



**System for Environmental and Agricultural Modelling;
Linking European Science and Society**

**Plan for use, maintenance, dissemination and
continuation of SEAMLESS-IF beyond lifetime of the
project – final version**

PD0.1.5

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SEAMLESS integrated project aims at developing an integrated framework that allows ex-ante assessment of agricultural and environmental policies and technological innovations. The framework will have multi-scale capabilities ranging from field and farm to the EU25 and globe; it will be generic, modular and open and using state-of-the art software. The project is carried out by a consortium of 30 partners, led by Wageningen University (NL).

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Executive summary

The Problem

National, European and global agriculture continuously change as a result of an enlarging EU, WTO agreements, economic development, introduction of novel agrotechnologies, changing societal demands and climate change. Assessing developments, policies and innovations in terms of their economic, environmental and social consequences, i.e., 'integrated assessment', is vital to pro-active policy making and innovation towards sustainable development. Research models are needed for better informed integrated assessments, but fragmentation in their development and lack of operational integration methods result in poor (re-)use of research tools for integrative purposes.

Objectives of the SEAMLESS project

1. Overcoming fragmentation and poor re-use of modelling efforts concerning agricultural systems in Europe and beyond, and facilitating model linkage for integrated studies.
2. Contribute to a better informed and consistent process of impact assessment of agricultural and environmental policies through the development of a computerized framework, SEAMLESS-IF, for integrated assessment of agricultural systems.

Methodology of SEAMLESS-IF

SEAMLESS-IF is an Integrated Framework for Integrated Assessments based on linkage of individual components (models, data, indicators) that enables analyses of the environmental, economic and social contributions of a multi-functional agriculture and the effects of a broad range of issues (e.g. climate change, new policies, innovation). Typical features of SEAMLESS-IF are: 1. analytical capabilities at multiple scales; 2. different time horizons possible; 3. micro-macro analysis; 4. economic-biophysical analysis; 5. operational methods for model linkage. SEAMLESS-IF integrates model components through its software architecture named SeamFrame and shared ontology (i.e. meta information to facilitate knowledge exchange between the components).

SEAMLESS-IF includes a pan-European data base, indicator systems and a range of models, of which the main ones are: (1) APES, a modular simulation model for calculating agricultural production and its externalities, (2) FSSIM, a farm model for quantifying the integrated agricultural, environmental and socio-economic aspects of farming systems, partly using the output from APES, (3) EXPAMOD, used for up-scaling the outcomes from FSSIM to the European scale, (4) CAPRI, a comparative static equilibrium model providing information on price-supply relationships, solved by iterating supply (from EXPAMOD) and market modules, and being applied to the agricultural sector of the European Union.

Benefits from SEAMLESS-IF and its niche

SEAMLESS-IF enables *Modellers* to more easily link and re-use models, tools and data bases for integrated agricultural and environmental studies, enables *Researchers*

to do integrated agricultural and environmental studies to support ex-ante impact assessment of policy proposals on agricultural systems, and allows *Policy staff* at EC and National governments to derive information for such ex-ante impact assessments.

SEAMLESS is the only pan-European initiative in the domain of agricultural systems and sustainable development that aims at developing multi-scale methods and operational model linkage methodology for integrated assessment.

Challenge with the SEAMLES-IF continuation

By the end of the project (March 2009) we will have delivered a working proof of concept of how to consistently link the backbone models in SEAMLESS-IF and how they can be applied to two very different kinds of assessment problems. At the same time the use and application of SEAMLESS-IF in *new* assessment problems will require further investments to calibrate and evaluate model performance. *We anticipate a transition phase of three years needed to bring SEAMLESS-IF to a stage, where it can and will be readily applied to a range of impact assessment problems. The prime aim of this Business Plan is to detail what is needed in these three years.*

New research projects using or extending SEAMLESS deliverables have already been initiated through EU funding. We strongly promote an open source attitude which implies that new projects will be with new partners (which is true in these new projects as well). The SEAMLESS project is committed to show policy users (e.g. DGs in the EC and national ministries) the added value of SEAMLESS-IF and its approach, but application projects have yet to be commissioned. Both the fact that new projects will be diverse in size, aims and partnership and the fact that application studies by policy users are yet uncertain, lead us to conclude that continuity of SEAMLESS after the project's end in March 2009 is not guaranteed. Continuity will require an institutional arrangement of at least core partners and some core funding to allow for maintenance of SEAMLESS-IF and to bridge a period of three years until widespread recognition and application of the tools can finance maintenance and fuel further dissemination.

Aim of SEAMLESS Association and Satellite projects

The mission for the continuation of SEAMLESS-IF use is twofold:

1. Maintain and disseminate SEAMLESS-IF and its components to
 - a. overcome fragmentation and poor re-use of modeling efforts concerning agricultural systems in Europe and beyond,
 - b. facilitate model linkage for integrated studies,
 - c. contribute to better informed process of impact assessment of agricultural and environmental policies,
 - d. advance our scientific understanding of agricultural systems and their relation with sustainable development and integrated assessment.
2. Enable and facilitate extension of SEAMLESS-IF and its components and make a synthesis of improvements and extensions.

The vision of the continuation is that SEAMLESS-IF and its components to be used for integrated studies. The modular set-up allows further scientific advancement in specific domains and on specific models and tools. SEAMLESS-IF is a product of a European and eventually international effort. The continuation ensures a shared maintenance, use, maintenance and extension of SEAMLESS-IF and its components.

The mission and vision will be realized through first the 'SEAMLESS Association' and second, 'Satellite projects' that have an applied or research focus.

SEAMLESS Association

The SEAMLESS Association will deliver the following services (a) Maintenance and updating of the integrated framework with the latest available versions of model components and data, (b) Adding new model components (prepared as standalone components in SEAMLESS Integrated Project but not integrated in SEAMLESS-IF, or newly developed in Satellite projects), (c) Licensing of SEAMLESS Integrated Framework and providing login credentials for the server application, (d) Hosting SEAMLESS-IF, setting up the infrastructure (servers) and ensuring easy access to the framework; (e) Certifying consultancies related to SEAMLESS-IF; (f) Certifying training on SEAMLESS-IF or tightly related subjects; (g) Disseminating SEAMLESS IF and its components. The Association is generally not responsible for maintenance and updating of the separate components, and does not steer their development, unless decided otherwise by component owners. All organizations that want to use SEAMLESS-IF and its components for not-for-profit purposes, can become member of the Association if they subscribe well defined conditions, and through that they have access to SEAMLESS-IF and its components pre-installed on a server.

Two types of membership are proposed, with different privileges and fees:

Developer

- Fee or contribution: at least 10 keuro per year, possibly complemented with in kind contribution;
- Vote in further development;
- Use of all services listed above;
- Restricted support.

User

- 1) Fee: 3.5 keuro per year in first year, possibly increasing in the next years, depending on services supplied;
- 2) Use of all services listed above.

SEAMLESS-IF and most of its components and data are available under open source conditions with mandatory feedback of extensions and improvements made to the components or SEAMLESS-IF to the Association. Access to the pre-installed version of SEAMLESS-IF with login credentials is restricted to members.

Satellite projects

Members of the Association apply for new research or application-oriented projects to different international or national donors. In these projects they will apply and possibly improve SEAMLESS-IF and/or some of its specific components. Financial sources can be core funding from universities or institutes, national, EU or international donors. Examples of such projects are provided in Chapter 4. Some projects of this kind have already started (LUPIS, CCAT, PRIMA, total budget ca. 6 Meuro) or proposals have been submitted, all with EC funding. A Scottish research consortium funded from Scottish ministries is collaborating with SEAMLESS and

uses (almost exclusively) SEAMLESS tools to assess future developments in Scottish agriculture.

As a prime satellite project and initial activity of SEAMLESS Association to focus its first activities, we propose a short and very application-oriented project. The purpose of this Example application is to deliver in a limited amount of time (max. 12 months – starting early in 2009) an appealing application of SEAMLESS-IF with policy and societal relevant outcomes, which demonstrates the added value of SEAMLESS-IF and its components to users in the EC and member states. We propose the following subject of the study: *Assessment of the consequences of (continued) high prices of agricultural commodities on European agriculture and its variation in farming systems, both in socio-economic and environmental terms.*

Costs of SEAMLESS continuation: SEAMLESS Association and Example application

The Association consists of: 1) Board (5 persons, 10 days a year each) and Advisory Board; 2) Executive manager (1 fte) and 3) Technical Committee, consisting of 5-7 persons with expertise on database (0.25 fte), ontology (0.25 fte), software engineering (expertise on GUI, Java Flex, etc. - 0.4 fte) and each of the model components (0.1-0.2 fte per component), and a technical leader (0.25 fte).

Financial resources are needed for salaries, operational costs and some equipment. The funding is needed for the initial three years of the Association. Thereafter, the viability and sustainability of the SEAMLESS Association will be assessed. Our vision is that the Association should then be self-sustaining.

The Example application is to be carried out with max. 10 key partners of the current SEAMLESS consortium, being members of the Association. The project needs human resources with the proper expertise on: software engineering, database and ontology development, and expertise on each of the core model components (APES, FSSIM, EXPAMOD and CAPRI, supplemented with GTAP).

Financing the SEAMLESS association and Example Application

We estimate that the Association needs 360 k€ per year (see Section 3 for more details). Assuming 10 members of the Association (with annual fee of 5-10 k€) we need ca. 275 k€ per year core funding from key partners; each extra member reduces this contribution.

We estimate that the Example application requires a budget of 300 k€ in total (for 2009), to be financed primarily through the partners. This will be a core activity of the Association guiding and steering the work in year 1 of the Association.

For more detailed information about SEAMLESS-IF and its components, see Section 1. The main steps towards continuation of SEAMLESS-IF are given in Section 2. The structure and costs of the proposed SEAMLESS Association are described in Section 3 and a number of potential SEAMLESS-IF applications in both the policy and the scientific domains in Section 4. Section 5 describes the Service management for SEAMLESS-IF beyond 2008. Section 6 gives more detail about the finances and financing of the Association. Section 7 details the Intellectual Property Rights of SEAMLESS-IF and relevant components. Annex 1 provides the Consortium Agreement of the SEAMLESS Association.

