PROJECT PERIODIC REPORT

Grant Agreement number:	**212117**
Project acronym:	**FUTUREFARM**
Project title:	**FUTUREFARM - Integration of Farm Management Information Systems to support real-time management decisions and compliance of management standards**
Funding Scheme:	**Collaborative project**

Date of latest version of Annex I against which the assessment will be made: 27/3/2008

Periodic report:	**1st ☐ 2nd X 3rd ☐ 4th ☐**
Period covered:	**from 1st January 2009 to 31st December 2009**

Name, title and organisation of the scientific representative of the project's coordinator:

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Declaration by the scientific representative of the project coordinator

I, as scientific representative of the coordinator of this project and in line with the obligations as stated in Article II.2.3 of the Grant Agreement declare that:

- The attached periodic report represents an accurate description of the work carried out in this project for this reporting period;
- The project (tick as appropriate):

  ☐ has fully achieved its objectives and technical goals for the period;

  ☐ has achieved most of its objectives and technical goals for the period with relatively minor deviations[1];

  ☐ has failed to achieve critical objectives and/or is not at all on schedule[2].

- The public website is up to date, if applicable.
- To my best knowledge, the financial statements which are being submitted as part of this report are in line with the actual work carried out and are consistent with the report on the resources used for the project (section 3.6) and if applicable with the certificate on financial statement.
- All beneficiaries, in particular non-profit public bodies, secondary and higher education establishments, research organisations and SMEs, have declared to have verified their legal status. Any changes have been reported under section 5 (Project Management) in accordance with Article II.3.f of the Grant Agreement.

Name of scientific representative of the Coordinator: Simon Blackmore

Date: ...../ ...../.....

Signature of scientific representative of the Coordinator: .....

1 If either of these boxes is ticked, the report should reflect these and any remedial actions taken.

2 If either of these boxes is ticked, the report should reflect these and any remedial actions taken.

1. Publishable summary

This is the second year report (Jan to Dec 2009) of the FP7 project FutureFarm (212117) 'Integration of Farm Management Information Systems to support real-time management decisions and compliance of management standards'

Project summary

In the future, European farmers will have to effectively manage information on and off their farms to improve economic viability and to reduce environmental impact. All three levels, in which agricultural activities need to be harmonized with economical and environmental constraints, require integrated ICT adoption: (i) improvement of farm efficiency; (ii) integration of public goods provided by farming into management strategies; (iii) relating to the environmental and cultural diversity of Europe's agriculture by addressing the region-farm interaction. In addition, the communication between agriculture and other sectors needs improvement. Crop products for the value added chains must show their provenance through a transparent and certified management strategy and farmers receiving subsidies are requested to respect the environment through compliance of standards.

To this end, an integration of information systems is needed to advise managers of formal instructions, recommended guidelines and implications resulting from different scenarios at the point of decision making during the crop cycle. This will help directly with making better decisions as the manager will be helped to be compliant at the point and time of decision making.

In FutureFarm the appropriate tools and technologies will be conceptually designed, prototypes developed and evaluated under practical conditions. Precision Farming as well as robotics are very data intensive and provide a wealth of information that helps to improve crop management and documentation. Based on these technologies a new Farm Information Management Systems (FMIS) will be developed.

As most relevant farm data will be readily available in the proposed information system, or may be automatically integrated using standardised services and documentation in the form of instructions to operators, the certification of crop production process and cross compliance of standards can be generated more easily than with present systems.

Consortium development

Project meetings were held in Rome to review the first year and The Netherlands to discuss progress and hold an open stakeholder meeting. Minutes are available on the web site www.futurefarm.eu. Many ad. hoc. meetings have taken place within the consortium.

The project administrator, Frank Dreger, left ZALF to start another job in March. We thank Frank for all his hard work and wish him success with his new career. Katerina Apostolidi has now taken over as project administrator and is doing well in keeping us organised.

A number of amendments were needed in the description of work and partner budgets to allow smooth development of the project. These were mainly in the form of transferring costs from Management (C) costs to RTD/Innovation (A) costs.

CRTH and ZALF have undergone audits by KPMG as requested by the Commission.

More than 42 presentations have been given about FutureFarm activities and deliverables.

Progress to date

The main outputs from the project are structured in the form of 55 deliverables from the 8 work packages. 16 of them were due in 2009 including this report. All of the deliverables have been produced on time including those which deadlines were extended by agreement of the steering committee.

The evaluation of what constitutes Cross Compliance has continued and has shown to be difficult to interpret as due to the complexity of national vs. EU rules and the interpretation of vague guidelines into the definition of formal rules needed for the FMIS.

The development of the Farm Portal has shown how important this will become. Not only will all the public data be available, but private data will also be available to those trusted partners like extension agents. All digital data flows on and off the farm should pass through the multifunctional farm portal as it can offer unified access and protocols.

The design and specification of the FMIS is continuing well. It is foreseen that the demonstration FMIS will not be a complete system but new exemplary elements will be integrated into an existing MIS, probably from CLAAS.

Decision processes and information flows within specific agricultural domains have been identified and used a framework for the design of the actual information system.

Specifications have been developed for a service-oriented architecture to make agricultural management and production standards available to farm software via the internet. This enables the software to be to some extent self-configuring based on the farm's location and the farmer's specified profile in terms of voluntary standards. Initially, this simplifies the production of manual checklists for the farmer. In the remaining work within the project, the possibilities for automating parts of the self-assessment will be fully investigated. The specifications developed may form the basis for industry standardisation efforts in this area.

Basic prototype software has been developed based on these specifications. Presentation of this software at the Agritechnica trade fair indicated that there was a great deal of potential interest in such a system from academics, advisors and software companies. Through bringing relevant stakeholders together in expert workshops in the remainder of the project it is hoped that sufficient interest can be generated to allow development to continue after the end of the FutureFarm project. The prototypes developed up until now will be made available under a liberal open-source license so that commercial software companies may benefit fully from them.

A significant milestone in this project period has been a survey report on the farmer's assessment of information systems and PF. This survey report covers the 4 countries: Denmark, Greece, Finland and Germany. The report addresses issues of time studies for paper work, meeting etc at farms, PF adoption among farms, use of automated systems and farmers' attitude towards information systems.

The cost of different information-intensive and safety systems has been estimated for different scale capacities and compared to conventional systems. Potential benefits related to these systems such as labour and fuel savings have been estimated and used to quantify the new factor productivities.

Several of the following techniques have been analysed with different scale capacities:

- Automated steering and optimized route planning
- Planning of fertilizer application and variable rate application.
- Variable herbicide spraying based on weed maps and weather forecast
- Variable rate cultivation of soils based on soil maps
- Harvest logistics/ harvest timing with fleet management
- Variable rate seeding

- Chlorophyll content measuring before harvesting to optimize harvest procedures
- Management of area subsidies

The above systems will be aggregated in terms of their broader socioeconomic impact analysis that will be carried out in the third project period. In this project period we made a survey report on the farmer's assessment of information systems and PF.

Deliverable 6.1 – on-farm bio-fuel production. The analysis of on-farm bio-fuel production revealed that:

- In farm vegetable oil production is feasible with simple means.
- Sunflower for the South and Rape seed for the North are candidate crops which produces oil that can power farm tractors with diesel engines.
- Both crops have a clear positive energy balance of the energy crops like rape seed and sunflower under European conditions.
- Up to 6.1% of the farm land can cover the requirements of crops without irrigation but up to 15% is required to cover the irrigation needs as well.
- Additional amounts of feedstock from the press cake and solid biomass from the crop stalks can provide animal feed and heat for residence, offices or greenhouses.
- Based on the results a direct energy independent farm is feasible. This farm would save significant amounts of energy: a considerable contribution to the achievement of the EU targets.
- Also a clear economic benefit for the farmer will be created.
- Use of vegetable oil might yield a higher NOx emission but a lower pm emission as well lower CO2 emissions.

Deliverable 6.2 – field robot demonstration. The state-of-the-art of agro-robotics was demonstrated to and discussed amongst a large group of experts in the field of precision agriculture and agro-ICT during JIAC2009. An audit amongst participants of JIAC2009 conference showed that the demonstration of the current state of the art of agro-robotics and the competition of the field robot event were very much appreciated.

Deliverable 6.3 – Fleet management. A literature review has revealed what the research community has shown to be possible for planning and managing the operation of teams of conventional and semi-autonomous machines. Currently available commercial technology for planning and managing the operation of agricultural machine fleets was identified. Limitations of currently available commercial research-prototype systems were identified. And finally recommendations were done for bridging the gaps between what is commercially available, and what constitutes state of the art in research, and develops a roadmap for what needs to be developed further.

A comparison of optimal field planning with practical field planning schemes revealed a fuel saving potential of 10%.

Computational and communication requirements for fleet management were analysed. It was concluded that due to computational complexity, computation of fleet management strategies will not be performed on board but by a central processor, the dispatcher. Band width requirements were analysed in view of data transmission requirements.

Dissemination activities are progressing well.

Expected final results and their potential impact and use

We are seeing the continued difficulty of formalising vague rules and implied understanding inherent in many guidelines which makes the ability to rationalise cross compliance very difficult. The ICT systems required to implement our recommendations are developing well and are already in the prototype stage. If these recommendations are to be utilised, further work must be carried out to formalise the definition of EU regulations, directives and guidelines.

Discussion and conclusions

The FutureFarm project has many diverse objectives and it is difficult to summarise them all. The project is still on-track with consortium members working well together and producing deliverables on-time. Our understanding of how ICT and robotics can improve the sustainability of European farms is increasing. We are continually finding new opportunities where improvements can be made to the current systems. One area that stands out from all others is the significant opportunities that better understanding of real time farm data and smarter machines can play to reduce the inputs currently used in crop production – without any adverse side effects. This is good for the environment and good for farmer economics but it is currently held back through lack of development funds.

FutureFarm is due to produce all the agreed deliverables on time. We should also find methods of summarising important points so that this process can continue after 2010.

Prof Simon Blackmore
Project Manager of FutureFarm
26th Feb 2010
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2. Project objectives for the period

The following objectives are taken out of the DoW/Annex I of FutureFarm (see page 10 f. of the Annex I). The work performed in the first project year is mirrored against these objectives. More details concerning the work can be found in section 3 “Work progress and achievements during the period”.

Objective 1

Develop a vision of the farm of tomorrow from the perspective of the project team and invited stakeholders to show a better understanding of how farming will develop. This will include identifying relevant drivers and their potential impact on crucial processes in knowledge management in arable crop production.

Call objectives met: *Vision of new knowledge based biological, technical, social and economic innovations.*

⇒ The objective of the work for this period was to analyse outputs from other WPs, in order to prepare the final outputs for this objective; the methodology on how to adopt new knowledge management on the farm level and the final vision of the farm of tomorrow from the perspective of the FutureFarm team.

⇒ Project team prepare Future Farm workshop as part of ISAF conference in May.

⇒ The form of report for adoption of new knowledge management methods on farm level and content for vision of future farm was prepared.

Objective 2

Identify and analyse a range of formal and informal management strategies in crop production and identify required indices in terms of management and practices that would constitute compliance to standards within the strategy.

Call objectives met: *Cost efficient compliance with standards as an integral part of farm operations*.

⇒ Work within WP2 has focused on the further analysis of the international agricultural and environmental standards that were broken down in field operations and targeted to the four experimental farms, where FMIS prototype will be based on. A survey in three countries (Greece, Germany and Denmark) was carried out to analyze the needs and requirements for a farm website to represent the concept of “multifunctional farm” incorporating management strategies and practices. The results of this survey together with the project partner’s vision on the future FMIS resulted in deliverable 2.2.

Objective 3

Analyse and specify the required knowledge, information and methods needed to adopt specific management strategies. Produce a set of specifications that can be used to define a flexible and dynamic Farm Management Information System (FMIS).

Call Objectives met: *Special requirements for high value markets, sharing good farming practices, recognition and communication of ecological and cultural diversity as well as regional demands on multifunctional production of non-commodities.*

- ⇒ One part of the work within WP3 has focussed on using the soft system methodology applied to the systems analysis and identification of system boundaries. This has involved a derivation of a baseline system involving crop and farm production, operations management and the use of farm management standards for production as well as monitoring and compliance. An analysis of the farm manager has identified the internal as well as external conflicts and problems that the farm manager currently faces. Based on this analysis, the boundary of the targeted system was defined and within the context of these boundaries a description of the proposed system was derived and a conceptual model was set up. The result of this work was deliverable 3.1.
- ⇒ Another part of the work within WP3 has concentrated on identifying decision processes and information flows within specific agricultural domains as a framework and guidance for the design of the physical information system. The information flow configuration was centred on the farmer as the principal decision maker. The information modelling has involved specific operations, tillage, seeding, fertilizing, spraying, harvesting, and irrigation, depicting the information flows between the different decisions processes involved with specific operations. This work resulted in deliverable 3.2
- ⇒ As continuation of the two main tasks of WP3, the knowledge and information from the flow diagrams to be encoded was defined and described. The encoding forms a core of the new information and knowledge management system structure. Deliverable 3.3 was the result of this work.

Objective 4

Apply and test the general principles of a FMIS by developing a prototype of an integrated FMIS. This will include elements from different methods and sources (e.g. GIS, DSS, expert systems, trusted third party knowledge, formal and informal knowledge transfer etc.). Ease of use and largely automated data handling procedures will be an important aspect. Working prototype will be made available for evaluation.

Call objectives met: *Integrated technologies and ICT tools to make cost efficient compliance with standards an integral part of farm operations.*

- ⇒ Work within WP4 in this reporting period has concentrated on developing and testing concrete specifications to allow transfer of definitions of agricultural crop production and management standards between systems. Specifications, which it is expected may be used as the basis for future industry standards in this area, for a catalogue-server-client architecture based on the publish-find-bind paradigm for service-oriented systems have been developed. These include two interface standards, for a catalogue and for a server publishing machine-readable definitions of agricultural standards, and an XML-based transfer format. The interfaces allow querying to retrieve rules based on location, interest and field operation type. Initial prototypes of the services and a basic client for search have been developed to test the standard, and were demonstrated at the Agritechnica 2009

trade fair, as well as being available on the project website. The above work has resulted in deliverables 4.1.1, 4.2, 4.1.2 and 4.3.

⇒ The architecture proposed within WP4 allows for a component-based farm management information system, with the rules subsystem which has been the focus of work within WP4 supplying functionality and knowledge which may be used in other parts of the FMIS. The integration of the rules subsystem with existing FMIS components (e.g. farm database, operation planning and documentation, etc.) to enable some automation of self-testing of compliance to an arbitrary set of farm standards will be the focus of work in the remainder of the project.

Objective 5

Provide a socio-economic, environmental and technology assessment to understand the drivers and issues from Objectives 1, 2, 3 and 4. Recommendations will be expected to show how development can be made to take advantage of opportunities and avoid obvious problems.

Call objectives met: *Understanding of overall trends of European societies, new models of relationships with consumers and citizens, rural economy, the multifunctional European farming model delivering public goods.*

⇒ The work conducted in this project period has given us a better understanding of the adoption of information management technology and precision farming technology among several European regions. It also reveals farmers perception of new technology and point out advantages and problems with precision farming technology and new farm information systems. This work resulted to deliverable 5.2

⇒ We have made a first comparison of cost structure of new precision farming systems compared with conventional practices. These findings indicate specific limits and opportunities for implementing information systems and PF-practices in Europe and will be included in deliverable 5.3.

Objective 6

Assess the influences of robotics and biofuels on economic and energetic efficiencies of farm production. Existing robotic and closed-loop on-farm biofuel systems will be demonstrated and evaluated as examples of internal flow management.

Call objectives met: *New models of material flow management, based on information and knowledge management supporting on-farm or local integration of environmentally friendly closed loop processing facilities, energy efficient cultivation with light machinery, precision farming and robotics.*

⇒ An analysis of the potential of on-farm bio-fuel production was conducted during this project year and resulted in deliverable 6.1. Major findings of this analysis were that a)in farm vegetable oil production is feasible with simple means b) sunflower for the South and Rape seed for the North are candidate crops for producing oil that can power farm tractors with diesel engines c)both crops have a clear positive energy balance d)up to 6.1% of the farm land can cover the requirements of crops without irrigation but up to 15% is required to cover the irrigation needs as well, e) additional

amounts of feedstock from the press cake and solid biomass from the crop stalks can provide animal feed and heat for residence, offices or greenhouses, f) a direct energy independent farm is feasible.

⇒ The Field Robot Event 2009, the FutureFarm demonstration of prototype robotic systems and the Joint International Agricultural Conference (JIAC) were held in parallel at the centre of Wageningen University's campus, Wageningen, the Netherlands, 6-8 July 2009. These activities delivered deliverable 6.2 of the FutureFarm project.

⇒ The potential savings in energy consumption and production cost by optimising single and multiple machine (fleet) machine usage at the farm level were investigated and the required data, information flow and information management for optimised farm mechanization management comprising single machines or fleets of conventional, or autonomous machines were identified. This work resulted in deliverables 6.3.1, 6.3.2 and 6.3.3

Objective 7

Develop a typology for information technologies in European farming (like precision farming) and a typology on its suitability for different farm groups within the member states of the EU. Application, integration, demonstration, generalisation and dissemination of project results on commercial farms within EU-countries.

