Best Practice Guide

Automated animal welfare monitoring at the slaughterhouse and giving feedback on broiler/pig lifetime welfare



This Best Practice Guide was developed as part of the aWISH project.

www.awish-project.eu

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1 Objectives and structure

What are the objectives of this Best Practice Guide?

Automated animal welfare monitoring at the slaughterhouse offers the ability to identify existing problems on farms, during transport and at slaughter and to provide the respective stakeholders with useful feedback on how to optimise animal husbandry, handling and management. Those technologies have the potential to become increasingly powerful in the future, not least with the use of artificial intelligence. This **Best Practice Guide (BPG)** offers recommendations for the development, installation and application of new technologies that can monitor the welfare and health of pigs and broilers throughout their lives on farms, during transport, and at slaughter. Retrospective examination of the animals at the slaughterhouse plays a significant role in assessing animal welfare throughout the production chain. Therefore, this BPG focuses primarily on technologies that can be applied at the slaughterhouse and provides recommendations for their installation and application. The field of technology and artificial intelligence will continue to evolve rapidly in the future, and technical developments will open up possibilities not yet known today. This BPG is based on experiences gained during the aWISH project, which was carried out between 2022 and 2026, and explicitly incorporates the technologies used in that project. In addition to automated welfare monitoring, providing different stakeholders along the production chain with feedback on the welfare status of animals is also of crucial importance. Only through effective and constructive feedback can animal caretakers identify areas of concern and take targeted measures to improve their animals' welfare. For this reason, this guide also addresses Best Practices for providing feedback to farmers, animal transporters and slaughterhouse staff. This BPG is intended to provide general advice that can be applied to various, yet unspecified technologies as well as to the specific technologies studied in the aWISH project.

Who is this Best Practice Guide intended for?

This Best Practice Guide is intended for technology providers and developers, slaughterhouse managers and staff, scientific experts, policymakers, and anyone involved in animal welfare issues in pigs and broilers.

How is this Best Practice Guide structured?

The BPG first addresses three main aspects of welfare monitoring technologies at the slaughterhouse: development, installation and application. For each aspect, the factual background including requirements and challenges is described prior to explaining specific Best Practices. Best Practices for application of technologies also include the assurance of data security and traceability as well as the maintenance of technology at the slaughterhouse. Best Practices are described both in general terms and specifically by animal species (pigs and broilers), wherever necessary. A separate chapter is devoted to the technologies used and studied in the aWISH project, describing their functions, specific requirements, and recommendations for use. In addition, Best Practices for designing a system to provide feedback on pig and broiler lifetime welfare are presented. The aim of such a feedback tool will be to inform farmers (and other stakeholders along the production chain, such as transporters and slaughterhouse managers and staff) about the results of automated welfare monitoring at the slaughterhouse, highlighting areas of weakness, positive aspects, and potential for improvement within their respective areas of responsibility.



The suggested Best Practices are derived from expert opinions and experiences with automatic monitoring technologies at slaughterhouses gathered by surveys and workshops with the technology providers, software developers and slaughterhouse managers of the aWISH project.

2 Development of technologies for animal welfare monitoring

Factual background

Current methods for automatic monitoring of animal welfare are based on imaging and computer vision systems, on biological sample analysis, or physiological and other sensors (Ferreira et al., 2025). The development of animal welfare monitoring systems at slaughterhouses or on farms requires extensive expertise in the fields of technology and animal welfare science. The challenge lies in combining these fields in such a way that the outcome meets the highest standards in terms of technical accuracy and scientific assessment of the welfare status of farm animals. If one intends to measure the status of animal welfare, a scientific evaluation of the methods used for this purpose is of paramount importance. However, there is still a large gap between people trained in scientific welfare assessment and experts in today's digital monitoring technology. It is important to bridge those two worlds together to implement feasible solutions for improving animal welfare and health on farms, on transport and at the slaughterhouse. Interdisciplinary research projects, such as the aWISH project, can help bridge the gap between the knowledge of animal welfare scientists and bioengineers or technologists, and train them all in the implementation and practical use on farms, at slaughterhouses and for their science. This forms the basis for the development of technologies with good functionality that can be implemented in practice. The development process can present several challenges, as demonstrated by the aWISH project, which are intended to be addressed through the Best Practices that have been identified. The challenges that may arise are explained in Table 1. Subsequently, Best Practices for the development process are explained.

Table 1: Challenges during the process of development of technologies for automatic welfare monitoring at slaughterhouses.

Stage	Challenges
Analysis of image and sensor data by scientific experts, such as animal scientists, vets or biologists (Labelling during development and evaluation process)	Recruitment and availability of scientists, initiation and implementation of research projects
	Setting gold standards or threshold values for the measurement of certain animal welfare indicators
	Availability of animals (too few animals) at the slaughterhouses for analysing the respective indicators (e.g. two few animals with poor stunning effect, which is good from a welfare perspective, but makes it difficult to develop an automated monitoring system to assess the effectiveness of stunning due to a lack of data on poorly stunned animals). This can make it difficult to develop a technology quickly and effectively.

Selection and installation of technical components	Finding or construction of suitable camera/sensor technology that can withstand the slaughterhouse conditions and meets the requirements for precise data analysis
	Finding suitable locations for the servers or data processing devices (e.g. computers) at the slaughterhouse, for instance separate clean rooms
	Power supply within the slaughterhouse can be insufficient (outlets, cables)
	Internet connection in the slaughterhouse can be insufficient
	Cleaning of the cameras is necessary in regular intervals. Image processing on dirty images results in problems in rating. Slaughterhouses often depend on service supplier for cleaning, and they are not especially aware of the material installed and the limitation to avoid soaking the equipment.
Data transfer	Data transfer within the slaughterhouse or to the outside can be challenging. For example, due to poor internet connection or even no internet connection available.
	Defining ownership of the data (slaughterhouse, technology provider, stakeholders such as farmers or transporters)

Best Practices

- It is necessary to ensure that the **camera and sensor technology best suited to the specific issue** is selected. For this purpose, **collaboration with specialised companies/providers** for sensor/camera technologies is strongly recommended. There are often already suitable sensors and cameras available on the market that can be combined with the new monitoring technology being developed. Collaborating with research institutes that work with sensor technologies can also be helpful.
- It should be checked whether **similar algorithms/technologies for the analysis of sensor/camera data already exist** that could be further developed for the new product. This saves time and money. In this case, it is also advisable to reach out to academic institutions or specialised companies.
- It is strongly recommended to **collaborate with scientific experts** (biologists, animal scientists, vets) during the development phase. This can be helpful for data collection and

assessment, e. g. image analysis, setting of threshold values. The goal is to establish the gold standard that the technology must meet. This should be done on a scientific basis.

- The **validation of the technology performance** requires **standardised interventions** with a clearly different animal welfare outcome. In this regard, a **collaboration with scientific partners** who are experts in the fields of biology, animal science and veterinary medicine is highly recommended as well. Joint research projects are a great way to collaborate with scientists from various disciplines.
- It is important to **collect sufficient starting material** for training artificial intelligence or developing algorithms. **Cooperation with a slaughterhouse** would be beneficial for this purpose.
- **Information about the conditions of slaughterhouse(s)** should be obtained early in the development process (building structure, power supply, internet).
- It should be ensured that the **technology is suitable for installation at different slaughterhouses** (no standalone solutions). It can be helpful to involve end-users in the development process.
- The space required for the equipment, the number of cables, the amount of data to be transmitted, and energy consumption should be **kept to a minimum**.
- **User-friendliness** should be a priority right from the development stage (simple operation, easy cleaning and maintenance). With a brief training session, all personnel involved (slaughterhouse staff, vets, etc.) should be able to apply the technique.
- If a slaughterhouse company is involved in the development process, it is important to ensure **direct communication between slaughterhouse employees and tech providers**; direct communication without intermediaries can be very helpful to avoid misunderstandings. There should be a **designated contact person** who is also available to answer questions by fast official channels.
- Concerning data collection, it is advisable to **use open file formats** so that data transfer and data reuse by stakeholders can be done easily.
- It should be possible to i**ntegrate the databases of the monitoring technologies into the slaughterhouses' IT systems**. Compatible formats should be used.
- The **amount of data** that needs to be transferred and stored should be **kept to a minimum**.
- **Ethical considerations**, including the responsible use of artificial intelligence and data security, should serve as guidelines for the implementation of automatic monitoring technologies in slaughterhouses.
- The **economic viability** of automated monitoring systems must be carefully assessed to determine whether their implementation is feasible for daily and routine use in commercial environments.



