2-Org-Cows

Trait Atlas

Guidelines for standardized measurements of fertility-, health- and milk records

CORE organic

Publishing Information

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Foreword

CORE Organic is the acronym for "Coordination of European Transnational Research in Organic Food and Farming Systems".
As an ERA-NET action, it intends to increase cooperation between national research activities.
CORE Organic Plus consists of 24 partners from 21 countries/regions.
The overall objective of CORE Organic is to enhance quality, relevance and utilization of resources in European research in organic food and farming and to establish a joint pool for financing transnational research in organic food and farming.
The background for this objective is that the public European research and development effort in organic food and farming is characterized by small research communities, often scattered and fragmented both geographically and institutionally. This generates a need for gathering the dispersed expertise into a critical mass, to maintain and increase the competitive quality and relevance of research.

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Introduction

2-ORG-COWS aims for an evaluation of novel functional traits and associated environmental descriptors as a prerequisite for both the implementation of organic breeding strategies for local dual-purpose cattle kept in organic pasture based production systems, and for preventive livestock health management. In consequence, the overall objective addresses both adaptation of the dual-purpose cow to pasture based systems, and vice versa adaptation of the system for improving functional (health) traits. Due to this reasons a uniform guide for recording animal welfare (health traits, behavior, fertility), production (milk and meat quality)- and environmental descriptors (feed intake and greenhouse gas emissions) has been developed.

Read more at the CORE Organic website: http://www.coreorganic.org/
http://coreorganicplus.org/research-projects/2-org-cows/
http://orgprints.org/view/projects/2orgcows.html

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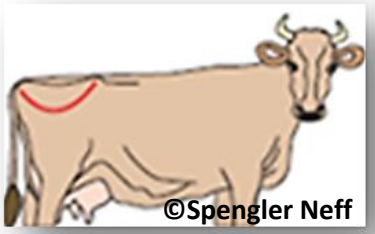
Overview of Conformation traits

The recording of conformation traits will be done by project partners. However, for the complex of health and behaviour traits we rely on the support of farmers and/or herd managers, who supervise the herd. In terms of health traits farmers need to note down all animals that sicken with any of the listed diseases during 2016/2017. Project partners are kindly asked to encourage and remind farmers to do so once in a while and shall transfer the lists with marked animals every 3 to 4 month, in order to update the data base. The behaviour score charts shall be filled in by farmers once for every animal. The general temperament shall reflect the animal's behaviour during milking in the parlour. Generally, all milking animals (1st to nth lactation) are to be added to trait recordings. All heifers that enter 1st lactation after calving will be included in the next recording cycle, as recordings take place at least 2-6 times a year.

Category	Trait	Scale	Interval of recording
Conformation (recorded by project partners)	Locomotion Score (LS)	1-5	**2 x** per year (Febr./Mar. and Sept./Oct.)
	Body Condition Score (BCS)	1-5	**6-10** x per year (at least every 2 month)
	Hygiene Score (HS)	1-5	**2 x** per year (Febr./Mar. and Sept./Oct.)



