Møller";"amoeller@vfd.dk"
"Wulf";"Becker";"wulf.becker@slv.se"
...
```

Example 2 (fixed-length):

```
123456789¦123456789¦123456789¦123456789¦123456789¦123456789

FRSTNAME(15)   LASTNAME(15)   EMAIL(30)
Anders         Møller         amoeller@vfd.dk
Wulf           Becker         wulf.becker@slv.se
...
```

Note: The first line in example 2 is not part of the file. It serves to visualise field lengths.

A XML-style file format is planned to be developed in the future (see Part I:5)

2.3 Data Type Formats

The data types given in the database schema in recommendation 1 must use the following text formats within an interchange package:

Data Type	Textual representation	Example
STR*nnn*	Text String with a maximum of *nnn* characters where *nnn* stands for a number between 0 and 255. 255 applies if no length is specified. Double quotes (" = ASCII 34) are not allowed in strings. Use single quotes (‘ = ASCII 39) instead.	Jayne Ireland
MEM	Memo: text strings larger than 255 characters. Double quotes (" = ASCII 34) are not allowed in strings. Use single quotes (‘ = ASCII 39) instead.	A verbose comment with lengthy explanations about etc. ...
DAT	Date: generally in the form CCYY-MM-DD with leading zeros[4]. In case of reduced precision, days (DD), months (MM) or years (YY) may be omitted starting from the extreme right-hand side. If time is also relevant use CCYY-MM-DD/hh:mm:ss	1999-01-21 1999-07 1984 1997-12-03/21:35:01
INT	Integer: in the range of +/- 2147483648 (= +/- 2^{31})	165
NUM	Decimal Numbers: use the point (. = ASCII 46) to separate decimals. All given decimals must be significant. Do not cut trailing zeros, i.e. trailing zeros should be used to indicate significant decimals.	3.472 5.0
FRC	Fraction: a decimal number between 0 and 1 (0 and 1 inclusive)	0.34
BLN	Boolean: 1 = true, 0 = false	0
THS	Thesaurus Entry: use valid interchange codes in string format	B0123
FIL	Additional (multimedia) Files: Generally files are referred to as URLs. If a leading “http://” or “ftp://” is omitted, “file://MMFILES/” is the default, i.e. a simple filename refers to a file in the directory MMFILES which is part of the interchange package. Files must use 8 character long filenames with an up to 3 character long file extension (also see chapter 2.6). Future versions of the recommendations will allow for longer filenames.	IMG123.JPG http://xyz.com/images/aple.gif ftp://abc.org/docs/manual.doc
KEY / FKY	Keys and Foreign Keys: Positive integers > 0 as described in chapter 1.4	136523

2.4 README.TXT

Extra information extending the recommendations (e.g. further text or database documents) may be added and must be described in a text file (README.TXT) using text encoding according to chapter 2.1.

The file format specifications concerning field separation of the database tables must be specified within the README.TXT file.

[4] According to ISO 8601:1988

2.5 Bundling and Compression of Files

For ease of handling and to reduce data size, the whole database as described in recommendation 1 can be compressed and bundled into one file. The following rules apply for file compression:

- It is recommended to use ZIP-compression. The ZIP format is widely used and software for decoding is available on many platforms.
- Within a compressed archive use paths relative to the root directory.
- Self-extracting archives (.exe) that can be run under the MS DOS operating system should be used only with bilateral agreement.

2.6 Directory Structure and Filenames

The files that form a food composition database should be named and arranged as given in the table below. All files within the "DB"-directory must be present even if they don't contain any data.

File/Directory Name	Explanation
EFXvvaaa/	The whole interchange package i.e. all files should be stored in one directory. We suggest to name such a directory according to the schema given on the left. "EFX" stands for EUROFOODS File Exchange. "vv" denotes the version number of the interchange recommendations used. The remaining characters can be chosen arbitrarily to distinguish separate packages. Example: EFX10ab4.
DB/	Directory "DB" contains all database files
SOURCEID.TXT	This file contains just one entry: the SOURCEID of the source that is subject of the data interchange.
SOURCE.TXT	table Source
CONTENT.TXT	table Content
FOOD.TXT	table Food
CONTFOOD.TXT	table Contributing Food
COMPONEN.TXT	table Component
CONTCOMP.TXT	table Contributing Component
VALUE.TXT	table Value
CONTVAL.TXT	table Contributing Value
STATVAL.TXT	table Statistical Values
PERCENT.TXT	table Percentiles
METHOD.TXT	table Method
PUBLICAT.TXT	table Publication
ORGANISA.TXT	table Organisation
PERSON.TXT	table Person
MMFILES/	Directory "MMFILES" contains all multimedia files mentioned in the database. Basically every file type is allowed (e.g. Word .doc, Acrobat .pdf, Rich Text Format .rtf, ASCII-Text .txt, Access .mdb, Excel .xls, dBASE .dbf, etc.) However, preference should be given to the most widely used file types. For image files, preference should be given to JPEG-files (.jpg) or eventually GIF-files (.gif). These file formats use data compression (unlike TIFF-files).
README.TXT	The "readme" file (see chapter 2.4)

3 Media to Use for Data Interchange

Food composition data files as described in recommendations 1 and 2 should be exchanged using either physical storage devices or the Internet as transportation medium. The following basic rules should be applied to guarantee maximal system compatibility on the physical level:

3.1 Physical Storage Devices

Only diskettes and CD-ROMs should be used for data interchange. In case of doubt about the technical facilities of the receiver, diskettes should be preferred.

Diskette

- use DOS-formatted PC-diskettes with 1.44 MB capacity

Explanation: both Mac and Unix can handle this format.

CD-ROM

- CD-ROMs must adhere to the international standard ISO 9660:1988, Information processing -- Volume and file structure of CD-ROM for information interchange

Note: the trend goes towards DVD (Digital Versatile Disc). DVDs will be recommended as soon as this standard is established and widely available on the market.

3.2 Internet

If data files are transferred over the Internet using E-mail, FTP, or the World Wide Web, the following rules should be applied:

E-mail

- Always mention the names and formats of all attached files in the e-mail. (e.g. 000EFX10.ZIP)
- Always mention the file format specifications concerning text encoding and field separation in the e-mail body.
- Do not use proprietary mailing solutions only available within your special mailing-tool, intranet or computer platform. Instead send files as MIME[5] compliant e-mail attachments.

FTP

- FTP (File Transfer Protocol) allows to transfer files in text-mode or binary mode. Always use binary-mode to preserve the original file structure and prevent the conversion of text into proprietary representations.

WWW

No restrictions specified for transmission of data files via WWW using the HTTP protocol.

[5] MIME = Multipurpose Internet Mail Extensions – an internet standard covering e-mail attachments.