1 SEAMLESS Integrated Framework and its components

1.1 Aims and brief description of SEAMLESS

The aim of SEAMLESS is twofold:

1. Overcoming fragmentation and poor re-use of modelling efforts concerning agricultural systems in Europe and beyond, and facilitating model linkage for integrated studies.
2. Contribute to a better informed and consistent process of impact assessment of agricultural and environmental policies through the development of a computerized framework, SEAMLESS-IF, for integrated assessment of agricultural systems.

SEAMLESS is an Integrated project within the 6th EU Framework Programme (<http://www.seamless-ip.org/>) that develops a computerized and integrated framework, SEAMLESS-IF, to compare alternative agricultural and environmental policy options (Van Ittersum et al., 2008). SEAMLESS facilitates the process of assessing key indicators that characterize interactions between agricultural systems, natural and human resources, and society. The framework operates through quantitative models, pan-European databases and qualitative procedures to simulate the impact on society of biophysical, economic and behavioural changes. It enables ex-ante assessments at the full range of scales from the global to the field level to support policy and decision making for sustainable development. It is designed to be flexible, such that it can deal with the policy issues of today and those of 2012. The framework provides an efficient start for a broad range of new analyses, though such new analyses will also require some investment in terms of data and model amendment and their consistent linkage. Example questions are:

- *What are the likely consequences of Common Agricultural Policy (CAP) reforms (e.g. quitting milk quota) on agricultural systems, rural employment, landscape and environment?*
- *What are efficient and effective policy measures within the nitrate directive or the water framework directive and does this differ between specific regions in the EU?*
- *What could be the consequence of alternative outcomes of WTO negotiations as to trade liberalization on farming systems in Europe and in less developed countries?*

Typical features of SEAMLESS-IF are: 1. analysis at multiple scales; 2. different time horizons possible; 3. micro-macro analysis; 4. economic-biophysical analysis; 5. operational methods for model linkage. SEAMLESS-IF integrates the following components through its software architecture named SeamFrame and shared ontology (i.e. meta information to facilitate knowledge exchange between the components, see Wien et al., 2007): a pan-European data base, indicator systems and a range of models, of which the main ones are: (1) APES, a modular simulation model for calculating agricultural production and its externalities (Donatelli et al., 2006a, b), (2)

FSSIM, a farm model for quantifying the integrated agricultural, environmental and socio-economic aspects of farming systems (Janssen & Van Ittersum, 2007), partly using the output from APES, (3) EXPAMOD, used for up-scaling the outcomes from FSSIM to the European scale, (4) CAPRI, a comparative static equilibrium model (Britz et al., 2007; http://www.ilr1.uni-bonn.de/agpo/rsrch/capri/capri_e.htm) providing information on price-supply relationships, solved by iterating supply (from EXPAMOD) and market modules, and being applied to the agricultural sector of the European Union; 5. PICA, a Procedure for Institutional Compatibility Assessment (Schleyer et al., 2007) that can be used in post-model analyses to assess compatibility of proposed policies with institutional constraints.

SEAMLESS-IF is a web-based, distributed software tool which means that all the necessary software needed, is kept on dedicated servers. You access and use SEAMLESS-IF with your favourite Internet browser. The framework consists of several parts, i.e., an assessment (incl. scenario) definition part, models, database and graphical user interfaces with a built-in presentation tool.

Prime potential users are 1. policy experts and integrative modelers working for DGs in Brussels (DG Agriculture, Environment, Economics and Finances, ...), including the Joint Research Centre, European Environment Agency, national ministries or regional agencies; 2. scientists in the domain of agricultural systems and environmental modeling and integrated assessment.

1.2 Planned achievements by the end of the project (March 2009)

The project ends in March 2009 and it will deliver a working version of SEAMLESS Integrated Framework with the so-called backbone components APES, FSSIM, EXPAMOD, CAPRI and the post-model tool PICA. During the final year the framework will be tested and applied for assessing (1) the effects of trade liberalisation on the agricultural markets and the agri-environmental system in the EU, and (2) the interactions between the CAP reform and specific measures and innovations in the frame of the nitrate directive on agricultural systems in 2 example regions in the EU. Although the prime purpose of the Test Cases is to test and improve SEAMLESS-IF, an important purpose is also to demonstrate the usefulness and relevance of the framework to potential users and stakeholders. We estimate that by the end of the project we will be able to present meaningful outcomes of these two test cases which may provide some interesting insights to users and stakeholders, but it is important to note that this is not the prime aim of the applications.

By the end of the project we will have delivered a proof of concept of how to consistently link the main models in SEAMLESS-IF and how they can be applied to an assessment problem. At the same the use and application of SEAMLESS-IF in new assessment problems will require further investments to calibrate and evaluate model performance. *We anticipate a transition phase of three years needed to bring SEAMLESS-IF to a stage, where it can be readily applied to a range of impact assessment problems. The prime aims of this Business Plan is to detail what is needed in these three years.*

1.3 What makes SEAMLESS unique and different from other initiatives

SEAMLESS Integrated Framework and its components are being developed in a European project (January 2005 – March 2009) with 30 partners including the leading institutes and scientists in the domain of modelling agricultural systems. The project has a methodological focus with participation from the full range of disciplines relevant for the subject: agricultural economics, agronomy, environmental science, information technology, institutional economics, social science and systems analysis.

SEAMLESS is one of the integrated projects funded under FP6 and aimed at delivering science-based methods for ex-ante impact assessment. Others are SENSOR (multifunctional land use; <http://www.sensor-ip.org/>), EFORWOOD (wood sector; <http://www.eforwood.com/>), PLUREL (urban-rural linkages; <http://www.plurel.net/>) and MATISSE (sustainable development across various sectors; <http://www.matisse-project.net/projectcomm/>). SEAMLESS is the only one with an exclusive focus on agricultural systems; the method allows extension to, for instance, rural development issues, but our core expertise is in agricultural systems. Also, its method (re-usable model components linked through a software infrastructure) is different from what the other projects use. The size and ambition of the project is unique in Europe and also internationally. In the US and Australia modelling systems are being developed for analysis of agricultural systems, but with an exclusive focus on one or two scales, e.g. GTAP (computable general equilibrium model for the global economy of which agriculture is one sector), DSSAT (cropping systems model), MIDAS (bio-economic farm model) and APSIM (cropping systems model). None of these initiatives aim at covering the full range of scales nor develop capabilities to link model components.

Projects that have some overlap with the SEAMLESS project are EURURALIS and SCENAR 2020. The EURURALIS project (<http://www.eururalis.eu/>) is a Dutch project that aims at assessing alternative scenarios and their consequences on rural areas. Its focus is on rural land use, rather than on agricultural systems, but it uses some models which overlap with those used in SEAMLESS (e.g. GTAP). EURURALIS however does not develop methods for model linkage. SCENAR 2020 (http://ec.europa.eu/agriculture/publi/reports/scenar2020/index_en.htm) is a study commissioned by DG Agriculture (EC) and aimed at exploring trends in European agriculture and rural economies till 2020. Also SCENAR 2020 overlaps with SEAMLESS in using e.g. CAPRI and GTAP. Both EURURALIS and SCENAR 2020 are more narrow in coverage of scales and associated model components, do not invest in development of model components themselves, nor in sophisticated methods for their linkage. We argue that both initiatives could benefit from SEAMLESS tools and methods.

1.4 Why is continuity not secured?

New research projects using or extending some of the SEAMLESS deliverables have already been initiated through EU funding, such as LUPIS (<http://www3.lei.wur.nl/lupis/>) and CCAT (<http://www.ccat.nl/>). We strongly promote an open source attitude which implies that new projects will be with new partners (which is true in these new projects as well). The SEAMLESS project is committed to show users (e.g. DGs in the EC and national ministries) the added value of SEAMLESS-IF and its approach, but application projects have yet to be commissioned. Both the fact that new projects will be diverse in size, aims and partnership and the fact that application studies by end users are yet uncertain, lead us to conclude that continuity of SEAMLESS after the project's end in March 2009 is not guaranteed. Continuity will require an institutional arrangement of at least core partners and some core funding to allow for maintenance of SEAMLESS-IF and to bridge a period of three years until widespread recognition and application of the tools can finance maintenance and fuel further dissemination.

2 Mission, vision and strategy for continuation of SEAMLESS-IF use

2.1 Mission

The mission for continuation of SEAMLESS-IF use is twofold:

1. Maintain and disseminate SEAMLESS-IF and its components to
 - a. overcome fragmentation and poor re-use of modeling efforts concerning agricultural systems in Europe and beyond,
 - b. facilitate model linkage for integrated studies,
 - c. contribute to better informed process of impact assessment of agricultural and environmental policies,
 - d. advance our scientific understanding of agricultural systems and their relation with sustainable development and integrated assessment.
2. Enable and facilitate extension of SEAMLESS-IF and its components and make a synthesis of improvements and extensions.

2.2 Vision

SEAMLESS-IF and its components are to be used for integrated science and studies requiring multi-scale analysis of economic, environmental and social aspects of the problems at stake. They are the product of a European effort (within the SEAMLESS project) by the leading scientists and groups in this domain. SEAMLESS-IF has a modular set-up of models and tools, which will facilitate the extension, maintenance and exchange of its components allowing advancement of science and assessment of different sort of problems. The shared (not restricted to the SEAMLESS consortium) maintenance, use and maintenance of the components allow their future applications, extension and innovation.

A SEAMLESS Association is proposed to support SEAMLESS-IF use beyond 2008. The association aims at making SEAMLESS-IF and its method for component linkages a standard for progressing science on aspects of agricultural systems and for doing integrated assessments of agricultural systems, agri-environmental interactions and policy impacts at a range of scales.

2.3 Strategy

The mission and vision will be realized through: 1. SEAMLESS Association; 2. Satellite projects that have an applied or research focus.

1. SEAMLESS Association

SEAMLESS Association will have the role to maintain, license and disseminate SEAMLESS-IF and all of its components (models, database, tools). This role can go with a distributed way of working, if that is efficient, serves the purpose of the Association and as long as legal regulations of establishing an Association permit. The Association brings together various improved and extended versions of

components, the method and expertise for model linkages, and the integrated framework SEAMLESS-IF. It also provides a standard for Quality Assurance of all the components of SEAMLESS-IF.

