COMMIT

PROJECTPLAN

WORKPACKAGES

DELIVERABLES

BUDGET

E-FOODLAB (P26)

Projectleider prof.dr. Jan Top

1. Background

International food industry and food supply chains are facing an ever increasing pressure to deliver safe, healthy and attractive foods in a highly competitive environment. This imposes a strong pressure on the innovation process, requiring a continuous interaction between science and development. The agrifood industry is opening up its generic research activities applying open innovation principles. It is well aware of the fact that sharing knowledge produces knowledge and speeds up the innovation process. In the Netherlands several top institutes have been launched (50% industry and 50% Min EZ) during the last decade, to mention TI Food and Nutrition, TI Green Genetics and TI Pharma. These institutes represent an annual turnover of several M€'s in agrifood-related research. Moreover, they act as scientific gateways to industrial companies like Unilever, FrieslandCampina, DSM, CSM, VION, EnzaZaden, Royal van Zanten, KeyGene, De Ruiter, RijkZwaan, NunhemsZaden, Syngenta spending orders of magnitudes more on R&D. Today's problems are complex, as we are facing issues related to health, safety, sustainability, availability of raw materials, and above all convenience.

A seamless integration between all experts on a certain research topic is needed to ensure that scientific excellence leads to industrial breakthroughs. A proper infrastructure is needed to optimize the production and transfer of knowledge in these institutes. However, it is not straightforward to design and implement adequate knowledge sharing processes and systems in research organizations. Agrifood research is multidisciplinary, multi-location, multi-project and multi-stakeholder. Moreover, experiments are becoming increasingly complex and extensive. Researchers tend to focus on problem solving and setting up experiments rather than providing and reusing information. Communication typically aims at achieving appreciation within the scientific community. The traditional scientific paper is typically not read by industrial experts. Moreover, the semi-open innovation model implies an inherent tension between confidentiality and openness. Finally, the traditional distinction between fundamental and applied research is weakening. Each project has its own content and style, depending on the actual network of operation (scientific, funding, society, industry). A need exists for continuous, user-specific interaction, rather than presenting final reports to a general audience.

2. Problem description

Presently, direct contact between researchers and industrial experts is the prevailing way to share knowledge and to define and control research. Electronic infrastructures are mostly used locally, supporting individual researchers or project teams. Although Internet resources are in principle available, no proper methods and tools are yet available to fully exploit them. The quality of the information shared – for example through an intranet platform - is not always optimal. Moreover, food research has a strong tendency to focus on the lab. New IT is often looked at with some mistrust.

In recent years, within the VL-e consortium the Food Informatics project has contributed significantly to creating an effective e-Science infrastructure for agrifood research. The industrial partners emphasize the need to continue research along these lines in order to bring this technology to maturity. Core issues are:

- Detection, selection and personalising of information sources.
- Collective development and maintenance of ontologies in specific application contexts.
- Extraction, storage, and alignment of vocabularies specialized to particular application domains.
- Integration of multi-source and multi-format agrifood data. Traditionally, research output is shared as finalized work in scientific publications. The underlying data and models remain hidden but become increasingly important.
- Creating incentives for knowledge sharing. A low-threshold infrastructure is needed to stimulate researchers to share and reuse data, models and methods.

Requirements on research documentation are increasing. The European Food Standards Authority (EFSA) has recently published a draft guidance for the submission of applications under the new nutrition and health claims regulation. This guidance gives insight in the impact that legislation will have on industry as well as research institutes. It includes applications under Article 18 – that is, those applications that are base on newly developed evidence and that include a request for proprietary data protection. In addition, the Medical Ethical Commission (MEC) requires proper documentation. Finally, patenting has already imposed the need for detailed bookkeeping of research activities.

Companies like Unilever, Friesland Foods, de Ruiter Seeds and others consider the top institutes as stepping stones to application of new information technology for R&D. For example, TI Food and Nutrition will continue to develop its food science platform Tiffany. The experiences gained in these institutes are passed on to the industrial partnersin a natural way. The technology has been demonstrated extensively in their own (agrifood) domain. Other top institutes have stated that their industrial partners have analogous needs. The present project is ideal for establishing a technological bridge between the top institutes at the generic aspect of knowledge management. These experiences translate directly to their industrial partners.