Call objectives met: *Generalisation of project results and demonstration of all of the above points and showing its feasibility for many future farms in the EU.*

⇒ WP 7 worked with tasks 1, 2, 4 and 5 with a main focus on task 2, 4 and 5. The work with task 3 begun also during this project year.

⇒ A typology that summarizes and structures the broad and diverse set of techniques constituting precision farming technology in EU – farms was developed during the previous project year. Minor improvements to the draft report produced then, resulted in deliverable 7.1.

⇒ Analysis for identifying regions with a potential for use of PF-technologies is done and will be discussed with the partners in month 26.

⇒ The main attention in task 4 was in the last year on i) the development and testing of the on-line measurement system of soil properties and ii) the development of calibration models.

⇒ Dissemination activities were in the focus of task 5. Results of the FutureFarm project were presented at the JIAC (Joint International Agricultural Conference) held in Wageningen (The Netherlands) in July 2009 and at the Agritechnica 2009 in Hannover.

3. Work progress and achievements during the period

For each work package, except project management, which will be reported in section 5, a summary of progress towards objectives and details for each task is provided in the following tables. Objectives and tasks of the following table are taken from the DoW, the work performed within each workpackage is mirrored against these objectives and tasks.

Work package number	**WP 1**	**Start date or starting event:**		01/01/2008		
Work package title	*Vision of the farm of tomorrow*					
Activity type	RTD					
Participant id	9	1	7	14		
Participant short name	***WR-INFO***	CRTH	ZALF	PROGIS		
Person-months per beneficiary	18	8	6.5	3.5		

Objectives

This WP analyses external drivers which will influence future farm management. Sub-objectives are:

- analyse the potential external drivers and describe how they will influence farming in the future
- organise workshops with stakeholders and provide an initial analysis of influences of external drivers at the level of the single farm
- define a strategy as to how farm knowledge management could be changed to adapt to the influences of external drivers
- organise a closing workshop to evaluate influences of external drivers and new methods of knowledge management on the future farm economy
- generalise the methodology to prepare a "road-map" for adoption by other farms.

Description of work

Task 1 *A comprehensive study will analyse external drivers* (e.g. technological developments, climate change, market globalisation, policy changes, competition between energy and food production)

The influence of these external drivers on future farm management in Europe will be analysed with respect to three periods: (i) short term (until 2013), (ii) middle term (until 2020), (iii) long term (after 2020). Potential scenarios for the farming sector in different European areas will be described.

Task 2 *Initial workshops will be organised with stakeholders* to discuss influences of external drivers

A SWOT analysis will be realised for every farm and every external driver. This analysis will be used as a basis for recommendations as to how knowledge management may be adapted at the level of the farm

Task 3 *Recommendations for adaptive knowledge management* on pilot farms will be defined.

In particular, three factors will be considered: (i) initial knowledge management analysis (WP3), (ii) analysis of influences of external drivers, (iii) new technological solutions (WP4).

Task 4 *Recommendations for adaptive knowledge management* be discussed with stakeholders.

Management strategies will be discussed in workshops and new technological possibilities will be demonstrated. Strategies for adoption of new methods and technologies on farms will be developed.

Task 5 Generalisation in order to apply results to other farms.

The output will be a road-mapping methodology for farms for their adoption on future knowledge management able to deal with new external influences.

Progress towards objectives

WP1 follow the time plan of the project. The first round of analysis and vision was prepared during the first year of the project. The main objective of work during second year of the project was monitoring of other WPs. Namely WP3 and WP4 results was analysed.

Progress/details for each task tackled

Task 1

Finished during first year

Task 2

Finished during first year

Task 3

The first draft of the vision of Farm of Tomorrow was prepared during the first year of the project. In the second year of the project, progress in technical WPs was monitored, in order to adapt vision and method of the adoption of this vision into final output. There have been no concrete deliverables during this period.

Task 4

The preparation of the final workshop for this Work Package started (Deliverable 1.4). It was agreed to organise the final workshop as part of the ISAF conference in May 2010 in Prague. There have been no concrete deliverables during this period.

Task 5

The work will start after the workshop in Prague (Deliverable 1.5).

Clearly significant results in this work package

WP1 has no deliverable during this reporting period. The main part of work within WP1 was monitoring of other projects. As a result of the work could be mentioned agreement about final workshop as part of ISAF conference with the organizers of ISAF conference.

Also, a draft of the content for the report on adoption of knowledge management methods

(deliverable 1.4) and a draft of the context of final vision (deliverable 1.5) have been prepared
If applicable, <u>deviations</u> from Annex I, impacts on other tasks as well as on available resources and planning N/A
If applicable, reasons for <u>not being on schedule</u>/ impacts on other tasks as well as on available resources and planning N/A
If applicable, reasons for <u>failing to achieve critical objectives</u> not achieved/ impacts on other tasks as well as on available resources and planning N/A
If applicable, propose <u>corrective actions</u>. N/A

Work package number	**WP 2**	**Start date or starting event:**		01/01/2008		
Work package title	*Analysis of management strategies and required compliance to standards*					
Activity type[3]	RTD					
Participant id[4]	1	7	5	3	14	9
Participant short name	***CRTH***	ZALF	UCPH	AU	PROGIS	WR-INFO
Person-months per beneficiary	15	8.5	1.5	3.5	4.5	1

Objectives

The main objective of this work package will be to analyze the *<u>needs and requirements</u>* of what will be the multifunctional farm of "tomorrow" based on the envisioned perspectives in WP1. The focus will be on identifying the necessary management strategies and the needed compliance with standard requirements. The multifunctional farm will take into account the current and future trends in European Agriculture with the new CAP, as well as world trade trends in less protected markets. Additionally, ICT tools and integrated technologies will be identified and analyzed that could enhance the use of the standards and communicate the information in the whole supply chain from suppliers to farmers, consumers, and other entities in the rural area. The outcome of this WP will mostly feed WP3 and WP5.

[3] RTD = Research and technological development; DEM = Demonstration; MGT = Management of the consortium.
[4] WP-leader in bold and italics

Description of work

Task 1 Identify the relevant *compliance to standards* (CRTH (lead), AU, UCPH, PROGIS)

The farm of tomorrow should be complied with European and Global standards to ensure competitiveness in international markets as well as sound environmental standards. The compliance to standards and organisation required are these, such as CAP Cross Compliance requirements, EUREPGAP, IACS, INSPIRE, catchment management, (Cooperative groups for ecological payments)). Additionally, BMP and other standards of environmentally sound production systems will be identified. This will be achieved through the identification and analysis of the standards for farm management within EU and also world-wide that could be applicable to all countries and to a variety of crops.

Task 2 Identify *personal management strategies* (CRTH (lead), AU, PROGIS).

This will be achieved with the identification and analysis of all personal farm management strategies that are currently used by the farmers. It will also give the perspective for future management strategies incorporating more aspects of rural development, such as agro-tourism to diversify and expand the traditional culture of farming in the EU. The management strategies will be tied in to the new technologies in agriculture, such as site-specific management.

Task 3 Identify *social organization of farmer decision making* (ZALF (lead), PROGIS)

This will identify social organization of farmer decision making (e.g. logistic leverage (group buying) trusted third party data processing). This will be achieved through interviews with farmer organizations to identify their decision making process in social organization aspects, such as logistic leverage and third party data processing and provide the perspectives for future social organization farmer systems in the farms of tomorrow.

Task 4 Set the *requirements for a Farm Portal* (CRTH (lead), ZALF)

The requirements for a farm portal to communicate the multifunctional farm of "tomorrow" of being environmentally and socially friendly, energetic autonomous and enhancing the rural economy will be analyzed. A specification of requirements for a Farm Portal will be analysed and designed regarding software and hardware requirements for a farm of tomorrow that will use internet protocol and wireless technologies to communicate farming activities with suppliers, sellers and the society.

Task 5 Identify *ICT tools and integrated technologies* (CRTH (lead), AU, ZALF, PROGIS)

ICT tools and integrated technologies have been used in all aspects of the everyday life as well as in all industries. In agriculture, ICT tools and integrated technologies (e.g. real-time tracking and tracing, automated reporting and use of site-specific technologies) have been used by many farmers and farmer organization. ICT tools and integrated technologies to enable the most efficient use of management strategies and compliance to standards will be proposed. The potential ICT tools and technologies will be evaluated in terms of automatic data acquisition, mobile decision support (information at the right place and at the right time), communication between process equipment and farm management information systems, etc.

Progress towards objectives

The effort in WP2 has been less intensive over the last twelve months, compared to the first year of activities. The main force was that the outcome of this WP should feed WP4 for the development of the FMIS. Therefore, the results from Deliverable 2.1.1 were elaborated and were broken down in field operations and targeted to the four experimental farms, where FMIS prototype will be based on.

Additionally, a survey in three countries (Greece, Germany, and Denmark) was carried out by WP2 in close cooperation with the partners from Germany and Denmark to analyze the needs and requirements for a farm website to represent the concept of "multifunctional farm". This survey enabled us to set the specification requirements for the development of the farm website.

Progress/details for each task tackled

Task 1

Completed in Month 12

Task 2

Completed in Month 12

Task 3

Completed in Month 12

Task 4

A framework to elicit the requirements of a farm portal from different groups/users was determined with personal interviews in three countries (Greece, Germany, and Denmark). Farm website is the prospective way of communication of the farm owner with the outside world. The Groups that are related to a farm website and described are (1) Farmers, (2) Consumers (3) Traders and (4) Advisors. The questionnaires were statistically analysed and described. The document of Specification Requirement of the website is consisted from 4 parts, which are (1) Scope, (2) Referenced Documents, (3) Requirements (Functional & Non-Functional), (4) Notes. Additionally, a description of a farm portal based on the project's vision for the farm in the future is provided.

Task 5

The work that had been completed in 2009 was based on the outcomes of our first deliverable 2.1.1, where the standards of the main formal management strategies were analyzed into a form of a checklist. Our first sub-task was to develop the vocabularies of the checklist derived from the regulations and requirements of Cross Compliance; Organic Farming; and Integrated Crop Management (GlobalGap). Secondly we categorized the checklists of these standards into field operations (operations which identified and analyzed on D2.1.2: Seeding, Fertilizing, Tillage, Irrigation, Spraying, Harvesting) as well for the checklists' vocabularies. The next step of this work (not been completed yet) has been to develop an ontology for the agricultural standards mentioned before, based on these categorized vocabularies. This work will be completed in the deliverable of Month 30th with the help of Edward Nash of WP4. The last sub-task was to compare the standards among the four experimental farms of the FutureFarm program. This comparison has two phases: The first that has been completed with the help of our partners, concerns the collection of the rules regarding the implementation of the European legislation (Cross Compliance) into the four countries, as well as for the requirements regarding fertilization. Finally, the on-going research has to do with the comparison of SMR and GAEC standards between the four countries mainly focused on identification of differences and similarities in standards between countries at farm level and a comparative approach of fertilization among the four farms.

Highlight clearly significant results in this workpackage

Within the second year of the project a thorough analysis of the standards was carried out. We have started to compare the Cross Compliance regulation among the four countries; however, we have realized that there is not a straight line for this. Within the next 6 months we will continue our effort on this. The survey we have undertaken to identify the needs and requirements for the farm portal has revealed a number of significant findings. Farmers and consumers have in many cases similar ideas and needs, while specialized needs have been identified. This study will enable us to set up a

European Framework for the design of a multifunctional European farm portal.
If applicable, <u>deviations</u> from Annex I, impacts on other tasks as well as on available resources and planning • In Annex I it was mentioned that WP2 will mainly feed WP3 and WP5. However, as the project developed it seemed to be more beneficial if WP2 would directly feed WP4. Mainly, the outcome of WP2 second year report will feed the specification of FMIS into the four countries. Therefore, in close cooperation with WP3 & WP4, it was decided that WP2 would directly feed WP4. • While the Future Farm project is progressing, there has been a need for a modification of Task 5 of WP2 in order to be better utilized by WP4. It was decided after the first year of the report that it would be very beneficial if WP2 could spend some more time after our first deliverable 2.1.1 due on January 2009 to further analyze the standards in country level to develop some real case studies on the experimental farms. Therefore, some changes on Task 5 have been made to better meet WP4 needs and the overall project.
If applicable, reasons for <u>not being on schedule</u>/ impacts on other tasks as well as on available resources and planning (explanations should be coherent with the declaration by the project coordinator) N/A
If applicable, reasons for <u>failing to achieve critical objectives</u> not achieved/ impacts on other tasks as well as on available resources and planning (explanations should be coherent with the declaration by the project coordinator) All critical objectives within this relatively small WP have been achieved.
If applicable, propose <u>corrective actions</u>.

Work package number	WP 3		Start date or starting event:			01/01/2008
Work package title	*Analysis and specification of knowledge based farm management*					
Activity Type	RTD					
Participant id	3	1	16	10	11	14	9
Participant short name	***AU***	CRTH	AUTH	MTT	UNIBAS	PROGIS	WR-INFO
Person-months per beneficiary:	19.5	9	8	8	7	2	1

Objectives

This WP will use the results from the vision (WP1) and the identified management strategies and standard compliance needs (WP2) as the basis for analysing knowledge based farm management. The main objective of this work package will be to analyse and specify the information needs and other requirements for knowledge based management strategies and the compliance with the new framework for European farming. This will include a "top-down approach" considering the decisions, information flow as well as the data flow between on-farm and local entities, including network solution for communication and information flow in the rural area based on a general model of decision-making and information flows.

Description of work

This work will establish a comprehensive and detailed quantitative and qualitative description of the identified knowledge management strategies, activities, processes, and information inherent in the proposed FMIS.

Task 1 Identify **decision processes** in the FMIS (AU (lead), CRTH, MTT, UNIBAS, WR-INFO)

The structure of the FMIS is analysed and it is formally described in terms of relevant decision processes. The decision processes are defined as activities and decision processes surrounding the material and information flow management in PF and identified from existing data and knowledge sources, results from WP1 and WP2 and including new results from empirical decision analysis research. Also, the decision processes are viewed on different planning levels, ranging from the strategic to the tactical and finally to the operational level.

Task 2 Identify **information needs and information flows** in the decision processes. (AU (lead), CRTH, MTT, UNIBAS)

The decision processes are analysed and described in terms of information needs and information flows to and from these processes. The employed methodologies include information feasibility, understood as the value of the information when used for decision making or process documentation. Furthermore, the value of the information is based on the concept of "rational agency" prescribing that all entities (humans, PF-technology, etc.) react rationally when called upon to act based on some input information (sensor information, observations, etc.). As part of this definition phase, user preferences and requirements are acquired through the use of participatory approaches.

Task 3 Identify and specify **inherent data in the FMIS**. (AU (lead), CRTH, AUTH, MTT, UNIBAS)

Based on the identified information needs in the FMIS, the inherent data is identified and specified. Specifically, the definition of spatiotemporal data required by different entities in the FMIS is important. Special attention must be paid to issues such as:

- Data sources and data types, where currently available and future data sources, like sensors and sensor networks, agricultural machinery, other people, web services and web databases, etc. are analyzed.
- Data-set sizes and compression: Sensor networks, machinery, robots, internet sources, etc may provide large amounts of data, why it must be estimated quantitatively if possible the potential incoming "data rates" and also the "data rates" needed/consumed by various system entities. It is likely that data compression/aggregation will be needed.
- Data representation, transmission and transformation: Various system entities need different types of data, or the same data in different scales, form, etc. Existing standards for agricultural and geodesic data representation, dictionaries and electronic interchange, such as ADIS, ISOBUS, "Spatial Data Transfer Standard" (SDTS), etc. will be evaluated.

The fully developed process model and the entities and attributes in the data model provide the basis for outlining the dedicated FMIS to be encoded in WP4.

Task 4 Definition of a **data dictionary/repository.** (AUTH (lead), MTT, UNIBAS, CRTH)

As a further detailing of the data in task 3, a data dictionary/repository is built involving definitions and representations of the individual data elements. A central issue is to assure consistency across usage processes. The dictionary will include both semantics and representational definitions for the data elements. The first components focus on giving a precise meaning of data elements, while the latter definitions describe the way data elements are stored in a database or other storage facility. Different data types (symbolic, numerical) the data precision, etc. will be analyzed and evaluated.

Task 5 Structuring of the **FMIS system architectures**. (AUTH (lead), MTT, UNIBAS)

The identified processes and data form the basis for configuring the FMIS system architecture and the identification of system components within this architecture which implement various functionalities and support the various decision processes as the basis for testing knowledge transfer and information encoding in WP4. A central component is the data storage facility or "farm database" (FDB). This entity will contain all the farm-related data, properly represented to be used by other "modules" which supply the functionality. Different external actors could implement modules and offer functionality with a service fee (e.g., farm consultants). Regardless of the architecture chosen, a detailed functional specification of the various components and their interactions is required. It will be ensured that the specified the data in task 3 used internally in the components, the interactions between components, and all user/decision processes defined in tasks 1 and 2 can be mapped to well-defined and unique interaction sequences among the components. An important point is the interface to the management strategies and required standard compliances identified in WP1.

