EU-PLF

Deliverable 2.4

Report on data collected on farm

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Authors :	Martijn Hemeryck
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RE	**Restricted to a group specified by the consortium (including the Commission Services)**	
CO	**Confidential, only for members of the consortium (including the Commission Services)**	

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1. Introduction

This text is a deliverable in the context of EU-PLF work package 2 (*Extensive Field tests*). It follows deliverables 2.2 (*Systems operational on 15 farms*) and 2.3 (*4 cow systems operational*), dealing with getting the systems up and running for all targeted farms and species. This deliverable provides an overview of all the measurements performed and the assessments conducted.

1.1 Pigs and broilers

The project foresaw the collection of automated measures on 10 selected pig farms and 5 broiler farms. The automated measurements consist of animal activity and distribution using the eYeNamic system and respiratory distress using the Sound Monitor. A training period of 3 productive cycles was included for both species, meaning 6 months per broiler farm and 12 months per fattening pig farm. Measurements were carried out for a period of 24 months, giving a total of 60 fattening cycles / 240 batches for both species. On one of the selected poultry farms (The Poultry Side), dust and ammonia emissions were monitored.

For each of the pig and broiler farms, the time range, the number of followed compartments, the number of cycles and the number of assessments is presented. The number of cycles is further specified per compartment. Additionally, the number of cycles with a data completeness larger than 90% is also given. A listing of additional Key Indicators (KIs) measured is also given where applicable. For one of the broiler farms (The Poultry Side), a more in-depth report on the emission measurements is provided. Table 1 and Table 2 give an overview per farm of the data collected thus far. Apart from the number of batches for which data has already been collected, the tables also list the current status. For most of the farms, data collection is on schedule will continue until the end of the project. For 3 of the pig farms, data collection has been halted. Given the large amount of data collected thus far and the continued interest of the remaining involved farmers, this will not affect the outcome of the project.

Table 1: status overview pig farms. The table lists for each of the pig farms the number of batches recorded (out of the 24 batches scheduled), the current status and some guiding notes.

Farm	Done	Status	Notes
Teeuwen (NL)	20	Running	Ongoing
Verhoijsen (NL)	24	Running	Ongoing
McCrea (UK)	15	Stopped	Stopped due to limited interest of involved farmer
Earl Bergot (FR)	16	Running	Ongoing
APC (FR)	12	Running	Ongoing
Merigo (IT)	12	Running	Ongoing

Granja Mir	20	Running	Ongoing
Granja La Llucanesa (ES)	31	Running	Ongoing
Karakai – Egyhazaskeszo (HU)	8	Stopped	Stopped due to limited interest from new management
Dunahyb (HU)	21	Stopped	Stopped due to running costs (internet provider)

Table 2: status overview broiler farms. The table lists for each of the broiler farms the number of batches recorded (out of the 48 batches scheduled), the current status and some guiding notes.

Farm	Done	Status	Notes
Colbers (NL)	12	Running	Ongoing
Speller (UK)	12	Running	Ongoing
The Poultry Side (UK)	13	Running	Ongoing
Lavarini (IT)	9	Running	Ongoing
Cal Xulic (ES)	12	Running	Ongoing

1.2 Cattle

Within the project, experiments were also performed for both dairy and beef cattle at the level of the individual animals. For dairy, 3 farms were targeted in varying climatological conditions. A total of 500 full cow lactations were to be monitored and linked to existing KI. For 10-15 animals, a link to new KI was to be examined. For beef cattle, experiments were scheduled at the Teagasc Research Centre. Twenty calves were to be monitored during a period of 24 months for a new KI: Bovine Respiratory Disease (BRD). The monitoring was to be performed using the Sound Monitor and clinical assessments. The clinical assessments consist of blood drawings and nasal samples. Table 3 lists the current status for the cattle monitoring, Table 4 gives and overview of the data collection for beef calves.

For the beef calves monitored at the Teagasc Research Centre, the audio recorded with the Sound Monitor is given in terms of days of recording, both aggregated as well as at the level of the 4 recording locations. Additionally, an overview of the other KI's is presented. For the dairy farms, an overview table is provided, detailing the specifics of the variables measured at animal level.

