WORK PACKAGE 1

CCCfarming:

study farms overview

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Introduction

The report provides an overview of the 60 study farms that are cooperating to the research activities of the CCCfarming (*Climate Care Cattle Farming Systems – ID 39274*) project. The project aims at developing climate smart cattle farming systems, able to reduce greenhouse gases (GHGs) and ammonia emissions while maintaining sustainable social-economic farm businesses. The first objective of the study is to deliver an assessment of the environmental performances of this network of study field farms located in the eight EU-countries participating the project. The assessment is based on measurements of GHGs (carbon dioxide, methane and nitrous oxide) and ammonia emissions with simplified measurement methods and on the application of three management tools designed to assess the nutrient balance at farm level. The results will allow to choose mitigation practices and techniques that will be screened for their socio-economic robustness and political implications, on basis of literature and the collected experimental data. In a following step, new farm systems will be built by assembling combinations of promising practices and techniques and will be tested on pilot and experimental farms for meeting the goals of the project. Farmers provide their contribution by sharing data, samples, practices and strategies through the whole duration of the project.

Definitions

This section contains definitions and descriptions for the terms used in the overview chapter and the informative sheets.

Informative sheets

Farm name	Unique code for study farm identification
Landscape	Dominant landscape
Soil type	Dominant soil type
Farming system	Organic or conventional
Total lands	Total extension in hectares of the lands related to the farming activity. It includes lands of property, rented lands, lands in commodatum, etc.
Dairy cow housing	Type of housing (lactating cows)
Bedding material	Type of bedding
Floor in walking alley	Floor material and type
Dairy herd	Total number of animals - dairy cattle only (year 2020)
of which dairy cows	Number of dairy cows in lactation and dry (year 2020)
Breed	Dairy cow breeds and their proportion (year 2020)
Herd production level	Average milk production in kg/cow*year (year 2020)
Milking system	Type and number of milking facilities
Feeding system	Description of the feeding system used indoor for lactating cows
Dairy herd grazing	Specifies if lactating cows have access to pasture or not
Manure type	Description of the type(s) of manure produced in the farm
Manure storage	Description of the facilities used in the farm for manure storage
Other farming animals	Specifies if additional livestock categories are present in the farm

Overview of the study farms

The following section presents an overview of the 60 study farms involved in the project. The selection of farms presented in this report is not intended to be fully representative of the dairy sector in each participating country. The selection criteria adopted by the project aimed to provide a grouping of commercial and research farms expressing an overall variability regarding a variety of management options such as farming systems, breeding techniques, herd management, housing systems, bedding materials and more, in order to investigate the connections between farming strategies and their environmental sustainability.

Given this premise, the sample of farms considered in the project clearly depicts a situation where lowland farming activities are prevalent (63%), but dairy farming in hilly territories is also well practiced (36%), while mountain farming is represented solely in 1 context. A limited part of the farms is devoted to organic farming (20%). The allocation of organic and conventional farms among the participating countries is reported in Figure 1.

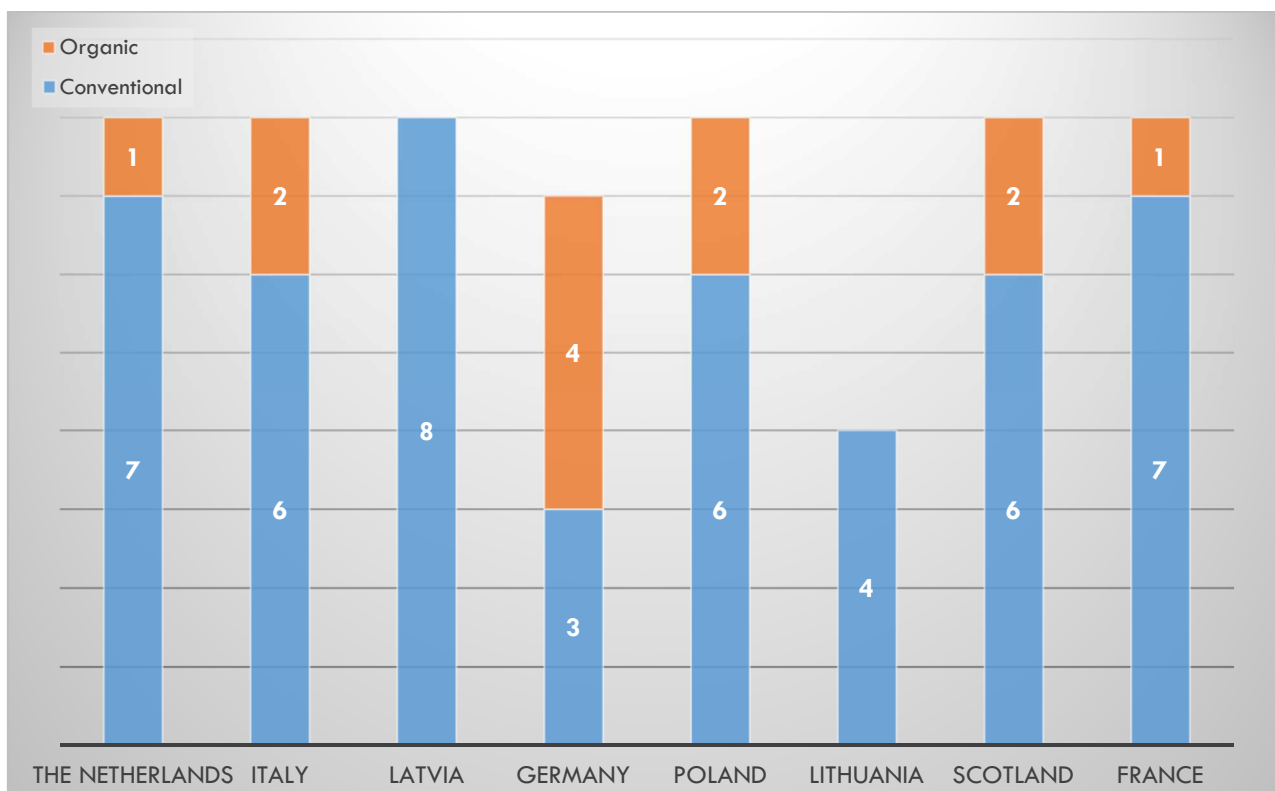*Figure 1. Allocation of organic and conventional study farms in the eight participating countries*

The extension of agricultural lands and their use is variable across farms and countries. However, in more than 60% of the study farms, arable lands are prevailing over other typologies of land use; for the remaining 37%, permanent grasslands represent the main land management type, indicating that

extensive systems in the context of dairy farming are also well represented. In reference to arable lands, commonly their extension per farm does not exceed 50 ha (25.4%) or is included between 51and100 ha (23.7%) or between101and 200 ha (23.7%). In 13 farms (22.2%) arable lands extend over more than 200 ha and, only in 3 of these, arable surface exceeds 500 ha. As to permanent grasslands, in 40.7% of the study farm sample their surface extends for not more than 50 ha. Overall, in nearly 85% of cases, grassland extension does not exceed 200 ha.

For the most part, dairy cattle is the only farmed species (68%). In 19 farms, additional categories of livestock are bred, the most frequent being pigs (7 farms), beef cattle (6 farms), sheep (4 farms), hens (2 farms) and poultry (1 farm). Dairy herd size is reported in Figure 2.
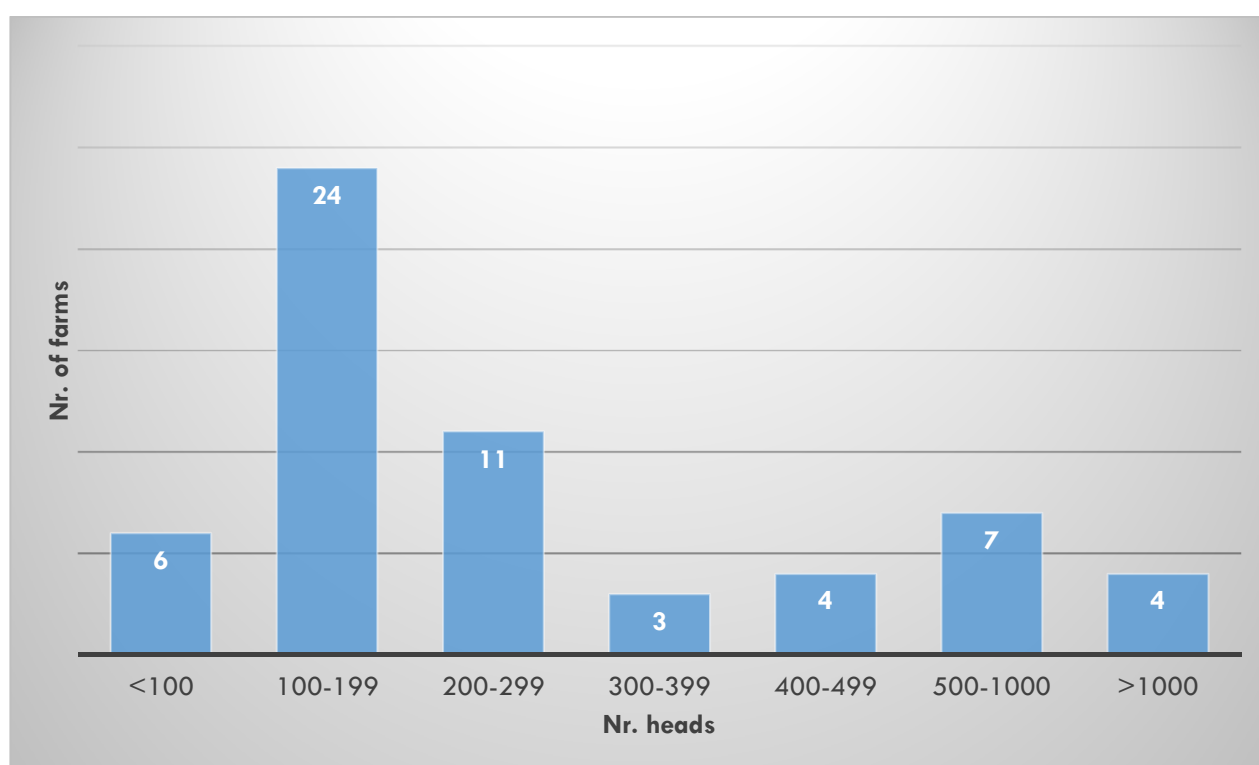
Figure 2. Dairy herd size of the study farms

When considering the entire dairy herd, over 50% of the study farms do not exceed the 200 heads. In particular, in 40% of the whole farm sample herd size is included between 100 and 200 heads. Very large farming realities are also well represented, with nearly 20% of the study farms breeding over 500 cattle heads. The distribution in abundance classes of the number of dairy cows (both lactating and dry) in each farm is reported in Figure 3. In nearly 75% of the farms, the number of dairy cows is below 200. As reported in Table 1, larger herds are situated in Germany, Poland and Scotland, the latter having three farms with over 500 heads.

In relation to herd management, nearly in 60% of the cases cows have access to pasture (extensive grazing or access to green exercise areas).

	Dairy herd		Dairy cows		Nr. of farms
	min.	max.	min.	max.	
The Netherlands	115	320	80	230	8
Italy	115	455	65	198	8
Lithuania	75	557	45	212	4
Germany	160	1700	90	800	7
Latvia	77	245	36	132	8
Scotland	40	2178	28	905	8
Poland	24	2600	10	1300	8
France	76	261	85	203	8

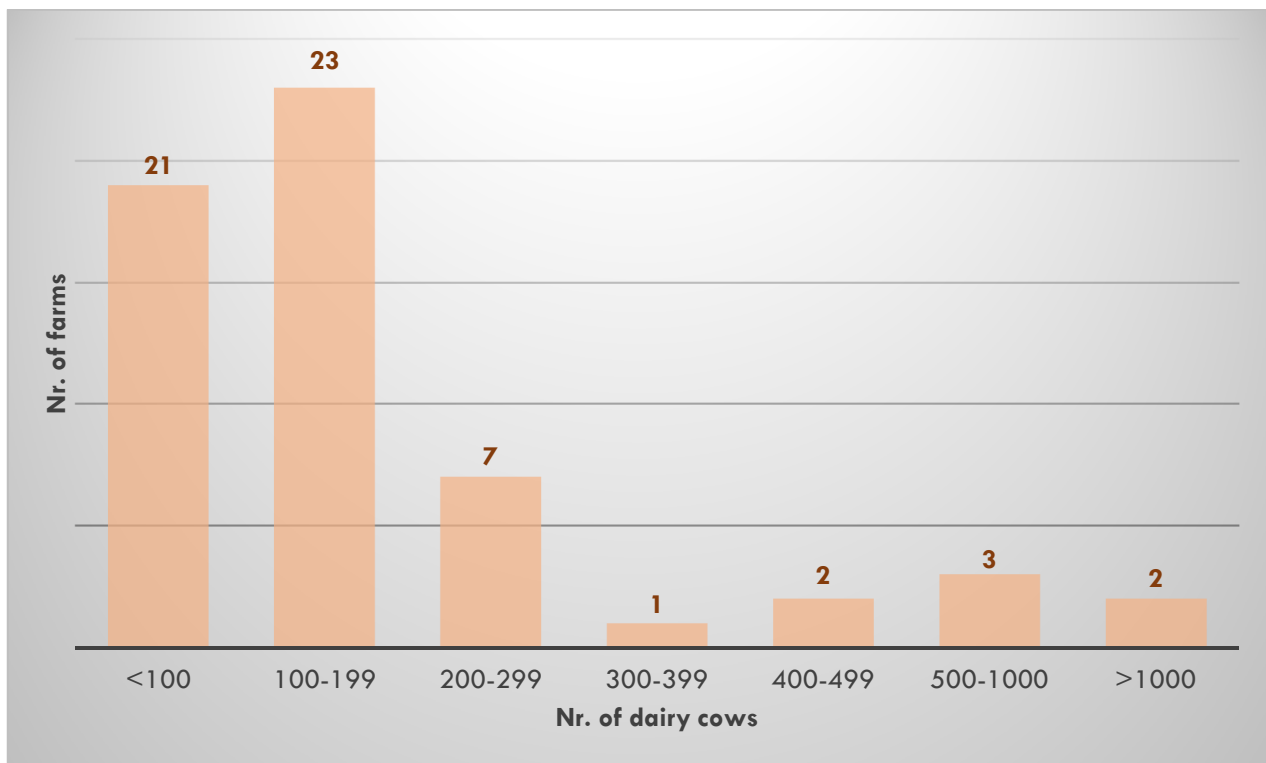Table 1. Minimum and maximum number of heads

