

# Animal-based indicators for welfare assessment: current status and future trends

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World Organisation  
for Animal Health  
Founded as OIE

*Training seminar on Animal Welfare in Europe*

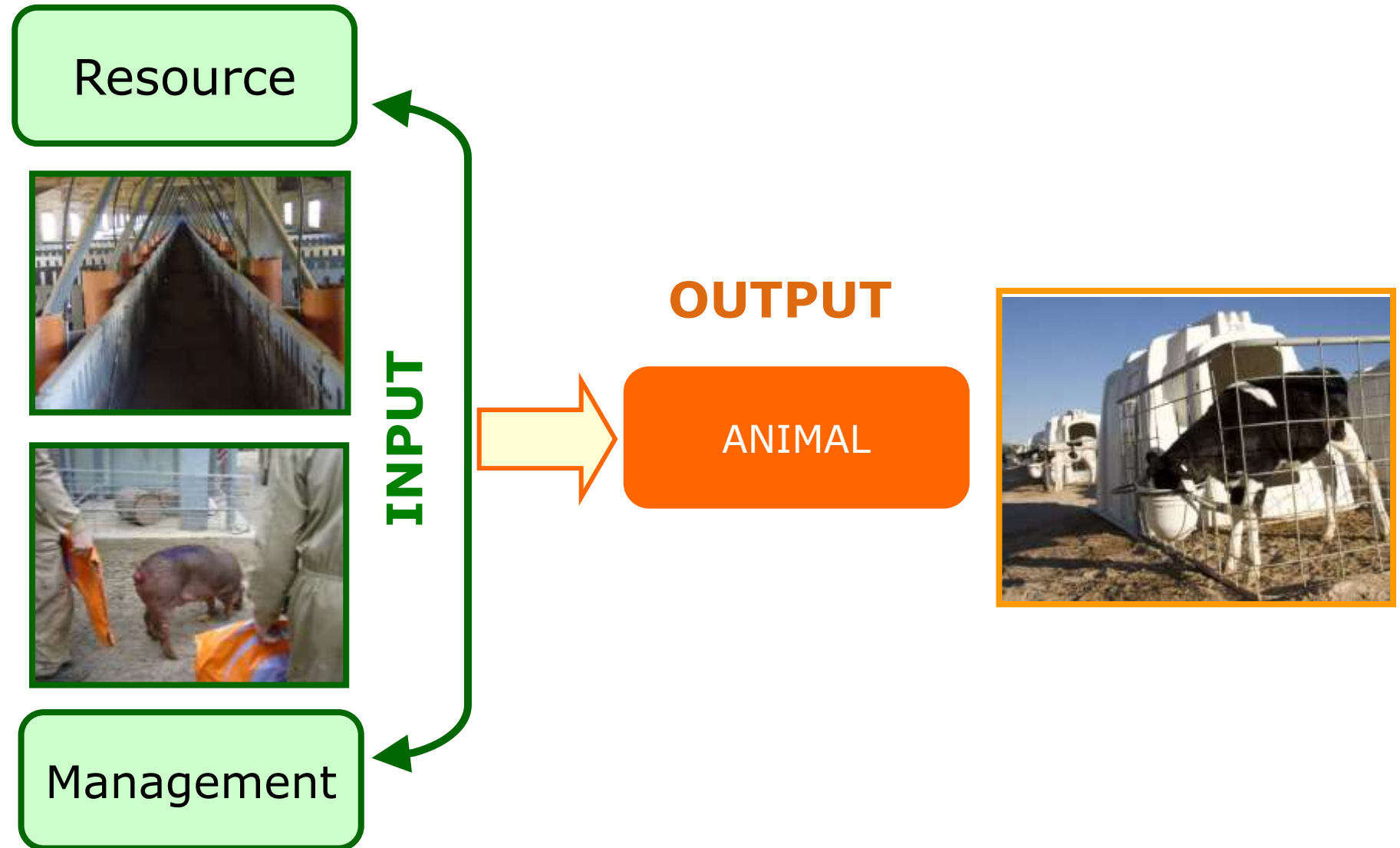
# Structure of the talk

- Current status of animal welfare assessment
- Opportunities from emerging technologies
- Experiences from research
- Concluding remarks

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# Animal welfare Indicators

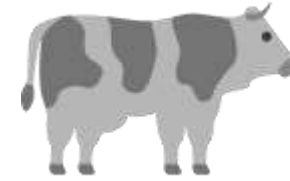


# Animal Welfare Indicators



**INPUT**

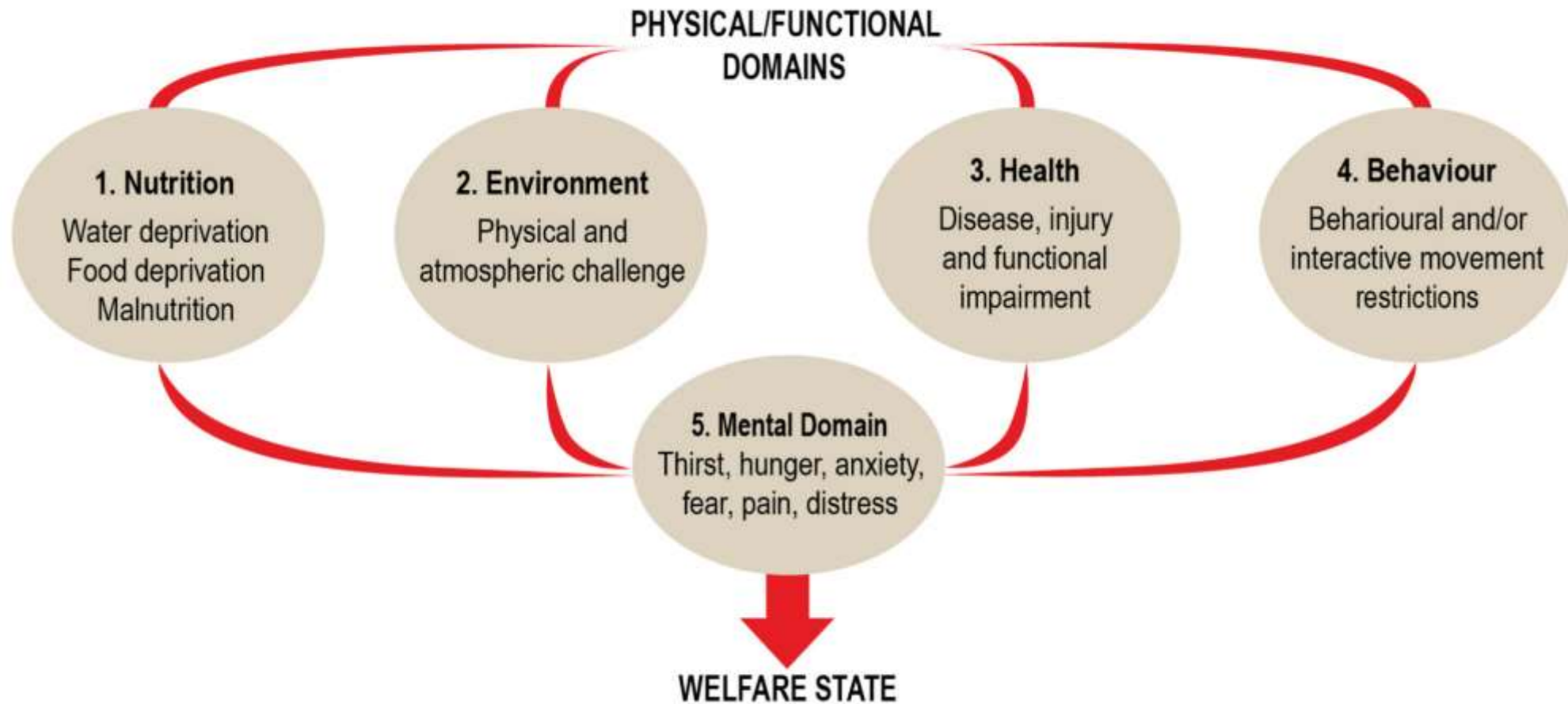
- Risk factors
- Easy to measure (less time & training)
- May not reflect the welfare