4 Reference List of Standardised Vocabularies (thesauri)

Recommendation 4 lists some of the standard vocabularies (thesauri) used within the COST Action 99 / EUROFOODS recommendations for data interchange and management. Each thesaurus consists of a set of concepts that may be arranged within a hierarchy. A concept is represented by a main descriptor – a term representing the concept – and may be further described with a scope-note and synonyms. A list of all thesauri will be available on the EUROFOODS or INFOODS Internet site and should be updated regularly.

4.1 Thesaurus Language and Translation

The official thesauri will use English as their main language. It is up to each user to translate thesauri for local usage. However, it is recommended to establish a central authority within each country to maintain and publish translations. It is also a wise idea to share translations among countries using the same language (e.g. Germany, Austria and Switzerland). EUROFOODS should try to keep track of existing translations. This information should also be accessible on the Internet.

4.2 Concept Description

The following fields are *always* given for each concept within a thesaurus:

Concept property	Description
Code	A unique and short alphanumeric code identifying each concept. The code is mainly used in data interchange package and does not necessarily need to be self-explaining. Codes are *not* case sensitive. Codes are kept unchanged when translating a thesaurus.
Descriptor	A text-string describing the concept. This string, like the code, must be unique since it is the representation of the code to the user.

The following fields are *optional*. However, it is highly recommended to give a scope-note, in order to unambiguously describe a concept.

Concept property	Description
Scope-note	A longer text explaining in detail any specialities to be considered when applying the concept (e.g. exceptions, relation to other concepts, further clarifications and definitions).
Synonyms	Synonymous text strings that express exactly the same concept as the descriptor and help people to find a concept (e.g. vitamin B1 and thiamin)
Abbreviation	Like the descriptor, but limited to 32 characters for computer processing with limited screen space.

Further fields for version control of concepts are available within the Thesaurus Manager software.

4.3 Acquisition Types

Source: EUROFOODS working group on data management and interchange.

Code	Descriptor	Scope note
O	In-house or affiliated laboratory	(O = own); in-house or affiliated laboratory report/protocol. Study design, sampling, and analysis are under direct control of the person or organisation reporting the data.
I	Industry laboratory	Laboratory report/protocol of a food producer or distributor.
D	Independent laboratory	Laboratory report/protocol of a third party laboratory not directly affiliated with the food producer or the organisation that initiated the investigation and now reports the data.
F	Food composition table	Compiled food composition table. The compiler is now responsible for the data. Typically, the underlying data sources are only documented briefly but further information is available from the compiler. Food composition tables are mostly published by the compiler.
P	Published and peer reviewed scientific paper	Peer reviewed scientific study, published in a journal or book.
L	Food label, product information	Food label or product information provided by the producer or distributor with no further information about the data sources.
S	Value created within host-system	To be used for values created by a compiler within his or her FCDBMS using calculation or estimation. Note: simple unit conversion does not fall into this category.
E	Other acquisition type	(E = else); other acquisition type not mentioned in this list
X	Acquisition type not known	

4.4 Publication Types

Source: EUROFOODS working group on data management and interchange.

Code	Descriptor	Scope note
B	Book	
AB	Article in book	
J	Journal	
AJ	Article in Journal	
R	Report	
AR	Article in Report	
AD	Authoritative Document	Document published by legal authorities, standards organisations, committees, patent offices, etc.
F	File or Database	
SW	Software	
L	Product label	
P	Personal communication	Personal communication with no further bibliographic information but the reporters name and address.
X	Publication type not known	
E	Other publication type	(E = else); other publication type not mentioned in this list

4.5 Main Food Groups

Source: EUROFOODS working group on data management and interchange. Adopted from the first grouping level of Eurocode 2 [25].

Code	Descriptor	Scope note
ALL	All EUROFOODS Foodgroups	
1	Milk and milk products	
2	Eggs and egg products	
3	Meat and meat products	
4	Fish, molluscs, reptiles, crustaceans and products	
5	Fats and oils	
6	Grains and grain products	
7	Pulses, seeds, nuts and products	
8	Vegetables and vegetable products	
9	Fruits and fruit products	
10	Sugar, chocolate and related products	
11	Beverages (non-milk)	
12	Miscellaneous foods	
13	Products for special nutritional use	

4.6 Units

Source: EUROFOODS working group on data management and interchange.

Unit description is influenced by International Standard, ISO 1000:1992 (incl. Draft Amendment 1, ISO 1000:1992/DAM 1(1997)). The standard is extended with food composition specific units. The table below lists the units that have so far been identified as relevant to the field.

Code	Descriptor	Scope note
RE	retinol equivalent	1 RE = 1 ug all-trans retinol
BCE	beta-carotene equivalent	1 BCE = 1 ug all-trans beta-carotene
ATE	alpha-tocopherol equivalent	1 ATE = 1 mg RRR-alpha-tocopherol
		1 ATE = 1 mg d-alpha-tocopherol
NE	niacin equivalent	1 NE = 1 mg niacin or 60 mg tryptophan
MSE	monosaccharide equivalent	1 MSE = 1 g glucose
kg	kilograms	
g	grams	
mg	milligrams	
ug	micrograms	
ng	nanograms	
l	litres	
ml	millilitres	
ul	microlitres	
mmol	millimols	
kJ	kilojoules	
kcal	kilocalories	
R	ratio	

4.7 Modes of Expression

Source: EUROFOODS working group on data management and interchange.

Code	Descriptor	Scope note
W	per 100g edible portion	
T	per 100g total food	as purchased including any waste e.g. chicken wing with bones, banana including peal, etc.
D	per 100g dry weight	
WKG	per Kg edible portion	
TKG	per Kg total food	
DKG	per Kg dry weight	
VL	per l food volume	
V	per 100ml food volume	
F	per 100g total fatty acids	
N	per g nitrogen	

4.8 Value Types

The Value Type is designed to further describe the figure in *Best Location* in the *Value* table, or to give a qualitative description of the value when no *Best Location* can be given.

Source: EUROFOODS working group on data management and interchange.

Code	Descriptor	Scope note
MN	mean	The compiler chose the mean of the statistic as Best Location.
MD	median	The compiler chose the median of the statistic as Best Location.
MI	minimum	The compiler chose the minimum value within the statistic as Best Location.
MX	maximum	The compiler chose the maximum value within the statistic as Best Location.
W	weighted	The Best Location is a weighted average of values from several sources. Examples of weighting criteria include weighting by brands, weighting by number of samples etc.
LT	less than	Use this value type if there is no further statistical information available for MX and if no other value type applies. LT is also useful in case of calculated or imputed rather than analysed values. The figure given in Best Location should be interpreted as an upper limit.