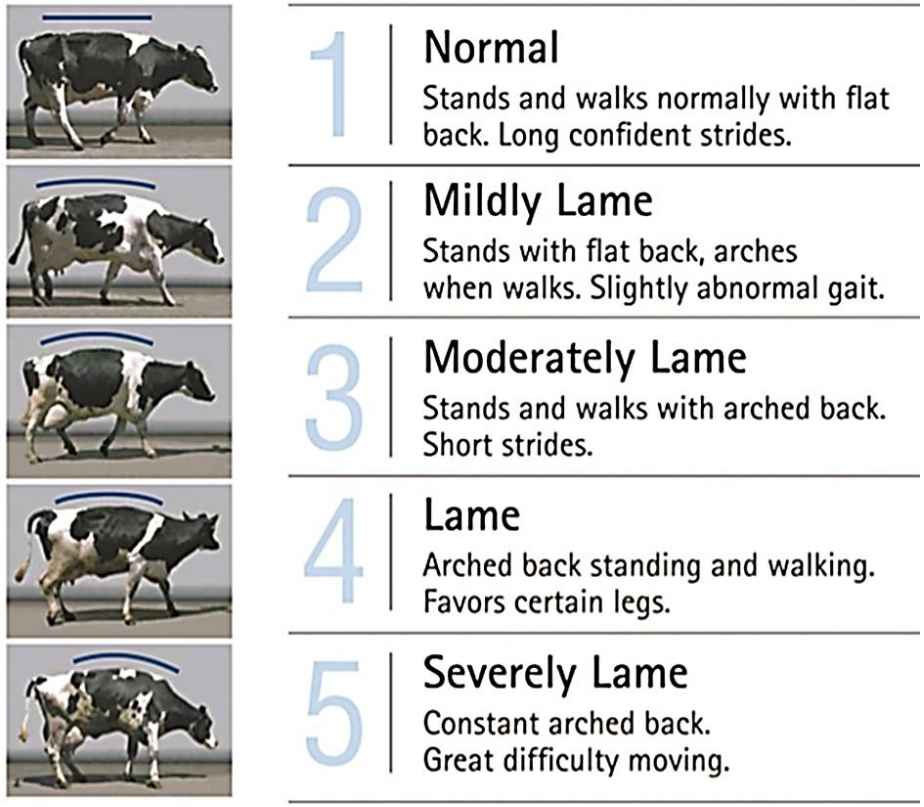
It is crucial that the **same** person is in charge of the recording in order to provide comparability of repeated measurements!!!

Locomotion Score (First Step®)

Frequency of recording: 2 times a year

- Once during the winter inside the barn (March 2016 **or**: December 2016, January, February, and March 2017)
- Once during summer when animals have access to pasture (May-October 2016), the recording should be done inside the barn

Source: http://hooftrimming.org/wpcontent/uploads/2012/12/New5point_locomotionscoreguide_002.png



Locomotion Score

Date of recording: _____ **recording person (Name): _____** **Name of Farm: _____**