Table 3: status overview cattle farms.

Variable	Planned	Done
Number of farms	3	8

Table 4: status overview beef calves.

Variable	Planned	Done
Number of animals	20	45 Holstein-Friesian / 37 Jersey
Time period	24 months	20/03/2013 to 06/07/2015

2. Data collection

2.1 Pigs

2.1.0 Overview

Period during which the measurements were performed	01/08/2013 to 23/08/2015
# Locations in the farm	39
# Cycles measured (completeness > 90%)	179 (41)
# Assessments	111

2.1.1 Teeuwen (NL)

Period during which the measurements were performed	17/10/2013 to 02/07/2015
# Locations in the farm	4
# Cycles measured (completeness > 90%)	20 (13)
# Assessments	16
Other KI's measured	• Feed • Temperature • Number of animals

2.1.2 Verhoijsen (NL)

Period during which the measurements were performed	15/11/2013 to 23/08/2015
# Locations in the farm	4
# Cycles measured (completeness > 90%)	24 (11)
# Assessments	15
Other KI's measured	• Feed • Water • Weight • Temperature • Number of animals

2.1.3 McCrea (UK)

Period during which the measurements were performed	16/08/2013 to 10/06/2015
# Locations in the farm	3
# Cycles measured (completeness > 90%)	15 (0)
# Assessments	11
Other KI's measured	/

2.1.4 Earl Bergot (FR)

Period during which the measurements were performed	01/01/2014 to 24/08/2015
# Locations in the farm	4
# Cycles measured (completeness > 90%)	16 (4)
# Assessments	11
Other KI's measured	• Number of animals • Feed supply • Temperature

2.1.5 APC (FR)

Period during which the measurements were performed	16/10/2014 to 24/08/2015
# Locations in the farm	4
# Cycles measured (completeness > 90%)	12 (1)
# Assessments	12
Other KI's measured	• Number of animals • Feed supply • Temperature

2.1.6 Merigo (IT)

Period during which the measurements were performed	09/10/2014 to 23/08/2015
# Locations in the farm	4
# Cycles measured (completeness > 90%)	12 (5)
# Assessments	13
Other KI's measured	/

2.1.7 Granja Mir (E)

Period during which the measurements were performed	16/11/2013 to 23/08/2015
# Locations in the farm	4
# Cycles measured (completeness > 90%)	20 (0)
# Assessments	8
Other KI's measured	/

2.1.8 Granja La Llucanesa (E)

Period during which the measurements were performed	08/11/2013 to 23/08/2015
# Locations in the farm	4
# Cycles measured (completeness > 90%)	31 (5)
# Assessments	8
Other KI's measured	/

2.1.9 Karakai – Egyhazaskeszo (HU)

Period during which the measurements were performed	01/02/2014 to 11-11-2014
# Locations in the farm	4
# Cycles measured (completeness > 90%)	8 (0)

# Assessments	6
Other KI's measured	/

2.1.10 Dunahyb (HU)

Period during which the measurements were performed	01/01/2014 to 23/08/2015
# Locations in the farm	4
# Cycles measured (completeness > 90%)	21 (2)
# Assessments	13
Other KI's measured	/

2.2 Broilers

2.2.0 Overview

Period during which the measurements were performed	06/08/2013 to 15/07/2015
# Broiler farms	5
# Cycles measured (completeness > 90%)	58 (38)
# Assessments	112

2.2.1 Colbers (NL)

Period during which the measurements were performed	09/11/2013 to 15/07/2015
# Locations	1 House with 28000 bird places
# Cycles measured (completeness > 90%)	12 (7)
# Assessments	30
Other KI's measured	• Feed • Water • Weight • Temperature • Relative humidity • Number of animals

2.2.2 Speller (UK)

Period during which the measurements were performed	23/09/2013 to 24/07/2015
# Locations	1 House with 45000 bird places
# Cycles measured (completeness > 90%)	12 (4)
# Assessments	29
Other KI's measured	• Feed • Water • Weight • Temperature • Relative humidity