In summary, the challenge is to remove the thresholds that exist in providing and reusing knowledge fragments on agrifood research, and to improve the quality of this information. This will be realized through new knowledge management processes, supported by advanced information technology. More specifically we identify the following needs:

- Facilitate knowledge sharing, both with peer researchers and with industrial experts. Stimulate continuous interaction on partial results using dynamic dossiers.

- Identify and discover relevant knowledge in existing and external data and documents. A general problem is to monitor the completeness and correctness of data sets, and to integrate data from different resources.
- Design and implement quality control mechanisms. Ensure knowledge traceability, claim registration and notification, and facilitate benchmarking of data and models.
- Automate standard tasks, such that researchers can focus on the more creative and challenging aspects of research.

3. Objectives

Project's goal

Due to its complexity, collaborative R&D in the agrifood domain requires continuous refinement of shared vocabularies. These vocabularies enable integration and processing of research data, reports and procedures from different sources, disciplines, locations and projects. For example, data from sensory experiments on new low-fat food products can be linked automatically to chemical and biophysical measurements. The objective is to develop tools that support industrial agrifood experts in improving and refining such formal vocabularies and applying them for data integration and for advanced document search. This enabling technology revolutionizes innovation in food and agricultural industry. It allows a continuous interaction between scientific research and industrial applications.

Planning of all dimensions

The overall objective of the project is to remove the thresholds that exist in providing and reusing knowledge fragments in agrifood research, and to improve the quality of this information. This will be realized through application-oriented Semantic Web vocabularies. This project is application oriented and intimately connected to implementation projects at TI Food and Nutrition and TI Green Genetics. These two institutes represent international food and plant breeding companies, which will benefit directly from the results of this project. Three work packages focus on different aspects of the same issue. First, the question is how to create and maintain vocabularies that work in practice. The second question is to apply these to make research data reusable. The third work package focuses on the question how to use these vocabularies to disclose specific fragments of text. Given its focus on applied e-science in agrifood, this project aims has a natural link to the e-Science Centre that is to be established in 2011.)

Specific objectives of this project are:

- To create methods and tools to have food experts collectively create and maintain ontologies for specific agrifood application contexts. Present vocabularies are mostly unsuitable for direct application in the food domain. The existing ROC (Rapid Ontology Construction) method is to be brought further by introducing consensus strategies, text mining techniques,

ontology merging, ontology completion, and an ontology development dashboard. This work builds on Commit project P1 and P23.

- To apply vocabularies and associated services for integrating food science data from different origins and backgrounds, both text and data. Full development and integration of OQR (Ontology of Quantitative Research) in practice requires employing the ontology in several services that provide immediate support for food researchers. This links to recent developments to enable smart electronic lab notes as a part of Tiffany, the knowledge management platform of TI Food and Nutrition. Technically, the aim is to add a Semantic Grid layer to existing tools such as spreadsheets, data from sensors and other data sets. This will allow researchers to transfer the meaning of this data explicitly. Moreover, semantic annotations enable automated processing and quality checks. This work links with P23, in particular the participation of Elsevier. Semantic sensor integration builds on the work in P5 at Philips.
- To establish methods and tools for disclosing agrifood research and implement these as automated services. Industry and in particular SME's are looking for new ways to disclose knowledge and information sources in agrifood R&D. At present, relevant sources are often hard to find, the quality of the information varies and it is not possible to access the information from a personalized (contextdependent) viewpoint.)This work fits within the growing availability of public sources as Linked Open Data. In particular Dutch horticulture will be supported in maintaining its lead position on the global plant breeding market.