- During the development process, it should be considered whether to **apply for intellectual property rights**.

3 Installation of technologies for animal welfare monitoring

Factual background

Following the initial development stages, the technology must be installed at the slaughterhouse in order to collect initial data from animals, which will be analysed and used as the basis for the first evaluation and further development of the technology. The following recommendations also apply to all existing technologies that are to be installed in new slaughterhouses. The requirements for installation vary depending on the technology. In the following, some general requirements are described that should apply to most technologies. Specific technologies may be subject to additional requirements. Important requirements for the installation are often the availability of enough space for installing the monitoring devices, a clean, independent room for the computer used for data collection, sufficient ceiling height for fixing cameras and sensors or a location close to a power point for energy supply (e.g. 230 VAC) and near a router for internet connection (reliable high-speed internet is often required). A proper fixture of the devices must be ensured (e.g. a plank to secure the camera on, a frame for mounting, a working table or panes). Arrangements should be made to protect the (partly) very sensitive equipment from moisture and dirt (e.g., a plastic cover to protect the camera during high-pressure cleaning). Whenever possible, equipment that is well-suited for cold and humid conditions should be selected from the initial stage. In addition, some technologies require a supply of air and water for proper function and maintenance or additional equipment like computers, hard drives or smart phones for data collection and software installation. Good accessibility of the slaughterhouse areas where the technology is installed is required for installation, but also for maintenance of the technologies. The positioning of sensors and other technical components in the slaughterhouse can vary considerably depending on the technology used and must therefore be selected on a case-by-case basis for each technology and the welfare indicators to be measured, as the following examples illustrate.

Positions of technology implementation:

- Tail lesions: before flaming
- Body weight detection: above animals in pen
- Lung/liver lesions: while hanging
- Footpad lesions and hock burns: after plucker
- Vocalisations: lairage area (potentially also during unloading, moving and stunning animals)
- Stress parameters: near bleeding
- Temperature and other climate parameters: in transporters, above animals in pens (preferably at animal height)

The installation process of automated monitoring systems can present several challenges, as demonstrated by the aWISH project, which are intended to be addressed through the Best Practices that have been identified. The challenges that may arise are explained in Table 2. Subsequently, Best Practices for the installation process are explained.

Table 2: Challenges during the installation process of technologies for automatic welfare monitoring at slaughterhouses.

Stage	Challenges
Installation of technical components	Finding the best camera/sensor position in the slaughterhouse
	Ensuring a reliable energy supply and a stable internet connection
	Finding a time window in which the installation is possible (no animals there, but staff available)
	Finding a contact person at the slaughterhouse who could support the installation or answer questions
Operation of the technology and data collection	Getting the animal in the right position to get a usable image or sensor data
	Carrying out control runs of the technology, with adjustments still to be made
	Communication with the slaughterhouse staff can be a challenge due to a foreign language or simply because the contact person is not available.

Best Practices

- **The slaughterhouse should be contacted well in advance** of the installation to find a responsible person who can support the installation process.
- It is recommended to **take the time to familiarise with the conditions at the slaughterhouse** in advance to find the best locations for the technical components.
- It should be ensured that the **installation site provides everything necessary** (power supply, internet connection, etc.).
- All **important details**, such as the placement of cameras and sensors and installation requirements, should be **coordinated in advance** with the person in charge at the slaughterhouse, so that a concept is established on the day of installation and the work to be performed is clearly defined.
- The **best camera or sensor position** can be found through **preliminary tests** during ongoing slaughter operations.
- It is recommended that the **technology provider should be present during the installation** or perform it personally to avoid misunderstandings in the positioning of devices.



- **Clear instructions** must be provided on how the object to be inspected (e.g. carcass) must be positioned in order to be detected by the camera(s) or sensors.
- A **test run** of the technology should be conducted.
- A **good internet connection** is essential for many technologies. Cellular network can be considered; however, a cellular network is not always possible, since slaughterhouses are often located in remote areas in the countryside. In this case, it is preferable to use the slaughterhouse's secure local network. It is very important to use **secure (encrypted) server connections**.
- Care should be taken to ensure that the **technology does not record things that are not strictly necessary** (like audio files for image analysis or persons in the slaughterhouse on video recordings or images).
- **Training** on how to use the technology, including troubleshooting minor issues and performing maintenance tasks, should be provided for slaughterhouse staff, preferably in different languages.
- A **written manual** should be provided that includes not only a detailed description but also a quick guide, as well as potential issues and solutions.
- For camera systems: **slaughterhouse staff must be informed about recording** and what is done with the images and videos (data security).

4 Application of technologies for animal welfare monitoring

Factual background

Applying the technology in routine slaughterhouse operations is ultimately the goal for which the technology was designed. Here, the system's practicality, functionality, and user-friendliness become apparent. Weaknesses in the technology and areas for improvement may become evident during daily operation. This should be prevented through a thorough development process on a scientific basis that also tests the technology's suitability under practical conditions. For daily use, it is important that all components of the system are closely coordinated and adapted to the slaughterhouse environment, which is often cold or hot and humid. This ensures that the equipment remains operational for a long time and does not require repairs or replacement after only a short period. Nevertheless, certain technical components must be replaced or calibrated at regular intervals to ensure accurate operation. This must be clearly specified by the manufacturer. In addition, to ensure proper operation of the technology, it is important that all personnel working with it have received thorough training on how the technology works and are familiar with its use. Slaughterhouse employees should understand the benefits of the technology for animal welfare and accept the newly installed technology. After all, if employees understand the effects and purpose of the technology, they may also be more motivated to work with it. In scientific studies, it was shown that a good knowledge about animal welfare obtained by training contributed to the willingness of farmers to acquire more information on this topic. Improved education led also to increased job satisfaction of farmers and had a positive effect on their perception of animal welfare (Croyle et al., 2019; Balzani and Hanlon, 2020). During the implementation, it is very important to assist slaughterhouse employees with any questions they may have and to provide technical support. To this end, the technology provider should establish structures that allow questions to be answered quickly and easily. The technology providers should be easily reachable so that slaughterhouse employees can contact them; preferably by phone or online. Remote troubleshooting systems can be very helpful; however, if necessary, the technology provider is also required to conduct an on-site inspection. Furthermore, data protection must be ensured when using the technology. Data may only be transmitted via secure connections, and stored data must be accessible only to authorised personnel. Since this involves sensitive data from farms and slaughterhouses, ownership of the data must be clearly specified. The application of automated monitoring technologies can present several challenges, as demonstrated by the aWISH project, which are intended to be addressed through the Best Practices that have been identified. The challenges that may arise are explained in Table 3. Subsequently, Best Practices for the installation process are explained.

Table 3: Challenges during the application of technologies for automatic welfare monitoring at slaughterhouses.

Stage	Challenges
Environmental conditions at slaughterhouses	The technology sometimes fails due to external conditions (poor power supply, internet problems, etc.).
	The operation of the cameras or sensors is impaired by dirt, moisture or other external influences.
	The sensors and cameras must be very well protected in order to withstand cleaning procedures.
Operation of the technology	Training the staff on how to use the technology (e.g. technical operation) and in the care of the technology (e.g. cleaning, maintenance) may be difficult.
	Operating errors by staff can occur and technical support from outside has to be provided.
	Technical support from outside is difficult to provide, e.g. due to the time of slaughter or other (technical) reasons.
Data collection	Data transfer can be difficult (e.g. poor internet connection).
	Data security must be ensured.