	• Number of animals • Fan rate • Air pressure

2.2.3 Veronesi - Lavarini (IT)

Period during which the measurements were performed	05/04/2014 to 05/08/2015
# Locations	1 House with 30000 bird places
# Cycles measured (completeness > 90%)	9 (7)
# Assessments	18
Other KI's measured	• Temperature • Relative humidity • Fan rate • Air pressure

2.2.4 Cal Xulic

Period during which the measurements were performed	06/08/2013 to 21/07/2015
# Locations	1 House with 42000 bird places
# Cycles measured (completeness > 90%)	12 (10)
# Assessments	10
Other KI's measured	• Feed • Water • Weight • Temperature • Relative Humidity • Fan rate • Air pressure

2.2.5 The Poultry Side (UK)

Period during which the measurements were performed	12/11/2013 to 05/08/2015
# Locations	1 House with 60.000 bird places
# Cycles measured (completeness > 90%)	13 (10)

# Assessments	31
Other KI's measured	• Feed • Water • Weight • Temperature • Ammonia • CO2

Dust, CO_2 and ammonia emission measurements

On-farm measurements of ammonia concentration, aerosol concentration at size fraction up to 1, 2.5, 4 (respirable fraction) and 10 µm, the aerosol particle size distribution and ventilation rate have been made from June 2013 (month 8).

Ammonia concentration was measured at 6-minute intervals using a Chemiluminesence NO_x analyser (model 42i, Thermo Electron Inc., USA) following catalytic conversion of Ammonia to Nitric Oxide at 77 C 5. Aerosol concentrations were measured at two locations below the fan shaft using DustTrac DRX analysers (TSI Ltd) fitted with a PM10 inlet, at 2-minute intervals. The bio-aerosol particle size distribution was measured using an aerodynamic particle sizer, size fraction from 0.7 to 20 µm (APS 3321, TSI Ltd) at 2-minute intervals. Due to the variable fan speed, some non-isokinetic sampling is to be expected. Ventilation rate was measured using three full size measuring fans (FANCOM BV) fitted below fans of ventilation stage 1, 2 and 3 (out of 6), as well as the duration each fan/stage was operational at any one time.

Data collection for each batch is given in the table below.

Batch nr	Start Date	Ammonia	Aerosol size fraction 1	Aerosol size fraction 2	Aerosol size distribution	Ventilation rate
1	June 2013	ok	ok	ok	partially	no
2	August 2013	ok	ok	ok	partially	ok
3	September 2013	ok	ok	ok	ok	ok
4	November 2013	ok	50%	50%	-	ok
5	December 2013	ok	ok	ok	ok	ok
6	February 2014	ok	ok	-	ok	ok
7	April 2014	ok	ok	ok	ok	ok
8	May 2014	ok	ok	ok	ok	ok
9	July 2014	-	-	-	-	-

10	August 2014	-	-	-	-	-
11	October 2014	ok	ok	ok	ok	ok
12	December 2014	-	-	-	-	-
13	January 2015	ok	ok	ok	ok	ok
14	March 2015	ok	ok	ok	ok	ok
15*	May 2015	ok	ok	ok	ok	ok
16 **	June 2015	ok	ok	ok	20%	ok
17	August 2015	-	-	-	-	-

* Litter sampling (dry matter) from batch 15 onwards

** Additional monitoring of T/RH in building

Continuous monitoring of aerosol concentration in the broiler house over long periods has proved to be difficult and expensive, mostly due to severe pollution of the optics of the instruments with aerosols. Both the aerosol particle sizer and the aerosol concentration monitors needed to be cleaned and recalibrated at a much higher interval than originally indicated by the manufacturer.

Ammonia monitoring to date has been more straightforward with no more than expected equipment failures.