**OUTPUT**

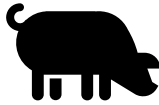
- Response of the animal
- More time and resources
- Higher specificity / sensitivity

# Animal Welfare Assessment



# Animal Welfare Assessment

**Welfare  
Quality**

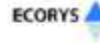


	Welfare criteria		Measures
<b>Good feeding</b>	1	Absence of prolonged hunger	Body condition score
	2	Absence of prolonged thirst	Water supply
<b>Good housing</b>	3	Comfort around resting	Bursitis, absence of manure on the body
	4	Thermal comfort	Shivering, panting, huddling
	5	Ease of movement	Space allowance
<b>Good health</b>	6	Absence of injuries	Lameness, wounds on the body, tail biting
	7	Absence of disease	Mortality, coughing, sneezing, pumping, twisted snouts, rectal prolapse, scouring, skin condition, hernias
	8	Absence of pain induced by management procedures	Castration, tail docking
<b>Appropriate behaviour</b>	9	Expression of social behaviours	Social behaviour
	10	Expression of other behaviours	Exploratory behaviour
	11	Good human–animal relationship	Fear of humans
	12	Positive emotional state	Qualitative Behaviour Assessment (QBA)

# Animal Welfare Assessment



External Scientific Report



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Development of a roadmap for action for the project  
More Welfare: towards new risk assessment  
methodologies and harmonised animal welfare data  
in the EU

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1

Scientific literature

2

Current methods and  
development of new ones



# Animal welfare indicators (by species)

Domain	Number of	Dairy cattle	Dairy calves	Beef cattle/veal calves	Goats	Sheep	Pigs	Broilers/broiler breeders	Laying hens/layer breeders	Turkey, duck, geese, and quail <sup>1</sup>	Rabbits	Horses	Fish/aquatic invertebrates
<b>TOTAL over all domains</b>	Total entries	1,114	135	399	320	322	445	246	191	149	278	372	215
	Papers	79	9	15	14	23	27	28 <sup>2</sup>	16	11 <sup>3</sup>	11	24	10 <sup>4</sup>
<b>Behaviour</b>	Total entries	39	13	34	14	24	48	8	78	23	25	41	16
	Unique indicators	35	13	26	5	13	25	6	31	9	13	28	16
<b>Environment</b>	Total entries	334	33	93	71	83	97	66	11	12	67	44	61
	Unique indicators	226	24	70	59	62	34	16	9	3	33	32	50
<b>Health</b>	Total entries	518	65	188	164	150	235	136	90	100	140	183	101
	Unique indicators	269	51	118	64	87	93	47	57	38	66	100	78
<b>Mental state</b>	Total entries	55	8	31	21	27	35	21	7	12	9	58	5
	Unique indicators	35	6	18	10	15	16	7	5	10	5	33	4
<b>Nutrition</b>	Total entries	168	16	53	50	38	30	15	5	1	37	46	32
	Unique indicators	83	12	37	21	27	15	5	5	1	20	25	17

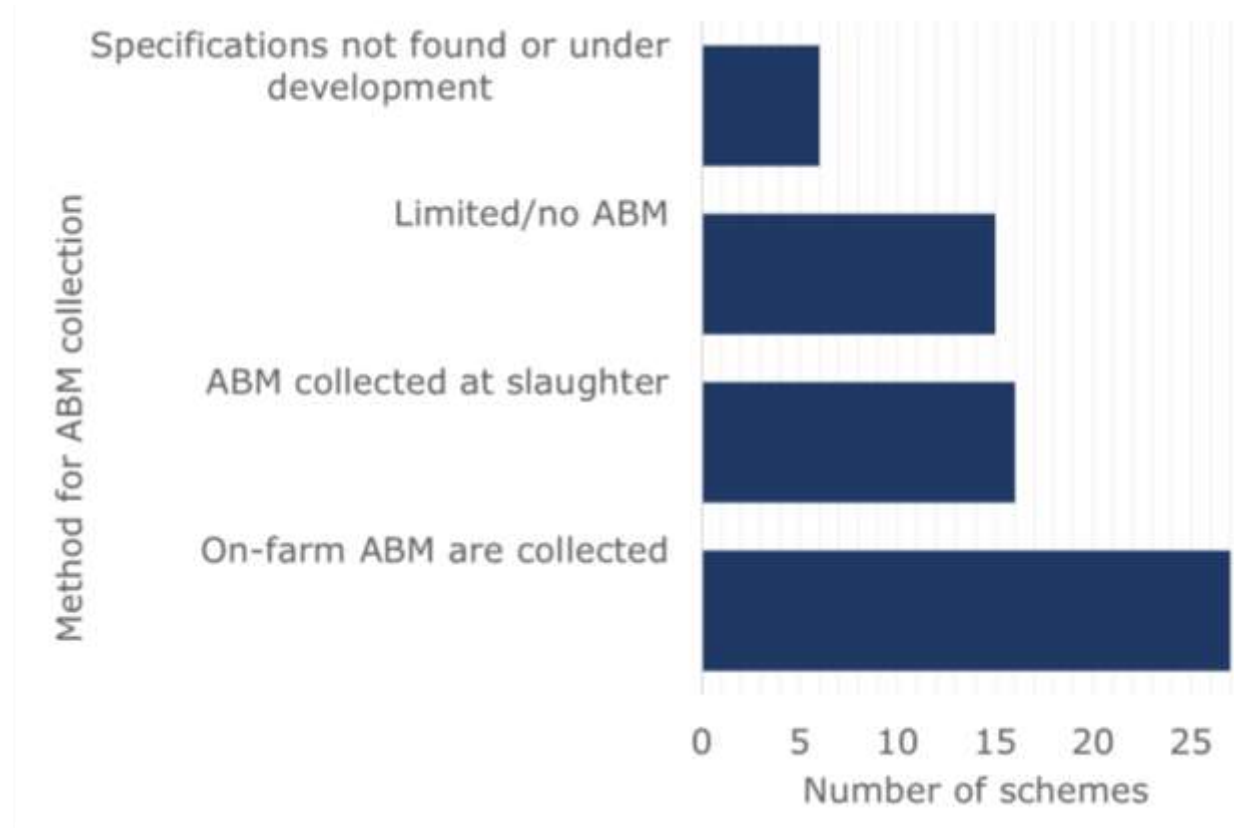
Paulovic et al. (2024)

