ICT-AGRI Call 2 Mid-term Project Report

Acronym

SILF

Title

SMART INTEGRATED LIVESTOCK FARMING

Period

1. March 2013 – 29. February 2016

Summary

Short description of activities and significant results

Available databases of relevance for development of an IoT data management platform for livestock farming were identified through a survey in the five partner countries Belgium, Denmark, Finland, Greece and Ireland. The results indicate multiple available databases within each country, with data of relevance for livestock health and welfare monitoring, both in the type of on-line as well as non on-line configurations. The results will form the basis for combining data into a dedicated farm journal. As part of such a farm journal input have been provided in the form of an energy audit protocol.

In terms of analyzing stakeholder involvement, identification of stakeholders was initiated and focusing on two technologies, lameness and energy consumption and for two processes: 1) the design of the technology, 2) the assessment of sustainability of the technology, focusing on different phases of the life-cycle: Usage, Maintenance, Implementation, and Production (construction). Important stakeholder for the design process includes the farmers and the advisors. For, implementation and production phase within design and assessment, the farm owner and the manufacturing industry were rated high. In continuation of the stakeholder analysis, survey consisting of questions to farmers about general farm issues and specifically about lameness was initiated. The choice experiment consists of some questions (referred to as choice sets) where the farmer needs to choose between three alternative systems and pick the one they prefer most. Responses are currently being collected.

Preliminary experiments with accelerometers have been carried out, to try to identify parameters and classifiers of lameness. 5 collars were fitted with 2 accelerometers each, the accelerometers were configured to sample at the maximum frequency (200Hz) rate to minimize the risk of missing cues in the data. This setup had the purpose of assessing the sensor positions influence on the ability to detect lameness. In the first experiment, there seem to be some difference in the movement/activity level of the lame cow during resting periods. However there is no obvious detection criterion to extract from the data, that wouldn't give a high

false positive rate. To make any definite conclusion more data is needed, along with validation data. Other developments within the area of testing lameness detection systems include that the the Stepmetrix system is being discarded, the Gaitwise system experienced malfunctions but is in repair. Demonstration farms in Finland, Belgium and Ireland search for alternative accelerometers or accelerometer based activity sensors. However, algorithms for accelerometers are being further developed on experimental basis.

A list of key environmental indicators was identified. These are currently being reviewed to propose a shortlist for wider discussion. The indicators include categories within energy, nutrient use, soil/land issues, biodiversity, water, carbon footprint and economy. The indicators form the basis for a farm based LCA where economic drivers can be connected. The next step will include identification of a number of farms in DK and IRE to test the LCA and relate the scoring to detection system data.

System analysis has been performed by indicating the identified stakeholders. A web has been made that represents the relations between different actors. This web will be updated continually with information about these relationships, as well as costs and benefits for different actors. A similar approach to the SILF web was used to make a farmer web that summarizes the different effects and economic consequences of lameness and their mutual relations. This web will be further updated to clarify the known and unknown costs in literature.

Deviations from the original project plan involve that the partner WebsTech went into bankruptcy preventing the provision of the test sites with accelerometers. The Stepmetrix system is not working, and the Belgian partner doesn't want to go on with this. Furthermore, the Gaitwise system has been repaired after the cold experience in Finland and is now in a new configuration to be put up in Belgium and Finland but it is not viewed as a usable reference system. Suggestions for alternations to the project are drafted.

Work progress and achievements

Project objectives for the period:

- To identify available production databases
- To identify available data in partner countries and description of protocols
- To create audit protocols for energy and barn climate
- To identify and document stakeholders in all countries
- To define interview framework for identified stakeholders
- To complete interviews with stakeholders
- To identify key indicators
- To setup Sensor systems (specifically accelerometers) on demonstration farms
- To test and validate first prototype of detection system
- To design LCA system model for confinement and grazing based dairy farms
- To design farm scale LCA model suitable for Farm Platform decision support
- To design a system for the costs and benefits for different actors and interrelationship
- To design a draft business model for market conditions and usefulness

Milestones and deliverables

Work progress and achievements by work package

WP1:

Task 1.1. Production databases

In order to get an overview of the available databases of relevance for development of an IoT data management platform, a survey was conducted in the five partner countries Belgium, Denmark, Finland, Greece and Ireland. The design and contents of a questionnaire for the survey was developed over a number of iterations within the project group and sent out to a responsible participant in each country. The questionnaire

contains two levels of questions to be answered: 1) Description of available data sources, and 2) Description of relevant data parameters in the databases.
All available databases with data of relevance for livestock health and welfare monitoring was requested with description of the accessibility (web-based or pc-based), availability (public, restricted or closed to other than the data owner; free or charged), ownership (authority, research, advice, farmers' union, …), dynamics (the update frequency of data), etc.
The answers to the questionnaire show that there are several (4 to 9) cattle production databases in each country (Fig. 1). In Belgium and Greece none of the databases are online, while all of the Danish and the majority of the Finnish and Irish are online. All countries have databases with parameters within each category, except the barn specific category, where none of the countries record such data.

