



# WP4

## Innovative feeding technologies to improve feed efficiency and reduce the environmental impact

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# What's wrong in **these** situations?



Air pollution

Fuel wastage



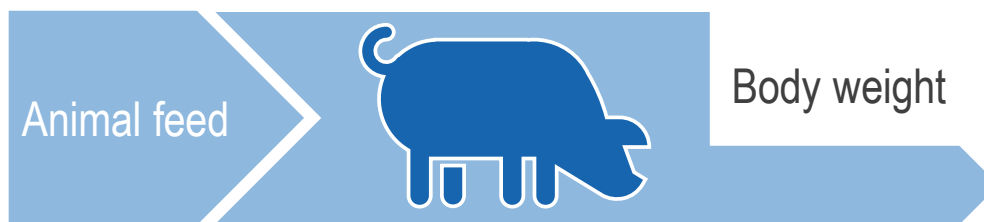
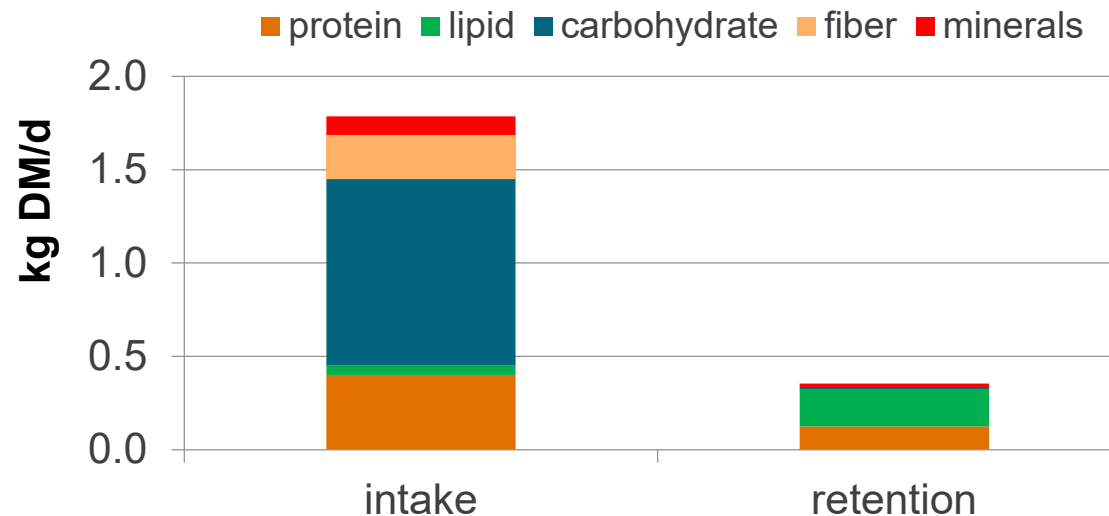
Fuel low efficiency

**Diagnostic result**



## Improvement of efficiency is a challenge for today's animal production

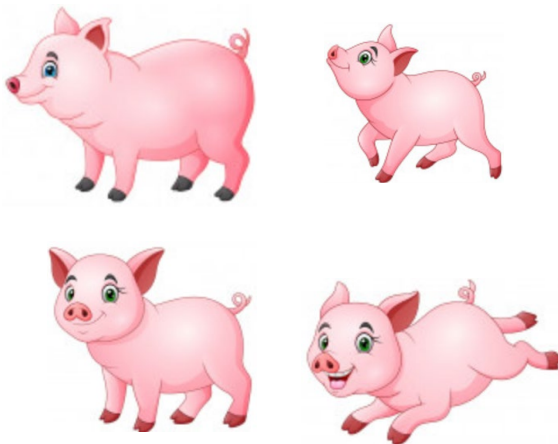
Pig	Intake	Retention
Energy	4050 MJ	34%
Nitrogen	7.4 kg	28%
Phosphorus	1.6 kg	27%



*“Increasing animal feed efficiency is required, while decreasing the environmental footprint”*