Animal ID	**Locomotion Score** 1= lame free 5=severely lame	**Comments**

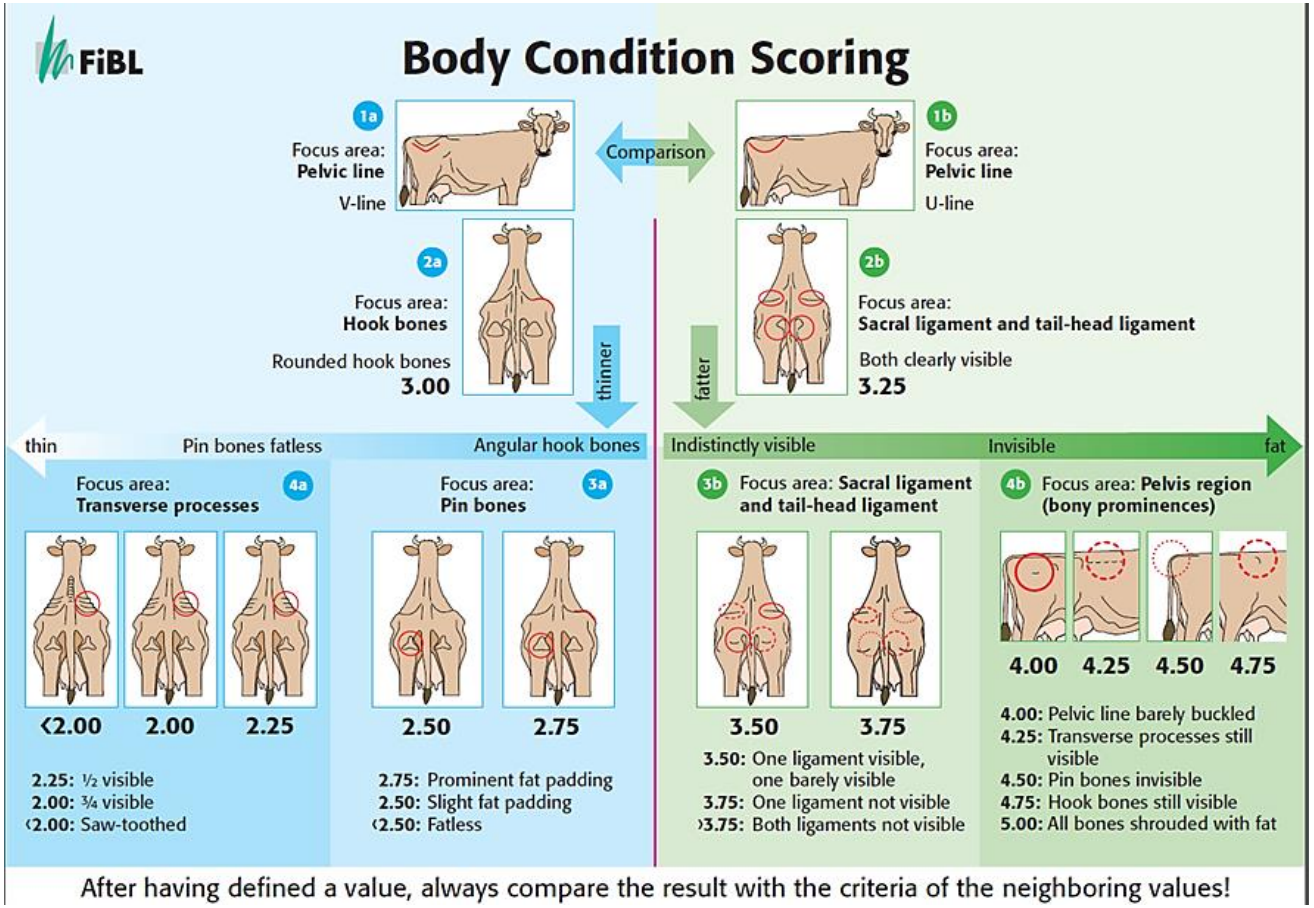
All milking animals (1st to nth lactation). All heifers that enter 1st lactation after calving will be included in the next recording cycle, as recordings take place at least 2-6 times a year.

Body Condition Score (by FiBL, A. Spengler Neff)

Frequency of recording: 6-10x per year (at least every 2 month)

- BCS data of the herd needs to be recorded at least every 2 months as the body condition of animals change during lactation period
- An extra PDF for the FiBL BCS scoring chart will be send via email

