



WP4 Tailored Standard Operating Procedures

Report on improved external validated sensor based SOPs

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1. Introduction

The main objective of this 4D4F workpackage is to develop(/test/implement) a series of Standard Operating Procedures (SOPs) which can be tailored to the specific needs of individual farms when adopting sensor and data analysis technology in dairy farming.

Standard Operating Procedures (SOPs) will set out protocols for how farmers perform specific tasks in such a way that other people can do the same task according to the protocol. In the 4D4F environment we see that tasks and processes more and more are supported and driven by data, the sensors that are used for monitoring, advice systems and machines to perform actions. So also for these situations SOPs are needed. In this report we describe the results of the SOP development process in the context of the 4D4F project. The SOPs will be designed so that they can be tailored to individual farmer needs. In the workpackage the following five tasks are foreseen. In this report we describe the results of the first task.

- **Task 4.a Develop draft Standard Operating Procedures (SOPs):**

This task will identify a set of topics (at least 10 e.g. the use of sensors to monitor mastitis, humidity in dairy housing) in which SOPs are needed and work with partners to establish a special interest group for each topic. A special interest group will typically contain 2 or more farmers, a technology company, an advisor/vet and a researcher/facilitator who will work together to develop a SOP for their topic area.

- **Task 4.b Test the Standard Operating Procedures**

This will be led by VHL with support from other partners to ensure the SOPs are tested in a variety of farm situations from across Europe. It will also learn from emerging systems which integrate sensor data into decision making such as Herd Navigator from DeLaval.

- **Task 4.c Integrate SOPs into a management decision tool:**

It will test how to integrate the SOPs into a strategic dairy decision support tool (OptiCow) which has already been developed by ZLTO in consultation with dairy farmers. This will be done by working with 30 farmers to gather relevant information (from sensors and other sources), define the objectives of the farm, describe the expected effects, check if these effects are realized and if necessary revise the tool to address farmer feedback (the plan – do – check – act cycle). This will enable the 4D4F network to evaluate how to implement the SOPs seamlessly with existing dairy decision support tools.

- **Task 4.d Publish Standard Operational Procedures (SOPs) which are capable of being tailored to specific farm situations:**

This task will create easily accessible materials for each SOP developed and tested in tasks 4a and 4b.

- **Tasks 4.e Link to EIP Operational Groups:**

This will be led by the network coordinator (Innovation for Agriculture) and will focus on ensuring that the SOP working groups created by the 4D4F project link to appropriate EIP Operational Groups and/or where groups focused on dairy sensor technology do not exist work with project partners to stimulate their creation.



Literature review

The International Conference on Harmonization (ICH) defines standard operating procedures (SOPs) as 'detailed, written instructions to achieve uniformity of the performance of a specific function' (Nickols, 2000). The ICH GCP cites in section 2.13 that 'systems with procedures that assure the quality of every aspect of the trial should be implemented'. Companies that write or are going to write SOPs, need to take these two very precisely. It says that SOPs need to be detailed, and need to be set out by writing. Traditionally SOPs contained a large amount of paper, but most SOPs are becoming more digitally available (Nickols, 2000).

In short: every document giving written instructions on how to do a task, or describing a system is considered an SOP (Edy et al., 2007). Some procedures for different areas of an organization are given different names. What these different types of instruction documents are called is really a matter of convenience for the different organizations. SOPs inform people what to do, and how to do it. That means that there are many different types of SOPs, for many different tasks all over the world. All of these SOPs contain different content and are very specific to an organization (Edy et al, 2007).

How to apply SOPs in Dairy Farming

But how can we make SOPs more useable in dairy farming? Today's farms are getting more and more in touch with automatic systems, such as for example milking robots, sensor technology and more real-time applications that make work on a dairy farm more easy. SOPs can help to make a decision on what to do when a certain alarm shows up when using sensors on cattle. But farms also get bigger and bigger in size and amount of cattle. This is also where SOPs can help managing a dairy farm.

But what is the difference between the organization of an average farm and a big farm? The biggest difference can be found in the perspective of the manager and his tasks on his farm. On an average farm the manager is mostly doing all of the tasks. On the bigger farm the manager is the person who controls the activities on the farm, done by co-workers, contractors or freelancers. The manager controls the overall farm, and the co-workers or contractors are just responsible for a part of the fulfilment. The combination of the manager and all the persons working on the farm is determinative for the success of the dairy farm (Zijlstra e.a., 2008). Other differences between an average farm and a bigger farm are the speed of growing, and the relevance for the farmer.

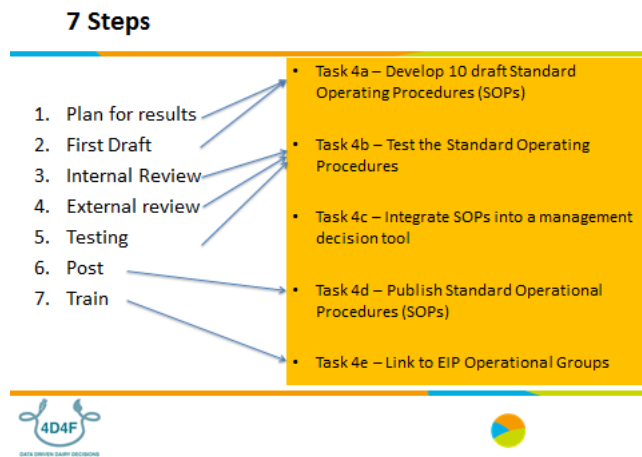
Jelle Zijlstra (2013) describes how labor on a farm should be organized after a so called 'growing phase'. The next challenge for the farmer after getting a certain size or amount of cattle, is to organize and manage the big farm. Important is to look at communication between co-workers on the farm, which is the key for a healthy working farm.



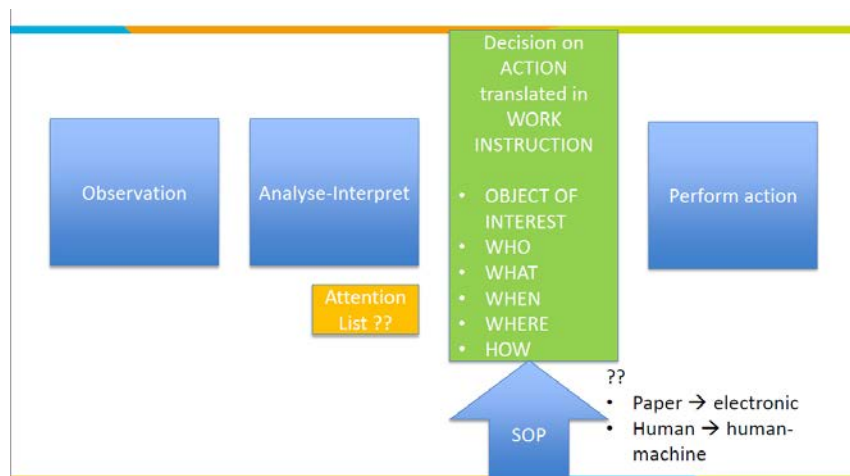
2. Methods and materials

The adopted method for this work package is developed by PennState Extension and called 'Standard Operating Procedures: A Writing Guide'. This Writing Guide contains 7 steps of developing and implementing SOPs. And also knowhow about how define systems, procedures and steps and formats for Standard Operating Procedures. This Writing Guide is also the basis behind DeLaval's SOPs. Source: <http://extension.psu.edu/animals/dairy/hr/personnel/ud011>

In the following figure the relation between the 7 steps and the work package tasks is described.



In addition, the figure below has been used for subscribing the actions.



Scheme for developing SOPs (Source: Kees Lokhorst)

How to read the results?

In chapter 3 you'll find several different Standard Operating Procedures (SOP). These SOPs are composed with a starting point of European farmer who want to start with working with SOPs and with sensors. Irrelevant in this report is the size of the farm. So this means the SOPs are not only developed for large farms with staff but also for family farms.

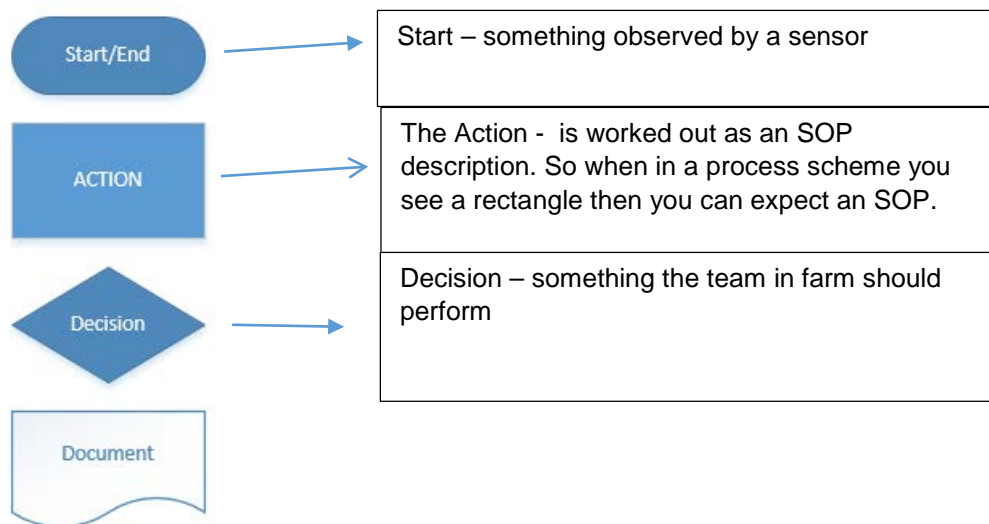
Every SOP on every farm is different. It depends on the aims of the farmers and the type of sensors they want to use. So in this report we present some examples of SOPs. When you want to adopt



them into your farm, we will advise you to ask your (technical) advisor to support you with adopting SOPs.

In the beginning of each SIG you'll find an overview belonging to the subject of the SIG. In this overview there are empty spaces. These empty spaces mean that there are a lot more possibilities to develop SOPs and to input sensors. Every process will be changing by adding sensors. Every sensor will have a different operating procedure.

For making flowcharts of a PROCESS the next symbols are adopted;



For the classification of the SOP's we use the SIG classification of the 4D4F project. In the next chapters per SIG the same structure will be used.

Level 1: 4D4F SIG number and process

Level 2: SENSOR

Level 3: DATA

Level 4: SOP

In the SIG/process level it is identified on which topic we work and described what the context is. You should imagine that the process is triggered by output (data) from a sensor. The sensor level we brought in to be able to show the difference when the same process is supported with different sensors and different data. The work instructions that should be described as a SOP in such a way that for the object of interest it is clear who does what, when, where and how.



Method of improving the SOPs

To test how to improve the existing SOPs and how to integrate the SOPs into a strategic dairy decision support tool, during the first quarter of 2018 there were organized 5 multi actor workshops occurred in Belgium, Sweden, United Kingdom and The Netherlands. VHL delivered the script of this workshop.

During a workshop we have a few topics according to the SOPs we would like to be highlighted;

- Is the method of current SOPs correct?
- What are the weaknesses and the strengths of the current SOPs?
- Which modifications of the current SOPs are necessary to make them practically feasible?
- How would the SOP look like if you would design these SOPs?
- Create an improved version of the SOPs

The workshops have been held in co-operation with, AB Vakwerk, IceRobotics and 4D4F-partners like Delaval, ZLTO, IfA, ILVO and Liba. SOP experts, farmers and advisors were attending the workshops.

The flowcharts in this report have been discussed step-by-step during the several workshops.

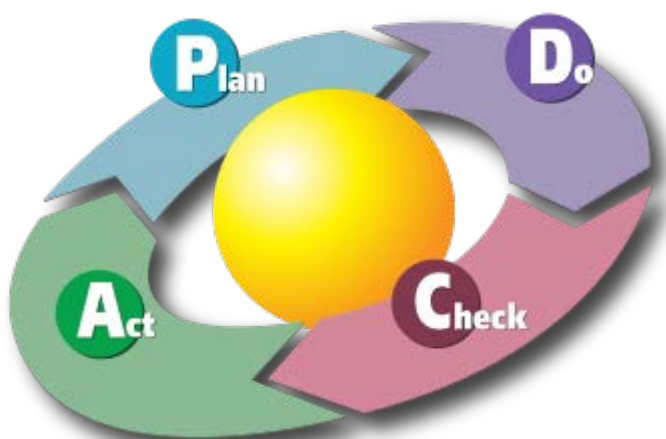
The output of these workshops has been the base of the improvements of the SOPs

4D4F SIG overview

1. Udder Health
2. Lameness
3. Nutrition
4. Reproduction
5. Data management
6. Milking data
7. Activity and behaviour
8. Metabolic diseases
9. Calves and young stock
10. Goats
11. Grassland management
12. Housing

General assumptions

You should consider these SOPs as an example of useful SOPs in practice. But when you will implement these SOPs in your own management you need to adjust them to your own management. Before you can adjust and adopt the SOPs on your own farm you need to use the **PDCA-cycle**.



First you need to make a **plan**. This plan has to contain the next two questions; What business goals will be achieved through better management with this SOPs? And how will those goals be measured? Then you need to adjust the SOP into your own (business)plan. Afterwards you have to implement the plan (just **do** it). When you have implemented the plan, the SOP, on your farm you have to collect data. **Check** the actual results by studying the data. Compare these to your plan. After checking the actual results you need to act on these. Are the results you suspected? You should **act** going forward with this SOP otherwise you need to probably change your plan or your SOP to fit better into your management.

The major aim of this report is to provide insight in the possibilities to develop SOPs.



3. Internal validated sensor based SOPs

3.1 Udder Health

Mastitis, an inflammation of the udder tissue, is one of the most common and most costly diseases in dairy cattle. The majority of mastitis cases are caused by bacteria that enter through the teat canal. The most important bacteria include *Staphylococcus aureus*, *Escherichia coli*, *Klebsiella spp.*, *Streptococcus uberis*, *Streptococcus dysgalactiae*, and *Streptococcus agalactiae*.

The economic repercussions of mastitis are considerable. Possible financial losses include a decreased milk production, discarded milk, treatment costs, additional labor, veterinary services and a higher culling rate. The average cost of one case of mastitis is estimated at +/- €300, with large differences depending on the severity, withdrawal times and veterinary legislation differing between countries. Mastitis therapy and dry-cow treatment are also the primary indication of antibiotic use in dairy cattle.

The symptoms of clinical mastitis include a drop in the milk yield, flakes or clots in the milk, watery milk, swelling of the mammary quarter, redness of the udder skin, fever and general illness. Detection with sensors can e.g. be made through conductivity, temperature, colour and LDH.

Maintaining a good udder health on AMS farms has proven to be even more challenging. The somatic cell count and the total bacterial count of milk is often higher in AMS farms compared to conventional dairy farms, whereas treatment cases are reported to be lower. Special attention should be paid to the hygiene management of the milk robot, the cubicles and the floors in the dairy barn.¹

The plan for results of this SIG will be described like:

What business goals will be achieved through better management with this SOPs?

By using these SOPs the udder health will improve. Like the somatic cell count (SCC) will decrease, the cows will both be healthier and increase in milk yield. It will also result in decrease the veterinarian costs and the use of antibiotics as well as waist of milk.

How will those goals be measured?

The udder health can be evaluated by monitoring:

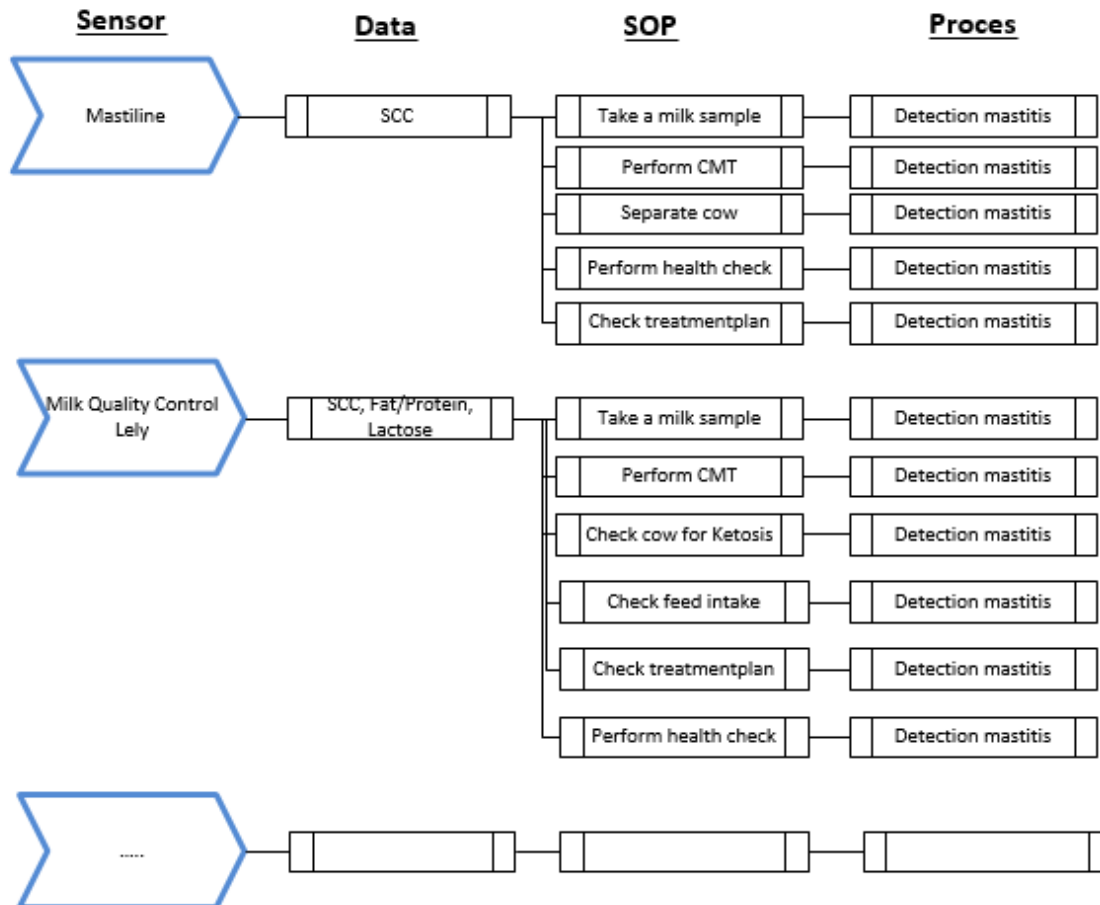
- Individual somatic cell counts (at cow and quarter level)
- Bulk milk somatic cell counts
- Bacterial culturing
- Electrical conductivity (and other sensor-related data)
- Antibiotic use
- Clinical mastitis records

For detail description; see Best Practice Guides on the 4D4F website.

¹ Source: BPG Udder Health



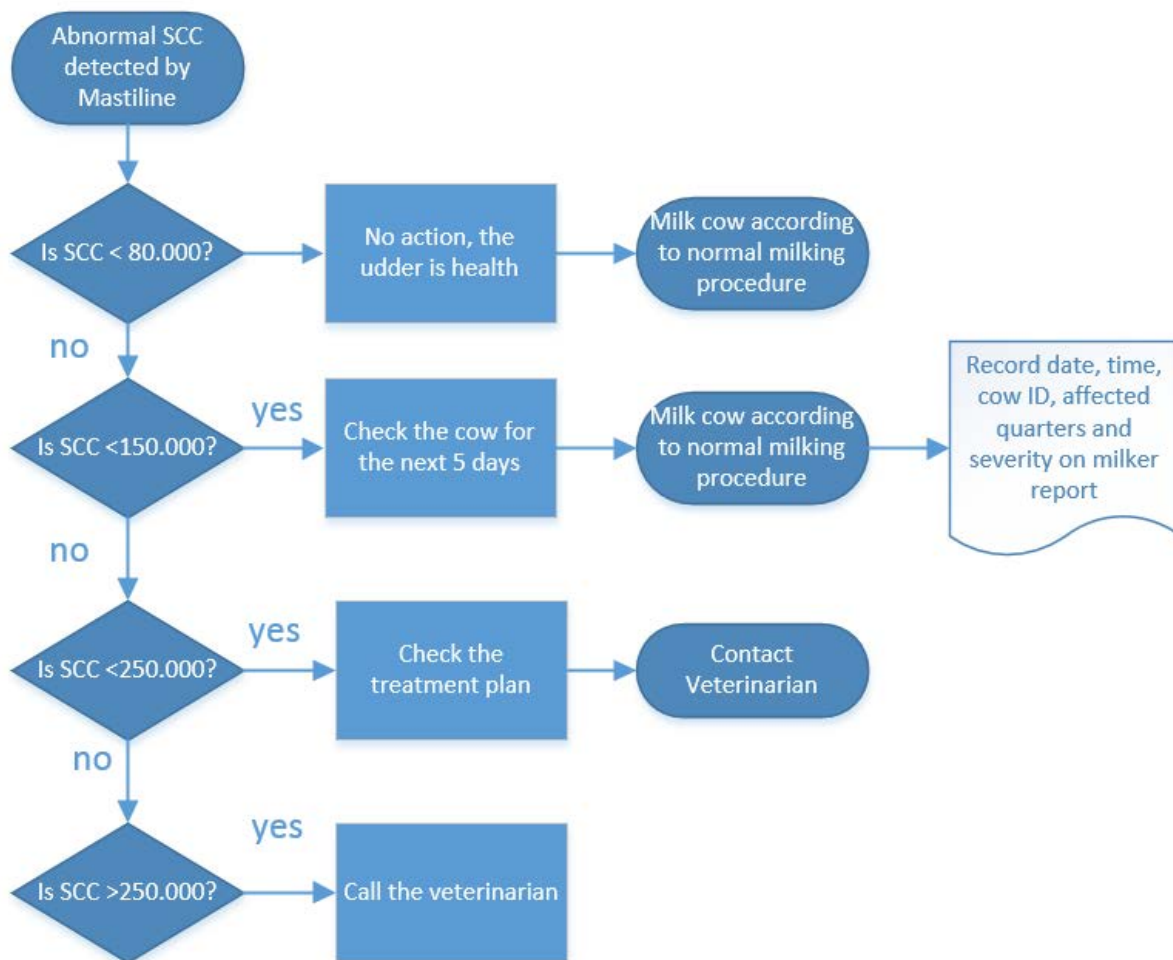
SIG 1 – Udder Health





Mastiline – SCC - process detection mastitis

- Original-



Note: the SCC numbers are an example. It depends to every different farm and management system/goals of the farmer.



SOP – No action

Object of interest: The udder
Who: The person who is responsible for the mastitis
What: No action
When: By SCC between < 80.000
Where: No specific area
How: Milking the cow just like all the other cows.

No action, the
udder is health

SOP – Check the cow

Object of interest: The udder of the cow
Who: The person who is responsible for mastitis
What: Check the cow for the next 5 days
When: When the SCC is higher than 150.000
Where: In the milking parlour
How: see how to pre milk the cow

Check the cow for
the next 5 days

HOW TO PRE MILK THE COW

1. Clean all four teats
2. Make sure the floor under the udder is clean
3. Milk the cow by hand until you have 4 milk rays
4. Do you see deviations? Like flakes or is the milk washy?
5. Write down the deviations
6. Clean your hands
7. Clean the floor



SOP – Check the treatment plan

Object of interest: Treatment plan
Who: The person who is responsible for the mastitis
What: Check the treatment plan
When: By SCC between 150.000-250.000
Where: In the office
How: On the computer

Check the
treatment plan

SOP – Call the veterinarian

Object of interest: Veterinarian
Who: The person who is responsible for mastitis
What: Call the veterinarian
When: When the SCC is higher than 250.000
Where: Wherever you are
How: Call number.....

