PhD School «Agriculture, environment and bioenergy»
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Animal welfare
for a sustainable animal husbandry

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OUTLINE

GENERAL INTRODUCTION

- Definition of animal welfare

- Why talking about animal welfare?

WELFARE EVALUATION

- European approach to the evaluation of animal welfare: animal-based *vs* resource-based indicators

THE FUTURE OF WELFARE

- New trends: positive welfare and animals' emotions

- New technologies for the evaluation and labelling of animal welfare

DEFINITION OF ANIMAL WELFARE

- Animal welfare is a state of mental and physical health in which the animal is in harmony with its environment (Hughes, 1976)

- The welfare of an animal is its state as regards its attempts to cope with its environment (Broom, 1986)

EVERYONE IS RESPONSIBLE FOR ANIMAL WELFARE

- EU animal welfare strategy (2012-2015) for improving welfare standards

  – enhancing knowledge among the many key agencies, organisations and individuals who are involved in the process

  – improving the competitiveness of European agricultural products by ensuring that markets and consumers recognise animal welfare as an added value

WHO CARES ABOUT ANIMAL WELFARE?

ANIMALS

FARMERS

CONSUMERS

WHY TALKING ABOUT ANIMAL WELFARE?

- Ethical reasons

- Animals in good welfare conditions → higher production levels

- Healthier products → good animal welfare improves animal health → reduced need to use antibiotics → less antimicrobial resistance → human health

- Consumers' demand → marketing

- Possibility to ask for public support (good farming practices: environmental protection & animal welfare)

WHY TALKING ABOUT ANIMAL WELFARE?

- European consumers are interested in products deriving from sustainable processes that respect the environment and animal welfare

NEED FOR CERTIFICATION LABELS

ENVIRONMENTAL LABELLING

Multiple labels, including organic labels, pay attention to:

- environmental emissions of farming and the supply chain (e.g. carbon and nutrient emissions)

- biodiversity impacts of farming

- animal welfare and respect of behavioural needs of the animals

E.g. Limits to transportation distance
→ lower emissions
→ higher welfare

VOLUNTARY CERTIFICATION SCHEMES

The European Commission's (2010) best practice guides are designed to support:

- environment
- animal welfare
- fair trade

Minimum requirements: European legislation forms the basis, partly complemented by national top-ups, for market standards and labelling of products

EXAMPLES OF ENVIRONMENTAL CERTIFICATION SCHEMES

- Maatlat Duurzame Veehouderij (Dutch quality mark for cattle):
  – Low environmental impact of housing structures
  – Measures taken for improving animal health and animal welfare

TAX DEDUCTIONS

PROBLEM: TOO MANY ANIMAL WELFARE LABELS!

- Many labels with different terms or requirements and rigour

- There is a need for harmonisation of animal welfare labelling

EU-wide animal welfare label

EVALUATION OF ANIMAL WELFARE

- Identify welfare needs 5 freedoms → 4 principles/12 criteria

Freedom from thirst, hunger and malnutrition
Freedom from discomfort
Freedom from pain, injury, and
Freedom from fear and distress
Freedom to express normal behavior
(Brambell Report, 1965)

EVALUATION OF ANIMAL WELFARE

- Identify welfare needs 5 freedoms → 4 principles/12 criteria

- Development and scientific validation of valid, repeatable and feasible indicators

- Development of protocols for on-farm welfare evaluation

- Training of personnel to apply the protocols

4 PRINCIPLES, 12 CRITERIA

WELFARE EVALUATION

	PRINCIPLES		CRITERIA
1	Good feeding	1	Absence of prolonged hunger
		2	Absence of prolonged thirst
2	Good housing	3	Comfort around resting
		4	Thermal comfort
		5	Ease of movement
3	Good health	6	Absence of injuries
		7	Absence of disease
		8	Absence of pain by management procedures
4	Appropriate behaviour	9	Expression of social behaviours
		10	Espression of other behaviours
		11	Good human-animal relationship
		12	Positive emotional state

(Welfare Quality, AWIN)

POSSIBLE SCENARIOS

		INDIRECT INDICATORS	
		poor	good
DIRECT INDICATORS	poor	**NO!**	NO
	good	OK	**OK!**

ADAPTATION!

EXAMPLES: COMFORT AROUND RESTING

- Resting is very important for the welfare of dairy cattle

- Indirect indicators: number, type and design of stalls/cubicles

- Can we use these indirect indicators to evaluate comfort around resting?