2.3 Calves

Teagasc (IRL)

Data description

Period during which the measurements were performed	20/03/2013 to 06/07/2015
# Locations	4
# Days recorded with Sound Monitor	1613

KI description

KI	Rate	Note
Feed intake (+ drinking rate)	Continuous	Via automatic feeder system
Feed composition	Fixed	Determined at start per animal
Blood sampling	Once	At arrival
Rectal temperature	2x/w (pre-wean); 1x/w (post-wean)	
Respiratory sounds	2x/w (pre-wean); 1x/w (post-wean)	Trachea and lungs
Presence of cough	2x/w (pre-wean); 1x/w (post-wean)	None, induced, spontaneous cough or repeated induced coughs, repeated spontaneous coughs
Ear position	2x/w (pre-wean); 1x/w (post-wean	Normal, ear flick or head shake, unilateral droop, head tilt or bilateral droop
Presence of nasal discharge	2x/w (pre-wean); 1x/w (post-wean)	None, small amount of unilateral discharge, bilateral or excessive discharge, copious bilateral discharge
Ocular discharges	2x/w (pre-wean); 1x/w (post-wean)	None, small amount, moderate amount of bilateral discharge, heavy discharge
Average air velocity	Daily, 5d/w	Average air velocity was recorded at three different heights; ground level, 1m above ground level and 2 m above ground level, in three different areas of the pen; the front opposite the automatic feeder, the middle and the back, diagonally opposite to the measurement taken at the front of the pen

2.4 Dairy

Farm	Loca-tion	Approx herd size	Milking system	Feeding strategy	Cows equipped with CowView	Centrally stored CowView data, period and completeness	Locally logged CowView data, period and completeness	Storage of animal history (production, reproduction, health)	Herd log book	Welfare Quality Assess-ment of comfort around lying	Cows equipped / monitored with other sensors	Data logging with other sensors
F-01	SE	180	Automatic milking system (AMS)	Mixed ration, concen-trate, summer grazing	205	Activities per hour (InBed, AtFeed, StandInAlley, WalkInAlley) since April 1st 2014; > 98 % completeness.	Filtered positions (FA), clustered positions (PC), concluded activities (PA), accumulated hourly activities PAA) since January 5th 2015; 95 % completeness	Life time	Since January 1st 2015	June 25th 2015	30 cows with Icetag and CowScout sensors; 10 of these marked as focal animals for video-validation	Icetag/ Cowscout: January 1st till June 25th 2015 Video: Marts 18th till 20th 2015 and April 8th till 10th 2015
F-02	D	600	Conven-tional rotary	Total mixed ration (TMR), 0-grazing	595	Activities per hour (InBed, AtFeed, StandInAlley, WalkInAlley) since January 1st 2014; > 98 % completeness.	Filtered positions (FA), clustered positions (PC), concluded activities (PA), accumulated hourly activities PAA) since January 5th 2015; >98 % completeness	Life time production and reproduction; health since January 1st 2015	Since January 1st 2015	June 11th 2015	None	None

F-03	NL	280	Automatic milking system (AMS)	Mixed ration, concen-trate, 0-grazing	238	Activities per hour (InBed, AtFeed, StandInAlley, WalkInAlley) Since October 1st 2014; > 98 % completeness.	Filtered positions (FA), clustered positions (PC), concluded activities (PA), accumulated hourly activities PAA) since January 5th 2015; >98 % completeness	Since January 1st 2015	Since January 1st 2015	June 11th 2015	None	None
F-04	NL	110	Automatic milking system (AMS)	Mixed ration, concen-trate, summer grazing	122	Activities per hour (InBed, AtFeed, StandInAlley, WalkInAlley) since Marts 1st 2015; > 98 % completeness.	None	Lifetime	None	None	None	None
F-05	DK	525	Conven-tional rotary	Total mixed ration (TMR), 0-grazing	488	Activities per hour (InBed, AtFeed, StandInAlley, WalkInAlley) since January 1st 2015; > 98 % completeness.	Filtered positions (FA), clustered positions (PC), concluded activities (PA), accumulated hourly activities PAA) since January 5th 2015; >98 % completeness	Life time	Since January 1st 2015	June 10th 2015	None	None
F-06	DK	485	Automatic milking system (AMS)	Mixed ration, concen-trate, 0-grazing	429	Activities per hour (InBed, AtFeed, StandInAlley, WalkInAlley) from November 1st 2014 till Marts 26th 2015; > 98 % completeness.	Filtered positions (FA), clustered positions (PC), concluded activities (PA), accumulated hourly activities PAA) from January 5th till Marts 26th 2015; >98 % completeness.	Life time until Marts 26th 2015	January 1st till February 28th 2015	None	Two video-validation study of each five focal animals	24 hours video recording; 1st round: February 3rd, 5th, 6th, 7th, and 10th 2015; 2nd round: November 21st, 22nd, 24th, 25th,27th, and 28th 2014