Call the veterinarian



Mastiline – SCC - process detection mastitis

- Changes-

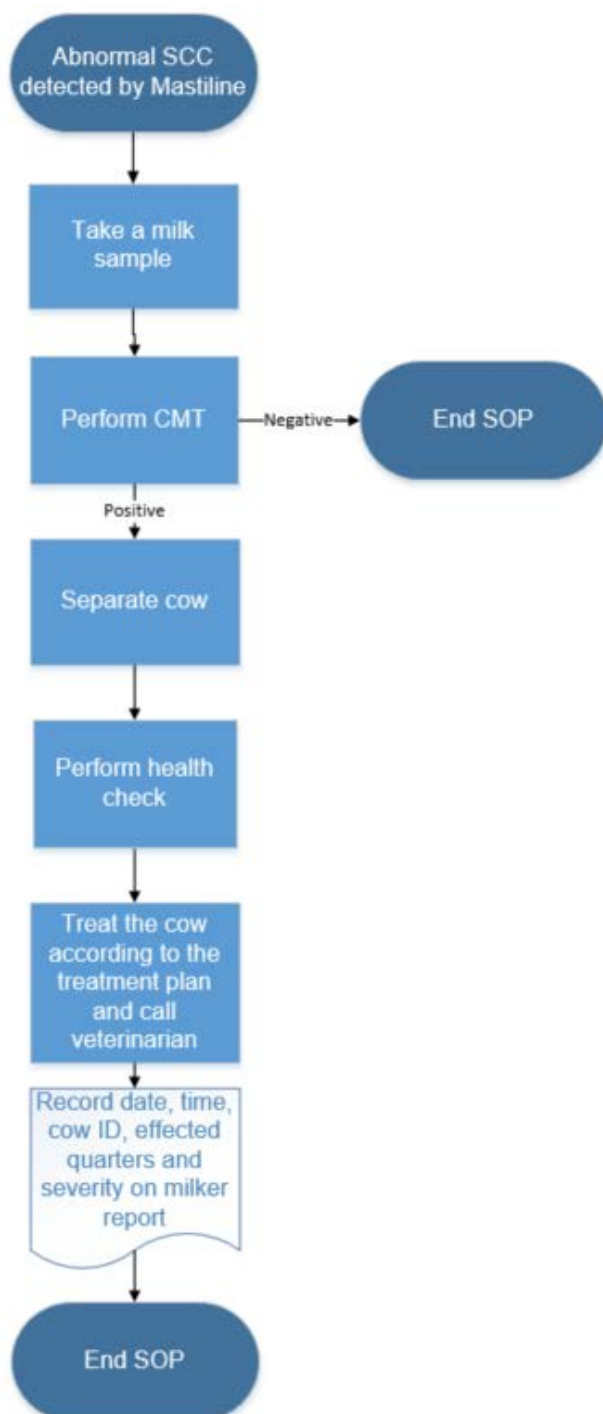
Below an overview of the made changes in the original SOP:

- Deleted “No action”, when something abnormal is detected there must always need to performed an action. Otherwise the you have to change the threshold.
- Deleted “decisions about the amount of SCC”, this will be covered in the treatment plan on dairy farms.
- Deleted “check the cow for the next days”, this action depends on the treatment plan.
- Combined “check the treatment plan” and “call the veterinarian”, depending on the treatment if calling the veterinarian is necessary.
- Added “take a milk sample”, a milk sample is necessary to diagnose de right disease according to udder health. It can also have the function of a quality check, when the treatment does not strike, the veterinarian has the original disease to prescribe the right treatment.
- Added SOP “take a milk sample”
- Added “separate the cow”, to prevent contamination it is always recommended to separate the cow from the herd, especially in case of udder health.
- Added an extra step to the description of “how to perform a CMT”, see step 7.
- The format of the SOP/process can also be changed, see the second improved version below.



Mastiline – SCC - process detection mastitis

- Improved-





SOP – Take a milk sample

Object of interest: Milk sample

Who: The person who is responsible for the mastitis

What: Take a milk sample of one or more suspected quarters

When: When you suspect mastitis

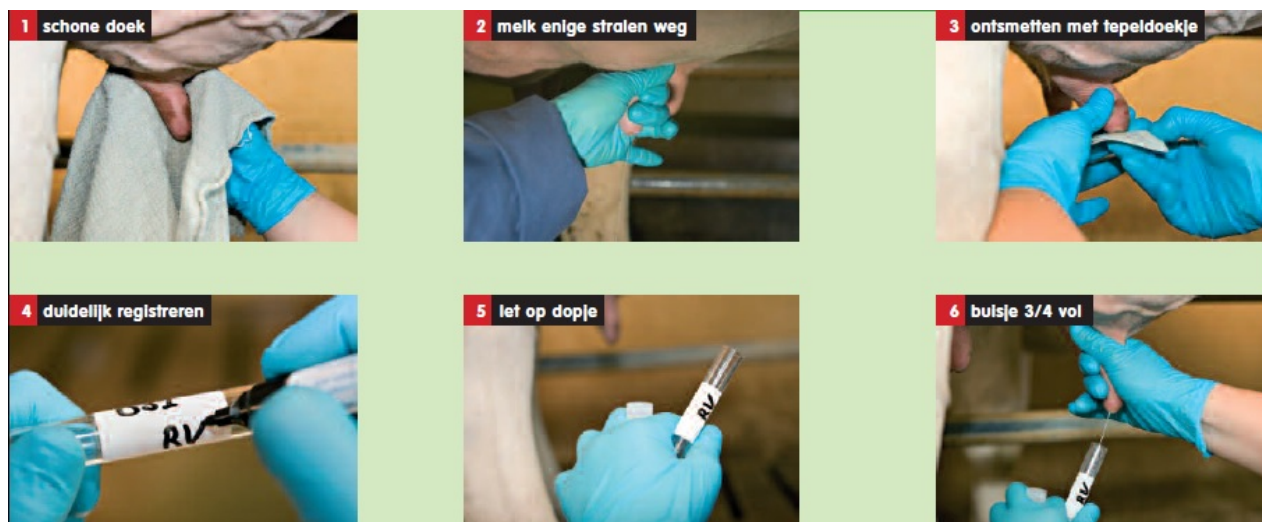
Where: In the milking parlour

How: see how to take a milk sample.

Take a milk
sample

HOW TO TAKE A MILK SAMPLE

1. Clean the quarter(s) with a clean cloth
2. Pre-milk the quarter(s)
3. Disinfect the teat(s)
4. Register on the tube the number of the cow and which quarter it contains
5. Make sure the cap of the tube stays (also) clean
6. Milk the quarter by hand in the tube until 75% of the tube is filled.
7. Take the milk sample to the veterinarian for further bacterial research



Source: UGCN



SOP – Perform the CMT

Object of interest: The CMT test

Who: The person who is responsible for the mastitis

What: Perform the CMT test on all four quarters

When: When you suspect mastitis

Where: In the milking parlour

How: See how to perform the CMT.

Perform CMT

HOW TO PERFORM THE CMT

1. Clean the four-well plastic paddle exhaustively
2. Pre-milk every quarter
3. Put the four-well plastic paddle straight underneath the udder, keep around 5 cm space between the udder and the four-well plastic paddle. Milk every quarter twice in a separate cup of the four-well plastic paddle
4. Remove the four-well plastic paddle from the udder. Keep the four-well plastic paddle slantwise until the milk hits the marking lines.
5. Add CMT liquid to the milk. The amount of liquid has to be the same as the amount of milk.
6. Swerve the four-well plastic paddle for 10 seconds slowly until the milk and the CMT-liquid is mixed.
7. Check if the liquid in one of the cups the consistency has changed. This can be checked easily by tilting the paddle to one side. If the consistency has changed (read: become thicker) in one or more cups, the corresponding quarters are infected with mastitis. When the consistency has changed the result of the CMT is positive.



UGA is de uiergezondheidsaanpak van de GD



SOP – Separate the cow

Object of interest: The cow

Who: Farmer

What: Separate the cow

Where: Separation room

When: When the cow has an abnormal SCC and positive CMT

How: By separating the cow from the herd, most of the time installing action on the AMS or give instructions to the milker to separate the cow after being milked.

Separate cow

SOP – Perform health check

Object of interest: The cow

Who: The person who is responsible for the health

What: Check the cow for health issues

When: When you have a positive CMT

Where: In the barn

How: See appendix 'SOP health check'

Perform health
check

SOP – Treat the cow according to the treatment plan and call veterinarian

Object of interest: The cow

Who: Farmer

What: Treat the cow according to the treatment plan and call veterinarian

Where: Separation room or straw penn

When: When the cow has an abnormal SCC and positive CMT

How: By following the instructions in the treatment plan and calling phone number.....

Treat the cow
according to the
treatment plan
and call
veterinarian

Mastiline – SCC - process detection mastitis

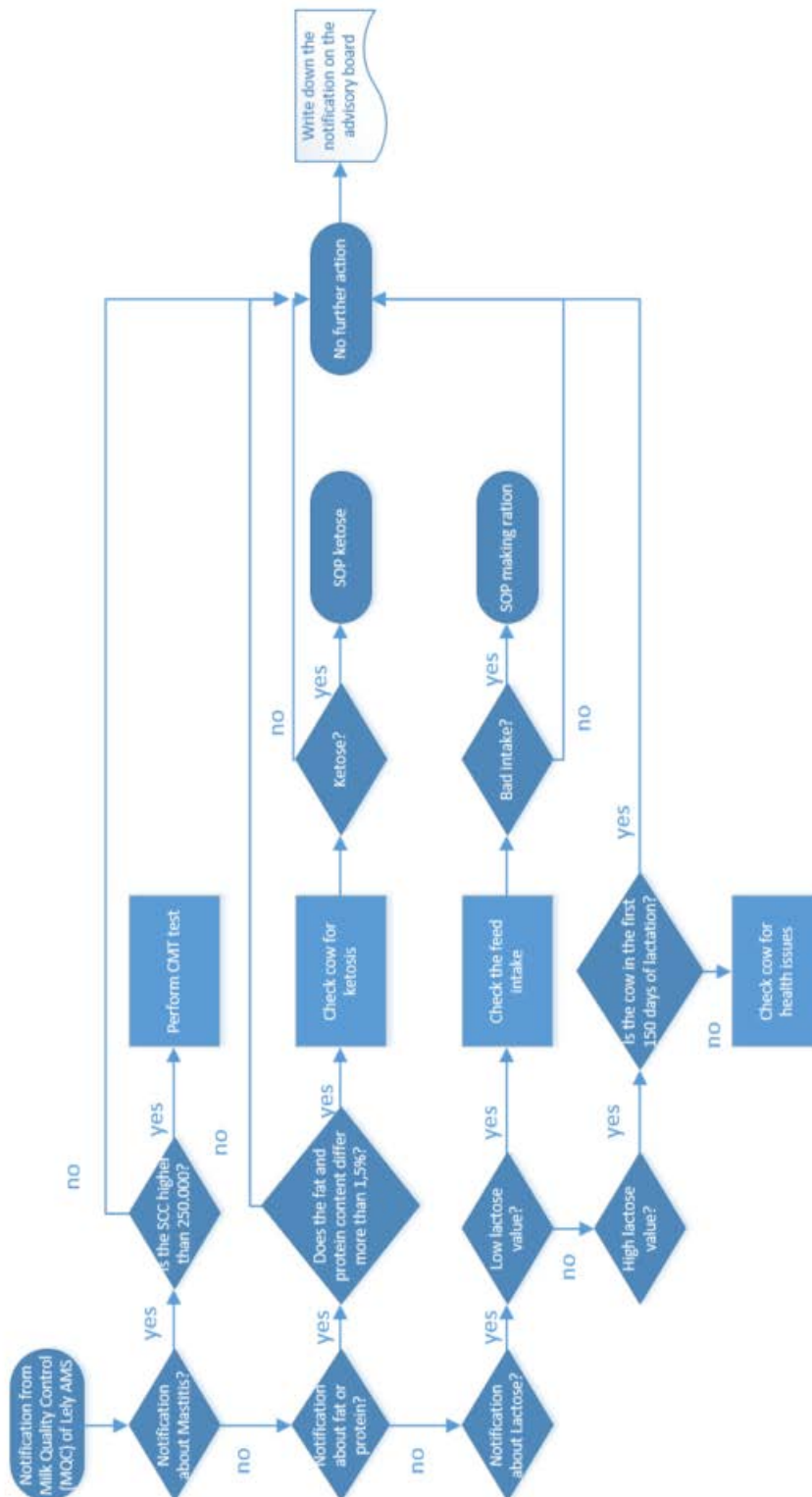
- Improved-

Because there are no decisions anymore in this flowchart the SOP/process could also look like:

Abnormal milk detected by Mastiline

1. Take a milk sample
2. Perform CMT
3. Separate cow
4. Perform health check
5. Treat the cow according to the treatment plan and call the veterinarian.
6. Record date, time, cow ID, effected quarters and treatment on the milker report

Supplemented with the above described actions.





SOP – Perform the CMT

Object of interest: The CMT test

Who: The person who is responsible for the mastitis

What: Perform the CMT test on all four quarters

When: When you suspect mastitis

Where: In the milking parlour

How: see how to perform the CMT.

Perform CMT test

HOW TO PERFORM THE CMT

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5. Add CMT liquid to the milk. The amount of liquid has to be the same as the amount of milk.
6. Swerve the four-well plastic paddle for 10 seconds slowly until the milk and the CMT-liquid is mixed.



UGA is de uiergezondheidsaanpak van de GD

SOP – Check the cow on Ketosis

Object of interest: The cow

Who: The person who is responsible for health

What: Check the cow on ketosis

When: When you have a notification of the MQC on fat or protein

Where: In the barn

How: to check if the cow has disease phenomena of ketosis

Check cow for
ketosis

SOP – Check the feed intake

Object of interest: The cow

Who: The person who is responsible for the feeding

What: Check the feed intake

When: When you have a notification of the MQC on lactose

Where: In the barn

How: to check if the cow has eaten enough during the last 5 days

Check the feed
intake



SOP – Check the cow for health issues

Object of interest: The cow

Who: The person who is responsible for the health

What: Check the cow for health issues

When: When you have a notification of the MQC on lactose

Where: In the barn

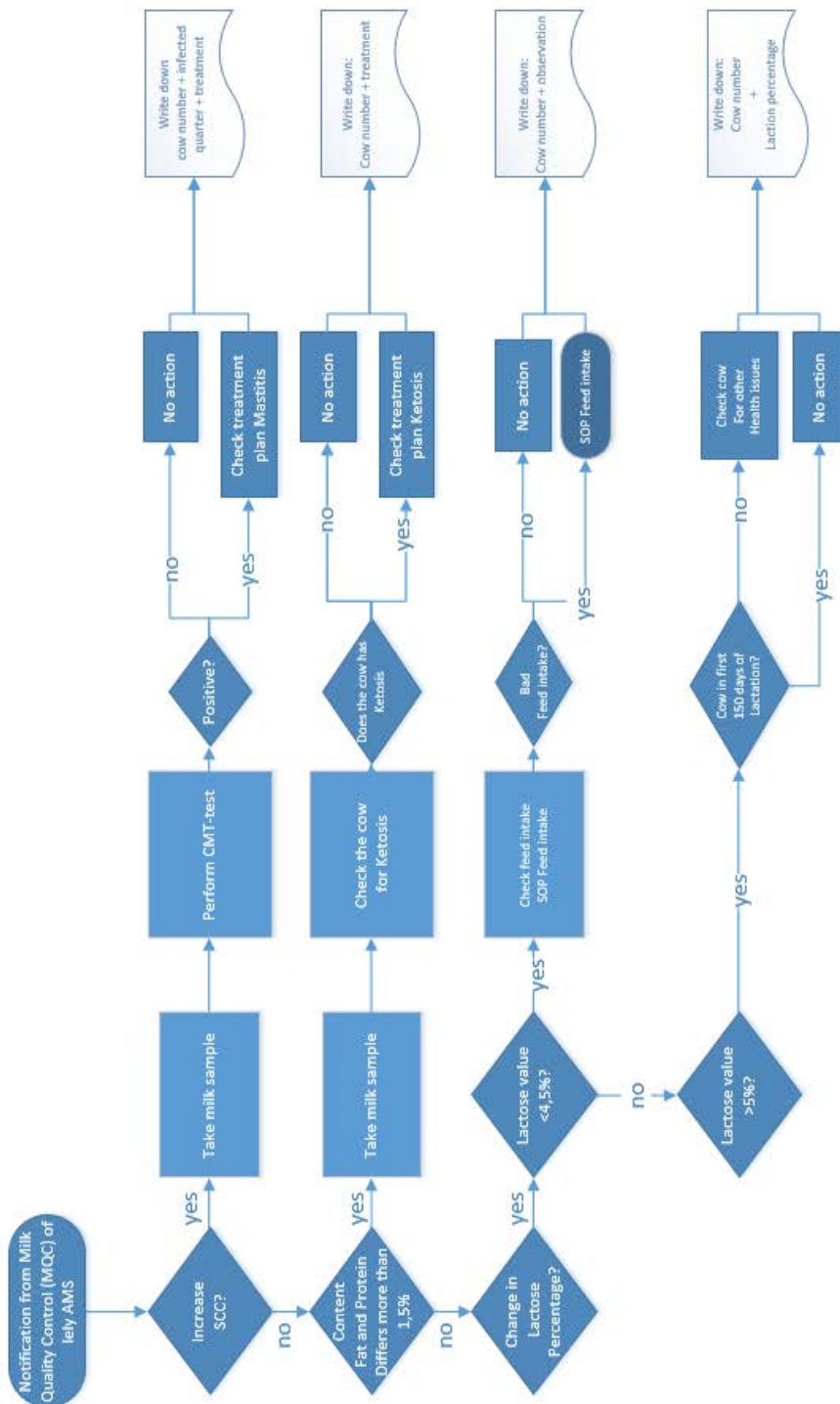
How: to check if the cow has disease phenomena

Check cow for
health issues



Below an overview of the made changes in the original SOP:

- Deleted “decisions about the amount of SCC”, this will be covered in the treatment plan on dairy farms.
- Added “take a milk sample”, a milk sample is necessary to diagnose de right disease according to udder health. It can also have the function of a quality check, when the treatment does not strike, the veterinarian has the original disease to prescribe the right treatment.
- Added SOP “take a milk sample”
- Added an extra step to the description of “how to perform a CMT”, see step 7.





SOP – Take a milk sample

Object of interest: Milk sample

Who: The person who is responsible for the mastitis

What: Take a milk sample of one or more suspected quarters

When: When you suspect mastitis

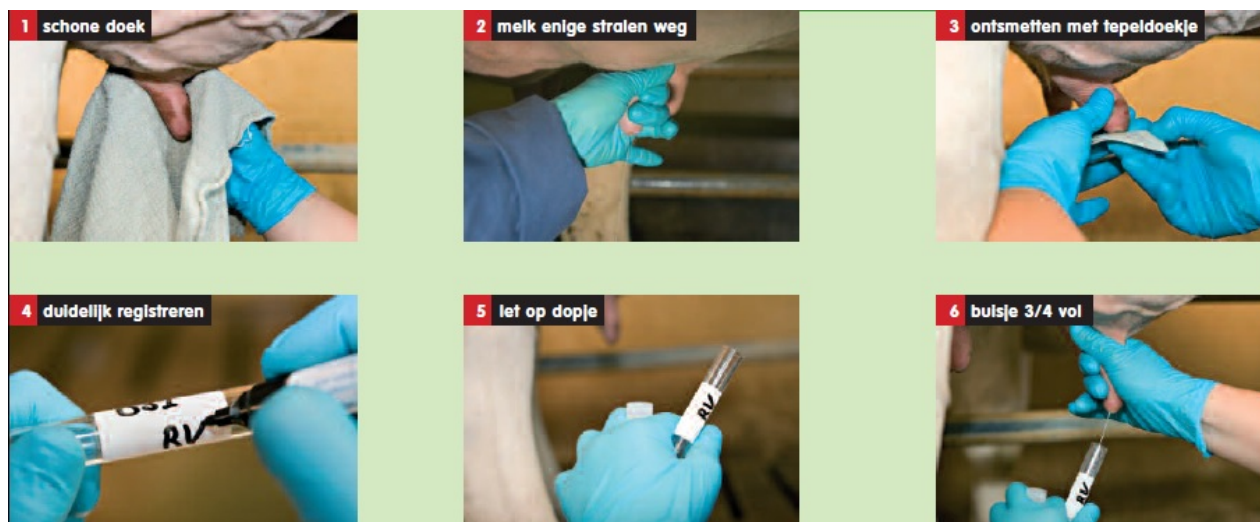
Where: In the milking parlour

How: see how to take a milk sample.

Take a milk
sample

HOW TO TAKE A MILK SAMPLE

1. Clean the quarter(s) with a clean cloth
2. Pre-milk the quarter(s)
3. Disinfect the teat(s)
4. Register on the tube the number of the cow and which quarter it contains
5. Make sure the cap of the tube stays (also) clean
6. Milk the quarter by hand in the tube until 75% of the tube is filled.
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Source: UGCN



SOP – Perform the CMT

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Who: The person who is responsible for the mastitis

What: Perform the CMT test on all four quarters

When: When you suspect mastitis

Where: In the milking parlour

How: see how to perform the CMT.

Perform CMT

HOW TO PERFORM THE CMT

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5. Add CMT liquid to the milk. The amount of liquid has to be the same as the amount of milk.
6. Swerve the four-well plastic paddle for 10 seconds slowly until the milk and the CMT-liquid is mixed.
7. Check if the liquid in one of the cups the consistency has changed. This can be checked easily by tilting the paddle to one side. If the consistency has changed (read: become thicker) in one or more cups, the corresponding quarters are infected with mastitis. When the consistency has changed the result of the CMT is positive.



UGA is de uiergezondheidsaanpak van de GD

SOP – Check the cow on Ketosis

Object of interest: The cow

Who: The person who is responsible for health

What: Check the cow on ketosis

When: When you have a notification of the MQC on fat or protein

Where: In the barn

How: to check if the cow has disease phenomena of ketosis

Check cow for
ketosis



SOP – Check the feed intake

Object of interest: The cow

Who: The person who is responsible for the feeding

What: Check the feed intake

When: When you have a notification of the MQC on lactose

Where: In the barn

How: to check if the cow has eaten enough during the last 5 days
(see Appendix: “**health check**” Feed intake)

Check the feed
intake

SOP – No action

Object of interest: The udder

Who: The person who is responsible for the mastitis

What: No action

When: CMT is negative

Where: No specific area

How: Milking the cow just like all the other cows.