## What is the key issue to improve feed efficiency and reduce the environmental impact?



to consider that ...  
**each animal is unique**



01

There is a large variation in nutritional requirements among individuals



02

The requirements also change very rapidly over time

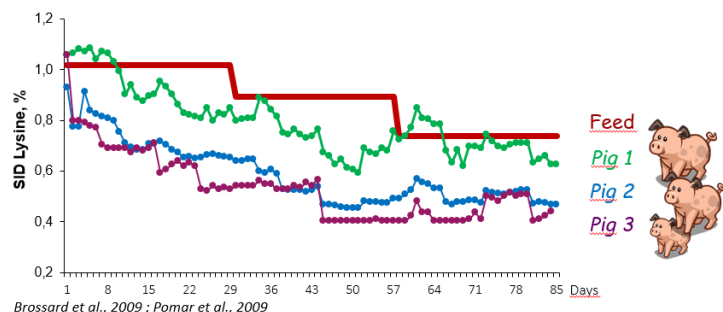


## The challenge...

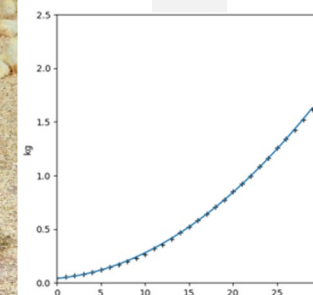
To adjust dynamically the diet to the animal nutritional requirements -> Precision feeding

In conventional production systems, monogastric animals are mostly fed as a group, even though there is a large variation in nutritional requirements among individuals and over the time.

### Individual requirements



### group requirements



This impairs the efficiency of nutrient utilization.



## WP4 Main objective -> to address this challenge

What do we need to implement Precision Feeding on farm ?



Measure and determine the requirements of each animal or group in real time (daily)