# Animal welfare indicators (by domains)

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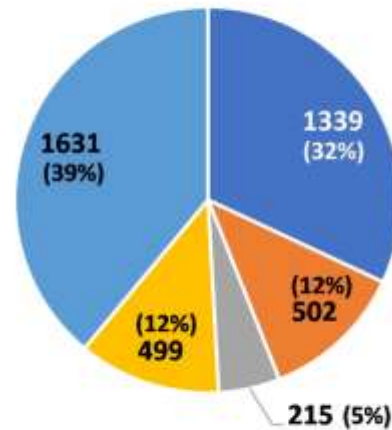
# Current Animal Welfare Assessment (CAWA)

High diversity of protocols in CAWA



# Current Animal Welfare Assessment (CAWA)

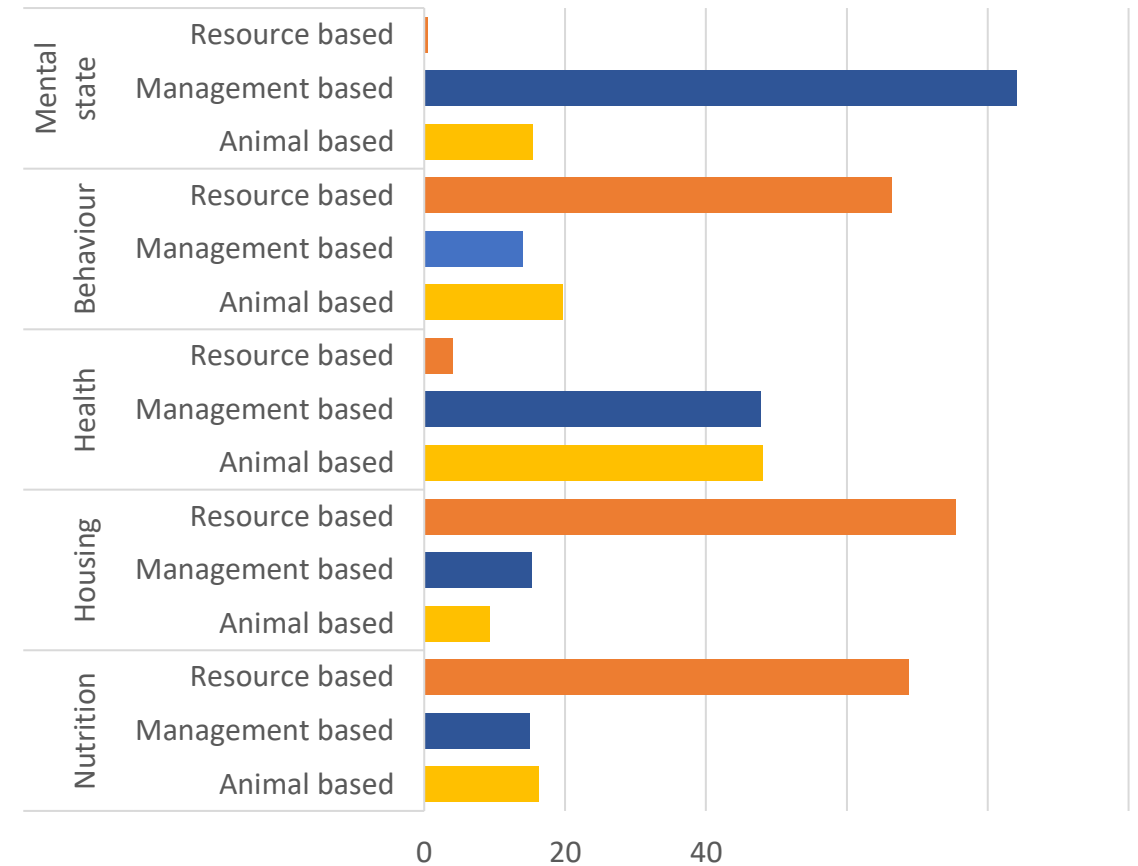
CAWA



■ Health ■ Behaviour ■ Mental state ■ Nutrition ■ Environment

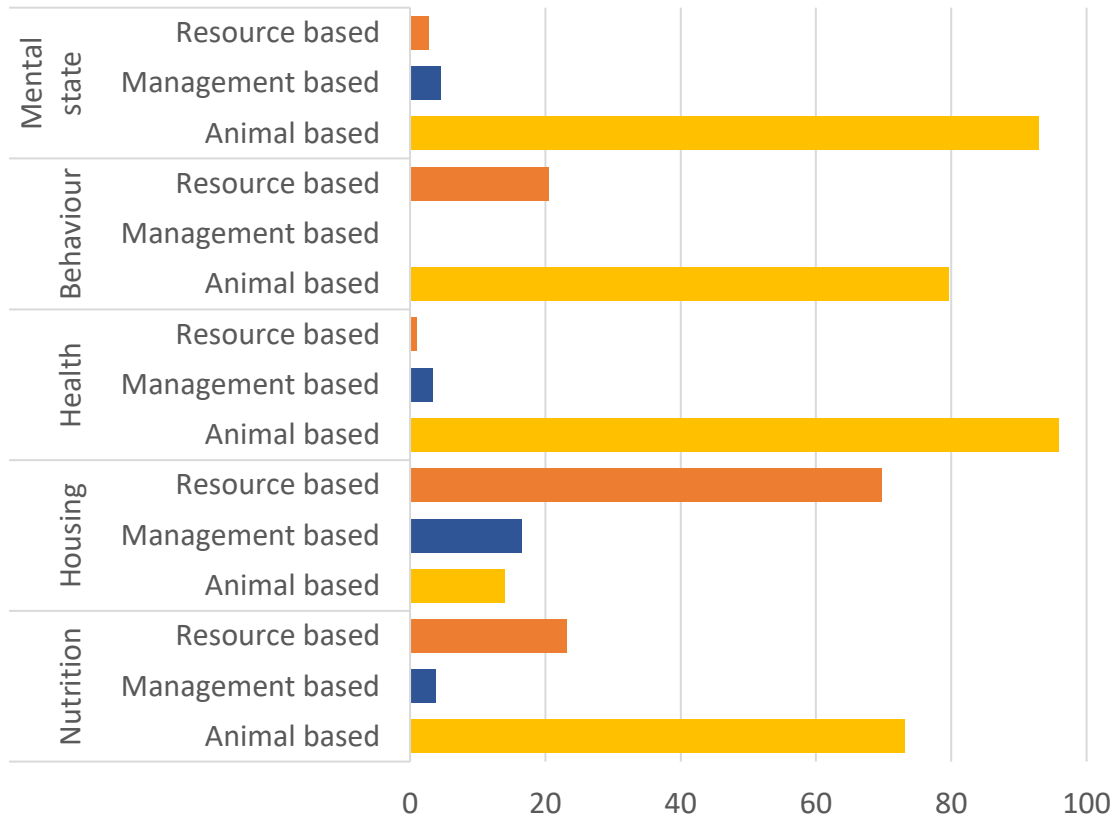
Gap → Mental State

CAWA: frequencies of the type of indicator per domain

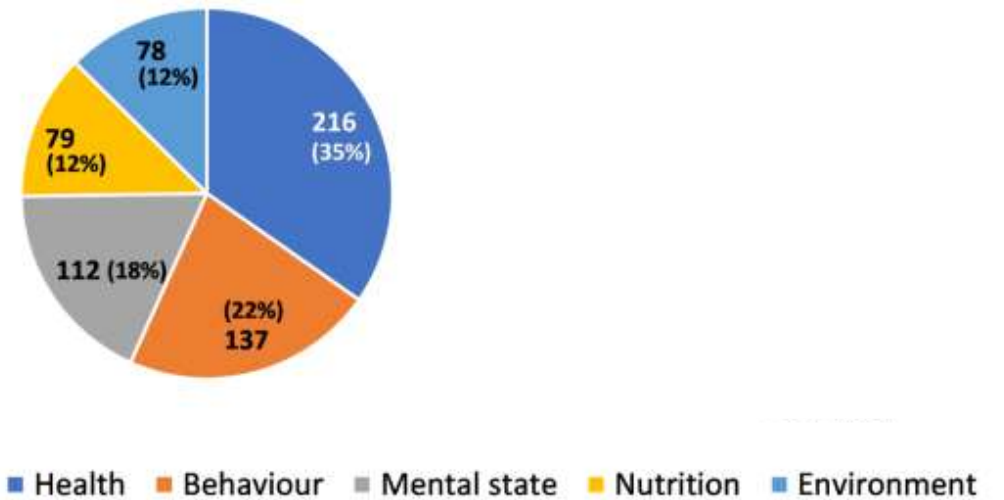


# Future animal welfare indicators

Development activities: frequencies (%) of the type of indicator per domain



Development activities



Development activities focus on ABM development or on new ways of collecting them **(PLF)**

# Summary and gaps in welfare assessment

## Current Animal Welfare Assessments (CAWA)

Labelling/certification schemes (LS)	➔	64
Enforcement activities (Enf)	➔	16

- Mostly Ruminants, Pigs, Broilers and Laying
- Gaps
  - Horses (specially for meat industry)
  - Poultry other than chicken, turkey and ducks
  - Fish other than salmon

## Future welfare indicators

Research Projects (RP)	➔	275
Operational groups (OG)	➔	15

- Ruminants: majority for dairy cattle
- Gaps:
  - Poultry other than chicken and turkey