No action, the
udder is health

SOP – Check the treatment plan

Object of interest: Treatment plan

Who: The person who is responsible for the mastitis

What: Check the treatment plan

When: CMT is positive

Where: In the office

How: On the computer

Check the
treatment plan

SOP – Check the cow for health issues

Object of interest: The cow

Who: The person who is responsible for the health

What: Check the cow for health issues

When: When you have a notification of the MQC on lactose

Where: In the barn

How: to check if the cow has disease phenomena

Check cow for
health issues



3.2. Reproduction

Reproduction is on the most farms a very important topic. With a good breeding system you have the opportunity to breed cows of good quality. You can aim on the goals you have in breeding. Nowadays there is a lot of information about the characteristics of the bulls and a lot of bulls to choose to use for breeding. Important KPIs on reproduction are; Submission Rate (SR) and Conception Rate (CR). The product of SR and CR is the Pregnancy Rate (PR).

In this chapter we are talking about the reproduction by cows as well as heifers.

The plan for results of this SIG will be described like:

What business goals will be achieved through better management with this SOPs?

By using these SOPs the KPI's on reproduction will improve. Like the amount of inseminations per cow per lactation and calving interval.

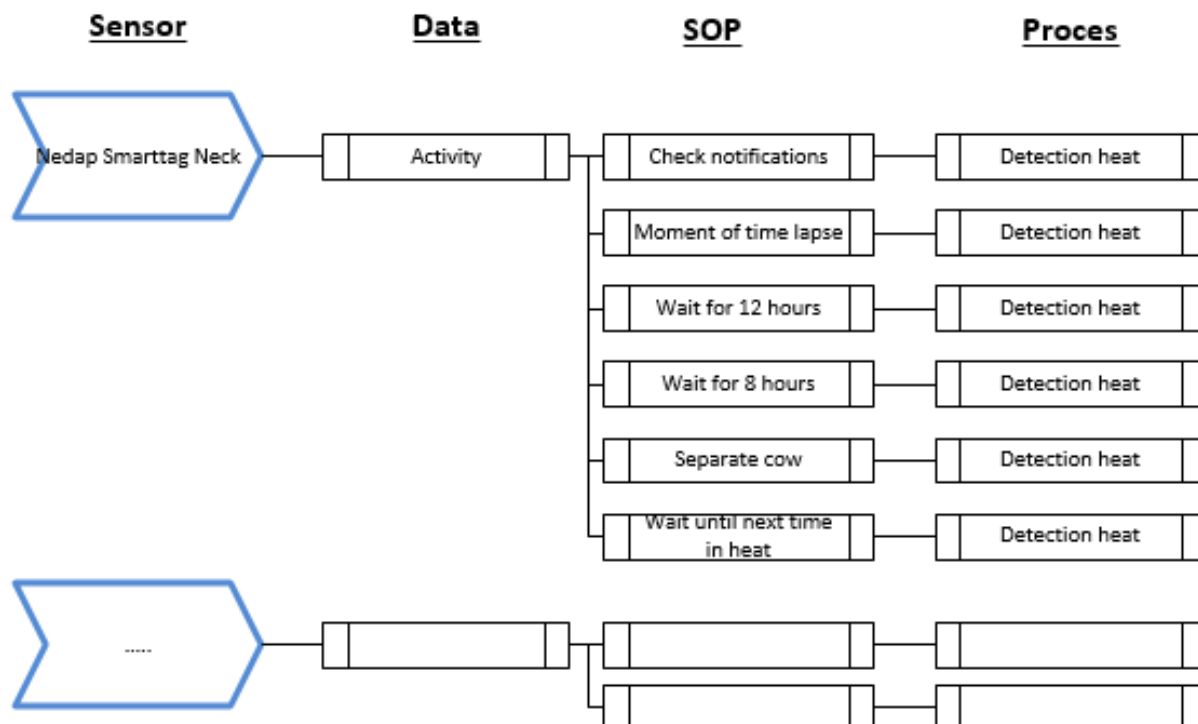
How will those goals be measured?

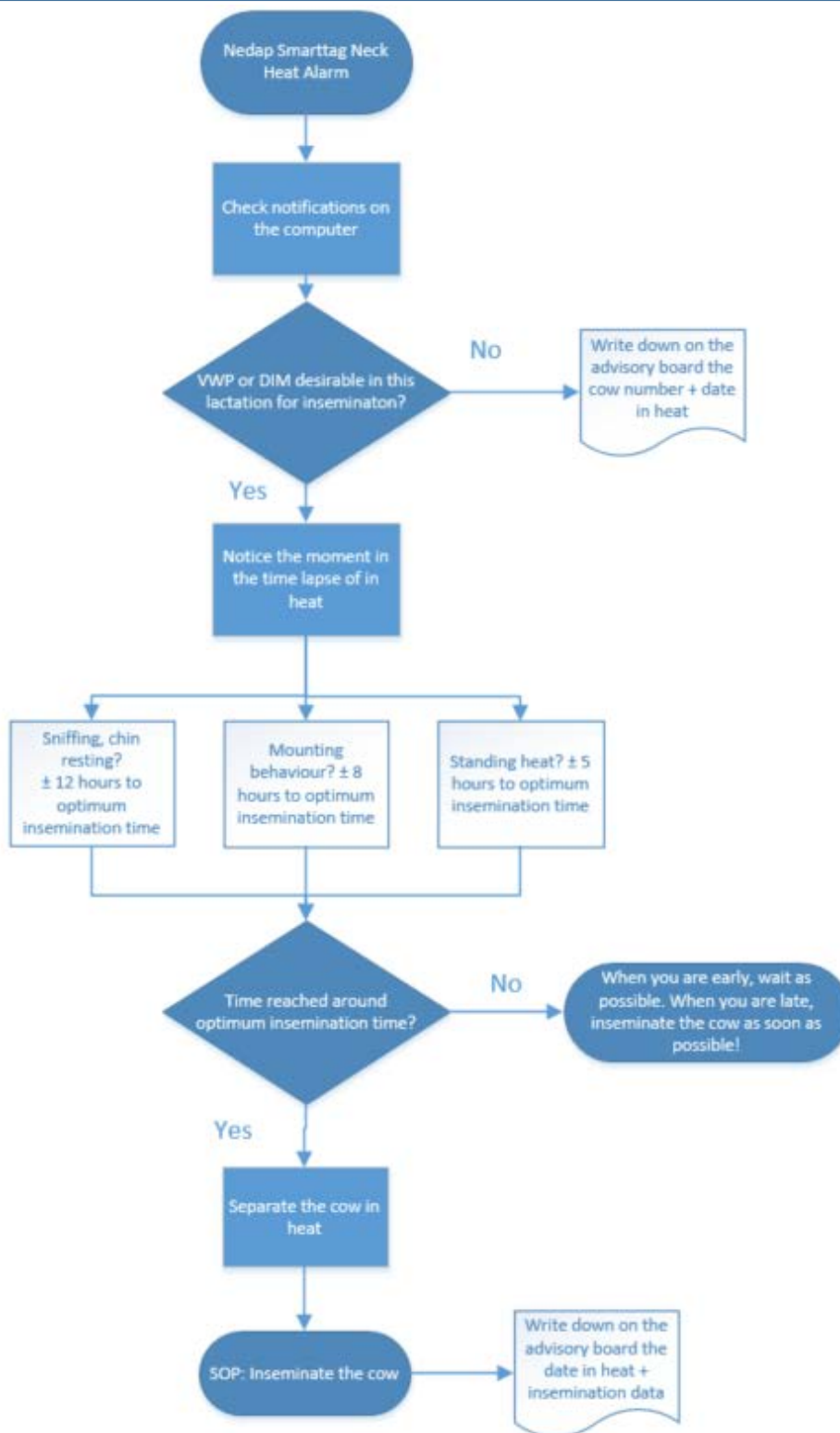
After the lactation you can see how much inseminations you needed to get the cow pregnant and how many days the calving interval was.

For detail description; see Best Practice Guides on the 4D4F website.



SIG 4 – Reproduction







SOP – Check the notifications on the computer

Object of interest: Attention list in heat

Who: The person who is responsible for reproduction

What: Check which cows (numbers) have an Nedap Smarttag Neck Heat Alarm

Where: PC/ Office

When: twice a day, in the morning and in the evening

How: Click on the list of attentions

Check notifications on
the computer

SOP – Notice the time lapse of in heat

Object of interest: the time lapse of the cow in heat

Who: Farmer

What: Notice the time laps of in heat

Where: Devise with the Nedap system installed

When: When there is a notification of the Nedap Smarttag

How: Checking the optimum insemination time on the notification

Notice the moment in
the time lapse of in
heat

SOP – Separate the cow

Object of interest: Cow in heat

Who: Farmer

What: Separate the cow in heat

Where: Separation room

When: If the Nedap Smarttag indicates it

How: By separating the cow from the herd.

Separate the cow in
heat

Note: The Nedap Smarttag Neck gives an indication of the optimum moment to inseminate the cow.



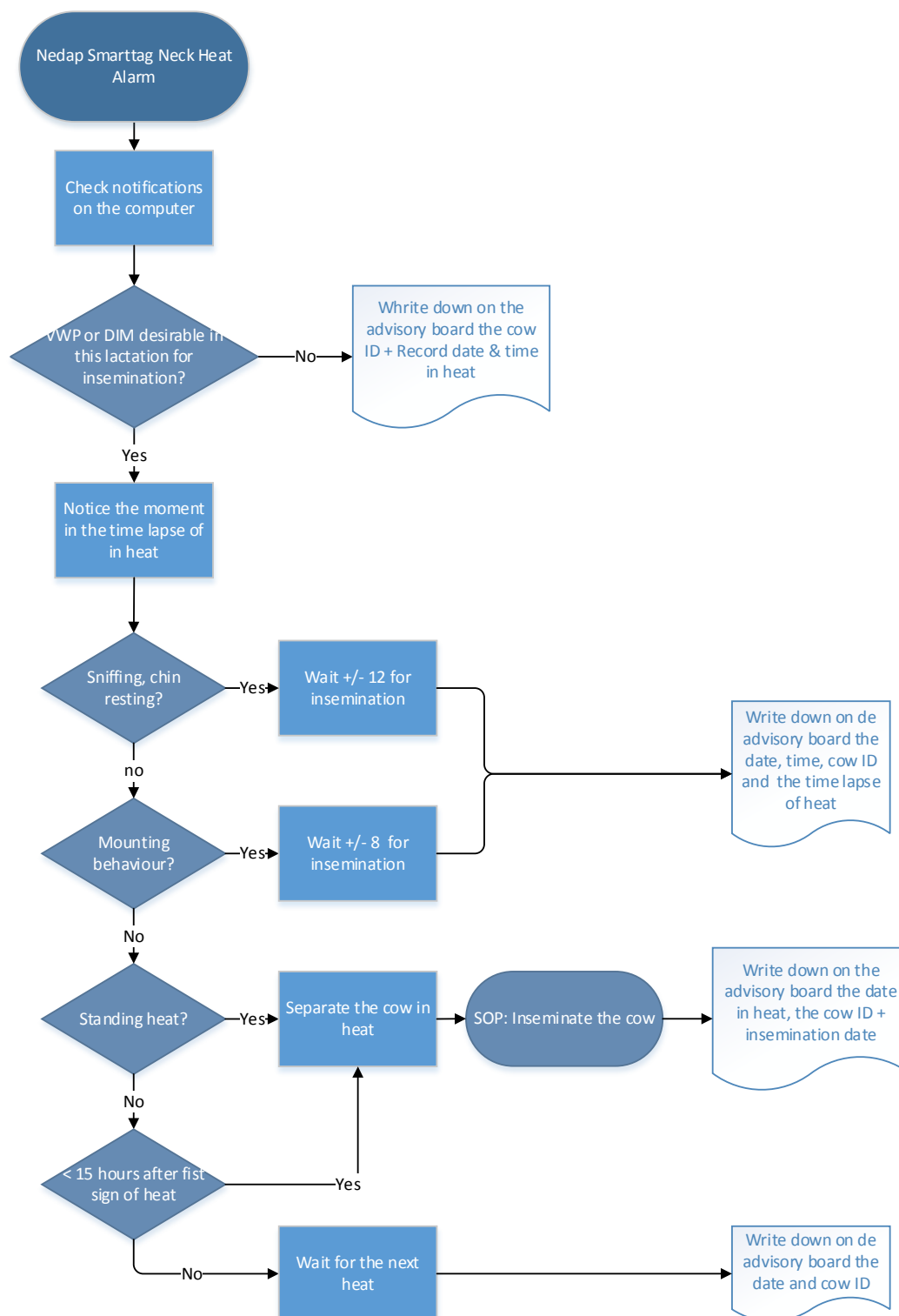
Below an overview of the made changes in the original SOP:

- Created decisions around the time lapse of insemination followed up by clear actions
- Made a clear decision about the amount of hours to inseminate the cow. So it is clear when it is too late to inseminate the cow. After this time the pass rate will decrease quickly.
- Added some extra information to SOP 'notice the moment in the time lapse of in heat', which make it easier to recognize the different moments of in heat.
- Added appendix about the optimal insemination moment



Nedap Smarttag Neck – Activity – Process detection heat

- Improved -





SOP – Check the notifications on the computer

Object of interest: Attention list in heat

Who: The person who is responsible for reproduction

What: Check which cows (numbers) have an Herd Navigator Heat

Alarm Where: PC/ Office

When: twice a day, in the morning and in the evening

How: Click on the list of attentions

Check notifications
on the computer

SOP – Notice the moment in the time lapse of in heat

Object of interest: moment in time lapse of in heat

Who: The person who is responsible for reproduction/ farmer

What: Check in which time lapse of in heat the cows is

Alarm Where: PC/ Office

When: When getting the notification

How: Check here below:

Notice the moment
in the time lapse of
in heat

The next step is to identify the moment of heat (Nedap, 2017). In the following explanations how to recognize the moment of heat (L. O'Connor, 2017).

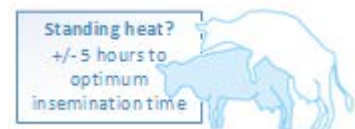
1. The cow is sniffing, chin resting and back rubbing;
2. Swelling and reddening of the Vulva;
3. More restless and alert to their surroundings;
4. Decreased Feed Intake and Milk Yield.



1. Mounting Other Cows;
2. Swelling and Reddening of the Vulva;
3. Bellowing, Restlessness, and Trailing;
4. Decreased Feed Intake and Milk Yield.



1. Standing heat;
2. Rubbed tail head hair and dirty flanks;
3. Mucus Discharge;
4. Sniffing Genitalia.



More info see **Appendix 1: Optimal insemination moment**



SOP – Wait +/- 8 hours for insemination

Object of interest: The cow

Who: Farmer

What: Wait 8 hours for insemination

Where: When the cow needs to be inseminated put her in the separation room

When: when the cow is in the right time laps of in heat to get inseminated (when the 8 hours passed by)

How: When the cow is in the right time laps the get inseminated, *call inseminator!*

SOP – Wait +/- 12 hours for insemination

Object of interest: The cow

Who: Farmer

What: Wait 12 hours for insemination

Where: When the cow needs to inseminate put her in the separation room

When: when the cow is in the right time laps of in heat to get inseminated (when the 12 hours passed by)

How: When the cow is in the right time laps the get inseminated, *call inseminator!*

Wait +/- 12 for
insemination

SOP – Separate the cow

Object of interest: Cow in heat

Who: Farmer

What: Separate the cow in heat

Where: Separation room

When: when the cow is in the right time laps of in heat to get inseminated

How: By separating the cow from the herd.

Mostly doing this with your management program.

Separate the cow in
heat

SOP – Wait for the next heat

Object of interest: the cow

Who: Farmer

What: wait for the next heat (+/- 3 weeks later)

Where: Separation room

When: You are too late to inseminate the cow

How: By writing the day of in heat and cow ID on the white board or management program.

Wait for the next
heat



3.3 Milking Data

Milk in itself is a great tool for managing your herd's health, production and fertility. National dairy herd improvement associations and animal health organizations therefore offer many different milk analyses on bulk milk or individual milk samples, such as:

- **Disease testing:** measuring the level of antibodies against Johne's disease, Leptospirosis, Salmonella, BVD, IBR, Q-fever, Neospora, liver fluke, ...
- **Pregnancy checks:** by measuring the amount of progesterone or pregnancy associated proteins in milk (PAG)
- **Microbiology:** diagnosis of mastitis, evaluation of selective dry cow treatment
- **Milk quality testing:** measuring the somatic cell count, total bacterial count, coli count freezing point, fat and protein content, ...
- **Evaluating the ration:** based on milk urea, fat-protein ratio, ketone bodies, ...
- **Genetic evaluation:** based on milking speed, teat morphology..

Recording the daily milk yield is a basic prerequisite for fine-tuning herd management decisions. There are many good reasons for milk recording, such as deciding which cows to breed from, or which ones to cull, calculating the herd's feed rations and identifying health issues.²

The plan for results of this SIG will be described like:

What business goals will be achieved through better management with this SOPs?

By using these SOPs the understanding and the using of the milking data can be increased. By knowing how to interpret the data, working with milking data will become more easier.

How will those goals be measured?

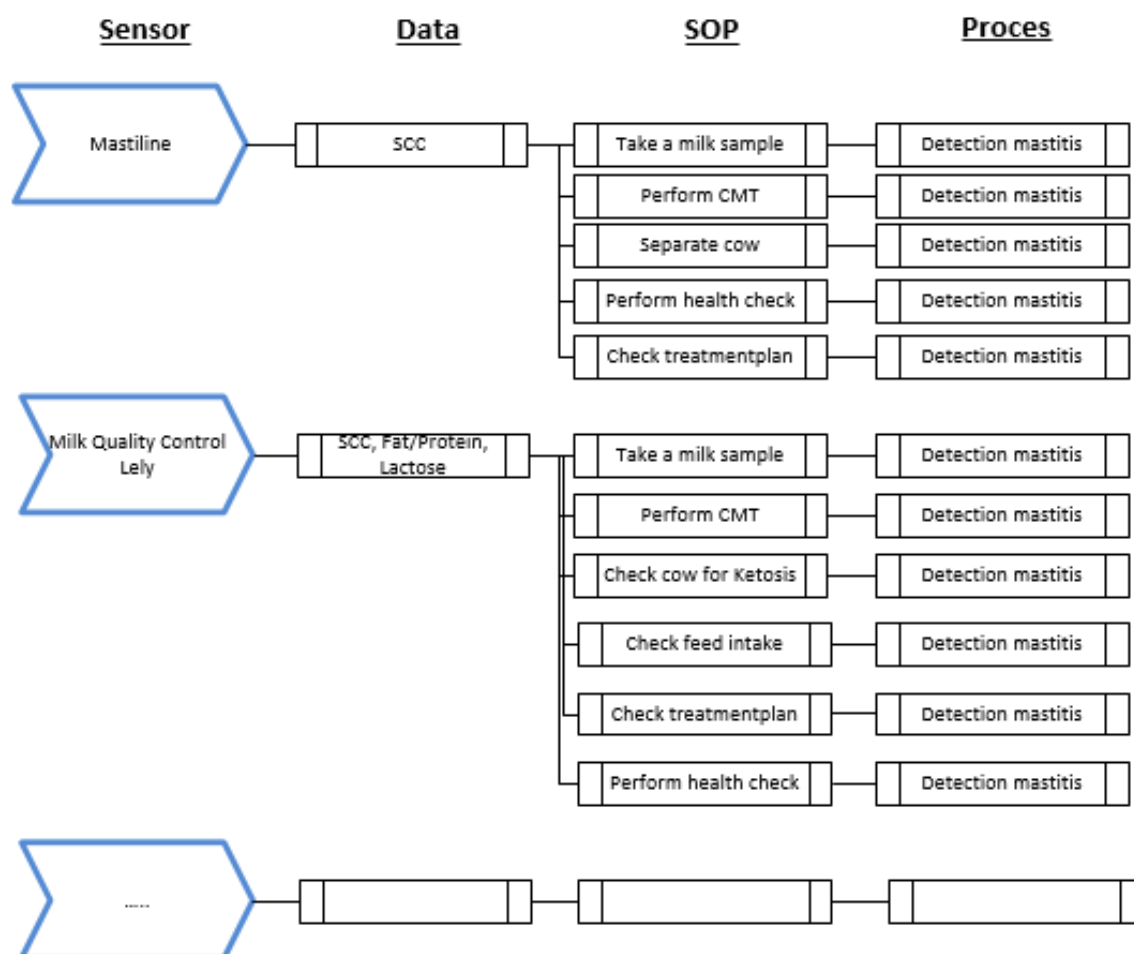
After all when the milking data has been understand well, the early warnings of diseases and other health issues can be interpret better. On long term it will mean lower advise and veterinarian costa.

For detail description; see Best Practice Guides on the 4D4F website.

² Source: BPG Milking Data



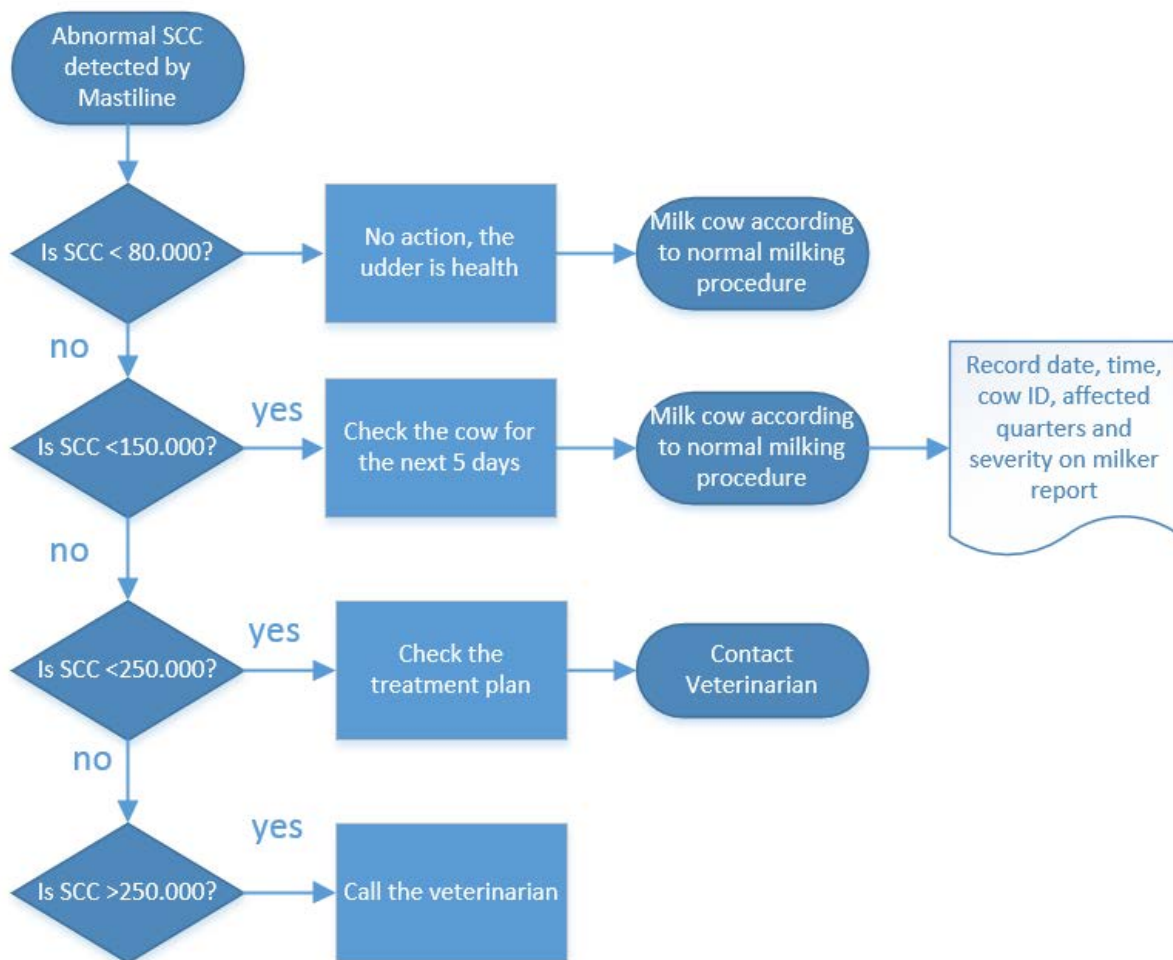
SIG 6 – Milking data





Mastiline – SCC - process detection mastitis

- Original-



Note: the SCC numbers are an example. It depends to every different farm and management system/goals of the farmer.