Data sources	Belgium	Denmark	Finland	Greece	Ireland
No. of databases	9	4	9	6	8
Online databases	0	4	6	0	6
Farm specific	5	3	5	3	2
Cow specific	2	2	2	2	2
Milk yield and quality	2	1	1	3	3
Health	3	1	3	2	2
Farm accounts	1	1	1	0	1
Input/Output	1	1	2	2	2
Barn specific	0	0	0	0	0

Figure 1. Number of cattle databases for the five partner countries, distributed on parameter categories.

Other results included the availability of databases containing data for parameters of the categories Farm specific, Cow specific, Milk yield and quality, Health, Farm accounts, Input/output and Barn specific, respectively. Specifically, in Denmark almost all cattle data are collected and stored into one, central database, Kvaegdatabasen (the Cattle Database). The database is owned and managed by VFL, the Knowledge Centre for Agriculture (www.vfl.dk), who is the main supplier of professional knowledge and advisory services for the agricultural sector in Denmark. Data in the database include calvings, relocations, slaughterings and deaths of individual animals, milk yield and quality, milk analyses, diseases and medicine consumption.

Task 1.2: Operational goals for sustainability indicators

Operationalizing of data per country has been initiated. The results from Task 1.1 will be analysed in order to identify how many countries actually can deliver the generic needed for a model with described data.
These data (some from platform, some from sensors) can be combined to a farm journal which specifically addresses a dedicated problem.

Task 1.3: Conceptual farm journal

The plan is to install the model on a farm (test or pilot) and automatically collect the data necessary and show alerts. (The Dutch partners that are delivering the model indicate the plausibility of such an approach).

Task 1.4: Energy audit

An Energy Audit in Greece has been initiated involving a systematic procedure that aiming at obtaining an adequate knowledge of the existing energy consumption profile of a site or system and identifying the factors that affect it, identifying and scaling the cost-effective energy saving opportunities to achieve improved energy efficiency of the site or system and cost savings, providing structured information to the audited site management for appropriate decision making mainly on energy saving measures. Preliminary results include data measurements on factors like climate variables (temperature & relative humidity in the center of the building), air velocity periodically in different locations, NH3 in the centre of the building / periodically in different locations, and air quality (PM10, PM2.5.and PM1).

WP 2

Task 2.1: Stakeholder survey/stakeholder involvement

For a survey of possibilities and implementation barriers, it is of high importance to know the opinion of stakeholders within these processes. In task 2.1., we have started to identify the stakeholders focused on the two technology missions, lameness and energy consumption. This was done for two processes: 1) the design of the technology, 2) the assessment of sustainability of the technology.

Four stages of the technology were addressed: Usage, Maintenance, Implementation, and Production.

All partners were asked to contribute with stakeholders within the missions and stages of technology, and to score the perceived importance of identified stakeholders from 1-5 (not important-very important).

The following stakeholders were identified by all partners: (not in prioritized order)

Farm owner
Farm employees
Authorities, regulators
Scientists
Retailers
Advisors
Vets
NGO's
Consumers
Food Industry
Milk processing industry
Vendor

There is quite some difference between what is perceived as important stakeholder in the different stages of a product. Scientists are not considered important in the maintenance, the implementation and the production phase. Considering the perception of stakeholders' importance between design and assessment processes, especially in the usage phase there was a considerable difference in rating. For maintenance, implementation and production the ratings were quit similar (see table on next page)

	Consumers	7	4

Task 2.2.: Identification of key indicators

ILVO developed a choice experiment that is incorporated in an online survey. The survey consists of some general questions about the farm and some more detailed questions about lameness. E.g. farmers are asked how important lameness is on their farm, what they think a lame cow costs, whether they use footbaths, etc. The choice experiment consists of some questions (referred to as choice sets) where the farmer needs to choose between three alternative systems and pick the one they prefer most. There are two question blocks for lameness which each have four choice sets. The first block is shown after the general questions about lameness. Between the first and second block, some information about the costs and effects of lameness are provided. Next, a second question block is shown to the farmer. Figure 2 shows the content of the different pages in the survey. Respondents cannot go back to the previous page.