MT	more than	Use this value type if there is no further statistical information available for MN and if no other value type applies. MT is also useful in case of calculated or imputed rather than analysed values, e.g. in recipe calculation. The figure given in Best Location should be interpreted as a lower limit.
BE	best estimate	According to the responsible compiler, the value is the “best” available. This type should be used when there is no further statistical information available.
TR	trace	Use Trace only when there is evidence that some amounts of the component is present but no precise figure can be given, e.g. if the level measured is below the level of quantification. Further information about the exact definition of trace should be provided under *Remarks* in either the corresponding Value-, Method-, Component-, or Source-Description. Normally trace values have a blank "Best Location". Never use trace together with a zero in Best Location.
BL	below detection limit	The component is not detectable with the applied method, e.g. below the limit of detection. However, the component might be present. It is recommended to provide information about the limit of detection within the corresponding method description. Use BL together with a blank "Best Location".
LZ	logical zero	The component in question never appears in the food in question, e.g. alcohol in meat, or fat in mineral water. Use LZ together with Method Type E.
RZ	regulatory zero	The component in question never appears in the food in question according to (national) food regulations
UD	undecidable	Use this value type together with a blank Best Location in cases where no decision can be made, e.g. the available data differ too much. Other statistical parameters, however, might be available, e.g. minimum and maximum.
N	unknown	Use this value type together with a blank Best Location in cases where compilation work has shown the value to be unknown, i.e. there is no literature available and no estimation or calculation possible. This Value Type is useful in food composition tables and might be useful at other levels of the compilation process (see chapter 3 in part I)
E	Other value type	(E = else); other method type not mentioned in this list
X	Value type not known	the type for the given value is not known

4.9 Method Types

Source: EUROFOODS working group on data management and interchange.

Code	Descriptor	Scope note
AG	analytical, generic	Use this Method Type if no further information on the nature of analysis is available.
A	analytical result(s)	Analytical result or statistic of multiple measurements of the same sample (replicates). See the property 'Headline method name' in the *Method* table for further information.
D	aggregation of contributing analytical results	Value derived as an aggregation of accepted analytical contributing results (e.g. from different sources). See the property 'Headline method name' in the *Method* table for further information.
CG	calculated, generic	Use this Method Type if no further information on the nature of calculation is available.
G	calculated as aggregate food item	Used in case of aggregated foods when the composition is mainly obtained by summation of the composition of its ingredients. See food description for further information.
R	calculated as recipe	Used in case of complete recipe calculation incl. NLG factors. See food description for further information.
P	calculated on component profile	E.g. fatty acid profile, amino acid profile for a specified food. See component description for further information.
S	summation from constituent components	See component description for further information. Note that summation includes subtraction, e.g. calculation of total carbohydrates by difference.
T	calculations including conversion factors	E.g. for energy calculation or for calculating alpha-tocopherol equivalents. The conversion factors should be documented within the recursive value description or within the method or component description.
K	calculated from related food	Useful as separate case where a specific calculation, rather than imputation is performed on a related food, e.g. Toast from Bread or the calculating the values for a food 'weighed with waste'. The food description should link to the related food.
IG	imputed/estimated, generic	Use this Method Type if no further information on the nature of imputation/estimation is available.
I	imputed/estimated from related food	The food description should link to the related food. No further information on the method available.
O	imputed/estimated from other food and other related component	Note that with *food* and *component* we refer to the definitions given in chapter Part I:3.2.
L	estimated according to regulatory requirements	L stands for legislation.
E	Other method type	(E = else); other method type not mentioned in this list
X	Method type not known	no method information available

4.10 Component Groups and Names

Source: EUROFOODS working group on data management and interchange with influences from the INFOODS tagnames [22].

The component groups were introduced to allow hierarchical searches and browsing in computer applications. However, the working group did not come to a consensus about the way the components are grouped. Therefore, the grouping should be considered preliminary and can serve as a basis for future discussions. The components themselves and their codes are considered stable but not exhaustive. Future versions will extend the list.

Please note that some components appear in more than one group.

The abbreviated descriptors have a maximum length of 32 characters and may be used on computer screens with limited size.

Code	Descriptor	Abbreviation	Scope note
1	**NUTRIENTS**		Components essential to humans or with essential activity or providing energy
1.1	**Proximates**		Components defining the gross nutritional composition and nature of a food: energy value, water, dry matter, ash, protein (total), fat (total), carbohydrates (total), alcohol, total organic acids
ALC	alcohol (ethanol)	alcohol	
ASH	ash (minerals)	ash	
CHOT	carbohydrate, total	carbohydrate, total	
DRYMAT	dry matter	dry matter	
ENERA	energy, gross, determined by direct analysis	energy, gross	
ENERC	energy, total metabolisable; calculated from energy-producing food components	energy, total	
FAT	fat, total (total lipid)	fat, total	
NT	nitrogen, total	nitrogen, total	
OA	organic acids, total	organic acids, total	
PROT	protein, total	protein, total	
WATER	water (moisture)	water	
1.2	**Carbohydrate components**		sugars, oligo- and polysaccharides, dietary fibre
CHOAVL	carbohydrate, available	carbohydrate, available	
1.2.1	**Sugars**		1-2 DP
SUGAD	sugar, added	sugar, added	
SUGAR	sugars, total	sugars, total	
1.2.1.1	**Monosaccharides**		glucose, fructose
FRUS	fructose	fructose	

Code	Descriptor	Abbreviation	Scope note
GALS	galactose	galactose	
GLUS	glucose	glucose	
MALTRS	maltotriose	maltotriose	(?)
MNSAC	monosaccharides, total	monosaccharides, total	
RIBS	ribose	ribose	
XYLS	xylose	xylose	(?)
FIBHEX	hexoses in dietary fibre	hexoses in fibre	(?)
FIBPEN	pentoses in dietary fibre	pentoses in fibre	(?)