Source: https://shop.fibl.org/de/artikel/c/rindvieh/p/1650-bsc.html



Body Condition Score

Date of recording: _____ recording person (Name): _____ Name of Farm: _____

Animal ID	**Body Condition Score** <2 = thin 5 = fat	**Comments**

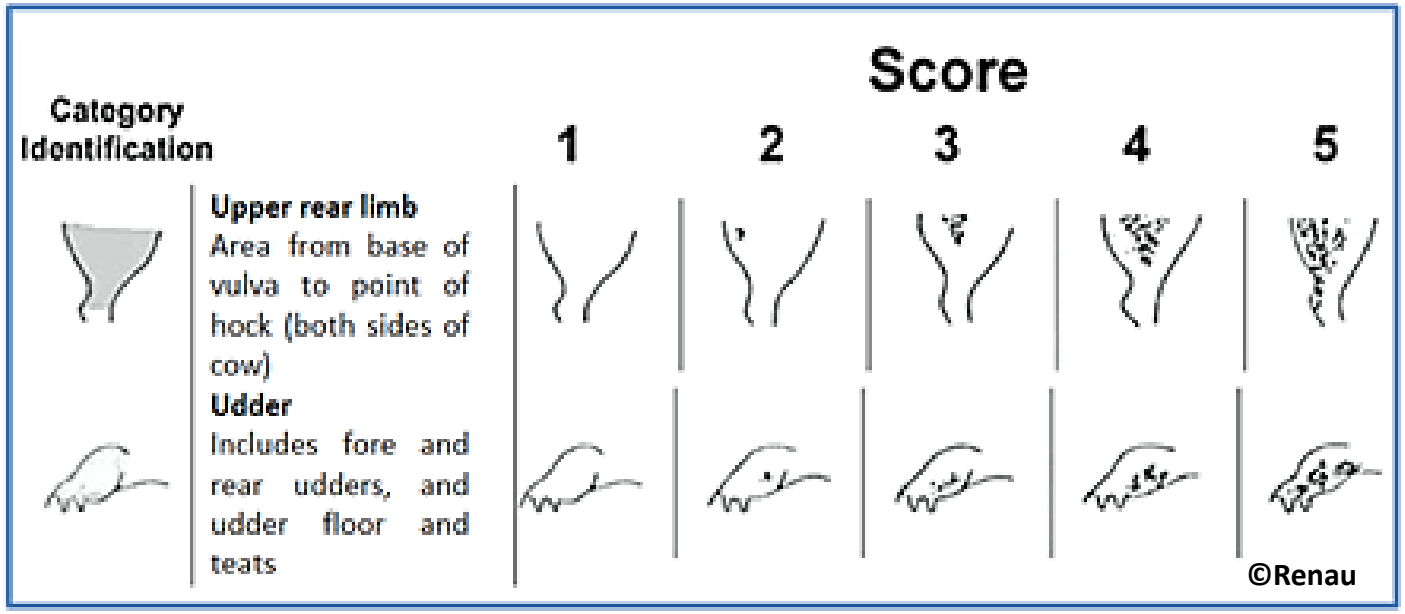
All milking animals (1st to nth lactation). All heifers that enter 1st lactation after calving will be included in the next recording cycle, as recordings take place at least 2-6 times a year.

Hygiene Score (by Renau et al. 2005)

Frequency of recording: 2 x per year (Febr. /Mar. and Sept./Oct.)

- Once during the winter inside the barn (March 2016 **or**: December 2016, January, February, March 2017)
- Once during summer when animals have access to pasture (May-October 2016)
- The recording should be done inside the barn!

Source: https://www.google.de/search?q=A+Tool+Box+for+Assessing+Cow,+Udder+and+Teat+Hygiene&ie=utf-8&oe=utf-8&gws_rd=cr&ei=PQjUVseBLYbOOK7Xu8gG (first PDF)



Hygiene Score

Date of recording: _____ **recording person (Name): _____** **Name of Farm: _____**

Animal ID	**Upper rear limb** 1=clean 5=very dirty	**Udder** 1=clean 5=very dirty	**Comments**

All milking animals (1st to nth lactation). All heifers that enter 1st lactation after calving will be included in the next recording cycle, as recordings take place at least 2-6 times a year.

Overview of Health traits

Frequency of recording: Whenever detected by farmer or herd manager

- Categorical trait, when at least one case of clinical mastitis (CM) is detected, it is registered as 1 otherwise it is scored as 0
- Whenever the symptoms (described below) are detected, the animal will have to be recorded
- Additional comments on treatment and medication are welcome

Recorded by: farmers, vets, herd managers

Category	Trait	Scale	Interval of recording
Health (recorded by farmers every time an animal is detected with any of these diseases → farmers should note this down on provided score charts and hand out this list to respective partner who will forward it to database)	Clinical mastitis Retained placenta Milk fever Ketosis Digital dermatitis Sole ulcerations Wall disorder Interdigital hyperplasia	Yes/ positive (1) No/ negative (0)	Whenever detected by farmer or herd manager

Clinical Mastitis

Source: http://dairy.ahdb.org.uk/technical-information/animal-health-welfare/mastitis/symptoms-of-mastitis/somatic-cell-count-milk-quality-indicator/#.VtQtnOamKUk