Task 6 Set up the FMIS system as a **generic reference information model**. (AU (lead)), CRTH, UNIBAS)

The FMIS system is set up as a generic reference information model functioning as a frame for compatible applications of the management processes involved in the multifunctional farm of tomorrow. In order to perform localization of the model and tailor or target the information system to the individual user's characteristics or preferences, an evaluation of the necessary adoption requirements is carried out. This evaluation is based on a focused study of the characteristics, the similarities and differences in agricultural production practices and farming

conditions in different EU countries/regions which are relevant to the application of farm management decision making.

Task 7 Analysis and identification of **real-time requirements**. (AU (lead), CRTH, AUTH, MTT, PROGIS)

As supplemental to the identified system requirements in the other tasks, the real-time requirements in any process or part of the proposed system is analyzed under the expectation that it will be possible to establish on-line control of field operations based on sensor measurements combined with information from databases and decision support. In this connection, the different time-scales of the system will be studied and characterized and specifications will be given. This sub-task will be linked to the "machine and labour management module", which could retrieve suggested operations and execute them with a team of robots, or lighter machines. This module will relate strongly to the logistics of using a fleet of light machines as dealt with in WP6.

Progress towards objectives

The work of the 2nd year of WP3 has been directed toward finalising the system analysis and identification of system boundaries as the basis for a conceptual model of the FMIS. Next, an extensive information modelling for specific operations, tillage, seeding, fertilizing, spraying, harvesting, and irrigation has been carried out as the basis for the partial encodings in WP4. Also, this last part has involved identifying the knowledge and information included in the partial encoding.

Progress/details for each task tackled

Task 1

Together with WP2 and WP4, the deliverable 3.1 "System analysis and definition of system boundaries" was completed. The results from the study have included the derivation of a baseline system involving crop and farm production, operations management and the use of farm management standards for production as well as monitoring and compliance. An analysis of the farm manager has identified the internal as well as external conflicts and problems that the farm manager currently faces. Based on this analysis, the boundary of the targeted system was defined and within the context of these boundaries a description of the proposed system were derived and a conceptual model were set up. The system analysis used a Soft System Methodology (SSM) approach, providing the guidelines for system identification and system design aimed at proposing an integrated FMIS that can support real-time management decisions and support reporting as well as application generation and improvement of the monitoring of compliance to management standards. Also, the deliverable 3.1. has been transformed into a submitted journal paper "Conceptual model of a future farm management information system".

Task 2

Discussion with WP4 on the requirements for the specifications as part of the machine-readable encodings. Exchange of information models as the basis for use-case analyses. Collaborative work between AU and MTT has involved information modelling for specific operations, tillage, seeding, fertilizing, spraying, harvesting, and irrigation. The information modelling comprised the information flows between the different decision processes involved with specific operations, for example the decision on acquiring machinery items involving input information like technology requirements and financial possibilities and produces output information like the selected technology. The completed deliverable presents the use of system engineering principles for the identification of decision

processes and information flows within specific agricultural domains as a framework and guidance for the design of the physical information system. The information flow configuration was centred on the farmer as the principal decision maker. The operations, tillage, seeding, fertilising, spraying, irrigation, and harvesting were analysed and specified.

New information management concepts and designs mean that the controlling of the core task will change. Farmers have to be ready to adopt new working habits and perhaps also undergo further training. Farmers can utilise different services more efficiently and they are able to outsource some of the tasks they had previously performed themselves. Farmers have better knowledge of their production processes and are able to evaluate the performance of the chosen technology. The new orientation and new working habits should lead to better process control in farms. Farmers can also utilise the collected farm data to show the quality of farming e.g. traceability, to markets and administration. The system concept also allows the farmers to access and utilise better scientific research and technological developments by providing fresh real process data and the ability to update the systems according to the latest knowledge.

Task 3

Based on the findings in D3.1 and D3.2, the knowledge and information from the flow diagrams to be encoded in WP4 have been identified and described. The developed flow diagrams do not commit yet to any particular technology or information format. The technology choices take place in the WP4. The fertilising case was chosen as an example for further work in WP3. The fertilising information flow describes generically data involved in the field tasks. The fertilisation task captures one of the most complex information and rule structuring due to environmental and yield quality constraints besides the actual farming practices and constraints. Thus, fertilising task is suitable target for encoding an example case of the core of the new information and knowledge management system structure in WP4.

Task 4

Initiation of a further detailing of the data in Task 3 by building a dictionary/repository involving definitions and representations of the individual data elements. Preliminary derivation of the data elements involved with the built information flows have been performed and will be further elaborated.

Clearly significant results in this work package

D3.1: The development of a baseline conceptual model for the FMIS outlining the functional elements and their interrelationships.

D3.2: The identification of decision processes and information flows within specific agricultural domains as a framework and guidance for the design of the physical information system.

D3.3: The identification and quantification of the knowledge and information from the flow diagrams to be encoded in WP4 have identified and described.

If applicable, <u>deviations</u> from Annex I, impacts on other tasks as well as on available resources and planning

In the second year, there have been no major deviations from the work described in Annex I

If applicable, reasons for <u>not being on schedule</u>/ impacts on other tasks as well as on available resources and planning
N/A
If applicable, reasons for <u>failing to achieve critical objectives</u> not achieved/ impacts on other tasks as well as on available resources and planning
N/A
If applicable, propose <u>corrective actions</u>.
N/A

Work package number	**WP 4**	**Start date or starting event:**			01/01/2008
Work package title	*Knowledge management in the FMIS of tomorrow*				
Activity Type	RTD				
Participant id	6	17	13	10	14	1
Participant short name	***UR***	TKK	CLAAS	MTT	PROGIS	CRTH
Person-months per beneficiary:	48	16	16	6	5	2

Objectives

This WP will use the results of existing published research into the decision-making process in (precision) farming together with the results of WP2 and WP3 to demonstrate how online machine-readable knowledge delivered via the internet may be used in the FMIS of tomorrow. The potential scope of such knowledge includes models and raw data used directly for decision-support, management strategies and information on regulatory and documentation requirements. Such knowledge should in future be made available in a machine-readable form by the originating organisations and continuously actualised, thus removing concerns from software vendors about liability for using inaccurate or out-of-date information in their products whilst still allowing the knowledge to be automatically incorporated in the decision-making process.

Description of work

Task 1 Definition of machine-readable encodings for decision parameters, frameworks, strategies and documentation (UR (lead), TKK, MTT, CLAAS, PROGIS, CRTH)

Existing published research and the findings of WP2 (definition of frameworks and strategies) and WP3 (knowledge management strategies) identify the information required for to define the parameters within which a decision is to be made. This task will define suitable data structures encodings for transfer of this knowledge to a FMIS in a machine-readable form (XML). To reflect the spatial and temporal variability inherent in (precision) farming, each definition would be expected to include a record of the region and period for which it is valid.

Task 2 Analysis and definition of interface to knowledge repositories (TKK (lead), UR (geospatial aspects), CLAAS, PROGIS)

In order to embed the knowledge encoded using the result of task 1 usable in the FMIS, all relevant parts must be reliably retrieved. This requires an interface to be specified allowing a repository to be queried based on the farmer's chosen strategy, location and the time of the decision, and the definitions matching this query to be returned.

Task 3 Analysis and definition of catalogue contents and interface (UR (lead), TKK, MTT)

A farmer must be able to find all repositories containing knowledge which affects the decision to be made. Such repositories must therefore be registered in one or more, potentially interconnected catalogues, which then act as a central point for knowledge retrieval for the farmer. This task will define what information (metadata) is required in order for definitions to be successfully retrieved and will establish a suitable encoding and interface for the querying of this metadata.

Task 4 Analysis and definition of required security systems (UR (lead), TKK, MTT, CLAAS, PROGIS)

An increasingly important aspect of publication of information via the internet is the need for security and a trust relationship between the client and server. In the context of the proposed FMIS of the future, the farmer must be able to verify the publisher in order to asses the trustworthiness, e.g. it would be expected that regulatory information would be published by the appropriate government agencies, certification information by the certificating body, and management/strategy information by research institutes or trusted advisors. Mechanisms to establish such a secure trust relationship must therefore be built into the proposed interfaces and encodings. Additionally, some providers may demand a direct end-user fee for the use of services, and so the requirements of business models, DRM and e-commerce must also be considered.

Task 5 Prototype repository and catalogue (UR (lead), TKK (interface aspects))

In order to test and demonstrate the efficacy of the specifications produced in tasks 1-3, it will be necessary to implement prototypes of the repositories and catalogues. This will enable early detection of potential problems in specifications and an iterative development process.

Task 6 Prototype clients (CLAAS, UR, TKK, Progis)

This task will demonstrate how the repositories and catalogues may be bound into a farmer’s FMIS, either, in a simple form, as an online reference to be used in manual processes, or, in an advanced form, to be used to directly configure the behaviour of the FMIS.

Task 7 Testing (UR, TKK, MTT)

The development of encodings and interfaces is expected to be an iterative process whereby ideas are developed, tested and refined. Experience dictates that theoretically good solutions are harder than expected to implement, which would hinder adoption. It is therefore important that unit-based testing is carried out throughout the duration of the project to verify the acceptability of solutions.

Task 8 Feedback and reporting (UR, TKK, MTT)

New formats and interfaces require a broad community to adopt them in order to be effective. It is therefore important that developments from tasks 1-3 are made in cooperation with the wider research and agricultural communities at an early stage in order to receive feedback and meet their demands. As well as articles in relevant publications, it would therefore be expected to directly contact vendors and (potential) suppliers of information to discuss potential issues and solutions. The consultation should take the form of expert groups.

Progress towards objectives

In the second reporting period, work in WP4 has concentrated on how knowledge transfer related to agricultural management and crop production standards may be implemented on a technical level and how this will be integrated into the operation of the FMIS. A definition of a machine-readable format for this, based on drawing together relevant existing formats, has been produced, together with specifications for interfaces for web-services to enable the knowledge to be automatically found and retrieved via the internet. These build on the component-based model of an FMIS developed in WP3 and the work on identifying structures in management standards performed together with WP2. The specifications developed and tested through prototypes may be used as the basis for future industry standards, allowing commercial FMIS vendors to dynamically bind knowledge on standards into the software.

Progress/details for each task tackled

Task 1

Based on the use-case analysis performed in period 1, an XML schema has been defined for the encoding of agricultural crop production and farm management standards (D4.1.1). This schema combines existing formats such as the W3C Web Ontology Language (OWL) and Rule Interchange Format (RIF) in order to formally represent the rules defined by the standards, together with metadata to enable the standards to be identified and retrieved.

For the encoding of documentation requirements no machine-readable encoding has been produced, rather the information which must be gathered is defined using OWL concepts within the rules in the encoding of the standards. These OWL concepts may then be mapped to concrete data types either at a software level within the FMIS or for data elements in a standardised transfer format such as agroXML. This is discussed fully in D4.1.2.

Task 2

A specification has been produced for a rules server interface based on the REST web-service architecture. This enables the production of simple client and server software. The interface allows for basic search operations based on the metadata encoded within the standard and then for the retrieval of the standard, or individual rules from the standard either one-by-one or filtered by operation. The technical specification is provided as an appendix to D4.2.

Task 3

A specification has been produced for a catalogue interface based on the REST web-service architecture. This allows for the production of simple client and server software. The interface allows further catalogues and rules servers to be found based on search parameters such as region and provider. This allows for a distributed and decentralised system. The technical specification is provided as an appendix to D4.2.

Task 4

Initial analysis has been made as to the required level of security and mechanisms which may provide this. Early indications are that existing standards such as HTTPS encryption and HTTP authentication may provide sufficient security. Federated access management systems such as Shibboleth may also be relevant.

Task 5

For the Agritechnica trade fair in November 2009 an initial implementation of the technical specifications resulting from tasks 2 and 3 was performed. This uses the Ruby programming language with a PostgreSQL database back end. The prototype is currently available via the project website.

Task 6

An initial simple search-and-view prototype client was implemented for the Agritechnica trade fair and is currently available on the project website. This is implemented in Ruby and allows the user to browse the available catalogues and rules servers, retrieve definitions of standards and individual rules filtered by operation. The rules may then be exported in the XML format defined in task 1 or printed to form an individual checklist for the farmer. No processing based on the rules has yet been implemented.

Task 7

During the implementation of prototype software in tasks 5 and 6, the specifications produced in tasks 1, 2 and 3 were tested and iteratively improved. This is an ongoing process as feedback from demonstrations of the software highlights potential further uses of and improvements to the system.

Task 8

Contact was made with a limited number of relevant stakeholders such as standards publishers (German ministry, organic groups) and software companies at the Agritechnica trade fair where a live interactive demo and a "promotional film" illustrating the proposed system were available. Further stakeholder feedback will be sought through expert workshops in the third reporting period. Additionally, the work was presented at a number of academic conferences and workshops covering geographic information, precision agriculture and organic standards.

Clearly <u>significant results</u> in this work package

Specifications have been developed for a service-oriented architecture to make agricultural management and production standards available to farm software via the internet. This enables the software to be to some extent self-configuring based on the farm's location and the farmer's specified profile in terms of voluntary standards. Initially, this simplifies the production of manual checklists for the farmer. In the remaining work within the project, the possibilities for automating parts of the self-assessment will be fully investigated. The specifications developed may form the basis for industry standardisation efforts in this area.

Basic prototype software has been developed based on these specifications. Presentation of this software at the Agritechnica trade fair indicated that there was a great deal of potential interest in such a system from academics, advisors and software companies. Through bringing relevant stakeholders together in expert workshops in the remainder of the project it is hoped that sufficient interest can be generated to allow development to continue after the end of the FutureFarm project. The prototypes developed up until now will be made available under a liberal open-source license so that commercial software companies may benefit fully from them.

If applicable, <u>deviations</u> from Annex I, impacts on other tasks as well as on available resources and planning

- Work within WP4 has led to the conclusion that an additional component of the FMIS rules subsystem should be specified, namely a component for performing evaluation of compliance to the rules. Since the interface to the catalogue was considered to be straightforward, the original deliverables 4.2 and 4.3 were combined and deliverable 4.3 redefined as a specification of the new component.
- Analysis of the standards led to the conclusion that a machine-readable definition of documentation requirements would be better classified as a definition of the data required

to assess compliance. The planned deliverable 4.1.2 was therefore refocused to reflect this.

- Neither of these changes impact on other tasks, resources or planning.

If applicable, reasons for <u>not being on schedule</u>/ impacts on other tasks as well as on available resources and planning

N/A

If applicable, reasons for <u>failing to achieve critical objectives</u> not achieved/ impacts on other tasks as well as on available resources and planning

N/A

If applicable, propose <u>corrective actions</u>.

N/A

Work package number	**WP 5**	**Start date or starting event:**			01/01/2008	
Work package title	*Socio-economic, technology assessment – economic and environmental impact*					
Activity Type	RTD					
Participant id	5	1	3	10	7	
Participant short name	***UCPH***	CRTH	AU	MTT	ZALF	
Person-months per beneficiary:	35	3	2	2	1	

Objectives

The main objective of this work package is to assess the economic and environmental impact on farmers, markets and regions from technical implications of information intensive management systems at the farm level. In addition the objective is to assess the likely acceptability of these systems among users and stakeholders.

Description of work

Task 1 Farm economic management model

The main task of this work package will include a model of farmers management of different input sources, treatment and information management systems (incl. precision farming systems) for a number of crop rotation systems. Focus will be placed on selected and commonly produced crops in different European regions including:

- Wheat
- Rape seed

- Sugar beets
- maize, and other cereals, cotton or other crops (dependent upon partner farms)

Based on a number of model farms designed for different European regions, we intend to integrate current advanced information, precision farming and robotic systems.

The model will allocate factor inputs (like fertiliser, pesticides and lime) to the farmers' different crops based on actual/expected prices of factor inputs, (water, pesticides, seeds, fertilisers and other costs), product prices (timing and quality) and yield response.

Differences in product quality are expressed in terms of price premiums and yields and nitrogen surplus and pesticide use are based on climatic conditions and yield response functions.

In this model a distinction will be made between management at the strategic level (investment in new technology) tactical level (farmers seed and crop choice etc.) and operational level (decisions about nitrogen applications and pesticides at a particular time) depending on the timeframe for choosing technology and operations.

Our analysis will rely on a rational behaviour among farmers and assume that farmers are risk averse.

We will identify, how often technology will induce the farmer to make a new decision and what consequences will that decision have for other future decisions. What are the consequences of that decision – in terms of physical yields and economic feasibility at that particular time? This task will be conducted in line with the management strategies in WP2.

The cost of different information-intensive and safety systems (incl. sensors, safety controllers, navigation controllers, software modules etc.) will be estimated for different scale capacities and compared to conventional systems.

Potential benefits related to these systems such as: labour savings, fuel savings and higher work quality (accuracies) will be estimated and used to quantify the new cost structures and factor productivities that will be applied in task 4. Moreover, data in relation to farmers decision making including product prices (seasonality) will be collected during the project and incorporated in the overall information management model.

The economic management system/model will rely on risk-averse behaviour and economic optimisation for different management scenarios in different rotations with different technology and technical safety levels varying from low level control to high level control.