1.2.1.2	**Disaccharides**		saccharose, lactose
DISAC	disaccharides, total	disaccharides, total	
LACS	lactose	lactose	
MALS	maltose	maltose	
SUCS	sucrose	sucrose	
TRES	trehalose	trehalose	
1.2.1.3	**Polyols**		sorbitol, mannitol, xylitol, inositol
INOTL	inositol	inositol	
MANTL	mannitol	mannitol	
SORTL	sorbitol	sorbitol	
XYLTL	xylitol	xylitol	
1.2.2	**Oligosaccharides**		3-9 DP
OLSAC	oligosaccharides, available	oligosaccharides	
1.2.2.1	**Malto-oligosaccharides**		maltodextrins
1.2.2.2	**Other oligosaccharides**		raffinose, stachyose, fructo-oligosaccharides
RAFS	raffinose	raffinose	
STAS	stachyose	stachyose	
GALSD	alpha galactosides	alpha galactosides	
1.2.3	**Polysaccharides**		> 9 DP
1.2.3.1	**Starch**		
STARCH	starch, total	starch, total	
STARES	starch, resistant	starch, resistant	
GLYC	glycogen	glycogen	
1.2.3.2	**Non-starch polysaccharides**		cellulose, hemicellulose, pectins, hydrocolloids
AMYP	amylopectin	amylopectin	
AMYS	amylose	amylose	
ARAS	arabinose	arabinose	
CELLU	cellulose	cellulose	

DEXTN	dextrins	dextrins

Code	Descriptor	Abbreviation	Scope note
INULN	inulin	inulin	
LIGN	lignin	lignin	
PECT	pectin	pectin	
PSACNC	polysaccharides, non-cellulosic	NCP	
PSACNCI	polysaccharides, non-cellulosic, water-insoluble	NCP, water-insoluble	
PSACNCS	polysaccharides, non-cellulosic, water-soluble	NCP, water-soluble	
PURAC	polyuronic acids	polyuronic acids	
1.2.4	**Fibre**		Total fibre as defined by any method, e.g. by AOAC or Englyst
FIBC	fibre, crude	fibre, crude	
FIBINS	fibre, water-insoluble	fibre, water-insoluble	
FIBSOL	fibre, water-soluble	fibre, water-soluble	
FIBT	fibre, total dietary	fibre, total dietary	
1.3	**Fat components**		Phospholipids, triglycerides, sterols, fatty acids
GLYLIP	glycolipids, total	glycolipids, total	
GLYRL	glycerol	glycerol	
1.3.1	**Fatty acids**		
F10:0	fatty acid 10:0 (capric acid)	fatty acid 10:0	
F10:1	fatty acid 10:1 (caproleic acid)	fatty acid 10:1	
F12:0	fatty acid 12:0 (lauric acid)	fatty acid 12:0	
F12:1	fatty acid 12:1 (lauroleic acid)	fatty acid 12:1	
F13:0	fatty acid 13:0 (tridecanoic acid)	fatty acid 13:0	
F13:0I	fatty acid 13:0 iso (isotridecanoic acid)	fatty acid 13:0 iso	
F14:0	fatty acid 14:0 (myristic acid)	fatty acid 14:0	
F14:0AI	fatty acid 14:0 anteiso	fatty acid 14:0 AI	
F14:0I	fatty acid 14:0 iso	fatty acid 14:0 I	
F14:1	fatty acid 14:1 (myristoleic acid)	fatty acid 14:1	
F15+17	fatty acid 15:0 + 17:0	fatty acid 15:0+17:0	
F15:0	fatty acid 15:0 (pentadecylic acid)	fatty acid 15:0	
F15:0AI	fatty acid 15:0 anteiso	fatty acid 15:0 AI	
F15:0I	fatty acid 15:0 iso	fatty acid 15:0 I	
F15:1	fatty acid 15:1 (pentadecenoic acid)	fatty acid 15:1	
F16:0	fatty acid 16:0 (palmitic acid)	fatty acid 16:0	
F16:0AI	fatty acid 16:0 anteiso	fatty acid 16:0 AI	

F16:0I	fatty acid 16:0 iso	fatty acid 16:0 I
F16:1	fatty acid 16:1 (palmitoleic acid)	fatty acid 16:1

Code	Descriptor	Abbreviation	Scope note
F16:1I	fatty acid 16:1 iso	fatty acid 16:1 iso	
F16:1N5	fatty acid 16:1 n-5	fatty acid 16:1 n-5	
F16:1N7	fatty acid 16:1 n-7	fatty acid 16:1 n-7	
F16:1N9	fatty acid 16:1 n-9	fatty acid 16:1 n-9	
F16:1TRS	fatty acid 16:1 trans	fatty acid 16:1 trans	
F16:2	fatty acid 16:2	fatty acid 16:2	
F16:3	fatty acid 16:3	fatty acid 16:3	
F16:4	fatty acid 16:4	fatty acid 16:4	
F16:UN	fatty acid 16:unidentified	fatty acid 16:unident.	
F17:0	fatty acid 17:0 (margaric acid)	fatty acid 17:0	
F17:0AI	fatty acid 17:0 anteiso	fatty acid 17:0 AI	
F17:0I	fatty acid 17:0 iso	fatty acid 17:0 I	
F17:1	fatty acid 17:1 (heptadecenoic acid)	fatty acid 17:1	
F18:0	fatty acid 18:0 (stearic acid)	fatty acid 18:0	
F18:0AI	fatty acid 18:0 anteiso	fatty acid 18:0 AI	
F18:0I	fatty acid 18:0 iso	fatty acid 18:0 I	
F18:1	fatty acid 18:1 (octadecenoic acid)	fatty acid 18:1	
F18:1CIS	fatty acid 18:1 cis	fatty acid 18:1 cis	
F18:1CN9	fatty acid 18:1 n-9 cis (oleic acid)	fatty acid cis 18:1 n-9	
F18:1I	fatty acid 18:1 iso	fatty acid 18:1 iso	
F18:1N5	fatty acid 18:1 n-5	fatty acid 18:1 n-5	
F18:1N7	fatty acid 18:1 n-7	fatty acid 18:1 n-7	
F18:1N9	fatty acid 18:1 n-9	fatty acid 18:1 n-9	
F18:1N9O	fatty acid 18:1 OH n-7 (ricinoleic acid)	fatty acid 18:1 OH n-7	
F18:1TN	fatty acid 18:1 trans	fatty acid 18:1 trans	
F18:1TN9	fatty acid 18:1 trans n-9 (elaidic acid)	fatty acid 18:1 trans n-9	
F18:1TNO	fatty acid, 18:0 dihydroxyoctadecanoic acid	fatty acid 18:0 diOH	
F18:2	fatty acid 18:2	fatty acid 18:2	
F18:2CN6	fatty acid 18:2 cis,cis n-6 (linoleic acid)	fatty acid 18:2 c,c n-6	
F18:2CON	fatty acid 18:2 conjugated	fatty acid 18:2 con	
F18:2ISO	fatty acid 18:2 iso	fatty acid 18:2 iso	
F18:2TN	fatty acid, 18:2 trans	fatty acid, 18:2 trans	
F18:3	fatty acid 18:3	fatty acid 18:3	