Best Practices for application of technologies

- Written **standard operating procedures (SOPs)** for the use of the technology should be provided to all employees of the slaughterhouse working with the technology.
- **Clear instructions** should be provided on the **methods and frequency of cleaning** the equipment of automatic monitoring systems, as well as the precautions that must be taken to protect sensitive devices during routine cleaning of the slaughterhouse.
- **Training on how to use the technology**, including troubleshooting minor issues and performing maintenance tasks should be provided for slaughterhouse staff in regular intervals and when new employees join the team. This can be carried out by a responsible, qualified person at the slaughterhouse and does not necessarily have to be performed by the tech provider. It can also be part of a standard operating procedure protocol (SOP's).

- **Support for technical problems** during the operation of the technology should be provided by the company which developed and/or sold the technology. Remote maintenance access via internet is therefore necessary.
- The **contact information for technical support** must be easily accessible to the relevant personnel at the slaughterhouse (e.g. posted on a bulletin board or clearly displayed on the equipment).
- It is recommended to **check regularly that the technology is working correctly**. This can be done through manual checks (e.g. comparative inspections by human staff) or technical checks by a technology provider (possibly automated functional self-tests can be implemented).
- If necessary, the **internet connection should be improved** since a stable, highspeed internet connection is mandatory for many technologies. It may be necessary to switch from a mobile connection to a fixed-line internet connection.
- **Data security** must be ensured. There must be clear guidelines on data protection that all employees of the slaughterhouse and stakeholders like farmers or animal transport companies are familiar with.
- **Data accessibility** should be possible via different ways: computer on-site, on hard drives, in a database, remotely (e.g. via VPN)

Best Practices for maintenance of technologies

- **Regular software updates** should be provided when necessary.
- **Spare parts availability** for technical components must be ensured. It is recommended to provide a list of spare parts, which can be obtained from the technology provider or purchased from third parties as needed.
- Concerning maintenance, a **checklist for verifying that the equipment is functioning properly** should be made available. This makes it easier to check regularly that the technology is working correctly and includes routine checks for contamination, loosening and damage of devices. The checklist can be added to the SOPs.
- **Written instructions for calibration procedures** should be provided including how often calibrations need to be performed.
- If calibration must be performed by a specialized company, the **relevant contacts** should be listed.
- There should also be **written instructions** specifying **how often certain parts of the technology need to be replaced** to ensure the equipment functions properly.
- It is recommended to specify **how the different technical components have to be cleaned** (e.g. wiping lens of camera, cleaning the camera housing, water pressure for cleaning).

Best Practices for training slaughterhouse employees on the use of technologies

- It is important that **employees understand the purpose and added value of the technology** for animal welfare. This may increase acceptance and willingness to learn how to use and maintain the new technologies. That is why training should not only focus on technical skills, but also on the potential to improve animal welfare.
- **Face-to-face learning** is preferred before the technology is used for the first time, since questions can be addressed directly.
- It is recommended to include **hands-on exercises** in the training. For example, it can be demonstrated how to clean the equipment, how to replace parts, or how to adjust settings.
- **Printed study materials** should be provided that summarise the course content concisely and can be used as a quick reference guide.
- **Digital learning materials** can also be made available; however, it is important to note that not all employees may be able to access digital content.
- **Quick guides with pictures or pictograms** displayed in the slaughterhouse building or attached to the equipment can be helpful.
- **E-learning** can be offered as a **refreshment of training sessions** for people who are able to access digital content. In doing so, the advantages of digital learning materials should be leveraged by including videos that visually demonstrate individual steps.
- Written **standard operating procedures (SOPs)** should be available. However, these should not be provided without informing employees about their content during training sessions.
- It is important that training not only covers the use of the equipment, but also the **requirements for cleaning, maintaining, and inspecting** the technical components.
- All **employees** working with the technology should know from the outset **what is expected of them**, what their workload will be and who to contact about which issues.

Best Practices for data security

- Data privacy and security: There must be **clear data protection regulations** that are coordinated among technology providers, slaughterhouses, and farmers. Written data protection agreements must be in place, which must be accepted by the parties and, ideally, confirmed with signatures.
- There must be an **agreement on data ownership** between the different stakeholders.
- **Data protection** should include encrypted data, access only to authorized persons, possibly anonymization of breeder identity.



- **Secure (encrypted) server connections** and communication channels should be used.
- Only **partial, encoded information** may be **sent from the sensors to the database** that is then converted to the correct information.
- Usage of **common industry standards**, like VPN connection is recommended.

5 Specific Technologies of the aWISH project

5.1 Technologies for automated monitoring of pig welfare

5.1.1 PigInspector (CLK GmbH)

Place of application: Slaughterhouse

What are the capabilities of this technology?

- Detection of ear necrosis, tail necrosis, scratches
- Tail length measurement
- Counting of slaughter marks (more than 2 on a carcass is not acceptable)
- Reading slaughter numbers
- Image recording with up to 5 cameras (head, back, ham, left and right flanks)

What technology is the system based on?

- Depending on the type of detection, the system uses either artificial intelligence (AI) or traditional image processing.

What type of cameras/sensors are used?

- 2D colour cameras (5MPx)
- Monochrome stereo camera for measuring tail length

What are the system requirements for the software?

- Processor: Intel Core i9-10900 2.80 GHz
- RAM: 32.0 GB
- Storage 466 GB SSD, 3.64 TB HDD
- Graphics Card NVIDIA Quadro
- Windows 11

Where is the best place at the slaughterhouse to take the measurement?

- After scalding and flaming
- If available, immediately after the slaughter number printer. Before the first cut is made in the carcass

What are the requirements at the slaughterhouse?

- No direct sunlight, fire, or other heat sources should be directed at the animal carcass or the camera.
- The environment should be free of steam.

- A control cabinet connected to the cameras is located directly at the camera installation site; ideally, a dedicated network cable should run between the control cabinet and the processing computer.
- The computer should be set up in a dry environment that is not too hot. A technical room or server room is sufficient.

How often is cleaning necessary? What needs to be cleaned? How should it be cleaned?

- Clean the camera glasses and lighting daily.
- Clean the lenses with a soft, wetted cloth and wipe them dry.
- It is best to do this after the regular daily cleaning at the slaughterhouse.
- No special chemicals are necessary.

What needs to be considered during application at the slaughterhouse?

- The pig carcass should not rotate but should always be conveyed in the same orientation relative to the camera.
- The image capture should be triggered by a photoelectric sensor — using a transmitter and receiver to ensure reliable triggering. The slaughterhouse can also provide its own digital hardware signal to trigger the cameras.
- The camera used for tail measurement should be mounted higher than the base of the pig's tail.

How is the system's proper functioning ensured over extended periods of time?

- The system was designed to require minimal maintenance. Regular calibration is not necessary.
- It is recommended that the protective screens are replaced annually.
- It is recommended to perform random checks of the images to ensure sharpness.

Who can perform maintenance?

- Maintenance can also be performed by trained slaughterhouse staff.
- If the calibration is no longer correct due to the camera or lens being misaligned, the technology provider (CLK GmbH) must be consulted.

In what file formats is the collected data provided?

- Images are saved as PNG and JPG files.
- The results are stored in a local database and as CSV files.



Can the system be integrated into the slaughterhouse's existing IT systems? What requirements must be met for this?

- The PigInspector can save images on a network drive at the slaughterhouse and use a database.
- The camera can also be triggered via a digital hardware signal provided by the slaughterhouse.
- A physical computer is not required if the slaughterhouse provides a virtual machine with sufficient performance.
- Communication is TCP/IP-based.