SOP – No action

Object of interest: The udder
Who: The person who is responsible for the mastitis
What: No action
When: By SCC between < 80.000
Where: No specific area
How: Milking the cow just like all the other cows.

No action, the
udder is health

SOP – Check the cow

Object of interest: The udder of the cow
Who: The person who is responsible for mastitis
What: Check the cow for the next 5 days
When: When the SCC is higher than 150.000
Where: In the milking parlour
How: see how to pre milk the cow

Check the cow for
the next 5 days

HOW TO PRE MILK THE COW

1. Clean all four teats
2. Make sure the floor under the udder is clean
3. Milk the cow by hand until you have 4 milk rays
4. Do you see deviations? Like flakes or is the milk washy?
5. Write down the deviations
6. Clean your hands
7. Clean the floor



SOP – Check the treatment plan

Object of interest: Treatment plan
Who: The person who is responsible for the mastitis
What: Check the treatment plan
When: By SCC between 150.000-250.000
Where: In the office
How: On the computer

Check the
treatment plan

SOP – Call the veterinarian

Object of interest: Veterinarian
Who: The person who is responsible for mastitis
What: Call the veterinarian
When: When the SCC is higher than 250.000
Where: Wherever you are
How: Call number.....

Call the veterinarian



Mastiline – SCC - process detection mastitis

- Changes-

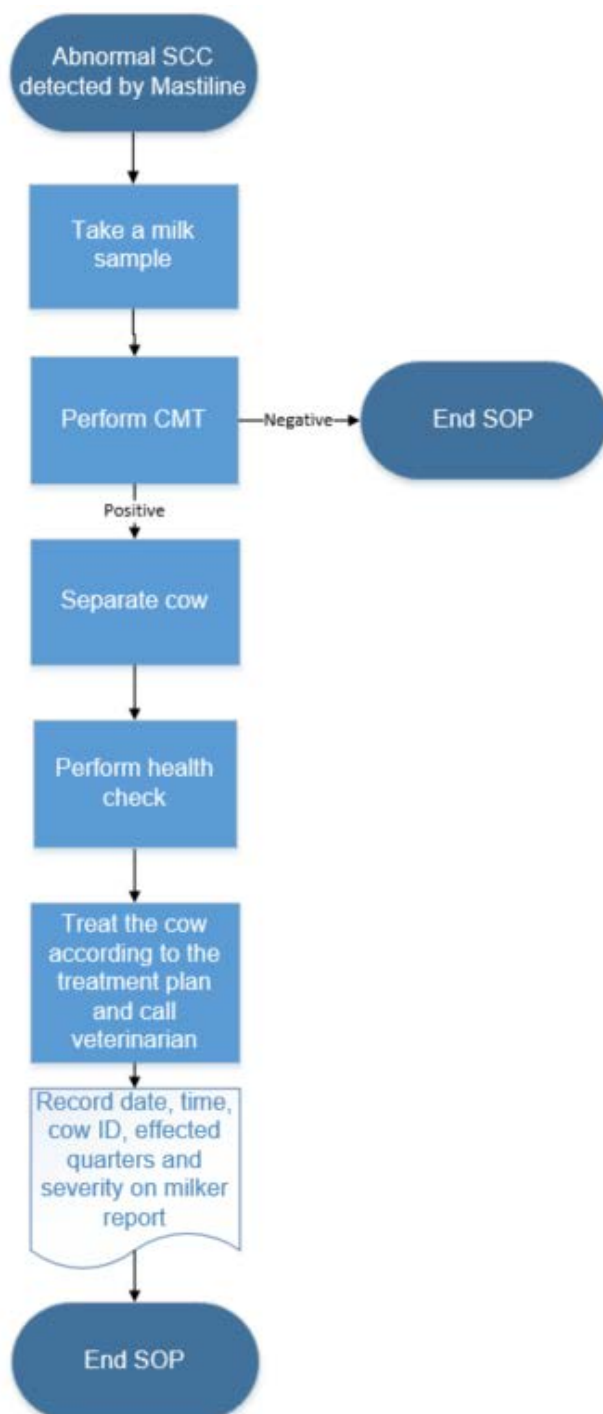
Below an overview of the made changes in the original SOP:

- Deleted “No action”, when something abnormal is detected there must always need to performed an action. Otherwise the you have to change the threshold.
- Deleted “decisions about the amount of SCC”, this will be covered in the treatment plan on dairy farms.
- Deleted “check the cow for the next days”, this action depends on the treatment plan.
- Combined “check the treatment plan” and “call the veterinarian”, depending on the treatment if calling the veterinarian is necessary.
- Added “take a milk sample”, a milk sample is necessary to diagnose de right disease according to udder health. It can also have the function of a quality check, when the treatment does not strike, the veterinarian has the original disease to prescribe the right treatment.
- Added SOP “take a milk sample”
- Added “separate the cow”, to prevent contamination it is always recommended to separate the cow from the herd, especially in case of udder health.
- Added an extra step to the description of “how to perform a CMT”, see step 7.
- The format of the SOP/process can also be changed, see the second improved version below.



Mastiline – SCC - process detection mastitis

- Improved-





SOP – Take a milk sample

Object of interest: Milk sample

Who: The person who is responsible for the mastitis

What: Take a milk sample of one or more suspected quarters

When: When you suspect mastitis

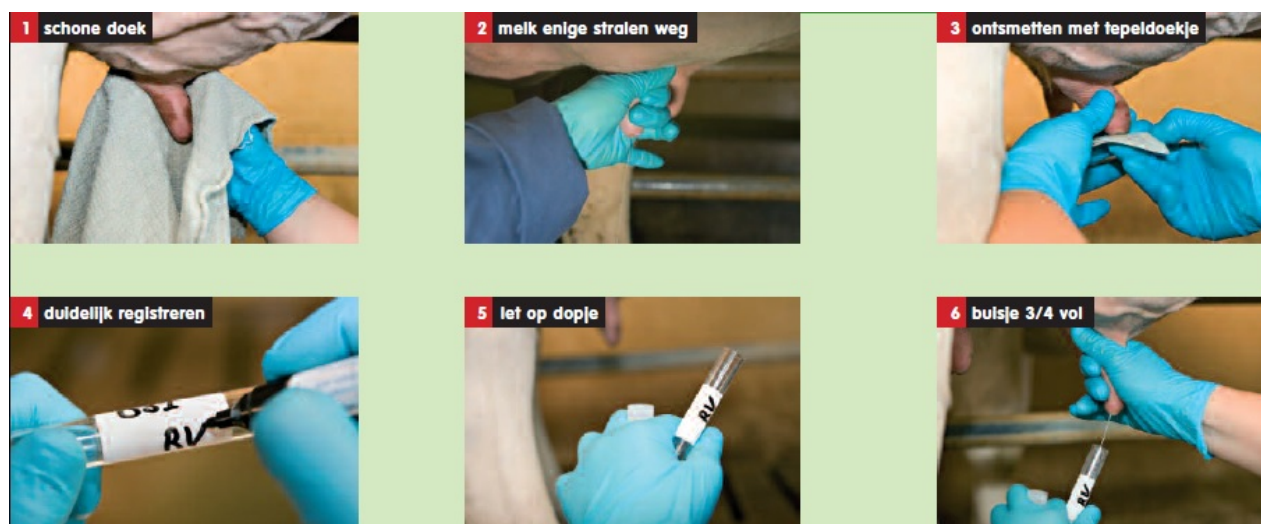
Where: In the milking parlour

How: see how to take a milk sample.

Take a milk
sample

HOW TO TAKE A MILK SAMPLE

1. Clean the quarter(s) with a clean cloth
2. Pre-milk the quarter(s)
3. Disinfect the teat(s)
4. Register on the tube the number of the cow and which quarter it contains
5. Make sure the cap of the tube stays (also) clean
6. Milk the quarter by hand in the tube until 75% of the tube is filled.
7. Take the milk sample to the veterinarian for further bacterial research



Source: UGCN



SOP – Perform the CMT

Object of interest: The CMT test

Who: The person who is responsible for the mastitis

What: Perform the CMT test on all four quarters

When: When you suspect mastitis

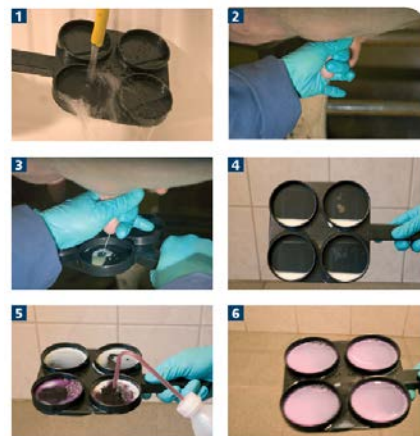
Where: In the milking parlour

How: See how to perform the CMT.

Perform CMT

HOW TO PERFORM THE CMT

1. Clean the four-well plastic paddle exhaustively
2. Pre-milk every quarter
3. Put the four-well plastic paddle straight underneath the udder, keep around 5 cm space between the udder and the four-well plastic paddle. Milk every quarter twice in a separate cup of the four-well plastic paddle
4. Remove the four-well plastic paddle from the udder. Keep the four-well plastic paddle slantwise until the milk hits the marking lines.
5. Add CMT liquid to the milk. The amount of liquid has to be the same as the amount of milk.
6. Swerve the four-well plastic paddle for 10 seconds slowly until the milk and the CMT-liquid is mixed.
7. Check if the liquid in one of the cups the consistency has changed. This can be checked easily by tilting the paddle to one side. If the consistency has changed (read: become thicker) in one or more cups, the corresponding quarters are infected with mastitis. When the consistency has changed the result of the CMT is positive.



UGA is de uiergezondheidsaanpak van de GD



SOP – Separate the cow

Object of interest: The cow

Who: Farmer

What: Separate the cow

Where: Separation room

When: When the cow has an abnormal SCC and positive CMT

How: By separating the cow from the herd, most of the time installing action on the AMS or give instructions to the milker to separate the cow after being milked.

Separate cow

SOP – Perform health check

Object of interest: The cow

Who: The person who is responsible for the health

What: Check the cow for health issues

When: When you have a positive CMT

Where: In the barn

How: See appendix ‘ SOP health check’

Perform health
check

SOP – Treat the cow according to the treatment plan and call veterinarian

Object of interest: The cow

Who: Farmer

What: Treat the cow according to the treatment plan and call veterinarian

Where: Separation room or straw penn

When: When the cow has an abnormal SCC and positive CMT

How: By following the instructions in the treatment plan and calling phone number.....

Treat the cow
according to the
treatment plan
and call
veterinarian

Mastiline – SCC - process detection mastitis

- Improved-

Because there are no decisions anymore in this flowchart the SOP/process could also look like:

Abnormal milk detected by Mastiline

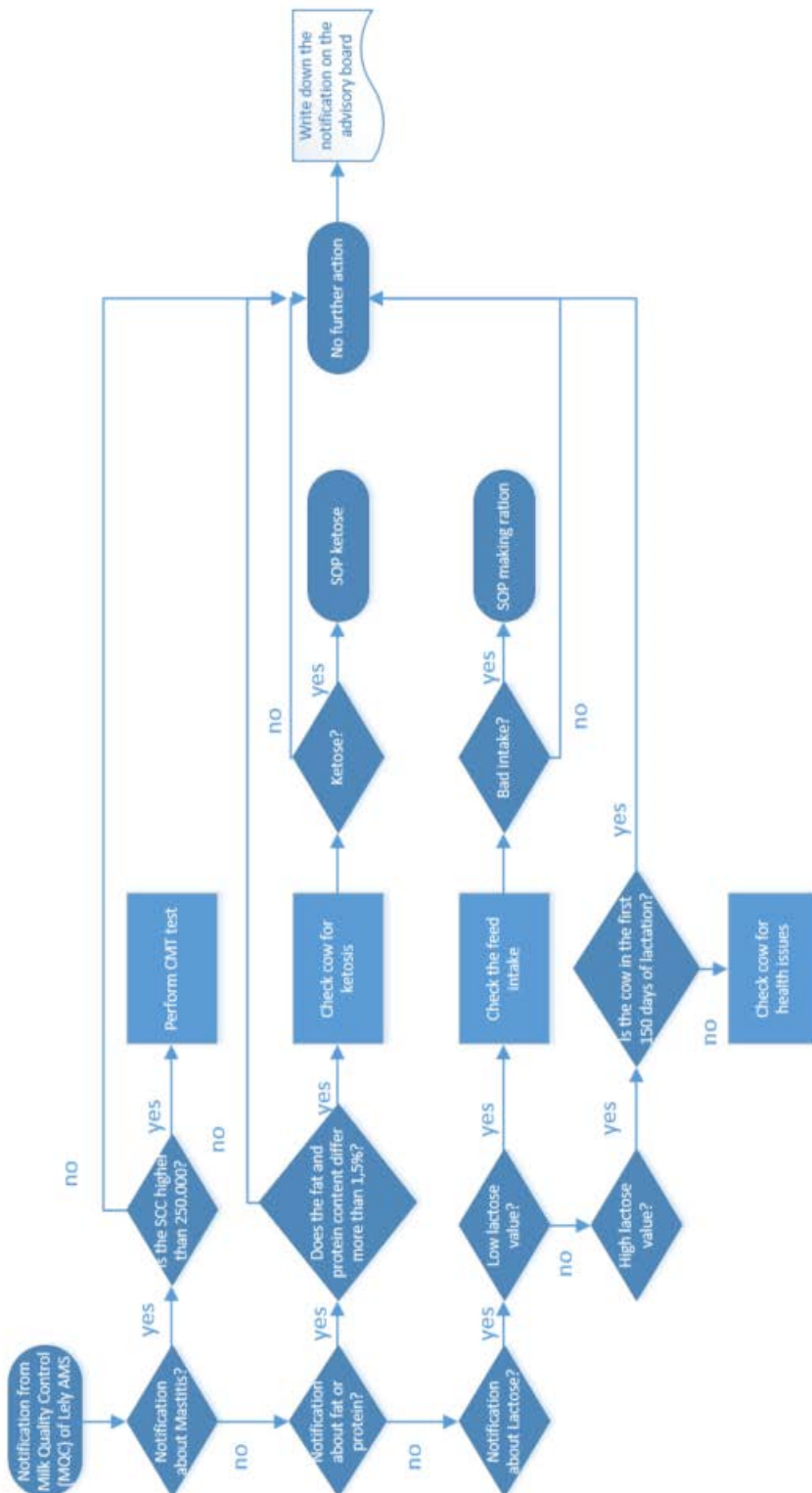
1. Take a milk sample
2. Perform CMT
3. Separate cow
4. Perform health check
5. Treat the cow according to the treatment plan and call the veterinarian.
6. Record date, time, cow ID, effected quarters and treatment on the milker report

Supplemented with the above described actions.



Lely Milk Quality Control - SCC - process detection mastitis

- Original -





SOP – Perform the CMT

Object of interest: The CMT test

Who: The person who is responsible for the mastitis

What: Perform the CMT test on all four quarters

When: When you suspect mastitis

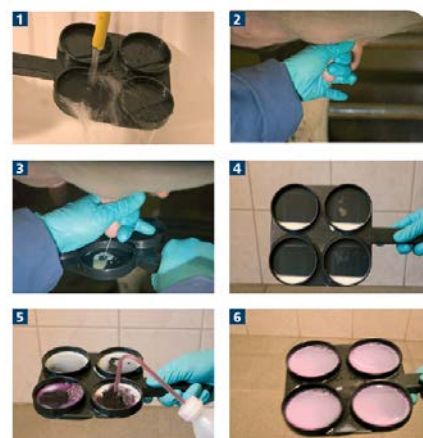
Where: In the milking parlour

How: see how to perform the CMT.

Perform CMT test

HOW TO PERFORM THE CMT

1. Clean the four-well plastic paddle exhaustively
2. Pre-milk every quarter
3. Put the four-well plastic paddle straight underneath the udder, keep around 5 cm space between the udder and the four-well plastic paddle. Milk every quarter twice in a separate cup of the four-well plastic paddle
4. Remove the four-well plastic paddle from the udder. Keep the four-well plastic paddle slantwise until the milk hits the marking lines.
5. Add CMT liquid to the milk. The amount of liquid has to be the same as the amount of milk.
6. Swerve the four-well plastic paddle for 10 seconds slowly until the milk and the CMT-liquid is mixed.



UGA is de uliergezondheidsaanpak van de GD

SOP – Check the cow on Ketosis

Object of interest: The cow

Who: The person who is responsible for health

What: Check the cow on ketosis

When: When you have a notification of the MQC on fat or protein

Where: In the barn

How: to check if the cow has disease phenomena of ketosis

Check cow for
ketosis



SOP – Check the feed intake

Object of interest: The cow

Who: The person who is responsible for the feeding

What: Check the feed intake

When: When you have a notification of the MQC on lactose

Where: In the barn

How: to check if the cow has eaten enough during the last 5 days

Check the feed
intake

SOP – Check the cow for health issues

Object of interest: The cow

Who: The person who is responsible for the health

What: Check the cow for health issues

When: When you have a notification of the MQC on lactose

Where: In the barn

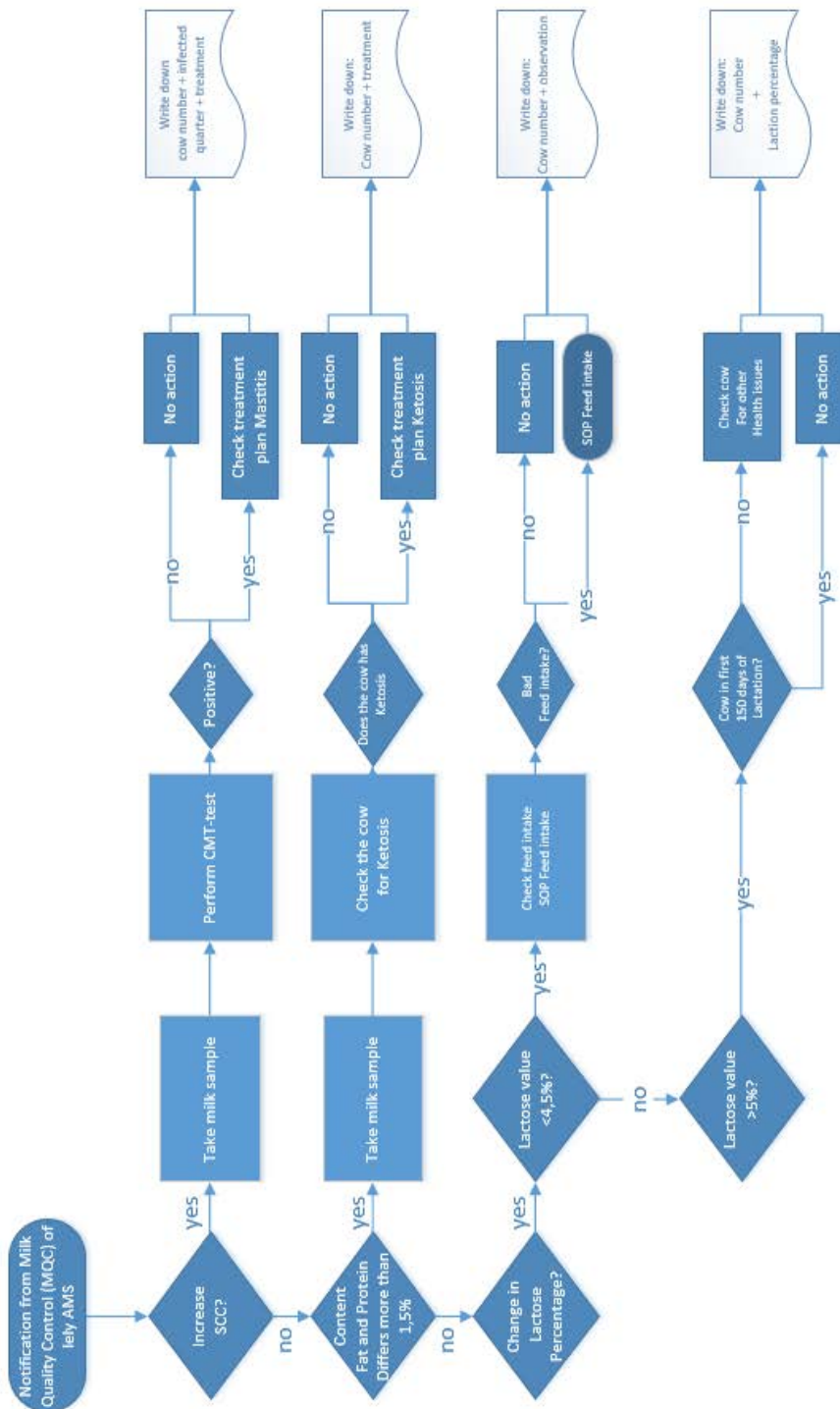
How: See appendix “SOP Health check”

Check cow for
health issues



Below an overview of the made changes in the original SOP:

- Deleted “decisions about the amount of SCC”, this will be covered in the treatment plan on dairy farms.
- Added “take a milk sample”, a milk sample is necessary to diagnose de right disease according to udder health. It can also have the function of a quality check, when the treatment does not strike, the veterinarian has the original disease to prescribe the right treatment.
- Added SOP “take a milk sample”
- Added an extra step to the description of “how to perform a CMT”, see step 7.





