Precision and Data Analysis Approach for Increasing the Effectiveness of Rabbit Meat Production

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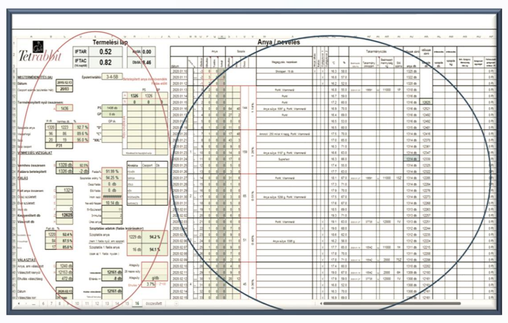
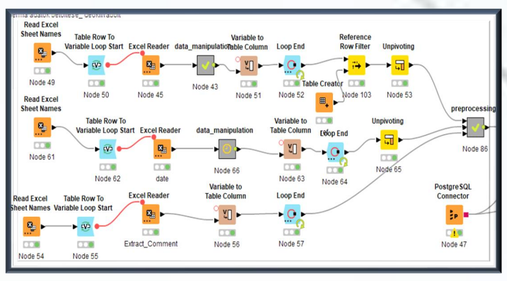
In this poster, we describe – through the characteristics of industrial rabbit meat production – the digitalisation of agri-food sector, its tools and approaches. Precision farming coupled with data analysis enables the exploitation of the opportunities for increasing production effectiveness and the early identification of food safety risks[1]. Rabbits are susceptible to a wide range of disorders, so timely identification of the different risk factors, causes and conditions is highly relevant from health, safety, economic and welfare perspectives as well.

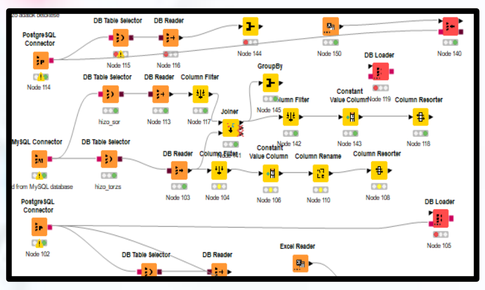
KNIME[2] data mining application was used for data wrangling and analysis, using 32 fattening rabbit rotations (age groups), which is about 10,000-12,000 rabbits per rotation. For the analysis we used linear and rank correlation with p=0.01, and graphical visualisation to identify anomalies.



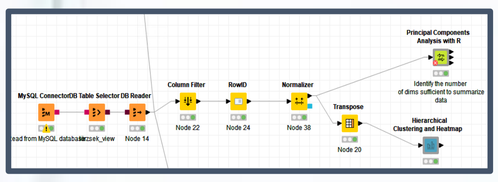
The raw data come from the daily data collection during production.



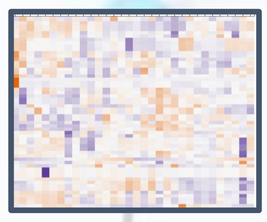
The most important aspect of the automation workflow was the "standardisation" of the data, the repeatability of the workflow and the creation of the desired database structure.



The main elements of data wrangling:
- learning (discovery) of the data,
- structuring the data to make the raw data manageable/standardised,
- the process of cleaning involves the removal of anything that might subsequently impede the process,
- data enrichment involves the addition/creation of additional data,
- a validation step checks the quality of the result,
- release is when the data reaches the correct state, sorted without errors and ready for analysis.



Running the analysis algorithm.



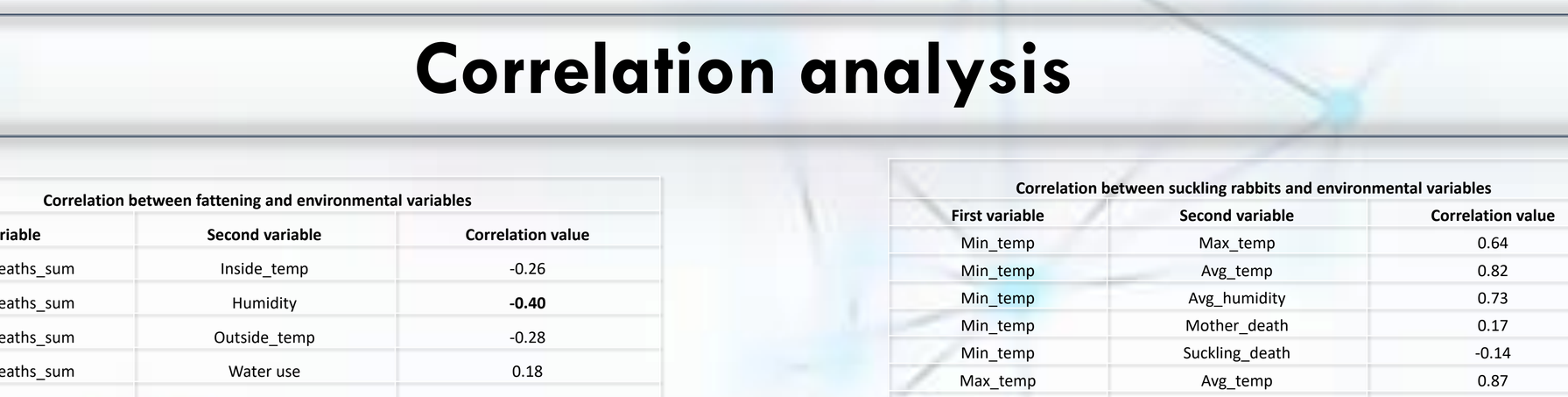
The end of the process is a spreadsheet or dashboard.