Other considerations when using this technology?

- To ensure that each pig can be evaluated individually, the slaughterhouse's computer system should automatically transmit a unique ID number for each pig to the PigInspector via TCP/IP. This allows the recorded findings and images to be clearly assigned to the respective animal.



5.1.2 Lesion-Detect (Innotech Vision)

Place of application: Slaughterhouse

What are the capabilities of this technology?

- Measuring lung lesions in near-real time and providing accurate and qualified assessment of the severity and incidence of EP (enzootic pneumonia) like lesions within a group of pigs.

What technology is the system based on?

- Computer vision with artificial intelligence (machine learning/deep learning image analysis) for automated lesion recognition and assessment from the large number of captured camera images.

What type of cameras/sensors are used?

- Camera-based vision sensors using 2D cameras.

What are the system requirements for the software?

- Dedicated cloud-based ADAMS (automated data analysis and management system) data platform.
- No local computer installation is required.

Where is the best place at the slaughterhouse to take the measurement?

- Along the slaughter line in a location that is not interfering with the slaughtering process but allows a clear view of lungs under controlled lighting.

What are the requirements at the slaughterhouse?

- Stable mounting location
- Reliable power supply
- Network/internet connectivity for data transfer
- Appropriate lighting
- unobstructed camera view

How often is cleaning necessary? What needs to be cleaned? How should it be cleaned?

- Camera lenses and sensor housing should be kept clean.
- Cleaning frequency depends on dust and dirt accumulation.
- Equipment should be protected from water during major cleaning events.

What needs to be considered during application at the slaughterhouse?

- Maintain unobstructed camera view
- Appropriate lighting



- Correct sensor positioning
- Avoid occlusion of the lungs being assessed

How is the system's proper functioning ensured over extended periods of time?

- Routine inspection, software updates, and periodic calibration/verification are carried out by the technology provider (qualified Innotech staff).

Who can perform maintenance?

- Basic inspections can typically be performed by trained site personnel.
- Software support, calibration, and advanced maintenance would normally be carried out by the technology provider or authorised service personnel.

In what file formats is the collected data provided?

- The system provides digital lung data that can be exported or integrated with farm management software.
- Performance reports are sent by e-mail to producers on a weekly basis or as required.

Can the system be integrated into the slaughterhouse's existing IT systems? What requirements must be met for this?

- Yes, and appropriate S3 bucket needs to be nominated where the data can be dumped.

Other considerations when using this technology?

- Prospective users should contact Innotech Vision for detailed technical specifications, installation requirements, supported interfaces, maintenance procedures, and validation data.



5.1.3 BlinkAI – Consciousness Sensor (Nuna Solutions)

Place of application: Slaughterhouse

What are the capabilities of this technology?

- BlinkAI automatically monitors stunning effectiveness in pigs after CO_2 stunning by analysing short video sequences of each animal.
- The system detects blink-related reflexes that may indicate incomplete stunning and provides objective monitoring to support animal welfare assessment.

What technology is the system based on?

- The system uses a hybrid computer vision approach combining:
  - Deep Learning (YOLO11 Pose) for anatomical localisation and tracking.
  - Classical Computer Vision (OpenCV) for eye analysis.
  - Temporal validation logic for blink-event detection.
- The system also uses a controlled pneumatic stimulation**:** compressed-air system with an electrically actuated solenoid valve and nozzle system to generate a short air puff towards the cornea, synchronised with video acquisition.

What type of cameras/sensors are used?

- Industrial IP camera
- Laser presence sensor (optional, used for event counting and diagnostics)
- Industrial Edge PC for AI processing

What are the system requirements for the software?

- Industrial Edge PC
- Windows operating system
- GPU recommended for real-time processing
- Ethernet network connection
- Optional connection to slaughterhouse MES / database

Where is the best place to take the measurement?

- Immediately after CO_2 stunning and before sticking, where the pig's head is visible from the front.
- The installation should ensure a stable viewing angle and minimal obstruction of the animal's face.

What are the requirements at the slaughterhouse?

- Stable camera mounting



- Reliable power supply
- Ethernet connection
- Protective enclosure for industrial environments
- Appropriate lighting conditions
- Regular cleaning of the protective glass (if it is needed)
- Internet access is only required for remote maintenance or software updates.

How often is cleaning necessary? What needs to be cleaned? How should it be cleaned?

- Only the protective window requires routine cleaning.
- The protective glass should be inspected and cleaned regularly.
- Cleaning frequency depends on slaughterhouse conditions and contamination levels (water, blood, anticoagulant droplets).

What needs to be considered during application at the slaughterhouse?

- Correct camera position.
- Stable mechanical installation.
- Proper visibility of the pig's head.
- Avoid excessive reflections where possible.
- Ensure the camera remains correctly aligned after maintenance.

How is the system's proper functioning ensured over extended periods of time?

- Periodic inspection should include:
    - Cleaning of the protective glass.
    - Verification of camera alignment.
    - Software updates when available.
    - Functional verification of the complete system.
- No regular calibration is required.

Who can perform maintenance?

- Routine cleaning can be carried out by trained slaughterhouse personnel.
- Software maintenance and updates should be performed by the technology provider or trained technical personnel.

In what file formats is the collected data provided?

- Database records (SQL)
- CSV exports (optional)
- JSON interfaces (optional)
- Video/image sequences for validation (when enabled)

Can the system be integrated into the slaughterhouse's existing IT systems? What requirements must be met for this?

- BlinkAI has been designed for integration with slaughterhouse IT systems and MES platforms. Integration can be performed using:
  - SQL databases
  - REST APIs
  - JSON
  - CSV
  - Other customer-specific interfaces

Other considerations when using this technology?

- The system has been specifically developed for real industrial slaughterhouse conditions.
- Performance depends on maintaining a clear view of the animal's head. Environmental factors such as contamination of the protective glass, excessive reflections or severe mechanical disturbances may affect image quality and should be minimised through appropriate installation and routine maintenance.

5.1.4 Tear staining sensor (ILVO)

Place of application: Slaughterhouse

What are the capabilities of this technology?

- Detection of the left- and right tear staining of individual pigs.
- Recording the pigs on the bleeding line from two separate angles (two cameras).
- Processing consists of multiple computer vision AI models (including detection model, segmentation model, pose-estimation model) to finally derive a prediction on the tear staining score of each pig for the left and right tear staining.
- The technology is able to link measurement from both views to the correct pig, but it is not able to link measurement to the correct batch or farm of origin.
- Currently, there is no automated dataflow from the camera recording to processing pipeline.

What technology is the system based on?

- The system relies heavily on computer vision AI models, including a detection model to detect and track the pigs (Yolo-family), segmentation model to find relevant regions for interpretation (Unet-family) and pose-estimation model to post-process and provide an idea of the orientation of the animal (Yolo-family).

What type of cameras/sensors are used?

- 2 RGB-cameras (Hickvision DS-2DE2A404IW-DE3)

What are the system requirements for the software?

- Regarding commercial software: only the yolo-model software is not open-source and requires a commercial license to be applied in any commercial product. Other software used is open source (alternatives exist for the yolo models if necessary).
- Regarding required hardware to run the software: having enough storage space to record data, a good processing unit to process the data (in theory this can be most modern computers, although the speed of analysis will heavily depend on the hardware).

Where is the best place at the slaughterhouse to take the measurement?

- It mainly depends on the setup of the slaughterhouse. In general, appropriate locations are between stunning and scalding as the majority of tear staining will be removed after this phase.
- The main requirement is that the pigs are hanging such that their orientation can be standardized to a certain degree.
- Currently the setup is situated on the bleeding line just behind the slaughter point.