Symptoms

- A reduction in milk yield
- An increase in body temperature
- The lack of appetite
- Sunken eyes
- Signs of diarrhea and dehydration
- Reduced mobility, pain of swollen udder
- The milk such as a watery appearance

Retained Placenta

Source: http://www.thecattlesite.com/diseaseinfo/232/retained-placenta/

Symptoms

- Degenerating, discolored, ultimately fetid membranes hanging from the vulva
- Retained membranes may remain within the uterus and not be readily apparent, in which case their presence may be signaled by a foul-smelling discharge
- Increased risk of developing metritis, ketosis, mastitis, and even abortion in a subsequent pregnancy

Milk Fever

Source: http://agriculture.vic.gov.au/agriculture/pests-diseases-and-weeds/animal-diseases/beef-and-dairy-cows/milk-fever-hypocalcaemia-in-cows

Symptoms:

- Animal staggers and goes down to a "sitting" position, often with a 'kink' in neck
- Lie flat on their side before circulatory collapse, coma and death
- Dry muzzle
- Staring eyes, cold legs and ears
- Constipation and drowsiness
- Heart beat becomes weaker and faster
- Body temperature falls below normal, especially in cold, wet, windy weather

Ketosis

Source: http://www.thecattlesite.com/diseaseinfo/194/acetonaemiaketosis/#sthash.i7QyDWjw.dpuf

Symptoms

- Reduced milk yield
- Weight loss
- Reduced appetite
- Dull coat
- Acetone (pear drop) smell of breath/ or milk
- Fever
- Some develop nervous signs including excess salivation, licking, aggression etc.

Health traits

Recording person (Name): _____ **Name of Farm:** _____

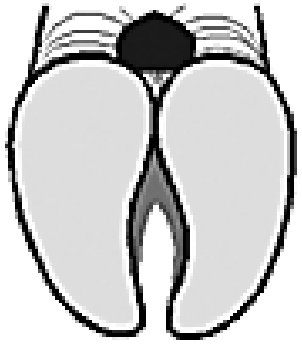
Animal ID	**Clinical Mastitis** (date of recognition)	**Retained Placenta** (date of recognition)	**Milk Fever** (date of recognition)	**Ketosis** (date of recognition)	**Comments** (treatment, medication, etc.)

All milking animals (1st to nth lactation). All heifers that enter 1st lactation after calving will be included in the recording procedure once a disease is detected.

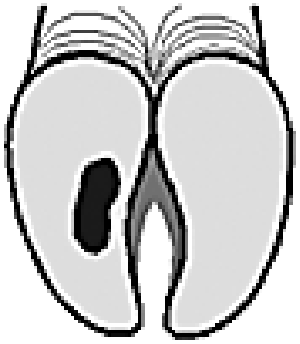
Claw Diseases

Source: http://www.sciencedirect.com/science/article/pii/S0022030205730150

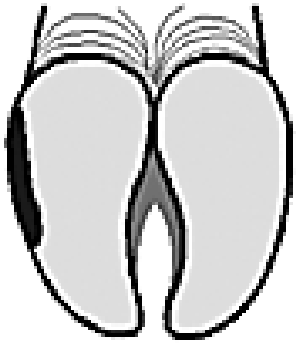
https://books.google.de/books?id=roHrW4mc_8kC&pg=PA100&lpg=PA100&dq=wall+disorder+claw+disease&source=bl&ots=jQfxAXW-Ag&sig=WbOFD71p8bC9fwMBr8uqVKptDI&hl=de&sa=X&ved=0ahUKEwiAmcuG_ZzLAhXoIpoKHce_D9kQ6AEISTAF#v=onepage&q=wall%20disorder%20claw%20disease&f=false



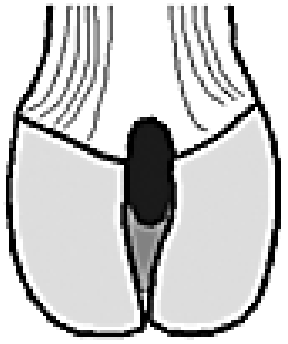
Digital Dermatitis



Sole Ulceration



Wall Disorder



Interdigital Hyperplasia

© König, 2005

Claw Diseases

Recording person (Name): _____ **Name of Farm:** _____

Animal ID	**Digital dermatitis** (date of recognition)	**Sole ulceration** (date of recognition)	**Wall disorder** (date of recognition)	**Interdigital dermatitis** (date of recognition)	**Comments** (treatment, medication, etc.)