  - Rabbits (only 1 RP)
  - Fish other than salmon, seabream, seabass and trout
- **PLF development is a major focus**

# (Some) **Remarks** on current welfare assessment

- **Behavioural indicators and mental state are areas under development**, especially for ruminants, broiler chickens and other poultry and fish
- **Lack of standardisation and need for harmonisation** on scoring method and indicators per domain
- **PLF is under development**, offering an **opportunity for early warning systems**, but also to **include indicators** (e.g. behaviour) that were **difficult to assess**

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# Animal welfare assessment: **limitations**

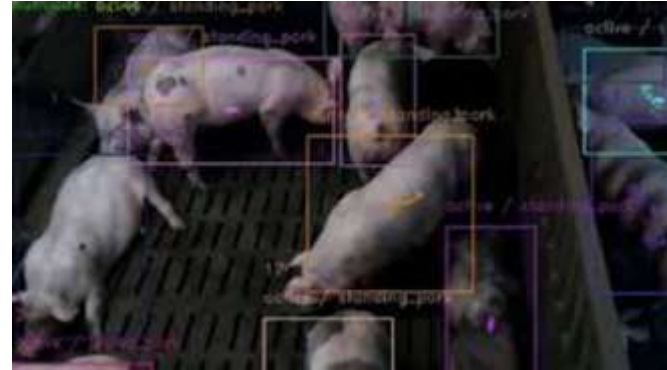


- Welfare protocols focus on **groups**
- Risk of **subjectivity**
- **Focal assessment:** provides a **(very) limited** timeframe
- **No anticipation** to welfare problems

# Opportunities from emerging technologies



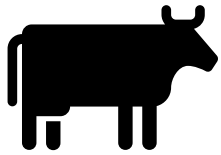
Precision  
Livestock  
Farming



- **Objective** assessment
- **Individual** monitorization
- **Continuous** assessment
- **Anticipating** animal welfare problems

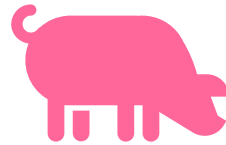
# Sensors availability for welfare assessment