Correlation analysis

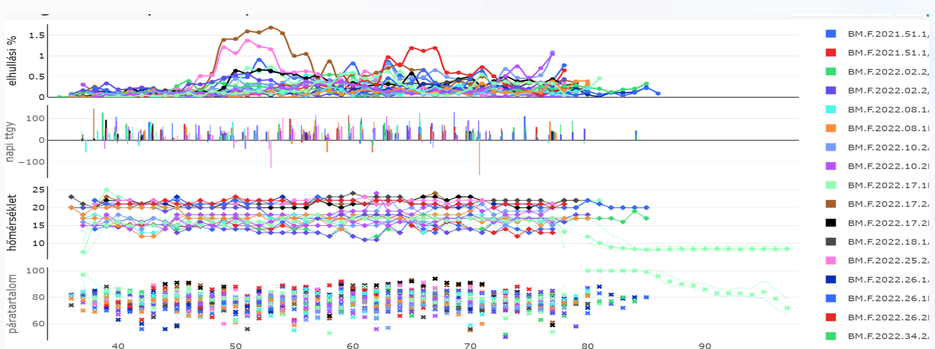
Correlation between fattening and environmental variables		
First variable	**Second variable**	**Correlation value**
Fattening_deaths_sum	Inside_temp	-0.26
Fattening_deaths_sum	Humidity	**-0.40**
Fattening_deaths_sum	Outside_temp	-0.28
Fattening_deaths_sum	Water use	0.18
Inside_temp	Humidity	0.66
Inside_temp	Outside_temp	0.95
Inside_temp	Water use	-0.04
Humidity	Outside_temp	0.61
Humidity	Water use	0.00
Outside_temp	Water use	-0.08

Correlation between suckling rabbits and environmental variables		
First variable	**Second variable**	**Correlation value**
Min_temp	Max_temp	0.64
Min_temp	Avg_temp	0.82
Min_temp	Avg_humidity	0.73
Min_temp	Mother_death	0.17
Min_temp	Suckling_death	-0.14
Max_temp	Avg_temp	0.87
Max_temp	Avg_humidity	0.63
Max_temp	Mother_death	0.10
Max_temp	Suckling_death	-0.27
Avg_temp	Avg_humidity	**0.75**
Avg_temp	Mother_death	0.12
Avg_temp	Suckling_death	-0.29
Avg_humidity	Mother_death	-0.02
Avg_humidity	Suckling_death	**-0.48**
Mother_death	Suckling_death	0.41

One important factor was humidity. There are several recommendations for desirable relative humidity in the literature, which do not overlap completely and therefore cover a relatively wide range (55-70%)[3,4]. Based on our results, humidity needs to be kept within very narrow ranges, as animals are very sensitive to humidity fluctuations[5]. Our experience has shown that annual losses can be reduced by 20-30%, which can be a more cost-effective approach than current husbandry practices. The right panel shows a negative correlation of -0.48 between suckling mortality (suckling death) and average humidity. So, with lower humidity, suckling (and mother) mortality is higher. At the same time, there is a 0.75 correlation between average humidity and average temperature, as we know that higher temperature is associated with higher humidity. The left panel also shows negative correlation of -0.4 between the fattening mortality (Fattening_deaths_sum) and humidity.



The above graph shows that the environmental effects are not immediate but appear with a delay of several days or weeks, and in most cases, they do not take the form of mortality but of reduced performance. In the latter case, it is difficult to know when in a given rotation the animals have been affected by the environmental factors resulting in a performance loss. Continuous and detailed measurements of environmental parameters, in parallel with performance indicators (body weight gain, specific feed intake metrics), are very helpful in identifying the occurrence of an environmental effect and in predicting the possible outcomes.



During the next steps of the study multivariate analyses will be performed, along with predictive and clustering algorithms to predict adverse events.
Current outcomes of the study are under publication.

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