All milking animals (1st to nth lactation). All heifers that enter 1st lactation after calving will be included in the recording procedure once a disease is detected.

Overview of Behavior Traits (by M. Kramer 2013, J. Juga 1996)

Frequency of recording: Once per animal

Source: http://www.sciencedirect.com/science/article/pii/S0022030213005092

Category	Trait	Scale	Interval of recording
Behaviour (recorded by farmer via questionnaire)	General temperament	1-5	**1 x** per animal by farmer
	Aggressiveness	Yes/No	
	Order in herd	1-3	

- **General temperament** is scored by farmers with codes between 1 (very nervous) and 5 (very calm) to describe the temperament that is shown by the cow within the milking parlor as described by Juga (1996)

Score	Behavior	Example (to be recorded in milking parlor)
1	Very nervous	Rearing, twisting, continuous violent struggle,
2	Nervous	Squirming, continuous shaking, Restless shifting
3	normal	Some shifting
4	Calm	Little shifting
5	Very calm	No movement

- **Aggressiveness**: binomial trait scored by farmers to describe whether a cow behaves aggressive (0) or untroubled (1) towards himself and herd mates
- **Rank order** in the herd is scored by farmers with codes 1 for low rank, 2 for medium rank, and 3 for high rank

Behavior Traits

Date of recording: _____ recording person (Name): _____ Name of Farm: _____

Animal ID	**General temperament** 1= very nervous 5= very calm	**Aggressiveness** 0=aggressive towards herd mates 1= untroubled towards herd mates	**Rank order in the herd** 1= low rank 2= medium rank 3= high rank	**Comments**

All milking animals (1st to nth lactation). All heifers that enter 1st lactation after calving shall be assessed within their first year of milking.

Overview of Fertility traits

➢ **Minimum requirements for recording of female fertility**

- Calving dates
- All dates of inseminations (AI and natural service)

➢ **Additional information that is recommended to be recorded on SensOor farms in 2-ORG-COWS**

- Dates of every observed heat (first heat and all further heat events without insemination)
- Fertility disorders (either diagnoses related to treatments by veterinarians or observations from farmers)
- Culling data (date and reason for culling)
- Body Condition Score (see recording protocol of UNI-KS)
- Calving ease of preceding parturition (ICAR guidelines, see below)
- Heat Intensity Score (Hansen Axelsson et al. 2011, see below

➢ **Additional information on the use of advanced biotechnology for reproduction (if available/applicable)**

- Pregnancy test results (e.g. rectal palpation, ultrasound, milk/blood tests, etc.)
- Progesterone level in milk
- Use of sexed semen, double AI, special semen characteristics
- Embryo transfer
- Oestrus Synchronization (Y/N)
- Start date of planned mating period and of planned calving period (for systems with strictly seasonal calving)

1. **Calving ease of preceding parturition (ICAR guidelines)**

Difficult calving lead to increased calf and cow mortality and could impair the health of the calf, the health of the dam, her subsequent fertility and her production performances.

Codes for calving mode or ease to be recorded by the farmer at every calving:

(1) Easy calving without assistance
(2) Easy calving with some assistance
(3) Difficult calving (hard pulling, assistance by 2 or more persons, mechanical assistance)
(4) Caesarean section
(5) Embryotomy

Birth type to be recorded by the farmer at every calving:

(1) Single
(2) Twins
(3) Triplets or more

Dead calf yes/no to be recorded by the farmer at every calving

2. Heat Intensity Score (Hansen Axelsson et al. 2011)

Heat intensity score is a measure of the cow's ability to show estrus and grades its strength.