- To a certain extent YES, <u>BUT</u>...

- These requirements might differ depending on animals' characteristics (e.g. selected breeds *vs* autochtonous breeds)

INDIRETTI *vs* DIRETTI

WELFARE EVALUATION

Priority to DIRECT indicators (EFSA, 2012)

RISK ASSESSMENT

FACTORS
(*RISKS*)

CONSEQUENCES
(*ADVERSE EFFECTS*)

Resource-based indicators

Management-based indicators

ANIMALS
(e.g. breed, sex, age...)

Animal-based indicators

Animals' response

RISK identification and calculation of the PROBABILITY that an ADVERSE EVENT will occur in a given population as a result of the EXPOSURE to that risk

EXAMPLES OF EC FUNDING ON ANIMAL WELFARE

- COST 846 Measuring and monitoring farm animal welfare (2001–2006)

- Welfare Quality (FP6): cattle, pigs, poultry (2004-2009)

- Welfare Indicators (FP7): sheep, goats, equids, turkey (2011-2015)

- Preparatory work for the EFSA Scientific Opinion on welfare in small scale farms (2014-2015)

WELFARE EVALUATION

WELFARE CRITERIA	WELFARE INDICATOR
Absence of prolonged hunger	BCS (too lean or too fat animals)
Absence of prolonged thirst	Water availability ... er of drinkers, fl... ter cleanliness)
Comfort around resting	Cleanliness of udder, flanks, legs; time to lie down; collisions with housing structures; % of cows lying out of the lying area
Absence of lesions	Lameness (locomotion score); skin damage; claw conformation
Human-animal relationship	Avoidance distance test
Positive emotional state	Qualitative Behaviour Assessment

RESOURCE BASED

COMFORT AROUND RESTING

Welfare® Quality
Science and society improving animal welfare

LYING DOWN MOVEMENT

- <u>Duration</u>

- <u>Transition movement</u>: correct/incorrect

- <u>Number of collisions</u> with structures

NO

YES

NO

YES

WELFARE EVALUATION
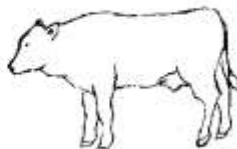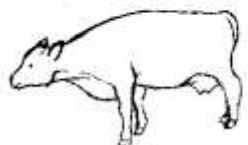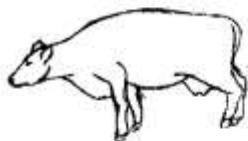
Normality traits:

- plain supporting surface are
- not bent
- same length
- scarce or null interdigital s
- angle with the ground not >

When two or more of these criteria are not respected → overgrown claw

AVOIDANCE DISTANCE TEST (AD, ADF)

In paddock (AD)

At the feed rack (ADF)

EXECUTION OF AVOIDANCE DISTANCE TEST
in goats

Test execution:
- move slowly towards the animal
- one step/sec (60 cm/step) speed
- evaluate the goat reaction

WELFARE EVALUATION

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Avoidance: the goat shows an avoidance reaction, turning the head and moving away

Contact: the goat can be touched but less than 3 seconds, before withdrawing

Acceptance: the goat can be gently stroked at least 3 seconds

QUALITATIVE BEHAVIOUR ASSESSMENT (QBA)

- Are animals happy, relaxed, at ease, suffering, annoyed, fearful...?

- Are we able to perceive it?

YES... THROUGH THEIR BODY LANGUAGE!

How can we read body language?

Requires a holistic perspective:

- *integrative*:   whole animal
- *dynamic*:   how animal behaves
- *expressive*:   style of behaving

To observe animal as whole being
=
to see more than just "behavior"

