Assessment of milk yield loss induced by heat stress in dairy cows

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**Abstract.** This study was developed within the EIT Food European project DAIRYSUST “Big data and advanced analytics for sustainable management of the dairy cattle sector”, running in 2021-2022. The aim of the project is to improve sustainability, animal welfare and productivity in dairy farming through the use of advanced data analytics. Livestock farms routinely produce and monitor data relating to environmental conditions, animal behaviour, and production parameters. The development of data-driven platforms and solutions which bring together all the separate data could be used to enhance decision-making and improve the sustainability of the agri-food system. This project is developing a system which integrates and harmonises the different data types. The outcomes are planned to be used by stakeholders in the dairy farming sector to improve their decision-making processes relating to sustainability, animal welfare and productivity.

In this context, the study aims to define, train, and test a model developed through machine learning techniques, adopting a Random Forest algorithm, with the main goal to assess the trend in daily milk yield of individual cows in relation to environmental conditions. The model has been calibrated and tested on the data collected on dairy farms which expressed their availability in collaborating in the project. The results show that the model can detect the drop in the cow’s milk yield due to extreme hot conditions inducing heat stress effects and milk yield loss. In fact, the average relative error provided by the model in the predictions, is 2% of the total milk production in the test days. The results confirm that the obtained Random Forest Model represents a reliable and viable tool for the evaluation of future production scenarios of dairy cows in presence of heat stress environmental conditions.

The model proposed may thus help to develop and improve decision support systems for farmers to increase both milk yield and animal welfare and, on the other hand, to reduce the resources needed, hence increasing sustainability of the dairy sector.