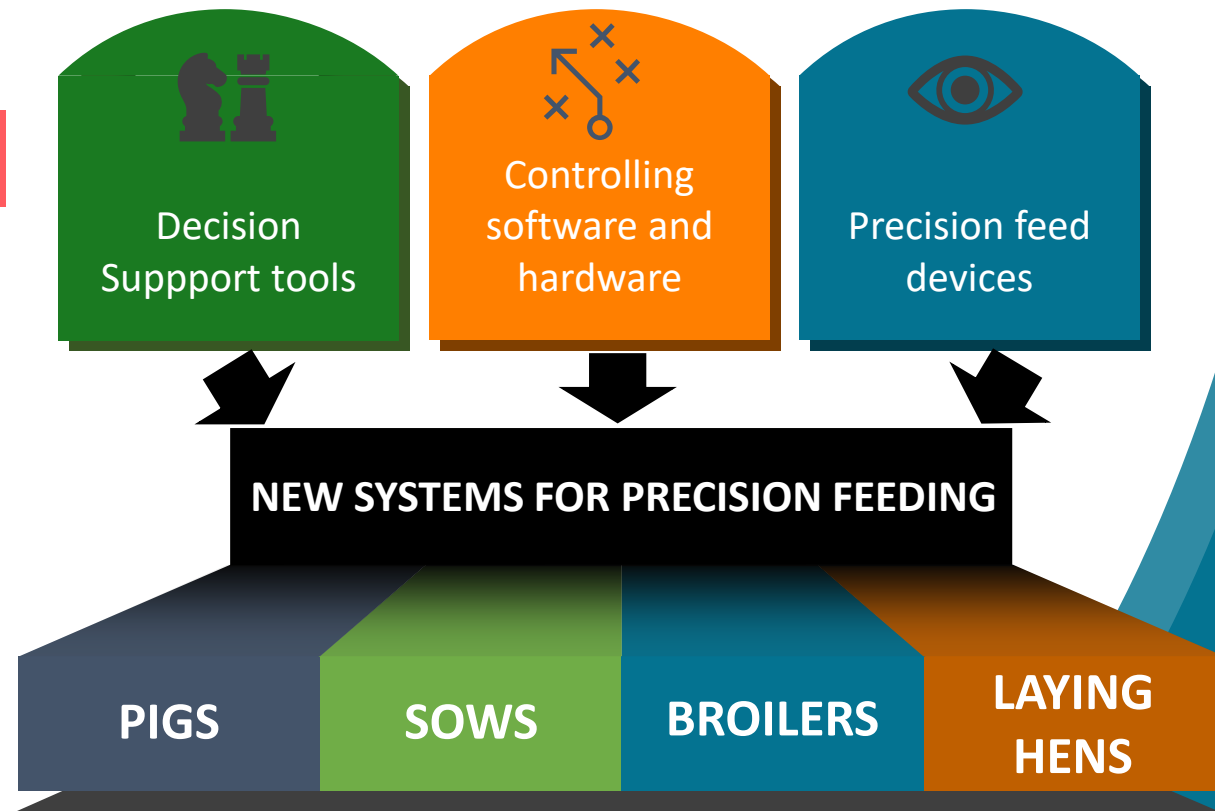
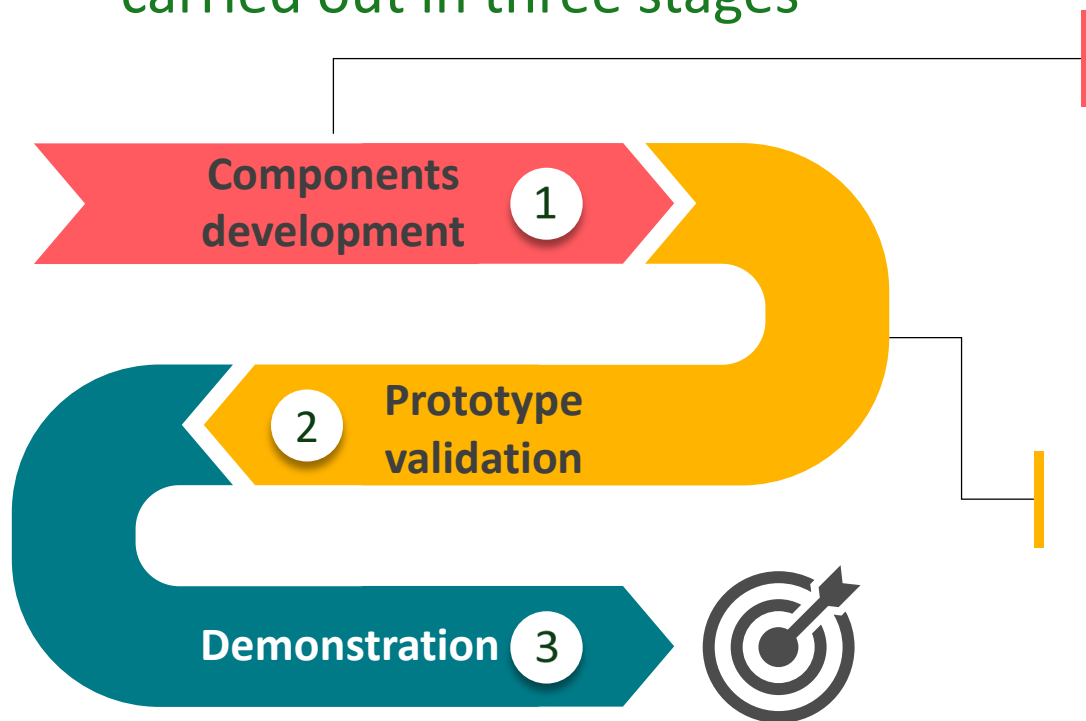


Develop an automatic feeding system capable to provide to each animal or group a feed adjusted to their requirements