All organizations that want to use SEAMLESS-IF and its components for not-for-profit purposes, can become member of the Association if they subscribe well defined conditions. Members and non-members have access to SEAMLESS-IF and most of its components and data under open source conditions. Only members have access to a pre-installed version of SEAMLESS-IF on a server. Members and non-members can use SEAMLESS-IF and its components in new projects, as long as 1) proper credits are given to component developers; 2) improvements and extensions are made available and reported back to the Association; 3) there are not-for-profit purposes.

The Association has little capacity for supporting the users with questions and problems about the specific components, model linkage or the integrated framework. Comprehensive support can only be supplied through specific collaboration or agreements with the developers of a component or the Association. The Association will stimulate and co-organize training, but not finance such activities.

The Association adheres Open Source principles (see Section 7; a variant based on Mozilla Public License 1.1 (MPL 1.1)) wherever possible, which implies that members have access to the source code of components and the framework. However, to make sure that master versions of the components and integrated framework contain the latest improvements or extensions, changes or extensions to these components are controlled and certified by the Association.

2. Satellite projects

Members of the Association apply for new research or application-oriented projects. In these projects they will apply and possibly improve SEAMLESS-IF and/or some of its specific components. Financial sources can be core funding from universities or institutes, national, EU or international donors. Examples of such projects are provided in Chapter 4. Some projects of this kind have already started (LUPIS, CCAT, PRIMA, total budget ca. 6 Meuro), all with EC funding. A Scottish research consortium funded from Scottish ministries is collaborating with SEAMLESS and uses (almost exclusively) SEAMLESS tools to assess future developments in Scottish agriculture. In The Netherlands a project on adaptation strategies related to climate change has been funded.

3 Structure and costs of SEAMLESS Association

3.1 Aim and mandate of Association

SEAMLESS Association is established for delivering the following services:

- a) Maintenance and updating of SEAMLESS Integrated Framework (SEAMLESS-IF) with the latest available versions of model components and data,
- b) Adding new model components (prepared as standalone components in SEAMLESS Integrated Project but not integrated in SEAMLESS-IF, or newly developed in Satellite projects),
- c) Maintenance of the bio-economic farm model FSSIM, including implementation of extensions developed in satellite projects,
- d) Maintenance and amendment of a version of the cropping system model APES for integration in SEAMLESS-IF,
- e) Licensing of SEAMLESS Integrated Framework,
- f) Hosting SEAMLESS-IF, setting up the infrastructure (servers) and ensuring easy access to the framework;
- g) Certifying consultancies;
- h) Certifying training on SEAMLESS-IF or tightly related subjects;
- i) Disseminating SEAMLESS-IF and its components.

The Association is generally not responsible for maintenance and updating of the separate components, and does not steer their development, unless decided otherwise by component owners. All organizations that want to use SEAMLESS-IF and its components for not-for-profit purposes, can become member of the Association if they subscribe well defined conditions (see Section 3.2), and through that they have access to SEAMLESS-IF and its components. It implies they can use these components in new projects.

3.2 Membership of the Association

Two types of membership are proposed, with different privileges and fees:

Developer

- Fee or contribution: at least 10 keuro per year, possibly complemented by in kind contributions; the Board can decide that in specific cases a cash contribution can be replaced by an in-kind contribution if the specific expertise is needed;
- Vote in further development through Board;
- Use of all services listed above (Section 3.1);
- Restricted support.

User

- Fee: 3.5 keuro per year in first year, possibly increasing in next years depending on the services provided;
- Use of all services listed above (Section 3.1);
- Restricted support.

SEAMLESS-IF and its components are available under open source conditions with few exceptions as to some components and a few datasets; a pre-installed version of SEAMLESS-IF on a dedicated server is only accessible to members (developers and users) through login credentials. Developers are involved in the decision making of the Association.

Members subscribe the aims of the SEAMLESS Association and commit themselves to support the Association in realising these aims. This can be done through initiation of and participation in new projects (Satellite projects) that use, extend or apply (parts of) SEAMLESS-IF and participation in any of the activities launched by the association (e.g. related to training or dissemination).

When the SEAMLESS project ends (March 31, 2009) SEAMLESS-IF and some components will be transferred from the project to the SEAMLESS Association. Partners of the SEAMLESS project will get free access to the servers on which SEAMLESS-IF is pre-installed until September 30, 2009. Thereafter, they will have to be a member of the Association to get free access.

3.3 Organisation of the Association

The *Association* consists of:

- 1) *Board* (5 persons from the ‘Developer’ members). The composition of the *Board* at the start of the Association will be:
 - a. two members from *Parties* within Wageningen University and Research Centre,
 - b. one member from the University of Bonn,
 - c. one member from the Institut National de la Recherche Agronomique,
 - d. one member from the University of Copenhagen
- 2) Co-ordinator appointed by the *Board*
- 3) *General Assembly* with representatives from all Developer members
- 4) *Advisory Forum* with representatives from all ‘Developer’ and ‘User’ members
- 5) *Technical Committee*, appointed by the *Board* consisting of 5-7 persons with expertise on databases, ontology software engineering (expertise on GUI, Java Flex, OpenMI etc.), each of the model components and a technical leader.

Tasks of the *Board* are:

The *Board* is chaired by the coordinator who is appointed by the *Board* for a period of 2 years. WU and Research Centre provides the coordinator for the first 2 years. Tasks of the *Board* are:

- a) Proposing to the *General Assembly* aims and mandate of Association
- b) Proposing to the *General Assembly* changes to this *Association Agreement* including membership fees and types of membership (excluding access of new *Parties* to the *Association* or a change of membership type of a specific *Party*)
- c) Deciding on new *Parties* to the *Association* or a change of membership of a specific *Party*
- d) Proposing every 2 years to the *General Assembly* the new composition of the *Board*
- e) Approving new satellite projects
- f) Initiating new satellite projects to further the mission and vision of the Association
- g) Deciding on the appointment of a coordinator every 2 years being one of the members of the *Board*
- h) Deciding on tasks of the Coordinator and the composition and activities of the *Technical Committee*
- i) Deciding on the development of and modifications in SEAMLESS-IF (e.g. model extensions and improvements from satellite projects).
- j) Decides on the spending of the membership fees, this includes amongst others costs related to:
 - a. Technical and functional hosting of the different servers used for the *Association* at Wageningen University and Research Centre,
 - b. Meetings costs (excluding travel costs) of the *Board*, *General Assembly*, *Advisory Forum* and *Technical Committee*,
 - c. Specific costs identified by the *Board*, needed for the *Association* and not covered by in kind contributions from Developer members.

Decisions are taken by a majority of votes where each *Party* has a vote with equal weight. At least 2/3 of the *Parties* has to be represented in a voting.

Tasks of the *Co-ordinator*

The co-ordinator, being one of the members of the *Board*, is appointed by the *Board* for a period of 2 years.

- a) Organization of 2-4 meetings a year for the *Board* of the *Association* including electronic meetings
- b) Organization of at least one meeting every 2 years for the *General Assembly* and *Advisory Forum* including electronic meetings
- c) Dissemination activities (flyers, newsletters, website, presentations)
- d) Organization of training
- e) Steering and organizing the *Technical committee*
- f) Overseeing the projects (research and applications) that use SEAMLESS-IF (also interacting in the proposal writing and the reporting phases)
- g) Replying to the open source community (partly done by the *Technical committee*)
- h) Organizing the legal issues with respect to the *Association* such as the *Association Agreement*

- i) Yearly financial planning and reporting
- j) Yearly reporting on activities of the *Association*
- k) Registration of new members
- l) Organization and preparation of annual meeting
- m) Preparing certification of training and consultancies

The co-ordinator assigns the day to day work (0.5-1 full time equivalent; fte) to an executive manager. The work of the executive manager is the responsibility of the co-ordinator

Tasks of *General Assembly*

The *General Assembly* is composed of representatives from all Developer members (see Article V). Tasks of the *General Assembly* are:

- a) Deciding on aims and mandate of Association proposed by the *Board*
- b) Deciding on changes to this *Association Agreement* including membership fees and types of membership proposed by the *Board* (excluding access of new *Parties* to the *Association* or a change of membership type of a specific *Party*)
- c) Deciding on the new composition of the *Board* proposed by the *Board* every 2 years.

Decisions are taken by a majority of votes where each *Party* has a vote with equal weight. At least 2/3 of the *Parties* has to be represented in a voting.

The *General Assembly* meets at least once every 2 years. This also includes electronic meetings

Tasks of *Advisory Forum*

The *Advisory Forum* is composed of representatives from all “Developer” and “User” members and shall be chaired by the coordinator. The *Advisory Forum* shall

- a) Advise the *Board* of SEAMLESS *Association* on the extensions and new versions of SEAMLESS-IF,
- b) Advise the *Board* of SEAMLESS *Association* on future satellite research projects to be initiated. Such projects may focus on specific extensions or applications,
- c) Advise the *Board* of SEAMLESS *Association* on any other strategic and operational issues concerning maintenance, dissemination and capacity building of SEAMLESS-IF and the underlying aims.

