Integrating innovative TECHnologies along the value Chain
to improve small ruminant welfARE management

RIM table – closing the loop

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Agricultural Engineering

Precision Livestock Farming (PLF) Lab

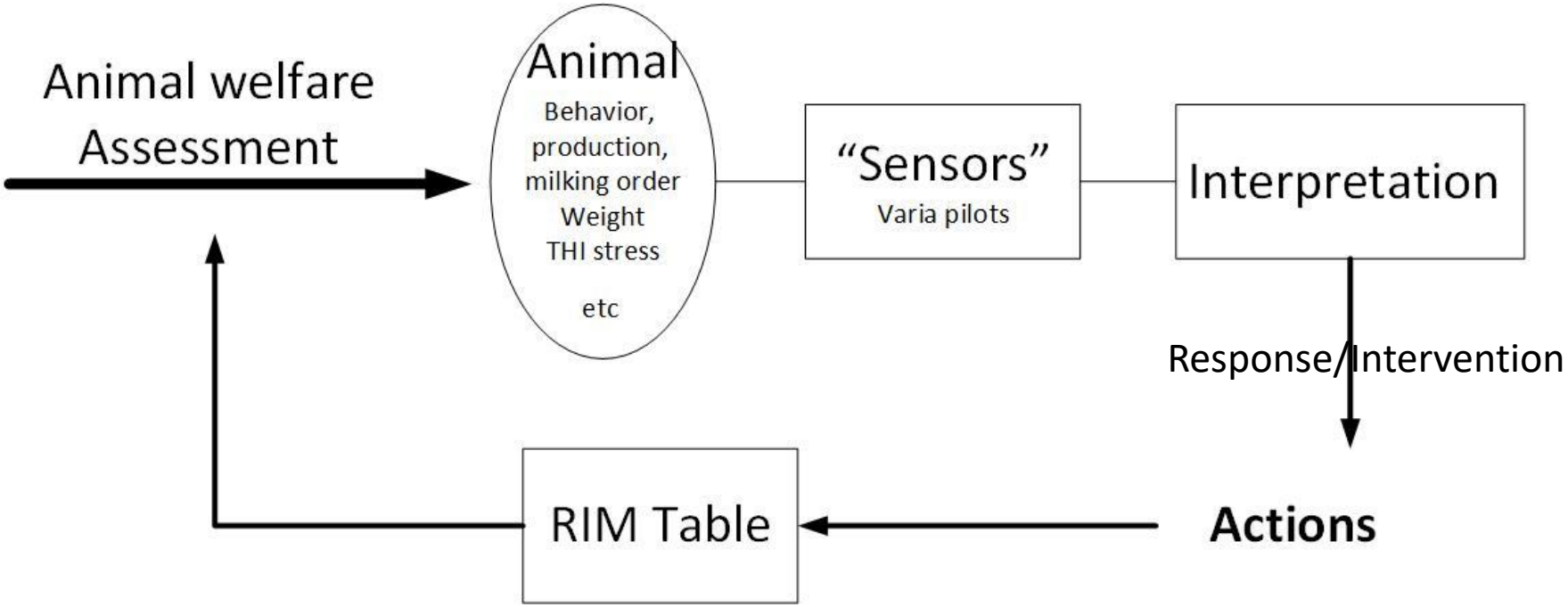
GA862050

RIM table – closing the loop

RIM= Response Intervention Mechanism

Practices to Animal-welfare **improvement**

Why RIM – is practically “Closing the loop” ?