- Ideally, this system should be situated between the stunning and slaughter point, as this would reduce a lot of complications in regards to blood accumulation on the recording device. However, often there is little room for the setup or the pigs are not in a suitable position to record the tear staining (lying on a conveyor belt instead of hanging).

What are the requirements at the slaughterhouse?

- The system requires the hardware to have the correct IP rating. Currently, no data transfer has been tested for this system, but it should work similar to other camera-based technologies in the slaughterhouse (such as the Blink-AI system of Nuna Solutions).
- While currently not considered, an information transfer from the hook to the system would also be beneficial to have automated batch/farm information.

How often is cleaning necessary? What needs to be cleaned? How should it be cleaned?

- Since the system has been installed at the bleeding line, a protective glass panel has been placed to protect the hardware. This panel requires almost continuous cleaning during operation (2x per minute).
- It is not known if the hardware also requires regular cleaning, but since the setup is comparable to the Blink AI system (Nuna Solutions), it is assumed that it will be similar to that system.
- Currently cleaning is performed manually using a squeegee. Automated systems could be viable but have not been tested. Importantly, these should guarantee that no possible contamination of the collected blood occurs. Possible solutions include fluid dispensing (Nuna Solutions) or a rotational cleaning system.

What needs to be considered during application at the slaughterhouse?

- A standardized position of the carcass. In the current setup this is done using a guiding rail which keeps the front legs of the carcass in place.
- The position and orientation of the cameras need to be set carefully such that the majority of animals can be analysed and the background lighting is minimized.
- An additional light source should be installed behind the cameras to minimize the effect of incoming light.

How is the system's proper functioning ensured over extended periods of time?

- Since this system is still in its research phase, it is not known if there is long-term drift (either due to changes at the slaughterhouse/pig breed or due to algorithmic drift).
- It is assumed that calibration and updates should be performed.



Who can perform maintenance?

- There is no experience with this yet. Maintenance will probably be led by the technology provider in collaboration with slaughterhouse staff.

In what file formats is the collected data provided?

- The raw video data is stored as mp4 files.
- The processed data is stored as csv file.

Can the system be integrated into the slaughterhouse's existing IT systems? What requirements must be met for this?

- There is no experience with this yet. Currently the system is bare-bones in terms of hardware and data-transfer, and it is assumed that this can be adapted to be integrated with the existing IT system at the slaughterhouse. The requirements will be the same as those for Blink AI (Nuna Solutions).

Other considerations when using this technology?

- Tear staining as a welfare indicator is still at a research stage.
- While it is possible to measure the severity of the indicator, it currently cannot be linked to specific events/phases or conditions, thus its validity as an animal welfare indicator needs further research.



5.1.5 Stremodo Behaviour Sensor (FBN)

Place of application: Slaughterhouse, Farm

What are the capabilities of this technology?

- The sensor measures movement, acoustic activity, and — in the case of pigs — stress vocalizations within a fixed area directly below the sensor.
- Measurements are taken on a technical scale that is essentially defined by the granularity of the measurement interval.
- Stress vocalizations can be detected every 100 ms, yielding values ranging from 0 to 600 detections per minute.
- Acoustic activity refers to all sounds within the monitored area. The range of values is the same.
- Movement activity is detected with a resolution of 5 ms, resulting in a range of 0 to 12,000 detections per minute.
- Since the sensor values are space-related, they must be normalized based on the sensor's distance above the floor (covered area) and the number of animals in the area. If necessary, motion activity can also be used to normalize the values measured by the acoustic sensors.

What technology is the system based on?

- Artificial intelligence is used to detect stress vocalizations in pigs.
- The aggregation of data into a biological indicator is specifically tailored to the species and the rearing context (birth, growth, slaughter) and is based on classical process control methods.

What type of cameras/sensors are used?

- The system relies on radar motion sensors to measure movement.
- Microphone arrays are used for acoustic direction-finding.

What are the system requirements for the software?

- There are no specific system requirements. Data is collected and processed into an event log directly on the sensor.

Where is the best place at the slaughterhouse to take the measurement?

- The measurement is best conducted in an area limited to 3–8 m² with a known or estimable number of animals or with a constant throughput of animals (in terms of animals per second).

- Possible locations at the slaughterhouse include the unloading ramp, driveways, and holding pens (lairage).

What are the requirements at the slaughterhouse?

- The sensors are powered and connected via Power over Ethernet (PoE).
- If necessary, a 24V DC power supply in series configuration with Wi-Fi data access is also possible
- A mobile sensor system with local data storage is also possible.

How often is cleaning necessary? What needs to be cleaned? How should it be cleaned?

- The sensors are designed to not require cleaning. The device housing is transparent to RADAR radiation as long as it is dry. A membrane cover over the microphones protects against the ingress of dirt and moisture.
- Mounting the sensor “upside down” ensures that no dust settles on the sensitive components.

What needs to be considered during application at the slaughterhouse?

- Loud metallic noises and sounds from wind, compressed air, or water jets can distort the acoustic analysis.
- Installing the system in close proximity to walls can interfere with the acoustic analysis (echoes).
- A movable mounting (vibrations) or people moving through the monitored area can distort the motion data.

How is the system’s proper functioning ensured over extended periods of time?

- There is little experience available regarding periods of use longer than a few months. There is a possibility that the microphones may degrade and that voltage converters may fail, for example, due to overheating.
- The sensors are equipped with status LEDs and a status display for visual inspection and functional testing.
- New models regularly perform a self-test on the microphones and can automatically report their status via the network interface.

Who can perform maintenance?

- Fault detection is performed automatically.
- After receiving instructions, a repair can be carried out by replacing the device, even without specialised knowledge.

- With specialised knowledge, individual sensor components can be replaced (plug-in system).

In what file formats is the collected data provided?

- The data is provided as CSV files.

Can the system be integrated into the slaughterhouse's existing IT systems? What requirements must be met for this?

- The data can be retrieved from the sensors via a central gateway and forwarded to another IT system via HTTP, either as raw data or as analysed indicator data.

Other considerations when using this technology?

- The comparability of data from different facilities depends on the installation conditions and cannot be guaranteed.
- When interpreting the data, the biological context of the data collection must be taken into account.
- Increased activity and increased stress vocalizations may indicate
    - Non-comparable recording conditions (day vs. night, homogeneous vs. heterogeneous groups, feeding vs. rest periods, newly mixed vs. stable groups)
    - Insufficient normalization of the data
    - Lower stress habituation in the animals
    - Higher absolute stress levels



5.1.6 IGFB Stress Parameter (FBN)

Place of application: Slaughterhouse

What are the capabilities of this technology?

- The concentration of IGFBP proteins which vertebrates use to regulate their metabolic response to stressors, can be detected in blood plasma obtained from slaughtered animals. Previous studies have shown that IGFBP levels respond in a stable manner to repeated or long-term stress and are unaffected by the acute stress of slaughter.

What technology is the system based on?

- The indicator is a laboratory parameter that evaluates the ratio of protein concentrations.
- HPLC, ELISA assays, and quantitative Western ligand blot (qWLB) are suitable methods for this analysis. In the qWLB, the IGFBP are separated by size and then bound to biotinylated IGF, which is made to glow, thereby allowing conclusions to be drawn about the protein concentration. This method has the advantage that multiple IGFBP isoforms can be measured simultaneously, and non-binding methylated or degraded proteins do not appear in the signal. Thus, the concentration of biologically functional proteins is measured. Other measurement methods measure the various IGFBP isoforms individually and cannot distinguish between functional and non-functional proteins.

What type of cameras/sensors are used?

- No sensors or cameras are used at the slaughterhouse.

What are the system requirements for the software?

- The analysis requires software for evaluating Western blots and performing curve regression. The software used in aWISH consisted of desktop applications that run on Windows and Linux. System requirements include 2 GB of RAM and a Java Runtime Environment.

Where is the best place at the slaughterhouse to take the measurement?

