GENTORE

NEWSLETTER

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About GenTORE

GenTORE – "GENomic management Tools to Optimize Resilience and Efficiency" - is a European Union funded project within the Research and Innovation Program H2020.

GenTORE will develop innovative genome-enabled selection and management tools to empower farmers to optimize cattle resilience and efficiency (R&E) in different and changing environments. The combined research and outreach program of GenTORE will make a contribution to addressing the challenges facing farming in a changing and volatile world.

Successful 3rd annual meeting GenTORE

The third annual meeting of GenTORE was held as an online event between the 11th –13th of May 2020. The meeting consisted of 3 plenary webinar sessions that included reporting, key points for the following years, internal WP meetings, a young scientist session with presentations and a workshop on what a future cow could look like in terms of important traits. We look back on a fruitful online meeting!

EAAP Annual Meeting 2020 as virtual event

The European Federation of Animal Science (EAAP) has, in light of the uncertainty about the COVID-19 pandemic and the difficulty in making plans about hosting a major international conference, decided to cancel the onsite 2020 EAAP Annual Meeting. However, the meeting will be hosted as a virtual event from the 1st to 4th of December! More information is coming soon.

Editorial

By: Nicolas Friggens—INRA

This GenTORE newsletter provides a brief window on the activities of our project in its third year. It has, of course, been a complicated year with the impact of the coronavirus which severely disrupted life and work for many. However, as shown by the seamless shift from a physical annual meeting in Padua in May to a virtual meeting, GenTORE has shown itself to be resilient, to adapt to the circumstances and to carry on. Who knew that you could get upwards of 80 researchers and stakeholders to all remember to mute their microphones and not talk over one another for 3 whole days! I take this opportunity to thank those who worked very hard to organize this meeting both the local hosts in Padua and the logistic team of the project.

This third year has also been very productive year, with a significant crop of peer-reviewed papers added to the GenTORE publications pipeline as well as numerous presentations at a broad range of meetings. Indeed, in this newsletter you will find a taster of these results with summaries from 5 early-career-stage researchers in addition to a feature on "eye-in-the-sky" technology for tracking cows at pasture. You will also find articles describing stakeholder engagement to different segments of our potential audience. In addition to strengthening our Young Scientists Network, GenTORE took the lead in setting up a dissemination cluster bringing together 6 projects working in the livestock space. This "Fitter Livestock Farming" cluster has enabled us to give added value to the individual projects outreach and dissemination activities, including being a major presence at a policy-makers forum in Brussels.

The project is firing on all cylinders. The later starting Work Packages are now up to speed and work package 1 is ending in glory. It has developed, and made publicly available, an unique and comprehensive Europe-wide farm typology and climate risk database. The first 3 papers building on this database are being submitted as we speak. A number of new methodologies for phenotyping resilience and efficiency have been developed that are adapted to the context of precision livestock farms (WPs 2 and 3). That is to say that they benefit from the fact that there are time-series measures and so can identify both time-trends in efficiency but also can quantify how animals deal with environmental perturbations (a measure of resilience). We have shown that there is a link between resilience, production levels and longevity, which will be taken into account in the development of GenTORE genomic evaluation and selection tools. The genomic work packages (4 and 5) have already produced methodological advances for multi-breed evaluations and have developed decision support tools that are being deployed to the breeding industry and at farm-level for breeding and replacement management.
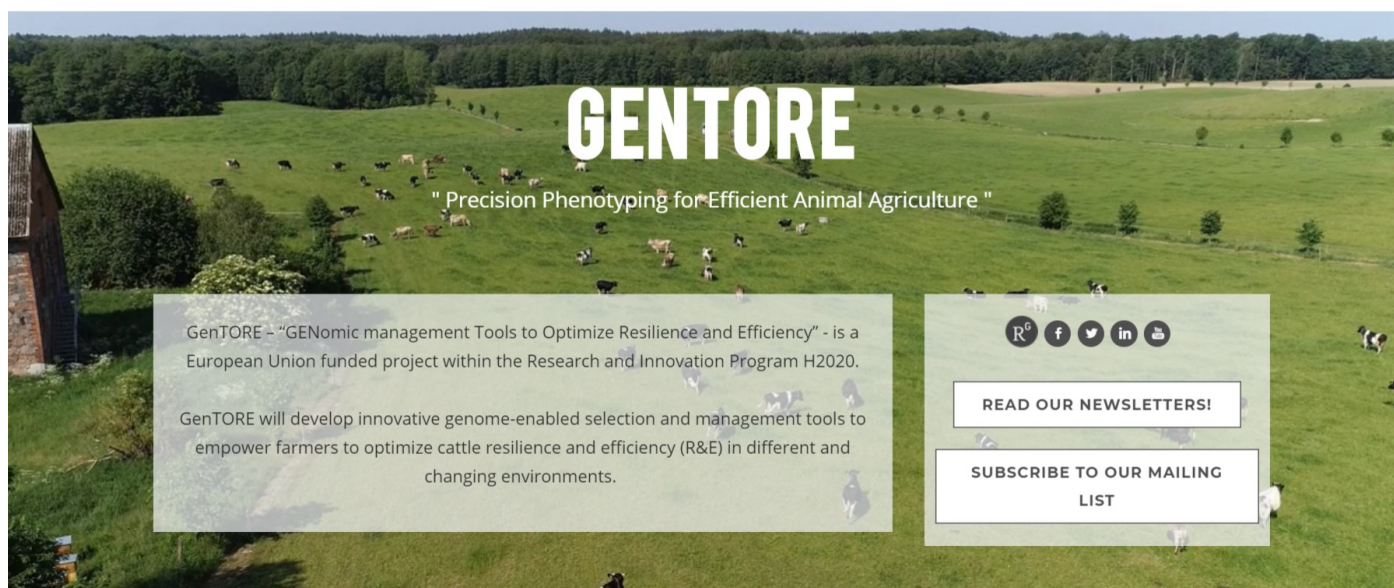
We've come a long way but the best is still to come!!! The GenTORE work and results are increasingly being integrated across work packages to bring together the animal biology, genetic resources and environmental considerations. The GenTORE tools together with the integration models being developed in WP6 will provide information to stakeholders on possible future outcomes of breeding and management choices, and reduce the negative environmental impacts of cattle farming.