Results

The overall objective of the project is to remove the thresholds that exist in providing and reusing knowledge fragments in agrifood research, and to improve the quality of this information. This will be realized through application-oriented Semantic Web vocabularies. This project is application oriented and intimately connected to implementation projects at TI Food and Nutrition and TI Green Genetics. These two institutes represent international food and plant breeding companies, which will benefit directly from the results of this project.Three work packages focus on different aspects of the same issue. First, the question is how to create and maintain vocabularies that work in practice. The second question is to apply these to make research data reusable. The third work package focuses on the question how to use these vocabularies to disclose specific fragments of text.

Deliverable Impact and Valorization

Companies like Unilever, Friesland Foods, de Ruiter Seeds and others consider the top institutes as stepping stones to application of new information technology for R&D. For example, TI Food and Nutrition will continue to develop its food science platform Tiffany. The experiences gained in these institutes are passed on to the industrial partners in a natural way. The technology has been demonstrated extensively in their own (agrifood) domain. Other top institutes have stated that their industrial partners have analogous needs. The present project is ideal for establishing a technological bridge between the top institutes at the generic aspect

of knowledge management. These experiences translate directly to their industrial partners. All output is exposed to and discussed continuously with industrial and non-profit partners through TI Food & Nutrition and TI Green Genetics.

Deliverable Dissemination

By its application-oriented nature, this project has continuous interaction with industry and society. In addition we define the following dissemination-oriented deliverables.

- Presentation for policy makers in agrifood (Ministry EL&I and others).
- Publication in professional magazine on use of vocabularies in agrifood.
- Press release on WURVOC.
- Workshop with Dutch top institutes on knowledge management using semantics.
- Presentation at a conference for ICT-professionals in the agrifood domain (VIAS symposium).
- Article in food magazine on S3 in food research.
- Professional article on semantics-based multi-sensor data integration in food research.
- Publication in professional magazine on knowledge disclosure in agrifood.
- Publication in professional magazine on automated fragment selection.

International Imbedding

One of our main stakeholders, TI Food and Nutrition represents multinational companies in food production. This provides a very strong international context to this work. In addition, natural links exist with FAO in Rome, INRA (France), EFSA (European Food Safety Authority), USDA (US). Within the FP7-program the HighTechEurope project is already an outlet for the tools to be developed.)In addition we mention the following specific deliverables.

- Established collaboration with INRA and possibly FAO on publishing vocabularies in agrifood. WP1, YR2
- WURVOC established in worldwide food research organisations. WP1, YR4
- Report on application of S3 in food security application in cooperation with INRA France. WP2, YR3
- Demonstrator S3 in electronic lab notes for international partners of TIFN. WP2, YR4
- Demonstration of semantic search in international food innovation consortia (Hightech Europe, EFSA, FAO, etc). WP3, YR3

Deliverable Synergy

As this project focuses on breakthroughs in applying new information technology, rather than creating new formalisms or algorithms per se. Therefore we aim to use scientific results from other projects within the Commit program, in particular P1, P5 and P23. However, our work has in independent pace, in the sense that that progress is not fully dependent on success of the other projects. In contrast, it is our experience that application-oriented work must run autonomously - driven by user requirements. It invokes the best technological solutions available at any time. In this way we can also relate application needs to new scientific

directions. The following specific deliverables are co-productions with other projects in Commit.

With P1

- Text-based tool for thesaurus refinement and extension in the context of a specific application.
- Method for automated selection of specific document fragments. How to extract specific information from a large document?
- Report: Method and demonstration triple-based search.

With P23

- Tool for reusing existing vocabularies to create application specific vocabularies.
- Method for data extraction from textual sources.
- Method for displaying vocabularies to end-users.
- Tools for displaying vocabularies to end-users.

With P5

- Demonstrator semantics multi-sensor data integration in Food Lab.
- Method to extract and analyse research in intervention studies using smart phone and web apps.

4. Economic and social relevance

Innovation in agrifood has a strong impact on society. Health problems such as obesity, allergy, coronary diseases and diabetes are increasingly affecting national health in a negative way. This in turn is causing an economic loss that is hard to underestimate. For example, in the Netherlands yearly 505 M€ is spent on the direct consequences of serious overweight. This amounts to about 1.6% of de total costs of health care for adults. Indirect costs (due to absence from work or disability to work) are being estimated at 2000 M€ per annum. Combined with lifestyle trends, demanding easy-to-prepare, tasteful and inexpensive food products, this imposes an urge for continuous innovation.

