

From Model Foods to Food Models

Industry guide for Food Modelling

Dr. András Sebők, Csaba Baár, Ágnes Gyuró
Campden BRI Magyarország Nonprofit Kft.



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Collecting and mapping the needs of the industry (1)

Models should consider the following aspects:

- **practically applicable** outputs,
- **clearly described application opportunities, benefits, instructions** for the user,
- **quick availability** (maximum one day) of the results
- as **product specific** as possible,
- **easy to handle,**
- as **reliable** and **precise** results as possible,
- the modelling activity shall **not require special equipment**
- **confidentiality** should be considered, regarding inputs.

Collecting and mapping the needs of the industry (2)

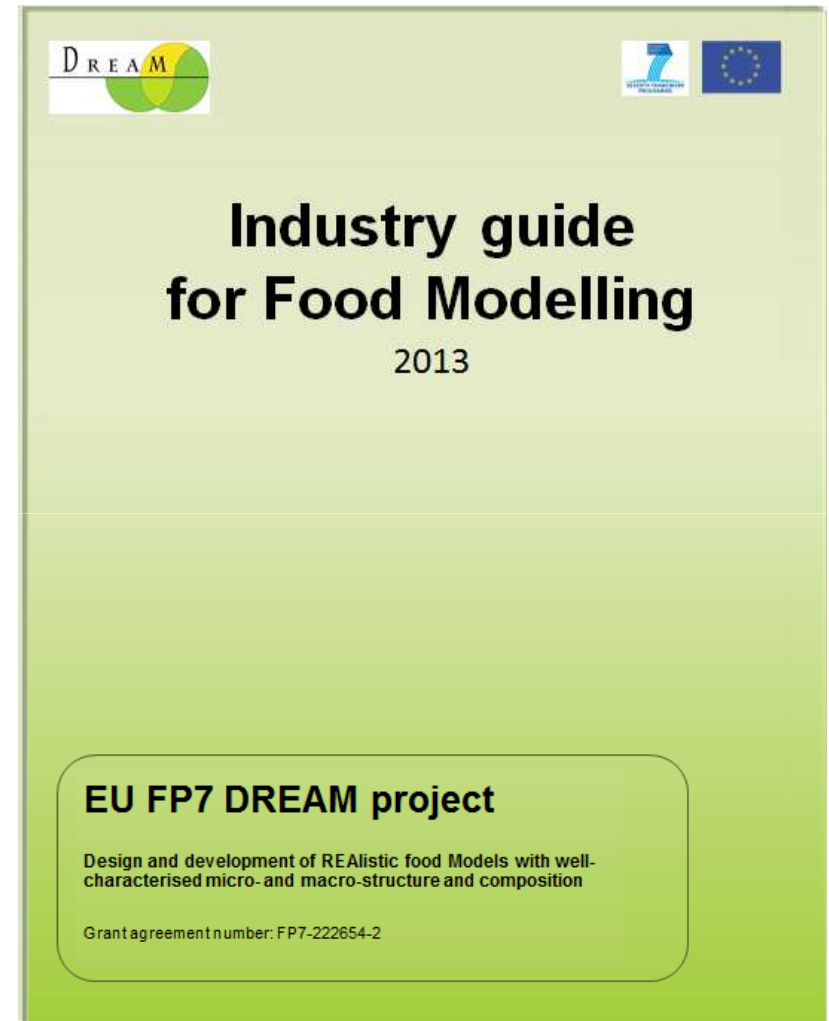
The **main barrier** of using models by the industry is...

- the **lack of knowledge**,
- **perception of complexity and sophistication of use** and of the need of **specific calculation skills**.

Therefore **significant efforts** should be made to **create awareness** and to **explain alternatives for use**.

Industry Guide for Food Modelling

- Collects and structures available knowledge and practice on the use of models.
- Provides practical help for the industry users, particularly SMEs.
- Saves knowledge, basis for the further development.
- Creates awareness of the industry on benefits of modelling.
- Provides an overview of food models and modelling tools.