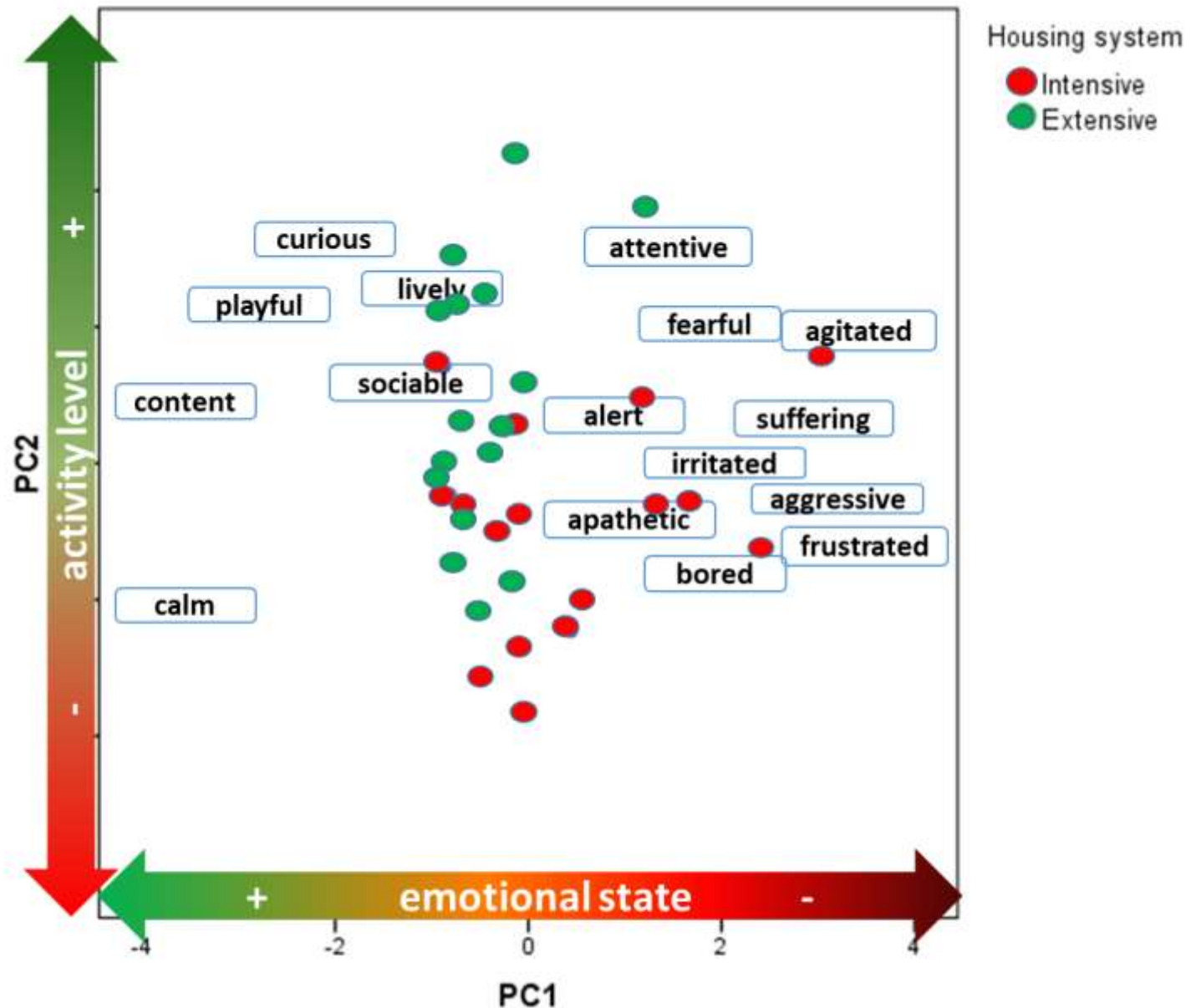# How can we read body language?

Not just 'standing' …

But an animal who stands in a certain way, with a certain expression …

Possibility to see also POSITIVE ASPECTS!

PCA example: intensive *vs* extensive goat farms

WELFARE PROTOCOLS

THE IMPORTANCE OF FARM RECORDS

- If collected regularly and properly, provide valuable information

- Important to set a reference period (e.g.: last 12 months)

ANIMAL-BASED

✓ SSC

✓ mortality

✓ distocyas

✓ downer cows

✓ …

RESOURCE-BASED

✓ Drug consumption → proxy for health problems

✓ Frequency of health treatments

✓ …

New challanges:
indicators of positive welfare

SURVIVAL
lack of negative feelings

RISK FACTORS

evaluation of negative welfare indicators

QUALITY OF LIFE
"a life worth living" or «a good life»

BENEFITS

evaluation of positive welfare indicators

The balance between positive and negative effects should be in favour of the first

(Mellor, 2016)

DEFINITION OF "ANIMAL WELFARE"

Animal welfare means how an animal is coping with the conditions in which it lives.