Codes for heat intensity score to be recorded by the farmer at every observed heat:

(0) no estrus- missed heats, e.g. detected by SensOor® but not the farmer
(1) uncertain
(2) weak
(3) normal
(4) strong
(5) very strong

Calving Ease and Heat Intensity

Animal ID	Calving Ease and Date (1) Easy calving without assistance (2) Easy calving with some assistance (3) Difficult calving (assistance by 2 or more persons) (4) Caesarean section (5) Embryotomy		Heat Intensity and Date (0) no estrus, missed by farmer (1) uncertain (2) weak (3) normal (4) strong (5) very strong	

Overview of Milk traits

Sampling bulk milk probes for analysis

Take a sample from at least two milking times (evening and morning). Take samples from the bulk milk tank every first day each month during 10 months, starting 01.04.2016 – 01.01.2017. Samples are filled into the 250 ml. The milk should be immediately frozen (18 ˚C). In the bottle should be not less than 200 ml and not more than 230 ml of milk. The bottles with the milk probes should be coded (permanent marker) with country (B, Nl, F, Sl, T, Pl, D), short code of farm and date of sampling. In the second week of January 2017 bulk milk bottles should be sent in the Styrofoam or any other box, which is helpful in delivery of frozen goods to the laboratory at the Institute of Genetics and Animal Breeding in Jastrzębiec. Order for delivery should be within 2x24 hours, only sending on Monday or Tuesday of the week. Please send samples to the following address:

Mr. Grzegorz Grodkowski
Instytut Genetyki i Hodowli Zwierząt PAN Jastrzębiec
ul. Postępu 36 A
05-552 Magdalenka, Polska/Poland

Please also notify us by e-mail about the shipping (g.grodkowski@ighz.pl or t.sakowski@ighz.pl), so we will able to handle the samples immediately.

Animal's diet

Please make an estimation of the cow's diet of the previous three days before each sampling. Only take a sample, if the diet was more or less constant during this period, otherwise wait till three successive days of constant diet of the cows. Please describe every month:

- Average milk yield (kg), fat (%), protein (%) per cow (at day of sampling)
- Estimate the intake of all fodders in kg DM/cow: hay, grass silage, maize silage, beets, concentrates, dried grass pellets, etc.
- If cows are grazing, please mention: number of hours per day on pasture

If possible describe the concentrate composition in percentages of components (barley, pea, lupine, oat, etc).

Fodder Composition

Farm ID: **Date:** **Country:**

Fodder (kg DM/cow) Fresh grass, hay, grass silage, maize silage, beets, concentrates, dried grass pellets, etc.	
Concentrate composition (barley, pea, lupine, oat, etc.):	
Pasturing (h/day):	

Information about pasture (fertilizers, minerals, crop rotation)

Overview of milk mid-infrared spectrum recording

Cow or bulk sampling

As recommended by ICAR for cow milk recording based on morning and evening sampling, a composite sample from 2 consecutive milkings (50/50) using an ICAR approved sampling device is stored immediately at 4°C with preservative (e.g. bronopol 0.02%). Identical procedure can be used for bulk milk (4°C and preservative). The milk sample has to be stored in an appropriate vial and stopper in order to prevent any loss or damage: a too large empty volume above the milk may facilitate churning during transport, a too small empty volume above the milk may cause problems with mixing at laboratory and fat loss may occur with imperfectly tight stopper.

Be aware that the milk sample cannot be frozen!

Analysing

The milk sample has to be analysed within the week with a FTMIR spectrometer. Ideally, the analysis is performed with an instrument from a lab participating to the spectral standardisation realized by the Walloon Agricultural Research Centre and organized by the European Milk Recording EEIG (for more information see http://www.milkrecording.eu/).