F18:3N3	fatty acid 18:3 n-3 (alpha-linolenic acid)	fatty acid 18:3 n-3	
F18:3N6	fatty acid 18:3 n-6 (gamma-linolenic acid)	fatty acid 18:3 n-6	
F18:4	fatty acid 18:4 (stearidonic acid)	fatty acid 18:4	

F18:4N3	fatty acid 18:4 n-3 (parinaric acid)	fatty acid 18:4 n-3
F19:0	fatty acid 19:0	fatty acid 19:0
F20:0	fatty acid 20:0 (arachidic acid)	fatty acid 20:0

Code	Descriptor	Abbreviation	Scope note
F20:0I	fatty acid 20:0 iso	fatty acid 20:0 I	
F20:1	fatty acid 20:1 (eicosenoic acid)	fatty acid 20:1	
F20:1N11	fatty acid 20:1 n-11	fatty acid 20:1 n-11	
F20:1N9	fatty acid 20:1 n-9	fatty acid 20:1 n-9	
F20:1TN	fatty acid 20:1 trans	fatty acid 20:1 trans	
F20:2	fatty acid 20:2 (eicosadienoic acid)	fatty acid 20:2	
F20:2N6	fatty acid 20:2 n-6	fatty acid 20:2 n-6	
F20:3	fatty acid 20:3 (eicosatrienoic acid)	fatty acid 20:3	
F20:3N3	fatty acid 20:3 n-3	fatty acid 20:3 n-3	
F20:3N6	fatty acid 20:3 n-6	fatty acid 20:3 n-6	
F20:4	fatty acid 20:4 (eicosatetraenoic acid)	fatty acid 20:4	
F20:4N3	fatty acid 20:4 n-3	fatty acid 20:4 n-3	
F20:4N6	fatty acid 20:4 n-6 (arachidonic acid)	fatty acid 20:4 n-6	
F20:5	fatty acid 20:5 (eicopentaenoic acid)	fatty acid 20:5	
F20:5N3	fatty acid 20:5 n-3 (timnodonic acid)	fatty acid 20:5 n-3	
F20:5N6	fatty acid 20:5 n-6	fatty acid 20:5 n-6	
F21:5	fatty acid 21:5 (heneicosapentaenoic acid)	fatty acid 21:5	
F21:5N3	fatty acid 21:5 n-3 (heneicosapentaenoic acid)	fatty acid 21:5 n-3	
F22:0	fatty acid 22:0 (behenic acid)	fatty acid 22:0	
F22:1	fatty acid 22:1 (docosenoic acid)	fatty acid 22:1	
F22:1CN1	fatty acid 22:1 n-11 (cetoleic acid)	fatty acid 22:1 n-11	
F22:1CN9	fatty acid cis 22:1 n-9 (erucic acid)	fatty acid cis 22:1 n-9	
F22:1N7	fatty acid 22:1 n-7	fatty acid 22:1 n-7	
F22:1N9	fatty acid, 22:1 n-9	fatty acid, 22:1 n-9	
F22:1TN9	fatty acid trans 22:1 n-9 (brassidic acid)	fatty acid trs 22:1 n-9	
F22:2	fatty acid 22:2 (docosadienoic acid)	fatty acid 22:2	
F22:4	fatty acid 22:4 (docosatetraenoic acid)	fatty acid 22:4	
F22:4N3	fatty acid 22:4 n-3	fatty acid 22:4 n-3	
F22:4N6	fatty acid 22:4 n-6	fatty acid 22:4 n-6	
F22:5	fatty acid 22:5 (docosapentaenoic acid)	fatty acid 22:5	
F22:5N3	fatty acid 22:5 n-3 (clupanodonic acid)	fatty acid 22:5 n-3	
F22:5N6	fatty acid 22:5 n-6	fatty acid 22:5 n-6	
F22:6	fatty acid 22:6 (docosahexaenoic acid)	fatty acid 22:6	
F22:6N3	fatty acid 22:6 n-3 (docosahexaenoic acid)	fatty acid 22:6 n-3	
F22:UN	fatty acid 22:unidentified	fatty acid 22:unident.	

F23:0	fatty acid 23:0 (tricosanoic acid)	fatty acid 23:0
F24:0	fatty acid 24:0 (lignoceric acid)	fatty acid 24:0
F24:1	fatty acid 24:1 (selacholeic acid)	fatty acid 24:1
F24:1N9	fatty acid 24:1 n-9	fatty acid 24:1 n-9

Code	Descriptor	Abbreviation	Scope note
F24:1	fatty acid 24:1 (selacholeic acid)	fatty acid 24:1	
F24:1N9	fatty acid 24:1 n-9	fatty acid 24:1 n-9	
F26:0	fatty acid 26:0	fatty acid 26:0	
F4-10:0	fatty acids 4:0 - 10:0	fatty acids 4:0 - 10:0	
F4:0	fatty acid 4:0 (butyric acid)	fatty acid 4:0	
F6:0	fatty acid 6:0 (caproic acid)	fatty acid 6:0	
F8:0	fatty acid 8:0 (caprylic acid)	fatty acid 8:0	
FACIDCTG	fatty acids, total, calculated as triacylglycerol equivalents	fatty acids, TAG equiv.	Triglycerides
FAESS	fatty acids, total essential	fatty acids, essential	
FAFRE	fatty acids, total free	fatty acids, total free	
FAMCIS	fatty acids, total monounsaturated cis	mono cis fatty acid	
FAMS	fatty acids, total monounsaturated	mono fatty acid	
FAPU	fatty acids, total polyunsaturated	poly fatty acids	
FAPUN3	fatty acids, total n-3 polyunsaturated	n-3 poly fatty acid	
FAPUN3FI	fatty acids, total polyunsaturated n-3 fish	fish n-3 poly fatty acid	
FAPUN3VE	fatty acids, total polyunsaturated n-3 vegetable	veg n-3 poly fatty acid	
FAPUN6	fatty acids, total n-6 polyunsaturated	n-6 poly fatty acid	
FASAT	fatty acids, total saturated	saturated fatty acid	
FATRN	fatty acids, total trans	trans fatty acid	
FAUN	fatty acid unidentified	fatty acid unidentified	
1.3.2	**Sterols**		
AVED5	delta 5-avenasterol (delta 5-avenastenol)	delta 5-avenasterol	
AVED7	delta 7-avenasterol (delta 7-avenastenol)	delta 7-avenasterol	
AVEDT	avenasterol, total	avenasterol, total	
BRASTR	brassicasterol	brassicasterol	
CAMD5	delta 5-campesterol (delta 5-campestenol)	delta 5-campesterol	
CAMD7	delta 7-campesterol (delta 7-campestenol)	delta 7-campesterol	
CAMT	campesterol, total	campesterol, total	
CHOLM	24-methylcholest-7-erol	24-methylcholest-7-erol	
CHORL	cholesterol	cholesterol	
FUCSTR	fucosterol	fucosterol	
FUCSTR28	isofucosterol	isofucosterol	
PHYSTR	phytosterols, total (total plant sterols)	phytosterols, total	

SITSTR	sitosterol	sitosterol
SPISTR	spinasterol	spinasterol
STERT	sterols, total	sterols, total
STGSTR	stigmasterol, unspecified	stigmasterol, unspec.