Task 2 Environmental impact and indicators

For each technical scenario at each site, a number of environmental indicators will be estimated including: nitrogen surpluses, pesticide use and fuel consumption for different strategies and technical scenarios.

Based on these systems we intend to compare the economic viability of different technologies compared with conventional systems according to expected future drivers such as changes in fuel prices, climate change reduction in farm subsidies and competition between bio-energy and food production as outlined in WP 1.

Environmental effects at the regional and EU-level are analysed and aggregated in terms of fuel, energy, fertilizer, and chemical costs in task 4.

Data collection

Each field site partner in Greece, Germany, Czech Republic and Denmark (see work package 7) will

be representative for the relevant technology, agricultural and market conditions at their sites. Farmer and field site partners will be interviewed several times during the season in order to describe farm behaviour, management and farm structures. Moreover, for each site we will collect data about labour and product prices for each season. The farmers should represent farming systems in Europe including:

- Different markets
- Farm holdings with different sizes and
- Farmers who use different information intensive farming technologies, such as. precision farming, autonomous systems and biofuel systems

In addition, partners in WP 2-7 will provide data regarding the different technical systems and specifications, yield response functions and factor inputs and outputs for the various technical systems.

Task 3 Technology assessment

In part 3 a partial and participatory technology assessment will be conducted to assess the likely perception among users. This assessment will rely on the conclusions drawn from the farm economic model and the environmental impact assessment. The participatory assessment will rely on interviews with relevant stakeholders and farm surveys in relevant regions. Moreover, compliance with standards and parameters such as legal requirements for control and safety systems for robotic and farming information management systems (FMIS) in an open and natural environment will be assessed in cooperation with WP2.

The PF adoption surveys will be conducted and compared with existing studies and feed back from user groups will be incorporated with work package 1. Farmers' attitudes and perspectives for the new generation of farms could be assessed by setting up an on-line questionnaire on the farmers' portal. This will be conducted in corporation with WP 1.

Task 4: Assessment of socioeconomic impacts on EU markets and regions

Computable General Equilibrium models (CGE models) may be often used to assess the market impacts on prices, employment, trade (imports/exports) etc. of policy incentives designed to promote a region's FMIS/PF network. More expansive economy wide CGE models frequently offer the advantage of broad coverage over multiple inter-related sectors, but at the expense of sector detail. As well, data to build comprehensive CGE models for FMIS-relevant EU regions and crops are often lacking, but available in the in house FOI GTAP model (Global Trade Analysis Project) which is a general equilibrium model and database.

The potential farm management information systems and precision farming systems are likely to be applied on relatively large farm holdings. In this matter, information- intensive technologies may have more obvious impacts on particular EU crops such as wheat, barley, and rapeseed, among others (hereafter, FMIS/PF-relevant EU crops) and on relevant regions. The regions may be aggregated at the EU-level, member states of focus (e.g. Greece, Germany, Denmark and Czech Republic), or multination EU sub-regions (hereafter PF-relevant EU regions).

Some of the relevant cropping systems and regions may also be non-EU entities in China or Eastern Europe.

In task 4 the socioeconomic effects are assessed by using the in-house FOI GTAP-model (global trade model and database) for a number of relevant information- intensive and precision farming systems. The new and more efficient technologies (PF and FMIS) are introduced to the GTAP with a change in cost structures and factor productivities estimated in task 1. By using the FOI GTAP

model the national and regional socioeconomic effects of PF can be assessed using factor productivity scenarios and slow or fast dissemination of the PF to other regions.

FOI's GTAP global trade model can be used for sectoral studies for PF-relevant crops for PE-relevant EU regions. The FOI GTAP database has 57 sectors of which 12 are primary agricultural sectors (wheat, other cereal grains, oil seeds, sugar beets etc.) and 8 are secondary agricultural sectors. Main components of the model include domestic production, domestic demand, exports and imports and various price variables. In addition, trade policy variables such as tariffs, subsidies/taxes (designed to promote PF) and market price-influencing events are built into the model as price wedges on the produced, consumed, and traded consignments of final products as well as on various inputs in the production process.

We propose application of the GTAP model to FMIS/PF-relevant markets in relevant regions that comprise settings of particular concern or interest to assess the market impacts of policies and incentives designed to promote FMIS and PF. We can reflect PF-augmenting policies on the model's input or/ output sides of the market of focus, and assess the proposed policies on the above-mentioned market variables.

Progress towards objectives

The main focus in this project period has been on the cost structure analysis and farm survey about perception of information systems in Europe. This survey report covers the 4 countries: Denmark, Greece, Finland and Germany. The report address issues on time studies for paper work, meeting etc at farms, PF adoption among farms, use of automated systems and farmers attitude towards information systems.

Progress/details for each task tackled

Task 1

The main task of this WP include a model of farmers more intelligent management of different input sources, treatment and information management systems (incl. precision farming systems) for a number of crop rotation systems.

For these crop rotations we have assessed the cost structure and potential economic benefits for various systems. So far we have focused on the following systems:

- Automated steering and optimized route planning

- Planning of fertilizer application and variable rate application.

- Variable herbicide spraying based on weed maps and weather forecast

- Harvest logistics and controlled traffic

- Precision seeding and seed patterns

A report is under preparation with focus on these systems.

Task 2

For some of the above systems, environmental impacts have been identified in terms of fuel savings and reduction of factor inputs.

Task 3

The main work in second project period has been on the farm survey and technology assessment task. The survey conducted was focused on the application of management information systems in agriculture and the role of precision farming. It has been carried out in autumn 2009 in following countries: Greece, Germany, Finland and Denmark with 75, 74, 78 and 182 respondents respectively. Also, farming practices at the field site in Czech Republic, Litovel, were identified.

During the second project period, and to address the above mentioned issues, we have had meetings among the WP5 group and among related partners in other WP's.

The group has visited the field-site in Czech Republic to assess relevant technologies and systems for the cost structure analysis and participated at the Agritechnica exhibition in Hannover. This will be compared with previous field trips to farms in Denmark and Germany.

Task 4

Only little progress has been made in this task. Task 4 will be a focus area in the third reporting period.

Clearly significant results in this work package

A significant milestone in this project period has been a survey report on the farmers assessment of information systems and PF.

This survey report covers the 4 countries: Denmark, Greece, Finland and Germany. The report address issues on time studies for paper work, meeting etc at farms, PF adoption among farms, use of automated systems and farmers attitude towards information systems.

The cost of different information-intensive and safety systems has been estimated for different scale capacities and compared to conventional systems. Potential benefits related to these systems such as labour and fuel savings have been estimated and used to quantify the new factor productivities.

Several of the following techniques have been analysed with different scale capacities:

- Automated steering and optimized route planning
- Planning of fertilizer application and variable rate application.
- Variable herbicide spraying based on weed maps and weather forecast
- Variable rate cultivation of soils based on soil maps
- Harvest logistics harvest timing with fleet management
- Variable rate seeding
- Chlorophyll content measuring before harvesting to optimize harvest procedures
- Management of areal subsidies

The above systems will be aggregated in terms of their broader socioeconomic impact analysis that will be carried out in the third project period. In this project period we made a survey report on the farmers assessment of information systems and PF.

If applicable, deviations from Annex I, impacts on other tasks as well as on available resources and planning

N/A

If applicable, reasons for not being on schedule/ impacts on other tasks as well as on available resources and planning

N/A
If applicable, reasons for <u>failing to achieve critical objectives</u> not achieved/ impacts on other tasks as well as on available resources and planning N/A
If applicable, propose <u>corrective actions</u>. N/A

Work package number	**WP 6**		**Start date or starting event:**			01/01/2008		
Work package title	*Influences of robotics and biofuels on economic and energetic efficiencies of farm production*								
Activity Type	RTD								
Participant id	12	10	18	3	16	1	5		
Participant short name	***WUR***	TKK	UAL	AU	AUTH	CRTH	UCPH		
Person-months per beneficiary:	8.5	5.5	5.5	6.5	4.5	4.5	1		

Objectives

- To assess the energy balance of current farming systems, to determine energy saving potentials and to typify current and new robot technology and their potential tasks in farming
- To asses the potential of on-farm bio-fuel production
- To optimize single and multiple machine fleet management in view of energy usage and costs
- To demonstrate current research robotic platforms

Description of work

Task 1 Energy balances and new mechanization specifications

a) Carrying out an energy audit and analyze energy balances of current farming systems including direct and indirect energy consumptions (hidden energy losses)

b) Identifying energy saving potentials in current farming systems (controlled traffic, increased productivity (time), soil regeneration and traffic reduction)

c) Typifying available and predicted robot systems and their potential tasks in farming (e.g. fleets of small light machines)

Task 2 On-farm bio-fuel production

a) Investigating the potential of on-farm closed loop energy flows, focusing on on-farm

production and processing of bio-fuels given current technology

b) Typifying technological innovations required for successful commercial on-farm implementation

Task 3 Optimized fleet management to reduce energy consumption and costs

a) Optimizing single and multiple-machine (fleet) route planning and machine usage

b) Investigating the required data, information flow and information management for optimized farm mechanization management comprising single machines or fleets of (autonomous) machines

Task 4 Demonstration of prototype robotic systems

a) Evaluation and demonstration of current prototype robotic systems during the Field Robot Event 2009 in Wageningen, The Netherlands

Progress towards objectives

The assessment of the energy balance of current farming systems, to determine energy saving potentials and to typify current and new robot technology and their potential tasks in farming is one of the final deliverables for this work package, during year two some preliminary investigations were performed. This objective will be the main priority of WP6 in year 3.

The assessment of potential of on-farm bio-fuel production was the main activity within this work package for the first year. The research was finished and final report was completed and submitted early 2009.

Single and multiple machine fleet management optimization in view of energy usage and costs was one of the main objectives in 2009. The research plan was finalized, tasks were distributed amongst partners and a draft report was completed by the end of 2009.

The robot demo was another main objective in 2009. The demo took place in July 2009 during the JIAC2009 – Joint International Agriculture Conference in Wageningen, The Netherlands together with the Field Robot Event competition.

Progress/details for each task tackled

Task 1

This task has been scheduled for 2010. Some preliminary analysis has been done. A more detailed research plan has been produced.

Task 2

In this working period this task was addressed in full detail and resulted in deliverable 6.1. In this report the potential of on-farm biofuel production is addressed. The following issues were investigated:

- Choice of crop depending on location in Europe,
- The energy budget of two biofuel crops: rapeseed and sunflower,
- Self sufficiency of European farms with respect to fuel,
- The economics of on farm biofuel production,

- Technical aspects of using vegetable oil as fuels for current farming machinery,
- Environmental effects and CO_2 budget.

All issues have been addressed in a final report that was submitted early 2009.

Task 3

In this working period work was focussed on:

- Review of the state of the art in on-farm route planning and machine usage (coverage as well as optimized on-field machine operation) and comparative study of existing approaches
- Identification of bottlenecks/limitations in currently available route planning algorithms
- Assessment of energy and cost savings potential by comparing optimized routes and routes used in standard agricultural practice
- Assessment of required data and information flow for fleet management.

Reports addressing each of these issues have been finished and delivered. They are namely deliverables 6.3.1, 6.3.2, and 6.3.3.

Task 4

During the first half of 2009 organization of the demonstration prototype robotic systems was finalized resulting in a demonstration of 10 robotic systems on 9 July 2009. This demonstration coincided with the Joint International Agricultural Conference (JIAC) visited by more than 500 people and the Field Robot Event competition, attended by 13 robotic systems and more than 100 robot team members. Both robot events were well attended and received considerable attention of the written press as well as international television (Korea and Reuters). A survey at the end of the JIAC revealed that the combination was very much appreciated by the visitors of the conference, raising discussion about potential, pro's and con's of robotics for future applications in agriculture.

Clearly <u>significant results</u> in this work package

Deliverable 1 – on-farm bio-fuel production. The analysis of on-farm bio-fuel production revealed that:

- In farm vegetable oil production is feasible with simple means.
- Sunflower for the South and Rape seed for the North are candidate crops which produces oil that can power farm tractors with diesel engines.
- Both crops have a clear positive energy balance of the energy crops like rape seed and sunflower under European conditions.
- Up to 6.1% of the farm land can cover the requirements of crops without irrigation but up to 15% is required to cover the irrigation needs as well.
- Additional amounts of feedstock from the press cake and solid biomass from the crop stalks can provide animal feed and heat for residence, offices or greenhouses.
- Based on the results a direct energy independent farm is feasible. This farm would save significant amounts of energy a considerable contribution to the achievement of the EU targets.
- Also a clear economic benefit for the farmer will be created.
- Use of vegetable oil might yield a higher NOx emission but a lower pm emission as well lower CO_2 emissions.

Deliverable 2 – field robot demonstration. The state-of-the-art of agro-robotics was demonstrated to and discussed amongst a large group of experts in the field of precision agriculture and agro-ICT

during JIAC2009. An audit amongst participants of JIAC2009 conference showed that the demonstration of the current state of the art of agro-robotics and the competition of the field robot event were very much appreciated.

Deliverable 3 – Fleet management. A literature review has revealed what the research community has shown to be possible for planning and managing the operation of teams of conventional and semi-autonomous machines. Currently available commercial technology for planning and managing the operation of agricultural machine fleets was identified. Limitations of currently available commercial research-prototype systems were identified. And finally recommendations were done for bridging the gaps between what is commercially available, and what constitutes state of the art in research, and develops a roadmap for what needs to be developed further.

A comparison of optimal field planning with practical field planning schemes revealed a fuel saving potential of 10%.

Computational and communication requirements for fleet management were analyzed. It was concluded that due to computational complexity, computation of fleet management strategies will not be performed on board the machines but at by a central processor, the dispatcher. Band width requirements were analyzed in view of data transmission requirements.

If applicable, deviations from Annex I, impacts on other tasks as well as on available resources and planning

Not applicable

If applicable, reasons for not being on schedule/ impacts on other tasks as well as on available resources and planning

Not applicable

If applicable, reasons for failing to achieve critical objectives not achieved/ impacts on other tasks as well as on available resources and planning

Not applicable

If applicable, propose corrective actions.

Not applicable

Work package number	WP 7	Start date or starting event:					01/01/2008
Work package title	*Generalisation, integration, application and dissemination*						
Activity Type	RTD						
Participant id	7	4	14				
Participant short name	***ZALF***	CU	PROGIS				
Person-months per beneficiary:	36	18	18				

Objectives

1) Continuously analyse and verify the procedures, protocols and tools (of WP 3, 4) in practical research work on four selected farms in the EU and generalise the potentials of information-driven technologies / PF with respect to the future farm-types in the EU27-member states (with WP1).
2) study the potentials, demands and procedures of on-line data acquisition on-field for a Farm-MIS with the example of on-line soil-analysis
3) analyse the demand and potentials of decision support tools in knowledge transfer for decision making and extension service (example: energy efficiency of crop production)
4) communicate and analyse relevant project results with stakeholders

Description of work

Task 1 *Derive a typology of PF-technologies suitable for EU-farmers* (ZALF, PROGIS, CU) Structuring the complexity of technologies for information driven crop production with a systematic typology. The typology will focus on archetypes of PF-technologies and their typical variations within the overall scheme of techniques and procedures around the information-oriented production of crops. The agronomical and technical/cultural differences of farming in Europe will be respected.

Task 2 *Derive a typology of farms and farming regions depicting the degree of potential economic and ecological benefits* when applying PF-technologies (ZALF, PROGIS).

This activity will produce a generic farm-typology containing specific information on the potential impacts of PF-technologies on typical European farms for predefined general conditions (with WP3, 5). The typical and relevant PF-information flows in farms and in regions will be considered.

Task 3 *Analyse the necessary links in information transfer* between the crop production processes and the relevant stakeholders in the value-added chain (PROGIS, ZALF).

This activity will produce information as to which steps, methods and procedures are necessary to comply with the demands form within the value added chain when crop production is managed in an integrative within the future farms of the EU.

Task 4 *Analyse potentials and develop general procedures for online data acquisition* for characterizing soils of fields on farms (CU, PROGIS).

Information on actual situations of sites (soil, relief) and canopy are relevant for decision making and quality control in the crop management. It has to be analysed and standardized which procedures are necessary to integrate online-sensor data into a Farm-MIS and how to implement this under practical farming conditions.

Task 5 *Analyse the feasibility and applicability of concepts, methods and results* of the FUTUREFARM project under practical farming conditions (CU, PROGIS, ZALF). This activity will produce experimental activities, information material, knowledge platforms for extension service and will produce transfer activities to enhance dissemination on potentials and constraints of a FMIS for future farms in the EU.

Progress towards objectives

For the analysis of the potential of using information-driven technologies with precision farming technologies as an example different indicators were tested.

The soil sampling on all pilot farms, jointly organised by ZALF and CU, was concluded.

Results of the FutureFarm project were presented at the JIAC (Joint International Agricultural Conference) held in Wageningen (The Netherlands) in July 2009 and at the Agritechnica 2009 in Hannover and discussed with different stakeholder groups.

Progress/details for each task tackled

Task 1.