Farm	Location	Approx herd size	Milking system	Feeding strategy	Cows equipped with CowView	Centrally stored CowView data	Locally logged CowView data	Storage of animal history (production, reproduction, health)	Herd log book	Welfare Quality Assessment of comfort around lying	Cows equipped / monitored with other sensors	Data logging with other sensor	Cows equipped / monitored with other sensor	Data logging with other sensor	Cows equipped / monitored with other sensor	Data logging with other sensor
INRA	Marcenat,	160	Conventional parlour	Hay – concentrates	48	Activities per hour (InBed, AtFeed, StandInAlley, WalkInAlley) from February 15 to May 2015; > 95 % completeness	90%	Life time	Since February 1st 2015	2 times during winter	Automatic weighing scale at exit of milking parlour (Delaval)	85%	Weighing trough (biocontrol)	>95%		
INRA	Marcenat	160	Conventional parlour	Silage – concentrates	28	Activities per hour (InBed, AtFeed, StandInAlley, WalkInAlley) from February 15 to May 2015; > 95 % completeness	90%	Life time	Since February 1st 2015	-	Automatic weighing scale at exit of milking parlour (Delaval)	85%	Feeding gate (Sodalec)	~100%	Bolus pH rumen (eCow)	65%
INRA	Marcenat	160	Conventional parlour	Hay, silage, concentrates	80	Activities per hour (InBed, AtFeed, StandInAlley, WalkInAlley) from February 15 to June 2 2015;	90%	Life time	Since February 1st 2015	-	Automatic weighing scale at exit of milking parlour (Delaval)	85%	-	-		

						> 95 % completeness										
INRA	Theix	70	Conven-tional parlour	Hay + Grass silage+ Maize silage + concen-trates	23	Activities per hour (InBed, AtFeed, StandInAlley, WalkInAlley) from March 3 to June 2 2014; > 95 % completeness	90%	Life time	31/03 till 02/06/2014	-						
INRA	Theix	70	Conven-tional parlour	Hay + Maize silage + concen-trates	25	Activities per hour (InBed, AtFeed, StandInAlley, WalkInAlley) from March 3 to June 2 2014; > 95 % completeness	90%	Life time	31/03 till 02/06/2014	-	Greenfeed (CH4 emitted)	95%				

Farm	**Location**	**Approx herd size**	**Milking system**	**Feeding strategy**	**Cows equipped with CowView**	**Centrally stored CowView data, period and completeness**	**Locally logged CowView data, period and completeness**	**Storage of animal history (production, reproduction, health)**	**Herd log book**	**Welfare Quality Assessment of comfort around lying**	**Cows equipped / monitored with other sensors**	**Data logging with other sensors**

ARO	Israel	Total 250 cows are in the farm. From which 42 are in the cow individual feed intake system and 60 cow are in the second CowView cowshed. All together potential 100 cows are located below the cowView antenna	24 Milking parlor made by afimilk 2 x 12 herringbone	TMR	Up to 100 See column 3	Activities per hour (InBed, AtFeed, StandInAlley, WalkInAlley) January 15th till April 28th 2015; > 95 % completeness.	The data is being locally stored since March 2015	Life time. All history, production, reproduction, activity, feed intake are stored.	Exist	None	Cow individual Feed intake, Activity Rumination Milk yield real time milk composition (AfiLab)	Feed intake

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