STID7	delta 7 stigmasterol (stigmasterol)	stigmasterol

Code	Descriptor	Abbreviation	Scope note
STID7911	delta 7911-stigmastadienol	delta 7911-stigmastadienol	STID7911
1.3.3	**Phospholipids**		
PHOLIP	phospholipids, total	phospholipids, total	
CHLMP	phosphatidyl choline (lecithin)	phosphatidyl choline	
1.4	**Protein components**		Nitrogen, amino acids
ALBU	albumin	albumin	
CASN	casein	casein	
COLG	collagen	collagen	
GLUTN	gluten	gluten	
PROCAN	protein, animal	protein, animal	
PROCPL	protein, plant	protein, plant	
1.4.1	**Nitrogen components**		
AMMON	ammonia	ammonia	
NITRA	nitrates	nitrates	
NITRI	nitrites	nitrites	
NITRN	nitrosamines, total	nitrosamines, total	
NNP	nitrogen, non protein	nitrogen, non protein	
1.4.2	**Amino acids**		
AAA	amino acids, total aromatic	aromatic amino acids	
AAE-	amino acids, total essential; unknown which aa are included	essent. amino acids; unknown	
AAE10B	amino acids, total essential; eight essential amino acids + CYS and TYR	essent. amino acids (10)	
AAS	amino acids, total sulphur-containing	S-contg. amino acids	
AAT-	amino acids, total; precise definition not specified	amino acids, total; unknown	
ALA	alanine	alanine	
ARG	arginine	arginine	
ASN	asparagine	asparagine	
ASP	aspartic acid (aspartate)	aspartic acid	
CYS	cystine	cystine	
CYSTE	cysteine	cysteine	
GLN	glutamine	glutamine	
GLU	glutamic acid (glutamate)	glutamic acid	

GLY	glycine	glycine
HIS	histidine	histidine
HYP	hydroxyproline	hydroxyproline
ILE	isoleucine	isoleucine
LEU	leucine	leucine
LYS	lysine	lysine

Code	Descriptor	Abbreviation	Scope note
LYSAVL	lysine, available	lysine, available	
MET	methionine	methionine	
PHE	phenylalanine	phenylalanine	
PRO	proline	proline	
SER	serine	serine	
THR	threonine	threonine	
TRP	tryptophan	tryptophan	
TYR	tyrosine	tyrosine	
VAL	valine	valine	
1.4.3	**Purines**		
CAFFN	caffeine	caffeine	
PIPN	piperine	piperine	
PURN	purines	purines	
THEBRN	theobromine	theobromine	
1.5	**Organic acids**		e.g. Oxalic acid, Phytic acid
ACEAC	acetic acid	acetic acid	
BENAC	benzoic acid	benzoic acid	
CHIAC	quinic acid	quinic acid	
CITAC	citric acid	citric acid	
FUMAC	fumaric acid	fumaric acid	
GULDKAC	di-keto-cholanic acid	di-keto-cholanic acid	
ISOCAC	iso-citric acid	iso-citric acid	
LACAC	lactic acid	lactic acid	
LACACD	D-lactic acid	D-lactic acid	
LACACL	L-lactic acid	L-lactic acid	
MALAC	malic acid	malic acid	
OXALAC	oxalic acid	oxalic acid	
PHYTAC	phytic acid (phytin P)	phytic acid	
PROPAC	propionic acid	propionic acid	
SALAC	salicylic acid	salicylic acid	
SUCAC	succinic acid	succinic acid	

TARAC	tartaric acid	tartaric acid	
1.6	**Vitamins**		
1.6.1	**Fat soluble vitamins**		vit A, D, E, K, carotenoids
CAROT	carotene, total (vitamin A precursors)	carotene, total	
CAROTENS	carotenoids, total	carotenoids, total	
CARTA	alpha-carotene	alpha-carotene	
CARTB	beta-carotene	beta-carotene	

Code	Descriptor	Abbreviation	Scope note
CARTBEQ	beta-carotene equivalents (provitamin A carotenoids)	beta-carotene equivs.	
CARTG	gamma-carotene	gamma-carotene	
CHOCAL	cholecalciferol (vitamin D3)	cholecalciferol	
CRYPX	cryptoxanthin	cryptoxanthin	
ERGCAL	ergocalciferol (vitamin D2)	ergocalciferol (vitamin D2)	
ERGSTR	ergosterol (provitamin D2)	ergosterol (D2)	
RETALD	retinaldehyde	retinaldehyde	
RETOL	retinol (preformed vitamin A)	retinol	
RETOL13	13-cis retinol	13-cis retinol	
RETOLDH	dehydroretinol	dehydroretinol	
TOCPHA	alpha-tocopherol	alpha-tocopherol	
TOCPHB	beta-tocopherol	beta-tocopherol	
TOCPHD	delta-tocopherol	delta-tocopherol	
TOCPHG	gamma-tocopherol	gamma-tocopherol	
TOCPHT	tocopherols, total	tocopherols, total	
TOCTRA	alpha-tocotrienol	alpha-tocotrienol	
TOCTRB	beta-tocotrienol	beta-tocotrienol	
TOCTRD	delta-tocotrienol	delta-tocotrienol	
TOCTRG	gamma-tocotrienol	gamma-tocotrienol	
VITA	vitamin A; retinol equiv from retinol and carotenoid activities	vitamin A; retinol equiv	
VITAACT	vitamin A acetate	vitamin A acetate	
VITAPAL	vitamin A palmitate	vitamin A palmitate	
VITD	vitamin D	vitamin D	
VITE	vitamin E; alpha-tocopherol equiv from E vitamer activities	vitamin E; a-tocoph equv	
VITK	vitamin K, total	vitamin K	
VITK1	vitamin K-1 (phyllokinone)	vitamin K1	
VITK2	vitamin K-2 (menakinone)	vitamin K2	
1.6.2	**Water soluble vitamins**		B-vitamins, vit C
ASCDL	L-dehydroascorbic acid	L-dehydroascorbic acid	

ASCL	L-ascorbic acid	L-ascorbic acid	
BIOT	biotin	biotin	Vitamin H
FOL	folate, total	folate, total	
FOLFRE	folate, free	folate, free	
NIA	niacin, preformed (nicotinic acid + nicotinamide)	niacin, preformed	
NIAAVL	niacin, available	niacin, available	
NIAEQ	niacin equivalents, total	niacin equivs, total	

Code	Descriptor	Abbreviation	Scope note
NIATRP	niacin equivalents from tryptophan	niacin equivs from trypt	
PANTAC	pantothenic acid (vitamin B5)	pantothenic acid	
PYRXL	pyridoxal	pyridoxal	
PYRXM	pyridoxamin	pyridoxamin	
PYRXN	pyridoxin	pyridoxin	
RIBF	riboflavin (vitamin B2)	riboflavin	
THIA	thiamin (vitamin B1)	thiamin	
VITB12	vitamin B-12 (cobalamin)	vitamin B-12	
VITB6	vitamin B-6, total	vitamin B-6	
VITC	vitamin C (ascorbic acid)	vitamin C	
1.7	**Minerals**		
1.7.1	**Macroelements**		K, Na, Cl, P, Mg, S, Ca
CA	calcium	calcium	
BRD	bromide	bromide	
CLD	chloride (chlorine)	chloride	
FE	iron, total	iron, total	
HAEM	iron, haem	iron, haem	
K	potassium	potassium	
MG	magnesium	magnesium	
NA	sodium	sodium	
NACL	salt	salt	
NHAEM	iron, non-haem	iron, non-haem	
P	phosphorus	phosphorus	
S	sulphur	sulphur	
1.7.2	**Trace elements**		Cu, Zn, Se, I, F, Cr, Mn, Mo, Co
AL	aluminium	aluminium	
AS	arsenic	arsenic	
B	boron	boron	
CD	cadmium	cadmium	
CO	cobalt	cobalt	

CR	chromium	chromium
CU	copper	copper
FD	fluoride (fluorine)	fluoride
HG	mercury	mercury
ID	iodide (iodine)	iodide
MN	manganese	manganese
MO	molybdenum	molybdenum
NI	nickel	nickel

Code	Descriptor	Abbreviation	Scope note
PB	lead	lead	
RB	rubidium	rubidium	
SE	selenium, total	selenium, total	
SI	silicon	silicon	
ZN	zinc	zinc	
1.8	**Miscellaneous**		
CO2F	carbon dioxide, free	carbon dioxide, free	
2	**BIOACTIVE CONSTITUENTS**		Components (other than nutrients) with physiological effects occurring in plants and animals.