Task 1 results in deliverable 7.1 "A typology of PF-technologies suitable for farms in the EU-member states" (due in month 13). A paper with the deliverables main content was submitted to the JIAC (Joint International Agricultural Conference) held in Wageningen (The Netherlands) in July 2009.

Task 2.

Task 2 will result in deliverable 7.3 "A typology of farms and regions in the member-states of the EU assessing the economic and ecological benefits from applying PF-technologies". Because Dr. Jürgen Schwarz left the project in February the deliverable could not finished in month 24. Analysis for identifying regions with a potential for use of PF-technologies are done and will be discussed with the partners in month 26.

Task 3.

Task 3 will result in deliverable 7.4 "Protocols for procedures deducting the necessary links with PF-Techniques from farming processes into the value added chain in the production of food, feed, fibres and fuels with crops" (due in month 30). Conceptual ideas for standardized information for the farm portal, integrating the needs of the farmers and towards their customers and chain partners as well as public authorities are developed. Preparatory work of training for two pilot-farms was done.

Task 4.

The main attention in task 4 was in the last year on i) the development and testing of the on-line measurement system of soil properties and ii) the Development of calibration models. After finalising the development of the on-line measurement system, and the testing of the system in 5 fields in Silsoe farm, UK, was organised the measurement trip to three FutureFarm pilot farms in Czech Republic, Denmark and Germany. The soil samples were analysed at ZALF and Canfield University and a calibration models were developed.

Task 5.

Dissemination activities were in the focus of task 5. Results of the FutureFarm project were presented at the JIAC (Joint International Agricultural Conference) held in Wageningen (The Netherlands) in July 2009. The project also supported the field robot event at the JIAC, partially with developments of the partner institutes, as an outlook for the use of modern technologies in future agriculture.

It was agreed that deliverable 2.2 and deliverable 7.2 should be developed in close cooperation between WP2 and WP7. Due to this, a scientist from CRTH visited ZALF in September 2009. Questionnaires for different target groups were developed and tested to ask their claims to a farm website.

At the Agritechnica 2009 in Hannover ZALF together with University of Rostock from WP4 presented an overview of FutureFarm with the main focus on the Farm Management Information System (FMIS) and PROGIS presented modern agro-technologies.

Clearly significant results in this work package

Deliverable 7.1 was concluded.

If applicable, deviations from Annex I, impacts on other tasks as well as on available resources and planning

The finalisation of deliverable 7.2 ("web portal") was postponed to month 33 (instead of month 18). This enables a close cooperation between WP 7 and WP 2, which has to develop a "farm portal" (deliverable 2.2).

If applicable, reasons for not being on schedule/ impacts on other tasks as well as on available resources and planning

The finalisation of deliverable 7.3 ("typologies of regions") will be postponed to month 26 (instead of month 24) due to the leaving of two scientist.

If applicable, reasons for failing to achieve critical objectives not achieved/ impacts on other tasks as well as on available resources and planning

n/a

If applicable, propose corrective actions.

n/a

3.2 List of meetings

The following table provides a list of work-package and other meetings, their dates, venues, participants, items discussed and decisions made.

Table 1: List of meetings within FutureFarm in the year 2009

Date	Location	Participants	Items discussed	Decisions
5-9/1/2009	Concepción, Chile	Mayer(PROGIS)	Frutic-Intern. Symposium of Information for Sustainable Production of Fruit and Vegetables	Discussion with target groups
28-30/1/2009	Rome, Italy	All	General Assembly; SC meeting	
28-30/1/2009	Rome, Italy	Henten(WUR), Vougioukas(AUTH), Oksanen (TKK), Guzman (CU), Sorensen(AU)	Research planning deliverable 3	Plan was agreed and implemented
29/1/2009	Rome, Italy	Pesonen (MTT), Pedersen (UCPH), Fountas (CRTH), Basso (UNIBAS), Vougioukas (AUTH), Sørensen (AU)	Internal WP3 meeting, further work planning in WP3	Task schedule and task allocation for coming deliverables
2-3/3/2009	Rome, Italy	Pesonen (MTT), Pedersen (UCPH), Fountas (CRTH), Basso (UNIBAS), Sørensen (AU)	Planned work in WP3, work on journal paper concerning decision making processes, etc., work on journal paper extracted from WP3.1 deliverable	Work schedule, allocation of tasks, organisation of the proposed papers
9-10/3/2009	Rostock, Germany	Mayer(PROGIS), Nash (UR)		Discussion on FMIS

Date	Location	Participants	Items discussed	Decisions
10-11/3/2009	Rostock, Germany	Bill (UR), Kaivosoja (MTT), Kluger (CLAAS), Mayer (Progis), Nash (UR), Nikkilä (TKK), Oetzel (CLAAS), Pesonen (MTT), Seilonen (TKK), Wiebensohn (UR), Guests: Kunisch & Martini (KTBL)	Relationship between agroXML/agriXchange and FutureFarm- Deliverable 4.1.1- System use-cases within WP4- System architecture- Plan of future work in WP4	Identification of RulesApp component - Restructuring of deliverables 4.2 and 4.3.- Refocusing of D4.1.2- Milestones for D4.2
10/3/2009	Mespol Medlov a.s.	Farmer, WRLS	Used standards	WP2 deliverables
15/3/2009	Mespol Medlov a.s.	Farmer, WRLS	Data measurements on the field	WP7 deliverables
23-27/3/2009	Helsinki, Finland	Pesonen (MTT), Suomi (MTT), Sørensen (AU)	Development of information models for selected operations	Design and configuration of information models
24/4/2009	Genf, Switzerland	Werner (ZALF), Wurbs (ZALF), Herold (ZALF), Pölling (ZALF), Mayer (PROGIS)	Global Humanitarian Forum	Discussion with target groups
30/4-1/5/2009	London, United Kingdom	Mayer (PROGIS)	Africa International Soft Commodities	Discussion with target groups
30-31/5/2009	Athens, Greece	Pesonen (MTT), Vougioukas (AUTH), Fountas (CRTH), Bochtis(AU), Sørensen (AU)	Development of procedures for specification of knowledge to be encoded	Derived procedural approach
3/7/2009	Wageningen, The Netherlands	Werner (ZALF), Herold(ZALF), Sorensen (AU), Pölling (ZALF)	Task 4 of Work Package 2	Carry out personal interviews for the Farm Portal. Athanasios Chatzinikos will spend 3 weeks in ZALF in September 2009

Date	Location	Participants	Items discussed	Decisions
3/7/2009	Wageningen, The Netherlands	Fountas (CRTH), Nash (UR), Wiebensohn (UR)	Task 5 of Work Package 2	Analysis will be focused on the fertilization case. We will analyze Cross Compliance regulation for all 4 countries.
6-9/7/2009	Wageningen, Holland	Pedersen (UCPH)	Presentation of work and further progress in relation to task 1 and 3	
6-8/7/2009	Wageningen, The Netherlands	All	Joint Int. Agricultural Conference (JIAC)	WP7 (A.Werner) chair of the session: Precision agriculture in regional modelling WP8 (S. Blackmore) chair of session: Future Farming.
6-8/7/2009	Wageningen, The Netherlands	Henten (WUR), Blackmore (CRTH), Vougioukas(AUTH), Bochtis (AU), Sorensen (AU), Pedersen (UCPH), Gemtos (CRTH)	Presentation of various results during JIAC2009 conference	Dissemination
7/7/2009	Wageningen, The Netherlands	Henten (WUR), Oksanen (TKK), Blackmore (CRTH)	Demonstration of robots	Demo and dissemination
8/7/2009	Wageningen, The Netherlands	Werner (ZALF), Wurbs (ZALF), Herold (ZALF), Pölling (ZALF), Fountas (CRTH)	Discussion on farm and web portal	Mr. Chatzinikos will come to ZALF in September 2009 to work together on the farm and web portal
9/7/2009	Wageningen, The Netherlands	All	Stakeholder meeting, SC meeting	

Date	Location	Participants	Items discussed	Decisions
9/7/2009	Wageningen, The Netherlands	Werner (ZALF), Wurbs (ZALF), Herold (ZALF), Pölling (ZALF), Markinos (pilot farm), Langkilde(pilot farm), Gnip (pilot farm)	Discussion on the contracts with the farms	The contracts will be signed as soon as possible
10/7/2009	Wageningen, The Netherlands	Pedersen (UCPH), Fountas (CERETH), Pesonen (MTT), Sørensen (AU)	Internal WP3 meeting, further work planning in WP3	Task schedule and task allocation
10/7/2009	Gütersloh, Germany	Kluger (CLAAS), Nash (UR), Oetzel (CLAAS), Wiebensohn (UR)	Finalise expected workflow of system components.	Production of Business Process Model showing workflow
22/7/2009	Berlin, Germany	Herold(ZALF), Pölling(ZALF), Prof. Wang (Stakeholder)	Information on ongoing work	
22/7/2009	Berlin, Germany	Werner (ZALF), Wurbs (ZALF), Herold (ZALF), Pölling (ZALF), Nash(UR)	Discussion on further work	Preparation of the Agritechnica, work on standards and their dissemination
23/7/2009	Wulfen, Germany	Werner (ZALF), Wurbs (ZALF), Herold (ZALF), Pölling (ZALF), Wang (stakeholder), Klemke (pilot farm)	Visit of the German pilot farm	
10/9/2009	Illinois, USA	Henten (WUR), Vougioukas (AUTH)	Progress discussion deliverable 3	Progress was on schedule and further strategy was agreed upon
30/9/2009	Gütersloh, Germany	Kluger (CLAAS), Nash (UR)	Discussion of content of “promotional video” for Agritechnica	Production of final “script” for video
2/10/2009	Gütersloh, Germany	Pölling (ZALF), Oetzel (CLAAS)	Discussion on a data set for del. 7.3; preparation of the Agritechnica	

Date	Location	Participants	Items discussed	Decisions
6-12/10/2009	Müncheberg, Germany	Werner (ZALF), Wurbs (ZALF), Herold (ZALF), Pölling (ZALF), Chatzinikos (CRTH)	Demands on a farm- and web-portal	Preparation of the questionnaires, developing and testing
29-30/10/2009	Rostock, Germany	Herold (ZALF), Nash (UR), Poelling (ZALF), Wiebensohn (UR)	Final preparation for FutureFarm stand at Agritechnica	N/A
29-30/10/2009	Rostock, Germany	Herold (ZALF), Pölling (ZALF), Nash(UR)	Preparation of the Agritechnica	
5/11/2009	Mespol Medlov a.s.	Farmer, WRLS,	Farm production and management	WP4 deliverables
7-14/11/2009	Hannover, Germany	Werner (ZALF), Wurbs (ZALF), Herold (ZALF), Pölling (ZALF), Nash(UR), Wiebensohn (UR), Chatzinikos(CRTH)	Presentation of the FutureFarm project, interviews with diff. target groups	
8/11/2009	Hannover, Germany, AgriTechnica	Pesonen (MMT), Sørensen (AU)	Survey about design of information infra structure – identifying alternatives to ISOBUS approach Identifying companies offering external services to farmers	Elements on the service oriented approach to be included in the paper on information modelling
12-15/11/2009	Germany, Hannover and Czech Republic, Litovel	Pedersen(UCPH), Ørum (UCPH), Sørensen (AU)	Adoption of PF and FMIS activities at field Scale – studying the latest technology at Agritechnica exhibition	

3.3 Usage of person months

Table 2 shows the use of resources (person months) for each partner and each work package.

The actual sum of person months can be mirrored against the person months planned according to the DoW for (i) each partner, (ii) each work package and (iii) for the overall project (at the bottom of the table).

This table is continued on the basis of "Table B1.3.6-1: Project Effort 1 - Indicative efforts per beneficiary per WP" in the Dow/Annex I of FutureFarm.

Table 2: use of resources - planned person months vs. used person months per work package and partner for the period 01.January 2009 - 31.December 2009

Partner	Person	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	Total
1 CRTH	**Planned**	**8**	**15**	**9**	**2**	**3**	**4.5**		**31.5**	**73.0**
	Simon Blackmore								6.00	
	Katerina Apostolidi								5.72	
	Spyros Fountas		3.00							
	Marilena Gemtou	4.80								
	Katerina Aggelopoulou					1.43				
	Thanasis Chatzinikos		3.43							
	Anna Vatsanidou		4.82							
	Theodoros Stergiopoulos			1.43						
	Sum: actual person months	4.80	11.25	1.43		1.43			11.72	30.63
	Sum 1st Period: actual person months	*2.40*	*7.39*	*1.43*		*1.43*			*9.86*	*22.51*
3 AU	**Planned**		**3.5**	**19.5**		**2**	**6.5**			**31.5**
	Claus Sorensen		1.00	2.93		0.75	1.50			
	Frank Oudshorn						0.60			

Partner	Person	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	Total
	Pernille Bildsøe			4.19						
	Niels Henrik Mortensen						1.40			
	Sum: actual person months		1.00	7.12		0.75	3.50			12.37
	Sum 1st Period: actual person months		*1.54*	*4.75*		*0.50*	*1.17*			*7.96*
5 UCPH	**Planned**		**1.5**			**35**	**1**			**37.5**
	Elena Tavella					2.00				
	Inger Marie Kirketerp					3.10				
	Jens Erik Ørum					1.60				
	Lartey Lawson					5.00				
	Søren M. Pedersen		0.50			3.30				
	Sum: actual person months		0.50			15.00				15.50
	Sum 1st Period: actual person months					*7.50*				*7.50*
6 UR	**Planned**				**48**					**48.0**
	Edward Nash				10.375					
	Wiebensohn				9.00					
	Sum: actual person months				19.375					19.375
	Sum 1st Period: actual person months				*8.50*					*8.50*
7 ZALF	**Planned**	**6.5**	**8.5**			**1**		**36**	**22.5**	**74.5**
	Armin Werner							0.68	1.26	
	Angelika Wurbs							1.58	2.09	
	Jürgen Schwarz							2.00		

Partner	Person	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	Total
	Frank Dreger							0.21	2.39	
	Silja Tiemann		1.00							
	Thomas Kutter		1.00							
	Bernd Pölling		0.40		0.15	0.15		0.93	2.87	
	Luzia Herold		0.24			0.45		1.36	3.20	
	Anne Winter							0.81		
	Dorett Berger							0.38		
	Viola Kannemann							0.40		
	Helga Pietschmann							0.24		
	Marianne Mäder							0.23		
	Renate Keitz							0.23		
	Elisabeth Streblow							0.13		
	Sum: actual person months		2.64		0.15	0.60		9.18	6.07	18.64
	Sum 1st Period: actual person months	*0.44*	*4.81*			*0.16*		*11.90*	*6.23*	*23.54*
9 WR-INFO	**Planned**	**18**	**1**	**1**						**20.0**
	Pavel Gnip	1.00								
	Karel Charvat	1.50								
	Matej Krocan	0.50								
	Zbynek Krivanek	0.50								
	Sum: actual	3.50								3.50

Partner	Person	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	Total
	person months									
	Sum 1st Period: actual person months	*8.30*	*0.50*	*0.50*						*9.30*
10 MTT	**Planned**			**8**	**6**	**2**				**16.0**
	Liisa Pesonen			3.25	1.65	1.10				
	Pasi Suomi			2.01						
	Jere Kaivosoja				1.91	0.20				
	Riikka Nousiainen					0.35				
	Frederick Teye			0.07						
	Asko Ojanne			0.06						
	Sum: actual person months			5.41	3.56	1.65				10.61
	Sum 1st Period: actual person months			*1.29*	*1.85*	*0.50*				*3.64*
11 UNIBAS	**Planned**			**7**						**7.0**
	Bruno Basso			1.92						
	Giovanni Cafiero			1.20						
	Sum: actual person months			3.12						3.12
	Sum 1st Period: actual person months			*1.00*						*1.00*
12 WUR	**Planned**						**8.5**			**8.5**
	Eldert van Henten						1.40			
	T. Bakker						4.60			
	Sum: actual person months						6.00			6.00

Partner	Person	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	Total
	Sum 1st Period: actual person months						*0.40*			*0.40*
13 CLAAS	**Planned**				**16**					**16.0**
	Kai Oetzel				1.20					
	Sasha Kluger				3.90					
	Sum: actual person months				5.10					5.10
	Sum 1st Period: actual person months				*4.00*					*4.00*
14 PROGIS	**Planned**	**3.5**	**4.5**	**2**	**5**			**18**		**33.0**
	Bernhard Aigner	0.01	0.02	0.01	1.07			0.21		
	Petutschnig	0.78	0.48	0.69	0.30			0.84		
	Renate Writzl	0.50	0.17	0.31	0.01			1.80		
	Silvia Druml	0.05	0.05	0.05	0.05			0.05		
	Karin Strobl	0.06	0.36	0.03	0.04			0.18		
	Walter Mayer	0.18	0.10	0.06	0.06			0.93		
	Simon Mayer							8.75		
	Sum: actual person months	1.59	1.19	1.16	1.54			12.75		18.21
	Sum 1st Period: actual person months	*1.66*	*1.30*	*0.19*	*0.74*			*1.06*		*4.95*
16 AUTH	**Planned**			**8**			**4.5**			**12.5**
	Dionysis Bochtis			0.74			1.72			
	Yiannis Ampatzidis			1.79						
	Hariklia Kotsakioti			1.34						
	Thomas Koletis			0.45						

Partner	Person	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	Total
	Sum: actual person months			4.32			1.72			6.04
	Sum 1st Period: actual person months			*1.16*			*2.78*			*3.94*
17 TKK	**Planned**				**16**		**5.5**			**21.5**
	Arto Visala						1.00			
	Timo Oksanen						3.50			
	Raimo Nikkilä				7.50					
	Ilkka Seilonen				4.00					
	Sum: actual person months				11.50		4.50			16.00
	Sum 1st Period: actual person months				*3.50*					*3.50*
18 UAL	**Planned**						**5.5**			**5.5**
	José Luis Guzmán Sánchez						1.527			
	Manuel Berenguel						1.047			
	Francisco Rodriguez						0.902			
	Julian Sanchez-Hermosilla						0.786			
	Sum: actual person months						4.262			4.262
	Sum 1st Period: actual person months						0.46			0.46
19 CU	**Planned**							**18**		**18.0**
	Abdul Mouazen							.25		

Partner	Person	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	Total
	Boyan Kuang							12		
	Sum: actual person months							12.25		
	Sum 1st Period: actual person months							0.19		0.19
Total	**Planned**	**36.00**	**34.00**	**54.50**	**93.00**	**43.00**	**36.00**	**72.00**	**54.00**	**422.50**
	Actual for Second Period	9.89	16.58	22.56	41.23	19.43	19.98	34.18	17.79	169.36
	Actual for First Period	12.80	15.54	10.32	18.59	10.09	4.81	13.15	16.09	101.39
	Actual for Both Periods	**22.69**	**32.12**	**32.88**	**59.82**	**29.52**	**24.79**	**47.33**	**33.88**	**270.75**

3.4 List of presentations

Table 3 shows a list of presentations given at conferences or other occasions with references to FutureFarm content in the year 2009. Amongst others, there was a FutureFarm session during the JIAC 2009 conference which alone has got a tentative list of nine presentations from the FutureFarm consortium.

