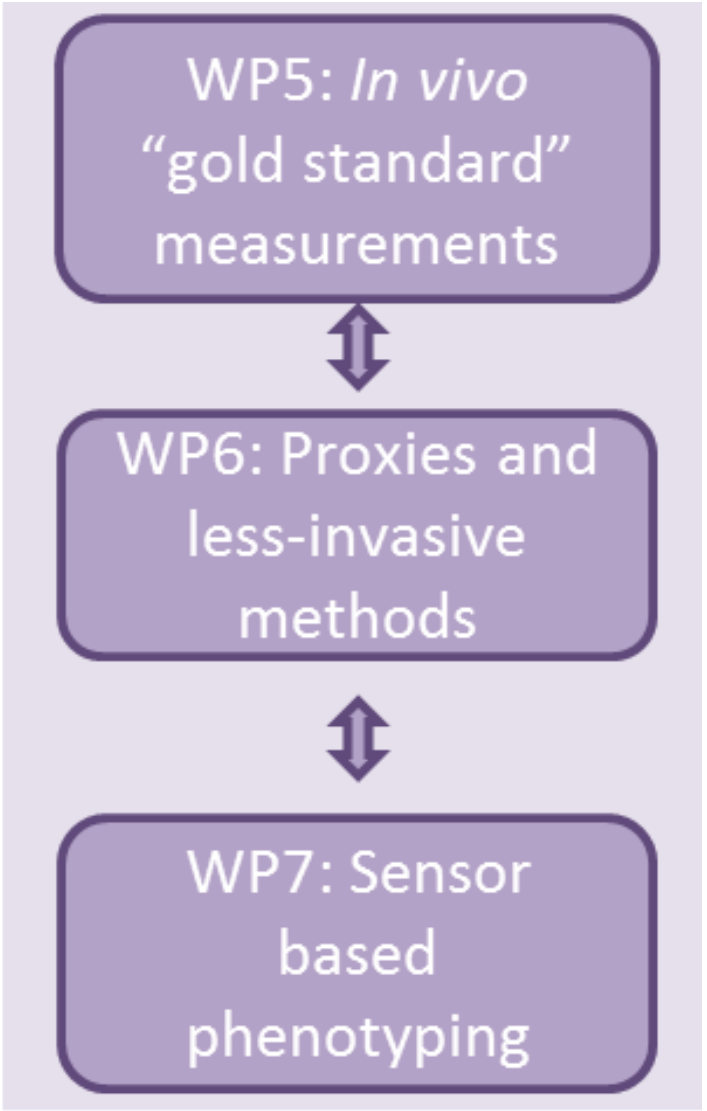
Focus on the Joint Research Activities

- Improving measurement methods and ethics, developing new methods, enhancing phenotyping capacity
- Reducing experimental constraints on animals



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Clermont - Ferrand, France 2-6 September 2018

WP5
Evaluation and standardization of nutrient use efficiency and emission measurement techniques

Leader WP5. Chris Reynolds (UREAD)
Task 5.1. Chris Reynolds (UREAD)
Task 5.2. Jan Dijkstra (WU)
Involved partners INRA, SRUC, WU, UREAD, FBN, AU

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WP5 Objectives

- To address sources of variation in key in vivo measurements of dietary nutrient use efficiency and associated emissions of methane and nitrogen by cattle (dairy and beef)
- To improve the accuracy and precision of measurements
- To unify the methods used across SmartCow RIs

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Task 5.1 Optimising measurements of **diet digestion and N balance** using *total collection of faeces and urine*

1/ **Historical databases (WP3) of digestion trials** and N balance analyzed for sources of variation due to:

- Location (experimental error) and animal

2/ **New methods** of collection developed as needed

- Non-invasive, automated collection of urine and faeces

3/ **Test** of optimum sampling period and procedures

- Collections over 10 days

Outputs:

- **Optimised protocols for measuring digestion and N balance that minimise variation and measurement error, irrespective of animals (gender, physiological state) and diet types**

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Task 5.2 Reducing uncertainty in **methane (CH4) emission** measurements using *Respiration Chambers*

1/ **Historical databases** (WP3) of CH4 emissions analyzed for sources of variation due to :

- Location (experimental error) and animal

2/ **Ring test** of CH4 recovery for chambers

- Methane recovery as described by Gardiner et al. 2015
- Identify sources of variation and options for improving recovery

Outputs

- **Optimised protocols for measuring CH4 emissions that minimise variation and measurement error**

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Clermont - Ferrand, France 2-6 September 2018

WP6
Evaluating proxies to quantify feed efficiency and its determinants in cattle

