



Precision Solutions in Livestock Farming –feasibility and applicability of digital data collection

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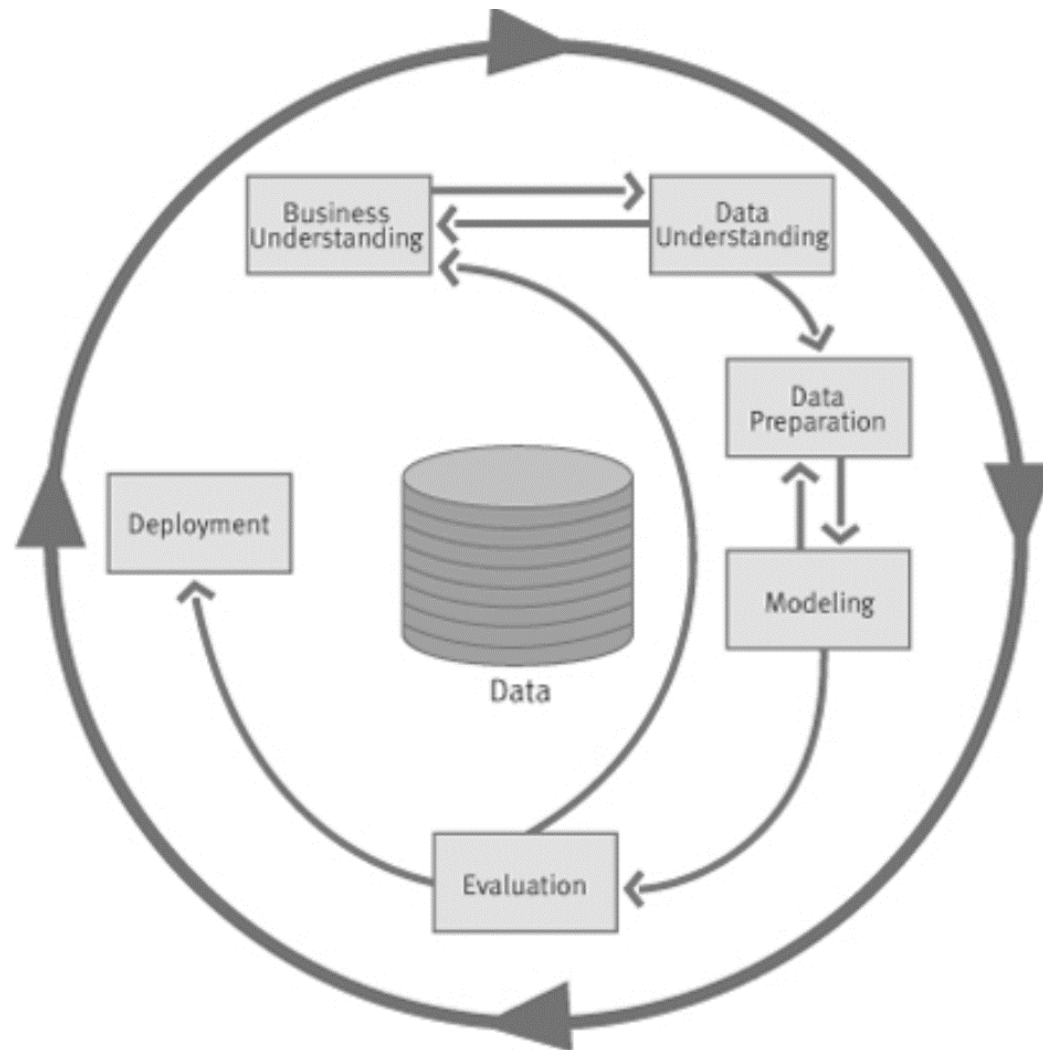
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Definitions and key words of Precision Livestock Farming (PLF)

- compared with traditional livestock management, PLF has the potential to **monitor, manage and control** many aspects of livestock production, both simultaneously and automatically (Wathes et al., 2008)
- smart technology that enables **individual animals to be monitored** more closely on farms that continue to upscale the size of their operations (Fancom company)
- **a multidisciplinary science** that requires collaboration among animal scientists, physiologists, veterinarians, ethologists, engineers, information and communication technology (ICT) experts, etc. (Berckmans, 2017)
- enables the **utilisation of technology** within livestock systems to provide opportunities for **better farm management and sustainable development** (Hart, 2018)

The data process model



source: CRISP-DM_Process_Diagram.png

Source of data for feeding PLF







- traditional business data
- machine-generated data (IoT)
- human-sourced data



Machine-generated data (IoT)

- environment-oriented (three types of housing system, temperature, humidity, airspeed, CO₂, NH₃, etc.)
- animal-oriented (characteristics of livestock species: body constitution, size, behaviour, etc.)

Essential characteristics of collected data (6Vs)

VOLUME	VARIETY	VELOCITY	VERACITY	VALUE	VARIABILITY
The amount of data from myriad sources	The types of data: structured, semi-structured, unstructured	The speed at which big data is generated	The degree to which big data can be trusted	The business value of the data collected	The ways in which the big data can be used and formatted
					

Data acquisition and housing systems

sensors	housing system		
	closed	semi-closed	free-range
temperature	xxx	x	x
humidity	xxx	x	x
air speed	xxx	x	x
ammonia	xxx	x	-
carbon dioxide	xxx	x	-
air pressure	xxx	x	x
feed level	xxx	x	-
drinking water flow	xxx	x	-

Applicability of PLF tools in different housing systems

Device*	housing system		
	closed	semi-closed	free-range
RFID (passive or active)	xxx	xx	xx
rumen bolus	-	xxx	xx
walk over weigher	xxx	xx	x
cameras	xxx	xx	-
UAV	-	x	xxx
GPS	-	x	xxx
accelerometer	xx	xxx	xx
pedometer	x	xxx	xx
microphones	xxx	xx	-

*based on Aquilani et al. 2022

Applicability of digital devices in cattle, pig and poultry

Device	livestock				
	dairy and beef cattle (semi-closed)	dairy and beef cattle (free-range)	pig (closed)	pig (free-range)	poultry (deep litter)
RFID (passive)	xxx	xxx	xxx	xxx	x
RFID (active)	xxx	xxx	-	-	-
rumen bolus	xxx	xxx	-	-	-
walk over weigher	x	x	xxx	x	xx
cameras	xx	-	xxx	x	xxx
UAV	-	xxx	-	xxx	-
GPS	-	xxx	-	xxx	-
accelerometer	xxx	xxx	-	-	-
pedometer	xxx	xxx	-	-	-
microphones	xx	-	xxx	-	xxx

Outputs of data collection tools

data source	output data format
RFID	number and/or letter
rumen bolus	number
walk over weigher	number
cameras	image, video
UAV	image, video
GPS	number and letter
accelerometer	number
pedometer	number
microphones	sound

Thank you for your attention!

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