- Blood samples are collected when the pigs are bled at the slaughterhouse.
- For the measurement, fresh blood must be drawn into an EDTA-coated reaction tube and centrifuged promptly at 2000g for 15 minutes to separate the blood plasma from the solid blood components. The plasma supernatant is pipetted off and frozen at -20 to -70°C for later analysis.

What are the requirements at the slaughterhouse?

- Workspace for EDTA tubes and for labeling samples.

- Separate room for centrifuging samples.

How often is cleaning necessary? What needs to be cleaned? How should it be cleaned?

- No cleaning of EDTA tubes. EDTA tubes are disposable items because the EDTA coating is removed during use or would be washed away during cleaning.
- The centrifuge and pipette must be cleaned regularly.

What needs to be considered during application at the slaughterhouse?

- EDTA is intended to prevent haemolysis of the samples and blood clotting. During sample transport, severe shaking and freezing must be avoided. Samples that have clotted prematurely or contain haemolysed plasma are unusable and must be discarded or, if suspected, documented.

How is the system's proper functioning ensured over extended periods of time?

- Pipettes and centrifuges must be inspected and maintained at the intervals specified by the manufacturer.

Who can perform maintenance?

- Maintenance should only be performed by trained technical personnel. Since laboratory equipment is widely used, there are specialized service companies that provide maintenance for it.

In what file formats is the collected data provided?

- The data is provided as CSV files.

Can the system be integrated into the slaughterhouse's existing IT systems? What requirements must be met for this?

- Since the data is generated by laboratory measuring instruments, it must be imported into an existing IT system as a file.

Other considerations when using this technology?

- The technology is still at an early stage of development. It remains to be determined what differences can be observed in transport and housing conditions, and how repeatable and comparable the measurement results are.
- To avoid inadvertently generating differences between samples due to measurement errors inherent in the procedure, samples must first be collected and then analysed together for comparison.
- Care must be taken to ensure that measurement errors affect all factors and groups equally. Usually, not all samples can be measured at once. For each measurement, care must then be taken to ensure that samples are selected from as many of the compared



factors (e.g., season) and groups (e.g., farm, sex, housing type) as possible. Therefore, it is not possible to measure Farm 1 first and then Farm 2, or to process the samples in the order they were received. They are first collected and then evenly randomized across the measurement runs.

5.1.7 Weight-Detect (Innotech Vision)

Place of application: Farm

What are the capabilities of this technology?

- Contactless camera-based livestock weighing.
- Automatically estimating animal/live weight from images.
- Tracking growth trends over time, enables benchmarking between pens/batches.
- Can generate alerts for abnormal growth patterns.

What technology is the system based on?

- Computer vision with artificial intelligence (machine learning/deep learning image analysis) for automated weight estimation from camera images.

What type of cameras/sensors are used?

- Camera-based vision sensors using Basler ToF camera.

What are the system requirements for the software?

- Dedicated cloud-based ADAMS (automated data analysis and management system) data platform.
- No local computer installation is required.

Where is the best place at the slaughterhouse to take the measurement?

- In the pig pen in an overhead location with a clear view of animals under controlled lighting.

What are the requirements on the farm?

- Stable mounting location
- Reliable power supply
- Network/internet connectivity for data transfer
- Appropriate lighting
- unobstructed camera view

How often is cleaning necessary? What needs to be cleaned? How should it be cleaned?

- Camera lenses and sensor housing should be kept clean.
- Cleaning frequency depends on dust and dirt accumulation.
- Equipment should be protected from water during major cleaning events.

What needs to be considered during application on the farm?

- Maintain unobstructed camera view



- Clean camera lenses
- Appropriate lighting
- Correct sensor positioning

How is the system's proper functioning ensured over extended periods of time?

- Routine inspection, software updates, and periodic calibration/verification are carried out by the technology provider (qualified Innotech staff).

Who can perform maintenance?

- Basic inspections can typically be performed by trained site personnel.
- Software support, calibration, and advanced maintenance would normally be carried out by the technology provider or authorised service personnel.

In what file formats is the collected data provided?

- The system provides digital weight and performance data as CSV file that can be exported or integrated with farm management software.
- Performance reports are sent by e-mail to producers on a weekly basis or as required.

Can the system be integrated into existing IT systems? What requirements must be met for this?

- Yes, and appropriate S3 bucket needs to be nominated where the data can be dumped.

Other considerations when using this technology?

- Prospective users should contact Innotech Vision for detailed technical specifications, installation requirements, supported interfaces, maintenance procedures, and validation data.



5.1.8 Enviro-Detect (Innotech Vision)

Place of application: Farm

What are the capabilities of this technology?

- Sensor/computer system for monitoring environmental variables in livestock buildings.
- Continuous automated monitoring and alerts of temperature, humidity, ammonia, dust, CO_2 and ventilation levels as well as real-time ammonia and dust emission rates.

What technology is the system based on?

- SBC and various sensor technologies.

What type of cameras/sensors are used?

- Various electro-chemical, infrared and photo-optic sensors used for measuring different gases, temperature, humidity and dust levels.

What are the system requirements for the software?

- Dedicated cloud-based ADAMS (automated data analysis and management system) data platform used.
- No local computer installation is required.

Where is the best place to take the measurement?

- Within and outside of livestock buildings

What are the requirements at the slaughterhouse?

- Stable mounting location
- Reliable power supply
- Network/internet connectivity for data transfer

How often is cleaning necessary? What needs to be cleaned? How should it be cleaned?

- General cleaning of the cover of the device.
- Device must be turned off and protected from water during major building cleaning events.

What needs to be considered during application at the slaughterhouse?

- Appropriate location selection of intake tubes.

How is the system's proper functioning ensured over extended periods of time?

- Routine inspection, software updates, and periodic calibration/verification are carried out by the technology provider (qualified Innotech staff).



Who can perform maintenance?

- Basic inspections can typically be performed by trained site personnel.
- Calibration and advanced maintenance would normally be carried out by the technology provider or authorised service personnel.

In what file formats is the collected data provided?

- The system provides CSV data that can be exported or integrated with farm management software.
- Performance reports are sent by e-mail to producers on a weekly basis or as required.

Can the system be integrated into the slaughterhouse's existing IT systems? What requirements must be met for this?

- Yes, and appropriate S3 bucket needs to be nominated where the data can be dumped.

Other considerations when using this technology?

- Prospective users should contact Innotech Vision for detailed technical specifications, installation requirements, supported interfaces, maintenance procedures, and data validation.



5.1.9 Cough detection system (BioSense)

Place of application: Farm

What are the capabilities of this technology?

- Automated detection of pig coughs using microphones installed in pig housing facilities
- Monitoring animal sounds and distinction of coughing from other sounds
- Continuous, non-invasive monitoring of respiratory symptoms and early warning of potential respiratory health problems
- Its capabilities help farmers and veterinarians identify periods requiring further attention, supporting timely intervention, improved animal welfare and more effective farm management.

What technology is the system based on?

- The system combines machine learning and deep learning techniques with audio signal processing for automated cough detection.

What type of cameras/sensors are used?

- Dahua IPC-HFW3541T-ZAS-27135-S2: a 5MP Lite AI/WizSense IR Vari-focal Bullet Network Camera, designed for indoor and outdoor surveillance.
- 1/2.7" CMOS sensor with a 2.7–13.5mm motorized varifocal lens and Starlight technology for low-light performance down to 0.005 Lux.
- External microphone, connected to camera is directional type microphone used for focused audio recording.

What are the system requirements for the software?

- The software is designed to operate on medium to low specification VPS server. Currently, system runs on VPS with:
    - 2 vCPU, modern XEON type equivalent
    - RAM: 4 GB RAM
    - OS: Ubuntu Server
    - Version: 24.04.1 LTS
    - Storage: 200GB

Where is the best place to take the measurement?