RIM: Case Study Collection: practical methods for enhancing animal welfare – **in practice !**

RIM table - Interesting animal-welfare improvement case-studies (ARO)

When	Farm	Issue	How the alarm was generated?	What was performed?	By whom?	Results
01/12/2020	Volcani farm (tag 3525)	fever	Sensor, EWS- Decreased growth rate, less visits	The animal was treated with antibiotic	Farmer	Recovered after few days
April 2020	Volcani farm (tag 3127)	Lame on two legs	EWS above	Nothing		Sold early
April 2020	Volcani farm (tag 3060)	Broken horn, still connected to the head	EWS above	Removal of the horn	Farmer	recovered
06/02/2023	Ivry farm (tag 552)	Lame, does not look good.	EWS above	Tracking the animal	Farmer	Never recovered
12/02/2023	Ivry farm (tag 22723)	Smaller than the average, weak and bullied	EWS above	Put in a younger group	Farmer	recovered
12/02/2023	Ivry farm (tag 22717	Abscess on the neck	EWS above	Treated with iodine	Farmer	Recovered slowly and not completely

RIM table - Interesting animal-welfare improvement case-studies (SRUC)

Date	Farm	Issue	How the alarm was generated?	What was performed?	By whom?	Results
19/04/2022	Kirkton	Bad Lambing	Shepherd	Lambed with intervention , medication given	Shepherd	Ewe died from compliactions
29/04/2022	**Kirkton**	**Ewe Prolapsed**	**Shepherd**	**Prolapse repaired & Medication given**	**Shepherd**	**Ewe Recovered in 2 Days**
01/05/2022	Kirkton	Infected lamb navel	Shepherd	Medication Given	Shepherd	Lamb Recovered
13/05/2022	Kirkton	Very Lame	Shepherd	Caught in field and treated	Shepherd	Ewe Recovered
30/06/2022	**Kirkton**	**Mastitis (One side)**	**During Welfare Assesment**	**Medication Given**	**Technician**	**Treated for one Day**
30/06/2022	Kirkton	Missing Teeth	During Welfare Assesment	N/A	Technician	Ewe Marked to cull (to be sold at the end of the year)
15/07/2022	Kirkton	Scabs on Head/ Lean	During Welfare Assesment	Medication Given (Removed from trial)	Technician	Treated for 4 Days
04/08/2022	**Kirkton**	**Wool Loss due to Photosensitisation**	**During Welfare Assesment**	**Brought into shed with mother , treatment given daily**	**Technician**	**Lamb Recoverd 7-10 Days**

RIM table - Interesting animal-welfare improvement case-studies (SRUC)

Date	Farm	Issue	How the alarm was generated?	What was performed?	By whom?	Results
10/08/22	Kirkton	Heaving, Possibly Pneumonia	Shepherd	Medication Given , Kept in shed for treatment	Shepherd	Ewe Recovered in 4/5 Days
10/08/22	Kirkton	Orf	During Welfare Assesment	Treated With Bactokill	Technician	Lamb recovered
10/08/22	Kirkton	Infected Ear	During Welfare Assesment	Medication Given	Technician	Lamb Recoverd
21/08/22	Kirkton	Lame	During Welfare Assesment	Foot Treated	Shepherd	Ewe Recovered
26/08/22	Kirkton	Mastitis (One side)	During Welfare Assesment	Medication Given	Shepherd	Treated for one Day