Table 3: List of presentations

Date	Location	Conference /Workshop	Name (Beneficiary)	Title of presentation (oral, poster, other)
26/1/2009	Bonn, Germany	Workshop	Werner (ZALF), Dreger (ZALF)	FutureFarm – more than just a research project of the EU (oral presentation)
9-10/2/2009	Moscow, Russia	Investment forum	Mayer (Progis)	Oral *"integrated farm management – including FutureFarm" and one to one discussions*
19/2/2009	Brussels, Belgium	KIS Partnering Forum 2009	Mayer (Progis)	Oral "software and IT-services" including FutureFarm presentation, one to one discussions
March 2009	Rostock, Germany	GIL Conference 2009	Nash (UR)	The need for content-lists, dictionaries and ontologies in expressing and evaluating compliance to crop-production regulations, guidelines and standards (oral presentation)
2-4/3/2009	Tunis, Tunisia	Trade commission to African Development Bank	Mayer (Progis)	One to one discussions also about FutureFarm contents
9-10/3/2009	Rostock, Germany	29. GIL Tagung 2009	Mayer (Progis)	Oral *"Change management" with information on FutureFarm*
13/3/2009	Sao Paulo, Brazil	Workshop	Werner (ZALF)	Suggestions for future priorities of German-Brazilian Cooperation in Science for Sustainability (oral presentation)

Date	Location	Conference /Workshop	Name (Beneficiary)	Title of presentation (oral, poster, other)
18-23/4/2009	Beijing, PRC	Agricultural Information Research Institute, CAAS Chinese Academy of Agricultural Sciences, And BEO Inc. Beijing EastDawn Information Technology Inc. / BEO Beijing Earth Observation Inc	Mayer (Progis)	Oral *presentation on a holistic farm management and one to one discussions with introduction of FutureFarm*
19 – 24/4/2009	Vienna, Austria	European Geosciences Union General Assembly 2009	Kuang, Mouazen (CU)	Comparison between Principal Component Regression, Partial Least Squares Regression and Artificial Neural Network analyses of vis-NIR spectra for the prediction of selected soil properties. (poster)
24/4/2009	Geneva, Italy	Global Humanitarian Forum	Mayer (Progis)	Oral *presentation on a holistic farm management with information on FutureFarm*
27-29/4/2009	Kiev, Ukraine	Trade commission Ukraine	Mayer (Progis)	one to one discussions including FutureFarm
29-30/4/2009	London, UK	The Africa International Soft commodities 2009	Mayer (Progis)	Oral – *"Technology and agricultural development" and one to one discussions on FutureFarm*
May 2009	Prague, Czech Rebublic	ISAF conference	WirelessInfo	Visions and recommendations for knowledge management (paper and oral presentation)
12-13/5/2009	Prague, Czech Republic	Joined conference, "EUROGI", "INSPIRE", "PROGIS", "CAGI"	Mayer (Progis), Writzl (Progis), Aigner, Petutschnig	Oral – *"Rural area management – state of the art IT services – status quo and outlook", with presentation of FutureFarm Poster and one to one discussions*

Date	Location	Conference /Workshop	Name (Beneficiary)	Title of presentation (oral, poster, other)
June 2009	Hannover, Germany	AGILE Conference 2009	Nash (UR)	Absolute and Relative Spatial References in Crop Production Standards
6-7/6/2009	Dingolfing-Landau, Germany	50 anniversary celebration MR Dingolfing-Landau e.V.	Writzl (Progis)	Poster *and one to one discussions including presentation of FutureFarm*
14-15/6/2009	Dresden, Germany	GI2009-Symposium-DRESDEN	Mayer (Progis)	Oral *"GIS based technology for communities water, forest, agriculture, environment and nature protection"- with introduction of FutureFarm*
15-17/6/2009	Cape Town, South Africa	AgriBusiness Forum 2009	Mayer (Progis)	Oral "Global Imaging and mobile telephony to improve productivity" – introduction of FutureFarm *and one on one discussions*
July 2009	Wageningen The Netherlands	ECPA 2009	Nash (UR)	Can compliance to crop production standards be automatically assessed? (oral presentation)
July 2009	Wageningen The Netherlands	ECPA 2009	Nash (UR)	Technology requirements for a standard information infrastructure to assist compliance with crop production standards (oral presentation)
July 2009	Wageningen The Netherlands	EFITA congress	Wirelessinfo	Future farm Vision (paper and presentation)

Date	Location	Conference /Workshop	Name (Beneficiary)	Title of presentation (oral, poster, other)
3/7/2009	Wageningen The Netherlands	Joint International Agricultural Conference 2009	Fountas (CRTH), Pedersen (UCPH), Sorensen, (AU), Chatzinikos (CRTH), Pesonen (MTT), Basso (UNIBAS), Vougioukas (AUTH), Nash (UR), Gemtos (CRTH), Blackmore (CRTH)	Management strategies and practices for precision agriculture operations
6/7/2009	Wageningen The Netherlands	Conference	Werner (ZALF), Schwarz (ZALF), Dreger (ZALF)	Typology of Precision Farming Technologies suitable for EU-Farms (oral presentation)
6-8/7/2009	Wageningen The Netherlands	Precision Agriculture '09, Papers presented at the 7th European Conference on Precision Agriculture	Henten (WUR)	Two sessions Future Farming devoted to oral presentation of 9 papers of Future Farm project
6-8/7/2009	Wageningen The Netherlands	Precision Agriculture '09, Papers presented at the 7th European Conference on Precision Agriculture, , Wageningen	Henten (WUR)	WURking: a small sized autonomous robot for the Farm of the Future (oral)

Date	Location	Conference /Workshop	Name (Beneficiary)	Title of presentation (oral, poster, other)
7/7/2009	Wageningen The Netherlands	Joint International Agricultural Conference 2009	Sørensen (AU), Fountas (CRTH), Pesonen (MTT), Pedersen (UCPH), Basso (UNIBAS), Nash (UR)	System analysis of management information systems for the future
7/7/2009	Wageningen The Netherlands	Joint International Agricultural Conference 2009	Sørensen (AU), Fountas (CRTH), Pesonen (MTT), Pedersen (UCPH), Basso (UNIBAS), Nash (UR)	Crop models provide the 'desired extra information' to reduce farmer's risk in decision making: the case of nitrogen application rates'
7/7/2009	Wageningen The Netherlands	Joint International Agricultural Conference 2009	Sørensen (AU), Fountas (CRTH), Pesonen (MTT), Pedersen (UCPH), Basso (UNIBAS), Nash (UR)	Farmer's risk in decision making: the case of nitrogen application rates,
7/7/2009	Wageningen The Netherlands	Joint International Agricultural Conference 2009	Fountas (CRTH), Pedersen (UCPH), Sørensen (AU), Pesonen (MTT), Basso (UNIBAS), Nash (RU)	Management strategies and practices for precision agriculture operations
7/7/2009	Wageningen The Netherlands	Joint International Agricultural Conference 2009	Pedersen (UCPH), Fountas (CERETH), Sørensen (AU), Pesonen (MTT), Basso (UNIBAS)	Potential savings and economic benefits in arable farming from better information management'

Date	Location	Conference /Workshop	Name (Beneficiary)	Title of presentation (oral, poster, other)
7/7/2009	Wageningen The Netherlands	Joint International Agricultural Conference 2009	Nash (RU), Nikkila (TKK), Pesonen (MTT), Sørensen (AU), Fountas (CRTH)	Technologies for a standardized information infrastructure to assist compliance to crop production standards
7/7/2009	Wageningen The Netherlands	Joint Agricultural Conference, Precision Agriculture 09, 919-926.	Pedersen (UCPH), Ørum (UCPH), Sørensen (AU), Fountas (CRTH), Pesonen (MTT), Blackmore (CRTH), Basso (UNIBAS)	Potential savings from better precision farming and information management
2/9/2009	Rosario, Argentina	CIGR Section V International Symposium	Sørensen (AU)	Information Systems and Management for Future Farming
7-8/9/2009	Cape Town, South Africa	World Sugar Summit 2009	Mayer (Progis)	Oral *"Integrated future-farm topology"*
8-13/9/2009	Urbana-Champaign, USA	4th IFAC International Workshop on Bio-Robotics, Information Technology, and Intelligent Control for Bioproduction Systems	Vougioukas (AUTH)	Oral: "Coordinated master-slave motion control for agricultural robotic vehicles."
1/10/2009	Vienna, Austria	MICROSOFT ReMix09	Mayer (Progis), Aigner	Oral „WinGIS with integrated Bing-technology on the sample farm management and Future Farm"
22-24/10/2009	Stockholm, Sweden	European Development Days	Mayer (Progis)	Poster on a booth and one to one discussions

Date	Location	Conference /Workshop	Name (Beneficiary)	Title of presentation (oral, poster, other)
November 2009	Geel, Belgium	International Workshop on Organic Food Authentication: Challenge or Utopia?	Nash (UR)	Automatically assessing systematic on-farm compliance to organic standards
1-4/11/2009	Pittsburgh, USA	Presentation at the American Society of Agronomy, Soil Sciences and Crop Sciences	Basso (UNIBAS)	2-D Spatial and Temporal Variation of soil properties in tillage systems using Electrical Resistivity tomography
8-14/11/2009	Hannover, GERMANY	Agritechnica 2009	CLAAS Agrosystems	Demo FMIS Client in AGRO-NET on FutureFarm booth
15-19/11/2009	Hannover, Germany	AGRITECHNICA 2009	Mayer (Progis), Writzl (Progis), Petutschnig	Poster and one on one discussions
2/12/2009	Brüssels, Belgium	Sektorseminar Brüssel EU-projects in the field of rural development, agriculture and forestry	Mayer (Progis)	One to one discussions. Personal contact with about 10 consultant. Contact details of about 100 collected - mailing follows.

3.5 List of publications

Table 4 shows the current list of publications, including those publications that have been submitted to the JIAC 2009 conference in Wageningen.

Table 4: List of publications

Title	Author(s)	Journal, book, conference, other	Status
Absolute and Relative Spatial References in Crop Production Standards	E.Nash	Proceedings of the 12th AGILE International Conference on Geographic Information Science, Hannover. CD-ROM ISSN 2073-8013	Published
Automatically assessing systematic on-farm compliance to organic standards.	E.Nash, A.Vatsanidou, S. Fountas, R.Nikkilä	International Workshop on Organic Food Authentication: Challenge or Utopia? : Proceedings of Workshop, Geel, Belgium, 30.11.-01.12.2009.	Published
Barnevelder bedenkt onkruidrobot [In Dutch]	Marijke van Voorst	Newspaper: Barneveldse Krant, zaterdag 28 februari 2009	Appeared
Boer zoekt robot [in Dutch]	Dorette Bos	Newspaper: De Technologiekrant	Appeared
Can compliance to crop production standards be automatically assessed?	E.Nash, A.Vatsanidou, S.Fountas	Precision agriculture '09: Papers presented at the 7th European Conference on Precision Agriculture, Wageningen, the Netherlands, 6-8 July 2009.	Published
Comparison between Principal Component, Partial Least Squares and Artificial Neural Network analyses for accuracy of measurement of selected soil properties with visible and near infrared spectroscopy.	Mouazen, A.M.; Kuang, B.; De Baerdemaeker, J.; Ramon, H	Geoderma	In revision
Conceptual model of a future farm management information system	C.G. Sørensen, S. Fountas, B. Basso, L. Pesonen, S.M. Pedersen, E. Nash, S.B.Blackmore	Computer and Electronics in Agriculture	Resubmitted after revision, under review.
Coordinated master-slave motion control for agricultural robotic vehicles.	Vougioukas, S.	Proceedings of the 4th IFAC International Workshop on Bio-Robotics, Information Technology, and Intelligent Control for Bioproduction Systems, paper #703	Published

Title	Author(s)	Journal, book, conference, other	Status
Crop models provide the 'desired extra information' to reduce farmer's risk in decision making: the case of nitrogen application rates	Basso, B, Fountas, S, Sartori, L, Pedersen, SM, Sørensen, CAG, Pesonen, L, Werner, A & Blackmore	Joint International Agricultural Conference	Published
De machine die zelf onkruid wiedt [In Dutch]	Margreet Terpstra	Newspaper: De Gelderlander, 8 July 2009	Appeared
En de robot... hij ploegde voort [in Dutch]	Joep Trommelen	Newspaper: De stentor, Friday 10th of July 2009	Appeared
European ag-Ministries get informed on the Future Farm Project with the target to get addresses and contact details of end-user groups at regional and national level, (WP7 B3.2)	Karin Strobl	Mailing	
Farmer's risk in decision making: the case of nitrogen application rates	Basso B, Fountas S, Satori L, Cafiero, Pedersen S.M, Sorensen C, Pesonen L, Werner A, Blackmore S (2009):	Joint international Agricultural Conference, Precision Agriculture Precison Agriculture 09, 927-933	Printed
Farming Robots Have a Field Day in Netherlands	Reuter	TV programm: New Tang Dynasty Television, 8 August 2009	Appeared
Formal representation of agricultural production standards	E.Nash, J.Wiebensohn, R.Nikkilä, A.Vatsanidou, S.Fountas	CIGR 2010, June 2010, Quebec	Accepted
Formale Modellierung landwirtschaftlicher Standards mit RIF und OWL	E.Nash, J.Wiebensohn	GIL-Tagung 2010, 24.-25.02.2010, Hohenheim	Accepted, in press
FutureFarm Vision	K. Charvat, P. Gnip, M. Krocan	JIAC conference Wageningen	Published
FutureFarm Vision	K. Charvat, P. Gnip, W. Mayer	Agris on-line Papers in Economics and Informatics	Published

Title	Author(s)	Journal, book, conference, other	Status
GI in Agriculture	R.Bill, E.Nash, G.Grenzdörffer	Chapter in Springer Handbook of Geographic Information	Submitted to editors. Book to be published September 2010 by Springer Verlag.
Implementing systems usability evaluation in the design process of active farm management information system	Norros L., Pesonen L., Suomi P., Sørensen CAG.,	Joint International Agricultural Conference	Published
Information modeling to support decision making in crop production	Sorensen C.G., Pesonen L., Fountas S., Suomi P., Bochtis D. Pedersen S.M.	Computer and Electronics in Agriculture	Under reiew
Information modeling in dairy production	Lindstrøm J., Sørensen C.G.	Joint International Agricultural Conference	Published
Information on PROGIS activities, including the participation in FutureFarm with periodical mailings to about 12000 contacts of the PROGIS database	Mayer W., Strobl K.	Mailing	
Interchange of Geospatial Rules: Towards GeoRIF?	Nash E., WIebensohn J., Walter K., Hey K.	GIScience 2010, September 2010, Zürich	Submitted, under review
I-un nouveau robot autonome: WURking [in French]	Anonymous	Newspaper: Agriculture, August 2009	Appeared
Machine Readable Encoding for Definitions of Agricultural Crop Production and Farm Management Standards.	Nash E., Nikkilä R., Pesonen, L., Oetzel, K., Mayer, W., Seilonen, I., Kaivosoja, J., Bill, R., Fountas, S., Sørensen, C.	FutureFarm project deliverable 4.1.1.	Published