For the analysis on the spectrometer, heat the vial in a water bath first (be sure the cap is well closed) until the sample reaches 40°C (+/- 2°C). Once the temperature of 40°C is reached, gently stir the sample three times before analysis. Do not leave the sample in the water bath for too long (max. 30 minutes before analysis with the spectrometer).

Data base

Milk components (e.g. fat and protein) and mid-infrared spectrum (wavenumbers and absorbance or transmittance values) can be extracted from the spectrometer according to the manufacturer's instruction. For each sample it is important to store additional information needed to standardize the spectrum: dates of sampling, analysis and the identification of the spectrometer used (brand, model and unique ID).

Overview of energy balance recording

The energy balance (EB) is the difference between the energy intake (feeding) and energy demand (energy requirements for general activity, maintenance, growth, production and reproduction).

EB estimation based on energy input minus energy output

Banos and Coffey (2010) described how to calculate EB from effective energy intake and effective energy demand per day for milk production, for maintenance and for activity. Those effective energies were calculated based on daily phenotypic records for milk yield, milk fat percentage, milk protein percentage, dry matter intake, live weight and body condition score and on feed analysis measures (metabolisable energy content, organic matter concentration, in vitro organic matter digestibility and crude protein). This method requires a lot of information on feed and on the animal.

EB estimation based on body reserve changes

Thorup et al. (2012) described an on-farm estimation of EB using daily body weight measurements and biweekly body condition score recording. EB could be calculated from changes in body lipid and body protein which are estimated from the changes of body weight and body condition score.

EB estimation based on milk composition changes

Lovendahl et al. (2010) and Friggens et al. (2007) presented an equation based on milk measures from two consecutive days (smoothed values when all variables were available for all days in lactation).

EB = 132.769 + 13.0675 * MFC – 140.304 * (F/P) – 95.1219 diff(MY) – 172.65 diff(F/P) + 802.306 diff(mPY)

This equation uses milk fat content (MFC), milk fat:protein ratio (F/P), differences of two consecutive days (current – previous) of milk yield (diff(MY)), of milk fat:protein ratio (diff(F/P)) and of milk protein yield (diff(mPY)).

Overview of grazing feed intake recording

Several factors influence the voluntary feed intake (during grazing). There are extrinsic factors as, environment, weather, herd management and supplementation with concentrate or silage. Intrinsic factors of the cow or the pasture also have an impact on this feed intake, like the intake capacity (based on rumen size for example), breed, physiological status, milk production level, digestibility and palatability of forage.

At herd level

Direct measurement of feed intake can be based on difference of herbage mass estimated before and after grazing if the two estimations are done during a short grazing period (1 or 2 days) and if the stocking rate is high (ideally all grass of the grazing area is consumed). The herbage mass is estimated by (1) cutting and weighting the grass harvested on a defined area or (2) using a 'sward height meter' or 'rising plate meter' for grass density and quantity determination. Be aware that this determination needs a calibration step.
If the grazing period extends a week, you need to take into account the grass regrowth, so exclosure cages are required to determine the herbage mass obtained by growth during this grazing period.

At animal level

For information purposes, indirect estimation is possible using marker technique as n-alkanes method (Mayes et al., 1986) or indigestible external marker (TiO_2 or Cr_2O_3).
New methodology for the indirect estimation uses near infrared reflectance spectroscopy (NIRS) (Decruyenaere et al., 2009, 2015). Faeces are sampled directly from the rectum of the cow or from fresh dungings at the pasture. Faeces samples are then oven-dried in thin layers (max. 2 cm thick) at 60°C for 48h (until constant weight). The layer is turned over several times during drying to prevent the growth of moulds. Dried samples are ground finely in a laboratory mill equipped with a 1 mm sieve. Then the ground samples are analysed with NIRS spectrometer and spectral information is compared to reference spectral data base in order to predict feed intake. For more information contact Dr Virginie Decruyenaere at Walloon Agricultural Research Centre (v.decruyenaere@cra.wallonie.be)

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