SOP – Take a milk sample

Object of interest: Milk sample

Who: The person who is responsible for the mastitis

What: Take a milk sample of one or more suspected quarters

When: When you suspect mastitis

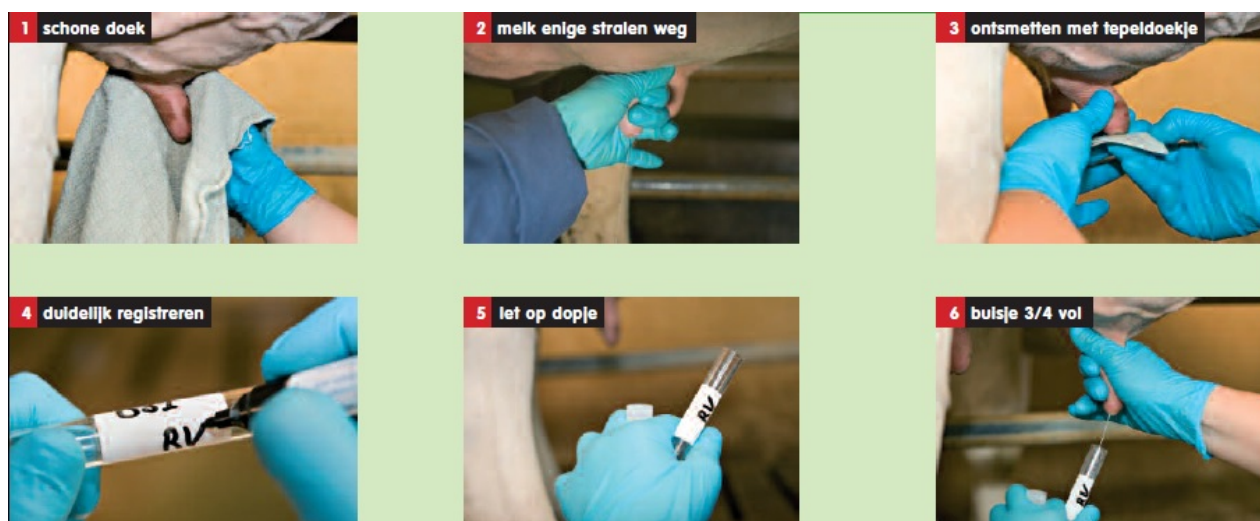
Where: In the milking parlour

How: see how to take a milk sample.

Take a milk
sample

HOW TO TAKE A MILK SAMPLE

1. Clean the quarter(s) with a clean cloth
2. Pre-milk the quarter(s)
3. Disinfect the teat(s)
4. Register on the tube the number of the cow and which quarter it contains
5. Make sure the cap of the tube stays (also) clean
6. Milk the quarter by hand in the tube until 75% of the tube is filled.
7. Take the milk sample to the veterinarian for further bacterial research



Source: UGCN



SOP – Perform the CMT

Object of interest: The CMT test

Who: The person who is responsible for the mastitis

What: Perform the CMT test on all four quarters

When: When you suspect mastitis

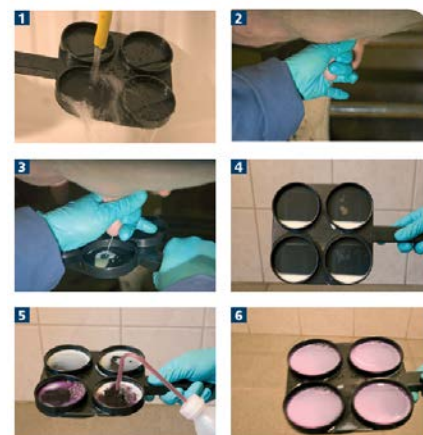
Where: In the milking parlour

How: see how to perform the CMT.

Perform CMT

HOW TO PERFORM THE CMT

1. Clean the four-well plastic paddle exhaustively
2. Pre-milk every quarter
3. Put the four-well plastic paddle straight underneath the udder, keep around 5 cm space between the udder and the four-well plastic paddle. Milk every quarter twice in an separate cup of the four-well plastic paddle
4. Remove the four-well plastic paddle from the udder. Keep the four-well plastic paddle slantwise until the milk hits the marking lines.
5. Add CMT liquid to the milk. The amount of liquid has to be the same as the amount of milk.
6. Swerve the four-well plastic paddle for 10 seconds slowly until the milk and the CMT-liquid is mixed.
7. Check if the liquid in one of the cups the consistency has changed. This can be checked easily by tilting the paddle to one side. If the consistency has changed (read: become thicker) in one or more cups, the corresponding quarters are infected with mastitis. When the consistency has changed the result of the CMT is positive.



UGA is de uiergezondheidsaanpak van de GD

SOP – Check the cow on Ketosis

Object of interest: The cow

Who: The person who is responsible for health

What: Check the cow on ketosis

When: When you have a notification of the MQC on fat or protein

Where: In the barn

How: to check if the cow has disease phenomena of ketosis

Check cow for
ketosis

SOP – Check the feed intake

Object of interest: The cow

Who: The person who is responsible for the feeding

What: Check the feed intake

When: When you have a notification of the MQC on lactose

Where: In the barn

How: to check if the cow has eaten enough during the last 5 days
(see Appendix: “**health check**” Feed intake)

Check the feed
intake



SOP – No action

Object of interest: The udder

Who: The person who is responsible for the mastitis

What: No action

When: CMT is negative

Where: No specific area

How: Milking the cow just like all the other cows.

No action, the
udder is health

SOP – Check the treatment plan

Object of interest: Treatment plan

Who: The person who is responsible for the mastitis

What: Check the treatment plan

When: CMT is positive

Where: In the office

How: On the computer

Check the
treatment plan

SOP – Check the cow for health issues

Object of interest: The cow

Who: The person who is responsible for the health

What: Check the cow for health issues

When: When you have a notification of the MQC on lactose

Where: In the barn

How: See appendix “SOP Health Check”

Check cow for
health issues



3.4 Metabolic Diseases

Metabolic disorders of cattle are a group of diseases that affect dairy cows immediately after calving. A number of disorders linked to incorrect diet or feeding can have adverse effects on dairy cow health and welfare, as well as productivity. Health disorders are associated with significant economic losses for dairy farms due to reductions in milk production, increased risk of culling and death, increased treatment cost and reduced reproductive performance. There are several metabolic disorders identified in dairy cows. In this guide we focus on three type of metabolic diseases include: ketosis, acidosis, and fatty liver. They all relate to the transition period, but then into the first week of lactation.

The reason that these diseases are called metabolic disorders is related to the fact that they are associated with the disturbance of one or more blood metabolites in sick cows. For example, ketosis is associated with enhanced ketone bodies in the blood.

Metabolic diseases have a great economic impact. The losses are as a result of decreased milk production, decreased efficiency of milk production, premature culling, veterinarian costs, reduced fertility and death in serious cases.³

What business goals will be achieved through better management with this SOPs?

By using these SOPs the health of the cattle will improve. Afterwards it will increase the milk yield and also decrease the veterinarian costs and the use of antibiotics.

How will those goals be measured?

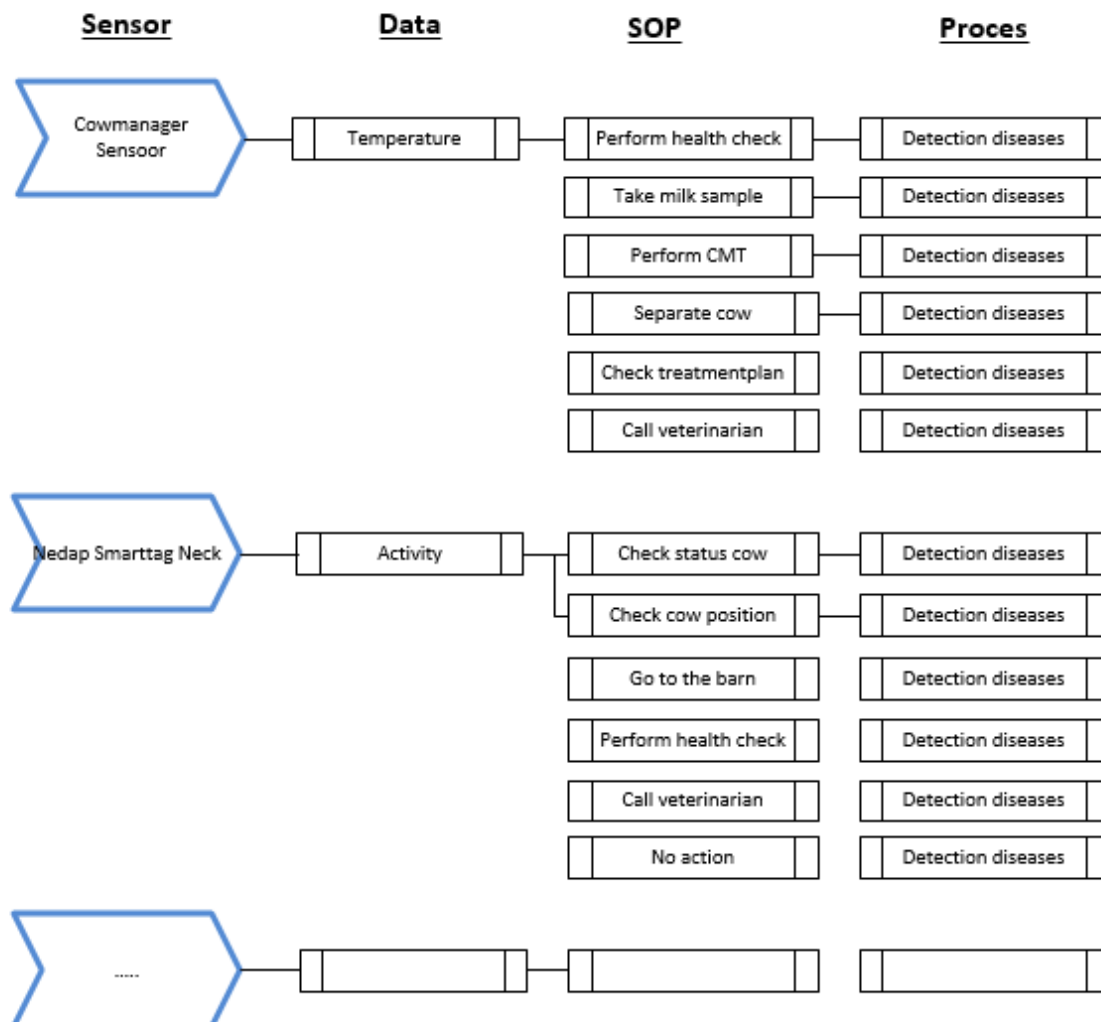
The health of the cattle can be measured by the amount of cows with a disease per year.

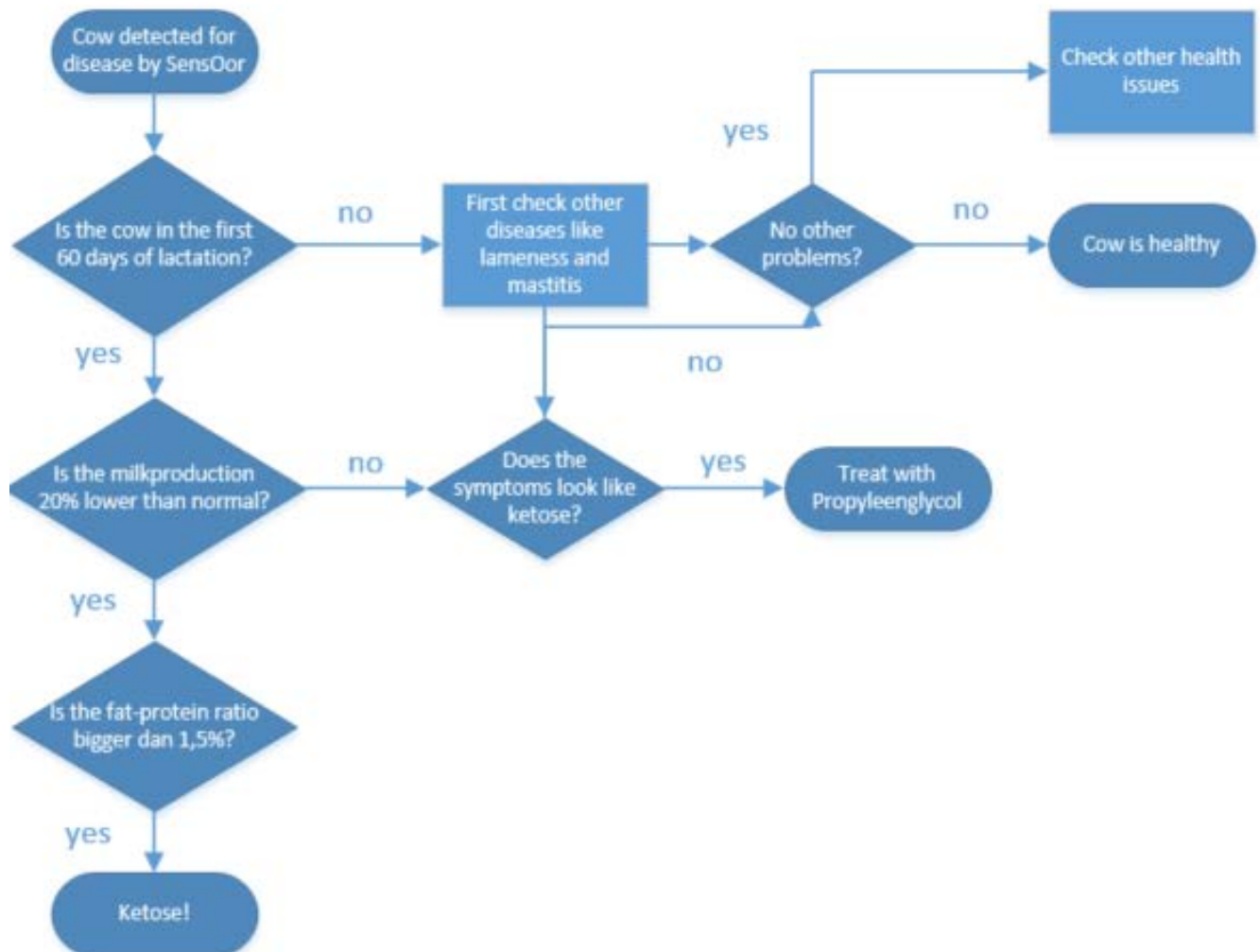
For detail description; see Best Practice Guides on the 4D4F website.

³ Source: BPG Metabolic diseases



SIG 8 – Metabolic disease





SOP – Check the cow for health issues

Object of interest: The cow

Who: The person who is responsible for the health

What: Check the cow for health issues

When: When you have a notification of the MQC on lactose

Where: In the barn

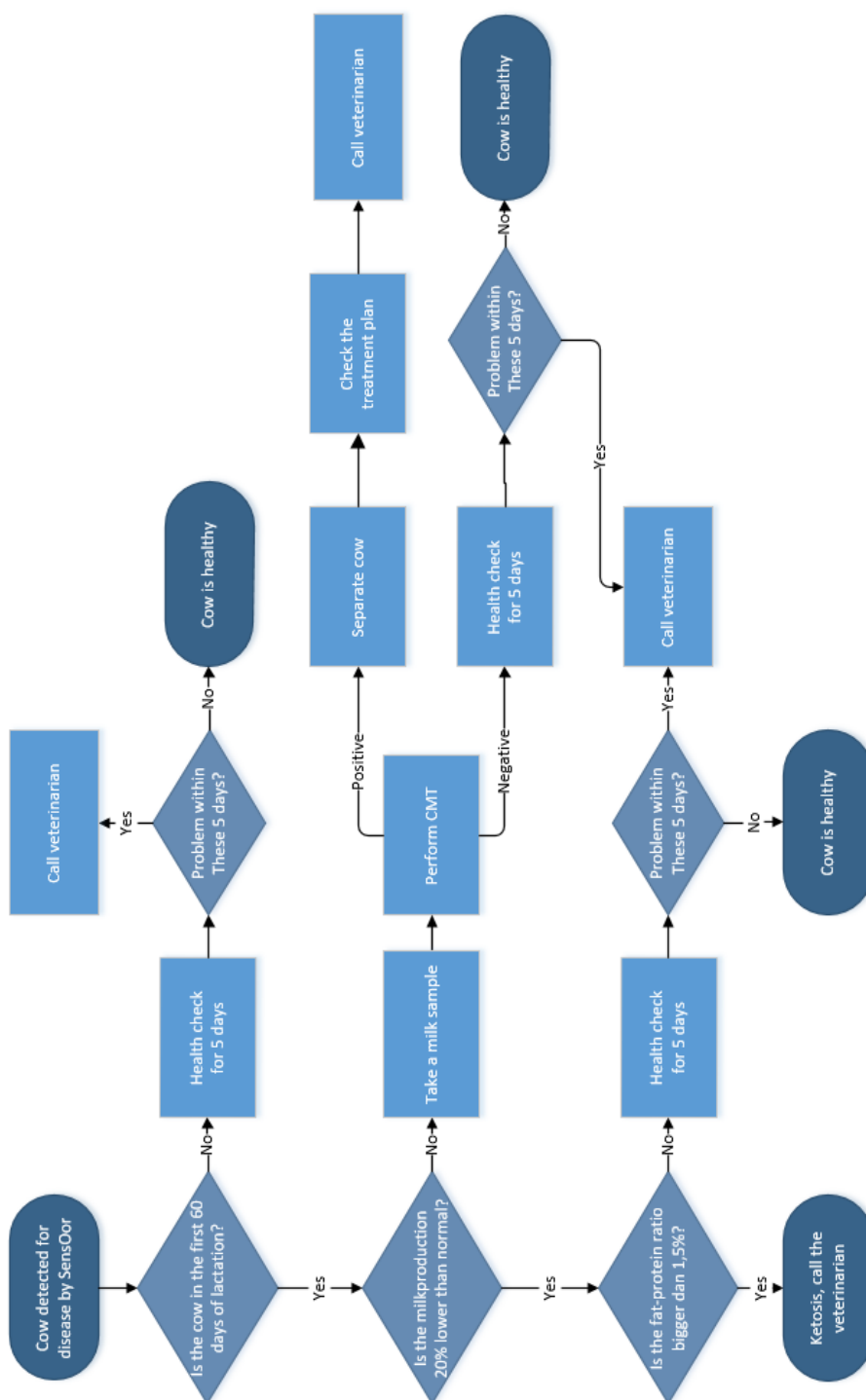
How: to check if the cow has disease phenomena

Check cow for
health issues



Below an overview of the made changes in the original SOP:

- Added “health check”, because when you receive a notification, there must, most of the time, be something wrong with the cow, otherwise you do not receive a notification.
- Added “take a milk sample”, a milk sample is necessary to diagnose the right disease according to udder health. It can also have the function of a quality check, when the treatment does not strike, the veterinarian has the original disease to prescribe the right treatment.
- Added “perform CMT”, to check the udder health.
- Added “call veterinarian”, instead of do-it-yourself diagnoses
- Added “separate the cow”
- Added “check the treatment plan”, because this has to be leading by treatments.
- Added more monitoring by questions like ‘are there problems within these 5 days?’





SOP – Perform health check

Object of interest: The cow

Who: The person who is responsible for the health

What: Check the cow for health issues

When: When you have a positive CMT

Where: In the barn

How: See appendix ‘SOP health check’

Perform health
check

SOP – Take a milk sample

Object of interest: Milk sample

Who: The person who is responsible for the mastitis

What: Take a milk sample of one or more suspected quarters

When: When you suspect mastitis

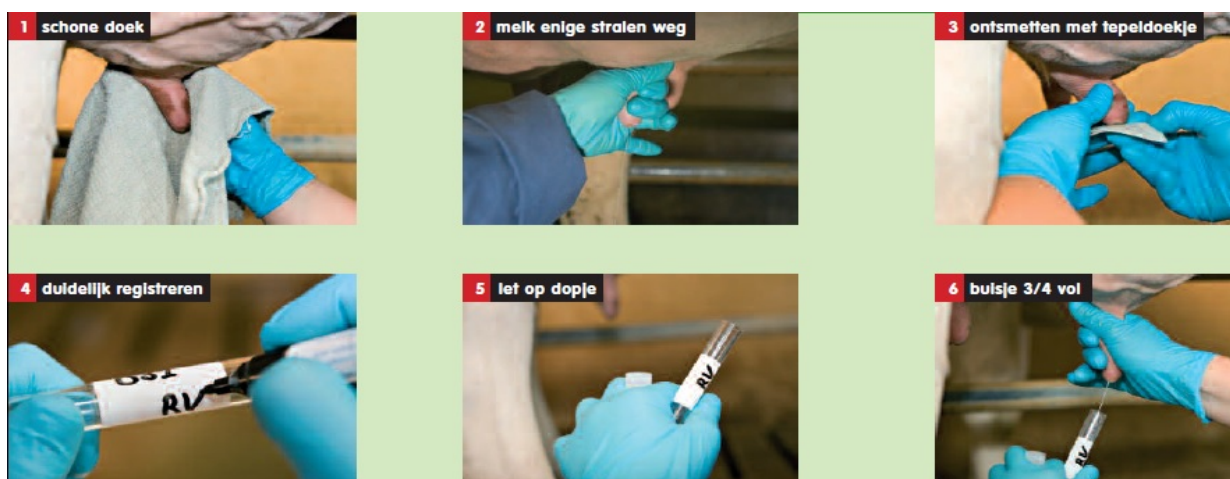
Where: In the milking parlour

How: see how to take a milk sample.

Take a milk
sample

HOW TO TAKE A MILK SAMPLE

1. Clean the quarter(s) with a clean cloth
2. Pre-milk the quarter(s)
3. Disinfect the teat(s)
4. Register on the tube the number of the cow and which quarter it contains
5. Make sure the cap of the tube stays (also) clean
6. Milk the quarter by hand in the tube until 75% of the tube is filled.
7. Take the milk sample to the veterinarian for further bacterial research



Source: UGCN



SOP – Perform the CMT

Object of interest: The CMT test

Who: The person who is responsible for the mastitis

What: Perform the CMT test on all four quarters

When: When you suspect mastitis

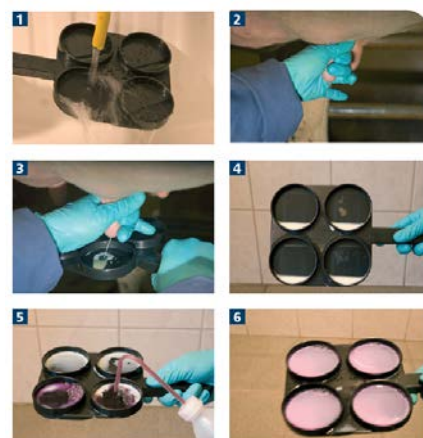
Where: In the milking parlour

How: see how to perform the CMT.

Perform CMT test

HOW TO PERFORM THE CMT

1. Clean the four-well plastic paddle exhaustively
2. Pre-milk every quarter
3. Put the four-well plastic paddle straight underneath the udder, keep around 5 cm space between the udder and the four-well plastic paddle. Milk every quarter twice in an separate cup of the four-well plastic paddle
4. Remove the four-well plastic paddle from the udder. Keep the four-well plastic paddle slantwise until the milk hits the marking lines.
5. Add CMT liquid to the milk. The amount of liquid has to be the same as the amount of milk.
6. Swerve the four-well plastic paddle for 10 seconds slowly until the milk and the CMT-liquid is mixed.
7. Check if the liquid in one of the cups the consistency has changed. This can be checked easily by tilting the paddle to one side. If the consistency has changed (read: become thicker) in one or more cups, the corresponding quarters are infected with mastitis. When the consistency has changed the result of the CMT is positive.



UGA is de uitergezondheidsaanpak van de GD



SOP – Call the veterinarian

Object of interest: Veterinarian

Who: The person who is responsible for mastitis

What: Call the veterinarian

When: According to the treatment plan or other issues

Where: Wherever you are

How: Call number.....