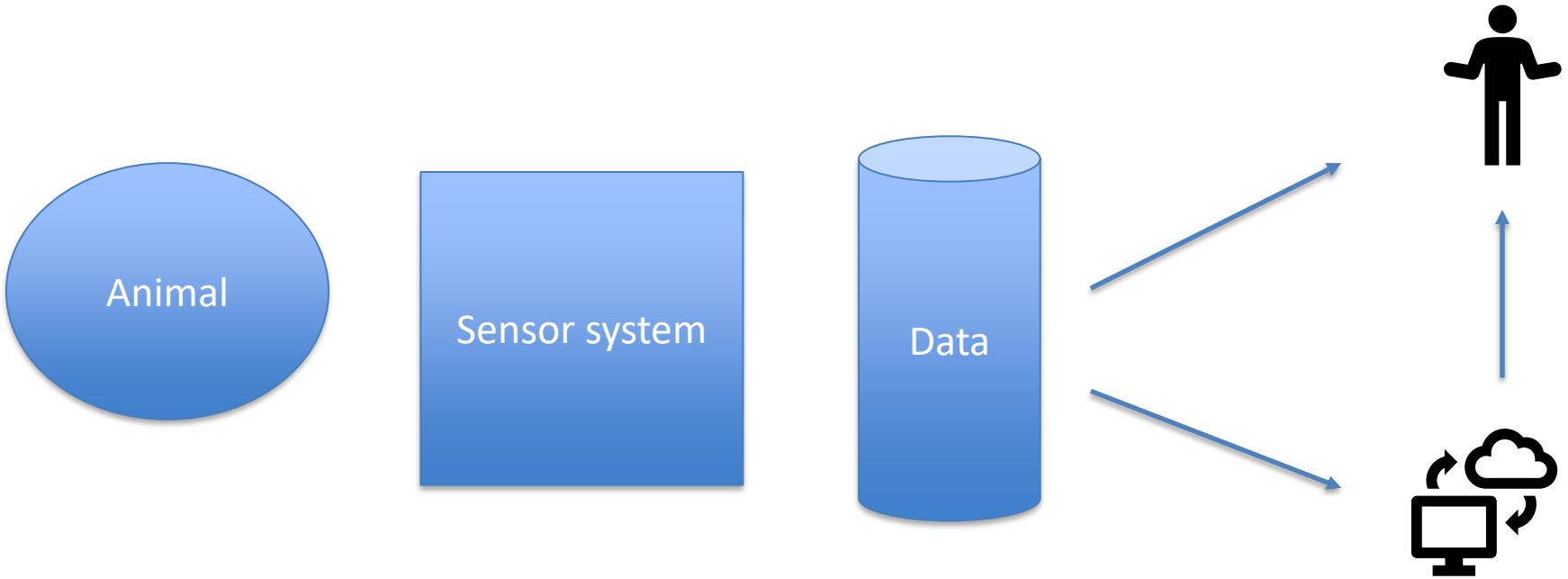
RIM table - Interesting animal-welfare improvement case-studies (IDELE)

When	Farm (trial)	Issue	How was the alarm generated?	What was performed?	By whom?	Results
04/07/2022	Le Mourier (T2)	Anal prolapse	daily observation by the technician during the trial	Animal treated	Farmer and technician	Prolapse became irreversible. Euthanized on 11/07/2022
11/07/2022	Le Mourier (T2)	Arthritis	daily observation by the technician during the trial	Animal treated	Farmer and technician	Reduction of arthritis
27/06/2022	Le Mourier (T2)	Severe arthritis	daily observation by the technician during the trial	Animal treated	Farmer and technician	Too painful, unable to walk. Euthanized on 29/07/2022
03/06/2023	Le Mourier (T3)	Sudden death due to enterotoxemia	daily observation by the technician during the trial	Animal taken out of the flock.	Farmer and technician	Dead
19/06/2023	Le Mourier (T3)	Low fever (39,5°C.), pasteurellosis suspected.	daily observation by the technician during the trial	No treatment needed.	Farmer and technician	Recovered

RIM table - Interesting animal-welfare improvement case-studies (IDELE)

	When	Farm (trial)	Issue	How was the alarm generated?	What was performed?	By whom?	Results
	19/06/2023	Le Mourier (T3)	Fever (40,5°C.), pasteurellosis	daily observation by the technician during the trial	Animal treated. Drug treatment: métacam 0,5ml. + linco-spectin 4ml.	Farmer and technician	After 5 days of drug treatment, recovered.
	09/06/2023	Le Mourier (T3)	Sudden death due to enterotoxemia	daily observation by the technician during the trial	Animal taken out of the flock.	Farmer and technician	Dead
20	18/05/2023	Le Mourier (T3)	Fever (40,2°C.), severe diarrhea	daily observation by the technician during the trial	Animal treated. Drug treatment: linco-spectin 2ml, metacam 0.25ml, bicarbonate + clay	Farmer and technician	Recovered