It is not surprising that the Netherlands is an important player in food research, partly due to large R&D efforts of this industry and partly due to strong academic research in this field. For example, TI Food and Nutrition is presently extending its consortium to include Kellogg, DANONE, Nestlé and others, thus growing to European and even global scale. Its research partners are Wageningen UR (including contract research institute Food & Biobased Research), TNO, NIZO, Maastricht University, University of Groningen and others. Each of these institutes performs a multitude of food-related research projects on a global scale, in or outside the TI Food and Nutrition Consortium. The agrifood sector is an important business area for the Dutch

economy and employment with a turnover of 57 billion euro's in 2006 (CBS). Out of all industrial employees, 15% are working in food industry. In the area of plant breeding, the direct turnover of the Dutch plant propagation industry is 2.5 billion euro's annually. Its labour force is 10,000. Moreover, 8 of the 10 largest vegetable seed companies have their main office or a major R&D location in the Netherlands.

Research in this area is globally highly competitive. The semi-open innovation approach only adds to the leading position of the Netherlands in food related research, provided a proper infrastructure is available. The main objective of this program is to develop and evaluate Semantic Web technology in operational conditions, directly influencing the way in which new food knowledge propagates into industry and society.

5. Consortium

In this consortium the Dutch top-institutes TI Food and Nutrition and TI Green Genetics collaborate with Wageningen UR – Food & Biobased Research. The latter has proven to be able to link academic research to practical applications. The top institutes act as pilot environments for their respective industrial partners as mentioned above. At TI Food and Nutrition the project Knowledge Management Platform TIFN runs in parallel with eFoodLab, thus providing an ideal context for validation and application of the tools developed here. At TI Green Genetics a specific project is established on knowledge disclosure as counterpart to eFoodLab.

6. Workplan

This program consists of three elements that are complementary and in coherence provide answers to the above issues. Part of this work is of direct interest to and responsibility of the user institutes. The eFoodLabproject has a more generic character and is to support activities work in the development work in the associated work at the TI's. The work done directly in the context of TI Food & Nutrition and TI Green Genetics is expected to deliver

- Disclosing information and knowledge sources for SME's, industry and trade in general and government.
- User-centred views and alerts on research output. Personalized and company-specific interfaces and alerts are ways to enhance involvement of industrial experts in food and plant breeding research.
- Integrated electronic lab notes. True capturing of scientific knowledge starts in the lab. It has a major impact on IPR, patenting and knowledge claims, but also on the efficiency of the individual researcher. The fast introduction of smart phones and tablet PC's will also have great impact.
- Data integration tools, enabling combination of data from different sources, systems and formats. Enriching research information with multimedia and semantics are interesting alternatives to the traditional publication.

- These functions require food and plant breeding thesauri in order to semantically enrich data.
- For an extensive description of this work we refer to the TIFN and TTIG project plans. To support these activities we propose the following complementary workpackets in the present program, resulting in a number of deliverables.
- WP1 Interactive and Collective Development of Food and Plant Ontologies – to develop the language and concepts needed for the other packets.
- WP2 Selecting, combining and interpreting distributed experimental food data.
- WP 3 Agrifood knowledge disclosure services

WORKPACKAGES

Project number P26	
Project title & acronym	Interactive and Collective Development of Food and Plant Ontologies
Projectleader	Nicole Koenderink, Wageningen UR – Food & Biobased Research