An animal is in a good state of welfare if (as indicated by scientific evidence) it is **healthy**, **comfortable**, **well-nourished**, **safe**, able to **express innate behaviour**, and if it is not suffering from unpleasant states such as pain, fear, and distress

OIE Terrestrial Animal Health Code, 2019

FIVE DOMAINS MODEL

Physical/Functional Domains							
Survival-Related Factors						*Situation-Related Factors*	
1: Nutrition		2: Environment		3: Health		4: Behaviour	
Negative	*Positive*	*Negative*	*Positive*	*Negative*	*Positive*	*Negative*	*Positive*
Restricted water & food; poor food quality	Enough water & food; balanced and varied diet	Uncomfortable or unpleasant physical features of environment	Physical environment comfortable or pleasant	Disease, injury and/or functional impairment	Healthy, fit and/or uninjured	Behavioural expression restricted	Able to express rewarding behaviours
Affective Experience Domains							
5: Mental State							
Negative Experiences			*Positive Experiences*				
Thirst	Breathlessness	Anger, frustration	Drinking pleasures	Vigour of good	Calmness, in control		
Hunger	Pain	Boredom, helplessness	Taste pleasures	health & fitness	Affectionate sociability		
Malnutrition malaise	Debility, weakness	Loneliness, depression	Chewing pleasures	Reward	Maternally rewarded		
Chilling/overheating	Nausea, sickness	Anxiety, fearfulness	Satiety	Goal-directed	Excited playfulness		
Hearing discomfort	Dizziness	Panic, exhaustion	Physical comforts	engagement	Sexually gratified		
Welfare Status							

EXTERNAL CIRCUMSTANCES + INTERNAL STATE = MENTAL STATE

Mellor, 2016

QUALITY OF LIVE (QoL)

Table 2. A Quality of Life (QoL) scale where the different categories are defined in terms of the relative balance of positive and negative experiences animals may have (adapted from [32]).

Category	Description
A good life	The balance of salient positive and negative experiences is strongly positive. Achieved by full compliance with best practice advice well above the minimum requirements of codes of practice or welfare
A life worth living	The balance of salient positive and negative experiences is favourable, but less so. Achieved by full compliance with the minimum requirements of code of practice or welfare that include elements which promote some positive experiences
Point of balance	The neutral point where salient positive and negative experiences are equally balanced
A life worth avoiding	The balance of salient positive and negative experiences is unfavourable, but can be remedied rapidly by veterinary treatment or a change in husbandry practices
A life not worth living	The balance of salient positive and negative experiences is strongly negative and cannot be remedied rapidly so that euthanasia is the only humane alternative

Mellor, 2016

WHICH POSITIVE INDICATORS?