Title	Author(s)	Journal, book, conference, other	Status
Management strategies and practices for precision agriculture operations	Fountas, S, Pedersen, S, Blackmore, S, Chatzinikos, A, Sørensen, CAG, Pesonen, L, Basso, B & Nash, E	Joint International Agricultural Conference	Published
Management strategies and practices for precision agriculture operations	Fountas S, Pedersen S. M, Sorensen C, Chatzinikos A, Pesoenen L, Basso B, Vougioukas S, Nash E, Gemtos T, Blaskmore S.	Proceedings of the Precision Agriculture ’09 (Editors: E.J. van Henten, D. Goense and C. Lokhorstpp), pp. 893-898	Printed
Modellierung komplexer Raumbezüge in landwirtschaftlichen Management-Standards	J.Wiebensohn, E.Nash	Geoinformatik 2010, 17.-19.03.2010, Kiel	Submitted, under review
Onkruid foetsie zonder mankracht [In Dutch]	Anonymous	Newspaper: De Telegraaf, 8 July 2009	Appeared
Potential savings and economic benefits in arable farming from better information management’	Pedersen, SM, Fountas, S, Sørensen, CAG, Pesonen, L, Basso, B, Ørum, JE & Blackmore, S	In: Edited by E.J. van Henten, D. Goense and C. Lokhorst.Precision agriculture '09. Wageningen: Wageningen Academic. Publishers. p. 919-926.	Published
Precision Agriculture as a Data Source for Compliance Checking	E.Nash, J.Wiebensohn, R.Nikkilä, A.Vatsanidou, S.Fountas	ICPA 2010, July 2010, Denver	Submitted, under review
Preliminary report on knowledge and information to be encoded	Pesonen, L., Sørensen, C. , Suomi, P. , Nikkilä, R. , Nash, E. , Oetzel, K.	FutureFarm project deliverable 3.3	Published

Title	Author(s)	Journal, book, conference, other	Status
REST-based web services for the discovery and distribution of agricultural production standards	Nikkilä, R., Nash, E., Seilonen, I., Koskinen, K.	CIGR 2010, Quebec, Canada	Abstract accepted
Robot integreren in landbouw is eeuwigdurend proces [In Dutch]	Petra Vos	Newspaper: Agrarisch Dagblad, 11 July 2009	Appeared
Robots winnen terrein in de landbouw [In Dutch]	Anonymous	Newspaper: Agrarisch Dagblad, 8 July 2009	Appeared
Ruud zoekt en vermaalt onkruid [In Dutch]	Myrthe Verweij	Newspaper: Trouw, 8 July 2009	Appeared
Seasonal greetings to all existing and new gathered contacts by mentioning that PROGIS is partner of FutureFarm	Karin Strobl	Mailing	
Specification of material and information flow	Sørensen, C. , Pesonen, L. , Suomi, P. , Fountas, S. , Basso, B.	FutureFarm project deliverable 3.2	Published
System analysis of management information systems for the future	Sørensen, CAG, Fountas, S, Basso, B, Pesonen, L, Pedersen, SM & Nash, E	Joint International Agricultural Conference	Published
System analysis of management information systems for the future	Sørensen, CAG, Fountas, S, Basso, B, Pesonen, L, Pedersen, SM & Nash, E	Joint International Agricultural Conference	Published
System analysis of management information systems for the future.	SØRENSEN, C.G., FOUNTAS, S., BASSO, B., PESONEN, L., PEDERSEN, S.M., NASH, E.	In: Edited by E.J. van Henten, D. Goense and C.Lokhorst. Presicion agriculture '09. Wageningen: Wageningen Academic Publishers. p. 943-950.	Published

Title	Author(s)	Journal, book, conference, other	Status
System description of proposed Farm Management Information System (FMIS).	Pedersen, S., Ørum, J.E., Fountas, S., Sørensen, C. G., Pesonen, L., Dreger, F.	FutureFarm project deliverable 5.1.	Published
System analysis and definition of syst em boundaries.	Sørensen, C., Bil dsøe, P., Founta s, S., Pesonen, L., Pedersen, S., Basso, B., Nash, E.	FutureFarm project deliverable 3.1	Published
Systems Analysis of Information systems for the future	Sørensen C.G Founts Basso B, Pesonen L, Pedersen S.M and Nash E (2009):	Joint International Agricultural Conference, Precision Agriculture Precision Agriculture 09. 943-950	Printed
Technologies for a standardized information infrastructure to assist compliance to crop production standards	Nash, EJ, Nikkilä, R, Pesonen, L, Sørensen, CAG & Fountas, S	Joint International Agricultural Conference	Published
Technology requirements for a standard information infrastructure to assist compliance to crop production standards	E.Nash, R.Nikkilä, L.Pesonen, C.Sørensen	Precision agriculture '09: Papers presented at the 7th European Conference on Precision Agriculture, Wageningen, the Netherlands, 6-8 July 2009.	Published
Technology requirements for a standard information infrastructure to assist compliance with crop production standards	Nash, E., Nikkilä, R., Pesonen, L., *Sørensen, C. G.*	ECPA 2009, Wageningen, Netherlands	Published
Technology requirements for a standard information infrastructure to assist compliance with crop production standards.	NASH, E., NIKKILÄ, R., PESONEN, L., SØRENSEN, C.G.	In: Edited by E.J. van Henten, D. Goense and C. Lokhorst. Precision agriculture '09. Wageningen: Wageningen Academic Publishers. p. 935-942.	Published

Title	Author(s)	Journal, book, conference, other	Status
The need for content-lists, dictionaries and ontologies in expressing and evaluating compliance to crop-production regulations, guidelines and standards	E.Nash	Anforderungen an die Agrarinformatik durch Globalisierung und Klimaveränderung: Referate der 29. GIL Jahrestagung, 09.-10. März 2009, Rostock. GI Edition Lecture Notes in Informatics, 142.: Gesellschaft für Informatik e.V., 2009. ISBN 978-3-88579-236-9, p. 121 - 124.	Published
The role of communication and co-operation in the adoption of precision farming	T. Kutter; S. Tiemann; R. Siebert; S. Fountas	Precision Agriculture	Online
Two Dimensional Spatial and Temporal Variation of soil properties in tillage systems using Electrical Resistivity tomography	Basso, B.; Amato M, Rossi, R. Kravchenko A., Sartori, L.,	Agronomy Journal	Published (Vol. 102 pages 440-449)
Typology of Precision Farming Technologies suitable for EU-Farms	Werner, A., Schwarz, J., Dreger, F.	Conference	Conference paper
Visions and recommendations for knowledge management	Karel Charvat, Pavel Gnip, Matej Krocan	ISAF conference	Published
WURking: a small sized autonomous robot for the Farm of the Future.	Henten, E.J., Asselt, C.J. van, Bakker, T., Blaauw, S.K., Govers, M.H.A.M., Hofstee, J.W., Jansen, R.M.C., Nieuwenhuizen, A.T., Speetjens, S.L., Stigter, J.D., Straten, G. van, Willigenburg, L.G. van, 2009.	In: Henten, E.J., Goense, D., Lokhorst, C. (Eds.), Precision Agriculture '09, Papers presented at the 7th European Conference on Precision Agriculture, 6-8 July 2009, Wageningen, The Netherlands, pp. 833-840.	Appeared

Title	Author(s)	Journal, book, conference, other	Status
Management strategies and practices for precision agriculture operations	Fountas, S., Pedersen, S., Sorensen, C., Chatzinikos,A., Pesonen, L., Basso, B., Vougioukas, S., Nash, E., Gemtos, T., Blackmore, S.	JIAC 2009	Proceedings

4. Deliverables and milestones tables

Deliverables (excluding the periodic and final reports)

TABLE 1. DELIVERABLES[5]

Del. no.	Deliverable name	WP no.	Lead beneficiary	Nature	Dissemination level	Delivery date from Annex I (proj month)	Delivered Yes/No	Actual / Forecast delivery date	Comments
1.1.1	List of external drivers	1	WR-INFO	R	PU	1	Yes		Attached to 1st periodic report
1.1.2	Analysis of external drivers	1	WR-INFO	R	PU	6	Yes		Attached to 2nd periodic report.
1.2.1	Knowledge management methods	1	WR-INFO	R	PU	6	Yes		Attached to 1st periodic report
1.2.2	SWOT analysis of drivers and farms	1	WR-INFO	R	PU	6	Yes		Attached to 1st periodic report
5.1	System description of farm management model conducted	5	UCPH	R	PU	6	Yes		Attached to 1st periodic report

[5] For Security Projects the template for the deliverables list in Annex A1 has to be used.

TABLE 1. DELIVERABLES[5]

Del. no.	Deliverable name	WP no.	Lead beneficiary	Nature	Dissemination level	Delivery date from Annex I (proj month)	Delivered Yes/No	Actual / Forecast delivery date	Comments
8.2	Meeting 1 with Commission in Brussels	8	CRTH	O	Co	9	Yes	10	Meeting with representatives of the Commission and selected stakeholders on 22nd October 2008 in Brussels, premises of the Leibniz Association; participants list and main presentation attached to 1st periodic report
1.2.3	Visions and recommendations for knowledge management	1	WR-INFO	R	PU	12	Yes	14	Attached to 1st periodic report. Nevertheless, this can be regarded as a 'snapshot'. This document will very likely change throughout the time of the project. Preliminary versions of the deliverable were presented at PROGIS conference in Villach (15th April 2008) and at the WCCA 2008 (Tokyo, August 2008)
2.1.1	Compliance to standards specifications	2	CRTH	R	PU	12	Yes	14	Attached to 1st periodic report
2.1.2	Management strategies and practices	2	CRTH	R	PU	12	Yes	14	Attached to 1st periodic report
2.1.3	Social organization of farmers decision making	2	ZALF	R	PU	12	Yes	14	Attached to 1st periodic report.
3.1	Systems analysis and definition of system boundaries	3	AU	R	PU	12	Yes	13	Attached to 1st periodic report

TABLE 1. DELIVERABLES[5]

Del. no.	Deliverable name	WP no.	Lead beneficiary	Nature	Dissemination level	Delivery date from Annex I (proj month)	Delivered Yes/No	Actual / Forecast delivery date	Comments
4.1.1	Machine readable encoding for Definitions of Agricultural Crop production and Farm Management Standards	4	UR	P/R	PU	12	Yes	14	Attached to 2nd periodic report. The initial title for this deliverable was "Machine readable encoding for definitions of regulatory framework requirements" but it has been altered in the light of work carried out.
6.1	Report on on-farm bio-fuel production	6	WUR	R	PU	12	Yes	19	Postponed to Month 18 (agreed by the Steering Committee in Brussels, October 2008), finally delivered on month 19. Attached to 2nd periodic report.
7.1	Typology of PF-technologies	7	ZALF	R	PU	13	Yes	26	Attached to 2nd periodic report.
3.2	Specification of material and information flow	3	AU	R	PU	18	Yes	18	Attached to 2nd periodic report.
4.2	Repository interface and catalogue definitions to enable discovery and retrieval of definitions	4	TKK	R	PU	18	Yes	20	Attached to 2nd periodic report. This deliverable changed its title and content in order to include also deliverable 4.3 as described in DoW.

TABLE 1. DELIVERABLES[5]

Del. no.	Deliverable name	WP no.	Lead beneficiary	Nature	Dissemination level	Delivery date from Annex I (proj month)	Delivered Yes/No	Actual / Forecast delivery date	Comments
6.2	Demonstration of prototype robotic systems	6	WUR	D	PU	18	Yes	19	This event was included in the JIAC 2009, held in Wageningen, 6-8 July 2009. There is a short report concerning this demonstration and it is attached to the 2nd periodic report.
7.2	Web-portal for knowledge exchange + illustrating PF-technologies to farmers	7	ZALF	P	PU	18	No	33	Postponed to month 33(agreed by the Steering Committee in Prague, February 2010). It was initially postponed to month 24 (agreed by the Steering Committee in Rome, January 2009). The postponing to month 33 is included in the amendment request sent to the EU on 21/2/2010. Work done until today with this deliverable was closely linked to deliverable 2.2
8.4	Six-month internal review	8	CRTH	R	CO	18	Yes	23	This report was delayed due to the changes in the project management team (Frank Dreger left, Katerina Apostolidi took over). The first draft was submitted in month 20, but did not reach its final version before month 23. Attached to 2nd periodic report.

TABLE 1. DELIVERABLES[5]

Del. no.	Deliverable name	WP no.	Lead beneficiary	Nature	Dissemination level	Delivery date from Annex I (proj month)	Delivered Yes/No	Actual / Forecast delivery date	Comments
3.3	Preliminary report of knowledge and information to be encoded	3	AU	R	PU	20	Yes	20	Attached to 2nd periodic report.
2.2	Requirements specification for farm portal	2	CRTH	R	PU	24	Yes	26	Attached to 2nd periodic report.
4.1.2	Data required to assess compliance	4	UR	P/R	PU	24	Yes	25	Attached to 2nd periodic report. The initial title of the report was 'Documentation requirements'. The deliverable itself was refocused to identifying the data which is required in order to assess compliance to a rule.
4.3	Specification of a Rules App to handle compliance assessment based on knowledge from repositories in combination with locally-held data	4	UR	P/R	PU	24	Yes	25	Attached to 2nd periodic report. This deliverable was re-defined, in order to analyse the interface and functionality of the software component called 'Rules App', defined to be responsible for processing rules and data to assess compliance.

TABLE 1. DELIVERABLES[5]

Del. no.	Deliverable name	WP no.	Lead beneficiary	Nature	Dissemination level	Delivery date from Annex I (proj month)	Delivered Yes/No	Actual / Forecast delivery date	Comments
5.2	Initial technology assessment regarding legal requirements, farmers' perception of information-intensive farming systems	5	UCPH	R	PU	24	Yes	26	Attached to 2nd periodic report.
5.3	Report on initial costs structure and factor productivity for relevant crops and regions	5	UCPH	R	PU	24	No	28	There has been a request by UCPH (lead beneficiary for this deliverable) to postpone the delivery till month 28.
6.3	Report on optimized fleet management to reduce energy consumption and costs	6	WUR	R	PU	25	Yes	25	Attached to 2nd periodic report.
7.3	Typology of farms and regions in EU states assessing the impacts of PF-technologies in EU-farms	7	ZALF	R	PU	24	No	30	This deliverable has been postponed to month 30 (agreed by the Steering Committee meeting in Prague, February 2010)

Milestones table

Table 5 list and comments the milestones due in 2009.

Table 5: List of milestones due in 2009 according to DoW, table B1.3.7-1

TABLE 2. MILESTONES							
Milestone no.	Milestone name	WP no.	Lead beneficiary	Delivery date from Annex I	Achieved Yes/No	Actual / Forecast achievement date	Comments
1	A system description of farm management is delivered.	5	UCPH	Month 6	Yes	Month 8	Finished two months later than initially aimed for. The discussion was intense among the relevant parts of the project during the development of the 'System description', which resulted in a better linkage of workpackages 2, 3 and 5.
2	First meeting with Commission in Brussels	8	CRTH	Month 9	Yes	Month 10	Meeting with representatives of the Commission and selected stakeholders on 22nd October 2008 in Brussels, premises of the Leibniz Association;
3	A set of visions is defined and delivered to WP 2 and 3.	1	WR-INFO	Month 12	Yes	Month 14	Attached to 1st periodic report as deliverable 2.1.3. Nevertheless, this can be regarded as a 'snapshot'. The visions deliverable was intensively discussed during the Rome meeting (28th-30th January 2009) and during the Prague meeting (2nd – 3rd February 2010). Specific contribution by each project partner was asked for so that the visions are updated to include all partners' views.

TABLE 2. MILESTONES

Milestone no.	Milestone name	WP no.	Lead beneficiary	Delivery date from Annex I	Achieved Yes/No	Actual / Forecast achievement date	Comments
4	A report on systems analysis and definition of system boundaries is provided.	3	AU	Month 12	Yes	Month 13	Attached as deliverable 3.1 to 1st periodic report.
5	Report 1	1, 2, 3, 4, 5, 6, 7, 8	CRTH	Month 12	Yes	Month 14	Delivered as the 1st periodic report.
6	Knowledge repository interface specifications are defined	4	UR	Month 18	Yes	Month 20	Attached as deliverable 4.2 to 2nd periodic report.
7	The requirements for farm portal are specified	2	CRTH	Month 24	Yes	Month 26	Attached as deliverable 2.2 to this 2nd periodic report
8	The knowledge repository catalogue is defined.	4	UR	Month 24	Yes	Month 25	Attached as deliverable 4.3 to 2nd periodic report.
9	Recommendations for machine and fleet management are presented.	6	WUR	Month 24	Yes	Month 25	Attached as deliverables 6.3.1, 6.3.2, 6.3.2 to this 2nd periodic report

TABLE 2. MILESTONES

Milestone no.	Milestone name	WP no.	Lead beneficiary	Delivery date from Annex I	Achieved Yes/No	Actual / Forecast achievement date	Comments
10	A typology of farms and regions in EU states is developed	7	ZALF	Month 24	No	Month 30	This milestone will be achieved in month 30.
11	Report 2	8	CRTH	Month 24	Yes	26	Delivered as this 2nd periodic report.