Objectives

The objective is to ensure that consensus-based concept formulation becomes an integral part of food science. In this workpacket we focus on supporting food experts in collectively creating and maintaining ontologies for specific application contexts. Such ontologies can for example be used for the annotation of large document repositories on food, facet browsing to efficiently retrieve available research data, and query expansion for efficiently finding relevant literature. Another application is prediction of food safety risks by linking heterogeneous data from the Internet with expert knowledge. Presently general vocabularies exist in the food domain. However, they are mostly unsuitable for direct use in research applications. For most projects, a dedicated vocabulary for the multidisciplinary background of the research is required. Methods and tools need to be developed to evaluate the fitness-for-use of vocabularies within specific application contexts, and to adapt them accordingly. The information sources and experts involved in these applications should be consulted on a continuous and semi-automated way to feed these adaptations. The Food Informatics (VirtualLab e-Science) project has initiated the ROC (Rapid Ontology Construction) method to construct such vocabularies. Several experiments are needed to develop this method to its full potential. ROC is to be extended by introducing *consensus strategies, text mining techniques, ontology merging, ontology completion,* and a *development dashboard*. This work focuses on the application of new developments in this area, in particular from P1 and P23 with the Commit consortium.

Project number P26	
Project title & acronym	Selecting, combining and interpreting distributed experimental food data
Projectleader	Jan Top, Wageningen UR – Food & Biobased Research

Objectives

The objective is to apply vocabularies and associated services to interpret and integrate food science data, both in text format and as raw data, from different origins and backgrounds.

Presently, food researchers tend to store their research data and models locally and individually; only formal publications are shared with other researchers. Spreadsheets are used all over in agrifood – also in large companies such as Unilever and DSM – but lack proper annotation and structure. To enable sharing and tracing research data, a first version of OQR (Ontology of Quantitative Research) has been developed in the Food Informatics (VL-e) project as a common language for quantitative research. OQR allows the formal description of quantitative data and their context information. OQR-enabled services can facilitate for example the exchange and interpretation of research data, and the coupling of models from different domains. Full integration of this approach in actual practice requires employing the ontology in several services that provide immediate support for food researchers. These generic services will enable the *scientific semantic spreadsheet*, *electronic lab note, multi-sensor output integration, conceptual invocation of modelling software.*A strong link to the e-Science Centre is expected to be established in 2011.

Project number P26	
Project title & acronym	Agrifood knowledge disclosure services
Projectleader	MariëlleTimmer, Wageningen UR – A&F

Objectives

The objective of this work package is to develop new ways to disclose knowledge and information sources in agrifood R&D through automated services. We focus onthe areas of plant breeding research and the production of sustainable food ingredients. Other applications will follow, for example on biobased economy. The purpose of creating these services is to make relevant information available to SME's in agrifood, but also to industryin generaland governmental institutes. At present, relevant sources are often hard to find, the quality of information varies and it is not possible to access the information from a personalized (context-dependent) point of view. This work fits within the growing availability of public sources as Linked Open Data.

The main challenge in this work package is to create methods to perform semantically enriched search, automated annotation of documents and automated selection of relevant sources. Another objective is to allow lower granularity of the items found, for examples specific sections or paragraphs rather than complete documents. It is also necessary to develop new ways to expose formal vocabularies to end users, in such a way that their complexity is hidden. Finally, the use of statements (triples) rather than just concepts or terms in search applications is still a challenge.

DELIVERABLES

Number of important journal paper
4

Number of important conference contributions
4

Products

1. Tool for reusing existing vocabularies to create application-specific vocabularies

   This tool facilitates reusing existing generic vocabularies to create application specific vocabularies. For the support of e.g. search query articulation, a vocabulary that is targeted at the search domain is required. Instead of recreating such a vocabulary from scratch, we aim to reuse as many relevant parts of existing vocabularies as possible. To support this, we allow a domain expert to indicate a number of concepts that are core concepts in the search domain. Based on these core concepts, we will search existing generic vocabularies for related terms and present those to the domain expert. In this way, the domain expert can simply indicate whether a term is relevant for the application-specific vocabulary or whether it is not.

   - WP 1 YP 2011

2. Tool to evaluate fitness-for use of vocabularies

   Formal vocabularies expressed in RDFS/OWL are becoming available on the web in large quantities. However, when using such a vocabulary in a specific context, always some adaptation is needed to fit it within this context. For example, a thesaurus obtained from the web can be reused for a search application that targets a set of documents in a specific domain. This tool shows how the content of the thesaurus and the documents fit, and possibly also where the thesaurus needs to be adapted.