## WP4 Development approach to build new management system for precision feeding

The development and implementation work has been carried out in three stages

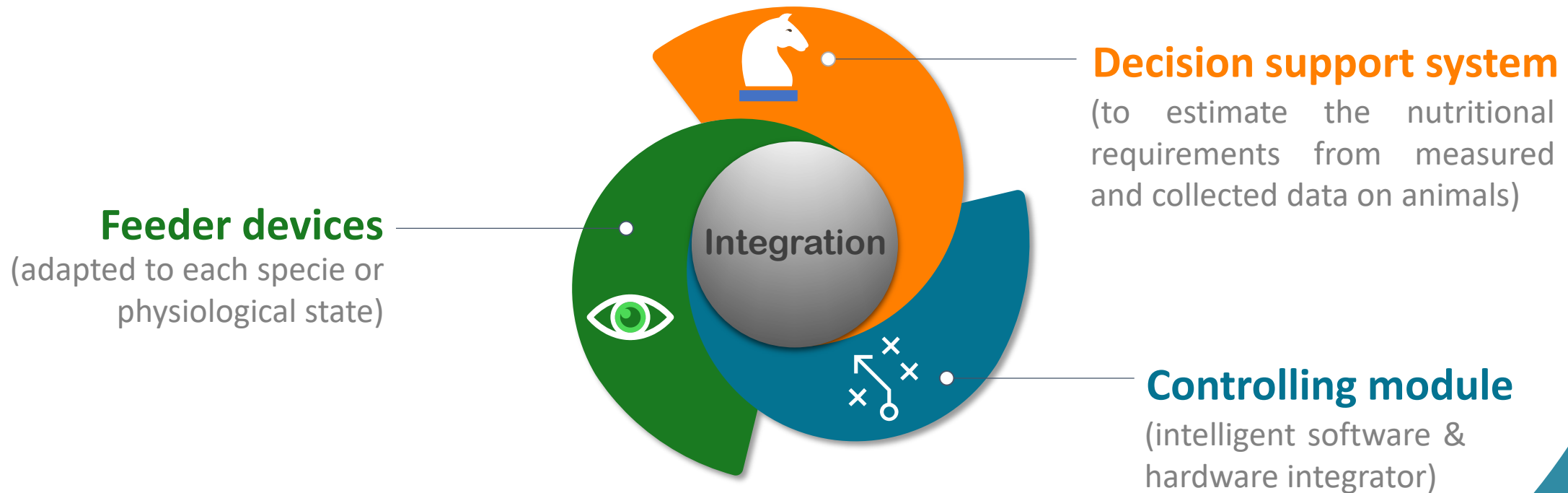






## WP4 Main results achieved (I)

- ▶ A common architecture has been proposed and designed to build precision feeding systems for growing pigs, sows and poultry, based in the development of 3 main components:

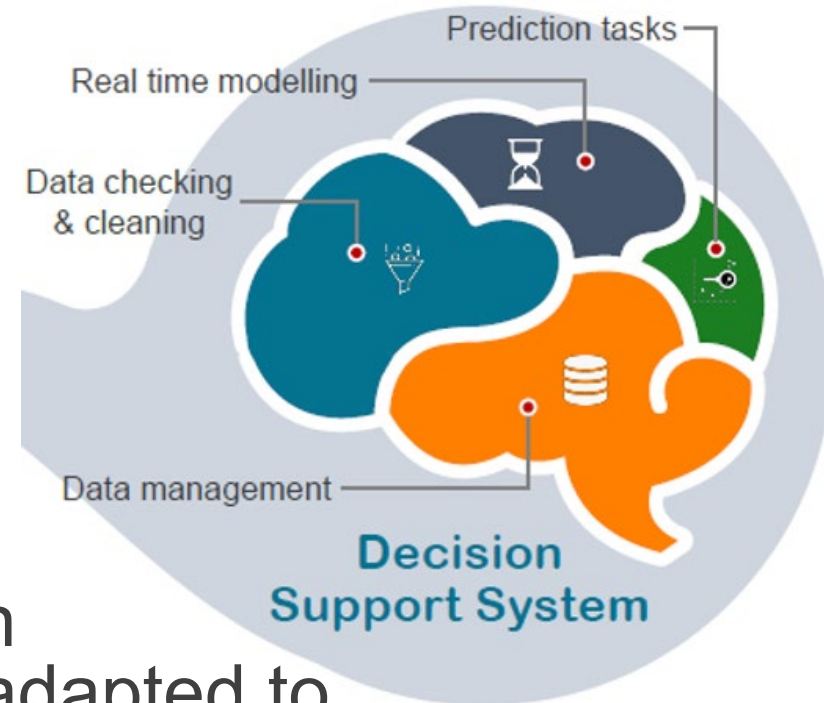






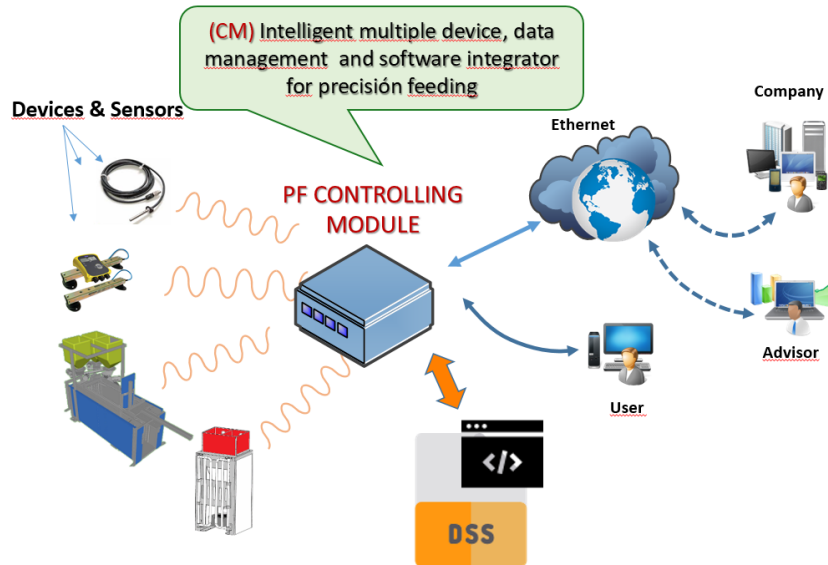
## WP4 Main results achieved (II)

- ▶ A set of RT decision support tool (DSS) has been developed for precision feeding application and adapted to  
 . pigs, sows, broilers & laying hens
- ▶ The DSS modules are capable to analyse and predict performance and to estimate in real time, the nutritional requirements of animals (individually or group), fed ad libitum or restricted (pigs)
- ▶ These modules have been designed to be integrated in the precision feeding system (PFS) under a common architecture



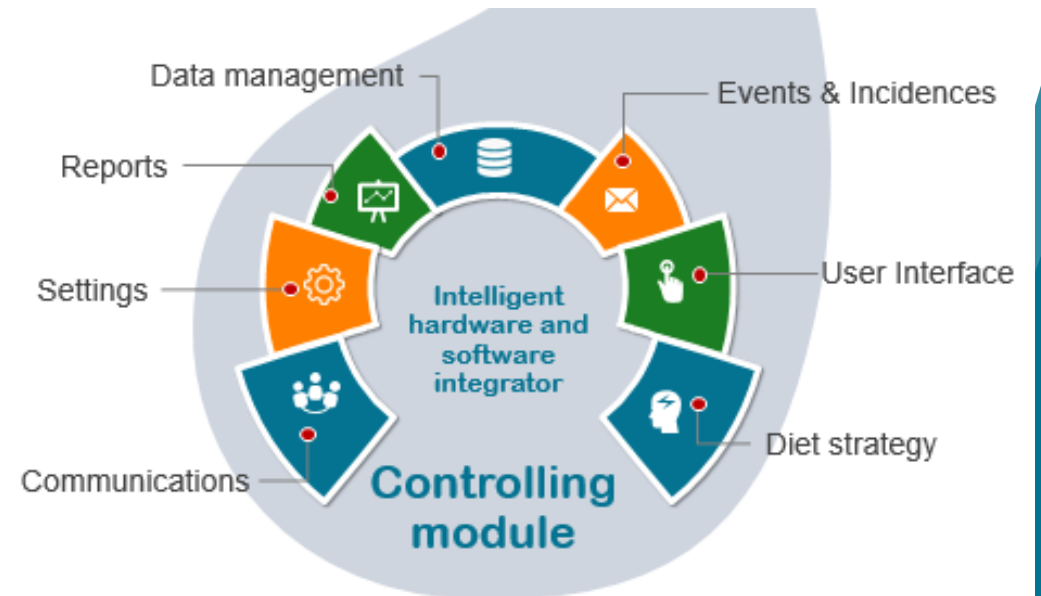


## WP4 Main results achieved (III)



- Precision feeding systems (PFS) become complex systems involving multiple hardware and software heterogeneous components that must be integrated to work together.

- To overcome this challenge, a specialized module named **controlling module** has been developed and validated: integrates multiple hardware & software components in an efficient way
- It is a essential component to build operative PFS





