

The Food Handbook Companion: A 'Serious Game' to Get-Acquainted and Customize On-The-Fly

Catrinel Turcanu¹, Dan Vamanu²

¹ Belgian Nuclear Research Centre SCK•CEN, Mol, cturcanu@sckcen.be

² Horia Hulubei National Institute of Physics and Nuclear Engineering, IFIN-HH, Bucharest, dvamanu@ifin.nipne.ro

1. Introduction

The Belgian Nuclear Research Centre (SCK•CEN) and Horia Hulubei National Institute of Physics and Nuclear Engineering, Bucharest (IFIN-HH) are partners in a bilateral scientific collaboration aiming at fostering academic exchanges and collaborative action in a number of fields. One of the topics addressed is the management of food production systems that were exposed to radioactive contamination. The focus is on setting up a stakeholder process in Romania, that may eventually lead to the customization of the *European Handbook for the Management of Contaminated Food Production Systems* [1] (currently referred to as the “Food Handbook”) – a multi-national endeavour sponsored under EU research programmes. It is sought that the customized handbook be used as a planning and preparedness tool, as well as a decision support in designing recovery strategies in the aftermath of radiological emergencies.

2. The 'Handbook Companion' notion

During discussions on the development and use of the Food Handbook and in consideration of lessons learned from practical exercises and case studies an idea emerged - of an interactive web tool that would act as the “Handbook’s companion”. It is deemed that such a tool could, on the one hand, help in the customization of the handbook and, on the other hand, facilitate the use of the handbook for learning and training purposes while also improving its reception by the stakeholders at large.

Concerning the first aspect, the belief was expressed – in line with past demonstrations [2] – that a live, comprehensive and friendly computer interface would be a natural user workpad for (re)formulating, sorting out and adapting the guidelines, provisions, methodological items, and technical data proposed by the reference Food Handbook in a generic fashion. This would then be tailored to the specifics - legal, regulatory, technical, procedural, and cultural - of varied stakeholders, of different national backgrounds – and this, *in the very process of effectively solving drill/no-drill issues in managing contaminated food production systems, locally*. For such an approach to the customization issue – that keeps the reference intact while adapting its *application* – both substance and language - as locally appropriate *in the very process of using the Handbook*, the term ‘*on-the-fly customization*’ was coined.

Supportive to the concept was also the observation that, being an extensive and comprehensive knowledge and information source, the reference Food Handbook as such presents an inherent degree of difficulty when it comes to its practical handling. This is especially noticeable when facing complex scenarios involving, for instance, a mix of different radionuclides. A ‘manual companion’ could also alleviate this potential drawback -

by offering to shoulder the classical book-shuffling and pencil-and-paper chores by a 'serious gaming' (see e.g. [3]) gadget that may considerably sweeten the pill.

3. Proving the concept

Although the initiative is still in an incipient stage, a working proof of concept of a Food Handbook companion was developed by IFIN-HH. The software proposes a structure consisting of three sections (see Fig. 1). The main section consists of '*Problem solvers*' implementing the decision framework described in the reference Food Handbook. A second section, designed in a way of '*3rd Party Abaci*', is meant to offer users a minimal selection of tools to address side-needs that may appear in the core-assessments. Such could be, for instance an orientation on environmental dispersion of abnormal radioactive releases under simulated or real meteo forecasts; the dosimetric impact of routine releases on complex pathways; or the interpolation and mapping of field-gathered data. It is implicitly understood that any software eventually sought and agreed upon by the stakeholder community may add to, or substitute for the current modules of sorts. A third code section - the '*Utilities*' covers an online library of relevant documents, web links, and multimedia items ('The Reading Room'); and a mapping facility based on web resources, to expedite geographic orientation needs.



Fig.1 Front page of the Handbook's companion

Currently the 'Problem solvers' section comprises four areas, depending on the targeted user:

- **The Food Handbook** online, in its entirety - to emphasize the adherence of the 'Companion' to its original reference and keep track of the changes operated in the process of 'on-the-fly' customization;
- **The Analyst's Companion** that allows users to interactively and expeditiously define management strategies. It draws upon (i) a list of target radionuclides; (ii) a set of basic filters relevant to option applicability, depending on physical, chemical and environmental properties of the radionuclides; as well as additional, selectable, filters relating to incremental dose implications; strategy efficiency; and stakeholder opinions on record; (iii) the on-the-fly customization, at the interface, of the derived set of options (e.g. by explicitly including back a previously discarded option, discarding options not legally-covered in the user's environment, trimming the technical language etc.). The operation as described amounts, in the end, to generating *formal reports* (see Fig. 2) summarizing the strategy found valid, and explaining the options and the associated, key limitations and constrains.

Valid options: 24 Addition of AFCF to concentrate ration /90%/ld-N/Ac-4,1,0/

24 Addition of AFCF to concentrate ration

Objective
To reduce activity concentrations of radiocaesium in meat or milk to below intervention levels.

Other benefits
Reduction in quantities of animal produce that will need to be disposed of. Normal animal

[Click me when ready, to draft the Response Action Recommendations](#)

RESPONSE ACTION RECOMMENDATIONS

Issued by: National Emergency Response Organization
Compiled: May 8, 2010, 20:38:44
by: John Doe, authorization 31415298
Reference: The European Food Manual

Caveat: data contents and language may have been customized on-the-fly by the assessment team, to conform with prevailing Law, regulations, and practices.