Call the veterinarian

SOP – Check the treatment plan

Object of interest: Treatment plan

Who: The person who is responsible for the mastitis

What: Check the treatment plan

When: CMT is positive

Where: In the office

How: On the computer

Check the
treatment plan

SOP – Separate the cow

Object of interest: The cow

Who: Farmer

What: Separate the cow

Where: Separation room

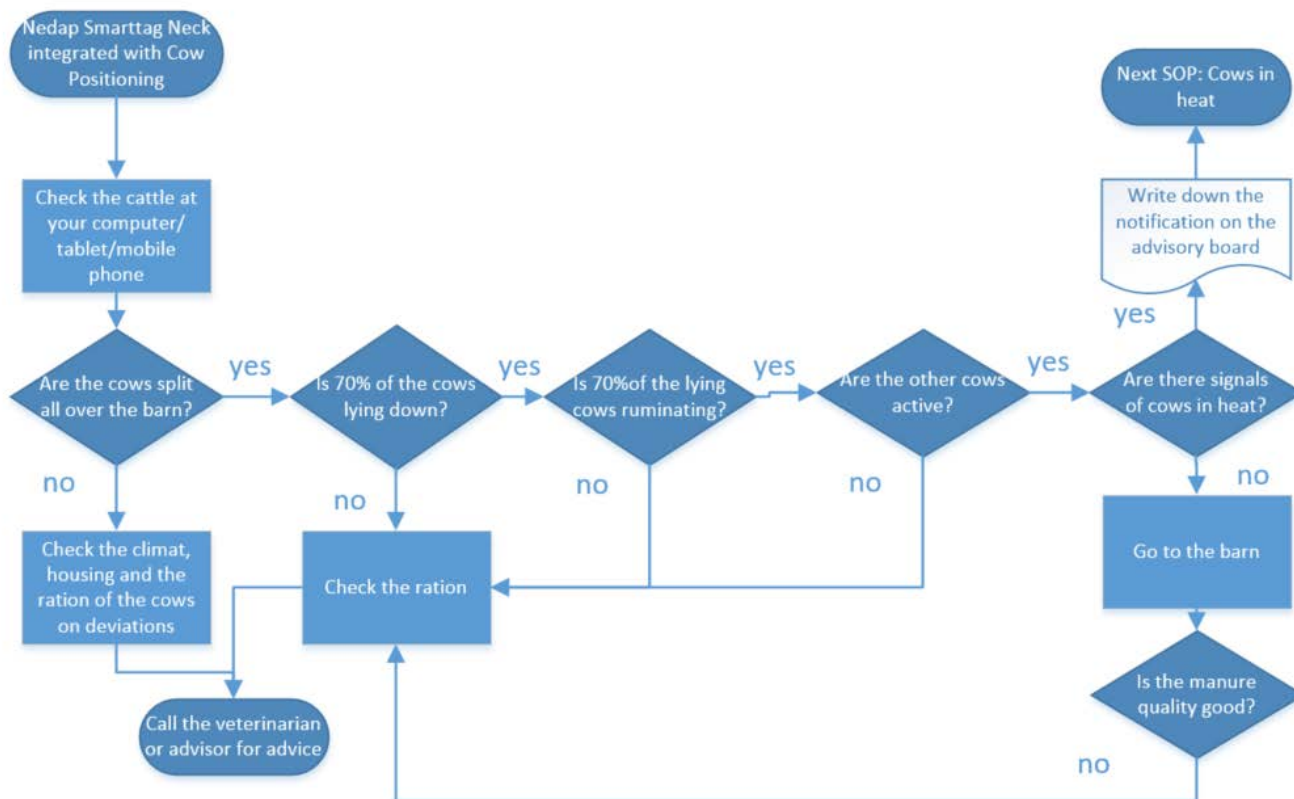
When: CMT is positive

How: By separating the cow from the herd, most of the time installing action on the AMS or give instructions to the milker to separate the cow after being milked.

Separate cow



Nedap Smarttag Neck with Cow Positioning –Process detection diseases - Original-





SOP – Check the cattle on the computer

Object of interest: The cattle

Who: Farmer

What: Check the cattle on the computer

Where: PC space

When: twice a day, in the morning and in the evening

How: Checking all the attention lists on the computer

Check the cattle at
your computer/
tablet/mobile
phone

SOP – Check the climat

Object of interest: The climat in the barn

Who: Farmer

What: Checking the climat in the barn

Where: In the barn

When: twice a day, in the morning and in the evening

How: Checking the lights, water facilities, gates and if there is enough fresh air

Check the climat,
housing and the
ration of the cows
on deviations

SOP – Check the ration

Object of interest: The ration

Who: Farmer

What: Checking the ration

Where: In the barn or the fields

When: three times a day, in the morning, afternoon and in the evening

How: Checking the feeding facilities, the stock and quality of the ration

Check the ration

SOP – Go to the barn

Object of interest: The barn

Who: Farmer

What: Go to the farm

Where: From location to the barn

When: Several times a day.

How: Walking

Go to the barn



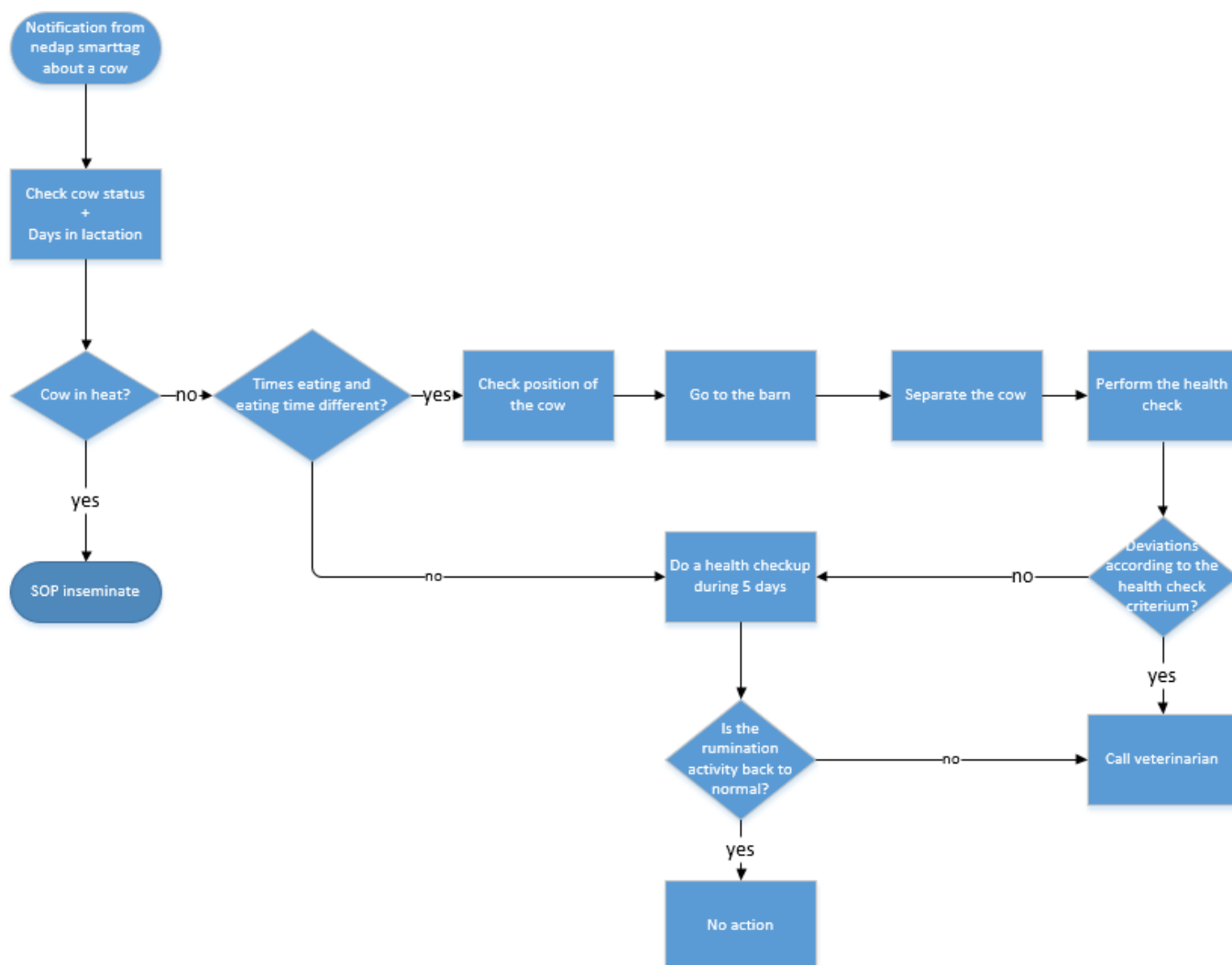
Nedap Smarttag Neck with Cow Positioning – Process detection diseases- Changes-

Below an overview of the made changes in the original SOP:

- The process became more focused on the individual cow instead of the whole cattle.
- Added the decision about “cow in heat” earlier in the process, when the cow is in heat, the behavior will be abnormal, but it does not mean the cow is ill.
- Added a clear decision about eating and eating time instead of checking the ration.
- Deleted decisions and added clear actions
- Added an explanation of the general behavior notifications/signs



Nedap Smarttag Neck with Cow Positioning – Process detection diseases- Improved-





SOP – Check cow status

Object of interest: The status of the cow
Who: Farmer
What: Check the cow on the computer
Where: PC space
When: You receive a notification
How: Checking all the attention lists on the computer

Check cow status
+
Days in lactation

SOP – Check the position of the cow

Object of interest: The position of the cow
Who: Farmer
What: Check the position on the computer/laptop/tablet
Where: PC space
When: When you receive a notification
How: Checking all the attention lists on the computer

Check position of
the cow

SOP – Go to the barn

Object of interest: The barn
Who: Farmer
What: Go to the farm
Where: From location to the barn
When: Several times a day.
How: Walking

Go to the barn

SOP – Separate the cow

Object of interest: The cow
Who: Farmer
What: Separate the cow
Where: Separation room
When: CMT is positive
How: By separating the cow from the herd, most of the time installing action on the AMS or give instructions to the milker to separate the cow after being milked.

Separate cow

SOP – Perform health check

Object of interest: The cow
Who: The person who is responsible for the health
What: Check the cow for health issues
When: When you have a positive CMT
Where: In the barn
How: See appendix ‘ SOP health check’

Perform health
check



SOP – Call the veterinarian

Object of interest: Veterinarian

Who: The person who is responsible for mastitis

What: Call the veterinarian

When: According to the treatment plan or other issues

Where: Wherever you are

How: Call number.....

Call the veterinarian

This picture below is showing an overview of what the Nedap sensor is monitoring what kind of behavior.

The sensors automatically monitors the activity and tracks the signs of heat – such as sniffing, chin resting, mounting and standing heat – of all cows all day long. But also change in other activity will be monitored and registered. When multiple cows have the same change in behavior, the system will give an herd notification. (Nedap, 2017)

Hours of lying down:	12-14 hours lying down
Periods of lying down:	11 periods of lying down
Amount of steps:	2500-3000 steps per day
Ruminating:	7-10 hours ruminating
Eating Hours:	4-6 hours eating
Amount of meals:	9-14 meals per day
Heat detection:	see SOP for individual cow

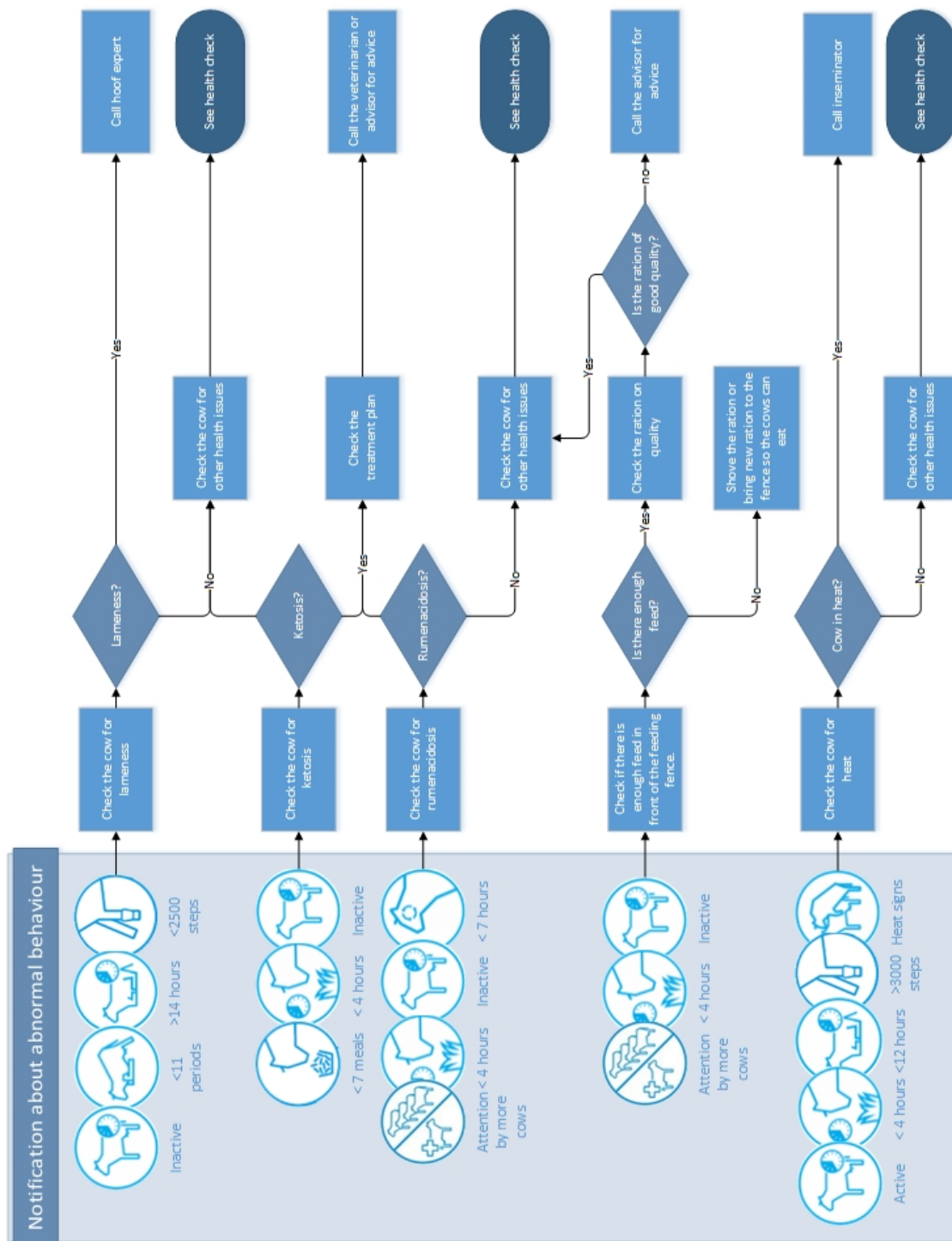


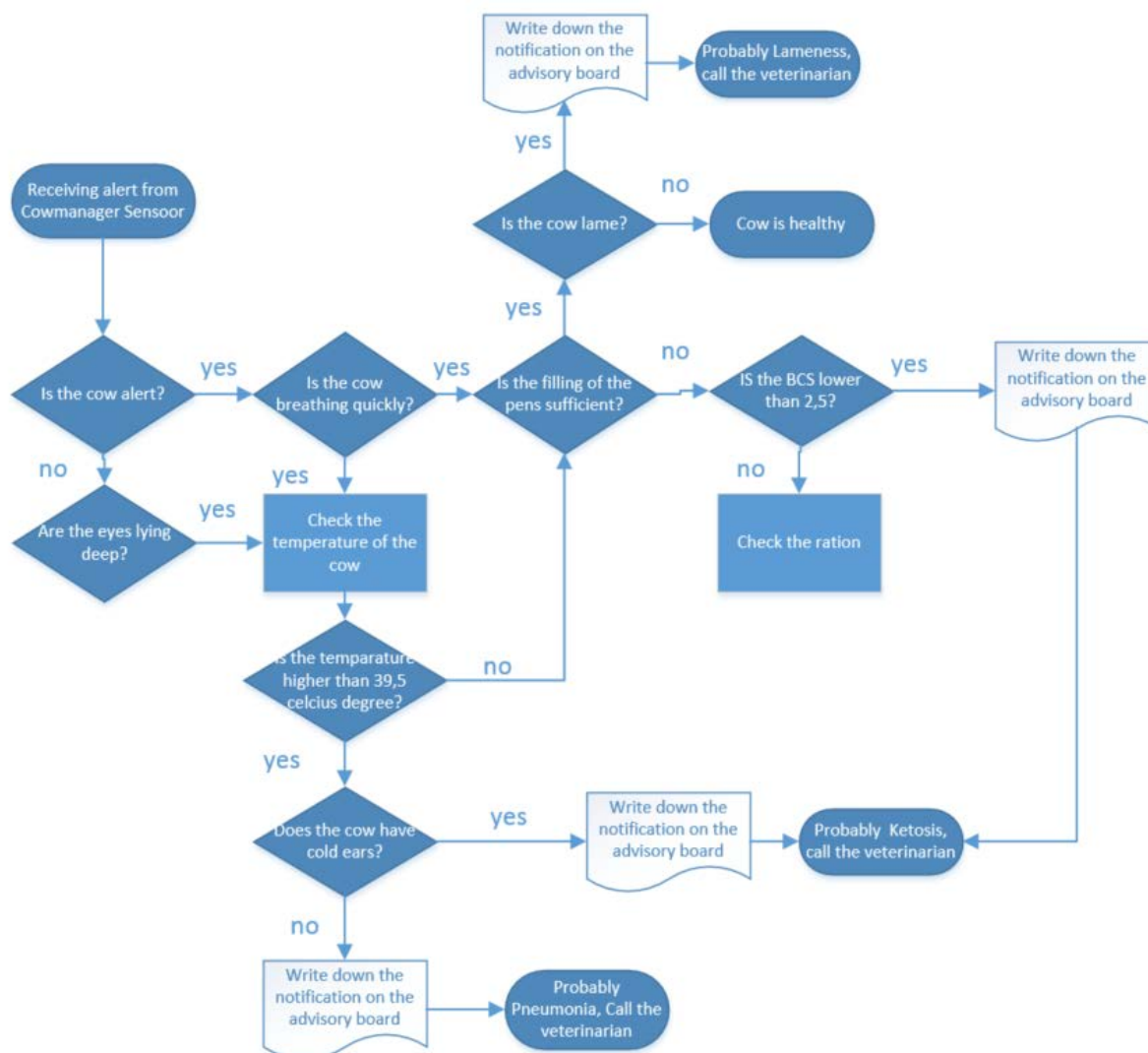
For more information see: www.nedap-livestockmanagement.com



Nedap Smarttag Neck with Cow Positioning – Process detection diseases- Improved-

Beside the flowchart we also designed an overview around the possible notifications of the Nedap SmartTag and what suppose to do when you see the notifications.







Horizon 2020
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SOP – Check the temperature of the cow

Object of interest: The cow

Who: Farmer

What: Checking the temperature of the cow

Where: In the barn

When: When you received a notification from Sensor

How: measuring with a thermometer in the rectum of the cow

Check the
temperature of the
cow

SOP – Check the ration

Object of interest: The ration

Who: Farmer

What: Checking the ration

Where: In the barn or the fields

When: three times a day, in the morning, afternoon and in the evening

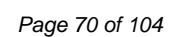
How: Checking the feeding facilities, the stock and quality of the ration

Check the ration



Below an overview of the made changes in the original SOP:

- The process became clearer
- Adopted improved SOP process detection ketosis
- Added more actions instead of decisions
- Added more check points like the health check





SOP – Check the cow for health issues

Object of interest: The cow

Who: The person who is responsible for the health

What: Check the cow for health issues

When: When you have a notification of the MQC on lactose

Where: In the barn

How: to check if the cow has disease phenomena

Check cow for
health issues

See appendix 'health check'

SOP – Take a milk sample

Object of interest: Milk sample

Who: The person who is responsible for the mastitis

What: Take a milk sample of one or more suspected quarters

When: When you suspect mastitis

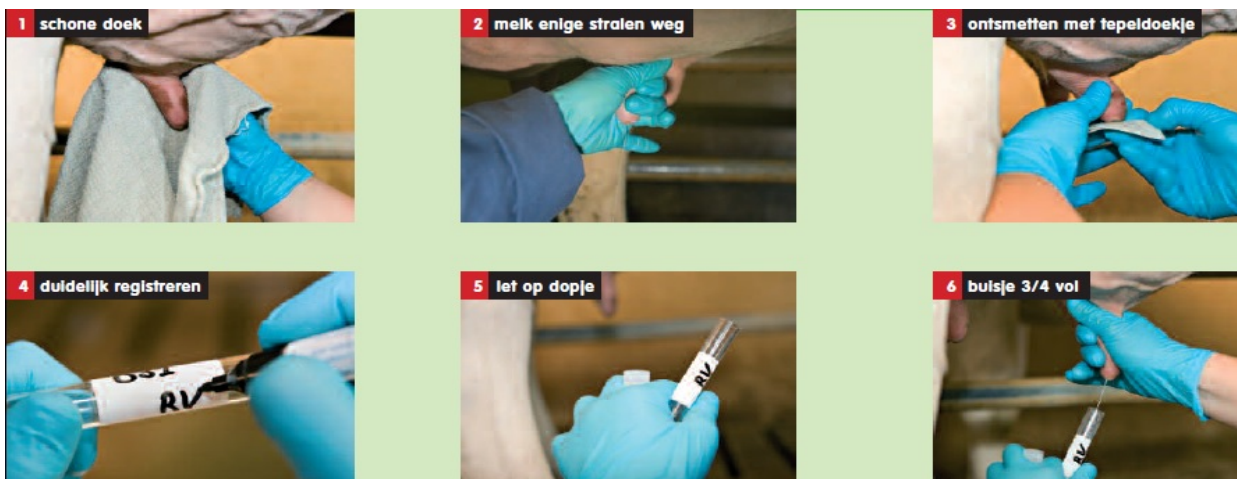
Where: In the milking parlour

How: see how to take a milk sample.

Take a milk
sample

HOW TO TAKE A MILK SAMPLE

1. Clean the quarter(s) with a clean cloth
2. Pre-milk the quarter(s)
3. Disinfect the teat(s)
4. Register on the tube the number of the cow and which quarter it contains
5. Make sure the cap of the tube stays (also) clean
6. Milk the quarter by hand in the tube until 75% of the tube is filled.
7. Take the milk sample to the veterinarian for further bacterial research



Source: UGCN



SOP – Perform the CMT

Object of interest: The CMT test

Who: The person who is responsible for the mastitis

What: Perform the CMT test on all four quarters

When: When you suspect mastitis

Where: In the milking parlour

How: see how to perform the CMT.

Perform CMT test

HOW TO PERFORM THE CMT

1. Clean the four-well plastic paddle exhaustively
2. Pre-milk every quarter
3. Put the four-well plastic paddle straight underneath the udder, keep around 5 cm space between the udder and the four-well plastic paddle. Milk every quarter twice in a separate cup of the four-well plastic paddle
4. Remove the four-well plastic paddle from the udder. Keep the four-well plastic paddle slantwise until the milk hits the marking lines.
5. Add CMT liquid to the milk. The amount of liquid has to be the same as the amount of milk.
6. Swerve the four-well plastic paddle for 10 seconds slowly until the milk and the CMT-liquid is mixed.
7. Check if the liquid in one of the cups the consistency has changed. This can be checked easily by tilting the paddle to one side. If the consistency has changed (read: become thicker) in one or more cups, the corresponding quarters are infected with mastitis. When the consistency has changed the result of the CMT is positive.



