



Best Practice Guide on Data Management

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The explosion in the numbers of sensors on farm has led to an exponential increase in the amount of data produced. **What is the value of this data?** The answer depends on how data is effectively included in daily management. This guide concentrates on strategies that will create value from data, save farmers' time, including best practice in displaying data to get information, compare dairy management systems, and look at the future benefits that may arise from storing data.

Initially dairy sensor technology were standalone single issue systems, for example; pedometer heat detection systems that just measured the number of steps a cow took. Current research **shows** the benefit of including lying time, eating time and rumination rate into the calculations. But no matter how complex the calculation, we cannot provide 100% certainty, what we can do is identify animals that stockmen need to focus their attention on – using their skill in combining data information with stockmanship to come up with an action. **Better decisions are made with this combination rather than using technology alerts or stockmanship alone**, especially as the stockman's time is spread over more and more animals.

User Interfaces

The way that data is presented is a key issue in enhancing the stockman's ability to make better decisions.

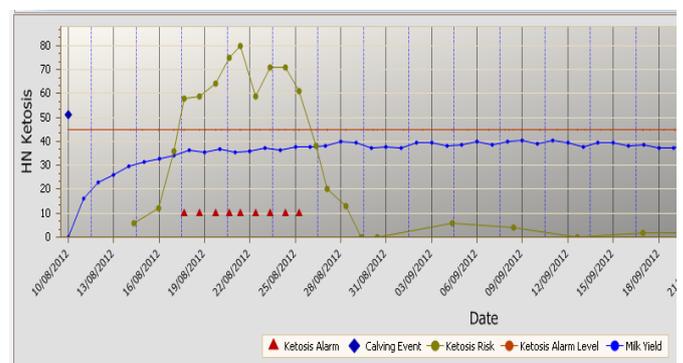
For routine alerts it is best practice to start the day looking at an "attention list" of cows to concentrate on.

Some systems give **overall rankings** by combining different measures into an **index** e.g. [Heatime Pro](#) (see figure below)

CURRENTLY IN HEAT COWS							
COW ID	GROUP NAME	DIM / AGE	HEAT INDEX	RUMINATION LOW	HOURS TO AI	DAYS SINCE LAST HEAT	DAYS FROM AI
5617	Mavkirot	92	92	-18	17	37	N/A
5635	Mavkirot	72	92	-32	11	N/A	N/A
5389	Amlata	346	88	-27	7	0	N/A
5595	Mavkirot	148	84	-7	17	21	N/A
5747	Eglot	473	76	N/A	! 0	21	N/A
5741	Eglot	484	76	N/A	5	7	N/A
5748	Eglot	472	60	N/A	23	17	N/A
5334	Amlata	272	52	-19	! 0	22	N/A
5708	Eglot	550	52	N/A	7	21	N/A

Heatime Pro

Or by providing a **percentage probability**, as in the green line below, which shows [DeLaval's](#) estimation of the chance of ketosis.



DeLaval Herd Navigator screen



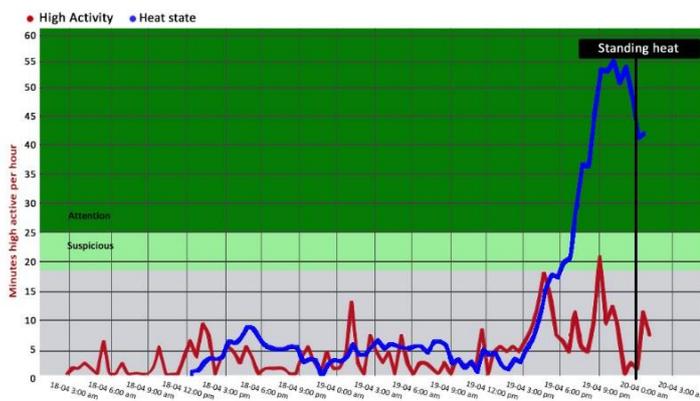
Others **categorize cows** for a certain trait such as strong heat; suspected heats; low activity.

Ideally such list should be combined into one. Based on the info of the lists, it is then best to investigate the information that is available for each cow. Combining the info with a visual check of the cow, and herd information, an action can be decided.

There are strong differences in graphical representation between systems.