I sincerely hope that you will follow the GenTORE story as it unfolds in the coming years. You can follow our progress on Twitter, LinkedIn and on our website. We are always interested and available to dialogue with you.

NEWS

GenTORE website updated

The website of GenTORE (www.gentore.eu) has been updated with a new and fresh design. Additionally, new documents have been uploaded to the website including; **fact sheets** in several languages (English, Italian, Spanish, French, German) (www.gentore.eu/fact-sheet) as well as results from the GenTORE project that have been written down in **practice abstracts** which can be found in the results section (www.gentore.eu/results).

GenTORE glossary

For communication & dissemination purposes, GenTORE has created a glossary that includes and explains relevant terms within the project to those who are interested in GenTORE's working field. The glossary can be found at GenTORE's website in the results section (www.gentore.eu/results).

Fitter Livestock Policy Brief

The European Common Dissemination Booster of 6 EU funded livestock projects "Fitter Livestock Farming" recently published a fitter livestock policy brief. This policy brief addresses the climate change issues and explains how their results help mitigate climate change. One of the main key elements that is addressed is the fact that "on-farm data" in general is often not shared very well and thus not always exploited in the best way. Only when agricultural end-users deploy the latest and most appropriate science and technology, will livestock agriculture be able to contribute fully to the battle against climate change. EU funded projects like those in the Fitter Livestock Farming cluster contribute to reducing the environmental impact of the EU cattle sector. The full Fitter Livestock Policy Brief can be found at the "Fitter Livestock Farming" section on the GenTORE website (www.gentore.eu/fitterlivestock).

Fitter Livestock Farming Workshop

GenTORE participated in the Fitter Livestock Farming Workshop about "What R&I can deliver to support climate mitigation and adaptation in livestock farming?" on 6 November 2019 in Brussels, Belgium. The workshop was jointly organized by the Animal Task Force (ATF) and the Common Dissemination Booster (CDB) Fitter Livestock Farming.

The introduction of the programme for Fitter Livestock Farming Cluster projects were provided by Nic Friggens. He stated that livestock farming is serious about mitigating climate change and adapting to environmental challenges. Nic gave brief information about the aim of the GenTORE project and he pointed out that there is a need for incentives to spread use of genomics, to facilitate incorporation of data from on farm technologies, to encourage practical use of decision support tools for reducing farms environmental footprint. The presentations of the workshop are available here.

NEWS

GenTORE Young Scientist Network

GenTORE has a Facebook page called GenTORE Young Scientist Network for PhD and Young Scientists working on GenTORE related topics. It's aiming to create a network to share the interdisciplinary approach from the GenTORE project and for young scientists to share experiences and views to any early-career scientists.

On 12 May 2020, during the third annual meeting of GenTORE, several young scientists presented their work on line with the GenTORE project.

Early-career scientists are welcome to join the GenTORE Young Scientist Network on Facebook!

Measuring cows from above and beyond using drones

By: Sander Mucher en Jappe Franke

Within the H2020 project GenTORE, we perform a feasibility study of novel technology in beef systems which shows how the use of aerial image information from drones and cow sensors can be used together with measures of cow characteristics and movement patterns as proxies for efficiency and resilience in rangeland beef production systems. Specific cow characteristics in which we are interested with deep learning are 1) automatic detection of location and animal counting; 2) cow postures like standing or lying; 3) individual cow identification; and 4) individual cow characteristics such as height, size and weight.