The *Advisory Forum* meets at least once every 2 years. This also includes electronic meetings

Activities of the *Technical committee*

The *Technical committee* is appointed by the *Board*, its tasks are:

- Technical and functional hosting of the different servers used for the *Association* at Wageningen University
- Updating the data bases (annual updates which relate to existing and new data bases; addition of data from other projects)
- Adjusting data base structure (i.e. extension of ontology)

- Integration of updated model components or new model components (advice on model updates, on the integration of models and on the integration of (new) models); this requires sufficient knowledge of the various model components and of OpenMI
- Updating baseline scenarios
- Updating indicators (including (new) indicator framework; integrate (new) indicators)
- Contributing to training material and training sessions

Required expertise in the *Technical Committee*:

- Professional setting up and hosting of server(s), incl. server itself (0.25 fte and 30 keuro)
- Data and database expertise, incl. soil, weather, agro-management, farming, socio-economic and policy data and PostgreSQL (0.25 fte)
- Ontology development and maintenance (possibly combined with other expertise in several persons) (0.25 fte)
- Software engineering: development and maintenance of Graphical User Interfaces, Java Flex, GIS, OpenMI (0.4 fte)
- Profound knowledge of the (types of) model components in SEAMLESS-IF (0.1-0.2 fte) per component:
 - APES – cropping system simulator
 - FSSIM (AM and MP) – bio-economic farm model
 - CAPRI – agricultural sector model
 - EXPAMOD – econometric extrapolation model
 - GTAP – computable general equilibrium model
 - Landscape and spatial components, incl. GIS expertise
- Technical overview (0.25 fte)

Tasks of the *Executive manager* (1 fte):

- Organisation of about 2 meetings a year for the Board of the Association
- Dissemination activities (flyers, newsletters, website, presentations)
- Organisation of training
- Steering and organising the Technical committee
- Overseeing the projects (research and applications) that use SEAMLESS-IF (also interacting in the proposal writing and the reporting phases)
- Replying to the open source community (partly done by the Technical committee)
- Organizing the legal issues
- Financial planning and reporting
- Registration of new members
- Organisation and preparation of annual meeting
- Organisation of meetings of the Technical committee
- Preparing certification of training and consultancies

3.4 Work plan SEAMLESS Association year 1

3.4.1 Goals of the first year

- Transfer SEAMLESS-IF components to SEAMLESS Association
 - Legally
 - technically
- Establish the organization
 - people and roles
 - software infrastructure
 - Open source community support
- Support the “high price” case study
- Improve SEAMLESS-IF
- Acquire new projects

3.4.2 Envisaged results

- Operational SEAMLESS Association (including support organization)
- Improved and operational SEAMLESS-IF
- New projects that make use of services of the Association

3.4.3 Work plan

In the first year of the Association the activities can be divided in:

- Coordination
- Maintenance and support
- Further development
 - Software development (integration, GUI)
 - Model development
 - Updating/developing data and indicators
- Extending SEAMLESS-IF for the high price scenario
- Dissemination

Coordination

In the first year the coordination will be very important and time consuming. The tasks of the coordinator are described in paragraph 3.4.

The formal launch and first year of the Association will need the following actions related to the coordination:

- Appoint Board and the technical committee.
- Describe the rules of the Association (statutes or other agreement)
- a kick-off meeting where the work plan will be discussed and details of the planned activities are defined with budgets and responsible people. (All partners involved)
- Define corporate identity , e.g. new logo, template
- Design and Implement new website
- Financial administration (via board treasurer)

- Acquisition and networking: attend conferences, join other project meetings to link up to other interesting developments, projects
(Total resources needed: 80 days)

Maintenance

The formal first year of the Association will need the following actions related to the maintenance and support:

- Buy/hire appropriate hardware configuration including technical support (see business plan section on Service Management)
- Install SEAMLESS-IF final version
- Test SEAMLESS-IF final version
- Make components open source available (e.g. change headers)
- Functional support during first year.
(Total resources needed: 70 days + 30 kEuro)

Further development

The formal first year of the Association will need the following actions related to the further development:

- Complete the SeamFrame refactoring and expected functionalities (based on trac tickets for milestone “beyond final version”)
 - User management; full implementation for all screens
 - Check for experiment updates (to decide to re-compute the experiment)
 - Advanced SEAM:Pres
 - Code generator improvement
 - Online help
 - GOF visualisation
 - Multi user
 - Single CAPRI
 - Single APES
 - CAPRI-GTAP link
(Total resources needed: ca 100 days)

Extending SEAMLESS-IF for the high price scenario

- Extend SEAMLESS-IF (components) for requirements of coming applications (e.g. high price scenario, new satellite projects)
 - Update ontology (incl. ontology knowledge sharing)
 - Extend the experiment designer (CAPRI part)
 - Adjust wrappers
 - Technical coordination, communication
(Total resources needed: ca 60 days)

Dissemination

- Build and manage contact database (10 days)
 - Develop dissemination plan (what, who, when, why) (15 days)
 - Organize a training for users (15 days)
 - Write 2 journal papers (30 days)
 - Preparing certification of training and consultancies (10 days)
- (Total resources needed: ca 80 days)

Time schedule of Workplan SEAMLESS Association; schedule starting from launch (M1-M12).

activity	1	2	3	4	5	6	7	8	9	10	11	12
Coordination												
Appoint Board and the technical committee	█											
Describe the rules of the Association (statutes or other agreement)	█	█										
a kick-off meeting		█										
Corporate identity		█	█	█	█	█	█	█	█	█	█	█
Acquisition and networking		█	█	█	█	█	█	█	█	█	█	█
Financial administration		█	█	█	█	█	█	█	█	█	█	█
maintenance												
Buy/hire appropriate hardware configuration	█											
Install SEAMLESS-IF final version		█										
Test SEAMLESS-IF final version		█	█	█	█	█	█	█	█	█	█	█
Funtional support during first year		█	█	█	█	█	█	█	█	█	█	█
Further development												
Complete the SeamFrame refactoring	█	█	█									
Implement (part of) beyond final version trac tickets		█	█	█	█	█						
Additional requirements for coming applications		█	█	█	█	█	█	█	█	█	█	█
Dissemination												
Build and manage contact database	█	█	█	█	█	█	█	█	█	█	█	█
Develop dissemination plan	█	█	█									
Organize training						█	█	█				
Preparing certification of training				█	█	█						
High price scenario												

3.5 Costs and budget

Financial resources are needed for first, money for meetings and travelling (10 k-euro per Board meeting) with two meetings a year (5 persons, 2 days per meeting, 10 days of work per year), second, salary for one full-time person for daily organization and system maintenance and third, development (this is the work of the Technical committee which does the specialised work, dissemination activities, and contact with the related projects).

Funding is needed for the initial three years of the Association. Thereafter, the viability and sustainability of SEAMLESS Association must be assessed. The long-term vision is that the Association should be self-sustaining.

All the costs are made for a starting period of 3 years and consist of the following amounts per year:

- Technical committee 150 k€
- Executive manager 100 k€
- Board for its labour 50 k€
- Meeting/travelling of Board 20€
- Hardware (incl. server) and material costs max. 30 k€
- Travel costs of the Technical committee 10 k€

Total cost per year = max. 360 k€

4 Possible Satellite projects for the short and the long term

The first section describes an application of SEAMLESS-IF for analyzing the impacts of high agricultural commodity prices (as driven by a possible, rapidly increasing demand for agricultural products from the bio-fuel sector and countries in East- and South Asia), which is to be performed in 2009. In Section 4.2 we elaborate what options we see to exploit SEAMLESS-IF in the policy domain, through potential applications of the framework and its components. Section 4.3 presents issues for new research in the scientific domain, which either extend SEAMLESS-IF or extend and develop new components.

To promote the SEAMLESS Association and to stimulate new Satellite projects, a dedicated project with an Example application of high interest to a range of users would be a great asset. Hence, we formulate such a project in Section 4.1.

4.1 Example application – Integrated assessment of a ‘high price scenario’ and agricultural systems in the European Union

4.1.1 Purpose and hypothesis

The purpose of the research proposed is to deliver rapidly (one year; preparations starting January-March; actual application April-December 2009) an appealing application of SEAMLESS-IF with policy and societal relevant outcomes, which tests the added value of SEAMLESS-IF and its components. The test will be targeted at both the scientific community and at the European Commission (DG Agriculture, DG Environment, JRC), EEA and several member states. For this purpose we propose the following application subject: *Integrated assessment of the consequences of (continued) high prices of agricultural commodities on European agriculture and its farming systems, both in socio-economic and environmental terms.*

Prices of agricultural commodities have increased considerably, particularly over the past 1-2 years (FAO, 2008), due to lower global supply and higher demands as a result of economic development with a higher demand for livestock products and biomass use for bio-fuel production. Whether the present peak of prices is permanent remains to be seen, but there is consensus that prices will not return to the level of 2005 and before. Continuing higher prices for agricultural commodities would be a real trend break and unprecedented since the introduction of the Common Agricultural Policy (CAP) in the European Union. It raises new questions regarding the reform of the CAP in 2013, with framework conditions having moved away from food abundance, milk lakes and butter mountains that drove many of the reforms in the past (EC, 2008). What effects do high prices have on agriculture in the European Union as a whole and how do regions, differentiated in productivity and production orientation, respond to this new economic environment? Will a sustained price increase for key agricultural commodities lead to further intensification of agricultural production and what environmental consequences arise from this for the EU as a whole and in specific “problem regions”? As there is a large variation in farming

systems across the EU (Andersen et al., 2007), the SEAMLESS system is especially suited to analyse the variation in responses across farming systems differing in size, intensity or specialisation. Through the unique link of bio-physical and economic tools, it will be able to provide policy relevant information by identifying the socio-economic and environmental effects at farm, regional and market level in a consistent fashion.

The aim of the proposed research is to investigate and assess the socio-economic and environmental consequences of sustained high prices at multiple scales, i.e. effects on a European, national, regional and farming system level. Interactions with reforms of the Common Agricultural Policy as well as policy-induced demands of biomass for bio-fuel will be addressed in a scenario-approach. The analysis is supposed to test the following hypotheses:

Main hypothesis: A sustained level of high demand and drought related supply shortages in important regions of the world will lead to strong reactions of the European agricultural sector, increasing supply of high price commodities accompanied by negative environmental consequences due to intensification of agricultural production.

Sub-hypothesis 1: Worldwide producer reaction and abolition of set-aside in the European Union will mitigate some of the price effects in the medium term.

Sub-hypothesis 2: Continuation of current supply and demand structures will favour intensive arable farms in economic terms and increase related emissions of nutrients and climate relevant gases.

Sub-hypothesis 3: Continuation of current supply and demand structures will decrease relative profitability of livestock production leading to smaller increases in production and related emissions of nutrients and climate relevant gases as well as medium term price increases for livestock products.