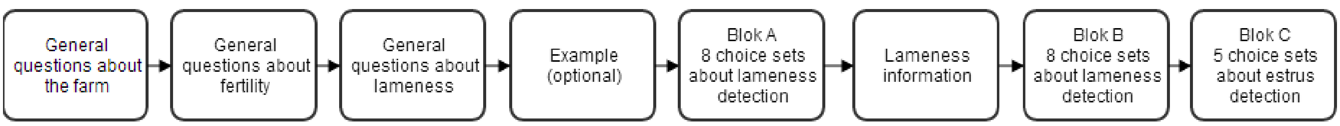

Figure 2: Schematic course of the survey

In total, the 32 different choice sets are divided in eight blocks, each containing four choice sets. The blocks presented to the farmer before and after the added information use different choice sets so that each respondent has to answer eight choice sets for lameness. Blocks are chosen at random when the survey starts to approximate a discrete uniform distribution of the eight blocks in the resulting dataset.
Figure 3 shows an example of one choice set.

	System on the cows' leg	Walk or pressure mat on the ground	Camera system
Percentage missed lame	30 %	30 %	30 %
Percentage false alarms	5 %	0 %	10 %
Cost price/cow/year	€ 75	€ 15	€ 35
Indication lame leg	Yes	Yes	Yes

Which system would you choose based on the table above?

- System on the cows' leg
- Walk or pressure mat on the ground
- Camera system
- I choose none of these systems, I will detect the lame cows myself without the help of a sensor

Figure 3: Example of one choice set

The survey has been started and the responses are gathered. Data processing will be initiated shortly.

Task 2.3: Blueprint for procedures including project findings
Based on the identified production databases and relevant data together with the stakeholder identification, key indicators, etc., the derivation of a generic infra-structure and information models has been initiated and continue in parallel with the further findings in the other WP's and tasks.

WP3

General developments within WP3:

- The Stepmetrix system is being discarded
- Algorithms are being developed by ILVO on Gaitwise.
- Algoriths for accelerometers are being developed by MTT and AU
- Demonstration farms in Finland, Belgium and Ireland are searching for alternative accelerometers
- Potential alternative accelerometers: NEDAP, ICE CUBE.

Task 3.1. Algorithms for early lameness detection

The Finnish measurements on the lameness detection system will be performed at MTT Maaninka. The cows will be guided to walk over the pressure walkway twice a week. Cows are milked twice daily in the 2x8 herringbone milking parlour. Health parameters followed medical treatments and medication, and fertility which are recorded continuously. The data includes also all the basic information in relation to the cows: age, breed, calving date, insemination date.

The measurement zone is placed inside the stable, in a retour alley beside the milking parlour. Each cow walks through this alley to return to the stable. All other hard- and software as well as the operator for the mat are located in the milking parlour in order not to disturb the cows walking over the measurement zone. For validation purposes, every cow walking over the GAITWISE system will be filmed, in order to score its gait for lameness assessment.

A separation of cows is made manually by herdsman. Cows are prevented from entering the measurement zone before the previous cow has exited the measurement zone. The operator controls starting of the measurements and video recordings and updates the cow ID and measurement time to the excel file in order keep track on the cow traffic. Cows should be motivated to reach the end of the alley, to shorten the queuing time of other cows.

MTT has delivered information for further development of lameness detection sensor for Task 3.1. Measurements were performed from June to December 2013 (Table 1.). All results have been delivered to ILVO for more detailed analyzis.

Table 1. Summary of results measured with Gaitwise lameness detection system.

Total cows	**118**
Min number of measurements/cow	1
Max number of measurements/cow	23
Mean number of measurements	9.440678
Median number of measurements	8
Total number of measurement days	32
Cows min/measurement	21
Cows max/measurement	62
Total number of walks	1347

The Gaitwise lameness detection sensor broke down due to cold climate conditions. This happened in Finland, but also in Belgium.