SOME EXAMPLES

- Few validated indicators

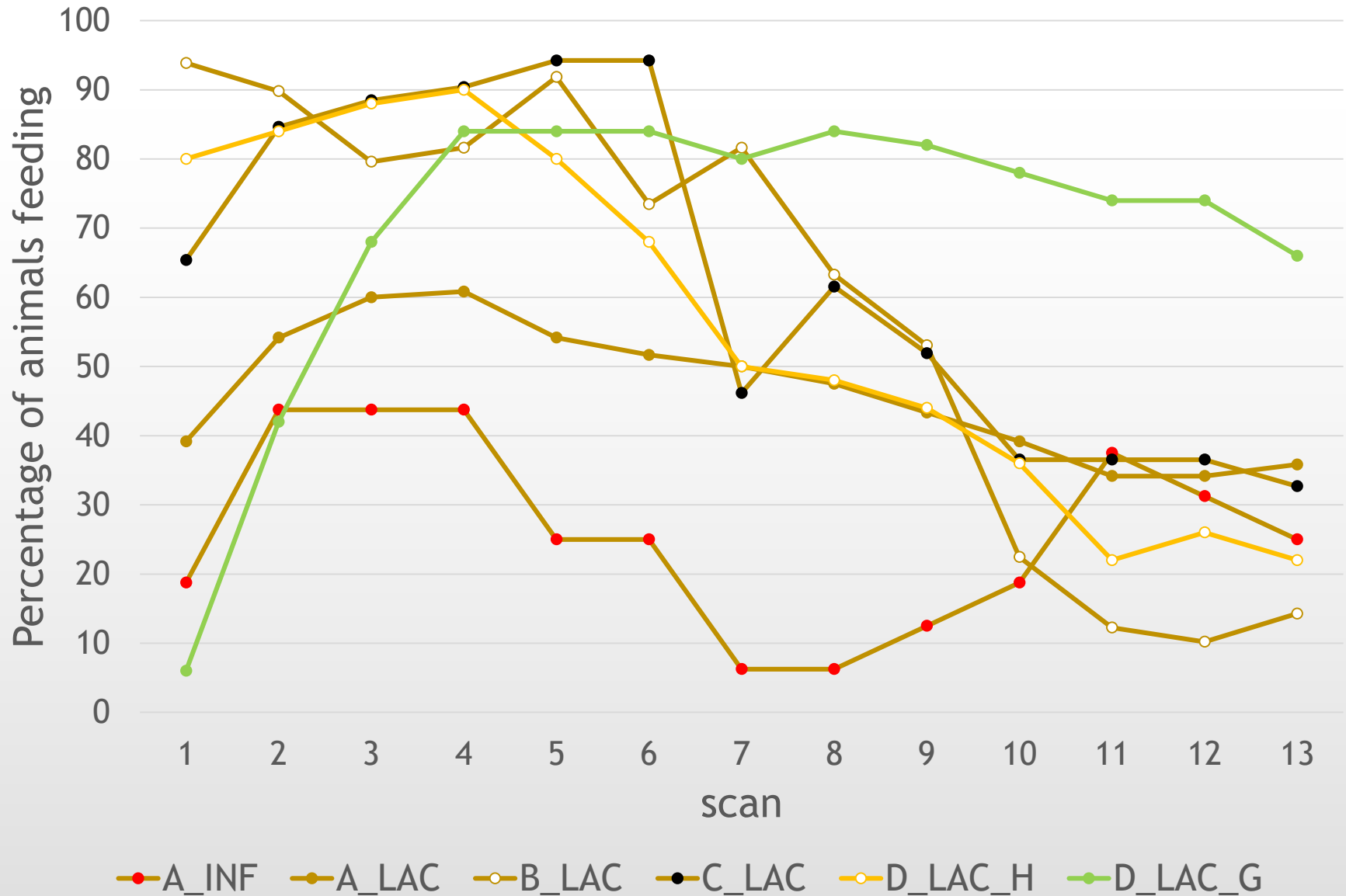- Usually require long observation time ($\rightarrow$ low feasibility)

- Lying posture
- Affiliative behaviours
  - play
  - self-grooming
  - allo-grooming
- Exploration
- Behavioural synchronisation
- Nasal temperature ($\downarrow$ in favourable conditions)

FEEDING SYNCHRONISATION

UNDERSTANDING ANIMALS' EMOTIONS

Examples of positive emotional states of relevance to animal welfare:

- Calmness

- Relaxation

- Curiosity

- Excitement

- Positive engagement

- Anticipation of reward or pleasurable events

- QBA

- Vocalizations

- Ear posture

- Eye white

- Tail position and movements

SOME EXAMPLES

EYE WHITE

EW1 – Eye white clearly visible

EW2 – Eye white little visible

EW3 – Normally open, eye white not visible

EW4 – Half-closed eye

Battini et al., 2019

EAR POSTURE

EP1 – Ear held upright

EP2 – Ear pinna directed forwards

EP3 – Ear held backwards

EP4 – Ear hung down loosely

Battini et al., 2019

PLF: new tools for welfare monitoring

- Sudden changes in behaviour or in physical state may indicate problems related to management (e.g. feeding system failure) or disease, as well as can signal specific physiological status such as oestrus or parturition

- Existing welfare assessment protocols rely on human experts scoring several welfare indicators → not optimal for continuous monitoring of animal welfare

- PLF uses novel technologies for real-time, continuous monitoring of individual animals → new opportunities to improve welfare assessment

PLF for welfare monitoring - examples

- To monitor changes in **animals' behaviour** (e.g. in feeding, drinking, moving, vocalization)
    - → accelerometers
    - → microphones
    - → cameras

- To monitor changes in **animals' productivity**
    - → milk flow sensor

- To monitor the **physical state of the animal body** (e.g. body temperature or rumen pH)
    - → thermal cameras
    - → rumen boluses