- The optimal measurement location is approximately 3 meters above the floor, centrally positioned above the pen containing the group of pigs to be monitored.

What are the requirements on the farm?

- Suitable location for microphone installation
- Protection of the equipment from moisture, dust and physical damage
- Reliable power supply

- Internet connectivity for data transfer

How often is cleaning necessary? What needs to be cleaned? How should it be cleaned?

- The microphones and their protective housing should be inspected and cleaned regularly, depending on dust accumulation and farm hygiene conditions.
- Cleaning should be performed with dry or slightly damp cloth, following the equipment manufacturer's recommendations.
- The equipment should be switched off before cleaning, and direct contact with water or cleaning agents should be avoided unless approved by the manufacturer.

What needs to be considered during application on the farm?

- Microphones should be securely installed approximately 3 meters above the floor, centrally positioned above the pen containing the group of pigs to be monitored.
- They should remain unobstructed and be protected from dust, moisture and physical damage.

How is the system's proper functioning ensured over extended periods of time?

- Regular inspection of the microphones, and verification of the system to determine whether it detects coughs correctly
- Microphones should be cleaned as needed.
- Software updates and recalibration or model adjustments may be necessary if the farm environment or recording conditions change.
- Maintenance frequency should be adapted to operating conditions and the manufacturer's recommendations.

Who can perform maintenance?

- Routine maintenance, including inspection and cleaning, can be performed by trained farm staff.
- Technical maintenance, troubleshooting, software updates, and system adjustments should be carried out by the technology provider or personnel with appropriate technical expertise.

In what file formats is the collected data provided?

- The collected audio data is provided in WAV format.

Can the system be integrated into the slaughterhouse's existing IT systems? What requirements must be met for this?

- The system is designed for use on farms and is not intended for direct integration into slaughterhouse.

Other considerations when using this technology?

- The system's performance may be affected by background noise, microphone positioning, and changes in farm conditions. Proper installation, regular equipment maintenance, and periodic verification of detection performance are important.



- The system should be used as an early-warning tool to support farmers and veterinarians, rather than as a replacement for veterinary examination and diagnosis.

5.2 Technologies for automated monitoring of broiler welfare

5.2.1 ChickenCheck Hockburn (CLK GmbH)

Place of application: Slaughterhouse

What are the capabilities of this technology?

- Detection of dermatitis on the knee joints (hock burns)
- Classification based on a defined evaluation scheme
- Generation of statistics at the flock level
- Image documentation, report generation
- Continuous measurement of image quality, including Email notification in the event of an error
- Automatic validation and calibration of camera parameters

What technology is the system based on?

- Classic image processing algorithms

What type of cameras/sensors are used?

- 2D Colour Cameras (1.4 MP)

What are the system requirements for the software?

- Processor: Intel Core i9-10900 2.80 GHz
- RAM: 32.0 GB
- Storage: 466 GB SSD, 3.64 TB HDD
- Windows 11

Where is the best place to take the measurement?

- After plucking the feathers (on the slaughter line before the feet are removed, not during the processing for roasting)

What are the requirements at the slaughterhouse?

- No direct sunlight
- The area should be free of steam.
- A control cabinet connected to the cameras is located directly at the camera installation site. Ideally, a dedicated network cable should run between the control cabinet and the analysis computer.
- The computer should be set up in a dry environment that is not too hot. A technical room or server room is sufficient.



- Internet access is required for remote maintenance purposes.

How often is cleaning necessary? What needs to be cleaned? How should it be cleaned?

- Daily cleaning of the camera lenses and lighting
- The glasses are cleaned with a soft, damp cloth and wiped dry. It is best to do this after the regular daily cleaning at the slaughterhouse.
- No special chemicals are necessary.

What needs to be considered during application at the slaughterhouse?

- It is recommended to install a guide rail to stabilize the hooks.
- The chain should run for at least two meters along a straight section.

How is the system's proper functioning ensured over extended periods of time?

- The system was designed to require minimal maintenance. Regular calibration is not necessary.
- It is recommended that the protective screens be replaced annually.

Who can perform maintenance?

- Maintenance can also be performed by trained slaughterhouse personnel.
- If the calibration is no longer correct due to the camera or lens being misaligned, the technology provider (CLK GmbH) must be consulted.

In what file formats is the collected data provided?

- Images are saved as PNG and JPG files.
- The results are saved to a local database and as a CSV file.

Can the system be integrated into the slaughterhouse's existing IT systems? What requirements must be met for this?

- It is possible to access the database from the customer's network and thus integrate the results into the existing IT infrastructure. This can be done, for example, via an ODBC interface.
- In addition, the drive or folder where the images are stored can be integrated into the IT infrastructure as a network drive.
- A physical computer is not required if the slaughterhouse provides a virtual machine with sufficient performance.

Other considerations when using this technology?

- To generate flock-level statistics, the flock number must be received via an external device, such as the Marel Innova PDS.

5.2.2 ChickenCheck Footpad (CLK GmbH)

Place of application: Slaughterhouse

What are the capabilities of this technology?

- Recognizing dermatitis on the pad of the foot
- Classification based on a defined evaluation scheme
- Generation of statistics at the herd level
- Image documentation, report generation
- Continuous measurement of image quality, including Email notification in the event of an error
- Automatic validation and calibration of camera parameters

What technology is the system based on?

- Classic image processing algorithms

What type of cameras/sensors are used?

- 2D Colour Cameras (1.4 MP)

What are the system requirements for the software?

- Processor: Intel Core i9-10900 2.80GHz
- RAM: 32.0 GB
- Storage: 466 GB SSD, 3.64 TB HDD
- Windows 11

Where is the best place to take the measurement?

- After cutting off the broilers' feet (still hanging on the shackles)



Figure 1: Picture taken with the ChickenCheck Footpad technology. ©CLK GmbH



What are the requirements at the slaughterhouse?

- No direct sunlight
- The area should be free of steam.
- A control cabinet connected to the cameras is located directly at the camera installation site. Ideally, a dedicated network cable should run between the control cabinet and the analysis computer.
- The computer should be set up in a dry environment that is not too hot. A technical room or server room is sufficient.
- Internet access is required for remote maintenance purposes.

How often is cleaning necessary? What needs to be cleaned? How should it be cleaned?

- Daily cleaning of the camera glasses and lighting
- The glasses are cleaned with a soft, damp cloth and wiped dry. It is best to do this after the regular daily cleaning at the slaughterhouse.
- No special chemicals are necessary.

What needs to be considered during application at the slaughterhouse?

- It is recommended to install a guide rail to stabilize the hooks.
- The chain should run for at least two meters along a straight section.
- The camera should be installed as close as possible to the cutter to prevent the feet from twisting further in the hook.
- If necessary, an additional rail must be installed to improve the positioning of the feet.

How is the system's proper functioning ensured over extended periods of time?

- The system was designed to require minimal maintenance. Regular calibration is not necessary.
- It is recommended that the protective screens be replaced annually.

Who can perform maintenance?

- Maintenance can also be performed by trained slaughterhouse personnel.
- If the calibration is no longer correct due to the camera or lens being misaligned, the technology provider (CLK GmbH) must be consulted.

In what file formats is the collected data provided?

- Images are saved as PNG and JPG files.
- The results are saved to a local database and as a CSV file.



Can the system be integrated into the slaughterhouse's existing IT systems? What requirements must be met for this?

- It is possible to access the database from the customer's network and thus integrate the results into the existing IT infrastructure. This can be done, for example, via an ODBC interface.
- In addition, the drive or folder where the images are stored can be integrated into the IT infrastructure as a network drive.
- A physical computer is not required if the slaughterhouse provides a virtual machine with sufficient performance.

Other considerations when using this technology?

- To generate flock-level statistics, the flock number must be received via an external device, such as the Marel Innova PDS.

5.2.3 ChickenCheck CatchDamage (CLK GmbH)

Place of application: Slaughterhouse

What are the capabilities of this technology?