The analysis will make use of the modelling chain included in SEAMLESS Integrated Framework (SEAMLESS-IF), with a cropping systems model simulating relationships between weather, soils and management, a bio-economic farm model simulating responses of major European farm types, an agricultural market model simulating price-supply relationships for agricultural commodities and a computable general equilibrium model, simulating the global economy (van Ittersum et al., 2008). The model chain includes a method to derive agro-technical information from field level for the farm analysis, and procedures to spatially allocate results from farm level to a region and to upscale results from farm analysis to the market level and back.

A pan-European database contains the relevant information on European soils, weather, farming systems, and agro-management for a sampled set of regions, agro-economic information for the supply and demand modules of the sector model and policy information.

The project aims to assess the re-usability of SEAMLESS-IF in terms of relevance and adequacy of the tools and in terms of precise efforts needed to use the research framework for this new question: all steps and investments will be carefully monitored which will yield important information for the future maintenance, improvement and organisation of the integrated framework.

4.1.2 Envisaged results

The concise project will produce the following results:

Synthesis of the SEAMLESS project:

1. A full synthesis and testing of what has been developed in the SEAMLESS consortium. Relevance, rigour and re-usability will be assessed through respectively a. interactions with users; b. monitoring of investment (parameterization and possibly extensions or amendments) needed to re-use the framework for a new problem; c. publication in a high-profile journal;

Spin-off of the SEAMLESS project:

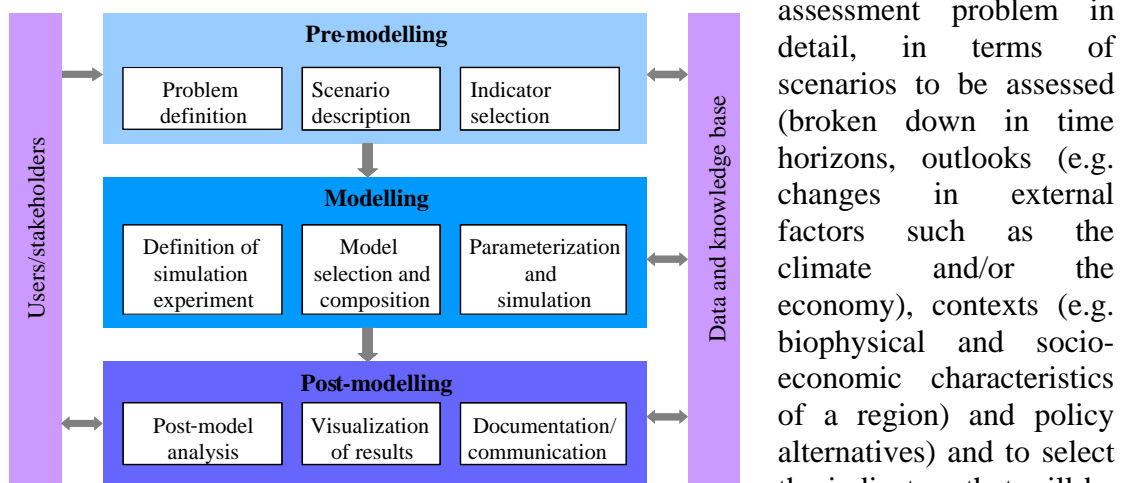
2. Integrated assessment of the implications of continued high prices of commodities on European agriculture at different hierarchical levels and in environmental, economic and social terms;

Leverage role for new projects in the frame of the proposed SEAMLESS Association:

3. Raising scientific interest in various disciplines through several scientific papers, of which one in a high-profile journal;
4. Raising and settling interest in the research tools and approach amongst policy agencies at EU and national level.

4.1.3 Workplan and timetable

The workplan will be structured along the figure below, distinguishing a pre-modelling, modelling and post-modelling phase. The project will last max. 12 months, starting in January 2009. The first three months will be used to define the assessment problem in detail, in terms of scenarios to be assessed (broken down in time horizons, outlooks (e.g. changes in external factors such as the climate and/or the economy), contexts (e.g. biophysical and socio-economic characteristics of a region) and policy alternatives) and to select the indicators that will be



assessed. This phase will be executed in close interaction with stakeholders in the EC and of ministries of several member states (e.g. The Netherlands, Czech Republic,

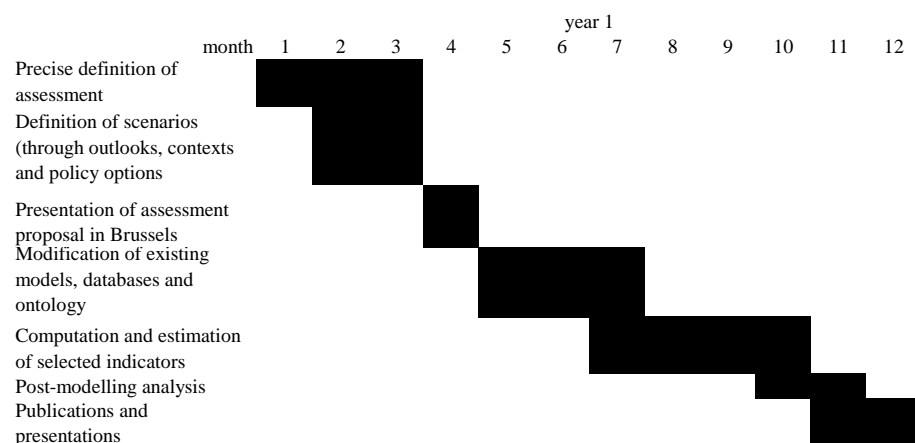
France, Germany and Sweden). The proposal will be presented in Brussels during a workshop (April 2009) on impact assessment of agricultural and environmental policies.

The modelling phase of the project will start in April and continue for approx. 6 months. Necessary (but restricted) extensions in models, databases and ontologies will be defined and implemented and extra data will be assembled. The final three months will be used for the post-modelling phase. This will include an uncertainty and sensitivity analysis to connect some margins to the results of the analysis. Also a presentation in Brussels and in one or more member states will be organized. Several journal articles will be written, of which at least one will be targeted at a high-profile journal showing both methodological advances of SEAMLESS-IF and the analytical results for the high price scenario.

Work plan elements:

1. Investigation of current situation on world markets. Identification of demand and supply developments differing from past long term trends leading to current price hausse.
2. Definition of scenarios based on step 1 and various policy options that for example result in an increased biomass demand for bio-fuel production (pre-modelling phase).
3. Definition of the required changes in the models, linkages, data bases and ontologies based on the scenario definition (point 2).
4. Modification of existing models, linkages, databases and ontology. Model adjustments may comprise: a. the introduction of alternative production activities (compared to the current farming system) to allow for changes in the activities of arable and/or livestock farming systems; b. integration of perennials and/or bio-energy crops in FSSIM; c. the parameterisation of models to other bio-physical and/or socio-economic conditions, and d. possibly the integration of GTAP.
5. Computation and Estimation of selected indicators with the partially modified SEAMLESS modelling chain (Modelling phase).
6. Aggregation, interpretation and presentation of results (post-modelling phase).

Time schedule of major steps in the project:



4.1.4 Project structure and project members

The project will be carried out by core members of the SEAMLESS Association that bring in own resources for this application. A project leader will be assigned. The project needs project members with the following expertise (4-5 fte in total):

- project leader – 0.2 fte
- SEAMLESS-IF expertise – 0.5 fte:
 - the integrated assessment procedure as used in SEAMLESS-IF;
 - profound knowledge of the graphical user interface of SEAMLESS-IF;
 - sufficient knowledge of the problem to be investigated, model components and their interactions, and SeamFrame.
- software engineering (SeamFrame and GUI development) – 1 fte (could be 2 persons with complementary expertise):
 - profound knowledge of SeamFrame, OpenMI and wrapping of components;
 - profound knowledge of GUI of SEAMLESS-IF and Flex software.
- database and ontology development – 0.5 fte (could be 2 persons with complementary expertise):
 - profound knowledge of the SEAMLESS ontology;
 - sufficient knowledge of Protégé to enter the ontology;
 - sufficient knowledge of conventions of Semantic-Rich-Development Architecture (SeRiDa) to translate ontology to relational database;
 - sufficient knowledge of the used datasets: FADN, climate data, soil data, farm management data (based on simple and detailed surveys), COCO/CAPREG data with policy information;
 - sufficient knowledge of metadata according to ISO and INSPIRE standards.
- expertise on contents and software implementation of each of the core model components and their linkages with other components – 0.3-0.7 fte for each component (could be 2 persons per component with complementary expertise):
 - APES;
 - FSSIM-AM and FSSIM-MP;
 - EXPAMOD;
 - SEAMCAP;
 - GTAP.

We estimate a budget of 300 k€ in total, to be financed primarily through the 5-10 key partners.

4.1.5 Clients and Financing

It is proposed to finance the project primarily with funds from a limited number of SEAMLESS partners or national funds to enable an efficient and fast start, to raise broad interest amongst potential users for this project and to seek their participation in a Stakeholder forum.

4.2 Potential Application projects

4.2.1 Subjects

We list some examples of potential applications, but these should be elaborated with the users. Such new applications can in principle deal with policies and their interactions with technological development with a) different time horizons, b) different regions, including developing countries, c) other issues and hence other interactions, and d) stressing other scales. Examples we can think of today include:

1. CAP reform

- Health check of CAP (ex-post) and beyond
- Assessment of CAP reform options 2013 (cf. Scenar 2020; http://ec.europa.eu/agriculture/publi/reports/scenar2020/index_en.htm). Scenar 2020 aims at identifying future trends and driving forces that will be the framework for the European agricultural and rural economy towards 2020. Some of the models used in this study are also be part of SEAMLESS-IF and SEAMLESS-IF can also offer analysis at micro level and on environmental issues. It seems likely that similar studies will be needed in the preparation of the reform of the CAP in 2013. We anticipate that SEAMLESS will be able to perform such studies, examining the impacts of policy measures on agriculture and sustainable development, both efficiently and effectively
- Cost benefit assessments of CAP reform measures, including costs and benefits in the economic, social and environmental domains. This may include reforms of the first and second pillars of the CAP.
- Budget reductions and re-allocations; impact assessment of different approaches for distributing the EU-funding for rural development
- Environmental consequences of a redistribution of the Pillar on payments, including a reduction of CAP expenses
- Sugar reform impacts (ex-post)
- Changes in payments and regulations for High Nature Value farming
- 2nd pillar rural development
- Structural changes in agriculture and their impacts on the environment

2. WTO negotiations

- Impact assessment of further trade liberalization scenarios (e.g. abolishment of milk quota)
- 3. Assessing implementations of Water and Nitrate framework directives*
- Detailed assessment of the impacts of different strategies for how to achieve the goals of the Directives as well as the Cross compliance rules
 - Introduction of a price of water for different states and regions in Europe
- 4. Impact assessment of European climate change adaptation and mitigation options*
- Impact assessment of the bio-fuel directive and associated policies focussing on its effects on both economy and environment on multiple scales
 - Assessment of the effects of climate change scenarios on the European agriculture with a specific focus on the availability of water
- 5. Ex-ante assessment of (a subset of) the IRENA indicators (with EEA, EUROSTAT, DG Agriculture and DG Environment)*

4.2.2 A Strategy towards clients

As prime users and prime interested parties in applications we envisage DG Agriculture, DG Environment, DG Economics and Finances, Joint Research Centre and European Environment Agency; however, as advised by the recent EC Review (2008), we will also increasingly seek interaction with national or regional Ministries. We believe that several of the issues of high interest at the EU level also are of high interest at the national level, such as the framing of regional and national action plans to fulfil the defined goals of several directives, the impacts on rural development of an increased focus on the second pillar of the CAP, etc.