Wageningen University and Research (WUR) initiated an Unmanned Airborne Remote Sensing Facility (WUR-UARSF, http://www.wur.eu/uarsf) in 2012 and is ROC certified since April 2015 and is using a wide array of drone mounted camera systems e.g., RGB, video, hyperspectral, thermal and Laser 3D scanning (LiDAR). We have used some of these drone cameras for locating and estimating individual cow characteristics. At the same time, Noldus Information Technology has been developing TrackLab, a tool for testing sensor fusion techniques to combine information from GPS tracking and accelerometer data to create a robust proxy for relevant behaviours of cattle. All

the work presented here is experimental and has been performed at various locations in the Netherlands and Poland. First of all, at CARUS, the research facility of the Department of Animal Sciences of Wageningen University, we performed two experiments, one from 1-5 October 2018 with 4 dairy cows and one from 20 – 22 May 2019 with 6 Holstein Frisian dairy cows. In Poland, we had an additional campaign on the 4th and 5th of June 2019 on a larger area at Juchowo biodynamic farm with nearly 2,000 hectares of land and 600 dairy cows (Schweizer Braun, local Pommern and Holstein Frisian). In Poland, the experiment included 100 dairy cows on approximately 100 ha of land. In total we performed more than 60 flights with RGB cameras, video, and a LiDAR scanning system using different unmanned platforms (helicopter as well as fixed wing).

> **Deep learning on UAS imagery is successful to detect, locate and count animals with accuracies over 90%.**

Before performing the image analysis with machine learning we annotated many images with LabelImg (more than 1000 annotations per site). LabelImg is a graphical image annotation tool and uses label object bounding boxes in images. The annotation concerned not only cows in general (Label 'Cow'), but also individual named cows. After this, the images and annotations were uploaded to the machine learning cloud service Nanonets (https://nanonets.com/). The study showed so far that deep learning on UAS imagery is successful to detect, locate and count animals with an accuracy over 90%.

SPOTLIGHT NOTABLE RESULTS

A new method to evaluate feed efficiency in dairy cattle that takes the dynamic of the process into account

By: Pauline Martin (WP2)

In the current context of high feed costs, which represent above 50% of the total costs of dairy production, feed efficiency has become both an environmental and economic priority. The notion of feed efficiency refers to improving the balance between output (production) and input (intake). If the concept seems pretty easy, the mathematical way to approach efficiency is not so simple. Various traits have been used to estimate feed efficiency, mostly based on ratios or residuals. The most common trait for dairy cattle is the Residual Feed Intake (RFI), which is defined as the difference between the actual feed intake of an animal

> Although the concept of feed efficiency seems pretty easy, the mathematical way to approach efficiency is not so simple.

and its predicted feed intake based on its performance (i.e. the intake necessary to cover the demands of the different energy sinks such as milk production, growth, etc.) estimated by regression. By construction, this method benefits from RFI being phenotypically independent (or genetically in case of genetic regression) from its predictors, which theoretically allows RFI to reflect digestive and metabolic variabilities. However, some issues remain with this approach. One of the main issues is the question of the time influence on RFI. RFI is usually measured between two given days. If the trial duration is too short, the number of measures will be low and the results of the prediction will not be accurate. On the other hand, with longer periods, different biological process are involved at the different lactation stages. Therefore, regression coefficients associated with the different predictors are likely to vary when taken at different lactation stages, leading to a biased assessment of RFI when estimated from point measures over the whole lactation. A second key issue is to identify which part of the residual is caused by errors (of measurement or modelling) and which part is due to the true animal variability in

efficiency. Previous work (see Fischer et al. 2018) has already focused on the question and proposed a very interesting approach with a random regression performed on each individual, but the high correlations among the predictors prevented the full model from running successfully.

In GenTORE WP2.1, our objective was to develop a new approach, robust enough to be used on various datasets and that would solve some of the issues of the classical RFI approach. Using historical data from the Aarhus University experimental farm (1,469 lactations out of 740 cows) that were shared in GenTORE, we tested various ideas. Using a multi-trait random regression model, the correlations between milk (corrected by its composition), live weight, dry mater intake (DMI) and body condition score (BCS) were investigated across the lactation. If the original aim was to produce correlations that could be used as predictor in Fischer's model, we realized that we could go further from our multi-trait random regression. It is in fact possible, at each time point, to perform a matrix regression on the variance-covariance matrix and on the animal effects from the three predictor traits (milk, weight and BCS) to obtain a predicted intake based on the other variables. By difference with the actual animal intake at this time point, it gives a RFI estimation. By this approach, we get a RFI estimation for each animal at each time point of the lactation (day or week depending on what was used).

> In GenTORE WP2.1, the objective was to develop a new approach to evaluate feed efficiency, robust enough to be used on various datasets and that would solve some of the issues of the classical RFI approach.

The estimated RFI possessed all the characteristics of a classical RFI, with a mean of zero at each time point and

a phenotypic independence from its predictors. The correlation between the averaged RFI over the lactation and RFI at each time point was always positive and above 0.5, and maximum in mid lactation (>0.9). In addition, the model performed reasonably well in the presence of missing data and recent tests showed that it was possible to mix data from different farms and obtain very similar results as if the model was run on each farm separately. This opens new perspectives for datasets that would be too small to be analyzed alone.