## Sensors available in the market



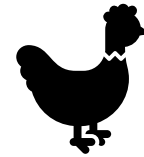
129

*Stygar et al., 2021*



83

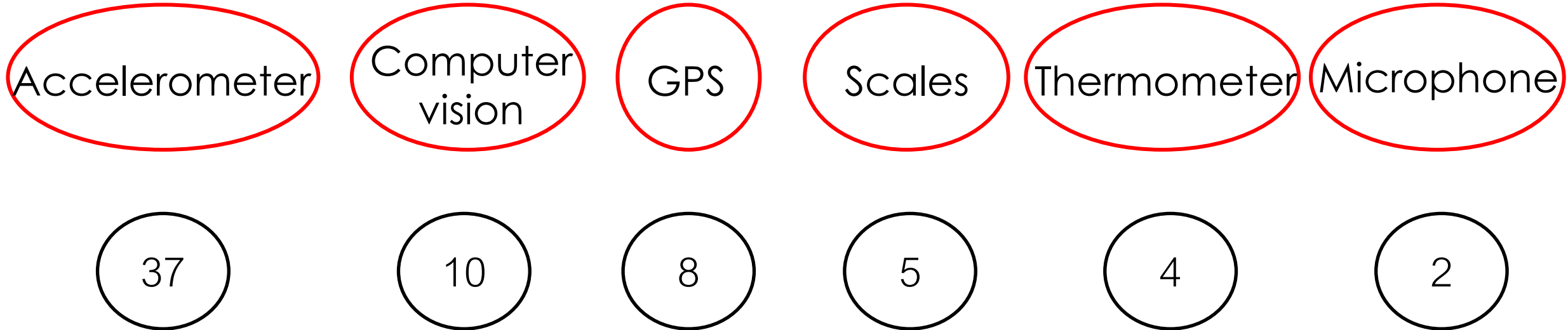
*Gomez et al., 2021*



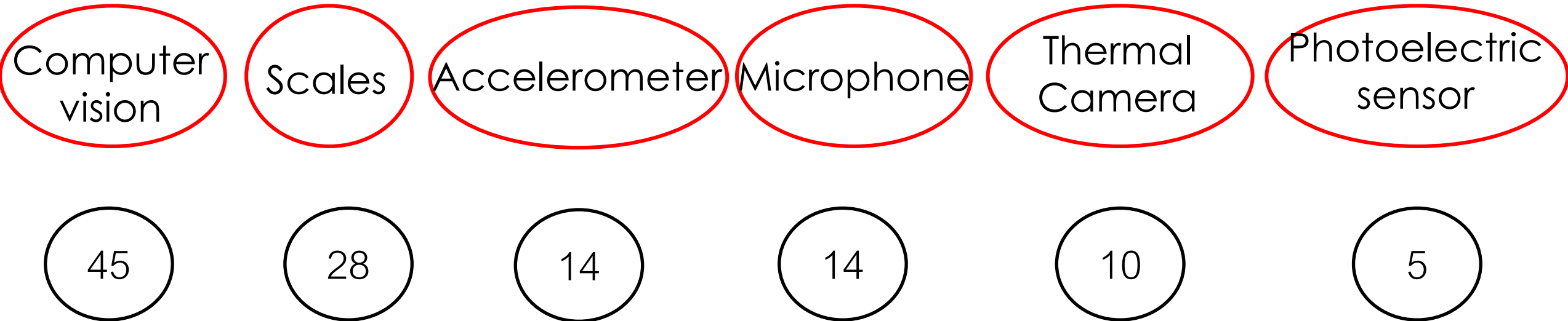
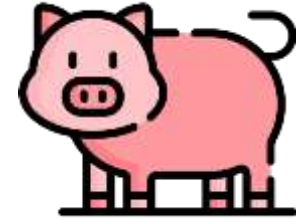
60