Figure 3. Number of dairy cows (lactating and dry) in the study farms

When examining housing systems, in 61% of farms cubicle barns are present. Tie-stall and compost bedded-pack barns are also well represented. One Freewalk housing system was also included in the study.
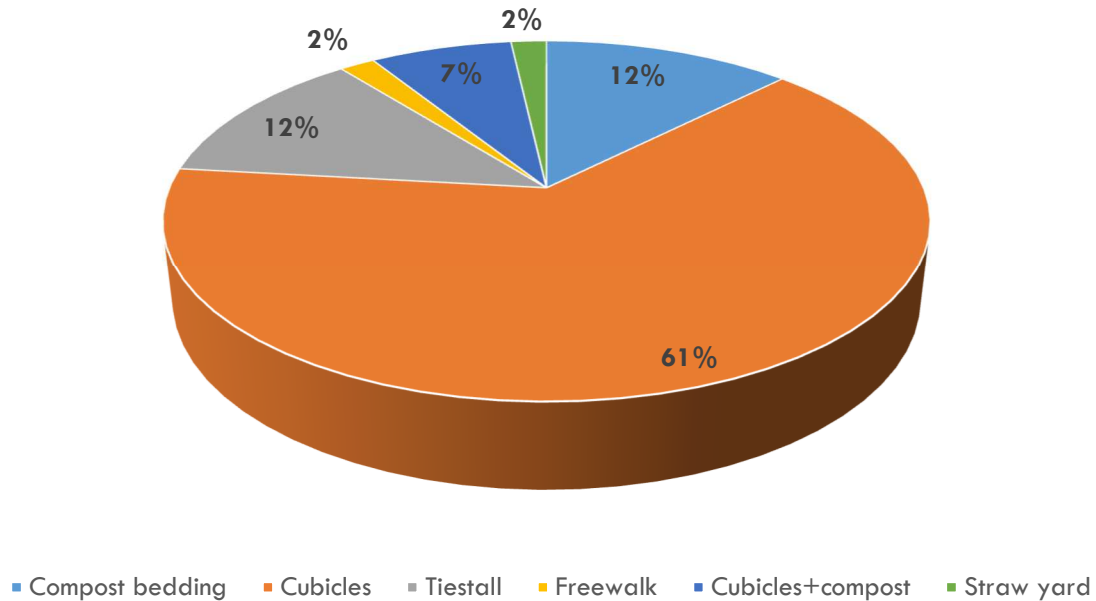
Figure 4. Housing systems for the dairy herd

In reference to bedding materials, 44 farms reported to use only one type of bedding material. In this case, the most frequent choice is represented by straw (21 farms), followed by sawdust (6 farms), mattresses (5 farms), sand (3 farms), woodchips (2 farms), dried-manure (2 farms), straw-lime (2 farms), artificial floor (1 farm), Miscanthus (1 farm) and hay (1 farm). In 15 farms multiple materials are used for bedding, the most common being straw. The most used floor material is concrete. In 41 farms, a unique type of floor is used. The most common is grooved concrete (14 farms), followed by full concrete floor (13 farms), slatted concrete floor (9 farms), rubber floor (3 farms) and low emission floor (2 farms). In the remaining farms, more type of floor are present, the most common being grooved concrete. In one of these farms, also artificial floor is present.

When analysing milking facilities, the most common solution is represented by milking parlour (58%); however, a relevant portion of the sample (30%) is equipped with automatic milking systems. The remaining portion of farms is characterised by a more traditional milking system, which is linked to the specific type of housing system used (i.e. tie-stall).

As to manure types produced at farm level and their storage, the largest part of the farms (69%) generates slurry (27% only slurry; 42% slurry and other types of manure). Solid manure is produced by over one third of the farms (8% only solid manure; 31% solid and other types of manure). In 17% of the study farms urine and faeces are separated, mostly mechanically after removal from the building; only 1 farm separates urine and faeces by permeable artificial floor and 1 implements separation by collecting urine in a central gutter on the alley. Manure from compost bedding is present in 6 farms. Only one farm produces deep litter.

As to liquid manure storage, 84% of farms utilises outside tanks, both above ground and underground, in concrete or metal. Only 1 farm stores liquid manure in a lagoon, while over 15% of cattle buildings are provided with under-floor storages. Solid manure is stocked outside in 34% of study farms, in concrete plates or in above ground walled areas.

Informative sheets

The 60 study farms are individually illustrated through informative sheets. The general traits of each farm are presented in an introductory paragraph, whereas the main data regarding lands, cultivations, herd and housing features and manure storage are schematically presented in a table. For every farm the most prominent traits are reported in the "*Highlights*" box. In addition, farms characterised by original or novel management solutions are provided with an *Innovation box*, with dedicated descriptions and photos. The research teams curated the description of their own pilot farms, as well as the collection of farm data and pictures. The "*Highlights*" box is themed as follows:

Lands management

Animal nutrition

Housing system

Animal genetic and breeding

Manure storage and management

Machineries

Energy

Farmer's goals and management choices

Dairy productions and commercialisation

The Netherlands

NL1DM

De Marke is a research station focusing on low emissions of ammonia and greenhouse gasses, low leaching of nitrate on a dry sandy soil and producing nature. The farm has a digester and citizens can refuel biogas. Grass and maize are in a rotation every 3 years. The herd is 1/3 Holsteins and 2/3 crossbreed of Montbeliard and Swedish Red. The stall has a low emission floor.

HIGHLIGHTS

Landscape	Flat
Soil type	Sand
Farming system	Conventional
Total lands	55 ha
- **Arable lands**	20 ha
	Maize and grassland (rotation every 3 years)
- **Permanent grassland**	15 ha
- **Other land types**	12 ha
	5 ha natural grassland, 7 ha pond
Dairy cow housing	Cubicles
Bedding material	Mattresses with wood dust
Floor in walking alley	Grooved concrete
Dairy herd	115
of which dairy cows	80
Breed	1/3 Holstein Friesian, 2/3 Holstein Friesian crossbreeds with Montbeliard and Swedish Red
Herd production level	10000 kg/cow*year
Milking system	Robot (N=2)
Feeding system	Feeding wagon, concentrates in feeding boxes
Dairy herd grazing	Yes
Manure type	Solid manure and liquid (separated)
Manure storage	Below concrete walking floor, concrete covered silo outside (slurry); open silo outside (dense feces); foly bassin (urine)
Other farming animals	No

Feeding efficiency in relation to ration

Dry-period and fertilization of land

3-yearly rotation grass-maize

NL2K00

This farm has a freewalk housing system with wood chips as bedding material. The heat of the bedding is used for heating the floor in house. He is sifting the big parts of the bedding to reuse. The farm is self supporting in concentrates by growing fodder beets. Total mixed ration is fed by feeding robot. Cows are selected basing on genotype to produce A1 milk. The milk is processed to freewalk cheese (*Weldaad* vrijloopkaas).

Landscape	Flat
Soil type	Sand
Farming system	Conventional
Total lands	67 ha
- Arable lands	7 ha
	Fodder beets
- Permanent grassland	60 ha
- Other land types	-
Dairy cow housing	Compost bedded-pack barn
Bedding material	Woodchips
Floor in walking alley	Low emission concrete floor
Dairy herd	131
of which dairy cows	92
Breed	Holstein Friesian
Herd production level	8000 kg/cow*year
Milking system	Rapid exit parlour (2x10)
Feeding system	Feeding robot
Dairy herd grazing	Yes
Manure type	Slurry (inside), compost (outside)
Manure storage	Below floor (slurry), open outside (compost)
Other farming animals	No

HIGHLIGHTS

Freewalk housing

Compost bedded-pack barn

Self supporting in concentrates

NL3VT

This farm tries to increase lifetime of the cows, soil fertility and be independent from others like input of feed and energy. The cubicles are renovated to give cows more space. Part of land us is a rotation of maize-wheat and grass. They make concentrates of grass, but like to dry it with low energy use by using small wind mill or solar panels.

Landscape	Flat
Soil type	Clay
Farming system	Conventional
Total lands	95 ha
- Arable lands	12 ha
	Wheat, maize
- Permanent grassland	53 ha
- Other land types	30 ha
	18 ha nature grassland, 12 ha temporary grassland
Dairy cow housing	Cubicles
Bedding material	Cut straw
Floor in walking alley	Slatted floor
Dairy herd	179
of which dairy cows	129
Breed	95% Holstein Friesian, 5% Holstein Friesian x FH
Herd production level	9700 kg/cow*year
Milking system	Side by side parlour (2x12)
Feeding system	Feeding wagon, concentrates in milking parlour
Dairy herd grazing	Yes
Manure type	Slurry
Manure storage	Below slatted floor
Other farming animals	No

HIGHLIGHTS

Emphasis on longevity

Sustainable soil use, e.g. rotation maize/wheat/grass

Aims to be self-sufficient in feed and energy

NL4VL

This farm has an innovative freewalk housing floor, It separates the urine and the faeces on an artificial floor. A manure robot, but later a loader, picks up the faeces. It is an organic farmer who is focusing more on soil fertility. Farmer would like to try out water infiltration and new crops like Sorghum.

Landscape	Flat
Soil type	-
Farming system	Organic
Total lands	115 ha
- Arable lands	4 ha
- Permanent grassland	71 ha
- Other land types	40 ha
	Nature grassland
Dairy cow housing	Freewalk
Bedding material	Permeable artificial floor
Floor in walking alley	Artificial floor and concrete low emission floor
Dairy herd	200
of which dairy cows	125
Breed	Holstein Friesian, Brown Swiss
Herd production level	6000 kg/cow*year
Milking system	Robot (N=2)
Feeding system	Total Mixed Ration, concentrates in milking robots
Dairy herd grazing	Yes
Manure type	Urine and faeces
Manure storage	Inside the barn (urine), outside under roof (faeces)
Other farming animals	No

HIGHLIGHTS

Freewalk housing system with permeable artificial floor

Manure robot and loader to remove faeces

Focus on soil fertility

NL5GR

This farm is producing milk to be processed for the ice cream Ben & Jerry. They milk cows in a new welfare friendly housing system with a rubber floor and sand bedding in the cubicles. By focusing on feeding much fresh grass, they try to reduce the losses of protein and use of energy.

Landscape	Flat
Soil type	Sand
Farming system	Conventional
Total lands	120 ha
- Arable lands	23 ha
	Maize
- Permanent grassland	97 ha
- Other land types	-
Dairy cow housing	Cubicles
Bedding material	Sand
Floor in walking alley	Rubber floor (Opticow)
Dairy herd	320
of which dairy cows	230
Breed	Holstein Friesian
Herd production level	9500 kg/cow*year
Milking system	Rotary parlour (36 stands)
Feeding system	Partial Mixed Ration (wagon), concentrates in rotary parlour
Dairy herd grazing	Yes
Manure type	Slurry
Manure storage	Outside silo (slurry), sink hole (urine)
Other farming animals	No

HIGHLIGHTS

- Low emission rubber floor
- Fresh grass
- Sand bedding in cubicles

NL6VR

This farm is combining several innovations. The floor separates faeces and urine. Underneath the floor, the urine is flushed by using waste water from milking robots. The faeces are separated by mechanical separator to make a dry stackable manure product. The liquid parts are stored in a manure bag. Through pipes, the methane is collected from the bag and being burned. The care farm is also helping people.

Landscape	Flat
Soil type	Clay
Farming system	Conventional
Total lands	70 ha
- **Arable lands**	8 ha
- **Permanent grassland**	37 ha
- **Other land types**	25 ha
	Natural grasslands
Dairy cow housing	Cubicles
Bedding material	Natural hay
Floor in walking alley	Low emission closed concrete floor with urine gutter in the middle
Dairy herd	120
of which dairy cows	60
Breed	Holstein Friesian
Herd production level	8500 kg/cow*year
Milking system	Robot
Feeding system	Silage (wagon), concentrate in feeding robots
Dairy herd grazing	Yes
Manure type	Dense faeces and urine (separated), slurry (from youngstock)
Manure storage	Open air (separated dense faeces)
Other farming animals	No

HIGHLIGHTS

Housing system

Separation of faeces and urine

Burning of methane from storage in balloon

NL7KOH

The farmer is very much interested in good soil management. His innovations are focusing on better manure/fertilizing management. Therefore, he invested in a bedded pack barn with composting of wood chips, using MgCl in slurry, dilution of slurry, using liquid fertilizer and invests in analyzing his soil with Kinsey method and discuss it with a soil specialist, and analyses his slurry in USA on special elements.

Landscape	Flat
Soil type	-
Farming system	Conventional
Total lands	64 ha
- **Arable lands**	4 ha
	Maize
- **Permanent grassland**	60 ha
- **Other land types**	-
Dairy cow housing	Compost bedded-pack barn
Bedding material	Wood chips
Floor in walking alley	Slatted floor
Dairy herd	149
of which dairy cows	104
Breed	Holstein Friesian
Herd production level	10500 kg/cow*year
Milking system	Robot (N=2)
Feeding system	Feeding wagon (40% concentrates in wagon, 60% in milking robots)
Dairy herd grazing	No
Manure type	Compost, slurry
Manure storage	Below slatted concrete floor (slurry), outside (compost)
Other farming animals	10 sheep

HIGHLIGHTS

- Bedded-pack barn since november 2013
- Improving soil management
- Focus on innovative manure and fertilizing management

NL8VV

This family farm works on solutions like more grazing, cows are not used to it, and use more grassland/less maize. All the grassland close to farm is in rotation with arable farmer who also uses manure. Cows are milked with milking robots in a modern cubicle stall. Slatted floor is cleaned with manure robot.

Landscape	Flat
Soil type	-
Farming system	Conventional
Total lands	57 ha
- Arable lands	-
- Permanent grassland	57 ha
- Other land types	-
Dairy cow housing	Cubicles (1-4-1)
Bedding material	Dried manure
Floor in walking alley	Slatted floor, manure cleaner robot
Dairy herd	195
of which dairy cows	115
Breed	Holstein Friesian
Herd production level	11500 kg/cow*year
Milking system	Robot
Feeding system	Partial Mixed Ration with feed wagon, 3 types of concentrtates in milking robot
Dairy herd grazing	Yes
Manure type	Slurry
Manure storage	Below slatted floor
Other farming animals	5 hens

HIGHLIGHTS

Manure diluted with water when applied to the field

100% grassland

Manure cleaner robot

Italy

IT1FE

Located in Mantua, in the Po Valley, the farm went recently through massive investments: the main building for dairy cows was completely rebuilt and designed for compost bedding and robot milking. In addition, the farm has two deep litter barns for dry cows and youngstock. Dairy farming is the only breeding activity and milk is entirely conferred to local cheese maker companies for the production of Grana Padano PDO cheese. The farmer is open to innovation: in 2020 he temporarily installed and tested a prototype harrow to automatically stir the compost bedding.

Landscape	Flat
Soil type	Loam
Farming system	Conventional
Total lands	53 ha
- Arable lands	53 ha
	Wheat, maize, lucerne
- Permanent grassland	-
- Other land types	-
Dairy cow housing	Compost bedded-pack
Bedding material	Chopped straw
Floor in walking alley	Grooved concrete
Dairy herd	115
of which dairy cows	65
Breed	Holstein Friesian
Herd production level	12800 kg/cow*year
Milking system	Robots (N=2)
Feeding system	Total Mixed Ration
Dairy herd grazing	No
Manure type	Slurry (unseparated)
Manure storage	Concrete tank above ground
Other farming animals	No

HIGHLIGHTS

Bedded-pack barn

Test of an automatic system for stirring the compost bedding

Dairy herd is increasing

IT2CA

The farm is located in a flat area near Mantua, Norther Italy, and has been managed by the same tenant family for almost 90 years. The dairy cattle barn was recently rebuilt with the aim to increase both animal welfare and productivity. Milk production is the only source of income for this farm. Cows are fed with a pre-prepared ration that is delivered weekly and is completed with maize silage produced in the farm. Milk is conferred to cheese maker companies, for the production of Grana Padano DPO cheese. The excess manure produced by dairy farming is conferred to a near farm equipped with a biogas plant.