This approach allows a dynamic estimation of the traits, free from all time-related issues inherent to the traditional RFI methodology, and can easily be adapted and used in a genetic or genomic selection context. However, some questions remain with respect to the ability to split true individual variability from errors or the possibility to compare efficiency from animals coming from different farms. These first results will be published soon, and we still have plenty of further developments to explore.

Farm adaptation to climate change impacts: a farmers' perception case study

By: Enrique Muñoz Ulecia, Alberto Bernués, Isabel Casasús, Sandra Lobón and Daniel Martín Collado - CITA

In Europe, the number of mountain farms is decreasing due to various socioeconomic drivers. Although mountain livestock farming systems are generally considered as extensive, they are actually very diverse, influenced by both internal factors (such as the level of use of natural resources or farmer's age) and external factors (like agricultural policy, environmental conditions or market dynamics). In addition, farmers need to adapt to crucial challenges that affect agriculture globally, like the increasing risk of droughts due to climate change and higher prices of inputs due to market dynamics. Understanding farmers' views on the relevance of actions and strategies to face these challenges is key to study mountain farming adaptive capacity and resilience.

The aim of this work was to analyze:

I. Farmers' perception about the relevance of different farm practices to face a situation of climate and market change and,
II. The influence of farms and farmers' characteristics on those perceptions.

To carry out this study, 54 beef farmers from the Spanish Pyrenees were surveyed in 2018 (GenTORE W1), gathering information about farm structure, management and economic performance. The questionnaire also measured farmers' perception on the importance of different actions to deal with I) **a 2-year-long drought** and II) **the rise of input prices during two consecutive years**. We specifically asked: *Would any of the following measures improve the continuation of your farm and how important would they be?* Farmers answered using a 5-point categorical scale from "Not important" to "Very important". Specifically, we considered 23 measures related to:

⇒ **Reproductive management**, like grouping calvings
⇒ **Health management**, such as eliminating the worst adapted animals
⇒ **Feeding management**, like extending the grazing season or looking for new grassland areas
⇒ **General management**, like introducing new breeds or modernizing machinery, and
⇒ **Commercialization**, like producing under a quality brand or diversifying activity in and out agriculture.

ANOVA was used to **identify which farm and farmer profile characteristics influenced their views in the relative importance to face these challenges**, like farmer age, size of agricultural area or whether they fatten on-farm or not.

Farmers generally thought that the best strategy to face to the short-term effects of both a prolonged drought and a rise of input prices would be to take measures to reduce production costs (i.e. eliminating the worst adapted animals, seeking for feed self-sufficiency) and

reduce investments (i.e. renewing machinery, introducing new breeds or changing the type of product). In the case of a scenario of rise of input prices, farmers would focus on measures related to feeding management such as extending the grazing season or seeking for new pastures.

> **Farmers thought that the best strategy to face short-term effects of both, a prolonged drought and a rise of input prices would be to reduce production costs.**

Besides this general strategy, we found that age, on-farm fattening and farmland area influenced farmers' perception on adaptation practices. Farmers above 51 years were significantly more determined to look for new pastures than the younger ones in an increase of input prices scenario. This could be related to the fact that young farmers tend to reduce labor and increase technification. Farmers that did not fatten on farm would be more likely to look for new pastures, while they considered less relevant to invest in renewing machinery or facilities, both in an increase in input prices and a prolonged drought scenarios. Finally, owners of large farms (above 77 ha) were significantly more determined to change indoor diets than farmers with smaller farms.

To conclude:

1. Farmers considered that implementing actions aiming to **reduce costs** such as eliminating worst adapted animals, diversifying activity out of agriculture and seeking for new pastures and self-sufficiency, would be the most relevant strategies to adapt to both increase in input prices and drought scenarios.

2. These strategies apply to short-term perturbations scenarios. **Farmer strategies to adapt to mid or long-term perturbations might be different**.

3. **Farm and farmers' characteristics** such as farmer age, farm size and on-farm fattening, **modify farmers' strategies to face challenges** related to climate change.

4. Some of the most relevant actions that are usually pointed out when analyzing farming at a systemic level such as introducing more adapted breeds, diversifying farm activity, seeking for external advice or modernizing farm technologies, were considered by farmers as having low relevance.

How do beef cows cope with short nutritional challenges during lactation?