UGA is de uiergezondheidsaanpak van de GD



SOP – Call the veterinarian

Object of interest: Veterinarian

Who: The person who is responsible for mastitis

What: Call the veterinarian

When: According to the treatment plan or other issues

Where: Wherever you are

How: Call number.....

Call the veterinarian

SOP – Check the treatment plan

Object of interest: Treatment plan

Who: The person who is responsible for the mastitis

What: Check the treatment plan

When: CMT is positive

Where: In the office

How: On the computer

Check the
treatment plan

SOP – Separate the cow

Object of interest: The cow

Who: Farmer

What: Separate the cow

Where: Separation room

When: CMT is positive

How: By separating the cow from the herd, most of the time installing action on the AMS or give instructions to the milker to separate the cow after being milked.

Separate cow



3.5 Calves and Youngstock

Calves and youngstock are very valueable for farmers. They are the future of their farms. In about two years a new born calf will having their first calf, so in two years of good care the young stock will be cows, money makers of the farm.

What business goals will be achieved through better management with this SOPs?

By using these SOPs the health of calves and youngstock will improve. When the calves are treated well they have more opportunities to be a healthy cow. When heifers are healthy they are probably easier to breed with. Afterwards it will also decrease the veterinarian costs and the use of antibiotics.

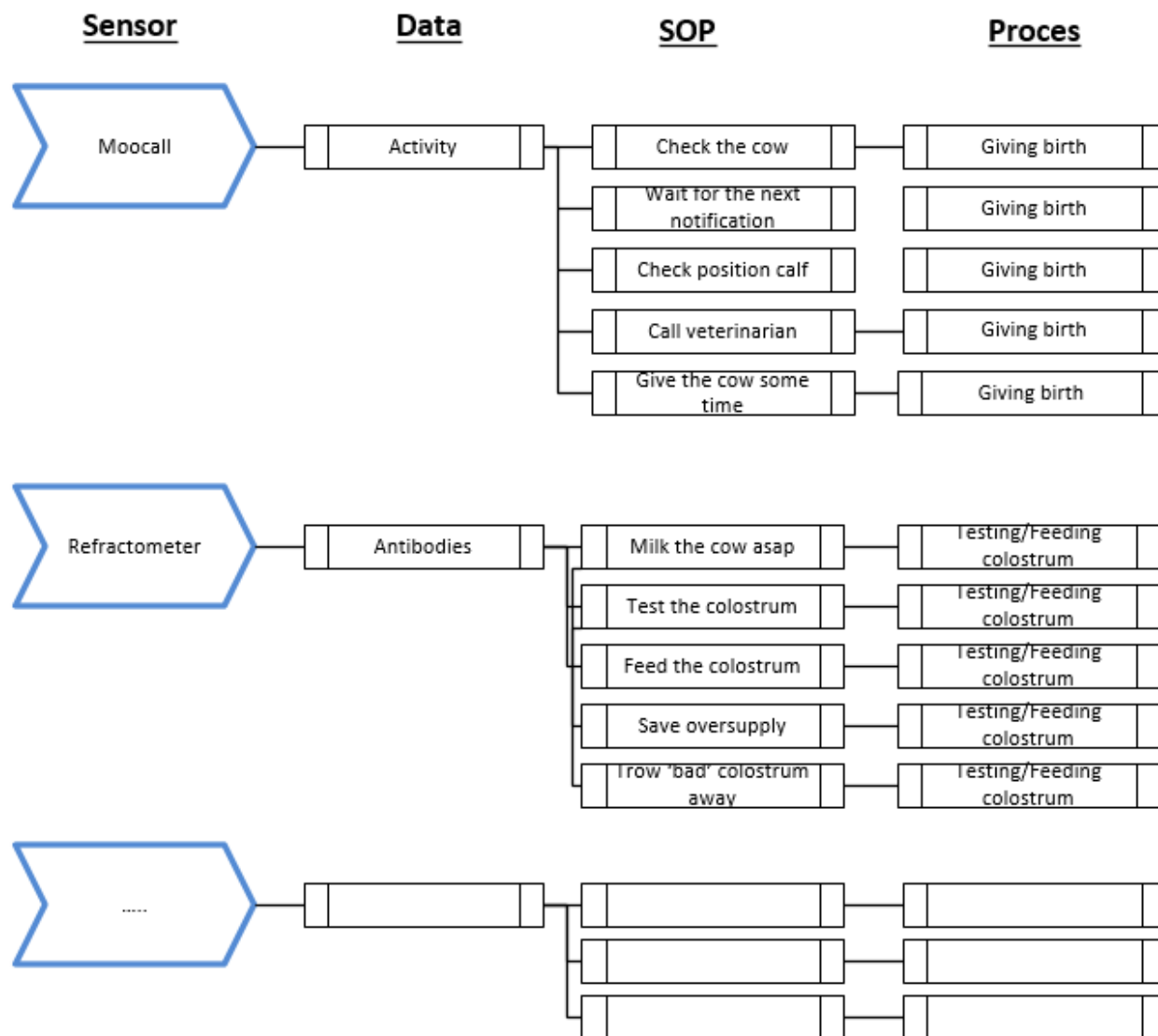
How will those goals be measured?

The health of calves and youngstock can be measured by the numbers of dead animals and the veterinarian costs.

For detail description; see Best Practice Guides on the 4D4F website.



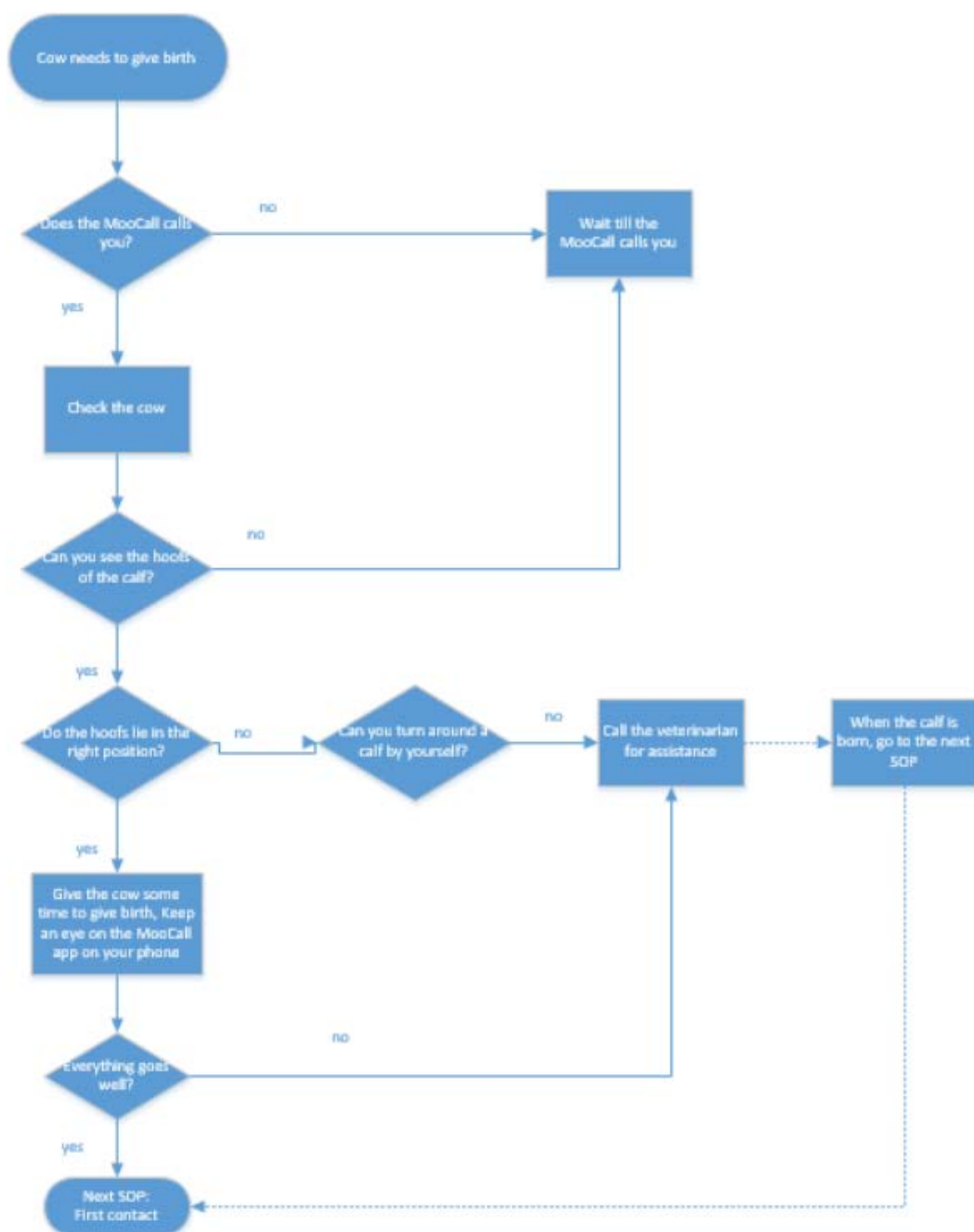
SIG 9 – Calves and Youngstock





Moocall – Activity – Process detection giving birth

- Original -





SOP – Check the cow in labour

Object of interest: The cow

Who: The person who is responsible for the cows in labour

What: Move the cow in the straw penn

When: When the cow is ready to give birth

Where: In the barn

How: See how to check the cow during labour

Move the cow in
the straw penn

HOW TO CHECK THE COW DURING LABOUR

1. *Check the time when you start watching the cow*
2. *Notice the status of the cow in labour*
3. *Check the cows several times at your own discretion*
4. *Keep tracking your time when you've seen changes during labour*

Attentions to check by cows in labour

1. *Is there enough clean straw?*
2. *Is the cow leaking milk?*
3. *Are the bands of the cow descent?*
4. *Can you see the fleeces?*
5. *Can you see the hooves of the calf?*

SOP – Keep an eye on the Moocall app

Object of interest: The Moocall app

Who: The person who is responsible for the cows in labour

What: Keep an eye on the Moocall app

When: When the cow is in labour

Where: On the phone

How: See how to check the Moocall app

Wait till the
Moocall calls you

Give the cow some
time to give birth, Keep
an eye on the Moocall
app on your phone

HOW TO CHECK THE MOOCALL APP

1. *Receive the first text message*
2. *About an hour after the first text message the cow will start calving.*
3. *The second text message will follow in an hour when tail activity continues*
4. *Easy calving may results in shorter notice periods*
5. *After the second text message you need to check on the cow by yourself*



SOP – Call the veterinarian

Object of interest: Veterinarian

Who: The person who is responsible for the cows in labour

What: Call the veterinarian

When: When the cow can't give birth by herself

Where: Wherever you are

How: By calling.....

Call the veterinarian



Moocall – Activity – Process detection giving birth

- Changes -

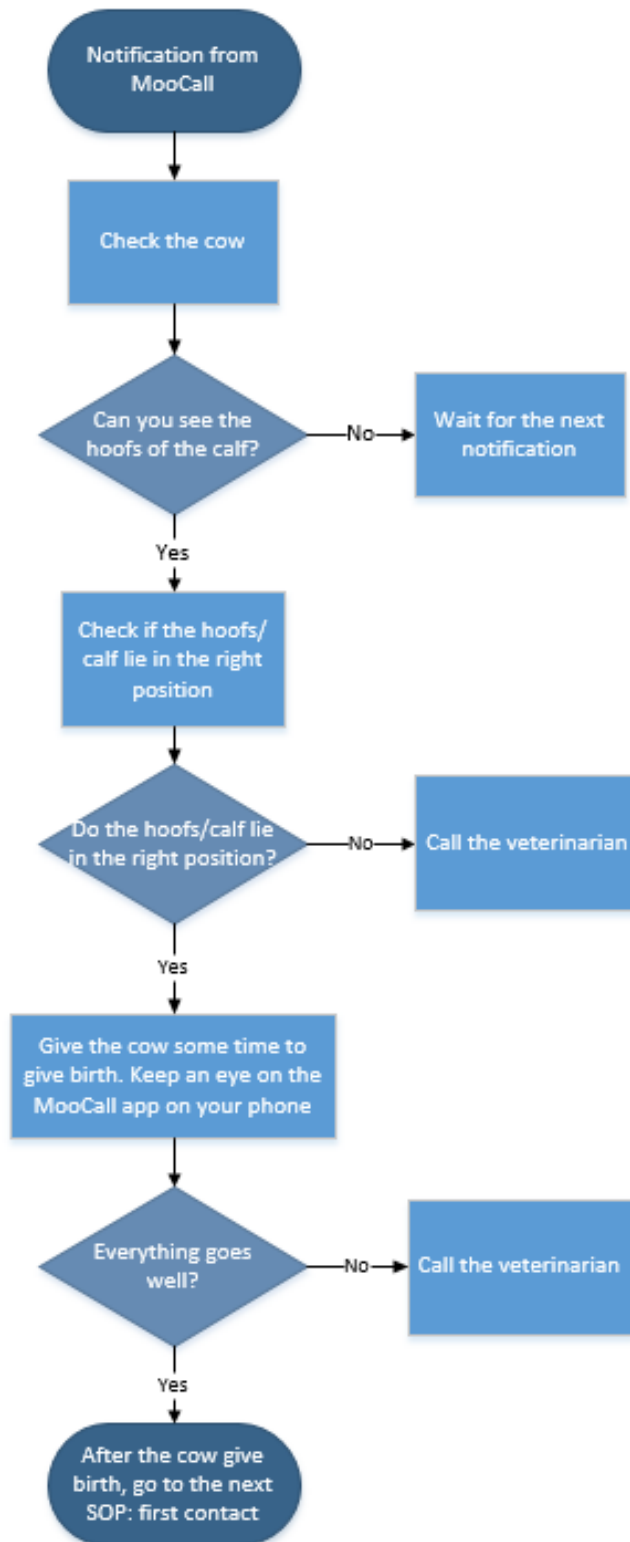
Below an overview of the made changes in the original SOP:

- The process became clearer
- Added clearer decisions
- Added instructions how to check a cow in labour



MooCall – Activity – Process detection giving birth

- Improved -





SOP – Check the cow

Object of interest: The cow

Who: The person who is responsible

What: The cow

When: When getting a notification from Moocall

Where: In the barn/field

How: See here below:

Check the cow

HOW TO CHECK THE COW IN LABOUR

1. Check the time when you start watching the cow;
2. Notice the status of the cow in labour
 - a. Is the area around the cow in labour clean?
 - b. Is the cow leaking milk?
 - c. Are the bands of the cow descent (Disappearing pelvic ligaments)?
When the bands of the cow has complete suck down, like in the picture here below, the cow is just hours removed from giving birth.



- d. Can you see the water bag?
When the water bag is showing the cow can give birth within one hour.



3. Check the cow several times at your own discretion;
4. Keep tracking your time when you've seen changes during labour.



SOP – Wait for the next notification

Object of interest: The cow

Who: Farmer

What: wait for the next notification

Where: Wherever you are

When: When you don't see the hoofs of the calf

How: by waiting for a notification from Moocall

Wait for the next
notification

SOP – Check if the hoofs/calf lie in the right position

Object of interest: The cow

Who: Farmer

What: The calf

Where: By the cow that's in labour

When: When you see the hoofs of the calf

How: Check if you see and feel the two hoofs. If you feel them, give the cow some time to give birth. When not, *call veterinarian!*

Check if the hoofs/
calf lie in the right
position



SOP – Call the veterinarian

Object of interest: Veterinarian

Who: The person who is responsible for the cows in labour

What: Call the veterinarian

When: When the cow can't give birth by herself

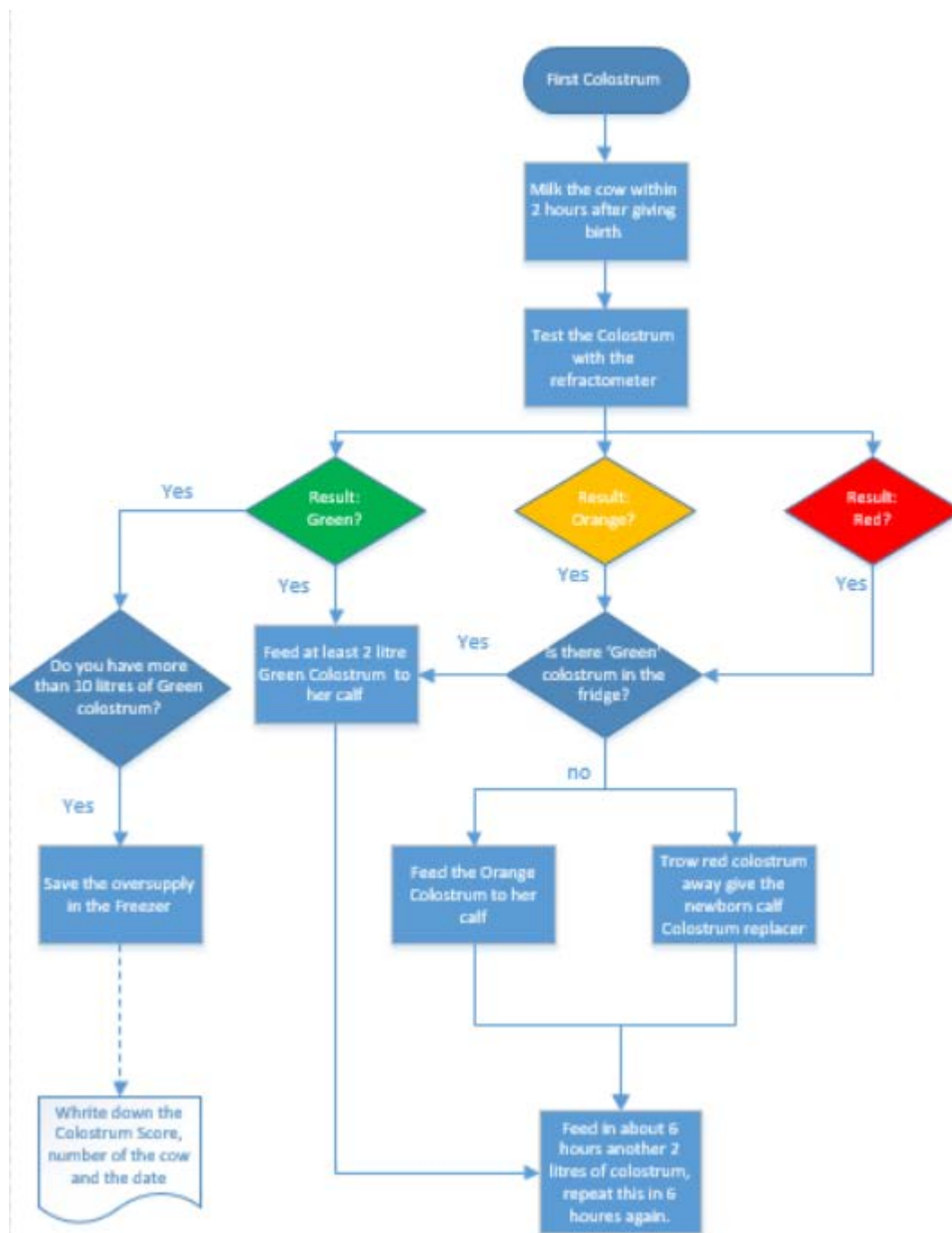
Where: Wherever you are

How: By calling.....

Call the veterinarian



Refractometer – Antibodies – process detection quality of colostrum - Original -





SOP – Milking the cow after giving birth with trolley milker

Object of interest: The milk

Who: The person who is responsible for milking cows

What: Milk the cow

When: After giving birth

Where: In the milking parlour

How: see how to milk with a trolley milker

Milk the cow within
2 hours after giving
birth

HOW TO MILK WITH A TROLLEY MILKER

1. *Feed the cow concentrate*
2. *Clean the udder*
3. *Massage the udder*
4. *Connecting liners*
5. *Take off all four liners gently*
6. *Post dip the cow*

SOP – testing the colostrum with the refractometer

Object of interest: The colostrum

Who: The person who is responsible for testing colostrum

What: Test the colostrum

When: After milking

Where: In the milking parlour

How: see how to test colostrum with refractometer

Test the Colostrum
with the
refractometer

HOW TO TEST COLOSTRUM WITH REFRACTOMETER

1. *Harvest the colostrum (see SOP milking with trolley milker)*
2. *Take the refractometer*
3. *Put some colostrum on the scale*
4. *Measure the quality of the colostrum*
5. *Administrate the outcome*



SOP – feeding colostrum

Object of interest: The colostrum

Who: The person who is responsible for feeding calves

What: 2 litres of colostrum

When: immediately after cow is milked

Where: in the barn

How: see how to feed colostrum



HOW TO FEED COLOSTRUM

- 1. Put 2 litres of colostrum in a bottle*
 - 2. Heat it up until 40-45 degrees Celsius*
 - 3. Go to the calf*
 - 4. Let the calf drink all the colostrum*
-



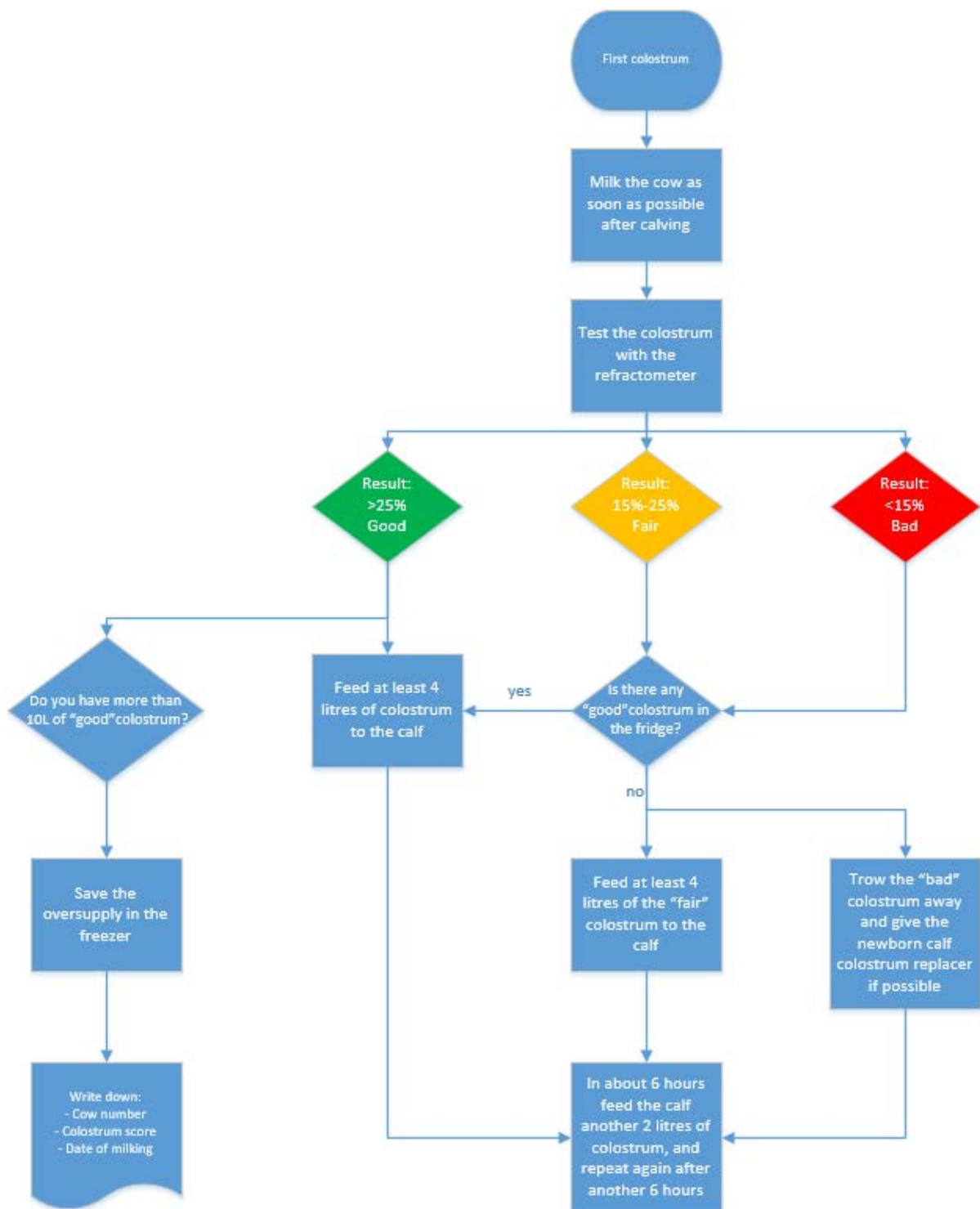
Refractometer – Antibodies – process detection quality of colostrum - Changes -

Below an overview of the made changes in the original SOP:

- Explained the results of the refractometer; what is good, fair and bad colostrum?
- Adopted words of good, fair and bad instead of green, orange and red colostrum. The color of the colostrum does not always tell something about the quality.
- Increased the amount of colostrum at the first feeding.