Interpretation – mind-map



EWS – early warning system

A few EWSs – (early warning system) algorithms – examples

THI heat stress **(group level)** –presented yesterday ☺

Body weight changes

Milking order - Bacteria - (SCC)

} presented today ☺

(animal level)

Data are in cooperation with Spain, Italy, Ireland and Scotland

A blueprint – a few projects on other production systems and other species - are advised

Milking order

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UAB
Universitat Autònoma de Barcelona

Agris

TECH CARE

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PLF Lab

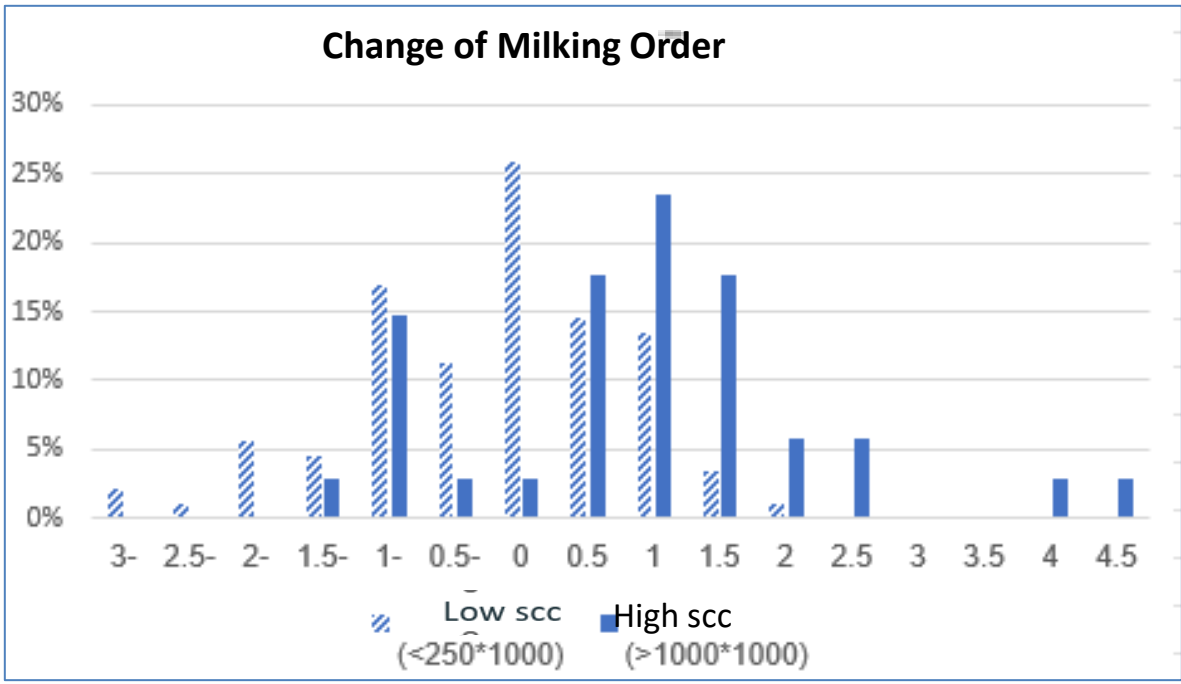
Information was **automatically recorded** by the milking machine.

The positions were categorized into groups, and a change was examined in increments of 50 positions.

Results – descriptive statistics

26% of ewes with **low** SCC **maintained** their positions (zero change) ,
compared to only 3% of ewes with high SCC.

76% of ewes with **high** SCC levels entered milking parlour **later than** their usual routine.