By Isabel Casasús, Karina Orquera, Juan Ramón Bertolín, Javier Ferrer, Mireia Blanco - CITA

In the typically extensive suckler cattle production systems in mountain areas, diet quantity and quality can vary widely both in the long and the short term. The objective of this experiment was to **determine the mechanisms through which suckler cows respond to short but severe nutritional challenges** that may occur during lactation, and **analyse if their ability to cope with such challenges and maintain their performance depended on the stage of lactation.**

In order to do so, the performance and plasma oxidative status of 16 Parda de Montaña autumn-calving suckler cows (calving LW 643 kg, calf birth LW 44 kg) were analysed in response to a 4-day restriction in months 2, 3 and 4 post-calving. Prior to restriction and after the challenge, the cows received a diet meeting 100% of their energy requirements (7.0 kg DM hay, 2.7 kg DM concentrate), while in the 4-day challenge, the diet met 55% of cow requirements (6.2 kg DM hay) (Figure 1). Dam and calf live weight (LW), dam milk yield (MY, weigh-suckle-weigh technique) and plasma malondialdehyde (MDA, indicator of lipid peroxidation) were measured twice the week before the restriction (basal), daily during the 4-d challenge and on the first 2 days of refeeding. All procedures were approved by the Animal Ethics Committee of CITA-Aragón (ref. 2018-01).
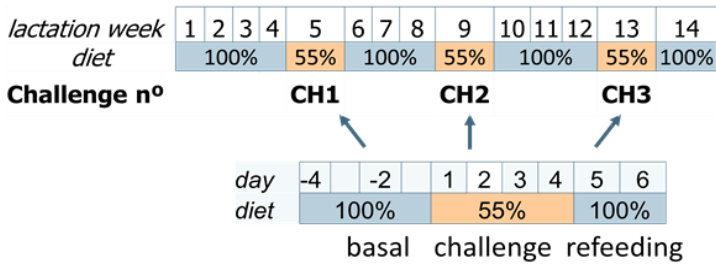

Figure 1. Experimental design

As lactation advanced, basal values of dam LW, milk yield and MDA concentrations decreased from month 2 to 4, implying **that decreasing performance after peak production reduced the oxidative status.**

The individual **response to undernutrition was immediate during the challenge, but resilience was reduced throughout lactation**, since recovery of basal values after a 2-day refeeding was complete at the start but not at the end of the study.

- Dam LW dropped immediately on the first day of restriction and did not recover by day 2 of refeeding in any month. Similarly, calf gains decreased during the challenge and did not fully recover during refeeding.

- Milk yield also dropped during the challenge, and thereafter recovered the basal values by day 2 of
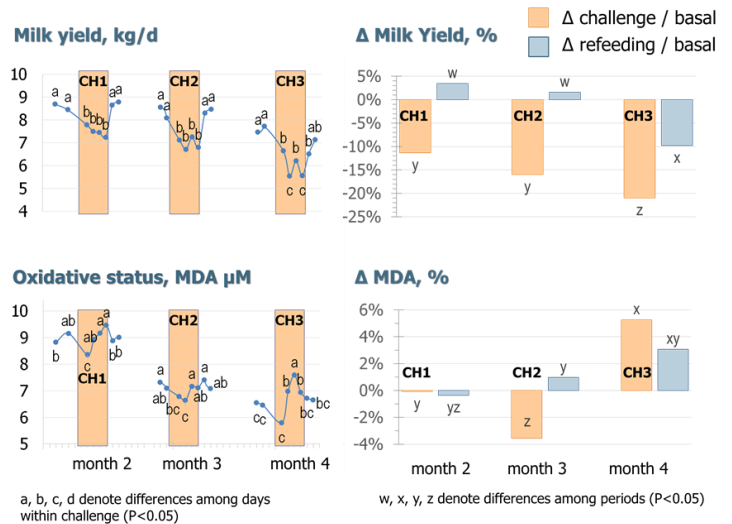

Figure 2. Changes in milk yield and oxidative status of cows following nutritional challenges during lactation.

refeeding in months 2 and 3 but not in month 4. The percent reduction of MY during the challenge increased through lactation, but recovery was lower in month 4 than the rest, when basal values were not reached after refeeding.

- Plasma MDA fell to a minimum at the start of the challenge, then increased sharply and finally returned to basal values in refeeding in all months. The difference between maximum and minimum MDA concentrations increased as lactation advanced, indicating a stronger oxidative response.

These preliminary results indicate that the patterns with which beef cows cope with short but severe nutritional challenges change throughout lactation, resulting in a lower ability to cope with the challenge and maintain performance as lactation advances.

Results presented at the 70th Annual Meeting EAAP (European Federation of Animal Science), Ghent (Belgium), August 26-30, 2019. "Performance and oxidative status and of beef cows facing short nutritional challenges during lactation". Book of Abstracts No. 25, page 617.

Resilience and productive lifespan can be predicted from at-market sensor data

By Ines Adriaens (KU Leuven)

New technologies on farms open up opportunities to collect information from the herd beyond basic monitoring. In the field of precision phenotyping, sensors are used to characterize complex animal traits based on high-frequency time series. Examples of such traits are resilience and efficiency. In the H2020 GenTORE project, different partners throughout Europe work together to identify and improve these traits in European beef and dairy cattle.

In work package 3 of GenTORE, the first task consisted of developing tools for the prediction of resilience and efficiency using already available at-market technologies. This aimed to add value to the sensors already present on farm and increase the commercial return on the investment. More specifically, the existing on-farm sensor data were used for developing a tool to predict lifetime resilience.