2.1	**Flavonoids**		
APIGEN	apigenin	apigenin	
CATEC	catechin	catechin	
EPICATEC	epicatechin	epicatechin	
KAEMF	kaempferol	kaempferol	
LUTEOL	luteolin	luteolin	
MYRIC	myricetin	myricetin	
QUERCE	quercetin	quercetin	
2.2	**Phytoestrogens**		
BIOCHA	biochanin A	biochanin A	
COUMEST	coumestrol	coumestrol	
DAIDZE	daidzein	daidzein	
FORMO	formononetin	formononetin	
GENIST	genistein	genistein	
GLYCIT	glycitein	glycitein	
ISOFLAVT	isoflavonoids, total	isoflavonoids	
LIGNANS	lignans, total	lignans	
MATAIRES	matairesinol	matairesinol	
SECORES	secoisolarisiresinol	secoisolarisiresinol	
2.3	**Tannins**		
TANNIN	tannin	tannin	

2.4	**Biogenic amines**	
CADAVT	cadaverine	cadaverine
CREATN	creatine/creatinine	creatine/creatinine
DOPN	dopamine	dopamine
HISTN	histamine	histamine
PHETN	phenylethylamine	phenylethylamine
PUTRSC	putrescine	putrescine
SEROTN	serotonin	serotonin

Code	Descriptor	Abbreviation	Scope note
SPERDN	spermindine	spermindine	
SPERN	spermine	spermine	
TYRA	tyramine	tyramine	
TRYPN	tryptamine	tryptamine	
2.5	**Carotenoic compouns**		
CANTHAX	canthaxanthine	canthaxanthine	
CAPSA	capsanthine	capsanthine	
LUTE	lutein	lutein	
LUTEZEAX	lutein plus zeaxanthine	lutein plus zeaxanthine	
LYCO	lycopene	lycopene	
2.6	**Biotoxins**		Toxic components in plants and animals
2.7	**Purines**		
CAFFN	caffeine	caffeine	
PIPN	piperine	piperine	
PURN	purines	purines	
THEBRN	theobromine	theobromine	
3	**ADDITIVES**		Additives as measured or calculated. Additives as ingredients are handled by food description.
ACEAC	acetic acid	acetic acid	
ACESK	acesulfam-K	acesulfam-K	
AL	aluminium	aluminium	
ASPM	aspartam	aspartam	
BENAC	benzoic acid	benzoic acid	
CARTB	beta-carotene	beta-carotene	
CITAC	citric acid	citric acid	
CANTHAX	canthaxanthine	canthaxanthine	
CO2F	carbon dioxide, free	carbon dioxide, free	
CYCL	cyclamate	cyclamate	

FUMAC	fumaric acid	fumaric acid
GLU	glutamic acid (glutamate)	glutamic acid
GLY	glycine	glycine
GLYRL	glycerol	glycerol
LACAC	lactic acid	lactic acid
LUTE	lutein	lutein
LYCO	lycopene	lycopene
MALAC	malic acid	malic acid
MANTL	mannitol	mannitol
NITRA	nitrates	nitrates

Code	Descriptor	Abbreviation	Scope note
NITRI	nitrites	nitrites	
PECT	pectin	pectin	
PROPAC	propionic acid	propionic acid	
SACCNA	sodium-saccharin	sodium-saccharin	
SORAC	sorbic acid	sorbic acid	
SORTL	sorbitol	sorbitol	
SUCAC	succinic acid	succinic acid	
TARAC	tartaric acid	tartaric acid	
TOCPHA	alpha-tocopherol	alpha-tocopherol	
TOCTRD	delta-tocotrienol	delta-tocotrienol	
TOCTRG	gamma-tocotrienol	gamma-tocotrienol	
XYLTL	xylitol	xylitol	
4	**CONTAMINANTS**		
4.1	**Organic contaminats**		
4.1.1	**PCBs**		
4.1.2	**Dioxins**		
4.1.3	**Mycotoxins**		e.g. Aflatoxins
4.2	**Inorganic contaminants**		
4.2.1	**Heavy metals**		
CD	cadmium	cadmium	
HG	mercury	mercury	
PB	lead	lead	
5	**PESTICIDES**		e.g. fungicides, herbicides, insecticides, rodenticides, ...
6	**OTHER RESIDUES**		e.g. hormones, veterinary drug residues
7	**OTHER COMPONENTS**		
8	**PROPERTIES**		e.g. waste, density, pH
CHEMSC	chemical score	chemical score	

DEN	density	density
EDIBLE	edible portion	edible portion
FACF	fatty acid conversion factor	FA conv factor
NCF	nitrogen conversion factor	nitrogen conv factor
PH	pH	pH
PORTION	usual portion	usual portion
WASTE	waste	waste

4.11 Headline Method Names

Source: EUROFOODS working group on data management and interchange.