Landscape	Flat
Soil type	Loam
Farming system	Conventional
Total lands	65 ha
** - Arable lands**	60 ha
	Maize, wheat
** - Permanent grassland**	5 ha
** - Other land types**	-
Dairy cow housing	Cubicles
Bedding material	Straw and sawdust
Floor in walking alley	Grooved concrete Slatted floor in front of milking robots
Dairy herd	250
** of which dairy cows**	160
Breed	Holstein Friesian
Herd production level	12200 kg/cow*year
Milking system	Robots (N=3)
Feeding system	Total Mixed Ration
Dairy herd grazing	No
Manure type	Slurry (unseparated)
Manure storage	Concrete tanks above ground
Other farming animals	No

HIGHLIGHTS

Conferring slurry to farm with biogas plant

Care to cow welfare

Barn rebuilt in 2018

IT3TO

This family-run farm is located in Verona, Northern Italy. The area, near the Mincio River, is flat and devoted to farming. Milk is the only production of the farm and is sold to processing companies for cheese making. The cheese trade is directed mainly to local catering companies and abroad. In 2018 the dairy cow barn was completely refurbished and designed for compost bedding. Also, the cow-calf and calves pens were rebuilt in order to increase the available surface and, thus, animal welfare. Farmers are thinking about renewing the milking parlour and covering slurry tanks.

Landscape	Flat
Soil type	Clay
Farming system	Conventional
Total lands	51 ha
- Arable lands	36 ha
- Permanent grassland	15 ha
- Other land types	-
Dairy cow housing	Compost bedded-pack
Bedding material	Sawdust
Floor in walking alley	Concrete
Dairy herd	300
of which dairy cows	140
Breed	Holstein Friesian
Herd production level	10500 kg/cow*year
Milking system	Parlour (6+6)
Feeding system	Total Mixed Ration
Dairy herd grazing	Yes
Manure type	Slurry (unseparated)
Manure storage	In ground concrete tanks
Other farming animals	5 Hens

HIGHLIGHTS

Compost-bedded pack

Barn rebuilt in 2018

Considering to cover slurry tanks

IT4AR

The farm is located at the far of Mantua Province, in a flat area within the Po valley. The farmers are open to innovations and new technologies. They recently built a new barn for dairy cows, a retrofitting barn for heifers and new housings for calves. They also invested in a slurry separator. The dairy production is flanked by pig breeding and fattening (over 2000 animals). The farmer is also considering to install a biogas plant and to adopt a slurry injection system.

|	
Farming system	Conventional
Soil type	Loam
Total lands	160 ha
- Arable lands	140 ha
- Permanent grassland	20 ha
- Other land types	-
Dairy cow housing	Cubicles (cows in lactation) Straw yard (heifers, dry cows)
Bedding material	Pelleted straw and lime Whole straw
Floor in walking alley	Grooved concrete Slatted floor (in front of the robots)
Dairy herd	400
of which dairy cows	200
Breed	Holstein Friesian
Herd production level	13000 kg/cow*year
Milking system	Robots
Feeding system	Total Mixed Ration with feeding robot
Dairy herd grazing	No
Manure type	Slurry and solid manure (separated), manure from straw yards
Manure storage	Above ground concrete tank
Other farming animals	2250 pigs

HIGHLIGHTS

Feeding robot

Water mattresses

Feaces and urine separation

INNOVATION BOX

Feeding robot
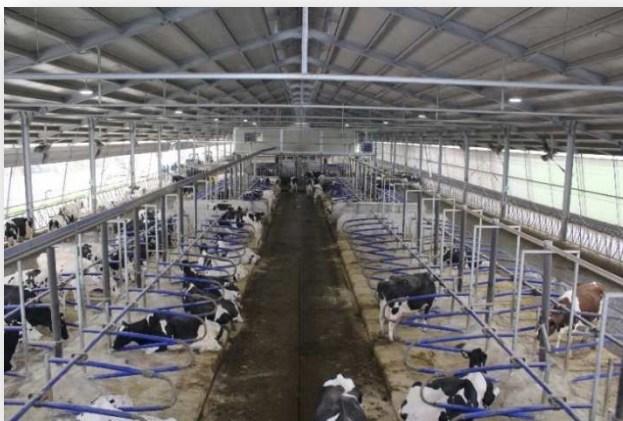
IT5GRO

The farm is located in Borgo San Lorenzo, Tuscany, in a hilly area at the border of the Northern Apennine chain. Dairy production, agritourism with restaurant and cheese making are the main sources of income of this farm. Milk is mainly conferred to a local company reselling both fresh milk and a wide selection of dairy products. This is also an educational farm. In 2013, the owners set up a small dairy factory and started their own production of cheeses and yogurt. Recently, a photovoltaic system was installed to power the entire farm, including the milking robots and the dairy factory.

Landscape	Hilly
Soil type	Sand
Farming system	Conventional
Total lands	53 ha
- Arable lands	51 ha
	Maize, cereals, lucerne
- Permanent grassland	2 ha
- Other land types	-
Dairy cow housing	Cubicles (cows in lactation) Straw yard (heifers, dry cows)
Bedding material	Straw
Floor in walking alley	Concrete
Dairy herd	155
of which dairy cows	80
Breed	Holstein Friesian, Brown swisse, Jersey, Red and white
Herd production level	9500 kg/cow*year
Milking system	Robot (N=1)
Feeding system	Total Mixed Ration
Dairy herd grazing	Yes
Manure type	Solid manure and urine (separated)
Manure storage	Above ground tank (uncovered)
Other farming animals	No

HIGHLIGHTS

Feed-pushing robot

Barn and dairy factory 100% powered by photovoltaic system

Smart LED illumination system in the barn

IT6AG

The barn is part of a big farming cooperative that includes also farm IT7SE. The farm is located in Barberino di Mugello, a hilly area in Tuscany, Central Italy. Organic dairy farming is the only breeding activity of this farm and milk is sold to a local processing company selling both milk and dairy products. Recently the dairy barn was doubled in size, in order to increase herd size and, thus, the overall milk production. The farm manager is considering to install a biogas plant and to increase the amount of grass fed in the ration.

Landscape	Hilly
Soil type	Predominantly clay
Farming system	Organic
Total lands	460 ha
- Arable lands	
- Permanent grassland	
- Other land types	
Dairy cow housing	Cubicles (cows) Bedded pack (heifers)
Bedding material	Straw
Floor in walking alley	Concrete
Dairy herd	455
of which dairy cows	192
Breed	Holstein Friesian
Herd production level	9300 kg/cow*year
Milking system	Parlour (12+12)
Feeding system	Total Mixed Ratio
Dairy herd grazing	Yes
Manure type	Solid manure and urine (separated)
Manure storage	Tanks above ground, not covered
Other farming animals	No

HIGHLIGHTS

Mechanical separation of urine and faeces

Planning to install a biogas plant

Planning to increase grasslands and the proportion of grass feed in the ration

IT7SE

This barn is part a big farming cooperative and is located in Borgo San Lorenzo, Central Italy, in a territory dominated by hills. This farm, in late 2020, was incorporated by the cooperative that owned farm IT6AG. Since then, the management is unique. The farm is devoted to organic milk production and milk is sold to a local processing company selling both milk and dairy products.

Landscape	Hilly
Soil type	Clay
Farming system	Organic
Total lands	300 ha
- Arable lands	
- Permanent grassland	
- Other land types	
Dairy cow housing	Cubicles (cows in lactation) Straw yard (heifers)
Bedding material	Straw
Floor in walking alley	Concrete
Dairy herd	450
of which dairy cows	181
Breed	Holstein Friesian
Herd production level	8840 kg/cow*year
Milking system	Parlour (9+9)
Feeding system	Total Mixed Ration
Dairy herd grazing	Yes
Manure type	Solid manure and urine (separated)
Manure storage	Above ground tank
Other farming animals	No

HIGHLIGHTS

Mechanical separation of urine and faeces

Planning to install a biogas plant

Planning to increase grasslands and the proportion of grass feed in the ration

IT8GRI

The farm is located in Tuscany, Borgo San Lorenzo, in an area at the border of the Northern Apennine chain. The landscape is hilly and agriculture activities are adapted to rugged terrains. Milk production is the main activity of this farm, however the family also owns little parcels of olive trees and chestnut groves, allowing the production of small quantities of olive oil and chestnuts. Milk is entirely conferred to a local milk company selling milk and other dairy products.

Landscape	Hilly
Soil type	Clay, sand
Farming system	Conventional
Total lands	55 ha
- Arable lands	35 ha
- Permanent grassland	15 ha
- Other land types	5 ha
	Olive groves, chestnut
Dairy cow housing	Cubicles
Bedding material	Straw
Floor in walking alley	Concrete
Dairy herd	187
of which dairy cows	106
Breed	Holstein Friesian
Herd production level	8000 kg/cow*year
Milking system	Parlour
Feeding system	Total Mixed Ration
Dairy herd grazing	Yes
Manure type	Solid manure and urine (separated)
Manure storage	Above ground concrete tanks (slurry and separated liquid) Above ground metal tank (solid)
Other farming animals	No

HIGHLIGHTS

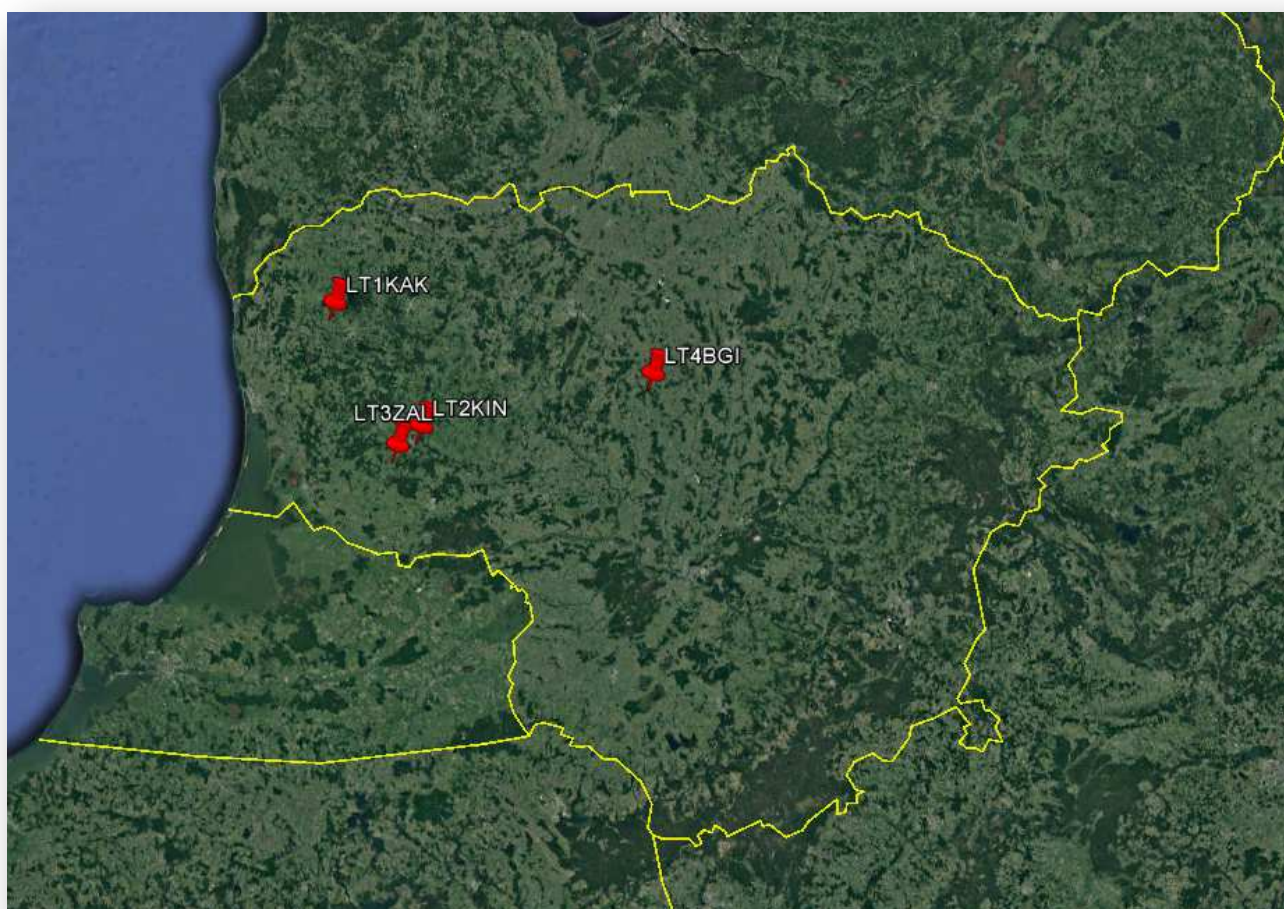Mechanical separation of urine and faeces

Covering immediately manure after spreding

Calves for beef production

Lithuania

LT1KAK

The farmer has enough knowledge about sustainable dairy farming, is interested in technological development and tries to introduce available innovations on his farm. Currently, there are not many of them but he is planning to buy smart equipment for soil fertilization in the near future. With the aim to improve the housing conditions and welfare of animals, the farmer has built a new barn for dairy cows and moved the cows in last year. To solve the manure storage problems, the farmer adopted manure separation technology.

Landscape	Slightly hilly
Soil type	Loam
Farming system	Conventional
Total lands	300 ha
- **Arable lands**	130 ha
- **Permanent grassland**	150 ha
- **Other land types**	20 ha
Dairy cow housing	Cubicles
Bedding material	Mattresses
Floor in walking alley	Concrete
Dairy herd	255
of which dairy cows	125
Breed	Holstein Friesian, Holstein Friesian x Lithuanian Black-and-White
Herd production level	9800 kg/cow*year
Milking system	Parlour (6+6)
Feeding system	Total Mixed Ration (wagon)
Dairy herd grazing	No
Manure type	Liquid
Manure storage	Above ground metal tank
Other farming animals	No

HIGHLIGHTS

Use of probiotics in the barn to reduce mitrogen losses

Mattresses (bedding)

Separation of faeces and urine

INNOVATION BOX

The farmer uses probiotics to reduce ammonia emissions and unpleasant odors. Probiotics are sprayed directly in cattle barns, mainly in areas where the animals stay and on surfaces containing most feaces.

LT2KIN

This farmer is very innovative in doing. In 2003, he was one of the first in Lithuania who purchase the equipment for manure solid fraction isolation. Currently, he has milking and feeding robots on his farm. Until June 2020, his farm was maintained on an organic farming basis, but now, due to strict organic farm requirements, he withdrew to conventional farming.