ILVO started the use of Synergistic Control (SGC) on the data provided by Gaitwise. Therefore, previously gathered data was processed and lameness parameters were calculated. SGC was performed for one lameness parameter; stride length. The Engineering Process Control step was performed by recursively calculating the control limits in the control charts. ARMA models were tested but could not yet be performed correctly due to missing values in the time series. A linear regression model was tested but could not be fine-tuned with these data. Several methods and control charts were tested: Shewhart control charts and CUSUM charts were applied and tested in the Statistical Process Control step. The results were promising, but extra information is needed to be able to explain events in the data that cause values to be out-of-control.

During these developments, the historical data used was found to be incomplete and extra information on cow health was lacking, making fine-tuning of the Synergistic Control process impossible. Future developments will focus on improving the EPC step by using ARMA models and by combining variables. Therefore, new data will be gathered with an improved measurement setup located in the new stable at ILVO Research Centre. Construction of this facility aims to be finished by October 2014. This setup will take the disadvantages from the old setup into account; (i) slopes before and after the measurement zone will be removed so that the space before and after the measurement zone is at the same height as the measurement zone itself, allowing a normal walking pattern on the measurement zone; (ii) a new pressure sensor that is more adapted for the use on farm and more temperature resistant; (iii) the selection gate will be further adjusted to avoid a hold-up of the cows before the gate. Cow identification will be improved for automatic recognition. Stepmetrix™ will be integrated in this setup to make comparison possible. Automatic measurements will be performed to gather data, and more extra information about the cows' health status and production information will be gathered. Special emphasis will be placed on a direct link between the measurement and cow's ID. The development of this new setup is currently in progress.

Task 3.2: ***System functionality***

Downscaling of Gaitwise, and accelerometer data has not started.

Task 3.3. System comparison

As part of the system comparison, Gaitwise cannot be used as true value. Therefore, expert and manual registrations will be considered as true values.

Preliminary experiments with accelerometers have been carried out, to try to identify classifiers of lameness. 5 collars were fitted with 2 accelerometers each, the accelerometers were configured to sample at the maximum frequency (200Hz) rate to minimize the risk of missing cues in the data. This setup had the purpose of assessing the sensor positions influence on the ability to detect lameness.

In the first experiment, there seem to some difference in the movement/activity level of the lame cow during resting periods. However, there is no obvious detection criterion to extract from the data, that wouldn't give a high false positive rate. In addition it has shown extremely difficult to identify if the changes in movement are caused by lameness or other factors such as flies in the barn, or different feeding. To make any definite conclusion more data is needed, along with validation data, further attempts to achieve this during the preliminary experiments failed due to reliability of the sensor logging and battery time.

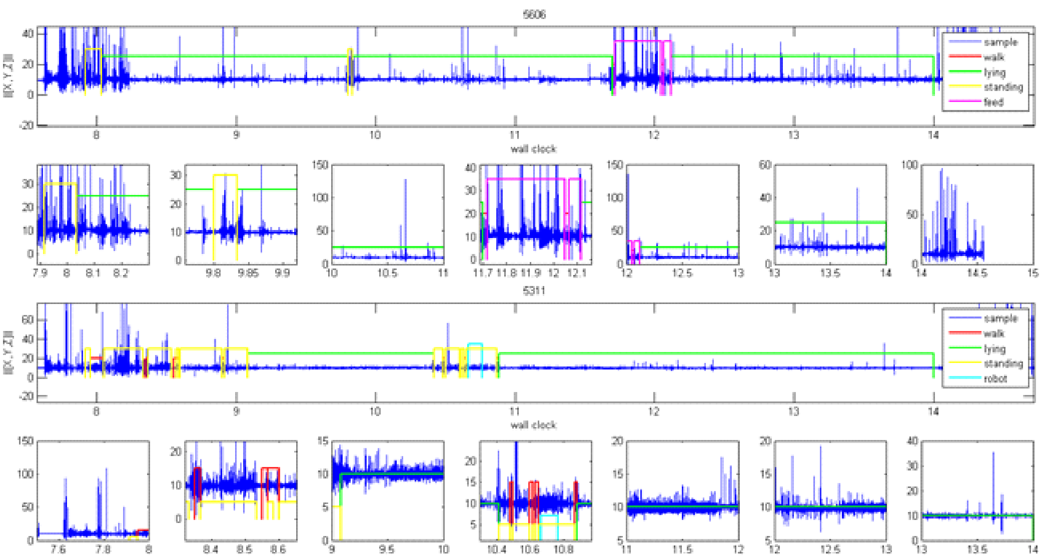

Figure 4: Showing magnitude of acceleration for lame cow(5606) and cow in heat (5311)

Given the difficulty of getting validation data, it should be considered to use gyroscope sensors (or alternative source of positional data, such as Smartbow® or Tracklab® as the cows movement pattern in the stable could be expected to change with lameness, i.e locations might change and the time spent in each location. Positional data is more expensive in equipment (smartbow tracklab), and battery time (gyroscopes) but could prove valuable during development of an acceleration based detection system.