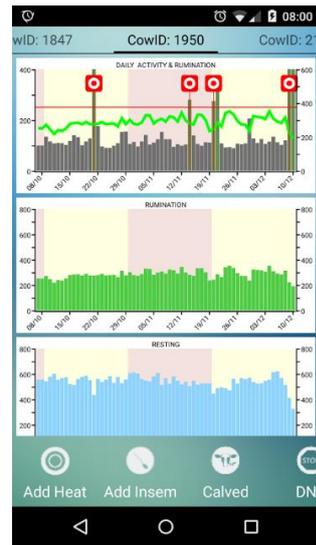
The Heatime Pro interface does not show the real values for activity data and rumination, but their relative rate of change. This makes the visual picture easier to understand.

The four week timescale is useful in judging how well the cow is cycling. Heatime Pro further allows the user to easily define the timescale that is viewed.



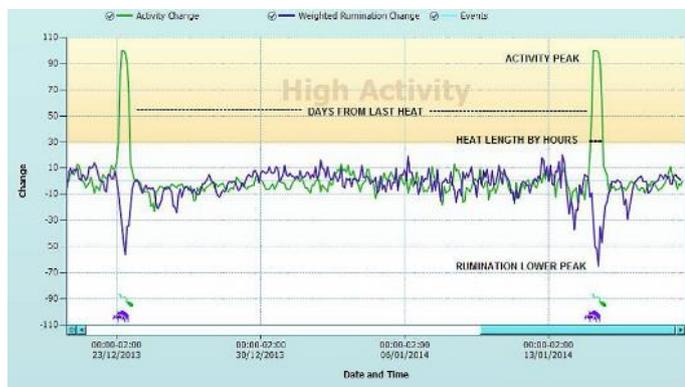
[CowManager](#) display

The graph from Cow Manager shows a two stage alert level, so the farmer can choose to investigate suspicious heats as well as obvious ones. The standing heat line is not part of the normal interface.



[DairyMaster Moomonitor+](#)

The DairyMaster Moomonitor+ has a good Smartphone App. The benefit of this smartphone interface is that the individual cow information can be accessed when inspecting the cow in the barn, both as a result of following up a health alert, or a stockman's intuition.



SCR Heatime Pro

Technology as support for the stockman

In order for technology to work successfully with farmers, trust has to be established. It is best practice to initially continue with traditional farm protocols when new technology is installed, effectively calibrating the system to on farm conditions, and gain an understanding on its capabilities and limitations. For instance identifying how the timing of heat alerts compares with visual observation of standing heat will enable optimal timing of insemination, or learning how far down the low activity list is it worth looking for sick cows.



Once a farmer has a feel for a system, a lot of time can be saved. Moreover, by automatically linking the alerts to barn automation such as a segregation gate, stress in cows can be reduced.

The best systems will not only provide attention lists, they will also give “push” alerts when immediate action is required, for instance a Smartphone App. This will only be effective if there are a small number of false alarms, otherwise there can be a loss of trust in the system. Currently, the number of false alarms remains a problem for most systems.

Herd Management Systems

So far we have looked at individual sensor systems. However optimal decisions will include combining information from many sources including:

- Current milk yield
- Previous milk yield
- Reproduction history
- Vet / treatment history
- Genetic merit / family history
- Location

The goal is to integrate data from multiple sensors, together with a single input whole farm recording system. The current reality is that farms use a number of standalone systems, each requiring duplicate data entry.

A successful herd management system will automate the collection, analysis and reporting of data gathered from sensors. The **warehouse of technologies** compares some of the herd data management systems that are available, and differentiates between systems that will accept data input from multiple sources and systems which are largely restricted to an individual company’s technology.

Data and Breeding

Accurate, objective data that can be directly assigned to parentage and aggregated to enable genomic analysis facilitates rapid selection for breed improvement.

New recording systems, such as [farmimpress](#), which can provide a detailed record of all animal treatments, open up the opportunity to breed for new traits. Imagine the progress that could be made with widespread accurate, animal level data on the usage of fertility treatments, antibiotic use, locomotion, condition score, feed intake...