The Knowledge and Dissemination Plan of the project describes the strategies to interact with the various user categories, e.g. through the User Forum and through the testing of SEAMLESS-IF. One of the purposes of these interactions is to raise the interest in applications with SEAMLESS-IF, which could ultimately result in the concretisation of a project along different pathways:

1. A specified project with e.g. DG Agriculture and JRC or EEA
2. Specified projects financed through national funds
3. Collaborations with other (existing) projects; SEAMLESS has close relationships with a range of new projects, some of which has strong partnership from the SEAMLESS consortium; examples are: LUPIS, CCAT, etc.

4.3 New research questions for Potential Research projects

4.3.1 Topics for new research in long term

An integrated assessment framework such as SEAMLESS-IF, by March 2009, will not be the final version of the framework. It will be a working version, which can be used for some applications and will require some well-defined new actions for specific applications. At the same time, new research will be needed to improve the science, concepts and methodologies of SEAMLESS-IF, to extend its capabilities in terms of spatial aspects and time horizon (currently, the frame is targeting at short to medium term time horizons, up to 2020-2025) and to strengthen its capabilities for assessing rural development issues. In short, we think the new research deals with extending modelling capabilities for new scientific insights and for enabling applications. These extensions can refer to:

- Improving the modelling of specific processes (e.g. farm decision making) and the scaling (e.g. micro-macro linkages)
- Space: EU enlargement, developing countries, lateral interactions
- Time: short, medium and longer time horizons
- Domains: agricultural sectors (horticulture, intensive livestock, forestry, ...), rural development

We have identified the following topics as essential future research subjects:

1. Impact assessment requires multi-scale capabilities, including methods for up- or downscaling from field-farm to region, EU and globe and vice versa. In SEAMLESS-IF we have adopted one type of scaling, in which individual model components targeted at specific scales are linked through either statistical meta-models or typologies. Once such framework is in place, there are other methods for scaling that could be developed and tested and which may be superior for some applications. An important research subject would be to explore alternative routes of scaling for e.g. micro-macro analyses (farm–market interrelationships) and micro-meso linkages (farm type–landscape interrelationships);
2. Generally impact assessment tools are strong in quantifying environmental and economic aspects, but quite poor in social and institutional dimensions of sustainability, including valuation by humans of agricultural systems and rural development issues. Improving capabilities in this domain requires an integrated approach; social and institutional aspects must be assessed not in isolation, but using and exploiting the biophysical and economic dimensions (and vice versa). For instance, post-model analysis of bio-economic models may form a basis for assessing social indicators;
3. Extending capabilities to assess second pillar aspects: contributions from agriculture to rural development;
4. Improving our understanding of structural changes in European agriculture in relation to changes in the CAP, and their impacts on the environment and employment in agriculture;
5. The spatial capabilities of impact assessment of agricultural systems models are modest. Generally, lateral interactions between spatial units are largely ignored.

For assessing environmental, biodiversity and landscape quality issues, explicitly including such lateral interactions is essential;

6. Extension of impact assessment capabilities for non land-bound agricultural sectors, i.e. horticulture and intensive livestock systems, both in EU, the Mediterranean and tropical regions exporting these products to Europe;
7. Using ex-ante impact assessment tools for ex-post policy monitoring and evaluation; this requires tools and approaches that use remote sensing data;
8. Innovative methods for simulating farm behaviour and its dynamics, such that results can be up-scaled to and downscaled from macro analyses;
9. Agenda for future data collection, e.g. data on farm management and data related to the social domain.

Naturally, such new research should be interrelated with applications.

4.3.2 A strategy towards clients

We envisage that this new research (see Section 4.3.1) for extending modelling capabilities and scientific insights and for enabling applications with SEAMLESS-IF, can be performed in collaboration with and/or funded by:

- FP7: DG Research (Theme 2 (Food, Agriculture and Fisheries, Biotechnology); Theme 6 (Environment, including Climate Change))
- ERAnet
- GMES, JRC, EEA
- National funding agencies (e.g. BSIK, ministries of Agriculture, Economic Affairs or Environment)
- International cooperation (e.g. US and Australia)
- International funding agencies (e.g. IFAD, Challenge Programmes of CG System)

5 Service management for SEAMLESS-IF beyond 2008 and cost estimation

For the continuation of SEAMLESS beyond the lifetime of the project, it is a critical success factor that the SEAMLESS-IF infrastructure is available, maintained and accessible. This memo describes first, the service management plan to support this and second, gives an estimation of the involved costs.

5.1 Service Management

A possible way of organization for the SEAMLESS service management is depicted in Figure 1.

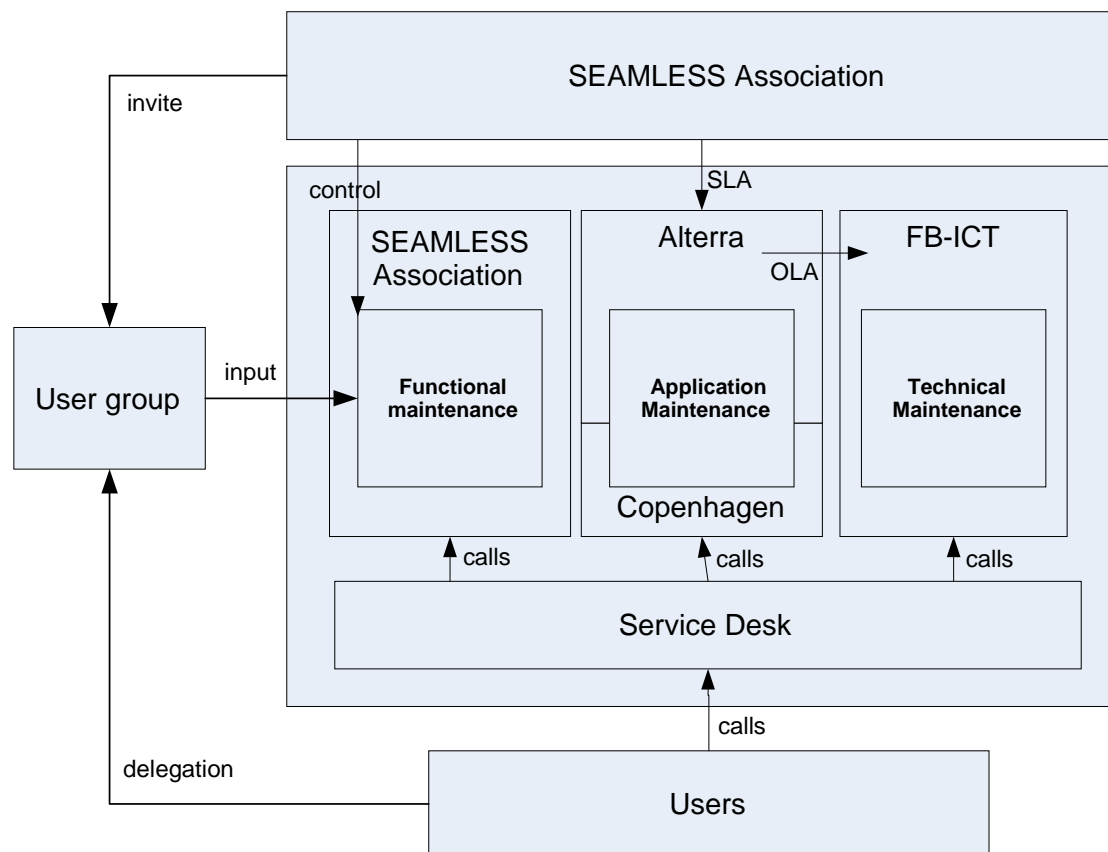


Figure 1 – SEAMLESS Service Management Organization

Three maintenance levels are distinguished: Functional maintenance, Application Maintenance and Technical maintenance. The main responsibility of functional maintenance is to maintain a functional information system that fits to the processes of the system users. Application maintenance deals with the management, maintenance and renewal of the application(s). The responsibility for technical

maintenance is the maintenance of the technical infrastructure and the availability of the IT system.

The SEAMLESS Association

The SEAMLESS Association is the owner of the SEAMLESS application. From its responsibility to offer continuity and availability of SEAMLESS to the users it contracts out the executing of the operational processes to an external party. Its role is:

- System owner
- Responsible for outsourcing of maintenance activities
- Responsible for the organization of the SEAMLESS user group
- Hosts the service desk through the SEAMLESS website
- Organizes the **service desk**, collects calls and Requests For Changes (RFC's), decides on the definition of **functional adaptations** to the SEAMLESS system, passes relevant issues to application maintenance and technical maintenance.

Alterra, Wageningen UR

Alterra is responsible for application and technical maintenance of the SEAMLESS-IF minus the SEAMLESS data bases. Its processes requests for change are provided through functional maintenance. Alterra subcontracts the technical maintenance to WUR FB-ICT, the IT service department of Wageningen UR.