Targeted users of the guideline

- technical professionals of the food industry (including SMEs) and R&D teams, including those who provide information for the marketing decision makers,
- decision makers on food safety, quality and nutritional questions,
- food safety and regulatory bodies,
- nutritionists,
- food scientists.

Method for preparation

- structure of the **Draft Practical guideline** was prepared,
- **detailed content** was developed **by the project partners** involving **national industry representatives** including SMEs from each country,
- based on a **template** the model developers provided **inputs for the guideline** related to their models,
- the guideline was **developed through several discussion rounds** (mainly through correspondence and with personnel meetings).

Structure (1)

1. Introduction

- 1.1. Objective of the guideline
- 1.2. Target audience of the guideline
- 1.3. Applicability of the guideline and instructions on the use of the guideline
- 1.4. Objectives of the DREAM project

2. Overview of the models and of the modelling in general

- 2.1. Why we use modeling in the food industry – benefits of modeling
- 2.2. How reliable are the models – limitations of applications
- 2.3. Different types of models
- 2.4. What can the models be used for (practical applications)?

Structure (2)

2.5. Identification of consumer's needs which have to be served with the application of food models

3. Designing and developing models

3.1. Defining the goal of the model: development and importance of the "statement of purpose"

3.2. Designing and developing of the models

3.3. Validation, practical testing and verification

3.4. How to make the model available for the potential users?

3.5. Maintenance of the models

4. Description of the different models/modelling software

4.1. Vegetable models

Structure (3)

- 4.2. Dairy product models
- 4.3. Meat models
- 4.4. Cereal models
- 4.5. General models
 - 4.5.1. Predictive microbiological models
 - 4.5.2. Heat treatment models

5. Conclusions

6. References

7. Glossary

8. List of abbreviations

9. Annexes

Benefits of modelling

- to **mimic the behaviour** of real food products,
- **predicting the impact of changes** to the ingredients, composition and process parameters, microstructure
- **reducing** the number of necessary **experiments at real conditions,**
- **saving time,**
- **reducing costs,**
- enabling experiments with real foods to **focus on the most promising test parameters,**
- **providing a more reproducible benchmark** for the impact of different treatments on food properties,
- **reducing waste** of food products during the experiments.

Typical examples of the different models

- optimising process conditions (temp./time profiles, product/water ratio, product size, etc.),
- assessment of influence of processing parameters on nutritional properties, food safety, sensory properties, microstructure, etc.
- standardising the method of assessment of the impact of internal/external parameters on properties and quality of food,
- rapid assessment of product safety and stability,
- prediction of microbial growth, survival or inactivation,
- reinforcing the HACCP plan,
- evaluation and verification of shelf-life of foods,
- optimisation and reducing costs in product/process development,
- meeting sustainability requirements – eco-design of products/processes,
- testing or replacing an ingredient in the product,
- screening options, which enables reduction of the number of experiments necessary.

Limitations of applications

- **models are not replacements** for validation of conclusions with real materials and for careful contemplation and professional experience,
- all cases of modelling are based on **several necessary simplifications, assumptions** and **prioritisation** of a few selected factors,
- some models are limited to a few **specific types of food products** and/or **parameters** and/or **conditions**,
- some models are limited to **specific processes**,
- difficulties in **availability of** the necessary **equipment, instruments, experimental facilities** and **conditions**,
- limited **availability of** specific **ingredients** necessary for preparation of real food models,

Typical phases of the model development process

- Defining the goal of the model: developing a statement of purpose
- Designing and developing the model
- Practical testing and verification
- Making the model available for the audience
- Maintenance of the model