Leader WP6. Cécile Martin (INRA)
Task 6.1. Gonzalo Cantalapiedra (INRA)
Task 6.2. Frédéric Dehareng (CRA-W)
Involved partners SRUC, UREAD, AU, CRA-W, INRA

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Clermont - Ferrand, France 2-6 September 2018

WP6 Objectives

- To evaluate **proxies*** of feed efficiency and its determinants in cattle (dairy and beef)
- To identify their **range of applicability** across **diets** and **individuals**

* define as indicators measurable frequently in body matrices easy to acess; less invasive and costly, easier to implement

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WP6 Approach and Methodology

1/ Descriptive analysis of **existing [database & samples bank]** from SmartCow partners

- Identification of proxies for which new samples analysis are needed

2/ Collection of **new and relevant [data & samples]** of body matrices from animal experiments **(WP5, SmartCow RIs)**

- to complete the database (animals, diets)

3/ Assessement of potential and limits of each prediction model

- Validation of proxies with a high potential of prediction
- Exploration of new proxies (single or in combination)

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Task 6.1 Evaluation of proxies to predict **digestibility, N partitioning and animal feed efficiency**

Parameter	Proxies	Matrices	Status
• Total tract digestibility	• NIR	• Faeces	• Solid • New
• N partitioning	• Urea-N concentrtaion • 15N natural abundance	• Milk, blood, urine, faeces	
• Animal feed efficiency	• 15N natural abundance • Urea-N • Metabolites	• Blood	

Open to collaboration

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Clermont - Ferrand, France 2-6 September 2018

Task 6.2 Evaluation of proxies to investigate **rumen fermentation parameters : CH4 emission and VFA, ammonia, pH**

Parameter	Proxies	Matrices	Status
• CH_4 emission	• MIR • NIR	• Milk • Faeces	• Solid • New
• VFA, ammonia, pH	• MIR • Volatile metabolome	• Milk • Breath gas	

Open to collaboration

Outputs Tasks 6.1 and 6.2

- **Improvement of existing prediction models (solid)**
- **Development of new equations (single or combination)**
- **Standard Guidelines for using most promising proxies**

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Clermont - Ferrand, France 2-6 September 2018

WP7

Using sensor data for a multivariate approach to phenotype behavioural traits, health and feed efficiency

Leader WP7. Lene Munksgaard (AU)
Task 7.1 Lene Munksgaard (AU)
Task 7.2 Kees Van Reenen (WUR-DLO)
Involved partners AU, INRA, IRTA, WUR-DLO

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WP7 Objectives

- To develop and test uniform protocols for validating the quality of data from smart technologies
- To develop new ways of predicting animals' characteristics based on their behaviour
- To implement methods for the analysis of combined data-sets in order to phenotype cows

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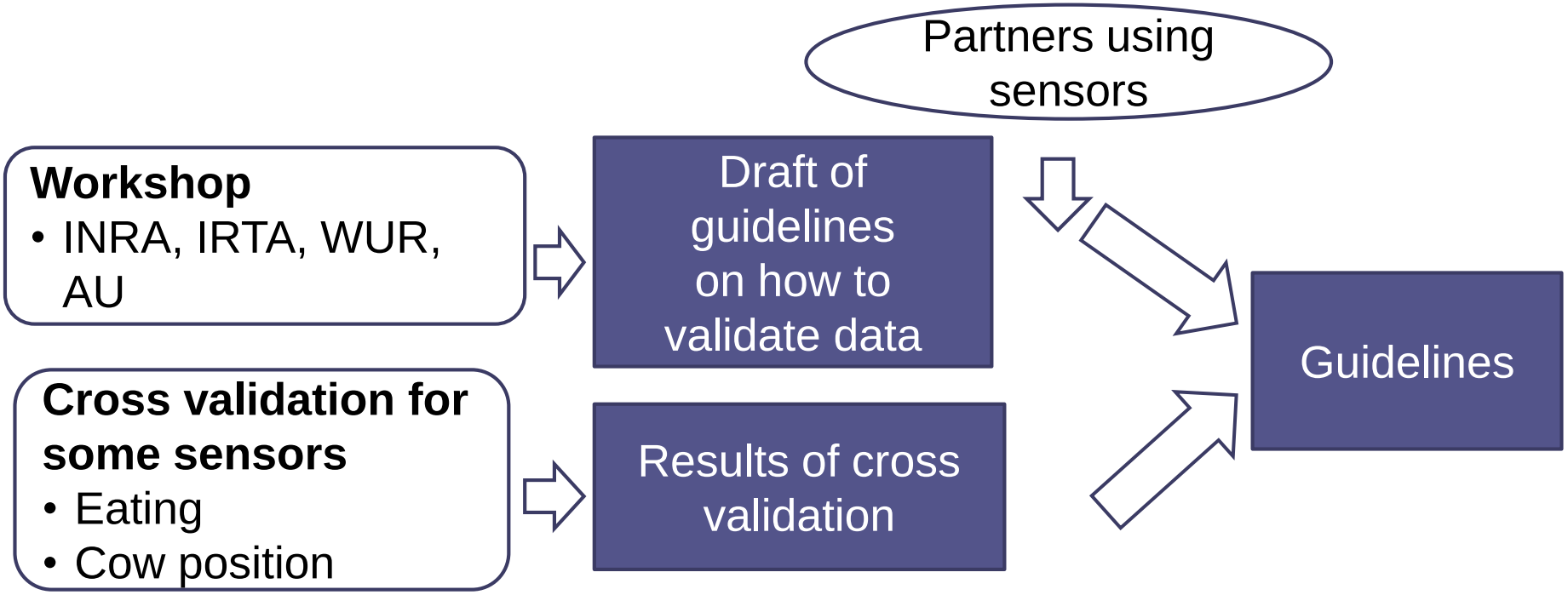
Task 7.1 Development and test of **uniform guidelines for validation of sensors output on animal behaviour**