5. Project management

In this section a summary of the project management activities covering the first project year is given. Project management mainly comprised the following activities:

Project Meetings

- A project meeting was held in Rome, 28-30 January 2009. The aims of this meeting were inter alia to (i)review of the first project year, (ii)inform about work progress since the meeting in Erkner, (iii)continue work on/finalise specific deliverables, (iv)review relation between workpackages, (v)discuss status of reporting for first reporting period (both content and financial aspects), (vi)make adaptations to the DoW, if necessary, (vii)discuss intensification of dissemination activities and (viii)plan FutureFarm activities for JIAC 2009 (Wageningen). During this meeting a fourth Steering Committee Meeting was held and a General Assembly meeting was also conducted. All presentations of this meeting are available on the internal area of the project's website.
- During the project meeting in Rome, a number of inter- and intra- Work package meetings were held. A meeting with the FutureFarm farmers also took place. It was decided that the farmers would sign a contract with ZALF.
- An Open Stakeholder Meeting was held in Wageningen, on July 9th, 2009. Four stakeholders were invited, in order to give a feedback on the project's progress and scope. The invited stakeholders were: a) Prof. Maohua Wang, China Agricultural University, Beijing b) Dr. Ehud Gelb, Centre for Agricultural Economic Research, Israel c) Hans Werner Griepentrog, University of Copenhagen, Denmark, d) Prof. Jess Lowenberg – DeBoer, Purdue University, United States. The reports from the aforementioned stakeholders are available at the internal part of the FutureFarm website.
- On the same day, the fifth Steering Committee Meeting was held. The aims of the meeting were inter alia to (i) discuss the stakeholder feedback (ii) review FutureFarm progress until then.
- Both the Open Stakeholder Meeting and the Steering Committee meeting were held during the JIAC 2009, July 6-8, Wageningen.
- Another project meeting was held in Prague, 2-3 February 2010. The aims of this meeting were inter alia to (i)review the second project year, (ii) continue work on/finalise specific deliverables, (iii) discuss the status of reporting for the second reporting period (content and financial aspects), (iv) discuss the aims of the project and their realisation, (v) discuss and decide on the new version of 'Description of Work' to be submitted to the Commission, (vi) plan future FutureFarm activities.

Issues concerning the consortium organization and management

- A few changes of the Consortium Agreement had to be communicated and agreed upon between the Commission and the Coordinator during 2008. These comprised changes of the representatives at Wageningen University (Information letter No 1) and including Special Clause No 30 for partner AU together with some changes in contact details. For including Special Clause No 30 an official note was received by the Coordinator in May 2009.

- A second amendment to the Grant Agreement was requested by the Coordinator, after the approval of the General Assembly during the Prague meeting. Since the Commission requested a revised version of Annex I of the Grant Agreement, a new version of this document was sent by the Coordinator together with an amendment request on February 2010. The changes in Annex I of the Grant Agreement include (i)reallocation of the budgets from management activities to research activities for all partners except CRTH (partner 01) and ZALF (partner 07), (ii)adjustment of delivery

dates for a number of deliverables to depict decisions made during the last five Steering Committee meetings (iii)postponing delivery due date of deliverable 7.2 to project month 33 due to new requests in the design and development of a farm portal (iv)modification of Task 5 of Work Package 2 and of deliverable 2.3. (v) modification of Task 6 of Work Package 4 and of deliverables 4.2, 4.3, 4.1.2, and 4.5 (vi) merge of deliverables 5.4 and 5.5 into one deliverable, 5.4

- Partner 13 changed its name from 'Agrocom GMBH & Co. Agrarsystem KG' to 'CLAAS Agrosystems GmbH & Co. KG'. From now on, the short name for this partner will be CLAAS.
- The second instalment from the EU was received by the Coordinator on November 6, 2009. The amount transferred to CRTH was 699.737,55€. The transfer to the project partner's bank accounts took place a few days later.
- The following table (Table 6) shows the sums that were transferred to the partners from the 2nd instalment together with the date of transfer. When the 1st instalment payment was made to the partners, the coordinator CRTH, withheld 10% from each partner as guarantee. This amount was paid out to the partners along with the 2nd instalment payment.

Table 6: Contributions paid by Coordinator to Partners at a glance

Beneficiary	10% Deduction from 1st Payment	Payment from 2nd Instalment	Total Contribution Paid by Coordinator to Beneficiaries	Date Paid
CRTH	31,371.23 €	153,826.00 €	185.197,23	06.11.2009
AU	13,879.64 €	73,241.25 €	87.120,89	18.11.2009
UCPH	13,069.33 €	70,988.40 €	84.057,73	18.11.2009
UR	12,875.08 €	45,027.60 €	57.902,68	17.11.2009
ZALF	27,772.33 €	162,006.40 €	189.778,73	17.11.2009
WR-INFO	6,911.67 €	55,732.80 €	62.644,47	17.11.2009
MTT	5,312.46 €	30,024.75 €	35.337,21	17.11.2009
UNIBAS	2,590.67 €	11,514.00 €	14.104,67	17.11.2009
WUR	5,315.07 €	5,028.75 €	10.343,82	17.11.2009
CLAAS	2,374.28 €	12,238.80 €	14.613,08	18.11.2009
PROGIS	7,112.11 €	26,784.00 €	33.896,11	18.11.2009
AUTH	3,755.50 €	19,584.00 €	23.339,50	17.11.2009
TKK	6,373.86 €	26,660.40 €	33.034,26	17.11.2009
UAL	1,546.67 €	3,514.00 €	5.060,67	17.11.2009
CU	4,431.20 €	3,566.40 €	7.997,60	17.11.2009

- At the end of the second reporting period, 270.75 personmonths effort have been spent on the project, which is 64.08% of the total person months planned. The project can be considered to be on track.

- A contract between ZALF (partner 07) and the each of the demonstration farms was signed, in order to facilitate the planned dissemination activities.

Project website

- The project website has been improved. The external part (visible from anyone) has been enriched to include the project's recent developments. The internal part (visible only from FutureFarm members) has been simplified in its use and a notification system was established so that FutureFarm members are notified by email for deliverable uploads or important changes.

Dissemination activities

- There have been a number of dissemination activities during 2009. In this section are mentioned some major ones.
- A FutureFarm presentation was held at the Federal Ministry of Food, Agriculture and Consumer Protection, Germany, on January 26th, 2009.
- A number of presentations of the FutureFarm results were held at the Joint International Agricultural Conference 2009, held at Wageningen, Holland, from 6th to 8th July. A special FutureFarm Session was organised.
- The Field Robot Event 2009, the FutureFarm demonstration of prototype robotic systems and the Joint International Agricultural Conference (JIAC) were held in parallel at the centre of Wageningen University's campus, Wageningen the Netherlands, 6-8 July 2009. On July 7 2009 a press conference was organized during which the objectives of the FutureFarm project, the robot demonstration and the JIAC2009 conference were jointly presented. Reuters produced a short item which was broadcasted at least once by the Chinese television. The robot demonstration was also covered by a local Dutch television station. A number of articles in magazines and newspapers were written concerning this event.
- At the Agritechnica 2009 in Hannover ZALF (partner 7) together with University of Rostock (partner 6) from Work Package 4 presented an overview of FutureFarm with the main focus on the Farm Management Information System (FMIS) and PROGIS (partner 14) presented modern agro-technologies.
- An application under NMP-2009-4.3.4-1 'Automation and Robotics for sustainable crop and forestry management' was made by some of the FutureFarm consortium members. The name of the proposed project is 'GrowBots'. The proposal was not approved initially but a redress has been requested.
- An application under KBBE-2009-1-4-03 'A common data exchange system for agricultural systems' was made by some of the FutureFarm partners. The name of the proposed project is 'AgriXchange' and it started in 2010. Some joint dissemination activities with this program are currently under discussion.

Impact of deviations from Annex I

- The transfer of delivery date of deliverable 7.2 from month 18 to month 33 is due to the new requirements for a farm portal, as described in deliverable 2.2. This change does not hinder the rest of the project partners to continue with their work. Additionally, this change is required in order to enhance the content of the specific deliverable.
- The changes in Work Package 4 are due to the identified need to focus more on the standards and the way they are translated and assessed through an information structure that can be implemented inside an information system.

6. Explanation of the use of the resources

The following tables show the use of resources of personnel costs, subcontracting and other major direct costs for each beneficiary. Since there is no standard definition for 'major cost items' it was agreed with the Commission that for FutureFarm the figure will be set as 3,000 €[6]. In the year 2009 the majority of costs went to personnel and travel costs.

Table 7: Personnel, subcontracting and other major direct cost items for all beneficiaries in FutureFarm in 2009

TABLE 8.1 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR DIRECT COST ITEMS FOR BENEFICIARY 1 (CRTH) FOR THE PERIOD

Work Package	Item description	Amount	Explanations
1,2,3,5,8	Personnel costs	114,675.05€	Salaries for project manager, project management assistant, one senior scientist and 5 junior researchers
	Subcontracting	-	
2	Major cost item	3,322.50€	Durable equipment - INVENTOR
1,2,3,5,8	Remaining direct costs	40,717.46€	Travel expenses, durable equipment, equipment depreciation and consumables
	TOTAL DIRECT COSTS	158,715.01€	

TABLE 8.2 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR DIRECT COST ITEMS FOR BENEFICIARY 3 (AU) FOR THE PERIOD

Work Package	Item description	Amount	Explanations
2, 3, 5, 6	Personnel costs	68,191.00€	Salaries of 2 scientists and 2 research assistants
	Subcontracting	-	
	Major cost item	-	
2, 3, 5, 6	Remaining direct costs	6,628.00€	Travel expenses
	TOTAL DIRECT COSTS	74,819.00€	

[6] E-mail from Nadine Kolloczek 20th June 2008

TABLE 8.3 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR DIRECT COST ITEMS FOR BENEFICIARY 5 (UCPH) FOR THE PERIOD

Work Package	Item description	Amount	Explanations
2, 5	Personnel costs	74,577.00€	Salaries
2, 5	Travel expenses	11,000.00€	Project meetings in Holland, Italy, Germany, Czech Republic and Denmark
TOTAL DIRECT COSTS		80,473.00€	

TABLE 8.4 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR DIRECT COST ITEMS FOR BENEFICIARY 6 (UR) FOR THE PERIOD

Work Package	Item description	Amount	Explanations
4	Personnel costs	73,751.77€	Salaries of 2 researchers
	Subcontracting		
	Major cost items		
4	Remaining direct costs	9,045.36 €	Equipment depreciation, consumables and travel
TOTAL DIRECT COSTS		82,797.13€	

TABLE 8.5 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR DIRECT COST ITEMS FOR BENEFICIARY 7 (ZALF) FOR THE PERIOD

Work Package	Item description	Amount	Explanations
2, 5, 7, 8	Personnel costs	104.876€	Salaries of 4 senior scientists, 2 post-doctoral students, of 2 PhD students (all contributing in varying degrees to WP 2, 5, 7, 8) and 7 technicians students (all contributing in varying degrees to WP7)
7	Subcontracting	37,778.00 €	Contract with the pilot farms for supporting soil sampling, interviews, dissemination activities, etc.
2, 5, 7, 8	Remaining direct costs	*30,563.00* €	mainly travel costs and soil sampling
	TOTAL DIRECT COSTS	173.217 €	

TABLE 8.6 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR DIRECT COST ITEMS FOR BENEFICIARY 9 (WR-INFO) FOR THE PERIOD

Work Package	Item description	Amount	Explanations
1,2,3	Personnel costs	12,218.00 €	Salaries
	Subcontracting	-	
	Major cost item	-	
1,2,3	Remaining direct costs	4,478.00 €	Travel costs
	TOTAL DIRECT COSTS	16,696.00 €	

TABLE 8.7 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR DIRECT COST ITEMS FOR BENEFICIARY 10 (MTT) FOR THE PERIOD

Work Package	Item description	Amount	Explanations
3,4,5	Personnel costs	33,267.00€	Salaries of 3 researchers and assistants
	Subcontracting	-	
	Major cost item	-	
3,4,5	Remaining direct costs	7,623.00 €	Consumables and travel
	TOTAL DIRECT COSTS	40,890.00€	

TABLE 8.8 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR DIRECT COST ITEMS FOR BENEFICIARY 11 (UNIBAS) FOR THE PERIOD

Work Package	Item description	Amount	Explanations
3	Personnel costs	15,600.00€	Salary of one senior researcher and one junior researcher
	Subcontracting	-	
	Major cost item	-	
3	Remaining direct costs	6,470.00€	Travel costs and consumables
	TOTAL DIRECT COSTS	22,070.00€	

TABLE 8.9 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR DIRECT COST ITEMS FOR BENEFICIARY 12 (WUR) FOR THE PERIOD

Work Package	Item description	Amount	Explanations
6	Personnel costs	36,235.00€	Salary of university staff and one in-house consultant
	Subcontracting	*6,705.00€*	Software development, field-test robot
	Major cost item		
	Remaining direct costs	26,431.00€	Organization costs, robot demonstration
	TOTAL DIRECT COSTS	69,371.00€	

TABLE 8.10 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR DIRECT COST ITEMS FOR BENEFICIARY 13 (CLAAS) FOR THE PERIOD

Work Package	Item description	Amount	Explanations
4	Personnel costs	26,035.64€	Salaries of 1 senior software developer and 1 junior developer
	Subcontracting	-	
	Major cost item	-	
	Remaining direct costs	751.92€	Travel expenses
	TOTAL DIRECT COSTS	26,787.56€	

TABLE 8.11 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR DIRECT COST ITEMS FOR BENEFICIARY 14 (PROGIS) FOR THE PERIOD

Work Package	Item description	Amount	Explanations
1, 2, 3, 4, 7	Personnel costs	65,942.00€	Salaries of 6 employees and 1 consultant
	Subcontracting	-	
	Major cost item	-	
1, 2, 3, 4, 7	Remaining direct costs	14,778.00€	Travel expenses, equipment, consumables
	TOTAL DIRECT COSTS	80,720.00€	

TABLE 8.12 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR DIRECT COST ITEMS FOR BENEFICIARY 16 (AUTH) FOR THE PERIOD

Work Package	Item description	Amount	Explanations
3, 6	Personnel costs	23,486.14€	Salary of 2 doctoral researchers and 2 masters students
	Subcontracting	-	
	Major cost item	-	
3, 6	Remaining direct costs	5,658.43€	Travel expenses
	TOTAL DIRECT COSTS	29,144.57€	

TABLE 8.13 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR DIRECT COST ITEMS FOR BENEFICIARY 17 (TKK) FOR THE PERIOD

Work Package	Item description	Amount	Explanations
4	Personnel costs	64,484.12€	Salary of a 2 postdoctoral researcher, a postgraduate student and a professor
	Subcontracting	-	
	Major cost item	-	
4	Remaining direct costs	8,670.37€	Travel costs
TOTAL DIRECT COSTS		73,154.49€	

TABLE 8.14 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR DIRECT COST ITEMS FOR BENEFICIARY 18 (UAL) FOR THE PERIOD

Work Package	Item description	Amount	Explanations
6	Personnel costs	18,802.60€	Salaries of researchers
	Subcontracting	-	
	Major cost item	-	
6	Remaining direct costs	1,558.04€	Travel costs
TOTAL DIRECT COSTS		20,360.64€	

TABLE 8.15 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR DIRECT COST ITEMS FOR BENEFICIARY 19 (CU) FOR THE PERIOD			
Work Package	Item description	Amount	Explanations
7	Personnel costs	26,995.23 €	
	Subcontracting	-	
	Major cost item	-	
7	Remaining direct costs	4,210.60 €	
	TOTAL DIRECT COSTS	31,205.83€	

7. Certificates

Two FutureFarm-beneficiaries, ZALF and CRTH, did reach the expenditure threshold of 375,000€ upon receipt of the second payment from EU, in November 2009. Nevertheless, the Certificates on Financial Statements will be provided till the end of April 2010, after an audit is arranged. They are not attached to this report as they have not been obtained yet.

Beneficiary	**Organisation short name**	**Certificate on the financial statements provided? yes / no**	**Any useful comment, in particular if a certificate is not provided**
1	CRTH	No	Will be sent to EU till the end of April
3	AU	No	Not expected to reach expenditure threshold in this project
5	UCPH	No	Not expected to reach expenditure threshold in this project
6	UR	No	Not expected to reach expenditure threshold in this project
7	ZALF	No	Will be sent to EU till the end of March
9	WR-INFO	No	Not expected to reach expenditure threshold in this project
10	MTT	No	Not expected to reach expenditure threshold in this project

Beneficiary	Organisation short name	Certificate on the financial statements provided? yes / no	Any useful comment, in particular if a certificate is not provided
11	UNIBAS	No	Not expected to reach expenditure threshold in this project
12	WUR	No	Not expected to reach expenditure threshold in this project
13	CLAAS	No	Not expected to reach expenditure threshold in this project
14	PROGIS	No	Not expected to reach expenditure threshold in this project
16	AUTH	No	Not expected to reach expenditure threshold in this project
17	TKK	No	Not expected to reach expenditure threshold in this project
18	UAL	No	Not expected to reach expenditure threshold in this project
19	CU	No	Not expected to reach expenditure threshold in this project