WP4

Task 4.1: Key environmental indicators

UCD developed a list of key environmental indicators. These are currently being reviewed to propose a shortlist for wider discussion. The indicators include:

Energy

a. ***Energy efficiency*** (the ratio of the amount of produced milk (liter) to the total energy input (MJ). Total energy input consists of direct and indirect energy inputs. Direct energy is used on farm for agricultural activities and it comprises mainly diesel fuel, electricity and natural gas. Indirect energy includes the energy that is used to produce farm inputs such as mineral fertilizers, seeds, pesticides, concentrates, forages and machines)

Nutrient use

b. ***The N surplus*** is calculated as total N input-total N output. N inputs comprise N in purchased concentrates, forages and by-products, straw (or sawdust), animals, mineral fertilizer and manure, in biological fixation and in atmospheric deposition. N outputs are comprised in exported milk, animals, manure and crops. All inputs and outputs are expressed in kg N per ha of total utilized farm area.
c. ***N use efficiency*** as =the farm's main product output (liters of produced milk) / the N surplus (kg N)

Land/Soil

d. ***Land use efficiency:*** $\text{Land}_{\text{Milk}} = (\text{Land}_{\text{on-farm}} + \text{Land}_{\text{off-farm}}) \times$ {(LUc (cows) + LUr(replacement animals) + LUb(bulls))/ LUt(total land use)}× (milk sale/dairy unit sale)
e. ***Soil structure***: It is not the main objective of this project, but is important for the sustainability of dairy farming.
f. ***P and N content in soil***: As nutrient in soil. The level of nutrient in soil can affect the extent of fertilizer application

Carbon Footprint

g. CO_2=Electricity+ diesel + fertilizer production+ transport of fertilizer Emissions associated with electricity use on farm is 0.533 kg of CO2 Eq/kWh (Irish energy reports, SEAI, 2010)
h. CH_4=Enteric fermentation from cows and other livestock unit+ fertilizer production+ transport of fertilizer+ diesel+ Dairy cows (manure storage+ manure spreading + collecting+ dung in the field)+ other livestock(manure storage+ manure spreading + dung in the field)
i. N_2O= fertilizer production+ transport of fertilizer+ fertilizer application+ diesel+ Dairy cows (manure storage+ manure spreading + collecting+ dung in the field)+ other livestock(manure storage+ manure spreading + dung in the field)
j. CF for production of feed

Biodiversity

k. Using Biodiversity score developed by SIMS. Refer to Donal O'Brien and Casey

Water

l. ***Water use efficiency***: = the amount of produced milk (litre) / the total amount of water used on the farm and off farm (m3). Total water use on farm consists of (1) drinking water for dairy cows and heifers, (2) cleaning water for stables, calf pens, milking parlor, udders, milk tank, milking machinery and field machinery, (3) water used in a plate cooler and (4) water for a walk-through foot-bath for the cows. Total water use off farm is mainly for feed production (information from Feedprint to estimate the water use for feed production in different countries might be useful, but can also used Aquacrop to calculate the water use). The latest ISO standard for water assessment in LCA will be considered for developing the calculation method and whether use gray water concept in assessment or not also will be discussed.

m. ***Water quality***: the eutrophication potential and acidification potential in water. Eutrophication potential (kg PO4-equivalent: P, PO_4, NH_3, NO_3, NOx) =Nitrate leaching+ manure application +manure storage+ dung in the field. Acidification potential (kg SO2-equivalent: SO_2, NH_3, NO_X) = manure application +manure storage+ dung in the field. It might be necessary to differentiate ground water from surface water. Surface water is more variable and can be affected by Eutrophication potential and acidification potential.

Economy

n. An UK empirically-based model EDMM (Economic Dairy Management Model) which simulates the revenue and costs attributed to dairy farm is being reviewed.