- responsible for **application maintenance** and **technical maintenance** through an Service Level Agreement (SLA) with the SEAMLESS Association
- performs application maintenance
- responsible for technical maintenance contracted out to FB-ICT

Univ. of Copenhagen (UOC)

UOC is responsible for application and technical maintenance of the SEAMLESS data bases. Its responsibility is similar to that of Alterra (see previous paragraph), but is focused only on the data bases of SEAMLESS-IF.

FB-ICT Wageningen UR

FB-ICT performs the technical maintenance of the SEAMLESS system. They host the technical architecture and take care of system administration, security issues and the technical availability of the hardware and OS-software.

- performs technical maintenance
- is responsible for technical maintenance through an Operating Level Agreement (OLA) with Alterra

User group

The user group is a group that is composed by the SEAMLESS Association and consists of SEAMLESS users.

- Advise on functional requirements and releases
- Advise on prioritizing RFC's
- Testing of changes and releases

5.2 Cost estimation

Technical maintenance

Based on [1] and the currently available infrastructure in the SEAMLESS project we can define the following minimal configuration:

- database server (Postgres), also runs SVN and Trac system; physical server current configuration unknown (Intel based system running Ubuntu Server Linux, disk approx. 250 GB, memory approx. 2 GB, CPU unknown)
- web server for WMS/WFS server (in Copenhagen); current configuration unknown
- Production server: running Models and SeamFrame (Process Services and Seam Services, and SeamGUI) for production purposes, accessible to users; virtual server, CPU 2x3.1 Ghz, Memory 2 GB, Diskspace 200 GB
- Test server: running Models and SeamFrame (Process Services and Seam Services, and SeamGUI) for testing purposes, accessible to developers; virtual server, CPU 2x3.1 Ghz, Memory 1 GB, Disk space 60 GB
- Integration build server (development): virtual server, CPU 1x1.5 Ghz, Memory 1 GB, Disk space 40 GB

The above configuration is currently being tested, which already has proven that it is not sufficient. Running the models is very resource demanding, which has a negative effect on the overall response time in SeamGUI. A first conclusion is that it is better to separate the model execution (Models + Process Services part of SeamFrame) from the rest (Seam Services) and run them on servers that do not influence each other. So, either physically different servers or virtual servers that can be completely separated.

Estimation of yearly costs for hardware and technical maintenance of this configuration is as follows:

Hardware component	Specs	Estimation – €/ year
Database server	Physical server Dual quad core CPU 4GB memory SAN connection	5.500
- storage 100 Gb	FC / SAN	1200
Webserver	Virtual server	2500

	1 CPU 1,5 Gb memory	
Production server	Virtual server 2 CPU 3 Gb memory	3000
- storage 200 Gb	FC / SAN	2400
Test Server	Virtual server 1 CPU 1,5 Gb memory	2500
- storage 100 Gb	FC / SAN	2400
Integration build server	Virtual server 1 CPU 1,5 Gb memory	2500
- storage 100 Gb	FC / SAN	2400
Total		24.500

Application Maintenance

It is hard to perform an estimation of the costs for application maintenance of the SEAMLESS software. It is uncertain how many users are going to use the system and what their specific requirements will be. It is also hard to predict how many and what kind of RFC's are going to be submitted, how these will be prioritized and which ones will be included in new releases.

We propose to allocate a provisional budget for the first year of € 25.000, -- for application maintenance (this is *additional to the technical maintenance*). Depending on the usage of this budget, adjustments could be made on a temporal basis and better insight in budget requirements for subsequent years could be obtained.

At the moment (considering current state of development) it seems likely that additional budget should be allocated to update the "research" version of SEAMLESS (the result of the project) into a "production" version of it. This poses some new requirements (e.g. scalability, reliability, performance, security), which are currently very low on the priority list.

Functional Maintenance

We propose to position functional management as an activity of the SEAMLESS Association. Incoming functional calls could be processed, documented and prioritized on an temporary (?) basis, resulting in one or more requests for new releases to the application maintenance group. The application maintenance group can estimate the required budget, after which the SEAMLESS association can decide about implementation of the release.

6 Financing the Association and Satellite projects and Estimated Spin-off

6.1 Financing SEAMLESS Association

During the first three years of the Association (from April 1, 2009) it will be financed through three different sources:

1. Membership fee: annual fee of 10 keuro is proposed for an institutional membership as a developer and 3.5 keuro as a user;
2. In kind contributions from members: a developer/owner of a component which is part of SEAMLESS-IF, might contribute 1-3 person months or more in kind to provide the expertise needed in the Technical committee; this contribution may substitute a cash contribution but this is to be decided by the Board;
3. Financial contribution from core funding of some key partners.

We estimate that the Association needs max. 360 k€per year (Section 3.3). Assuming 10 members of the Association we need ca. 275 k€per year core funding from key partners; each extra member reduces this contribution. The ca. 275 keuro should be covered from, possibly in-kind, contributions from the Developer members of the Association.

The table below provides an overview of the financial promises so far. Most partners do not discriminate between the Association and High price scenario, so it is hard to separate. Value of in-kind contributions has been estimated.

From this table it is clear that we still need ca. 275 keuro or pm equivalents for year one. There seem to be chances for another 50-75 keuro (or 5-8 pm) from Wageningen partners. The remaining >200 keuro should come from other partners.

6.2 Financing Satellite projects

6.2.1 Example application project

It is proposed to carry out an Example application (Section 4.1) with 5-10 key partners of the SEAMLESS Association. The project should run between January and December 2009. The project needs human resources with the proper expertise on: software engineering, database and ontology development, and expertise on each of the core model components (APES, FSSIM, EXPAMOD and CAPRI, supplemented with GTAP). We estimate a budget of 300 k€ in total, to be financed through the partners of the Association (see Annex 2).

6.2.2 Satellite projects

Sections 4.2 and 4.3 list potential subjects for new projects, with respectively a more applied and a more scientific focus. A number of satellite projects have been funded and started already. We assume this shows that it will be possible to formulate and finance a range of new satellite projects within the coming three years, primarily through European and national funding agencies (see above for concrete suggestions as to clients and donors).

6.3 Spin-off effect of the SEAMLESS Association

This section gives an overview of the expected (financial) spin-off of the SEAMLESS Association for its members.

The described spin-off is mainly about new (Satellite) projects in existing and new markets. It is not about the other value added described in this Continuation plan.

The SEAMLESS Association will be an accelerator for the innovation cycle (Figure). Experience and feed-back from the application of SEAMLESS-IF will be transformed in innovation needs and research questions. Through participation in the SEAMLESS Association, members will be “first in mind” (for both clients and research partners) when it comes to impact assessment studies. This will result in more (international) projects in which SEAMLESS-IF is being applied or further developed.

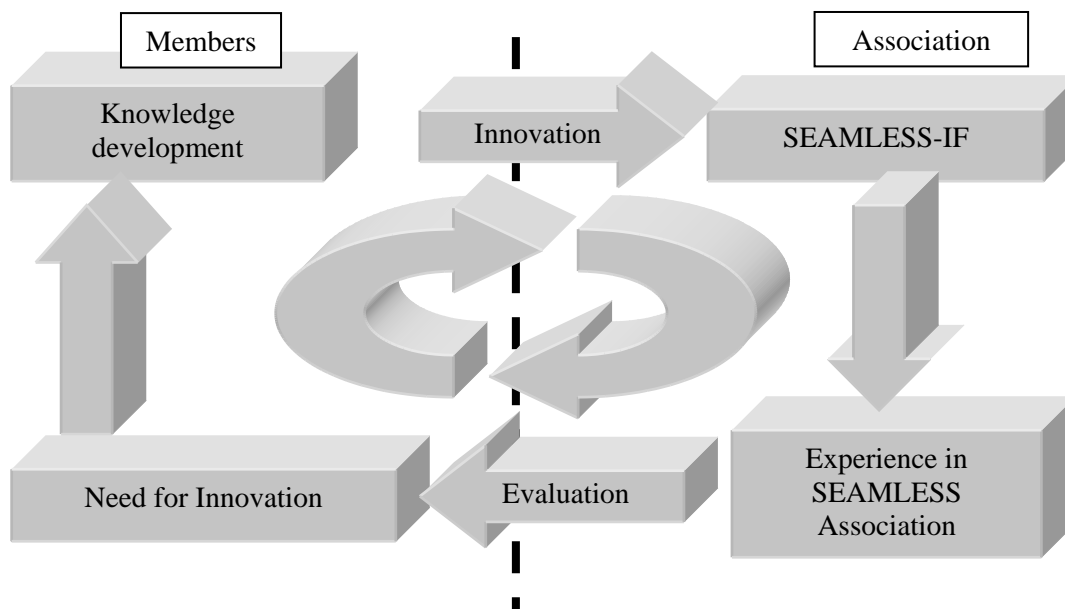


Figure. Innovation cycle

The next table gives an overview of the expected turnover (k€) of projects in which SEAMLESS-IF (or individual components) is being applied or further developed.

Type of project	2009	2010	2011
Framework Programme EU (FP7) (Applying SEAMLESS-IF or new research questions)	800	1400	2000
Impact Assessment, Europe (outside Framework Programme)	400	600	1000
Applying SEAMLESS-IF, national (FES programme, national ministries)	200	600	1000
International projects (outside EU; AUS, NZ, USA, developing countries)	400	600	1000
Continued development individual components	400	800	1200
Total	2200	4000	6200

Next to these projects, which are about direct use and development of (components of) SEAMLESS-IF, participation in the SEAMLESS Association will result in new projects that do not directly use SEAMLESS-IF (because of the important network function of the Association).

7 IPR of SEAMLESS-IF and its components

7.1 IPR of SEAMLESS components and SEAMLESS-IF

7.1.1 Integrated model components

Integrated (modified) model components that allow integrated assessment being part of the SEAMLESS association will be subject to an open Source Code regulation as part of a future Association agreement unless otherwise agreed for specific elements. Parties will grant to others a worldwide, royalty-free, non-exclusive, sublicensable license, within the regulations of the SEAMLESS Association agreement.