   - WP 1 YP 2012

3. Text-based tool for thesaurus refinement and extension in the context of a specific application

   Specific applications have their own range of concepts and relations between concepts, for example hidden in a set of documents. Automatic extraction of terms and relations to improve vocabularies is a well-known research topic. This deliverable aims to apply academic tools to develop an approach that works in practice.

   - WP 1 YP 2013

4. Tool for displaying vocabularies to end-users

Formal vocabularies can be complex and large. They are typically embedded in an application that hides them from the end user. However, sometimes a certain view on the vocabulary for the user is needed, for example when suggesting related terms in a search application. The question is how and what should be shown to the user, and whether these requirements effect the structure of the thesaurus itself.

- WP 3 YP 2013

5. Tool for automated selection of specific document fragments

   Description The ultimate objective of a search application is not such much to retrieve specific documents or data, but rather to provide and answer to a question. One way of making the step from a document to answer is to extract only the paragraph or even the argument from the text, rather than the entire text. This deliverable aims to apply academic tools that perform this type of action in practical applications.

   - WP 3 YP 2014

6. WURVOC established as a platform for sharing vocabularies in the agrifood domain

   Description WURVOC (Wageningen UR vocabularies) intends to be a web-based platform for disseminating vocabularies and related web services on agrifood.

   - WP 1 YP 2014

Software

1. Tool for expert participation in vocabulary development

   Creating formal vocabularies labour intensive and expensive. Cost and time involved can be reduced by having the domain experts actively participate in the process of creating and improving vocabularies. However, this requires tools that are easy to use by non-IT users, in the context of the applications that are using these vocabularies. Moreover, support is needed manage the structure and quality of the vocabulary.

   - WP 1 YP 2014

2. Semantic Scientific Spreadsheet (S3)

   The web services associated OQR-ontology will be used in an Excel add-in that researchers can use to annotate (semantically enrich) their data. In this way people and computers can interpret and integrate data from different sources nambiguously.) The researcher will also be supported in converting his/her data on the basis of conversion between different systems of units.

   - WP 2 YP 2011

3. Tool for automated annotation of data tables using OQR and S3

Research output in spreadsheets is usually ambiguous, incomplete and unstructured. However, using OQR and a set of heuristics it is possible to automatically upgrade meta-data, such as parameters and units of measure.

- WP 2 YP 2012

4. Tool for semantic data entry

   To improve the quality and understandability of spreadsheet files - which are abundant in scientific research - it is necessary to assist the user in entering meaningful data that is properly annotated. S3 supports annotation in terms)of quantities and units of measure, but other aspects need to be covered as well: type of object studied ('milk'), accuracy indicators, experimental setup, etc.

   - WP 2 YP 2013

5. Semantic search extension

   Description Semantic search uses semantic information from ontology's or thesauri to enhance and guide searching on the web or on dedicated websites. Ontology's may for instance be used to expand search queries to also include more specific terms than those used in the query. A search, for instance,)using not only 'fish' but also 'herring' will return not only documents containing the word 'fish' but also documents containing only the word 'herring' and not 'fish'. Ontology's may also be used to suggest alternative terms that are related to a search term, thereby guiding the user in creating a more effective search query. MediaWiki is a popular server application that is used to run many popular Wikis, such as Wikipedia. For this deliverable a MediaWiki extension (plugin) will be created that brings semantic ontology-based search to Wikis run on MediaWiki software.

   - WP 3 YP 2011

6. Tool for semi-automated annotation of documents

   Description A bottleneck in creating and maintaining high-quality repositories is that fact that contributors have to enter lots of meta-data at entry. Part of this annotation can be automated, thus lowering the work load for users and improving the quality of the information. Documents properly annotated are more easy to find.