NEW TECHNOLOGIES: APPS FOR WELFARE EVALUATION

❖ Automatic data collection
❖ No transcription errors
❖ Instantaneous analysis of data
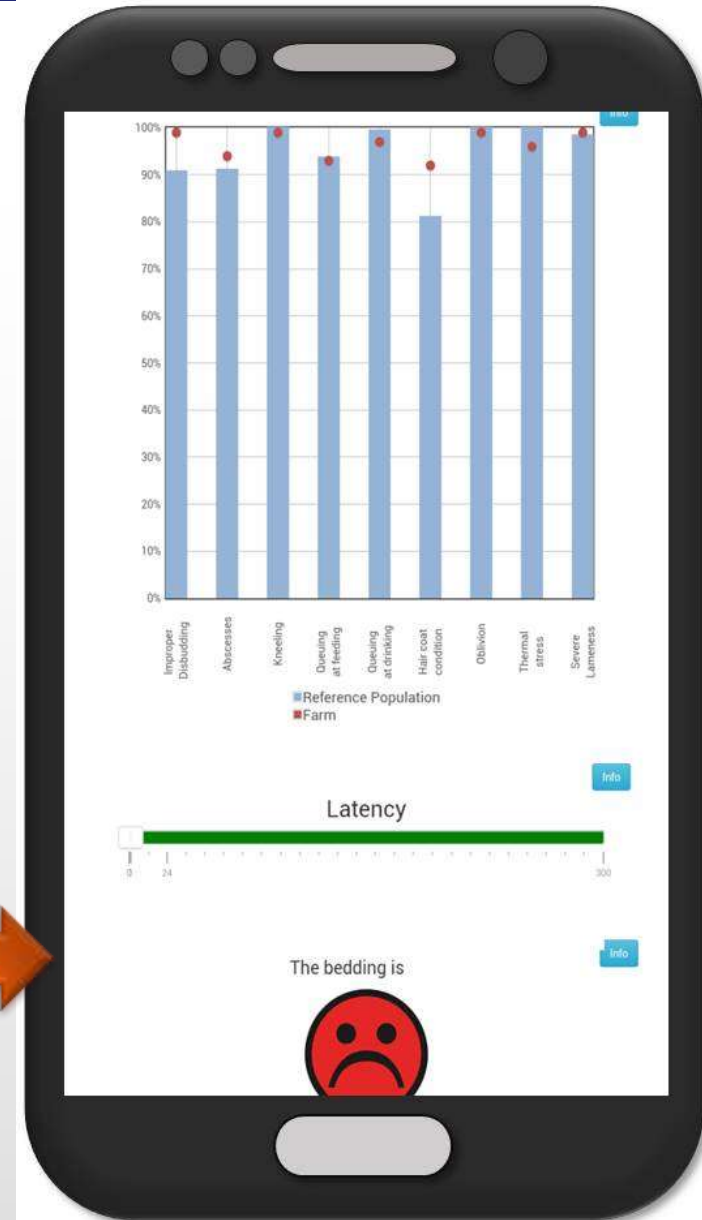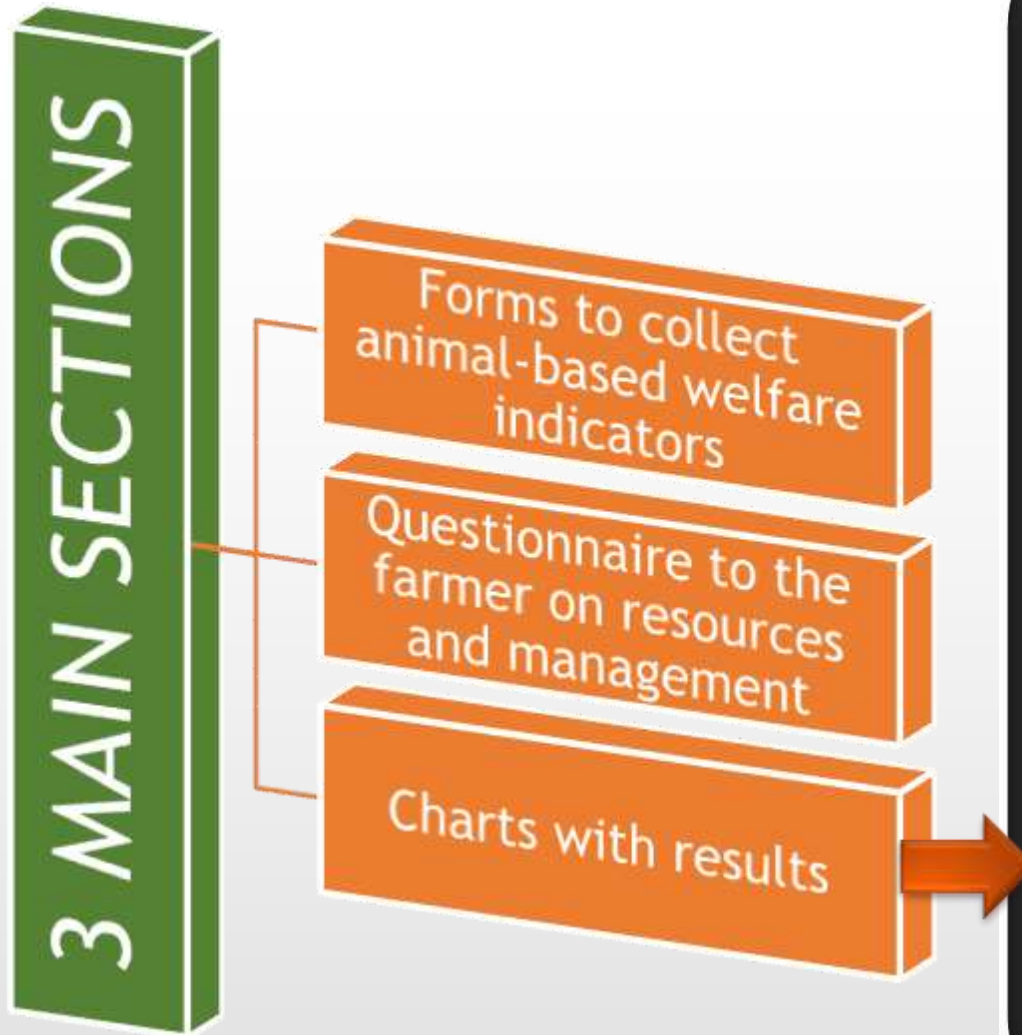