*Rowe et al., 2019*

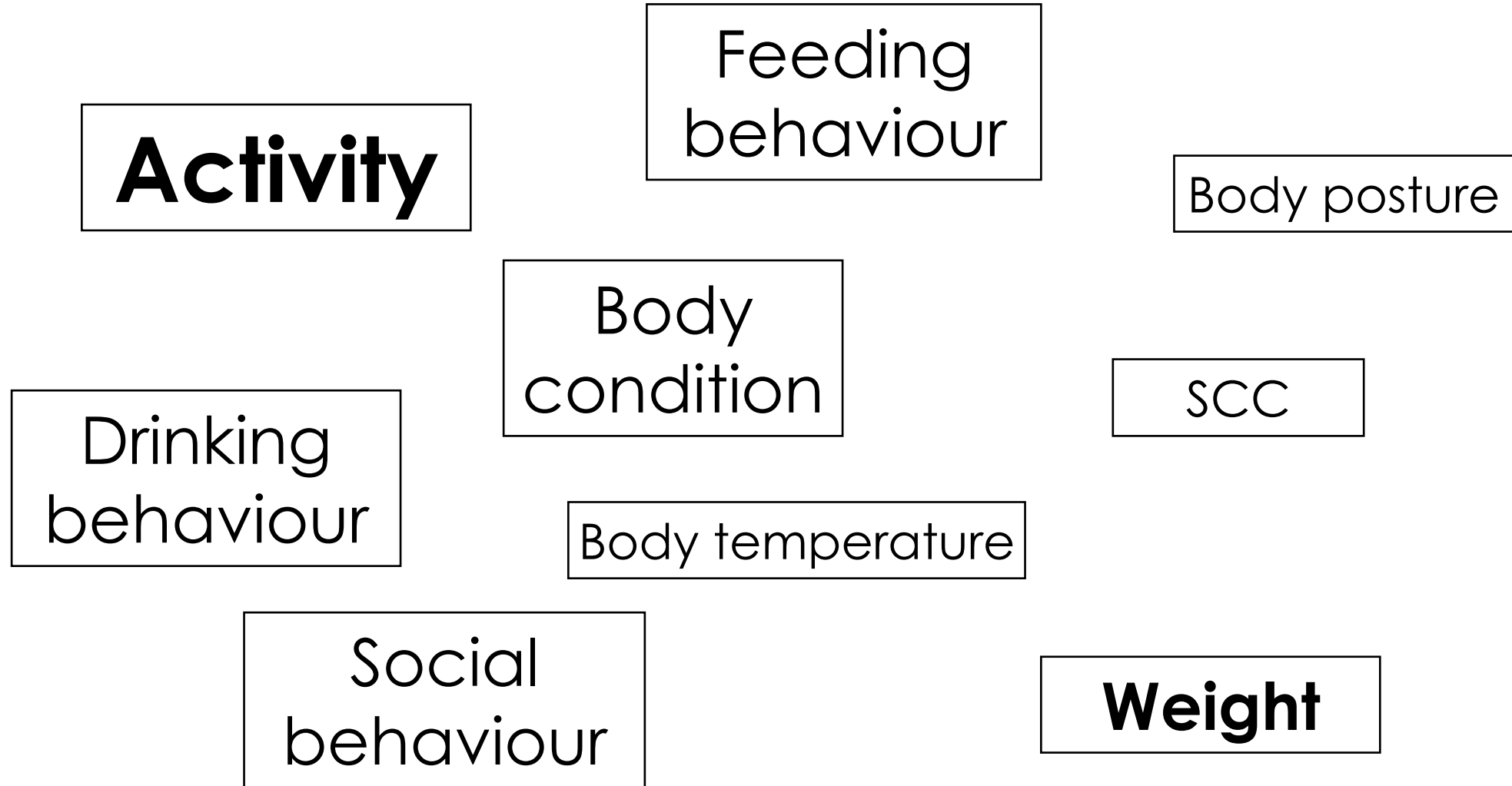
# Sensors in cattle



# Sensors in pigs



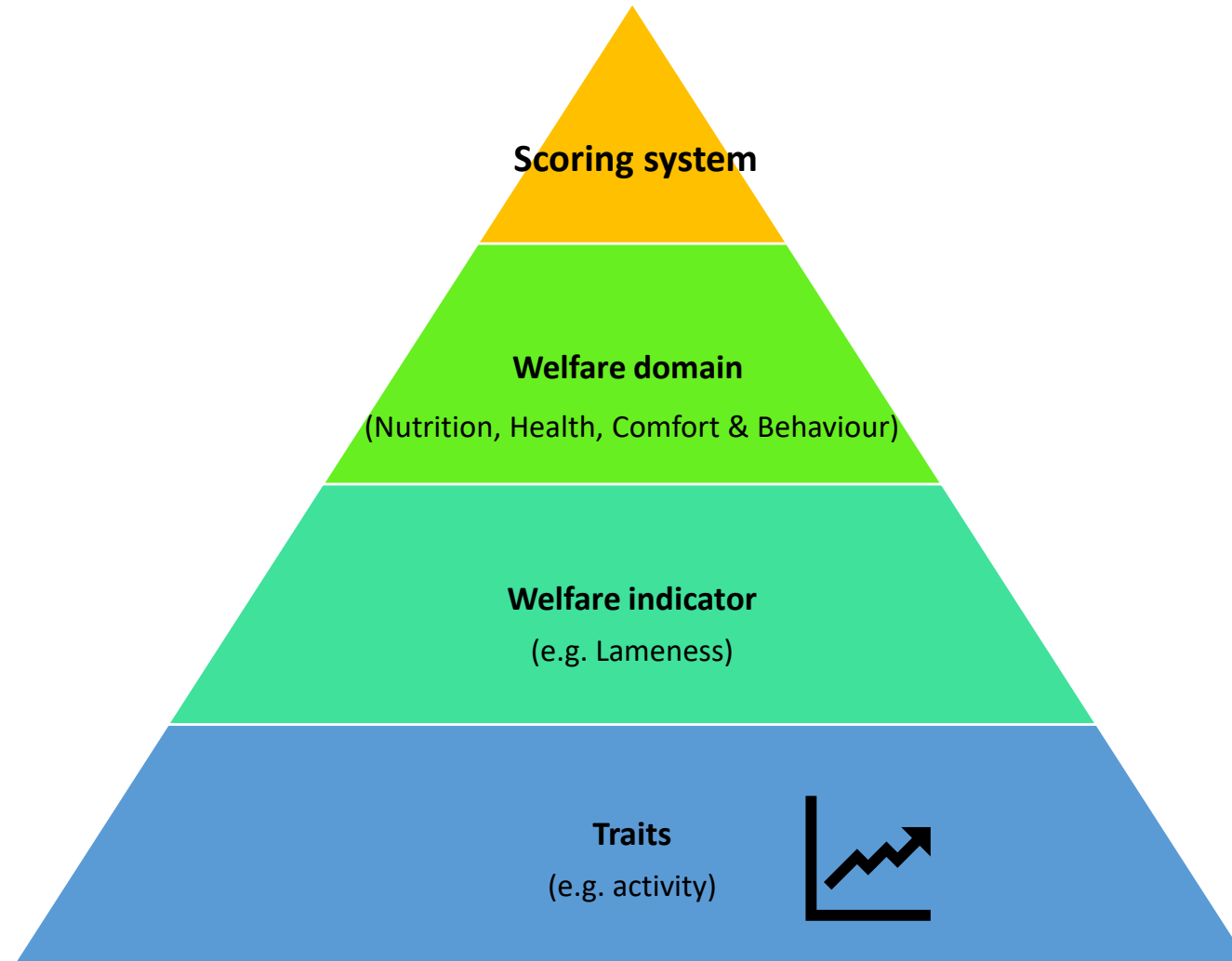
# Traits provided by sensors



# Sensor welfare traits: **examples**

<b>Domain</b>	<b>Indicator</b>	<b>Behaviour trait</b>
Comfort	Resting	Laying time
Feeding	Feeding behaviour	Feeding time
Health	Lameness	Activity
Natural behaviour	Abnormal behaviour	Tail biting

# Animal welfare assessment: new paradigm

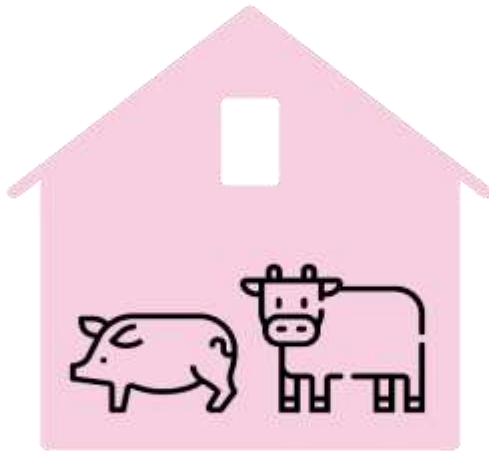




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# The ClearFarm project



-  EMISSIONS ...
-  ENERGY ...
-  LIGHT ...
-  TEMPERATURE / HUMIDITY ...
-  FEED ...
-  WATER ...
-  HEALTH ...
-  BEHAVIOUR ...