Landscape	Slightly hilly
Soil type	Loam, peat
Farming system	Conventional
Total lands	270 ha
- Arable lands	156 ha
- Permanent grassland	104 ha
- Other land types	10 ha
Dairy cow housing	Cubicles
Bedding material	Rubber mattresses
Floor in walking alley	Concrete
Dairy herd	280
of which dairy cows	135
Breed	Holstein Friesian, Holstein Fresian x Lithuanian Black-and-White
Herd production level	7800 kg/cow*year
Milking system	Robot
Feeding system	Feeding robot
Dairy herd grazing	No
Manure type	Solid manure and urine (separated)
Manure storage	Above ground metal tank
Other farming animals	No

HIGHLIGHTS

- Rubber mattresses (bedding)
- Separation of faeces and urine
- Milking and feeding robots

LT3ZAL

The farm is small, and the farmer complained that it is difficult to run a farm and make plans for its modernization when the milk purchase prices are so low. It seemed that the farmer has little knowledge about greenhouse gas and ammonia emissions, but still, he is participating in even several projects. He is satisfied with his participation and the results but, after project completion date, he does not contemplate about using innovative products due to financial reasons.

Landscape	Slightly hilly
Soil type	Loam
Farming system	Conventional
Total lands	86 ha
- Arable lands	26 ha
- Permanent grassland	50 ha
- Other land types	10 ha
Dairy cow housing	Tie-stalls
Bedding material	Mattresses
Floor in walking alley	-
Dairy herd	75
of which dairy cows	45
Breed	Holstein Friesian, Holstein Fresian x Lithuanian Black-and-White
Herd production level	7533 kg/cow*year
Milking system	Milking pipeline
Feeding system	Total Mixed Ration (wagon)
Dairy herd grazing	Yes
Manure type	Liquid
Manure storage	Above ground concrete tank
Other farming animals	No

HIGHLIGHTS

Mattresses (bedding)

Tie-stall

Farmer participates to several research projects
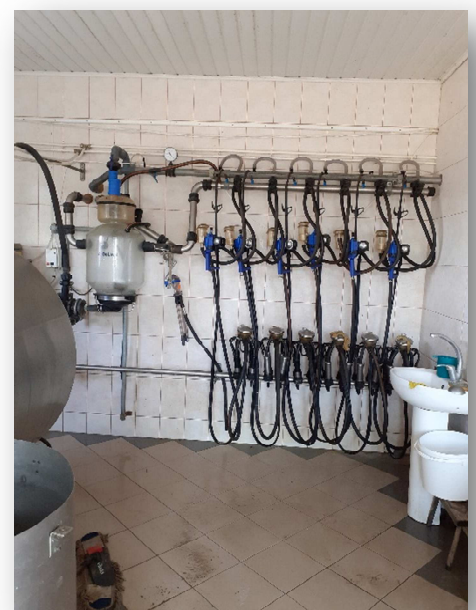
LT4BGI

The farm manager started to run the farm three years ago. The farm itself was established in 1952, and currently it is an experimental farm of the Animal Science Institute which serves as a basis for scientific research. Some time ago it was quite a big farm with modern technologies of that time. Unfortunately, currently the farm cannot apply for a modernization support under the measures of Rural development programme because of its status and receive even the partial support that normally are given to all other farms. Therefore, the farm operates on the poorly upgraded production facilities. Tiestall housing system is applied for dairy cows. Despite the old facilities, the farm manager is doing his best to develop a strong and environmentally friendly farm. Participation in INTERREG project allowed to acquire a modern slurry acidification equipment to reduce ammonia emission and unpleasant odours.

Landscape	Flat, slightly hilly
Soil type	Sand, pit, clay
Farming system	Conventional
Total lands	694 ha
- Arable lands	390 ha
- Permanent grassland	295 ha
- Other land types	9 ha
Dairy cow housing	Tie-stalls
Bedding material	Rubber mattresses, straw
Floor in walking alley	-
Dairy herd	557
of which dairy cows	212
Breed	Holstein Friesian crossbreeds, Lithuanian local (rare) breeds
Herd production level	7906 kg/cow*year (HF crossbreeds), 5263 kg/cow*year (Lithuanian local breeds)
Milking system	Milking pipeline
Feeding system	Total Mixed Ration (wagon)
Dairy herd grazing	Yes
Manure type	Slurry, semi-liquid
Manure storage	Lagoon, concrete manure storage area
Other farming animals	103 beef cattle

HIGHLIGHTS

Slurry acidification in the field

Tie-stall, rubber mattresses

Participant of Conservation programm of local rare breeds

INNOVATION BOX

Slurry acidification in the field. Acid can be applied in-line during field application. The approach decreasing pH of slurry to reduce ammonia and GHG emissions, increases a value of slurry fertilization and availability to plants

Germany
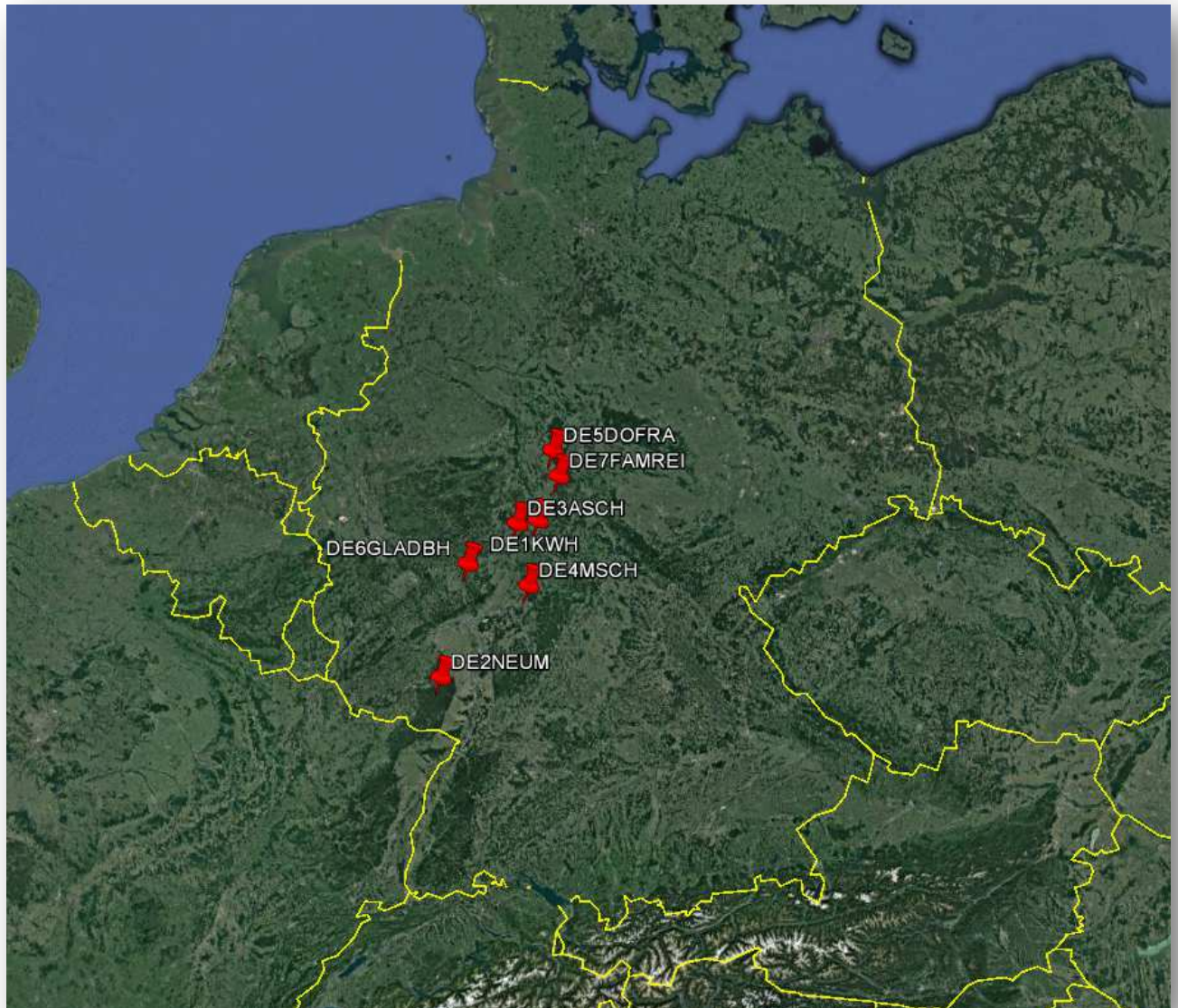
DE1KWH

The farm is located near Bad Zwesten, a small town in a hilly area in the north of Hesse. Central Germany. It is an organic producing farm. Their main business is milk production. They sell the milk to a local company and produce their own cheese. They have also some pigs, breed "Bunte Bentheimer" and some laying hens. All these animal products are organic and selling in a local shop at the farm.

Landscape	Hilly
Soil type	Loam
Farming system	Organic
Total lands	90 ha
- Arable lands	60 ha
- Permanent grassland	30 ha
- Other land types	-
Dairy cow housing	Cubicles
Bedding material	Straw-lime, straw
Floor in walking alley	Slatted
Dairy herd	160
of which dairy cows	90
Breed	Holstein Friesian, Angler Rotvieh
Herd production level	8624 kg/cow*year
Milking system	Parlour
Feeding system	PMR, fresh grass (summer), out of parlour feeder
Dairy herd grazing	Yes
Manure type	Slurry
Manure storage	In-ground concrete tank
Other farming animals	10 Pigs, 90 hens

HIGHLIGHTS

Summer ration only grass

Organic production

Producing own cheese

DE2NEUM

This farm is located near Kaiserslautern, a big city in Rhineland Palatinate. It is a wine region in West Germany. The farm is an educational and experimental farm. Educational for farmer and also for school children and teacher. They have their own shop, where they sell a.o. meat from their suckler cow herd and lambskin from their herd of sheep. Innovative is, that they have a cow shower in the dairy cow barn and rubber floor in the walking area from the cows. The waiting area in front of the milking parlour has a small gradient, that's more comfortable for the cows to walk to the milking parlour. They have also weighing troughs for the feed and a feeding robot. Recently, they installed the Smartbow-System from zoetis.

Landscape	Hilly
Soil type	Clay
Farming system	Conventional
Total lands	266,41 ha
- **Arable lands**	111,8 ha
- **Permanent grassland**	154,6 ha
- **Other land types**	-
Dairy cow housing	Cubicles
Bedding material	Straw-lime, straw
Floor in walking alley	Rubber
Dairy herd	313
of which dairy cows	144
Breed	Holstein Friesian
Herd production level	13943 kg/cow*year
Milking system	Herringbone parlour (2x12)
Feeding system	Self propelled TMR mixer
Dairy herd grazing	No
Manure type	Slurry
Manure storage	Above ground concrete tank
Other farming animals	30 suckler cows, 80 sheep, 594 pigs

HIGHLIGHTS

Cow shower

Rubber floor (walking alley)

Educational farm
Own shop

DE3ASCH

The farm is located near Giessen, in the middle of Hesse. Central Germany. Dairy production and biogas production are the main sources of income of this farm. It is still growing. At the moment they have ca. 400 lactating cows. 100 of these cows are living in a composted bedded pack barn.

Landscape	Hilly
Soil type	Sand, sandy loam
Farming system	Conventional
Total lands	210 ha
- Arable lands	70 ha
- Permanent grassland	140 ha
- Other land types	-
Dairy cow housing	Compost bedded-pack
Bedding material	Rough sawdust, grain husks, straw-lime
Floor in walking alley	Grooved concrete
Dairy herd	860
of which dairy cows	450
Breed	Holstein Friesian
Herd production level	12045 kg/cow*year
Milking system	Parlour
Feeding system	Total Mixed Ration
Dairy herd grazing	No
Manure type	Composted manure, slurry
Manure storage	No storage because of biogas, but above ground concrete tank (outside storage for seperated liquid manure)
Other farming animals	No

HIGHLIGHTS

- Compost bedded pack
- Biogas
- Dairy herd is growing
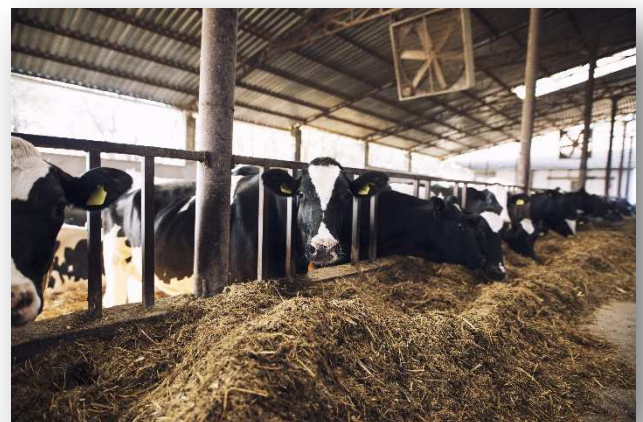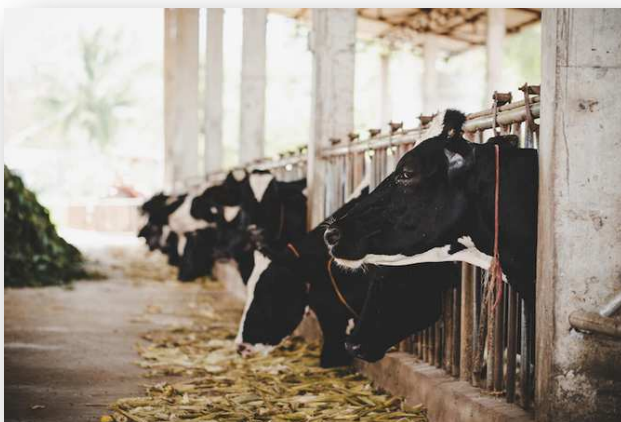
DE4MSCH

This farm is the biggest farm in Hesse. Located in south-east Hesse, 40 minutes to Frankfurt am Main by car. Central Germany. They have almost 700 lactation cows and a biogas system, which produces 850 kW/h electricity and 850 kW/h thermal power. Since 2018 is there a compost bedded pack barn for ca. 400 cows.