Resilience was defined as the ability of a cow to recalve and consequently to extend her productive lifespan, together with high production, good fertility and decent health. We assumed that discriminating potential lowl resilient animals from potential high resilient animals would be beneficial, because this would allow selection of specific (high) resilience cows for e.g. advanced breeding techniques, whereas low

resilient cows can be selected for culling. This is especially important for example, when the capacity of the milking machine and availability of newly calved heifers require additional space.

> Discriminating potential low resilient animals from potential highly resilient animals would be beneficial for e.g. advanced breeding techniques or selecting cows for culling.

To rank the different cows on a farm for resilience, this trait had to be quantified in an objective way. To this end, each cow was awarded a resilience score after exiting the herd and thus, at the moment her productive life was completed. The score included her last parity number which achieved the highest weight, together with respectively penalty or bonus points for old or young ages at first calving, high or low calving intervals, low or high production performance and for the number of inseminations and the number of registered health events. The resulting ranking within a farm allowed distinction of high from low resilience animals. When this ranking can be forecasted from early life (i.e., first parity) sensor data, sensors can be used for predicting the lifetime resilience of the cows.

Daily measurements from milk meters and activity sensors were used to characterize the performance of the animals throughout lactation. The idea was that, specific features of these time series were associated with physiological traits of the animals, in their turn affecting resilience. For the milk meter data, features describing the shape of the lactation curve, the day-to-
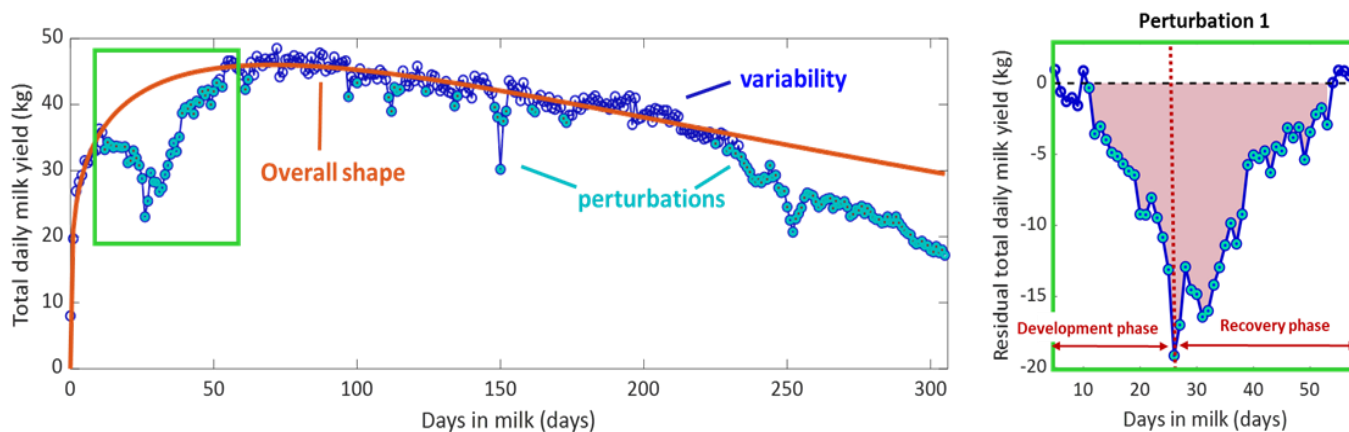

Figure 1. Example of the sensor feature categories for milk meter data. Characteristics related to shape, variability and perturbations were calculated.

day variability and the occurrence of perturbations were defined. For the activity time series, a distinction between short-term peaks indicating estrus behavior and long-term changes linked to general health problems was made. Figure 1 shows an example of the lactation curve of a specific animal together with some of the sensor features calculated.

> A single model predicting lifetime resilience at all farms could not be found because determinants for resilient cows and long lives differed across farms.

To link the milk yield and activity features with lifetime resilience, data from 27 modern dairy farms with an automated milking system throughout the UK and Belgium were used. Thirteen of these farms had, besides milk meters, also activity meters installed. For all cows for which the entire lifetime performance of the animals was available, the resilience scores were calculated and the cows were ranked within the farm. Next, sensor features from first parity sensor data were computed. These sensor features were entered in a multiple linear regression model with the resilience ranking as output variable to research the link between both. Initially, we looked for a single model over all farms, as we assumed that the same sensor features would relate with the resilience on all the different farms. For example, a high number of large perturbations in the milk yield indicating bad health

was expected to negatively affect productive lifespan. However, the analyses showed that such a single model could not be found, and accordingly, that the determinants for resilient cows and long lives differed across farms.

Alternative models were developed for each farm individually, selecting the sensor features specific for that farm that could predict the resilience ranking. We evaluated whether the models could distinguish between high (H), middle (M) or low (L) resilient cows. With these models, the proportion of cows predicted correctly in the right category (H/M/L) using only milk meter features varied from 35.8% to 70.0%, with an average of 46.7 ± 8% correct and 4.7 ± 3.5% oppositely classified (high in low and vice versa) over the 27 farms (Figure 2, purple data). When both milk meter features and activity features were included, the accuracy of the models increased to on average 55.7 ± 12.1% of the animals (range 44.4 to 84.0%) correctly and 2.3 ± 2.1% (range 0 to 6.7%) oppositely classified (blue data in Figure 2).