Refractometer – Antibodies – process detection quality of colostrum - Improved -





SOP – Milking the cow after giving birth with trolley milker

Object of interest: The milk

Who: The person who is responsible for milking cows

What: Milk the cow

When: After giving birth

Where: In the milking parlour

How: see how to milk with a trolley milker

Milk the cow within
2 hours after giving
birth

HOW TO MILK WITH A TROLLEY MILKER

1. *Feed the cow concentrate*
2. *Clean the udder*
3. *Massage the udder*
4. *Connecting liners*
5. *Take off all four liners gently*
6. *Post dip the cow*

SOP – testing the colostrum with the refractometer

Object of interest: The colostrum

Who: The person who is responsible for testing colostrum

What: Test the colostrum

When: After milking

Where: In the milking parlour

How: see how to test colostrum with refractometer

Test the Colostrum
with the
refractometer

HOW TO TEST COLOSTRUM WITH REFRACTOMETER

1. *Harvest the colostrum (see SOP milking with trolley milker)*
2. *Take the refractometer*
3. *Put some colostrum on the scale*
4. *Measure the quality of the colostrum*
5. *Administrate the outcome*



SOP – feeding colostrum

Object of interest: The colostrum

Who: The person who is responsible for feeding calves

What: 2 litres of colostrum

When: immediately after cow is milked

Where: in the barn

How: see how to feed colostrum



HOW TO FEED COLOSTRUM

- 1. Put 2 litres of colostrum in a bottle*
 - 2. Heat it up until 40-45 degrees Celsius*
 - 3. Go to the calf*
 - 4. Let the calf drink all the colostrum*
-



3.6 Grassland Management

Grass is the cheapest forage available, and optimizing the growth stage at which grass is harvested/grazed will lead to more milk produced from forage, and more profit. But grazing management is rather complex. Dairy farmers that apply grazing on their farm have to cope with a daily variation in grass offer, grass quality and the grass intake of their cows. Also changing weather conditions and soil conditions have to be taken into account. Working with different parcels at the same time it is important to support dairy farmers in making more data driven decisions on when to mow the grassland or to start grazing on that specific parcel.

Within Europe there are a lot of different grazing systems that can be practiced on dairy farms. In all of these grazing systems there is a need for objective measurement and prediction of grass growth. In this best practice guide we focus on tools and systems to measure and predict grass growth.

What business goals will be achieved through better management with this SOPs?

By using these SOPs the management of grassland will improve. The stock of grasses will be better managed, the cattle will have available more and better quality of grasses. The moment of choice by making decisions like can I start harvesting or can the cattle graze in this pasture will be better supported by using tools in combination with the SOP.

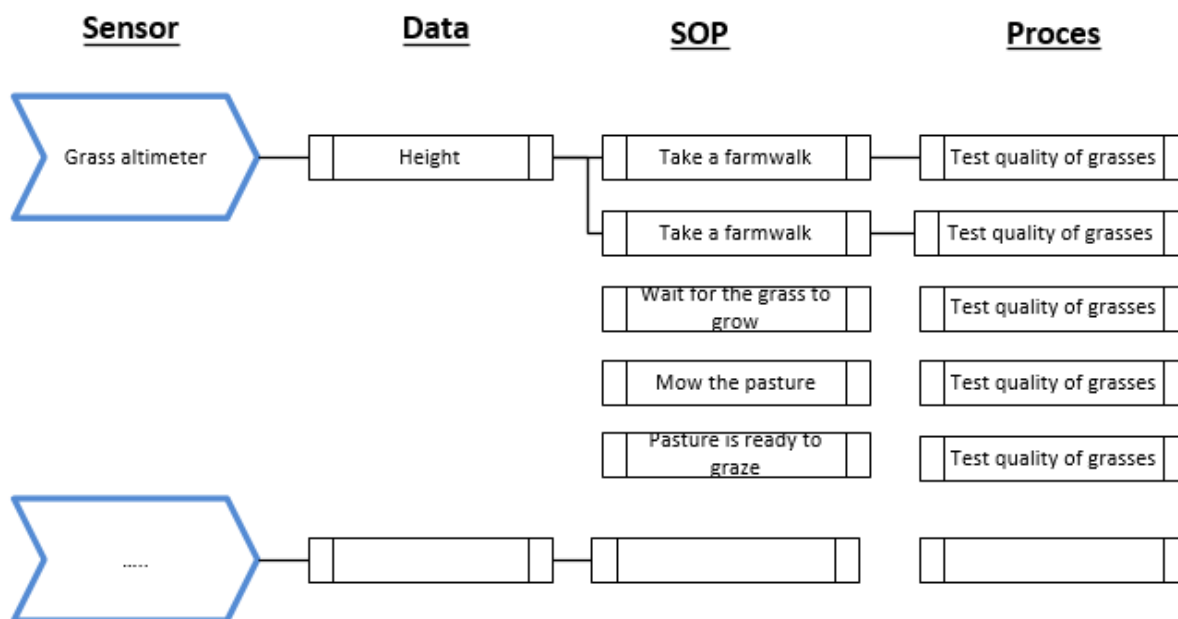
How will those goals be measured?

The quality of the harvested grasses can be measured in the grass-resources. The quality of grazing grasses can be measured in the quality of the milk.

For detail description; see Best Practice Guides on the 4D4F website.

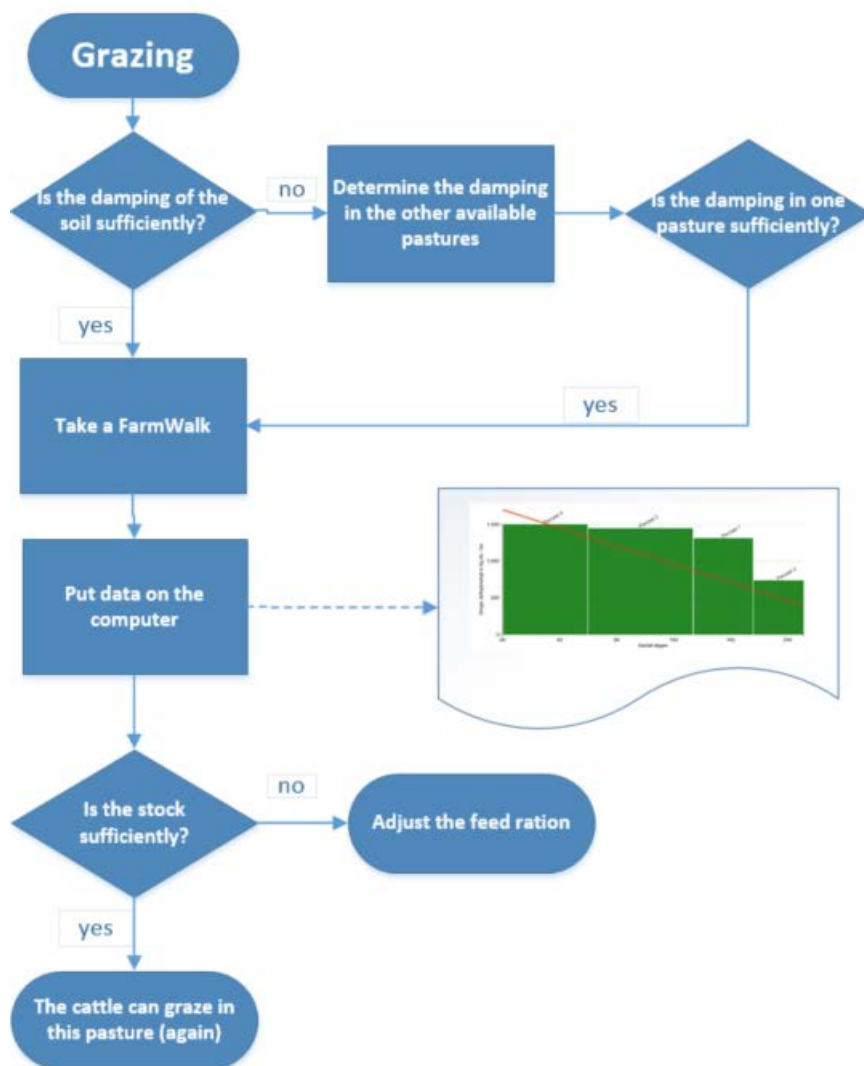


SIG 11 – Grassland management





Grass altimeter – height – process detection grass growth - Original -





SOP – Determine the damping in the pasture

Object of interest: The damping

Who: The person who is responsible for measuring grassland

What: Determine the damping in the other available pastures

When: When you'll start grazing

Where: In the pasture

How: see how to determine the damping in the pasture

Determine the damping
in the other available
pastures

HOW TO DETERMINE THE DAMPING IN THE PASTURE

1. *Go to the pasture*
 2. *Walk through the pasture and measure by walking the damping of the pasture*
 3. *Multiple your footprint with 7,5, this will be the footprint the cow will make*
-

SOP – Take a Farmwalk

Object of interest: The Farmwalk

Who: The person who is responsible for measuring grassland

What: Take a Farmwalk

When: When you'll start grazing

Where: In the pasture

How: see how to do a farmwalk

Take a FarmWalk

HOW TO DO A FARMWALK

1. *Go to the pasture*
 2. *Walk through the pasture and measure by using a grass altimeter the height of the grasses*
 3. *Walk in a V or W shape*
 4. *Measure at 30 points in the walked shape.*
 5. *Reduce this with the cutting height.*
 6. *Calculate the average height.*
 7. *Convert this into KG/DM per HA*
-



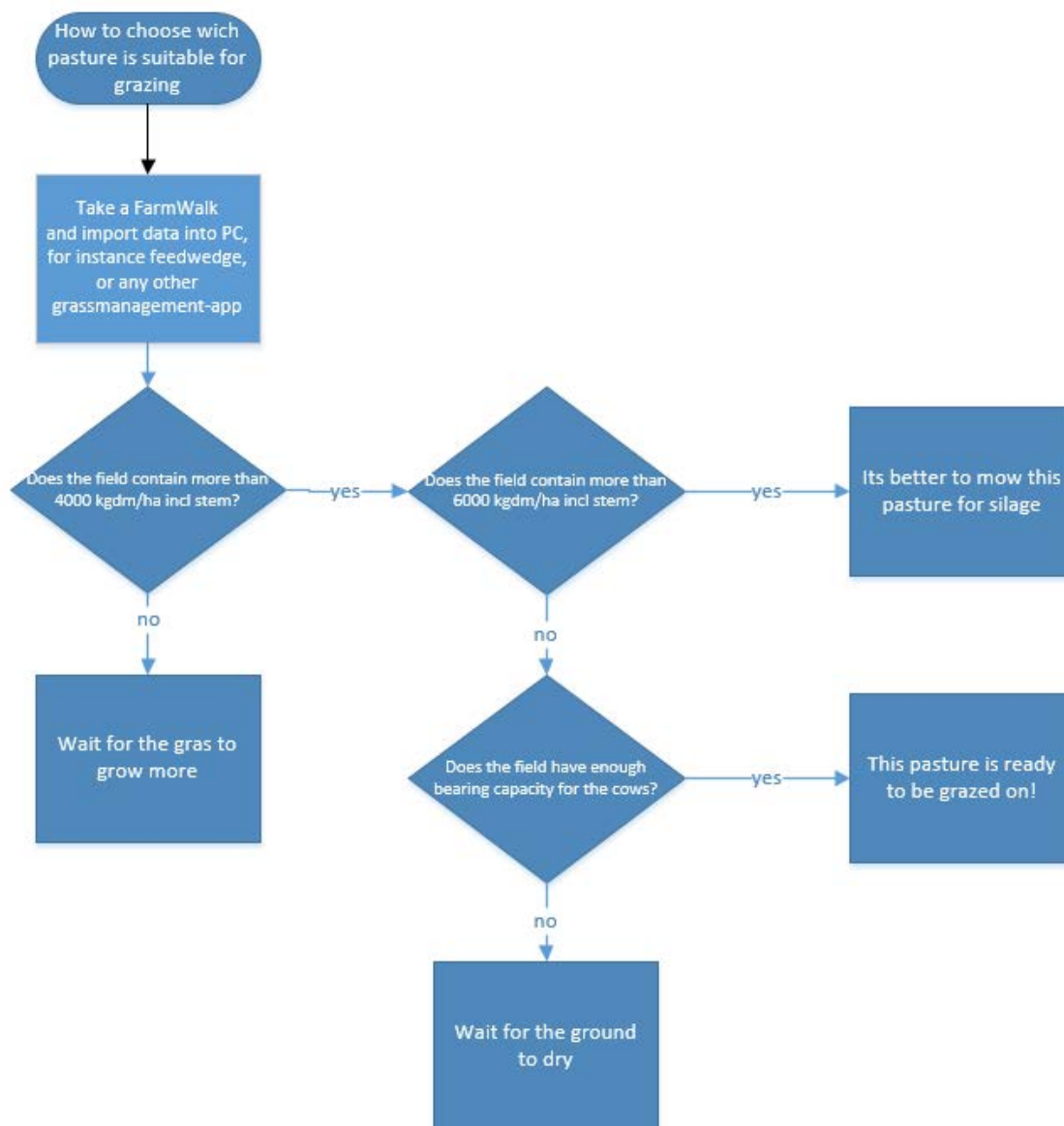
Grass altimeter – height – process detection grass growth - Changes -

Below an overview of the made changes in the original SOP:

- Explained the actions more extensive
- Give practical advise



Grass altimeter – height – process detection grass growth - Improved -





SOP – Take a Farmwalk

Object of interest: The Farmwalk

Who: The person who is responsible for measuring grassland

What: Take a Farmwalk

When: When you'll start grazing

Where: In the pasture

How: see how to do a farmwalk



HOW TO DO A FARMWALK

1. *Go to the pasture*
 2. *Walk through the pasture and measure by using a grass altimeter the height of the grasses*
 3. *Walk in a V or W shape*
 4. *Measure at 30 points in the walked shape.*
 5. *Reduce this with the cutting height.*
 6. *Calculate the average height.*
 7. *Convert this into KG/DM per HA*
-



Discussion

SOPs around the Herd Navigator and Body Condition Score (Delaval)

After the workshops around the processes and SOPs about the sensor technologies mentioned above, we have sent the feedback to Delaval Sweden. Because the feedback was especially focused on the sensor technologies of Delaval, we decided to use this feedback in general in the process of improving the SOPs, but not publish the improved SOPs of Delaval. This choice is made to give Delaval time and space to gain their own information of the workshops. We assume that all partners respect this choice.

Acknowledgement

We want to thank our partners for their co-operation on the workshops and especially extern partners of the project; AB Vakwerk and IceRobotics for participation on the workshops.

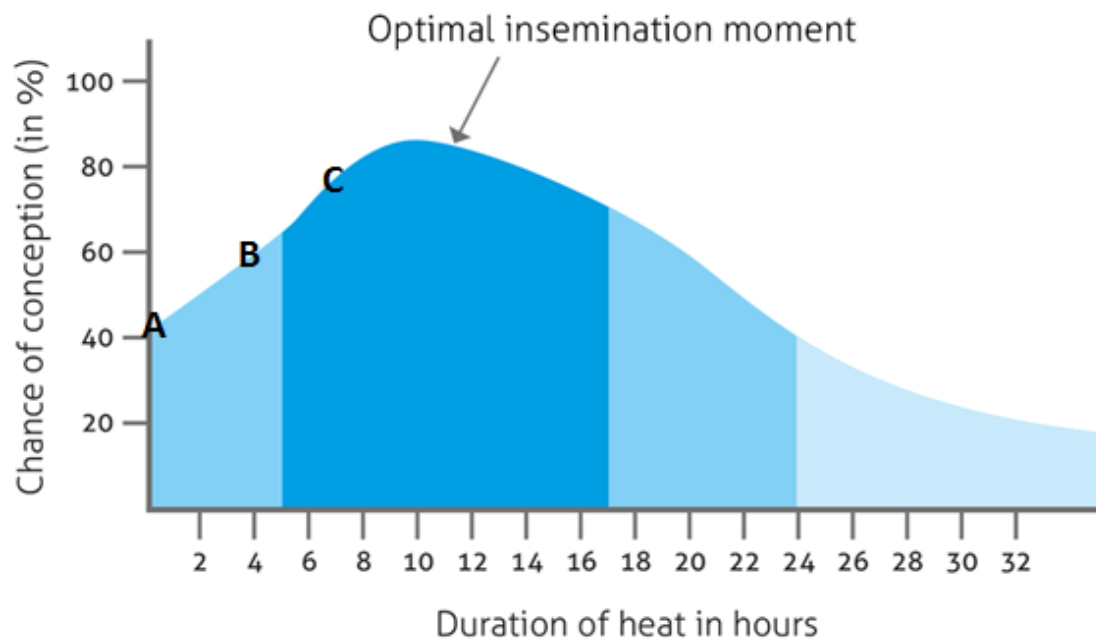


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Appendix 1: Optimal insemination moment





SOP Health Check

Checklist (Check the box if true)

1. First Check:

The first thing you need to do to determine if the cow needs attention or not is to check the following points:

- ☐ The cow doesn't react quickly and/or is not active
- ☐ The eyes are "laying deep" and are a bit pale
- ☐ The cow is breathing quickly
- ☐ The manure of the cow looks like water

If you checked 3 out of the 4 boxes, continue with **2. Temperature**. If not, continue with **3. Body Condition Score**.
If you checked the fourth box, you should immediately **call the veterinarian**, the cow already has a health problem

2. Temperature

Measure the temperature of the cow. You can measure this by using a rectal thermometer, and pressing it against the wall of the rectum, this will give the most accurate reading of the cows temperature. The temperature of the cow says a lot about the health of the animal.

If you've done this, check the following points:

- ☐ The temperature is higher than 39.5°C
- ☐ The ears are cold

If you checked the first box, the cow probably has Pneumonia. **Call the veterinarian!**

If you checked both boxes, the cow probably has ketosis. **Call the veterinarian!**

If the cow has a temperature between 38°C and 39°C, go to 3. Body Condition Score

3. Body Condition Score

Check the "metabolic moments" poster to learn about BCS and how to give a cow a score. A Body Condition Score is an easy way to check if the feed intake and her digestive system of the cow is good, most sick cows have a lower score than healthy cows.

- ☐ The cow is in the first 60 days of her lactation
- ☐ The cow has a score of <2.5
- ☐ The cow has a score of >4

If you checked the first two boxes, the cow probably has ketosis. **Call the veterinarian!**

If you checked the second box, smell the cows breath:

- If it smells like acid, the cow probably has rumen acidosis. **Call the veterinarian!**
- If it doesn't smell like acid, check **4. Feed Intake**.

If you checked the third box, the cow is too fat, ask a veterinarian for advice. This is not an urgent problem.

4. Feed intake

Check the "Feed Intake Scoring" poster to learn about how to score rumen and belly fill

- ☐ The rumen of the cow (white arrow) has sunken into her body
- ☐ The belly (blue arrow) is flat, and not sticking out of the cow (unlike the "eaten well" score)
- ☐ The ribs and hips are becoming visible, and don't have fat on them.

If you checked the first box, the cow hasn't eaten today, check the cow again tomorrow, if the rumen is the same or getting worse, call the veterinarian

If you checked all the boxes, the cow might be lame (check **5. Lameness**) if this isn't the case: **Call the veterinarian!**

5. Lameness

Check the "Lameness Scoring" poster to learn about scoring lameness. If a cow has pain during walking, she doesn't want to go eat, drink and get milked. Lameness costs farmers hundreds of euros, so it's necessary to treat it as quick as possible.

- ☐ The cow has a score of 0 or 1
- ☐ The cow has a score of 2 or 3

If you checked the first box, no action is necessary.

If you checked the second box, the cow is lame. **Call the veterinarian!**






















Appendix 4: Feed Intake Scoring

Eaten well	This cow has eaten well. Rumen fill, belly fill and condition are OK.
Rumen fill	This cow has not eaten enough <i>TODAY</i>.
Belly fill	This cow has not eaten enough <i>THIS WEEK</i>.
Condition Score	This cow has not eaten enough <i>THIS MONTH</i>.



Appendix 5: Lameness Scoring

Score	Walking speed	Stride	Weight bearing	Backline	Head
0 Walks evenly No action required This cow is normal	Confident. Similar walking speed to a person. Maintains position in the herd. 	Long, even and regular. Rear foot placement matches front foot placement. 	Evenly placed and weight bearing when standing and walking. 	Straight (level) at all times. 	Held in line or slightly below the backline and steady when walking. 
1 Walks unevenly Minor action required Record and keep an eye on her – some cows normally walk unevenly	Not normally affected, should easily maintain position in the herd. 	May have uneven stride and/or rhythm. Rear foot placement may miss front foot placement. 	May stand or walk unevenly but difficult to identify which leg/s are affected. 	Straight when standing, may be mildly arched when walking. 	May have slight bob and/or may be held lower than normal. 
2 Lame Action required This cow is lame and needs to be reported, drafted and examined within 24 hours	May be slower than normal; may stop, especially when turning a corner. 	Shortened strides rear foot placement falls short of front foot placement. 	Uneven – lame leg can be identified. 	Often arched when standing and walking. 	Bobs up and down when walking. 
3 Very lame Urgent action required This cow is very lame and needs urgent attention. Draft and examine as soon as possible	Very slow, stops often and will lie down in paddock. Cannot keep up with the healthy herd. 	Shortened and very uneven. Non lame leg will swing through quickly. 	Lame leg easy to identify – 'limping'; may barely stand on lame leg/s. 	Arched when standing and walking. 	Large head movements up and down when walking. 