- A LCA model is being developing in OpenLCA, currently the focus is modeling the feed production unit. Considering the compound of concentrate feed in different systems are not the same, and in different countries this difference can be great. As the feed production unit influences the CF in a significant way feedprint is being to different feed production and supply management scenarios to reflect the actual situation in individual farms. The result will be integrated in OpenLCA or Excel to calculate the carbon footprint.
- Existing LCA based models are being reviewed
- A farm-scale LCA model has been drafted as the “bronze” or “silver” standard against which simplifications will be assessed. This model is being parameterized and tested.

Task 4.2: Production indicators

- A list of key production indicators has been developed and is being evaluated

Task 4.3: Economic and environmental indicators

- Some LCC models (standard LCC models for buildings) have been reviewed
- The farm-scale LCA model is being designed to allow parallel calculation of farm costs and life cycle costs.
- Scenarios for business-as-usual and with technological intervention are being defined, in the first instance for LCGR dairy with confinement systems to follow.

WP 5

Task 5.1 System analysis

System analysis has been performed by indicating the stakeholders in WP 2. A web has been made that represents the relations between different actors. This web will be updated continually with information about these relationships, as well as costs and benefits for different actors.

Bayesian decision making was used as a conceptual framework to test its value as a decision tool. Both the Bayes theorem and the Bayes criterion are used in this framework. Although the framework is easily

understandable, the application on the concept of lameness is not straightforward. Several methods were tested to fill out the payoff values needed for the calculations, but until today, no good solution was found. It was concluded that the framework should be applied more in depth by splitting the decision making on farm level and on cow level. Although both have an influence on the economic results of lameness and lameness reduction strategies, they could not be incorporated in the same framework together. Further research will be performed to find out how decisions can be taken using a Bayesian tool on cow level and on farm level. A possible solution could be to incorporate each in a separate framework and to link these frameworks afterwards.
A similar approach to the SILF web was used to make a farmer web that summarizes the different effects and economic consequences of lameness and their mutual relations. This web will be further updated to clarify the known and unknown costs in literature. Using this web, a Bayesian framework could be initiated to serve as a decision tool for action after lameness detection on individual cow level.

Task 5.2: **Analyzing sustainability**

- Foundation work on life cycle costing has been started.

Task 5.3. Farm-specific decision support

- Preliminary activities initiated

WP6

Coordination/demonstration and dissemination activities:

General project management activities concentrating on coordinating overall project tasks. Two full project meetings have been held:

- Kick-off meeting, 4 March. Place: Aarhus University, Department of Engineering, School of Engineering
- Yearly meeting, 19. March 2014. Place: ILVO: Ghent, Belgium
- Establishment of website

Milestones and deliverables SILF for 1 March 2013 – 1 March 2014 (yellow marking indicate activities within the first half project period)

Task		Month	Status	Responsible	
1.1	Mapped available data (IoT) from partner countries	6		AU	ok
1.2	To proceed from analysis of key data to operationalizing historical records	20		AU/UCD	In progress
1.3	Find demonstration sites and implement farm platform	24			In progress
1.4	Creation of audit protocol for energy and barn climate	12		CERETETH	ok
2.1	Stakeholders identified and	12		AU	ok

	interview framework defined				
2.2	Indicative key indicators identified	18		UCD/AU	In progress
2.3	Generic information model derived from current management practices	24		AU/ILVO	In progress
3.1	Sensor systems (specifically accelerometers) installed and working on demonstration farms	12		ILVO	Delayed Stepmatric aborted Gaitwise under reconstruction
3.2	Initial data (after 12 month) structured and stored for analysis	24			Ok for gaitwise
3.3	Preliminary analysis of accelerometer data	24		AU	Started
4.1	LCA system model for confinement and grazing based dairy farms	12		UCD	Started but delayed
4.2	Production efficiency indicators	24		UCD/ILVO	In progress
4.3	Economic scenarios defined	24		UCD/ILVO	In progress
5.1	System analysis framework	12		ILVO	Started but delayed
5.2	Draft 1 business models	18		ILVO	Started but delayed
5.3	Draft 1 Farm specific DSS	24		ILVO	In progress
6.1	First consortium kickoff meeting	1	Accomplished	AU	ok
6.2	Website established	3		AU	ok
6.3	Planning of workshops and demonstration in place	4		AU	Ongoing
6.4	Yearly proceeding meetings with all partners	13,25		AU	Ongoing
	Deliverables				
1.1	Report of available data in partner countries and description of protocols	6		AU	ok
1.2	Outline of operational goals and thresholds for identified indicators integrated with IoT	24			
1.3	Report on setup and demonstration of dedicated farm journal focusing on lameness	34			