From this study, we concluded that at-market sensor technologies indeed can be used to predict productive lifespan and resilience, but that there is a big difference in both performance and in model structure across farms. This may be caused by the differences in applied management or other external factors, and should be taken into account when developing novel tools using existing data for phenotyping or monitoring complex traits. Read the full article at sciencedirect.com.
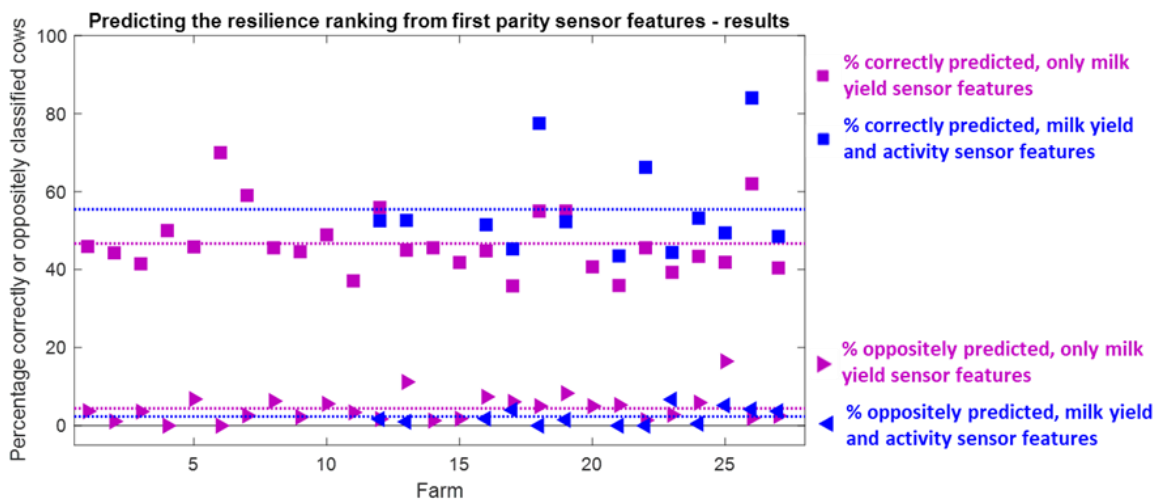

Figure 2. Classification performance of the individual farm models to predict cows in the correct high, middle or low resilience class using milk meter data only (purple) or milk meter and activity data combined (blue).

Variability in daily milk yield can help identify resilient herds

By Marieke Poppe (WUR)

Average variability in daily milk yield at herd level can help to identify which herds are resilient and which are not. This is the main outcome of WUR researchers using Dutch data from milking robots. Resilient herds are herds with a low level of environmental disturbances and cows that can cope well with disturbances. Herds with low variability in milk yield among their cows tended to have relatively good health, fertility, and survival, which confirms that these herds are resilient.

> Herds with low variability in milk yield tended to have lower average SCS[1], higher proportion of cows with an indication of rumen acidosis (based on fat and protein content) and a higher survival to second lactation.

Variability in milk yield indicates herd resilience
Environmental disturbances, such as pathogens or extreme weather, can have a negative effect on health, production and welfare of cows. Therefore, it is desirable to have a low number of disturbances on farms in combination with cows that are resilient to disturbances. Herds are expected to differ in these aspects, and are thus expected to differ in their so-called 'herd resilience'. To identify which herds are resilient and which are not, a resilience parameter was developed. This parameter quantifies the average variability in daily milk yield of cows in a herd, while taking into account differences in genetic level between herds. From previous research we know that high variability in milk yield in individual cows is associated with deteriorated resilience and low variability is associated with good resilience. Therefore, average variability at herd level was expected to indicate herd resilience. The data showed that the average variability in daily milk yield differed largely between herds. Furthermore, herds with low variability tended to have for example lower average SCS[1] (r=0.19), a higher proportion of cows with an indication of rumen acidosis based on fat and protein content (r=0.31), and a higher survival to second lactation (-0.13). These results confirm that average variability in daily milk yield in a herd can be used to identify which herds are resilient and which are not.

Improving herd resilience
Knowledge of resilience at herd level is useful, because it suggests when improvement of management is desired. Herds with low resilience may need to decrease their disturbance level, for example by providing more protection against hot weather or improving hygiene. Another option for herds with low resilience is to improve the resilience of their cows, for example by providing a balanced feed ration or vaccination against certain diseases. Of course, the causes of low herd resilience differ extensively between herds, and no single solution exists. Therefore, the own expertise of farmers, together with data on traits like SCC[2], is needed to develop a strategy to improve resilience of individual herds. In conclusion, average variability in daily milk yield of a herd can serve as a useful benchmark for herd resilience.