   - WP 3 YP 2013

7. Full ontology of units and measures with web services for programmatic access.

   An Ontology of units of measure, quantities, and other quantitative concepts will be delivered, as part of a broader ontology of quantitative research in which quantitative knowledge (in the form of tabular data, formulas) and their origin (e.g. measurement, computation) can be expressed. The ontology of units will be used in web services that can be used by software developers. The web services will be used the Scientific Semantic

Spreadsheet S3.
- WP 2 YP 2011

8. Method and demonstrator semantic invocation of numerical methods
   Description For reuse and integration data and models produced in scientific research it is necessary to annotate them properly using formal vocaburies. However, numerical processing tools and applications typically only handle basic data types, such as numbers (float, integer), strings and booleans. To apply such methods to semantically enriched data and models, these need to be 'stripped from and dressed with semantics' before and after processing automatically.
   - WP 2 YP 2014

User studies

1. Evaluation of tool for expert participation in vocabulary development.
   The tools of supervised co-creation of vocabularies by experts are evaluated in a number of applications, for example on 'Meat alternatives'.
   - WP 1 YP 2013

2. Workshop with users and stakeholders TIFN and TIGG on fitness-for-use of vocabularies in search applications
   Description In the applications that are being developed for TIFN, TIGG and others (Tiffany, Sustainable Proteins, Plant Breeding), we will evaluate our tools for analysing and adapting thesauri to these specific applications.
   WP WP 1 YP 2012

3. First demonstrator knowledge sharing in agrifood for SME to show the potential of new search technology.
   Description Within the international consortium HighTech Europe we demonstrate and evaluate new thesaurus-based search and navigation.
   - WP 3 YP 2011

4. 2e User studies Demonstration multi-sensor data integration at Restaurant/Foodlab of the Future
   Description The Restaurant of the Future enables food research, specifically aiming at consumer perception.)It applies multiple sensors and sensor types. Semantically enriching the data produced by these sensors facilitates their interpretation and integration. In this way, the quality of the research data improves, as well as the speed at which they can be analysed.
   - WP 2 YP 2014

5. Demonstrator semantics multi-sensor data integration in Food Lab
   Description With several food scientists we evaluate the effectiveness of semantically enriching data in the Food Lab. For example, in sensory experiments different signals are being monitored. The question is how the effort of formalising these data pays back in terms of improved insight and efficiency.
   - WP 2 YP 2014

6. Workshop with Dutch top institutes on knowledge management using semantics
   Description Several technological top institutes in the Netherlands perform strategic research for Dutch and international industries. These virtual institutes have similar issues and opportunities with respect to knowledge sharing. Many of the tools developed and the experience gained in eFoodLab with TIFN and TIGG can be extended to other top institutes. This possibly leads to new initiatives in this area.
   - WP 2 YP 2011

Other results

1. PhD thesis on OQR
   This PhD thesis describes the development of a comprehensive ontology of units of measurements and associated web services. Secondly, the process of computational analysis of models and data is formalized. The underlying effect is that research data can be reused and integrated, and that computations and experiments can be reproduced.
   - WP 2 YP 2012

2. Report: Method anddemonstration triple-based search
   Detecting facts and events from the web is very interesting for example predicting food safety risks or innovation opportunities. This deliverable explores academic tools to detect relevant RFD-triples on the web. Next, knowledge rules can be applied to infer the implications of the facts and events found.
   - WP 3 YP 2014

3. Workshop with policy makers in agrifood on expert participation in vocabulary development
   The findings of the research from other deliverables of this project (Method to evaluate fineness-for-use of vocabularies, Tool for reusing existing vocabularies) will be presented and evaluated. Application context is the semantic search in a project on 'meat alternatives',)for the Ministry of Economic Affairs, Agriculture and Innovation. The application is demonstrated to the policy makers of the Ministry EL&I and I&M.
   - WP 1 YP 2013

4. Workshop food TIFN and food industry on Semantic Scientific Spreadsheet
   Description The industrial partners of TIFN have indicated that lots of their internal research

output ends up in rather informally structured spreadsheets. This severely obstructs reuse and analysis of these data. We introduce S3 in a workshop such that the tool can be disseminated to these industrial partners.

- WP 2 YP 2011