1.4	Report on dedicated setup and demonstration of farm journal focusing on energy and barn climate	24			
2.1	Documented identification of relevant stakeholders	4		AU	ok
2.2	Interviews and other communications with stakeholders completed	12		ILVO	Ok for Belgium
2.3	Documented identification and specifications of key indicators aimed	20			
2.4	Design guidelines for blueprint for technology developers of smart livestock farming information system	34			
3.1	First prototype of detection system is ready for testing/validation	18		ILVO	Delayed
3.2	Downscaling of technology and analyses is investigated based on historical data	24			
3.3	All 3 lameness detection systems are compared and best indicators are known	33			
4.1	Farm scale LCA model suitable for Farm Platform decision support	24			
4.2	Demonstration farm and case study verification of key production indicators for Farm Platform decision support	30			
4.3	Cost-benefit of Farm Platform decision support	34			
5.1	System that describes the costs and benefits for different actors and the way they are related	12		ILVO	OK
5.2 a	Business models making economic and sustainability effects of smart lameness detection for different actors explicit	14			
b	Farm characteristics that determine the usefulness of smart lameness detection	20			
c	Effect of market conditions on	12		ILVO	Delayed

	the usefulness of smart lameness detection at farm level				
d	Optimal economic scale of the smart lameness detection system	30			
e	Effect of internalization of smart lameness detection and energy audit	28			
5.3	Farm-specific decision support system for analyzing the economic relevance of smart lameness detection	30			
6.1	Well functioning web site with updating procedure	5		AU	ok
6.2	Yearly proceedings of annual result	12,22, 36		AU	ok

Deviations from proposal / work plan

WP 3.
Stepmetrix is not functioning.
Gaitwise broke down because of freezing temperatures, but is being repaired.
The partner Webstech went broke, no deliveries of sensors possible
Testbarn in Belgium was not finished.

Based on the deviations mentioned above, the suggestion is to redirect the workplan for WP 3 in the following way:

1. Cooperate withthe EU-project Autograss milk project which is also developing a model based on generic data and sensor input. Here, the sensor input is activity sensors that can discriminate between walking, standing and lying down. In the attached file you can see what is required. We are now in dialogue with the Dutch team to identify the data necessary without AMS. This model can be installed on-site, and show the farmer every day which cows need attention.

2. We analyse data sets already available. It may be possible to get data from smartbow at KFC gathering raw accelerometer data together with position (distance walked). Other possible available data include icetag and lameness observations. There might be more dataset available.

3. We use home built accelerometers or platforms and experiment with getting more informations out of the data. The data has to be validated to manual gait registrations or lesion detection.

Due to the altered situation with regard to accelerometer provider and some of the test facilities, it will be inquired if the project period can be extended to cover 2016 (end project 31-12-2016).

Dissemination activities (including list of publications where applicable)

The 17th International Symposium and 9th International Conference on Lameness in Ruminants, hosted by the University of Bristol, School of Veterinary Sciences, will be held from the 11th to the 14th August 2013 at the Bristol Marriott City Centre Hotel

The 6th European Conference on Precision Livestock Farming that will be held in Leuven, Belgium on September 10-12, 2013. This conference will be a Joint European Conference on Precision Livestock Farming
Demonstration farms: will be research farms in Finland, Ireland and Belgium.

MTT Maaninka Research Station Open day 23.8.2013. Among other activities the SILF project and Gaitwise equipment were presented to the visitors. Total amount of visitors estimated to 1000 persons.
SILF Project meeting 3/2014

Several visitor groups at MTT Maaninka Research Station

Dairy care
http://www.dairycareaction.org/first-dairycare-conference.html poster
EAAP 2014
http://www.eaap2014.org/
Copenhagen – 25-29 August 2014, SILF presentation

WAFL 2014
https://colloque.inra.fr/wafl2014
France – 3-5 Sept 2014, SILF presentation
ECPLF 2015 Milaan, SILF presentation

Project management

General project management activities concentrating on coordinating overall project tasks. Two full project meetings has been held:

- Kick-off meeting, 4 March. Place: Aarhus University, Department of Engineering, School of Engineering
- Yearly meeting, 19. March 2014. Place: ILVO: Ghent, Belgium