Outputs

- **Uniform methods and guidelines for validating sensors**

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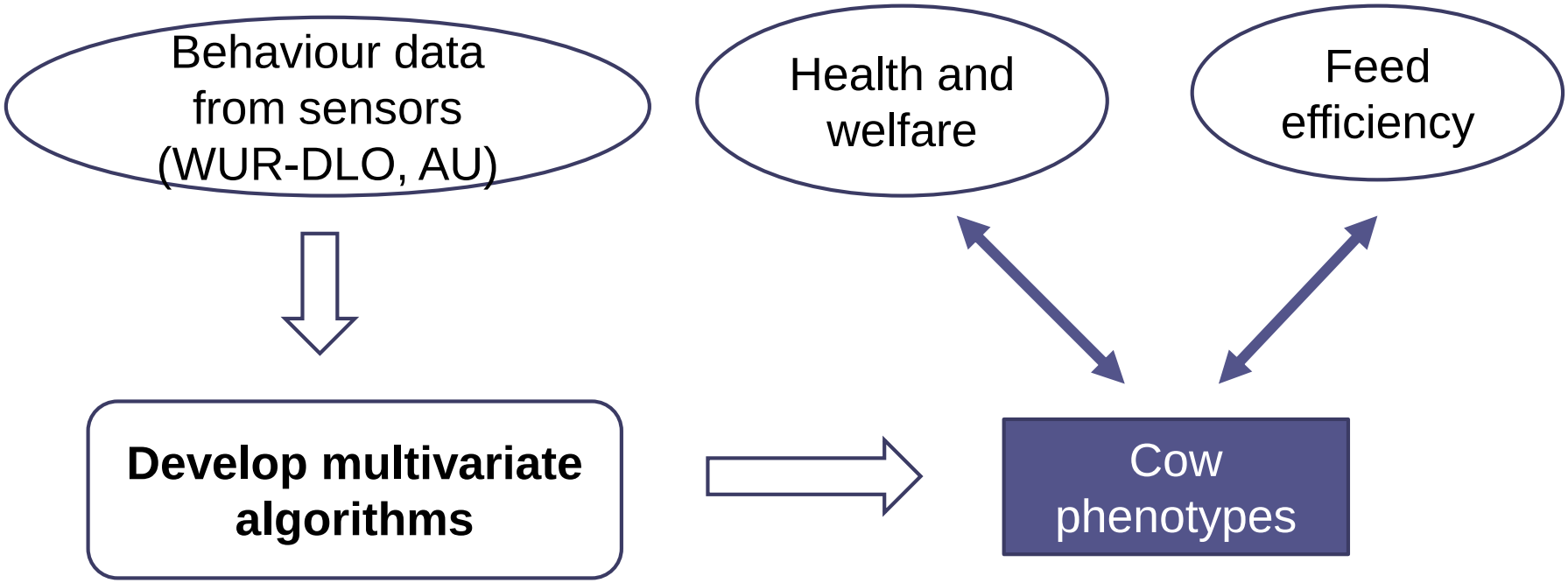
Task 7.2 Development **of novel algorithms** for prediction of complex cow characteristics



Outputs

- **Algorithms for phentopyting cows based on automatic recording of behaviour and the relationship to health, welfare and efficiency**

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Thank you for your attention













Further information on: *www.smartcow.eu*

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Clermont - Ferrand, France 2-6 September 2018