(1) Each unit represents a change of 50 places.
(2) Negative values indicate moving earlier in milking order, <u>positive</u> values indicate a <u>forward</u> shift

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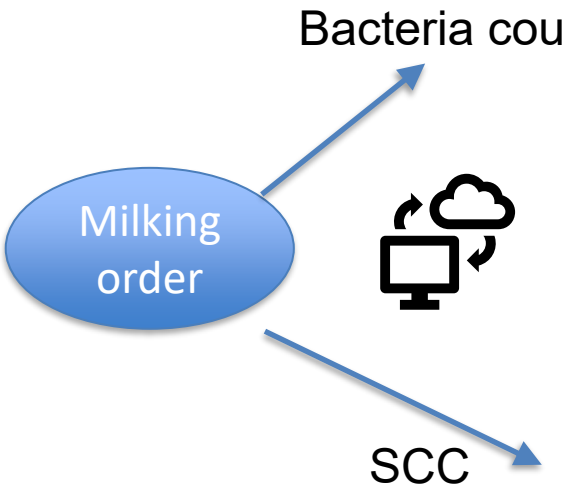
Results – (ML) Machine learning model

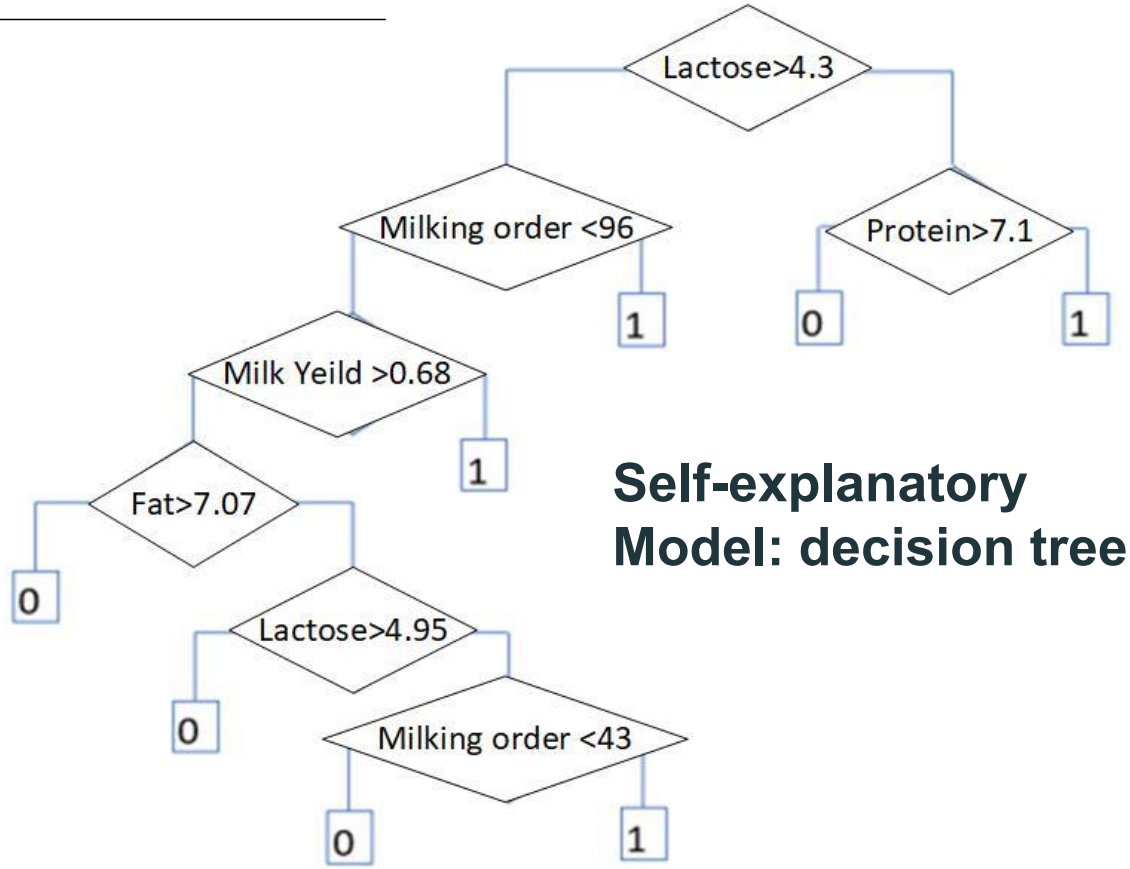
Best Model: Random Forest

Overall accuracy: 80%

Table 1- A comparison of F1 scores for the models using optimal hyperparameters

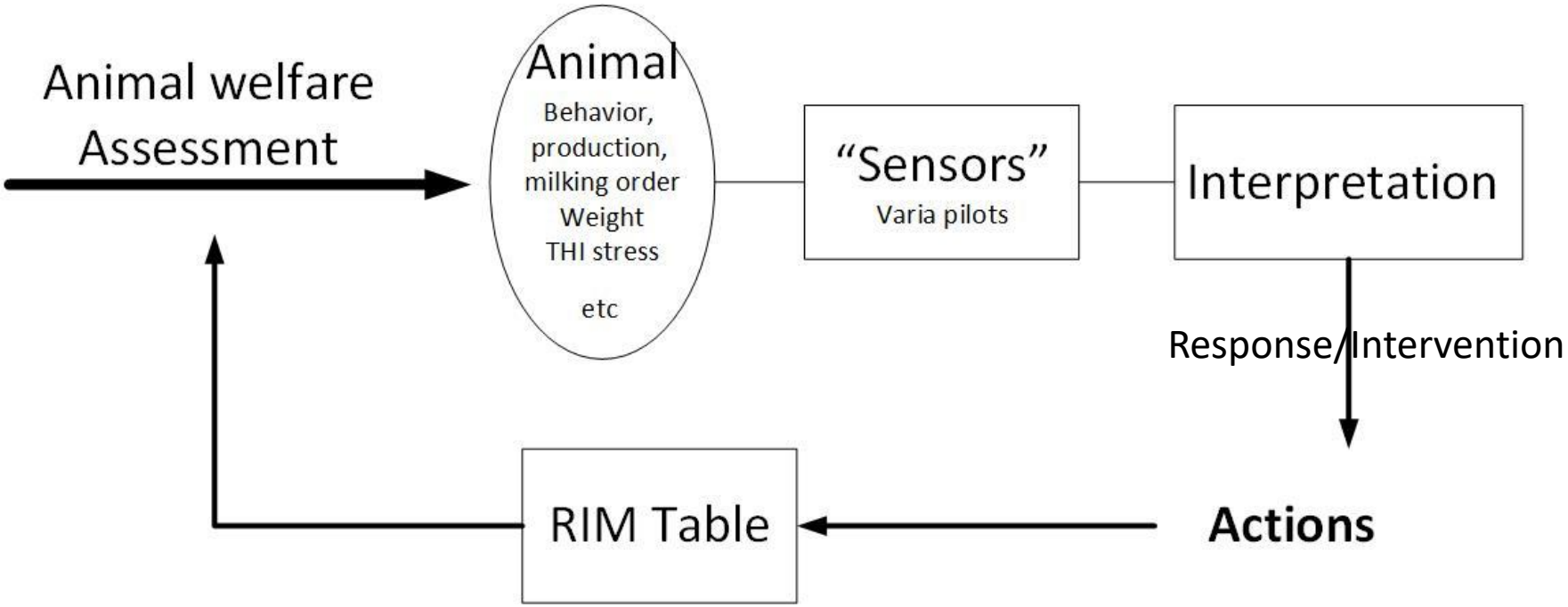
	Random Forest	Decision Tree	Logistic Regression
F1 Score	0.78	0.75	0.75





Self-explanatory Model: decision tree

Closing the loop – a blue print was developed and validated



A blueprint to other animal welfare PLF tools

Long development phases – today data status

Availability to the farmers and industry

RIM: Case Study Collection: practical methods for enhancing animal welfare – **in practice !**

What can be learned - time , engineering expertise, interaction with the animals, then interact with the farmer and the production chain