### ► Growing pigs

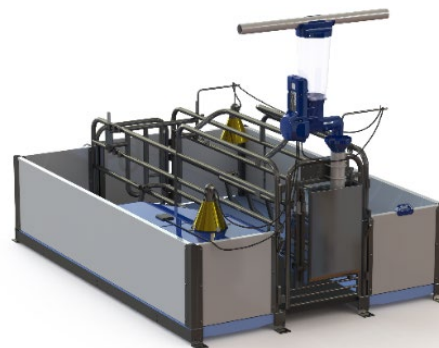
► *Restricted feeding*

► *Ad-libitum feeding*

### ► Sows

► *Gestating*

► *Lactating*

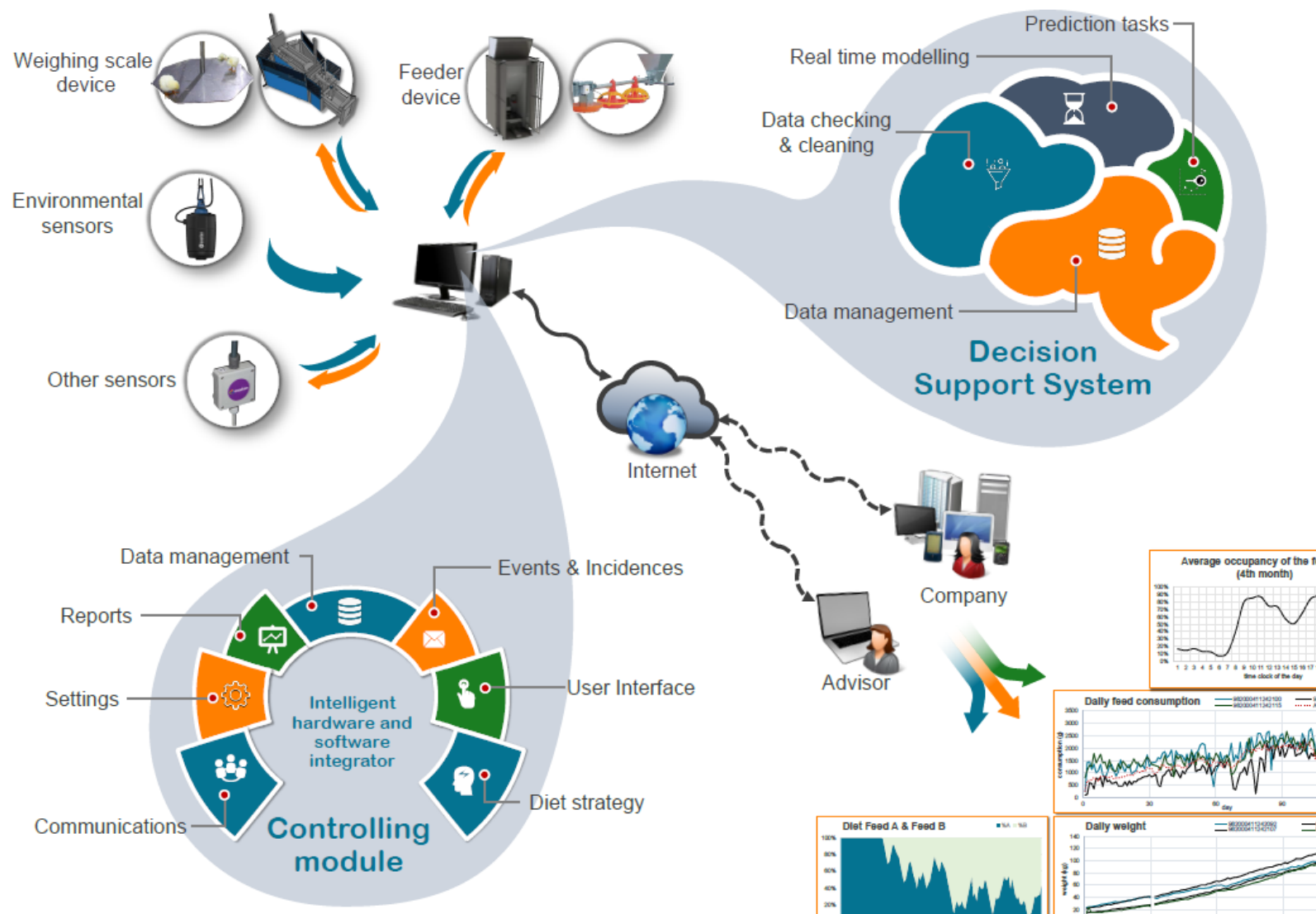


Precision feeder devices

All the  
prototypes  
developed or  
adapted are  
now available