Landscape	Hilly
Soil type	Loam, turf
Farming system	Conventional
Total lands	680 ha
- Arable lands	460 ha
- Permanent grassland	220 ha
- Other land types	-
Dairy cow housing	Compost bedded-pack
Bedding material	Spelt husks, wood chips, straw-lime
Floor in walking alley	Grooved concrete
Dairy herd	1700
of which dairy cows	800
Breed	Holstein Friesian
Herd production level	11279 kg/cow*year
Milking system	Rotary parlour
Feeding system	Total Mixed Ration
Dairy herd grazing	No
Manure type	Composted manure, slurry
Manure storage	Above ground concrete tank (outside storage for slurry and seperated liquid manure)
Other farming animals	No

HIGHLIGHTS

Compost-bedded pack barn since 2018

Biogas

Largest herd in the region

DE5DOFRA

The farm is located near Kassel, a bigger city in the north of Hesse. Central Germany. It is an experimental farm from the university Kassel. Central Germany. They are organic producer and have the breed "German black pied" as their dairy herd. This breed is an old breeding type. It is smaller, has a lower milk yield, is more frugal and robust. Also, it has better fattening performance. Is considered a dual-purpose cattle. The cows don't get any concentrates, the milk production based only on grass, hay, grass silage, straw, minerals and salt. This farm has a huge farm shop, where you can buy organic and regional products only. They have 1 ha for Vegetable self-harvesting and many different arable crops cultivated.

|	
Landscape	Hilly
Soil type	Clay
Farming system	Organic
Total lands	334 ha
- **Arable lands**	207 ha
- **Permanent grassland**	39 ha
- **Other land types**	88 ha
Dairy cow housing	Deep straw, cubicles
Bedding material	Straw, straw-lime
Floor in walking alley	Grooved concrete
Dairy herd	170
of which dairy cows	90
Breed	German Black Pied
Herd production level	6862 kg/cow*year
Milking system	Parlour
Feeding system	Grass silage
Dairy herd grazing	Yes
Manure type	Deep litter
Manure storage	Above ground concrete tank
Other farming animals	10 pigs, 670 hens

HIGHLIGHTS

 No concentrates

 Deep straw

 Organic farming
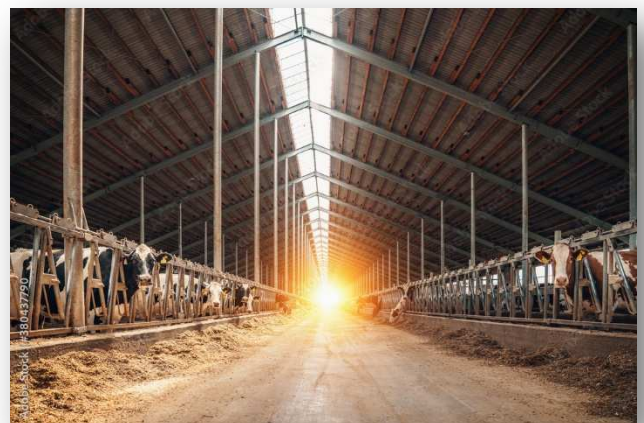
DE6GLADBH

This is the organic farm from Justus-Liebig-University, Giessen. It is located in the west of Hesse, near a small town called Limburg an der Lahn, Central Germany. Its task is the production of seeds of important cereals, seed potato production and animal feed in a way that is as environmentally and resource-friendly as possible. This requires management that is more strongly based on the internal nutrient cycles on the farm and uses self-regulating forces on the farm as far as possible. This includes the preservation and creation of a richly structured cultural landscape with its ecologically valuable animal and plant communities. Their breeding goal is the longevity of the animals. As well as own calf and heifer rearing is pursued. The female calves are reared for breeding and fattening and the males are sold to the mast. In addition, 100 laying hens live on the domain. Among other things, the scientists deal with issues of crop rotation and soil cultivation, the availability of phosphorus in the soil, the effect of biogas manure on soil, plant and environment and the health and performance of dairy cows in organic farming. The new dairy cow barn has a grass roof and they have an own farm shop, where you can buy a.o. eggs from their hens and potatoes from their fields and milk and meat from the cows.

Landscape	Hilly
Soil type	Loam
Farming system	Organic
Total lands	170 ha
- Arable lands	100 ha
- Permanent grassland	70 ha
- Other land types	-
Dairy cow housing	Cubicles
Bedding material	Straw-lime
Floor in walking alley	Grooved concrete
Dairy herd	180
of which dairy cows	90
Breed	Holstein Friesian
Herd production level	9527 kg/cow*year
Milking system	Parlour
Feeding system	Partial Mixed Ratio Summer: fresh grass, out of parlour feeder
Dairy herd grazing	Yes
Manure type	Slurry
Manure storage	Above ground concrete tank
Other farming animals	100 hens

HIGHLIGHTS

Focus on longevity

Organic farming

Fresh grass in summer

DE7FAMREI

This farm is located in the north of Hesse, next to Kassel, a bigger city. Central Germany. It is an organic farm. They have a new composted bedded pack barn. Built in 2018 for 100 dairy cows. The barn offers a high level of cow comfort, which has significantly improved cow health. The farmer is well educated in lameness cows. He has been taking part in studies for over 15 years. The claw disorders could be significantly decimated by the composting area.

Landscape	Hilly
Soil type	Loam
Farming system	Organic
Total lands	130 ha
- Arable lands	75 ha
- Permanent grassland	55 ha
- Other land types	-
Dairy cow housing	Compost bedded-pack
Bedding material	Spelt husks, wood chips, straw
Floor in walking alley	Grooved concrete
Dairy herd	190
of which dairy cows	100
Breed	Holstein Friesian
Herd production level	8257 kg/cow*year
Milking system	Parlour
Feeding system	PMR, out of parlour feeder
Dairy herd grazing	Yes
Manure type	Composted manure
Manure storage	No
Other farming animals	No

HIGHLIGHTS

Compost-bedded pack barn

Organic farming

Focus on cow's health

Latvia
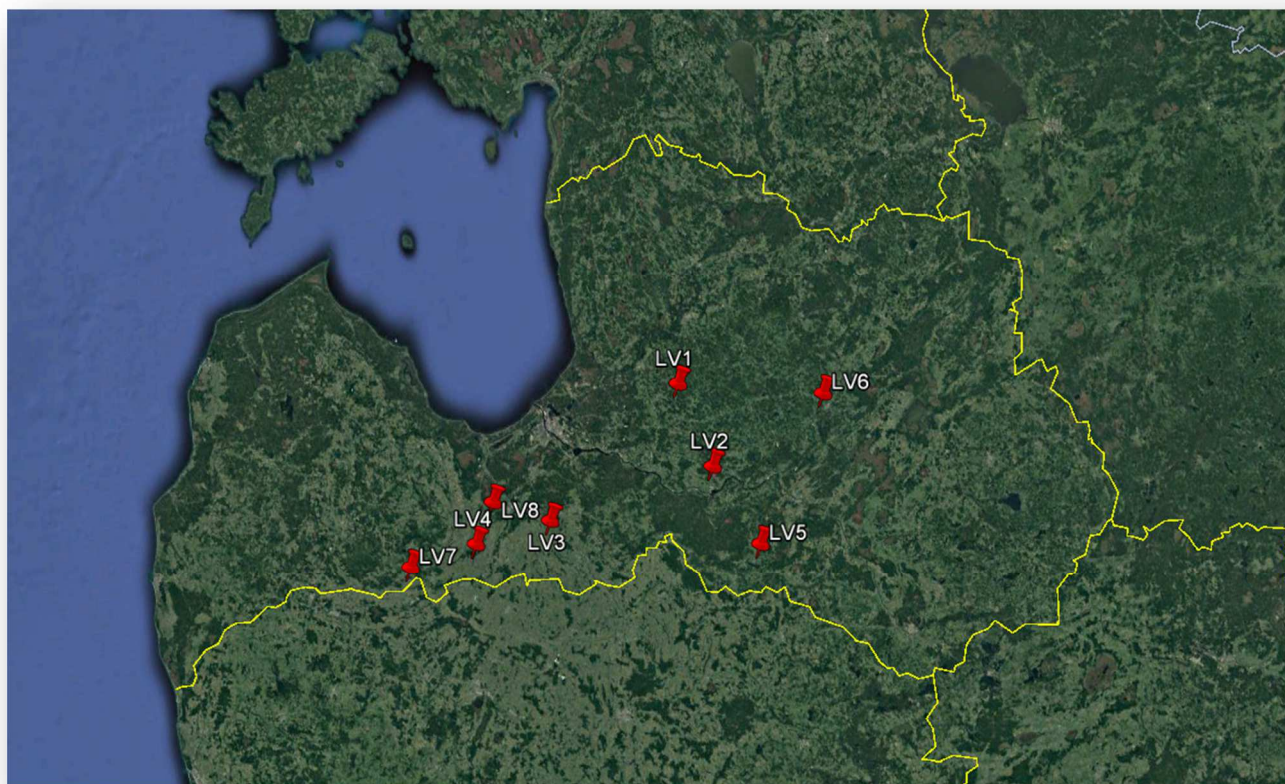
LV1

The farm is located in the central-northern part of Latvia ran by a family of two generations. The farm is exclusively engaged in dairy farming, providing grazing 24 hours a day during the summer time. This farmer is very enthusiastic in learning new skills, for example, he gladly take part in various experiments such as trying out new products from whey – lactobionic acid in dairy cow ration.

Landscape	Flat
Soil type	Loam, sand
Farming system	Conventional
Total lands	120,53 ha
- Arable lands	80,42 ha
- Permanent grassland	35,51 ha
- Other land types	4,6 ha
Dairy cow housing	Tie-stalls
Bedding material	Straw
Floor in walking alley	Concrete
Dairy herd	77
of which dairy cows	36
Breed	60% Holstein Red and White, 40% Holstein Black and White
Herd production level	100076 kg/cow*year
Milking system	Tie-stall (3 milking clusters)
Feeding system	Total Mixed Ration (winter), granzing and concentrates
Dairy herd grazing	Yes
Manure type	Solid manure
Manure storage	Concrete field outside (solid manure), in ground concrete tank (slurry)
Other farming animals	No

HIGHLIGHTS

Testing new whey products and lactobionic acid in cow ration

Tie-stall

Grazing 24h/day in summer

INNOVATION BOX

Farmer takes part in the study of new products from whey - lactobionic acid in dairy cow ration.

LV2

This farm is managed by family in a very democratic manner – all decisions are taken jointly. The farm is situated in Vidzeme, which is characterized by impressive natural objects such as Latvia's longest river Gauja and the highest mountain Gaizins. Farmer is planning farm renovation and new barn building for dairy cows. The farm also breeds beef cattle, for which new and modern housing has been built. Family wants to try something new for them, they want to use bacteria additive for solid manure storage place.

Landscape	Flat
Soil type	Loam
Farming system	Conventional
Total lands	374 ha
- Arable lands	224 ha
- Permanent grassland	144 ha
- Other land types	6 ha
Dairy cow housing	Tie-stalls
Bedding material	Straw, wood chips
Floor in walking alley	Concrete
Dairy herd	187
of which dairy cows	120
Breed	60% Holstein Black and White, 40% crossbreeds
Herd production level	8400 kg/cow*year
Milking system	Tie-stall (8 milking clusters)
Feeding system	Total Mixed Ration
Dairy herd grazing	Yes
Manure type	Solid manure
Manure storage	Concrete field outside (solid manure), in ground concrete tank (slurry)
Other farming animals	144 Beef

HIGHLIGHTS

- Tie-stall
- Planning to use bacterial additives in solid manure storage
- Thinking about renovations and building a new barn for dairy cows
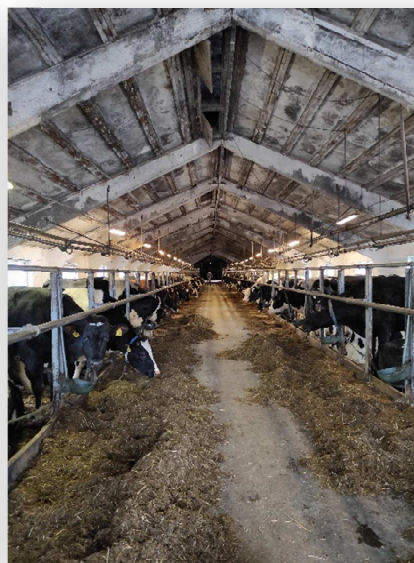
LV3

This farm is situated in the central region of Latvia, in Zemgale. Two years ago a new generation took over the management of the farm. Already the third generation who run this farm has a higher education in agronomy. The farm owns and rents land not only for livestock but also for growing grain and rape for export. New farmers are ready and interested in innovations and they are opened for experiments in animal husbandry.

Landscape	Flat
Soil type	Clay
Farming system	Conventional
Total lands	414 ha
- Arable lands	385 ha
- Permanent grassland	7 ha
- Other land types	22 ha
Dairy cow housing	Tie-stalls
Bedding material	Straw
Floor in walking alley	Concrete
Dairy herd	245
of which dairy cows	132
Breed	51% Holstein Red and White, 24% Latvian Brown, 18% Holstein Black and White, 5% milk crossbreeds, 2% Danish
Herd production level	5625 kg/cow*year
Milking system	Tie-stall (6 milking clusters)
Feeding system	Total Mixed Ration
Dairy herd grazing	Yes
Manure type	Solid manure
Manure storage	Concrete field outside (solid manure), in ground concrete tank (slurry)
Other farming animals	No

HIGHLIGHTS

New generation took over farm management, open to experiments and innovation

Tie-stall

Export of grain and rape

LV4

The farmer runs a farm with the help of the whole family, he works with the idea of leaving the farm to the younger generation. This farm is located in the northern part of Vidzeme. This is a multidisciplinary farm, in addition to animal husbandry, farmer practices grain growing and agricultural machinery rental. The farmer manages impressive land areas. Most of the cows feed is produced on the farm themselves by growing grains and legumes for roughage.

Landscape	Flat, forestry
Soil type	Loam, sand
Farming system	Conventional
Total lands	770 ha
- Arable lands	630 ha
- Permanent grassland	95 ha
- Other land types	45 ha
Dairy cow housing	Tie-stalls
Bedding material	Straw
Floor in walking alley	Concrete
Dairy herd	98
of which dairy cows	65
Breed	40% Holstein Red and White, 40% Holstein Black and White, 12% Latvian brown, 8% other milk red crossbreeds
Herd production level	8200 kg/cow*year
Milking system	Tie-stall (3 milking clusters)
Feeding system	Total Mixed Ration
Dairy herd grazing	Yes
Manure type	Solid manure
Manure storage	Concrete field outside (solid manure), in ground concrete tank (slurry)
Other farming animals	No

HIGHLIGHTS

Self-produced grains and legumes in dairy cow ration

Tie-stall

Multidisciplinary farm

LV5

The farm is located in Selija's region, in the very southern part of Latvia. This is a family farm in which the new generation starts to take the lead. New farmers have put a lot of work into it – they have built a new barn that they run themselves. The milking system on the farm is fully automated.

Landscape	Flat
Soil type	Loam
Farming system	Conventional
Total lands	281 ha
- Arable lands	249 ha
- Permanent grassland	4 ha
- Other land types	28 ha
Dairy cow housing	Cubicles
Bedding material	Straw
Floor in walking alley	Grooved concrete
Dairy herd	120
of which dairy cows	96
Breed	Holstein Black and White
Herd production level	6700 kg/cow*year
Milking system	Robot (N=2)
Feeding system	Total Mixed Ration, concentrate robot
Dairy herd grazing	No
Manure type	Slurry, solid manure (heifers)
Manure storage	Uncovered outdoor pit
Other farming animals	No

HIGHLIGHTS

New barn for dairy cows in 2017


Farmer open to innovations

Liquid manure scraping

LV6

This farm is situated in northeast Latvia, in the nation's heartland: in largest and most ethnically Latvian region – Vidzeme. Two brothers have taken care of the farm, one of them has taken full responsibility for livestock farming. He has studied in Denmark, is very progressive and directed to seeking a balance between human activity and nature. The farmer really cares for environment!