# Animal welfare data

## PLF technologies

-  Collars (Connecterra)
-  Rumen bolus (Smaxtec)
-  GPS (Herd-itt)

## Other sources

-  Vet records
-  Milking robots
-  Cortisol data
-  Environment



## Sensor data

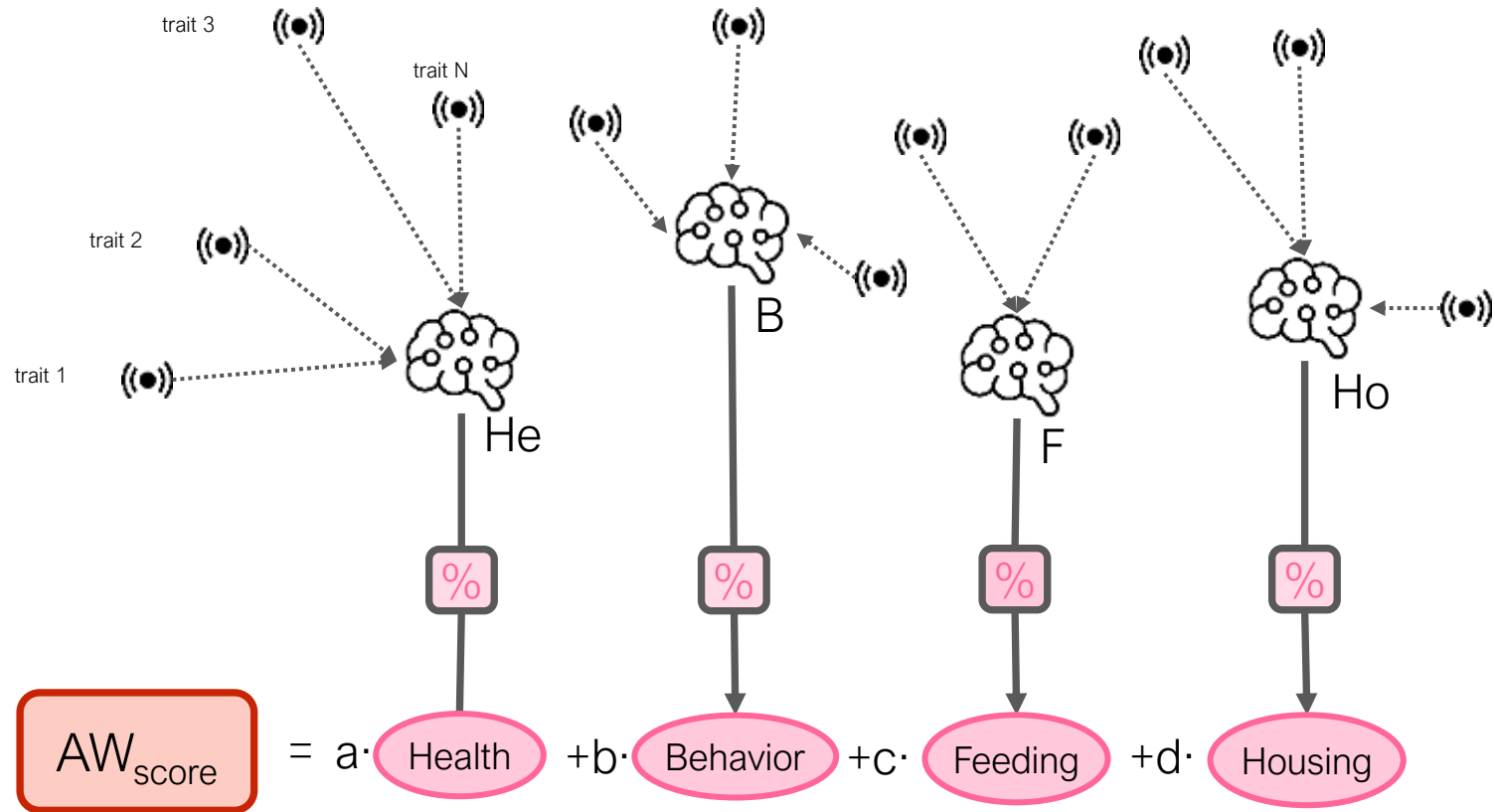
Walking time	Rumination time
Lying time	Eating/feeding time
Standing time	Number of drinking cycles
Milk production (DMP)	Rumen temperature
Days in milk	SCC/Conductivity
	Rumen pH

## AGGREGATED DATA

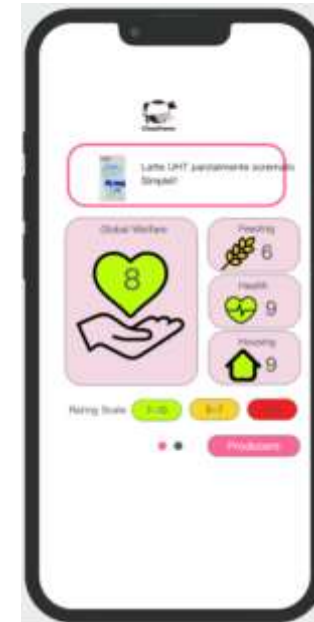
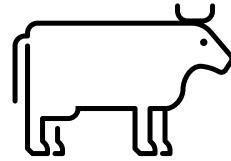
## Farm records

Analgesics/anti-inflammatories	Activity
	Antibiotics

# Aggregation of animal welfare data



# The ClearFarm output



# The ClearFarm output II



Platform for **dairy cattle** available.



**Progress** in our understanding of:



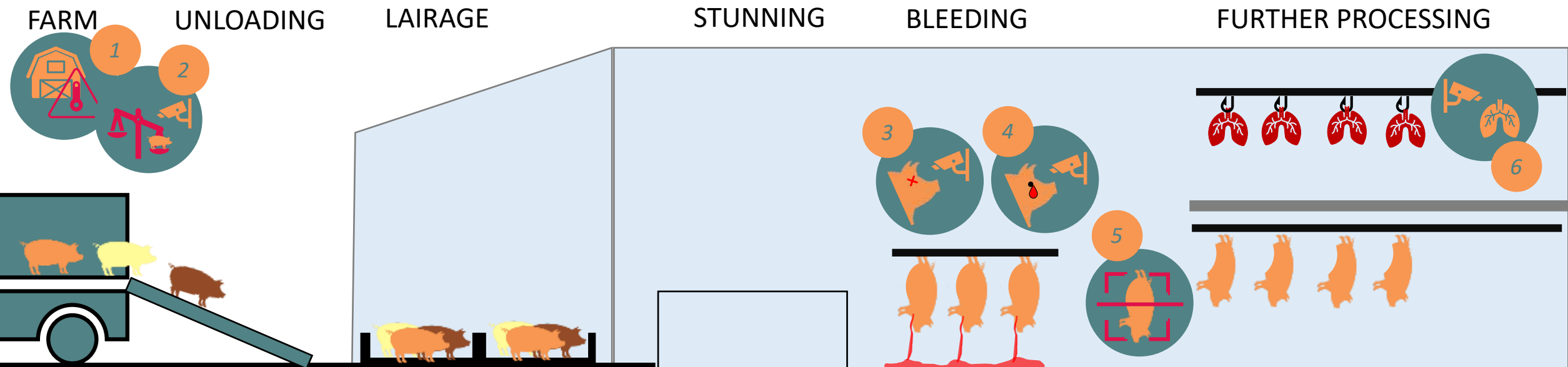
What do European citizens think about the **PLF**