> The own expertise of farmers, together with data on traits like SCC[2], is needed to develop a strategy to improve resilience of individual herds.

This work has been accepted by Journal of Dairy Science under the title 'Between-Herd Variation in Resilience and Relations to Herd Performance', by M. Poppe, H.A. Mulder, C. Kamphuis, and R.F. Veerkamp.

[1] somatic cell score
[2] somatic cell count

MEET GENTORE

Cagla Yuksel Kaya Kuyululu (EFFAB)

WP7 Leader—Outreach, dissemination and training

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Cagla Yuksel Kaya Kuyululu is working as Project Manager at the European Forum of Farm Animal Breeders (EFFAB). She was trained as a veterinarian at Ankara University, Turkey. Afterwards she started her PhD on agricultural economics researching "Supply Management Strategies in Milk Production". Cagla was also selected as the Turkish Dairy Scientist by International Farm Comparison Network located in Kiel, Germany. She has been working for the breeding sector since 2000, which included working for several governmental organisations, ministries and Turkish National Public Television (TRT) as lead dairy and agricultural policies expert. After moving to the Netherlands, she started to work more on communication and knowledge exchange. She is currently leading the Communication and dissemination work packages in 4 different EU projects. She is also the Coordinating expert of EIP-AGRI Sustainable beef production focus group. In GenTORE she leads WP7 with the aim to ensure the knowledge exchange between GenTORE and its stakeholders and increase the uptake of the GenTORE results by the breeding and cattle sector so that the farmers and consumers could benefit as end-users.

Donagh Berry (TEAGASC)

WP5 Leader – Genome-based management indexes

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Farming beef and sheep in Southern Ireland with his wife and three young daughters, Donagh is also a senior principal investigator in quantitative genetics at Teagasc Moorepark as well as being the director of the VistaMilk Research Center. Following his degree in Agricultural Science at Dublin, he undertook a PhD in dairy cattle genetics in collaboration with Wageningen University. He later completed a part-time MSc in Bioinformatics and Systems Biology. Donagh prides himself on delivering on innovative, easy-to-use, value-creating decision support tools for farmers. This is what drew him to WP5 of GenTORE where the goal is to develop tools to aid the many decision making processes on farm. An index to rank dairy cows based on expected remaining lifetime profitability was developed which is now actively used by Irish dairy farmers. As part of WP5 of GenTORE, the framework of this index was modified for use in ranking beef cows. An additional index, which is currently being piloted, was developed to rank animals on expected relative profit if grown for slaughter. Combined, the young animal and beef cow index can be used to decide if a female would be more profitable for meat production or for graduation into the mature herd.

RECENTLY PUBLISHED

- Breed- and trait-specific associations define the genetic architecture of calving performance traits in cattle - D.C. Purfield, R.D. Evans, D. P. Berry - *TEAGASC*

- Development of an index to rank dairy females on expected lifetime profit - M.M. Kelleher, P.R. Amer, L. Shalloo, R.D. Evans, T.J. Byrne, F. Buckley, D.P. Berry - *TEAGASC, ICBF, AbacusBio*

- Influence of dietary energy concentration and body weight at slaughter on carcass tissue composition and beef cuts of modern type Fleckvieh (German Simmental) bulls - A.C. Honig, V. Inhuber, H. Spiekers, W. Windisch, K. Götz, T. Ettle - *LFL, TUM*

Visit the GenTORE website to stay up-to-date on the newest publications: www.gentore.eu

GᴇɴTORE TV

GenTORE TV continues to publish informative videos about the GenTORE project and its work packages. GenTORE coordinator Nic Friggens describes the GenTORE project in an interview at the Animal Task Force - Fitter Livestock Farming. Additionally, all young scientist sessions that were held during the third GenTORE AGM are now available, among which the session from Aniela Honig (LfL) - Influence of feed energy concentration and final weight on the empty body composition of Fleckvieh bulls. Subscribe to GenTORE H2020 on YouTube to see all videos. The videos are also accessible from the GenTORE website under 'MEDIA'.
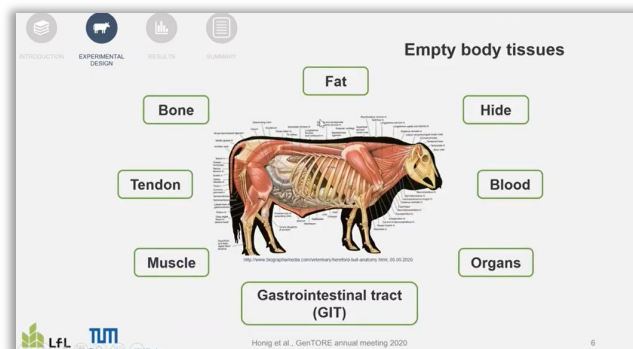
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| 01 - 04 December 2020 | 71st EAAP Annual Meeting | Virtual event |
| 04 November 2020 | 10th ATF Seminar | Brussels, Belgium |

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