Event: Accidental atmospheric release at NPP X and consecutive radioactive contamination of nearby farm land.
Nuclides involved in the assessment: 89Sr 90Sr 131I 134Cs 137Cs

24 Addition of AFCF to concentrate ration

Objective
To reduce activity concentrations of radiocaesium in meat or milk to below intervention levels.

Other benefits
Reduction in quantities of animal produce that will need to be disposed of. Normal animal

Fig. 2 Formal report summarising the strategy

With the current Companion version no contamination data is required, this aspect being indirectly accounted for through the filtering done on the minimum efficiency with respect to the target medium. Concerning the latter, the tool allows for the specification of one value that is to be applied for all countermeasures and all radionuclides.

The 'Analyst' is assumed to be a person with an adequate knowledge of the handbook and with a decent understanding of radiation protection and emergency management.

- **The Operative's Companion**, allowing a fast design of a management strategy based solely on selection trees and main look-up tables - all provided by the reference manual and appropriately taken online, as addressable maps. The user may select a decision tree (e.g. for management of contaminated cereals); display it along with the respective decision ('lookup') table (see Fig. 3); and, after proper consideration, point at an end-node in the tree, thereby promptly obtaining in display the complete datasheet for the corresponding option. The overall results of the analysis can again be saved as a formal report.

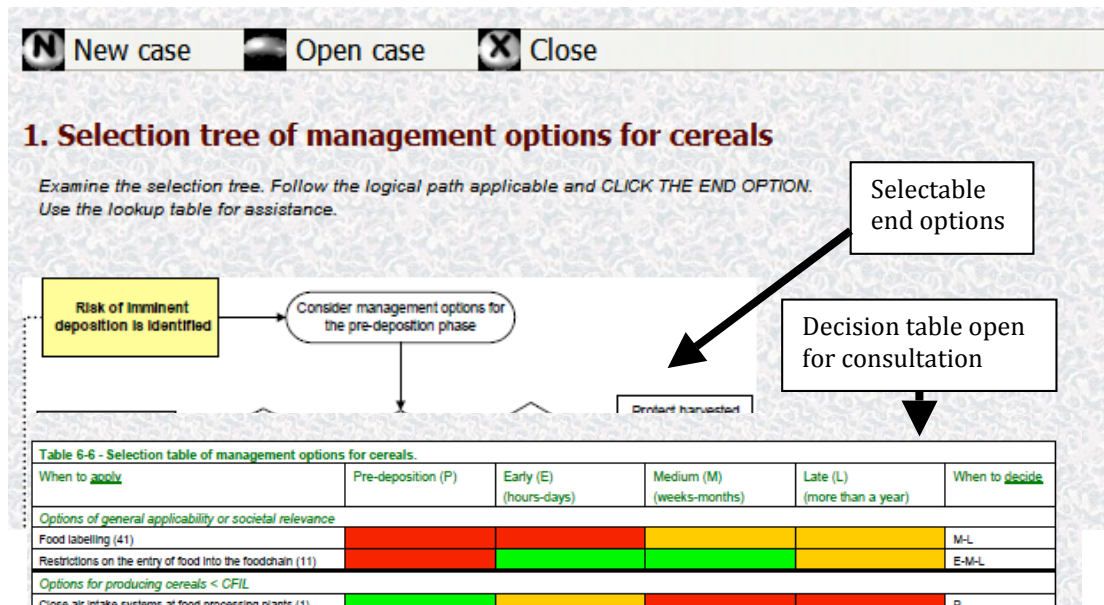


Fig.3 Selection of response plan based on (customized) decision tree and lookup table

Though an adequate knowledge of the handbook and a decent understanding of radiation protection principles may still be the normal prerequisites, operating this section is less demanding - because more straightforward and user-transparent.

- **The Stakeholder’s Companion**, adding to the toolkit multi-criteria decision analysis software. The related methods can directly account for the preferences of different stakeholders and help in identifying consensual, satisfactory management strategies by taking into account the pro’s and the con’s raised by different options.

4. Follow-up

Within the framework of the SCK*CEN/IFIN-HH cooperative agreement, this fall, 2010 will see the organization, in Romania, of a workshop *cum* training in the utilization of the Food Handbook. The event will offer time and a good opportunity to preliminarily test and evaluate the response to a first full-contact with the Handbook Companion, of various stakeholders. If the results will such warrant, it is envisaged that a server be opened, on the IFIN-HH premises, to permanently host the software for testing by interested members of the NERIS platform and, possibly, other users, in view with gathering a more comprehensive feedback and fresh ideas on the matter.

References

1. Nisbet A.F. (ed.), Rice H. (ed.) et al. (2006). *Generic Handbook for Assisting in the Management of Contaminated Food Production Systems in Europe following a Radiological Emergency*. EURANOS(CAT1)-TN(06)-06. Health Protection Agency.
2. Vamanu D.V., McKenna T.J. (1996). *ROBOT - Rule-Oriented Basic Operational Tool*. U.S. Nuclear Regulatory Commission, Washington D.C., March, 1996.
3. Wikipedia (2010). *Serious Game*. <http://en.wikipedia>.