Landscape	Flat, hilly
Soil type	Clay
Farming system	Conventional
Total lands	178 ha
- Arable lands	115 ha
- Permanent grassland	40 ha
- Other land types	23 ha
Dairy cow housing	Cubicles, compost-bedded pack
Bedding material	Straw, lime
Floor in walking alley	Grooved concrete
Dairy herd	115
of which dairy cows	65
Breed	50% Holstein Black and White, 40% Holstein Red and White, 10% Latvian Brown
Herd production level	9000 kg/cow*year
Milking system	Parlour (2x5)
Feeding system	Total Mixed Ration
Dairy herd grazing	No
Manure type	Slurry, solid manure (heifers)
Manure storage	Uncovered outdoor pit
Other farming animals	No

HIGHLIGHTS

Extensive farming

Care for the environment

Liquid manure scraping
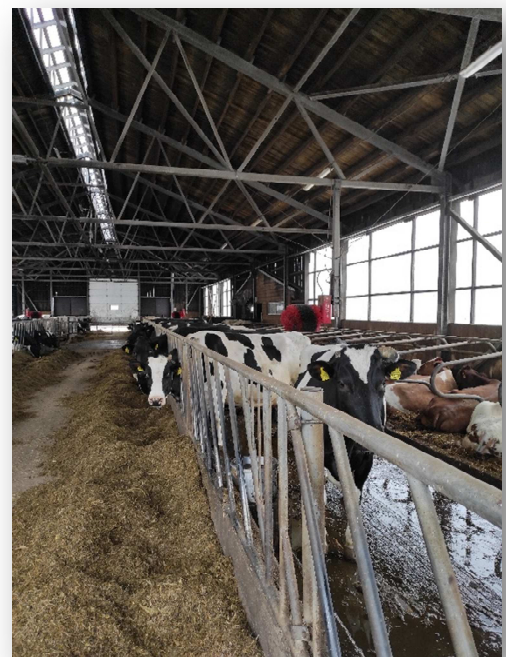
LV7

This is a family farm managed by father and son located in Zemgale. This region is one of the most fertile grain fields in Northern Europe. They support exact farming, the milking system on the farm is fully automated and they are using feeding robot. The farm is one of the first in Latvia which started to make silage from corn cobs. Farm's members are opened for innovation and are ready to try manure acidification.

Landscape	Flat
Soil type	Mineral soils, medium/moderately dry
Farming system	Conventional
Total lands	152 ha
- Arable lands	110 ha
- Permanent grassland	30 ha
- Other land types	12 ha
Dairy cow housing	Cubicles, compost-bedded pack
Bedding material	Straw
Floor in walking alley	Grooved concrete
Dairy herd	189
of which dairy cows	127
Breed	90% Holstein Black and White, 10% crossbreed Holstein Red and White, Latvian Brown, Danish red
Herd production level	10845 kg/cow*year
Milking system	Robot (N=2)
Feeding system	Feeding robot, concentrate in AMS
Dairy herd grazing	No
Manure type	Slurry, solid manure (heifers)
Manure storage	Uncovered outdoor pit
Other farming animals	No

HIGHLIGHTS

- Ready to try manure acidification
- Open to innovations
- Liquid manure scraping

LV8

The farmer runs his farm in the south-center of the country, in Zemgale's region. The largest part of Zemgale is flat with extensive grain fields. This is a family farm where the son recently took over management for livestock farming. In 2019 there is a new barn built for dairy cows, milking and feeding systems are fully robotized. The farm uses microbial additives for slurry. Farmer is always opened for innovations and is excited to participate in experiments and new studies.

Landscape	Flat
Soil type	Loam
Farming system	Conventional
Total lands	492 ha
- Arable lands	466 ha
- Permanent grassland	9 ha
- Other land types	17 ha
Dairy cow housing	Cubicles
Bedding material	Rubber mattresses
Floor in walking alley	Grooved concrete
Dairy herd	230
of which dairy cows	150
Breed	80% Holstein Black and White, 10% Danish Red, 10% milk crossbreeds
Herd production level	8900 kg/cow*year
Milking system	Robot (N=3)
Feeding system	Feeding robot, concentrate in AMS
Dairy herd grazing	No
Manure type	Slurry, solid manure (heifers)
Manure storage	Above ground metal tank, above ground concrete tank, solid manure composted on concrete field outside the barn
Other farming animals	No

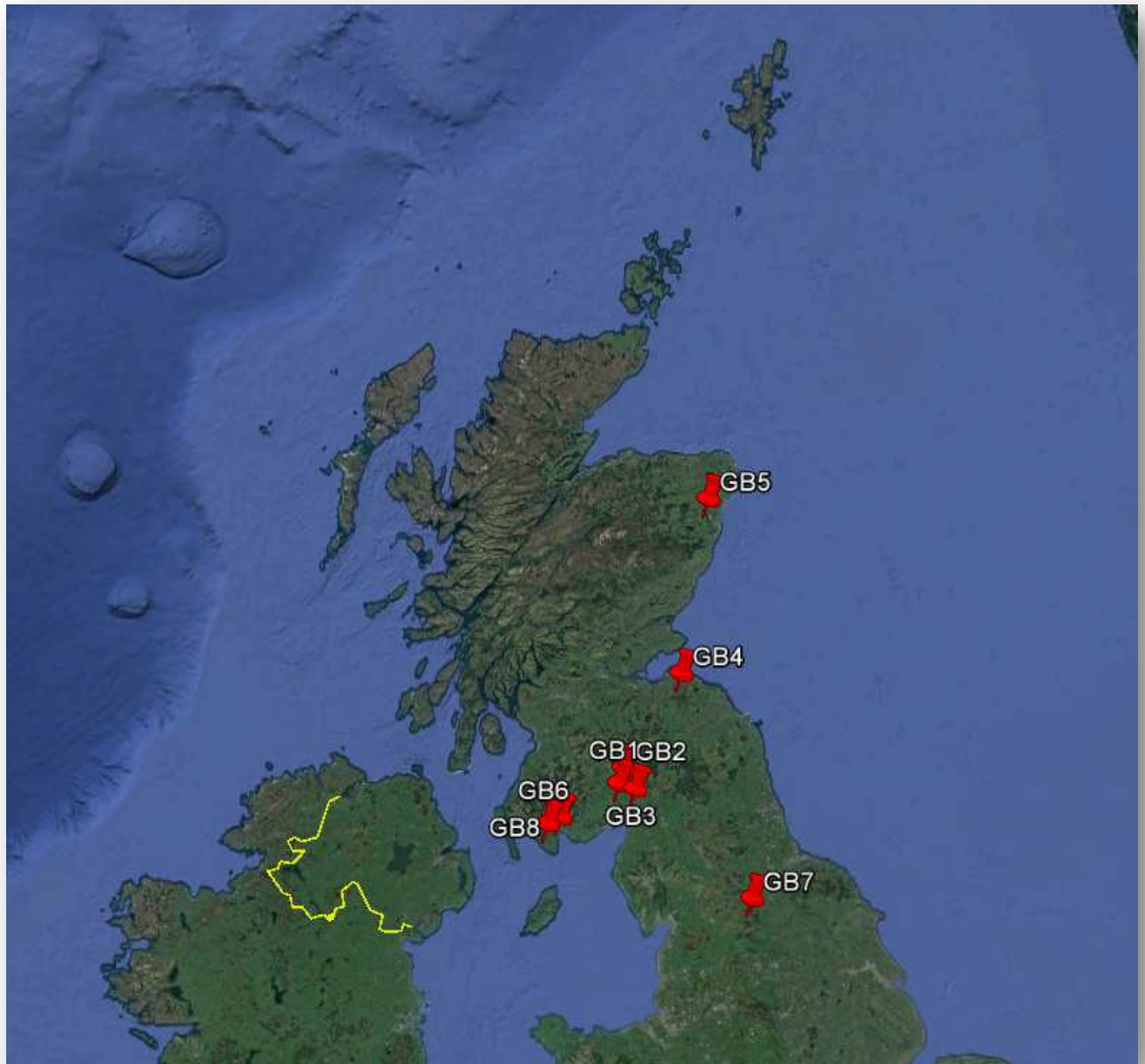**HIGHLIGHTS**

New barn for dairy cows in 2019

Microbial additives for slurry
Manure scraping

Open to innovations

Scotland

GB1

This is the SRUC experimental dairy farm, home of the Langhill herd. This herd has the pedigree of the animals traced back over 30 years and is the longest running dairy genetics experiment in the world. The current trial is investigating a standard energy and a high energy diet on the performance of the select genetic line (top 1% of UK herd) and the control genetic line (UK average) for milk yield as well as butterfat and protein content. The farm is part of the old Crichton hospital and was originally used for producing food for the patients along with providing work for them. The Farm Manager has worked at Crichton for over 40 years. They operate a multi-cut silage system to attempt to increase the energy component of the silage and try to produce 4 to 5 silage cuts each year.

Landscape	Hilly
Soil type	Siltyc loam
Farming system	Conventional
Total lands	230 ha
- Arable lands	71 ha
- Permanent grassland	148 ha
- Other land types	11 ha
Dairy cow housing	Cubicles
Bedding material	Sawdust
Floor in walking alley	Grooved concrete and slatted
Dairy herd	270
of which dairy cows	220
Breed	Holstein Friesian, Holstein Friesian crossbreeds
Herd production level	10450 kg/cow*year
Milking system	Herringbone parlour
Feeding system	Mixer wagon behind strap
Dairy herd grazing	No
Manure type	Slurry, solid (calves)
Manure storage	Above ground, metal tank
Other farming animals	No

HIGHLIGHTS

Pedigree dairy herd

Multi-cut silage system

Longest running dairy genetics experiment in the world

GB2

This is the SRUC dairy herd based at the Barony campus and used for demonstration and teaching. The herd is milked through a robotic milking machine. A multi-cut system is employed, with 4 to 5 cuts of silage annually. Maize silage is grown under plastic as a forage crop, along with wholecrop wheat and barley. There are currently approximately 400 Holstein-Friesian crosses in the herd.

Landscape	Flat
Soil type	Sandy loam
Farming system	Conventional
Total lands	254 ha
- Arable lands	56 ha
- Permanent grassland	184 ha
- Other land types	14 ha
Dairy cow housing	Cubicles
Bedding material	Sawdust
Floor in walking alley	Grooved concrete and slatted
Dairy herd	406
of which dairy cows	250
Breed	Holstein Friesian, Holstein Friesian crossbreeds
Herd production level	10200 kg/cow*year
Milking system	Robot
Feeding system	Mixer wagon behind strap
Dairy herd grazing	No
Manure type	Slurry, solid (calves)
Manure storage	Above ground, metal tank
Other farming animals	200 sheep

HIGHLIGHTS

SRUC dairy demonstration herd

Robotic milking

Multi-cut silage system

GB3

A large housed, high production, herd that produces around 6.1 million litres of milk each year. Each cow in the milking herd has a monitor that assess the health of the animal, along with the rumen health through its temperature and how this varies with a record of the past temperature of the animal. Additionally, the cows are fed a slightly different diet depending on their stage of lactation. The farmer has concerns about the carbon footprint of the farm and a desire to reduce this. He has already begun to reduce the amount of soya and replace this with rapemeal. The farmer has been involved in a number of projects linked to SRUC in the past.

Landscape	Flat
Soil type	Sandy silt loam
Farming system	Conventional
Total lands	275 ha
- Arable lands	76 ha
- Permanent grassland	176 ha
- Other land types	23 ha
Dairy cow housing	Cubicles
Bedding material	Sawdust
Floor in walking alley	Grooved concrete and slatted
Dairy herd	971
of which dairy cows	559
Breed	Holstein Friesian
Herd production level	11000 kg/cow*year
Milking system	Parlour
Feeding system	Mixer wagon behind strap
Dairy herd grazing	Yes
Manure type	Slurry and solid (calves)
Manure storage	Above ground, metal tank
Other farming animals	No

HIGHLIGHTS

Highly productive herd

Automatic health and rumen monitoring

Farmer reducing carbon footprint

GB4

The farm has a herd of approximately 500 Holstein Friesians that produces around 4 million litres annually. The milk is used to produce their own artisan products on site, including award winning cheeses. They are very concerned with the carbon footprint of the milk produced and in reducing this as much as possible. They are involved with an initiative to try to reduce greenhouse gas emissions from the dairy industry in Scotland and are looking for practical ways to do this while maintaining efficiency.

Landscape	Hilly
Soil type	Sandy silt loam
Farming system	Conventional
Total lands	179 ha
- Arable lands	61 ha
- Permanent grassland	81 ha
- Other land types	38 ha
Dairy cow housing	Cubicles
Bedding material	Sawdust
Floor in walking alley	Slatted floors
Dairy herd	500
of which dairy cows	450
Breed	Holstein Friesian
Herd production level	8900 kg/cow*year
Milking system	Parlour
Feeding system	Grazing and housed with concentrates
Dairy herd grazing	Yes
Manure type	Slurry
Manure storage	Above ground metal tanks
Other farming animals	Beef

HIGHLIGHTS

Large Holstein herd

On farm cheese production

Farmer reducing carbon footprint

GB5

An organic farm that has a herd of mainly Friesians but with a few Jerseys. The farmer won Farmer's Weekly 'Young Farmer of the Year' in 2015. Around 15% of the milk produced on the farm is sold through milk vending machines, this allows direct marketing to customers. The milk vending machines use glass bottles that can be refilled and therefore reduces plastic waste. The farm is Scotland's longest established organic dairy.

|	
Landscape	Hilly
Soil type	Sandy loam
Farming system	Organic
Total lands	147 ha
- Arable lands	28 ha
- Permanent grassland	118 ha
- Other land types	1 ha
Dairy cow housing	Cubicles
Bedding material	Mattrasses
Floor in walking alley	Solid, scraped
Dairy herd	180
of which dairy cows	140
Breed	Holstein Friesian crossbreeds
Herd production level	7945 kg/cow*year
Milking system	Parlour
Feeding system	Grazing and concentrates
Dairy herd grazing	Yes
Manure type	Slurry
Manure storage	Above ground, metal tank
Other farming animals	No

HIGHLIGHTS

Organic herd (longest estbalished in Scotland)

'Young Farmer of the Year Award' in 2015

15% of the milk is directly sold to cosutmers (vending machines)
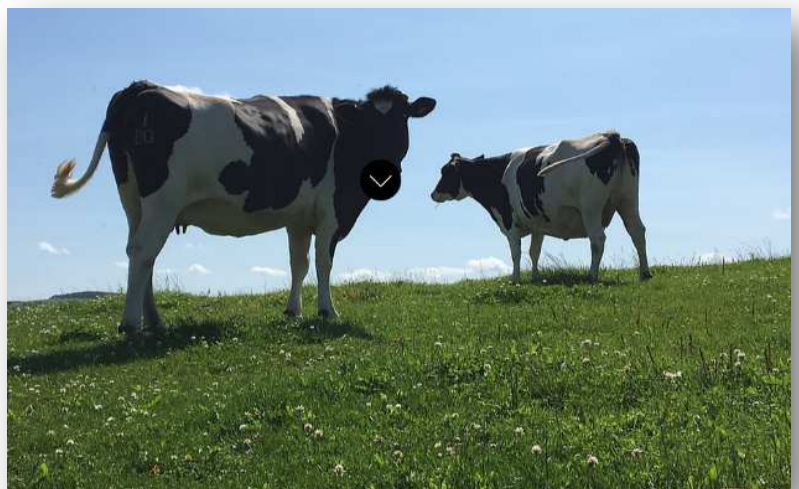
GB6

A large grazing farm that concentrates specifically on the quality of the grass being produced. The farm is unusual as the housing cubicles doesn't have a roof, with the cows open to the weather all year round. The large herd of over 1,600 dairy cows produce over 5 million litres of milk annually, mainly from grazed grass and grass silage. The cows are milked through a rotary parlour twice a day, with a paddock based grazing system to utilise the grass as efficiently as possible. The farmer has been involved with a number of research initiatives and recently looked at a fast breeder project to improve the genetics of the herd through genetic indexing.

