Climate impact at dairy farms

Reducing heat stress impact on dairy cows

Emerging DS/AI methods

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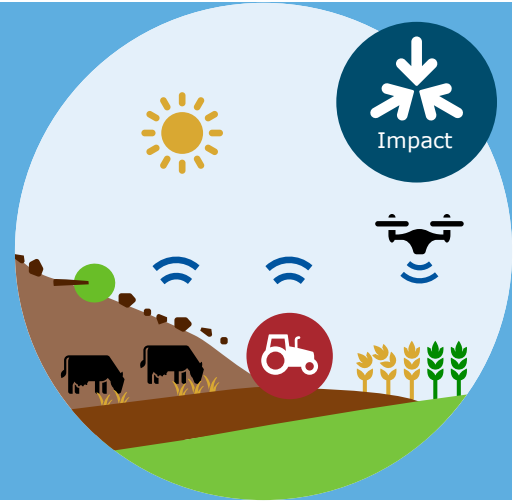
Data Driven Discoveries in a changing climate (D3C2)

Objective: This project aims to characterise the impact on heat stress on cow behaviour by using high-frequency behavioural sensor data.

Activities

We studied the effects of heat stress on cow activity by using high-frequency sensor data (step count) and information from nearly 5,000 cows across 13 farms. Additionally, we analyzed over 15 years of daily milk records from the same cows to quantify the impact of heat stress on milk production. We developed a novel modeling procedure to iteratively fit several factors — farm-, cow-, and weather-related — to describe the sensitivity of cows to heat stress. Our research included 'activity' both as a dependent variable to assess cows' heat stress sensitivity and as an explanatory variable to estimate its relationship with milk losses.

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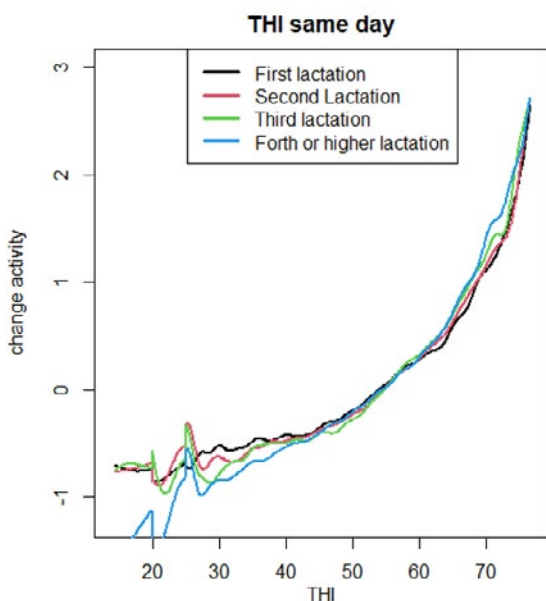
Achievement

With the new modelling technique we developed in this project, we have gained experience of how it can be used in heat stress research. From a data scientist perspective, this project contributed to learning about the behavioural changes of cows during stress. Data scientists and domain experts had fruitful discussions when interpreting the outcomes together. From the domain expert's point of view, it was good to see a novel modelling technique applied to quantify heat stress effects.

In 2023, research on heat stress gained enough momentum in our department to build a small community for sharing experiences. This community, which represents different livestock species, will remain active after the project is closed. We are proud that our team is actively involved in this new community of heat stress research enthusiasts.

Outlook

The plan is to further improve the new model and test it in other heat stress-related research projects. In the near future, we aim to focus on behaviour-based heat stress indicators in different livestock species.

Deliverables

We delivered a conference abstract:
Fodor, I., R.S.C. Rikkers, M. Taghavi and I. Adriaens (2023). Dairy cow behaviour as proxy for heat stress sensitivity in dairy cows. Book of Abstracts of the 74th Annual Meeting of the European Federation of Animal Science, Lyon, France, 26 August – 1 September, 2023. Wageningen Academic Publishers, The Netherlands. p.775.

Lessons learned

One of the lessons we learned, is that mild-to-moderate heat stress can be expected not only in summer, but also in spring and autumn – even in temperate climate. We also found that behavioural changes may be better targets for heat stress detection than milk production. This is because the time lag between the stressor and the response is shorter with behaviour than with milk production. During heat stress, the activity of cows is increased.

Contact

István Fodor
Researcher
istvan.fodor@wur.nl

Wageningen University & Research
P.O. Box 47
6700 AB Wageningen
The netherlands
T +31 317 48 07 00
www.wur.eu

Project members
Torsten Pook
Ines Adriaens