Development of the statement of purpose

- **Template** for statement of purpose was developed.
- Statements of purpose **prepared by the model developers** were received and agreed.
- Statements of purpose was defined as following:
 - details of the **nature and intended use** of the model
 - discursive: model type, circumstances and ranges of use, foods and process represented and the boundaries, delivery mechanism, target users
 - each **model output** with its required accuracy
 - Y variables
 - each **model input** with its valid range
 - X variables
 - **constraints** on the valid use of the model

Template for description of models

1. Name of the model
2. Type of the model
3. Is the model developed in the DREAM project?
4. The model is designed for... / What activities the model is intended to assist? / Problems that can be solved
5. Benefits of the model
6. Any limitations of the model
7. Targeted users
8. List of the equipment / tools that are necessary (*for the production, for the analyses*)
9. Expected inputs of the model
10. Outputs of the model

Template for description of models

11. Description of the use of the model. Please, provide a detailed production protocol based on the results of the R&D work!
12. Practical advices for using the model
13. Failures that should be avoided (examples on possible failures)
14. How will users utilize the results? Detailed in-depth list that contains the possibilities for utilizing the outputs of the model.
15. Examples on successful practices

Models in the Guideline



Vegetable models: PhytoVeg Brassica Thermal Treatment model, Tomato/lycopene model, Tannins from fruit to juice

Meat models: Protocol for standardized pork meat samples, Cooking yield model



Dairy product models: Dairy dessert model, Dairy dessert and acid milk gels model, Soft cheese model



Cereal models: Bran bread model, Digestive biscuit model, Biscuit baking model, ERH CalcTM



Predictive microbiological models:

- Sym'Previus,
- FORECAST, ACID CLUB, Pathogen Modeling Program (PMP), ComBase

Heat treatment models: cTemp

Maintenance of the models

The accuracy and applicability of the models has to be revised regularly.

Model foods:

- Revision of the method
- Change of material and equipment
- Further improvements

Food models (softwares):

- Feedback from users
- Improvement of functionality
- Improvement of graphical interface
- Update of the database

Prepared by...

Campden BRI Magyarország Nonprofit Kft. (CCHU), Hungary

- András Sebők,
- Ágnes Gyuró,
- Csaba Baár,

SOREDAB SAS (SOREDAB), France

- Isabelle Gaucher,
- Oline Rusten,

Institute technique du lait et des produits laitiers (ACTILAIT), France

- Jean-René Kerjean,

Reviewed by...

Campden BRI (CBRI), United Kingdom

➤ Martin Whitworth

Contributors

Contributor	Company	Country
Florence Postollec	ADRIA Développement (ADRIA)	France
Keith Jewell	Campden BRI (CBRI)	United Kingdom
Martin Whitworth	Campden BRI (CBRI)	United Kingdom
Angelo Visconti	Consiglio Nazionale delle Ricerche (CNR-ISPA)	Italy
Alan Mackie	Institute of Food Research (IFR)	United Kingdom
David Page	Institut National de la Recherche Agronomique (INRA Avignon)	France
Catherine Renard	Institut National de la Recherche Agronomique (INRA Avignon)	France
Hubert Chiron	Institut National de la Recherche Agronomique (INRA Nantes)	France

Contributors

Contributor	Company	Country
Jean-Dominique Daudin	Institut National de la Recherche Agronomique (INRA Clermont)	France
Nathalie Perrot	Institut National de la Recherche Agronomique (INRA Grignon)	France
Carolina Realini	Institut de Recerca y Tecnologia Agroalimentàries (IRTA)	Spain
Hartikainen Katri	Valtion Teknillinen Tutkimuskeskus (VTT)	Finland
Kaisa Poutanen	Valtion Teknillinen Tutkimuskeskus (VTT)	Finland
Matthijs Dekker	Wageningen Universiteit (WUR)	The Netherlands

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Online guideline

Draft **practical guideline can be downloaded** from the following link:

<http://dream.aaeuropae.org/LinkClick.aspx?fileticket=51u%2b0i67BI8%3d&tabid=61>

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