"I'm done my paper work. Need help with yours?"
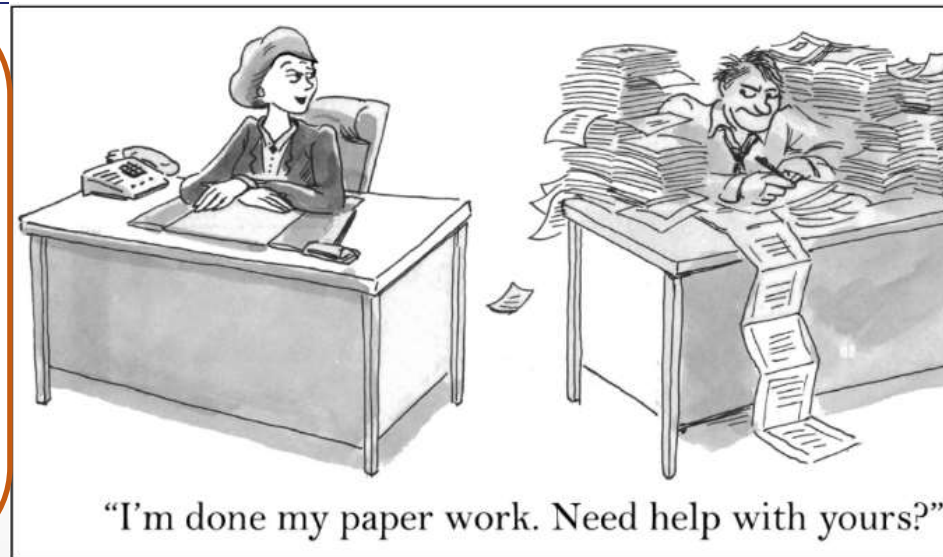
➢ Possibility of continuous monitoring of animal welfare
➢ Comparison with similar farms

➢ Accurate, precise and objective measure of animal welfare
➢ Improvement of dialogue with farmers

AWIN APPS

FUTURE DEVELOPMENTS FOR WELFARE ASSESSMENT

- Development and validation of new feasible indicators of positive welfare

- Refinement of existing apps and development of new apps for animal species and categories in different management situations

- Reduction of time for welfare assessment (e.g. 2-level assessment protocols, use of PLF)

- Implementation of data bases for comparisons (reference populations)

- Implementation and development of teaching and training (e.g. adoption of e-learning techniques)