This proposal needs further investigation and discussion, e.g. through experimental use and application. A categorisation of methods might be useful, in order to make the thesaurus more user-friendly and to allow several levels of detail. A proposal might be to distinguish two levels of method name:

- method headline: e.g. air drying
- method specification: air drying at 100-105°

Code	Descriptor	Abbreveation
ME1	acid detergent method (ADF)	ADF
ME2	acid detergent method [Clancy modification]	ADF[Clancy]
ME3	acid hydrolysis; extraction	acid hydrol>extrn
ME4	air drying at 100-105°	air drying,100-105
ME5	air drying at 130°	air drying,130
ME6	air drying at 70°	air drying,70
ME7	alkali treatment; enzymatic hydrolysis	enzyme hydrol<alk
ME8	alkaline distillation	alk distilln
ME9	alkaline hydrolysis; extraction	alk hydrol>extrn
ME10	atomic absorption spectroscopy (AAS)	AAS
ME11	atomic absorption spectroscopy (AAS), flame	AAS,flame
ME12	atomic absorption spectroscopy (AAS), flameless	AAS,flameless
ME13	atomic absorption spectroscopy (AAS), graphite oven	AAS,graphite oven
ME14	atomic absorption spectroscopy (AAS), hydride	AAS, hydride
ME15	automated amino acid analysis	aut AA
ME16	Babcock, modified	Babcock, mod
ME17	bioassay	bioassay
ME18	Biuret reaction	Biuret
ME19	bomb calorimetry, adiabatic	bomb calorim,adiab
ME20	bomb calorimetry, ballistic	bomb calorim,ballis
ME21	calculated, Atwater factors, available carbohydrate	{STDA}
ME22	calculated, Atwater factors, total carbohydrate	{STDT}
ME23	calculated, CODEX labelling factors, total kcal	{CDXC}
ME24	calculated, CODEX labelling factors, total kJ	{CDXJ}
ME25	calculated, kJ factors, available carbohydrate	{KJA}
ME26	calculated by difference	{DF}
ME27	calculated by summation	{SM}
ME28	Carpenter method	Carpenter
ME29	colorimetry	colorim
ME30	colorimetry with GLC	colorim<GLC
ME31	column chromatography	column chrom
ME32	continuous extraction	cont extrn

Code	Descriptor	Abbreveation
ME33	Dean & Stark distillation	Dean & Stark
ME34	dry ashing	dry ashing
ME35	dye binding	dye binding
ME36	Englyst method	Englyst
ME37	enzymatic hydrolysis	enzyme hydrol
ME38	flame photometry	flame photom
ME39	fluorimetry	fluorim
ME40	Folch extraction	Folch
ME41	Folin's reagent	Folin's reagent
ME42	formol titration	formol titrn
ME43	freeze drying	freeze drying
ME44	gas solid chromatography (GSC)	GSC
ME45	GLC	GLC
ME46	GLC, capillary	GLC,capillary
ME47	GLC, packed column	GLC,packed column
ME48	glucose oxidase	GluOxidase
ME49	gravimetric method	gravim
ME50	gravimetric method (AOAC)	gravim[AOAC]
ME51	gravimetric method (Hellendoorn)	gravim[Hellendoorn]
ME52	HPLC	HPLC
ME53	HPLC, normal phase	HPLC,norm ph
ME54	HPLC, reverse phase	HPLC,rev ph
ME55	immunoassay	immunoassay
ME56	inductively coupled plasma optical emission spectrophotometry (ICPOES)	ICPOES
ME57	ion-exchange chromatography	ionXchrom
ME58	ion specific electrode analysis	ion sp electrode
ME59	IR absorption	IR absorp
ME60	Karl Fischer method	Karl Fischer
ME61	Kjeldahl method	Kjeldahl
ME62	microbiological assay	microbiol assay
ME63	microdistillation	microdistiln
ME64	microwave drying	microwave drying
ME65	mixed solvent extraction	mixed solvent extr
ME66	near infra-red reflectance (NIR)	NIR
ME67	neutral detergent method	NDF
ME68	NMR	NMR
ME69	optical rotation	opt rot
ME70	polarimetry	polarim
ME71	protein from amino acid nitrogen	{CNA}
ME72	protein from protein nitrogen	{CNP}
ME73	protein from total nitrogen	{CNT}

Code	Descriptor	Abbreveation
ME74	radio-isotopic dilution	radio-isotopic diln
ME75	radio-protein binding assay	RPBA
ME76	radiochemical assay	radiochem assay
ME77	radioimmunoassay	radioimmunoassay
ME78	radiometric microbiological assay	radiom microbiol assay
ME79	reductiometric method	reductiometric
ME80	Röse-Gottlieb method	Röse-Gottlieb
ME81	Schmid-Bondzynski-Ratzlaff method	SBR
ME82	Schoorl method	Schoorl
ME83	Southgate method	Southgate
ME84	Soxhlet extraction	Soxhlet
ME85	spectrophotometry	spectrophotom
ME86	titrimetry	titrimetry
ME87	total sugar method	tot sugars
ME88	vacuum drying at 60°	vacuum drying,60
ME89	Weibuhl Stoldt method	Weibuhl Stoldt
ME90	Wenlock modification	Wenlock mod
ME91	Werner Schmidt method	Werner Schmidt
ME92	x-ray fluorescence (XRF)	XRF
X	Method Name not known	

ISO Standards

A number of standards of the International Organisation for Standardisation (ISO), Geneva, Switzerland address issues of data interchange. The following standards have so far been identified as relevant for food composition data interchange.

For more information see http://www.iso.ch.

- **ISO 639:1988** Code for the representation of names of languages
- **ISO 2108:1992** Information and documentation -- International standard book numbering (ISBN)
- **ISO 3166-1:1997** Codes for the representation of names of countries and their subdivisions -- Part 1: Country codes
- **ISO 3166-2:1998** Codes for the representation of names of countries and their subdivisions -- Part 2: Country subdivision code
- **ISO 3297:1998** Information and documentation -- International standard serial numbering (ISSN)
- **ISO 6093:1985** Information processing -- Representation of numerical values in character strings for information interchange
- **ISO 8601:1988** Data elements and interchange formats -- Information interchange -- Representation of dates and times
- **ISO 8859-1:1987** Information processing -- 8-bit single-byte coded graphic character sets -- Part 1: Latin alphabet No. 1
- **ISO 8879:1986** Information processing -- Text and office systems -- Standard Generalized Markup Language (SGML)

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This report covers recommendations for food composition data management and interchange. The recommendations are firmly founded on previous work carried out internationally by Infoods and by national agencies and institutes as well as on international standards. The recommendations cover the description of food, component, value and data source. The proposed model is sufficiently generic to handle food composition data at the various levels of aggregation and with various levels of additional descriptive information. The recommendations also include technical issues such as file formats. Recent developments of software tools to support the recommendations are briefly described.

15

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