Landscape	Flat
Soil type	Sandy silt loam
Farming system	Conventional
Total lands	932 ha
- Arable lands	-
- Permanent grassland	858 ha
- Other land types	74 ha
Dairy cow housing	Cubicles
Bedding material	Sawdust
Floor in walking alley	Slatted floor
Dairy herd	1632
of which dairy cows	1025
Breed	Jersey Friesian crossbreed
Herd production level	6000 kg/cow*year
Milking system	Parlour
Feeding system	Mixer wagon behind strap
Dairy herd grazing	Yes and concentrate
Manure type	Slurry
Manure storage	Open lagoon
Other farming animals	Pigs

HIGHLIGHTS

Large, grazing based herd

Houseing cubicles without roof

Genetic indexing

GB7

A small upland farm that milks a small herd of Northern Dairy Shorthorns, a rare breed. The milk is used in the production of a speciality, artisan cheese that is sold to restaurants all over the UK. The cheese is produced on the farm site. The farmer is very interested in reducing the greenhouse gas emissions and the overall carbon footprint, not only of the milk production but of the cheese production. The cows are all grass fed as much as possible, gazing the upland hay meadows. The use of inorganic fertiliser has been reduced to zero.

Landscape	Mountain
Soil type	Peaty loam
Farming system	Organic
Total lands	198 ha
- Arable lands	-
- Permanent grassland	191 ha
- Other land types	7 ha
Dairy cow housing	Open shed
Bedding material	Straw
Floor in walking alley	Solid
Dairy herd	40
of which dairy cows	28
Breed	Northern short horn
Herd production level	1800 kg/cow*year
Milking system	Parlour
Feeding system	Grassing and grass silage
Dairy herd grazing	Yes
Manure type	Solid
Manure storage	Above ground, solid walled
Other farming animals	Sheep

HIGHLIGHTS

Small rare breed farm

Upland grazing hay meadows

Artisan cheese production

GB8

A large, high production dairy farm with a herd of approximately 2,200 milking cows. The herd produces close to 9 million litres of milk annually. The farmers, a husband-and-wife team, are very interested in the reduction of greenhouse gases and limiting the farm's carbon footprint. They are part of the Scottish dairy farmers initiative to help reduce greenhouse gases from dairy farms and are looking for practical methods to reduce their carbon footprint while maintaining efficiency.

Landscape	Hilly
Soil type	Clay loam
Farming system	Conventional
Total lands	506 ha
- Arable lands	120 ha
- Permanent grassland	325 ha
- Other land types	61 ha
Dairy cow housing	Cubicles
Bedding material	Sawdust and straw
Floor in walking alley	Both solid floor with scraper and a slatted floor shed
Dairy herd	2178
of which dairy cows	905
Breed	Holstein Fresian
Herd production level	9800 kg/cow*year
Milking system	Parlour
Feeding system	Grazing and concentrates
Dairy herd grazing	Yes
Manure type	Slurry
Manure storage	Above ground, metal tank
Other farming animals	No

HIGHLIGHTS

Large herd

Farmer reducing carbon footprint

Specific diet for high milk production

Poland
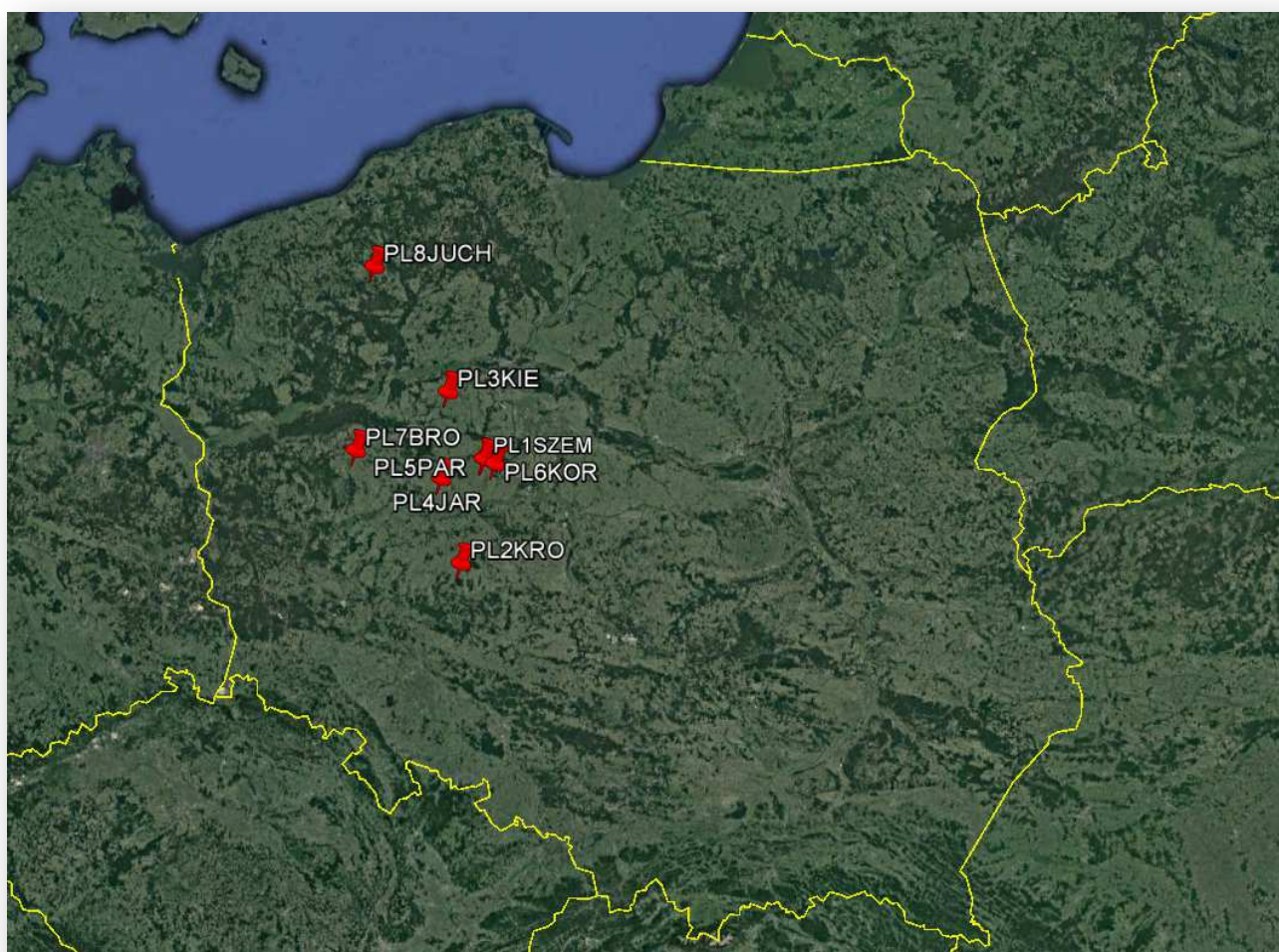
PL1SZEM

Farmer cooperates with the University by carrying out joint research. A typical family farm with an average (in Poland) number of cows. Milk yield above the Polish average. The barn was built 20 years ago and needs partly renovation (the floor is made of cement with the grooves and requires re-cutting). The farmer is open to new technologies, but is taking actions with caution. Farmer is searching for new substitutes for expensive protein feeds. He is consulting animal nutrition with specialists. Investment in photovoltaics. Environmental protection yes, but it requires a comprehensive approach (government guidelines). Milk is delivered to dairy company that the farmer is a shareholder; production process in the dairy factory is carried out using traditional methods.

Landscape	Lowland
Soil type	Clay
Farming system	Conventional
Total lands	64 ha
- Arable lands	28 ha
- Permanent grassland	15 ha
- Other land types	19 ha
Dairy cow housing	Cubicles
Bedding material	Straw
Floor in walking alley	Grooved concrete
Dairy herd	177
of which dairy cows	54
Breed	95% Holstein Friesian, 2,5% Holstein FriesianXJersey, 2,5% Holstein FriesianXRed Swedish
Herd production level	9500 kg/cow*year
Milking system	Side by side parlour (2x4)
Feeding system	Partial Mixed Ration (mixer wagon), extra concentrates from feed station
Dairy herd grazing	No
Manure type	Manure and slurry
Manure storage	Concrete (manure), in ground tank (slurry)
Other farming animals	No

HIGHLIGHTS

Diet composed by triticale/barley grain additioned with urea and Maxammon preparation

Photovoltaic system

Open to new technologies

PL2KRO

The farmer runs a family farm with his wife. The farm has the highest milk yield in Poland (15.464 kg for 2020). Farmer is very open to new technologies, although he takes into account the costs of introduction. The farmer has an extensive practical knowledge. The farmers' family runs educational programs for children. The farm is located on the suburbs of the small town at Wielkopolska region (West Poland). This is an attractive investment area, especially for single-family houses. This causes the social pressure to limit the agricultural production. Farmer is very open to the environmental protection i.e., reduction of the negative impact of animal production on the environment. Family is open to trainings and research.

Landscape	Lowland
Soil type	Predominantly sandy, clay
Farming system	Conventional
Total lands	135 ha
- Arable lands	95 ha
- Permanent grassland	10 ha
- Other land types	-
Dairy cow housing	Cubicles
Bedding material	Chopped straw
Floor in walking alley	Grooved concrete
Dairy herd	270
of which dairy cows	120
Breed	Holstein Friesian
Herd production level	15000 kg/cow*year
Milking system	Side by side parlour (2x3)
Feeding system	Partial Mixed Ration (feeding wagon), extra concentrates from feed station
Dairy herd grazing	No
Manure type	Manure and slurry
Manure storage	Concrete (manure), in ground tank (slurry)
Other farming animals	No

HIGHLIGHTS

- Alkaline-treated triticale in cow ration
- Open to new technologies
- Specific diet for high milk production

PL3KIE

The farmer runs a dairy farm. The farm has its own land, but due to the crop rotation he uses the land that belongs to his brother (better rotation). A very modern robotic barn. He is consulting animal nutrition with specialists. Farmer is very open to the environmental protection i.e., reduction of the negative impact of animal production on the environment.

|	
Landscape	Lowland
Soil type	Predominantly sandy, clay
Farming system	Conventional
Total lands	1100 ha
- Arable lands	310 ha
- Permanent grassland	27 ha
- Other land types	-
Dairy cow housing	Cubicles
Bedding material	Separated slurry
Floor in walking alley	Slatted floor
Dairy herd	840
of which dairy cows	210
Breed	Holstein Friesian
Herd production level	12400 kg/cow*year
Milking system	Robots (N=3)
Feeding system	Partial Mixed Ration (mixer wagon), extra concentrates from robots and feed station
Dairy herd grazing	No
Manure type	Slurry
Manure storage	Below slatted floor
Other farming animals	No

HIGHLIGHTS

By-products (wet plates) in dairy nutrition

Open to sustainable practices

Robotic milking
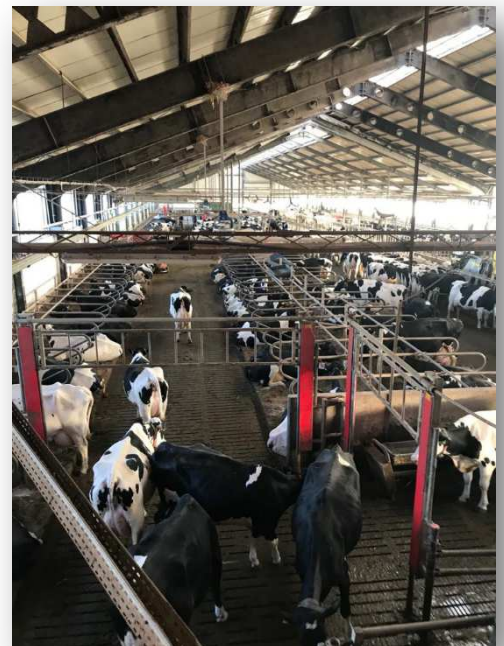
PL4JAR

Large industrial farm with 1.200 cows in one barn. The farm is open to cooperation in various fields (research, trainings and internships for university and high school college students i.e., from veterinary technical college). The farm is open to new products - the person responsible for dairy production worked in the UK for many years. High awareness of possible changes resulting from consumer pressure. Very high welfare of cows. Educational program for children.

Landscape	Lowland
Soil type	70% medium soils, 30% sandy
Farming system	Conventional
Total lands	2930 ha
- Arable lands	850 ha
- Permanent grassland	93 ha
- Other land types	-
Dairy cow housing	Free stall
Bedding material	Sand
Floor in walking alley	Grooved concrete
Dairy herd	2600
of which dairy cows	1300
Breed	Holstein Friesian
Herd production level	12100 kg/cow*year
Milking system	Rapid exit parlour (2X36)
Feeding system	Total Mixed Ration (mixer wagon)
Dairy herd grazing	No
Manure type	Solid manure and slurry
Manure storage	Slurry tanks
Other farming animals	No

HIGHLIGHTS

Compact TMR feeding

Manure belt recovery system

Care for cow welfare

PL5PAR

Typical small family dairy farm with tethering system. Handling animals requires a lot of works. Traditional system of nutrition and milking. The barn was adapted and modernized from an old building. Due to the high uncertainty as to the future of the farm, there is no decision to build a new facility.

Landscape	Lowland
Soil type	Clay
Farming system	Conventional
Total lands	25 ha
- **Arable lands**	5 ha
- **Permanent grassland**	3 ha
- **Other land types**	-
Dairy cow housing	Tie-stall
Bedding material	Straw
Floor in walking alley	-
Dairy herd	24
of which dairy cows	10
Breed	Holstein Friesian
Herd production level	5600 kg/cow*year
Milking system	Traditional milking system with 2 cans
Feeding system	Conventional (forage and concentrate)
Dairy herd grazing	No
Manure type	Solid manure and slurry
Manure storage	Concrete (solid manure), in ground tank (slurry)
Other farming animals	10 pigs

HIGHLIGHTS

Small dairy herd

Traditional farm management

Milk delivered to the dairy cooperative

PL6KOR

A typical family farm with an average (in Poland) number of cows. Milk yields typical for barns under the milk control. The family is open to new technologies, but very carefully verifies and calculates costs. The nutrition of dairy cows should be verified and the particular diets should be recalculated and balanced. The farmer is very satisfied with the photovoltaic system because of reduced energy cost. A big problem with high milk somatic cells counts. The farm supports the local dairy company.