Smartphone Data Entry

Current best practice is direct entry of non-sensor data in real time directly into the management system via smartphone or tablet. The best systems:

- Use a phone/tablet that is robust enough for use in a farm setting
- Use dropdown menus where possible to accurately record events as they happen
- Is able to provide individual animal data in real time
- Can be accessed when away from the farm
- Can run off-line and then automatically synchronise
- Can support multiple operators



Reviewing cow data on data management app via a smart phone



The benefits of the above are that more data can be recorded more accurately in less time, and that the information is available in real time in the cow shed.

Additional useful features of herd management systems are:

- Farmers can customise the information shown on the home page
- Systems can automatically populate the database from existing records
- Automatic provision and electronic submission of all statutory reports
- The ability to exchange data with other agencies e.g. milk recording, national databases
- Automatic creation of customised action lists

Is Big Data the Future?

The increasing use of technology and sensors in cowsheds, creates more and more data. The hype term for this is “Big Data”. This means that the volume of data is too large to analyse and interpret with merely a graphical interface. Big Data is term that we all see but how can it help?

There is only a limited amount of information that a human can take in and make decisions from. Exceed the optimum and the quality of the decision making deteriorates. Computers are different, they thrive on data, and the more data the better the decision. Rather than modelling against a gold standard indicator (for example a standing heat in identifying oestrus) and flagging up an alert when it occurs, [connecterra](#) uses machine learning on individual cows to analyse multiple data sources to give both detection and prediction of oestrus and health issues.

To Cloud or not to Cloud?

Big Data is usually linked with the “Cloud”. As for intensive analytics, such as the ones mentioned in the previous paragraph, strong calculation power is needed. This can easily be organized in the Cloud without investment costs at the farm. So, in the dairy sector, the Cloud is a welcome technology to embrace, enabling farmers to exploit modern data analytic tools in the dairy farming environment. Moreover, with a Cloud solution, comes a Smartphone app. As mentioned before, an app can give you direct information standing between your cows or allows you to enter data in the barn.

Data Security & Data Ownership

In terms of data security, Cloud systems are better than any local system. The providers of such clouds also run systems for other sectors, including health care and financial data. So these systems are well protected.

A more important issue is Data Ownership. The basic rule is simple: the data is owned by the entity producing them, the dairy farmer. But who else can see and use the data has to be depicted in the User Terms of cloud based software. It is strongly advised to read these user terms, or ask your provider what exactly is happening with the data and keep good track of permissions given to third parties (veterinarians, feed companies etc.).

Cloud based systems enable sharing, and data sharing can bring value to the support of the farmer. However, remain assertive on the sharing, and be aware of the future value of aggregated data.

Key Performance Indicators (KPIs) and Benchmarking

Knowledge is power. The ability to know where best to focus management time and investment is common amongst the most profitable dairy managers.

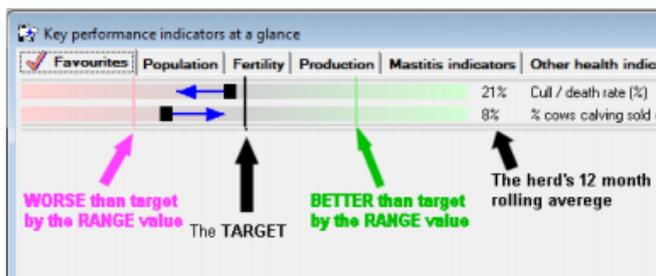


The first step is to decide what are the most important factors that affect your dairy business. These are KPIs and will vary for different dairy systems .

The second step is to identify areas in which your herd has the ability to improve. This can only be done by benchmarking your farm’s KPIs with those of other similar farms. UK milk recording organisation NMR, compiles a range of different dairy KPIs in its [interherd plus report](#) which are displayed as follows:

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Presentation of KPIs in NMR's interherd plus

Note how the colour coded presentation shows not only how each KPI compares to the target, but also if the KPI is improving or deteriorating.

Best practice is for a group of similar dairy farms to confidentially share physical and financial data. This will improve the relevance of the benchmarking, and motivate competitive improvement. Focus should be given to areas where the greatest gains can be made, and not to important KPIs where performance is already elite.

[Lely's T4C](#) farm homepage has a colour-coded fuel gauge style presenting KPIs.



Lely T4C