**What is needed to** develop a PLF-based platform for **pig welfare assessment**



What are the main elements that contribute to the **carbon footprint of dairy and pig farming**

# The aWISH project



1 Barn climate monitoring

2 Weight predicting via camera

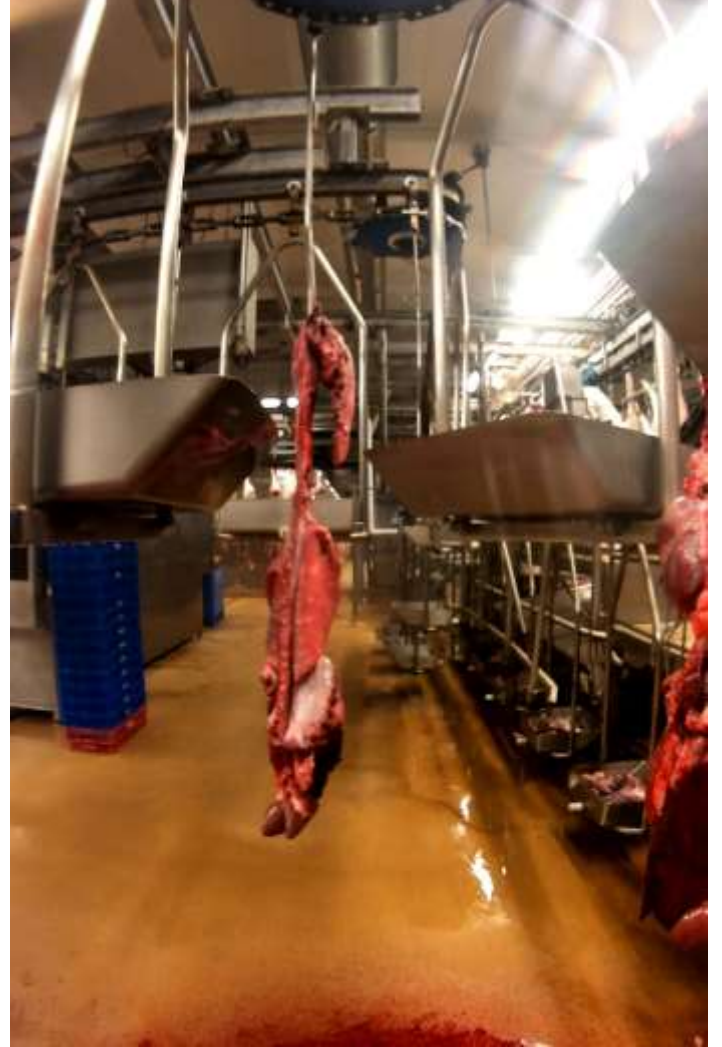
3 Stunning Effectiveness

4 Tear Staining

5 AUTOFOM3 – Backfat and Muscle Depth

6 Pulmonary and liver health monitoring

# The aWISH project





# The aWISH project

Broilers and Laying Hens		Relevant Scenarios for Welfare Assessment at the Slaughterhouse			
Welfare Quality Principle	Welfare Consequence	ABM	Farm	Transport	Slaughterhouse
Good feeding	Prolonged hunger	Presence bile/urates/orange discharge at bottom containers		[11]	[11]
		Emaciated animals, body weight	[26,34,56,68]		
	Dehydration	Dehydrated animals	[34,68]		
Good housing	Heat stress	Panting		[11]	[11]
	Cold stress	Huddling		[11]	[11]
		Piloerection		[11]	[11]
		Shivering		[11]	[11]
	Limited movement	Pilling up (overcrowding in container)		[11]	[11]
	Proper housing	Dirty animals	[69]		
Good health	Injuries (pain)	Breast blisters	[26,34,68,69]		
		Hock burn	[34,68,69]		
		Footpad lesions	[26,34,56,68,69]		
		Plumage damage	[26]		
		Keel bone fracture	[26]	[26]	[26]
		Wing injuries (bone fractures)		[11,68,69]	
	Disease	Bruises and skin damage	[56,68]	[11,56,68,69]	[11,56,68,69]
		Ascites	[26,34,68]		
		Arthritis	[26,56]		
		Septicaemia	[26,34,56,68]		
	Hepatitis	[26,34,56,68]			
	Pericarditis	[26,34,56,68]			
	Abscesses	[26,34,56]			
	Parasites	[68]			

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- Link animal behaviour - animal welfare
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# But... All that glitters is not gold



PLF can **directly harm animals** because of

(1) technical failures

(2) harmful effects of exposure, adaptation or wearing of hardware components

PLF may create **indirect effects on animal welfare** if the farmer or stockperson

(5) becomes under- or over-reliant on PLF technology

(6) spends less (quality) time with the animals, and

PLF may also **compromise the interests of the animals** by creating transformations in animal farming so that the housing and management

(9) become more industrialized

Finally, PLF may **affect the moral status of farm animals** in society by leading to

(11) further animal instrumentalization, and

(12) increased animal consumption and harm

## (Some) **Remarks** on using PLF to monitor welfare

- PLF is a **new paradigm** of animal welfare assessment, based on objective, systematic and continuous evaluation
- Changes in **behaviour, physiology and performance** can now (PLF) be assessed, with great potential to monitor **animal welfare**
- Large datasets from PLF need **deep analysis and integration** to convert it into meaningful outcomes
- Welfare assessment using PLF can be performed **on-farm** and at the **slaughterhouse**
- PLF tools has potential but also **risks** and **threats**

# Acknowledgements



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aWISH  
ANIMAL WELFARE INDICATORS AT  
THE SLAUGHTERHOUSE

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