### PFS component integration to be ready to work on farm

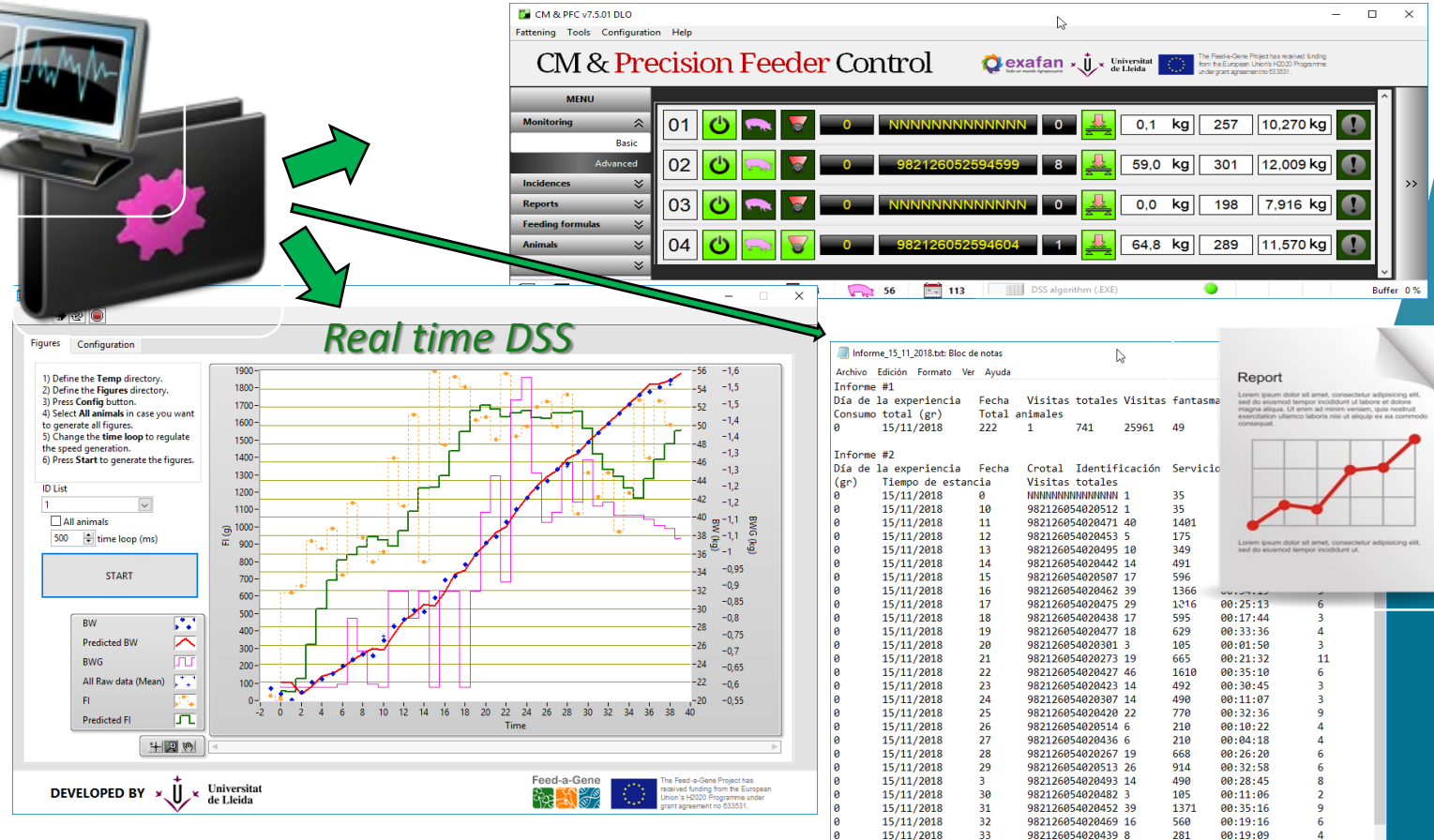
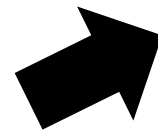






## WP4 Main results achieved (VI)

- Two pre-industrial PFS prototypes for growing pigs (in ad libitum or restricted feeding) has been build for demonstration purposes
- This two pre-industrial PFS prototypes are available & running