APES components within SEAMLESS-IF are available as open source with the following exceptions: the components SoilTemperature, SoilN, Soilreader, Diseases, AbioticDamages, CropML-WARM, CropML-CropSyst and the adapters for these components (Modcom classes which allow to use the components in Modcom) are granted on the basis of Binary Code Access on a royalty-free basis, provided no financial profit will be made by the third party.

7.1.2 Stand alone versions of the model components

SEAMLESS Association takes a responsibility for the maintenance and further development of APES and FSSIM as described in Annex 3.

7.1.3 Data

It is the general policy of SEAMLESS to make, as much as possible, all components including the database available in the public domain on the basis of open source principles regarding software. Details are provided in the Consortium Agreement.

7.2 IPR in SEAMLESS Association - Open Source license

See Consortium Agreement.

8 Legal arrangement SEAMLESS Association

Legal form of SEAMLESS Association: the Association will as a consortium with a Consortium Agreement (similar to the one that was used in SEAMLESS – see Annex 1). The establishment of a legal entity is time consuming and a road with obstacles. This could be started up, e.g. in year 2 of the Association after a go/no go decision.

9 References

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- EC review of SEAMLESS Integrated Project for year 2007, March 2008, Brussels, Belgium.
- Janssen, S., Van Ittersum, M.K. (2007). Assessing farm innovations and responses to policies: A review of bio-economic farm models. *Agric. Systems* 94: 622-636.
- Schleyer, C., I. Theesfeld, et al. (2007). Approach towards an operational tool to apply institutional analysis for the assessment of policy feasibility within SEAMLESS-IF D2.4.2 (SEAMLESS report 29, see <http://www.seamless-ip.org/>)
- Van Ittersum, M. K., F. Ewert, et al., 2008. "Integrated assessment of agricultural systems – A component-based framework for the European Union (SEAMLESS)." *Agricultural Systems* 96:150-165.
- Wien, J.J.F., Knapen, M.J.R., et al., 2007. Using ontology to harmonize knowledge concepts in data and models. MODSIM 2007 International Congress on Modelling and Simulation. Modelling and Simulation Society of Australia and New Zealand, December 2007.

ANNEX 1 Consortium Agreement SEAMLESS Association

Association Agreement

System for Environmental and Agricultural Modelling; Linking
European Science and Society

SEAMLESS

Co-ordinator: Wageningen University and Research Centre

Signed by party: <party name and number>

ANNEX 2 Contributions of partners – year 1

Budget SEAMLESS Association (year 1) and High price application as per March, 2009.

Partner	Proposed cash contribution	Proposed person-months contribution
Alterra	10 k€ or more if needed	8
Cemagref	10 k€	-
IAMM	?	2-3
IDSIA	5 k€	4
INRA	10 k€	8
LEI	10 k€	4
PRI	12.5 k€	1.5
UBER	?	-
Univ. of Bonn	5 k€	2
Univ. of Copenhagen	10 keuro	3 (for each of the next 3 yrs)
UMB	10 k€	-
VUZE	3.5-10 k€	-
WU	22.5 k€	16.5
Total	ca. 110 keuro	ca. 50

ANNEX 3 Role and position of APES and FSSIM within SEAMLESS Association

APES

In the November 2008 SEAMLESS Board meeting the future of APES and FSSIM was discussed, in the context of the Association and SEAMLESS-IF. This mail summarizes the point of view of the Board as to APES - this also determines the vision and aims of SEAMLESS Association. Complete minutes of the Board meeting are available upon request.

Standalone APES is being further developed outside the SEAMLESS association by the addition of new components and functionalities which can be developed by different partners, as stated by Marcello. Leadership needs to be organised but is likely to be taken by CRA, following indications from Marcello. CRA is not joining the SEAMLESS Association and will therefore not be involved directly in the further integration of (any additions to) APES into SEAMLESS-IF. The SEAMLESS Association and its members have interests in both the standalone and integrated versions of APES, just as with FSSIM (and other components). It is recognised that standalone APES will be available to members of the SEAMLESS Association in the same way as it is available to other research groups. However, it may be necessary for the Association, through its members, to upgrade the version of APES integrated in SEAMLESS-IF and to further invest in a version of APES to be integrated in SEAMLESS-IF. This may include bug fixing and adding additional functionalities as well as the development of components presently not available as source code to members of the Association.

In short the conclusion of the Board meeting is the following: for the integrated use of APES we will develop APES within the Association further. This integrated version will also be available as a SEAMLESS standalone version as we envisage a need for being able to run model chains using standalones.

Our preferred option is for this work to be combined with the development of the standalone APES so that both parties can benefit from the collaboration. If necessary the Association will invest in specific actions that assist this focus on a version to be used for SEAMLESS integrative purposes. We will nominate a contact point and coordinator for this further development of the integrated APES version before the end of March 2009.

We hope this vision and aim provides a clear context for the future of APES in relation to SEAMLESS-IF, and encourages new projects investing in this. A similar mail focusing on the future of FSSIM (following the same strategy) has been sent to partners involved in FSSIM. Please do not hesitate to contact me in case of questions.

Martin van Ittersum,
January 2009

FSSIM

Introduction

Of all components in SEAMLESS-IF, FSSIM has been developed in tightest interaction and integration with SEAMLESS-IF. It is proposed to maintain FSSIM through the SEAMLESS Association, without a working group focusing on FSSIM. Core modeling and coding expertise (see below) is with persons in Wageningen University (and Alterra after transfer of Sander Janssen) and IAMM (in fact INRA after transfer of Kamel Louhichi). ZALF has expertise for the surveys.

Core testing, data and application expertise is with INRA, Plant Research International, IAMM and Wageningen University. This note focuses on the modeling and coding maintenance, recognizing the importance of the other expertise!

FSSIM components and experts

1. FSSIM-AM: the components of FSSIM-AM and their prime experts include :

For current activities:

- Surveys (simple and detailed): ZALF
- Simple Current Activity generator (SCA): Sander Janssen (WU-Alterra)
- Simple Management Translator (SMT): Roelof Oomen (WU)

For alternative activities:

- Production Enterprise Generator: Sander Janssen (WU-Alterra)
- Production Technique Generator: Sander Janssen (WU-Alterra), Roelof Oomen (WU)

For livestock activities:

- Livestock Activity Generator (LAG): Sander Janssen (WU-Alterra)

Eelco Meuter has expertise in some components; Huib Hengsdijk and others have rich expertise as to contents of the components.

2. FSSIM-MP: Kamel Louhichi (IAMM-INRA)

More persons at IAMM have been working with FSSIM-MP, but more in the background. Argyris Kanellopoulos (WU) has good expertise on parts of FSSIM-MP as standalone and as integrated in SEAMLESS-IF. Recently, Pytrik Reidsma and Marcel Lubbers followed a course in FSSIM-MP.

The two parts FSSIM-AM and MP are glued together in Seamless-IF through the FSSIM wrapper (Sander Janssen (WU-Alterra), Hongtao Li (IDSIA)). As FSSIM is a comprehensive model and many files are exchanged between FSSIM-AM and MP, the wrapper is a crucial component to facilitate this exchange and not a small component in itself.

3. FSSIM standalone Graphical User Interface: Eelco Meuter (WU). To aim of the FSSIM-GUI is to enable students and researchers easy access to the FSSIM model for runs and model tests. The FSSIM-GUI is developed as a web-interface, to which users can logon and get access to the FSSIM-GUI.
4. Testing and application: this has been done within the system by mainly Argyris Kanellopoulos and Sander Janssen (WU); outside the system Hatem Belhouchette, Kamel Louhichi and other participants from WP6 have spend a lot of time on this.

Partners of SEAMLESS Association

Wageningen University, Alterra and INRA will be partners of SEAMLESS Association. Through this expertise and resources must be secured to maintain and improve FSSIM and its components. Hatem Belhouchette will be employed by IAMM from 2009 onwards – hence IAMM may become a partner.

Training:

Training in FSSIM-AM and FSSIM-MP should be organized in the winter/spring of 2009 to make sure we broaden the expertise base. Training should result soon in at least one extra expert in France and in The Netherlands.

Priorities for maintenance and extension

From the SEAMLESS Association components will be maintained and improved. Priorities for this could be:

- We may need to find a more efficient solution for the Surveys: the current linkage to the SEAMLESS database is not efficient, e.g. first the survey is completed, then transferred from ZALF to Copenhagen by Erling and Sandra manually. This is time-consuming and slows down progress, as we have a ‘waterfall’ model, in which we wait for each other to make the next step. Potential solutions are:
 - Link the current survey(s) directly SEAMLESS database (time required: 1 to 2 months)
 - Build new surveys that are directly linked to the SEAMLESS database (time required: 2 to 3 months)
 - Make the current transfer from the ZALF database to the SEAMLESS database automatic through a ‘start transfer’ button in the survey (time required: 2 weeks to a month).
- Further develop and test FSSIM-AM and MP for alternative activities. During the SEAMLESS project, we ,mostly ran FSSIM for current activities and not yet for alternative activities. Although components are available (PEG and a simple version of PTG), the broad application still needs to occur. Steps required:
 - Extend and further develop the PTG for conservation management. (1 to 2 months)
 - Review results of the combined FSSIM-AM, APES and FSSIM-MP ‘chain.’ (1 to 2 months).
- Running time: the running time of the models jointly is high, making it difficult to test and debug. For example, running FSSIM without APES for 13 regions and 55 representative farms takes 6 to 7 hours. Reducing the running time would make FSSIM more suitable to large scale applications.

- There is a strong wish to enable replacement of specific components of FSSIM-AM by an XML file with data. This should be facilitated by the GUI of FSSIM, preferably.

Maintenance is required for FSSIM as an integrated model. If an appropriate infra-structure is available, this could take 1 month each year, spread over the year, and probably different persons need to provide their support. With appropriate infrastructure, a versioning and release policy is meant to make sure we always have a running version that people can use, and that improvements can be fed back into FSSIM. Setting up this infrastructure requires some time, but can be combined with the set-up of a similar infrastructure for the SEAMLESS-IF.

Organisation

Workflow, working conventions (use of SVN server etc.) and decision making of the working group within the Association need to be detailed.

Martin van Ittersum and Sander Janssen

Wageningen, November 2008