Landscape	Lowland
Soil type	Sandy
Farming system	Conventional
Total lands	55 ha
- Arable lands	35 ha
- Permanent grassland	20 ha
- Other land types	-
Dairy cow housing	Compost-bedded pack barn
Bedding material	Straw
Floor in walking alley	70 % deep litter, 30% slutter floor
Dairy herd	140
of which dairy cows	63
Breed	85% Holstein Friesian, 5% crossbreeds
Herd production level	8100 kg/cow*year
Milking system	Side by side parlour (2x5)
Feeding system	Partial Mixed Ration (mixer wagon), extra concentrates from feed station
Dairy herd grazing	No
Manure type	Manure and slurry
Manure storage	Plate and tank under slatted floor (slurry)
Other farming animals	No

HIGHLIGHTS

- Photovoltaic system
- Gorzowska mixture (increase in forage efficiency from the same area)
- Compost-bedded pack barn

PL7BRO

The experimental farm of the Poznan University of Life Sciences. It was established on the former land property (mansion). Most of the barns with tethering system. The farm manager is strongly focused on ecology. The farm is testing and using the effective microorganisms in either management or nutrition. The farm owns ecological pastures and meadows. An attempt to combine ecology with modern management and nutrition. Cows on pastures (spring – autumn) after TMR feeding.

Landscape	Lowland
Soil type	Variable, mostly clay and sandy soils
Farming system	Conventional, bioorganic
Total lands	737 ha
- Arable lands	127 ha
- Permanent grassland	480 ha
- Other land types	130 ha
Dairy cow housing	Cubicles
Bedding material	Straw
Floor in walking alley	Slatted floor
Dairy herd	580
of which dairy cows	170
Breed	82% Holstein Friesian, 18% crossbreeds
Herd production level	10300 kg/cow*year
Milking system	Hall (2x8)
Feeding system	Feeding wagon (mixer), feeding station
Dairy herd grazing	Yes
Manure type	Manure and slurry
Manure storage	Plate (manure) and tank (slurry) covered with vegetation dross
Other farming animals	1000 sheep, 150 beef cattle

HIGHLIGHTS

- Slurry tank covered with plants. Use of microrganisms for manure fermentation
- 130ha ecological permanent grassland
- Use of microorganisms in animal nutrition

PL8JUCH

Ecological, versatile and modern farm. Bright barns for 650 animals, including 360 milking dairy cows, are made mostly of wood. Barns have 3 areas: rest area, runway area and feeding area. High average age of herd (7-8 years) with relatively high average milk yield. Pasture feeding from May to October. Dairy cows have horns. 97% of own nutritional components. The farm is very open for ecology, environmental protection, dissemination of basic knowledge of plant and animal production.

Landscape	Hilly
Soil type	Variable, mostly clay and sandy soils
Farming system	Organic
Total lands	1587 ha
- Arable lands	640 ha
- Permanent grassland	920 ha
- Other land types	27 ha
Dairy cow housing	Free stall
Bedding material	Chopped straw with calcium
Floor in walking alley	Concrete, rubber
Dairy herd	617
of which dairy cows	360
Breed	70% Holstein Friesian, 30% Swiss Brown
Herd production level	5600 kg/cow*year
Milking system	Parlour (2x16)
Feeding system	Partial Mixed Ration; hay, only concentrates and minerals (80:20)
Dairy herd grazing	Yes
Manure type	Manure and slurry
Manure storage	Concrete (manure), tank (slurry)
Other farming animals	No

HIGHLIGHTS

Milk production based on hay nutrition

97% own nutritional components

Open to environmental protection

France

FR1DERV

This experimental farm is located in The Pays de la Loire County, between Rennes and Nantes. It is characterised by dry conditions (700 mm of rain per year) and loamy soils. Estabished in 1973, this dairy farm is specialised in the field of milking. It also carries out studies on fodder productions and on environmental impact assessments. At the end of 2018, the "Agri Méthane Derval" biogas unit has been launched. The farm is also focused on the control of the energy consumption of the milking unit.

Landscape	Lowland
Soil type	Loam
Farming system	Conventional
Total lands	105 ha
- Arable lands	105 ha
- Permanent grassland	-
- Other land types	-
Dairy cow housing	Cubicles
Bedding material	Straw
Floor in walking alley	Grooved concrete
Dairy herd	160
of which dairy cows	85
Breed	Holstein Friesian
Herd production level	8600 kg/cow*year
Milking system	Robot
Feeding system	Trough feeding
Dairy herd grazing	Yes
Manure type	Solid manure, Slurry
Manure storage	Open liquid manure tank
Other farming animals	No

HIGHLIGHTS

- Methanization unit
- Studies on fodder production
- Speciliazed in the field of milking

FR2BMAISON

This experimental farm is located in Normandy on a loamy sandy clay soil. Established in 1972, the farm carries out studies on pasture management and grass productions. The dairy herd is 100% composed by the Normande breed. Studies are oriented on mixed crop livestock farming systems, agroecology and energy productions and savings: heat recovery under the bedding straw area and solar panels.

Landscape	Lowland
Soil type	Loamy, sandy, clay
Farming system	Conventional
Total lands	96 ha
- Arable lands	41 ha
- Permanent grassland	55 ha
- Other land types	-
Dairy cow housing	Straw yard, slatted floor
Bedding material	Straw
Floor in walking alley	Slatted floor
Dairy herd	165
of which dairy cows	90
Breed	Normande
Herd production level	6800 kg/cow*year
Milking system	Parlour (2x5)
Feeding system	Trough feeding
Dairy herd grazing	Yes
Manure type	Slurry, solid manure
Manure storage	Slurry: under slatted floor, outside covered tank. Solikd manure: storage in the field.
Other farming animals	Fattening bovine (males from the dairy herd) N=38

HIGHLIGHTS

Agroecological system

Studies on pasture management and grass productions

Energy production (heat recovery / solar panels)

FR3TREV

This farm is located on a loamy clay soil in the black mountain of West of Brittany. The experimental farm is managed by the "Chambre d'Agriculture" of Britany since 1971. Studies are carried out on milking, sustainable production systems and fodder production. Since 2018, the objective of the farm is to quantify the extent to which implementation of best practices will lower the carbon footprint of a maize and grass system.

Landscape	Lowland
Soil type	Loamy clay
Farming system	Conventional
Total lands	131 ha
- Arable lands	110 ha
- Permanent grassland	21 ha
- Other land types	-
Dairy cow housing	Cubicles
Bedding material	Sand
Floor in walking alley	Grooved concrete
Dairy herd	225
of which dairy cows	130
Breed	Holstein Friesian
Herd production level	7770 kg/cow*year
Milking system	Parlour (2x10)
Feeding system	TMR
Dairy herd grazing	Yes
Manure type	Slurry, solid manure
Manure storage	In ground concrete tank
Other farming animals	No

HIGHLIGHTS

Low-carbon system

Fodder and grasslands production

Feed efficiency

FR4TRINOT

This farm created in 1974 is located on a sandy clay soil in the Pays de la Loire County, near from Angers. The farm carries out studies on animal feeding and fodder crops adapted to water shortages but also on animal welfare and production costs.

Landscape	Lowland
Soil type	Sandy soil
Farming system	Conventional
Total lands	188 ha
- Arable lands	144 ha
- Permanent grassland	44 ha
- Other land types	-
Dairy cow housing	Cubicles
Bedding material	Straw
Floor in walking alley	Grooved concrete
Dairy herd	261
of which dairy cows	137
Breed	Holstein Friesian
Herd production level	9400 kg/cow*year
Milking system	Rotary parlour (28 places)
Feeding system	TMR and individual feeding system (84 weighing troughs)
Dairy herd grazing	No
Manure type	Solid manure, slurry
Manure storage	Slurry: open concrete tank Solid manure: stockpile
Other farming animals	Pigs (sows)

HIGHLIGHTS

Working on feed efficiency

Studies on fodder production adapted to water shortages

All the animals are genotyped

FR5KERLT

The farm is located on a sandy clay soil. Established for more than twenty years, the production is now diversified with dairy processing, vegetable production, drying of firewood and energy production by photovoltaic panels and bioreactor. The digestate is applied to the fields and avoid mineral fertilizers; it is dried with the heat coming from cogeneration and this solid fraction replaces part of the straw (100t/year) used in straw areas. Heat from cogeneration is also used to obtain better (drier) forages and therefore replaces 40t/year of soybeans. The farm produces locally about 95% of all feed for the herd. It recently received the High Environmental Value certification ("farms limiting inputs and with concern for biodiversity"- June 2020). The bedding has recently been partly (25%) replaced by water circulation mattresses (Aquaclim®) and the exercise areas have been covered with the Magellan® rubber mats with liquid manure drainage. Cleaning by hydrocurage has been abandoned in favor of a manure scraper

Landscape	Lowland
Soil type	Sandy, clay
Farming system	Conventional
Total lands	250 ha
- Arable lands	170 ha
- Permanent grassland	30 ha
- Other land types	50 ha
Dairy cow housing	Cubicles
Bedding material	Straw flour, Aquaclim® mattress
Floor in walking alley	Grooved concrete and Magellan® flooring
Dairy herd	261
of which dairy cows	203
Breed	Holstein Friesian
Herd production level	10500 kg/cow*year
Milking system	Robot
Feeding system	Robot
Dairy herd grazing	No
Manure type	Slurry
Manure storage	Open liquid manure tank and Bioreactors
Other farming animals	No

HIGHLIGHTS

Energy production by bioreactor and photovoltaic panels

Digestate replaces all mineral fertilisers

Innovative bedding system and excercise area

FR6ATLS

The farm is located on a sandy clay soil. The dairy cow building has recently been completely redone to accommodate a larger herd and for the sake of animal welfare. The animal's sleeping area and exercise area are made up of innovative systems: sleeping area with water circulation mattress (Aquaclim®) with animal heat recovery and exercise area with rubber mat (Magellan®) with drainage of the purine. Frequent scrapings to maintain dry soil. A bioreactor is under construction. In the long term, it should supply all of the methane needs of the nearby town (around 7,300 inhabitants).

Landscape	Lowland
Soil type	Clay, sandy
Farming system	Conventional
Total lands	210 ha
- Arable lands	160 ha
- Permanent grassland	-
- Other land types	50 ha
Dairy cow housing	Cubicles
Bedding material	AquaClim© mattresses, a little straw
Floor in walking alley	Magellan© floor system
Dairy herd	180
of which dairy cows	155
Breed	Holstein Friesian
Herd production level	8500 kg/cow*year
Milking system	ROTO fulllwood pack 32 places with milk meter
Feeding system	Green feed and full ration
Dairy herd grazing	No
Manure type	Slurry
Manure storage	Open liquid manure tank (Bioreactors under construction)
Other farming animals	No

HIGHLIGHTS

Bioreactors with direct distribution of biogas (under construction)

Innovative sleeping system and exercise area

Frequent scraping

FR7GRL

The farm is on sandy clay soil. It is located in the outbuildings of a medieval castle. All the crops are used to feed the herd and the dairy farm has been in organic production since 1997. The farm receives visitors and tourists and is part of the "Gîtes de France" association. It owns the label "Tourism and Handicap".

|	
Landscape	Lowland
Soil type	Mainly loamy
Farming system	Organic
Total lands	252 ha
- Arable lands	159 ha
- Permanent grassland	-
- Other land types	93 ha
Dairy cow housing	Compost bedded-pack barn
Bedding material	Miscanthus
Floor in walking alley	Grooved concrete
Dairy herd	108
Breed	Holstein Friesian
Herd production level	7965 kg / cow*year
Milking system	Parlour (16)
Feeding system	Silage defacer bucket
Dairy herd grazing	Yes
Manure type	Composted manure
Manure storage	Open slurry pit
Other farming animals	No

HIGHLIGHTS

Composted bedding pack barn (Miscanthus)

Organic production since 1997

Registered with "Gîtes de France"
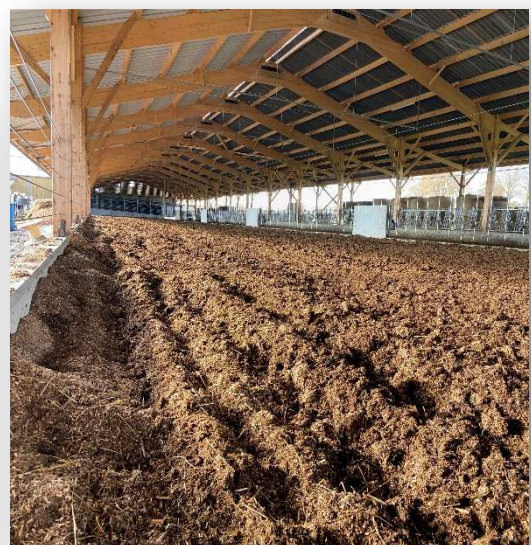
FR8ALPA

The farm is located in the Madon valley (river) on a clay-limestone soil. The farm was built in 1969 with dairy and pig breeding. In 1996 the pig farming was stopped. The dairy cow building was renovated in 2015 and the roof redone in 2020. This building has straw bedding stalls, a grooved concrete floor and a milking robot. Animal wastes are scraped with the straw and collected in a nearby stockpile.

Landscape	Lowland
Soil type	Mainly clay-limestone soil
Farming system	Conventional
Total lands	140 ha
- Arable lands	75 ha
- Permanent grassland	40 ha
- Other land types	25 ha
Dairy cow housing	Cubicles
Bedding material	Straw
Floor in walking alley	Grooved concrete
Dairy herd	75
Breed	Holstein Friesian
Herd production level	10600 kg / cow*year
Milking system	Robot
Feeding system	Maize silage + clover/alfalfa/ryegrass mixture + corn feed + nitrogen corrector
Dairy herd grazing	Yes
Manure type	Liquid manure mixed with straw
Manure storage	Stockpile (concrete floor and 2 walls)
Other farming animals	30 Beef cattle; poultry

HIGHLIGHTS

Dairy cow building renovated in 2015 and 2020

Slurry and straw scraped and stored in a nearby stockpile

Natura 2000 meadow

Appendix 1

List of participants

Participant number	Participant name	Country
1	Wageningen Research - coordinator	The Netherlands
2	University of Firenze	Italy
3	Latvian University of Life Sciences and Technologies	Latvia
4	Justus Liebig University Giessen	Germany
5	Poznan University of Life Sciences	Poland
6	Lithuanian Institute of Animal Science	Lithuania
7	Scotland's Rural College	Scotland
8	French Livestock Institute de L'Elevage	France
9	INRA UMR PEGASE	France
10	UMR 1069 Sol Agro & Hydro Systèmes	France
11	UMR Ecosystème Prairial	France
Associated partners		
12	University of Kentucky	USA
13	Federal University of Lavras	Brazil
14	ARO Volcani Center	Israel

Three INRA partners act as one organisation in the execution of the project

Appendix 1