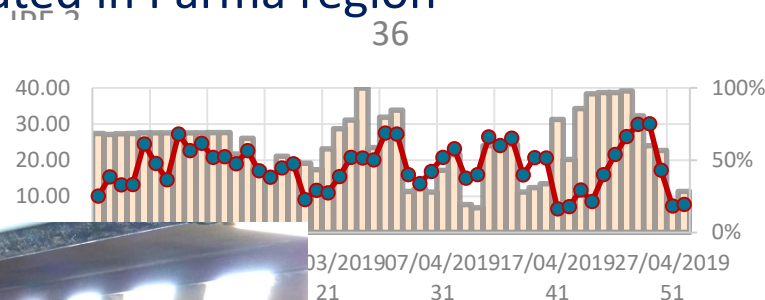




## WP4 Precision Feeding Demonstration activities

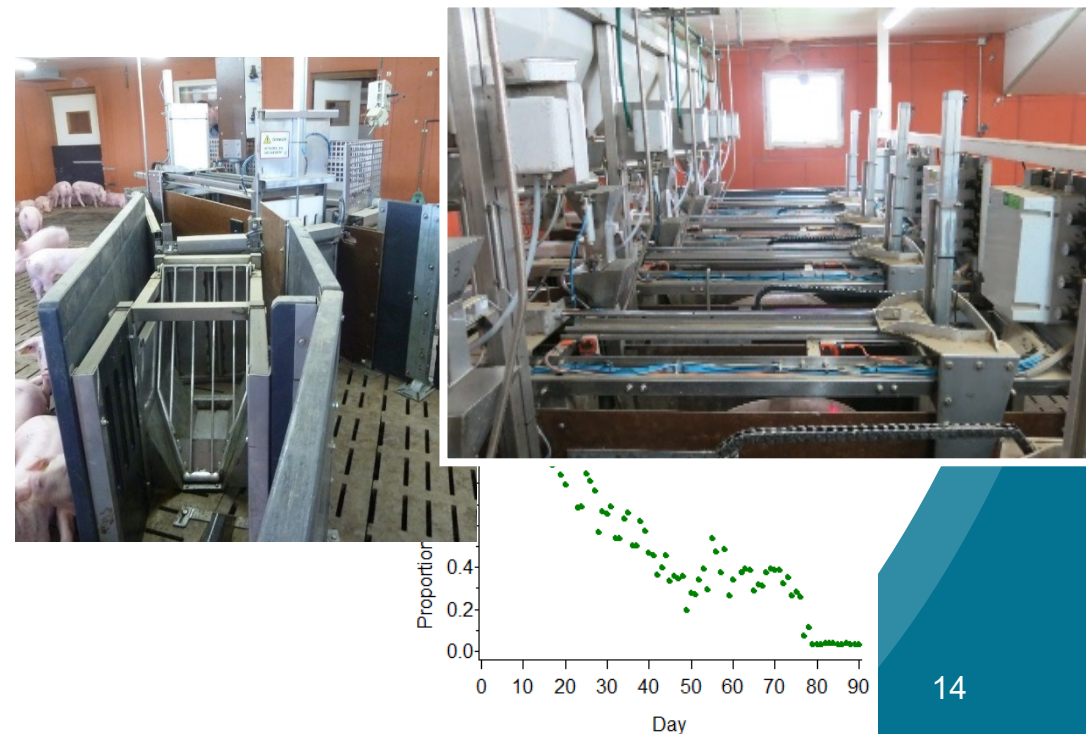
### *Growing pigs fed ad libitum*

A PFS including 4 precision feeders has been installed and run in a commercial pig farm belonging to Gran Suino Italiano pig producers association located in Parma region



### *Growing pigs in restricted feeding conditions*

A PFS including 5 precision feeders is running at IFIP research station at Romillé (France) and demonstration experiments has been performed for validation and diffusion





New precision feeding technology can offer simultaneous benefits to the animal, the farmer and the society

### ► To the animal

- Fitted animal nutritional needs considering variation in time and among animals
- Welfare improvement by early identification of some health problems

### ► To the farmer

- Increase in feed efficiency and minimise feed cost
- Real-time monitoring of performance traits (e.g. feed and nutrient intake, and weight gain) for animals housed individually or in groups.
- Thanks to PFS, feed management is simplified

### ► To the society

- Decrease in environment impact by reducing nutrient excretion
- Targeting the animal as an individual
- Design aspects that accompany these systems may improve welfare and quality of animal products