- Detection of hematomas on the breast, thighs, and wings, as well as broken wings
- Classification based on a defined evaluation scheme
- Generation of statistics at the herd level
- Image documentation, report generation
- Continuous measurement of image quality, including Email notification in the event of an error
- Automatic validation and calibration of camera parameters

What technology is the system based on?

- Classic image processing algorithms as well as artificial intelligence (AI) models

What type of cameras/sensors are used?

- Colour cameras: 2 x 2D (5 MP)

What are the system requirements for the software?

- Processor: Intel Core i9-10900 2.80 GHz
- RAM: 32.0 GB
- Storage: 466 GB SSD, 3.64 TB HDD
- Graphics Card: NVIDIA Quadro
- Windows 11

Where is the best place to take the measurement?

- After plucking the feathers (on the slaughter line before the feet are removed, not during the roasting process)

What are the requirements at the slaughterhouse?

- No direct sunlight
- The area should be free of steam.
- A control cabinet connected to the cameras is located directly at the camera installation site. Ideally, a dedicated network cable should run between the control cabinet and the analysis computer.
- The computer should be set up in a dry environment that is not too hot. A technical room or server room is sufficient.
- Internet access is required for remote maintenance purposes.

How often is cleaning necessary? What needs to be cleaned? How should it be cleaned?

- Daily cleaning of the camera glasses and lighting
- The glasses are cleaned with a soft, damp cloth and wiped dry. It is best to do this after the regular daily cleaning at the slaughterhouse.
- No special chemicals are necessary.

What needs to be considered during application at the slaughterhouse?

- The camera system must be installed in a 180° curve so that the wings do not block each other's visibility.
- It is recommended to install a guide rail to stabilize the hooks.

How is the system's proper functioning ensured over extended periods of time?

- The system was designed to require minimal maintenance. Regular calibration is not necessary.
- It is recommended that the protective screens be replaced annually.

Who can perform maintenance?

- Maintenance can also be performed by trained slaughterhouse personnel.
- If the calibration is no longer correct due to the camera or lens being misaligned, the technology provider (CLK GmbH) must be consulted.

In what file formats is the collected data provided?

- Images are saved as PNG and JPG files.
- The results are saved to a local database and as a CSV file.

Can the system be integrated into the slaughterhouse's existing IT systems? What requirements must be met for this?

- It is possible to access the database from the customer's network and thus integrate the results into the existing IT infrastructure. This can be done, for example, via an ODBC interface.
- In addition, the drive or folder where the images are stored can be integrated into the IT infrastructure as a network drive.
- A physical computer is not required if the slaughterhouse provides a virtual machine with sufficient performance.

Other considerations when using this technology?

- To generate flock-level statistics, the herd number must be received via an external device, such as the Marel Innova PDS.

5.2.4 Enviro-Detect (Innotech Vision)

Place of application: Farm

Please see Chapter 5.1.8 in “Technologies for automated monitoring of pig welfare”

5.2.5 EBENE® App (ITAVI)

Place of application: Farm

What are the capabilities of this technology?

- Complete farm welfare assessment

What technology is the system based on?

- Scoring equations by welfare indicator and by criterion

What type of cameras/sensors are used?

- Smartphone/tablet (no special sensors)

What are the system requirements for the software?

- Mobile app to be installed on smartphone/tablet + internet connection

Where is the best place to take the measurement?

- Not applicable (farm tool)

What are the requirements on farm?

- Smartphone
- Internet
- User account

How often is cleaning necessary? What needs to be cleaned? How should it be cleaned?

- Not applicable

What needs to be considered during application on farm?

- Follow assessment protocol and the instructions of the mobile app.

How is the system’s proper functioning ensured over extended periods of time?

- Software updates, no regular frequency

Who can perform maintenance?

- Technology provider of the EBENE app

In what file formats is the collected data provided?

- CSV/PDF via the back-office

Can the system be integrated into the slaughterhouse's existing IT systems? What requirements must be met for this?

- Not applicable (farm tool)

Other considerations when using this technology?

- Users need to be trained before using the welfare assessment app (recognition of the different animal behaviours and methodology of observation).

5.2.6 EBroilerTrack Image (ITAVI)

Place of application: Farm

What are the capabilities of this technology?

- Track individual broilers on farm, under commercial stocking density

What technology is the system based on?

- Image analysis based on artificial intelligence (AI)

What type of cameras/sensors are used?

- 2 RGB cameras (8MP)

What are the system requirements for the software?

- Laptop/GPU (Jetson Nano)
- Internet to transfer data to the cloud and for output visualizations

Where is the best place to take the measurement?

- Not applicable (farm tool)

What are the requirements on farm?

- Power supply
- Stable camera installation, i. e. the camera must not move once installed (strictly levelled)
- Internet connection

How often is cleaning necessary? What needs to be cleaned? How should it be cleaned?

- Regular dust removal from the camera lenses to avoid compromising the results of the image analysis (at least once a week).
- Using dry microfiber cloth
- It is important not to move the camera while cleaning it

What needs to be considered during application on farm?

- Cleanliness of the cameras is very important.
- Stable camera installation must be ensured.

How is the system's proper functioning ensured over extended periods of time?

- Updates may be necessary

Who can perform maintenance?

- Technology provider (ITAVI)



In what file formats is the collected data provided?

- CSV files

Can the system be integrated into the slaughterhouse's existing IT systems? What requirements must be met for this?

- Not applicable (farm tool)

Other considerations when using this technology?

- There are 4 h recordings every 2 days, under 3 periods of the day.

5.2.7 EBroilerTrack Sound (ITAVI)

Place of application: Slaughterhouse

What are the capabilities of this technology?

- Stress monitoring of broilers in lairage
- Technology can trigger welfare alerts (heat stress)

What technology is the system based on?

- Image analysis based on artificial intelligence (AI)

What type of cameras/sensors are used?

- Microphones

What are the system requirements for the software?

- Laptop for audio recording and data processing
- Internet for output visualizations

Where is the best place to take the measurement?

- Lairage area before slaughter

What are the requirements at the slaughterhouse?

- Power supply
- Internet connection

How often is cleaning necessary? What needs to be cleaned? How should it be cleaned?

- Microphones must be cleaned at least twice a week.
- Using dry cloth

What needs to be considered during application on farm?

- Microphone placement (distance from animals; microphone height; distance from the wall)

How is the system's proper functioning ensured over extended periods of time?

- Update every year, if necessary

Who can perform maintenance?

- Trained slaughterhouse staff
- Technology provider (ITAVI)

In what file formats is the collected data provided?

- CSV files



Can the system be integrated into the slaughterhouse's existing IT systems? What requirements must be met for this?

- Yes, the requirement is slaughterhouse-specific, need to discuss directly with the slaughterhouse

Other considerations when using this technology?

- None



5.2.8 Heat stress modelling (ITAVI)

Place of application: Not defined

What are the capabilities of this technology?

- Predict broilers' heat stress during transport
- Decision-support system for adaptation strategies choices

What technology is the system based on?

- CFD modelling

What type of cameras/sensors are used?

- No sensor, just modelling

What are the system requirements for the software?

- No requirement, link to the specific web page to access the simulations

Where is the best place to take the measurement?

- Not applicable

What are the requirements for use?

- Internet connection

How often is cleaning necessary? What needs to be cleaned? How should it be cleaned?

- Not applicable

What needs to be considered during application?

- Basic information on the relevant transport needed:
    - Number of broilers
    - Individual live weight (kg/animal)
    - Departure point
    - Duration of the transport
    - Loading density (cm^2/kg)

How is the system's proper functioning ensured over extended periods of time?

- Model validation/updates, no regular frequency

Who can perform maintenance?

- Technology provider (ITAVI)

In what file formats is the collected data provided?

- No file extraction possible, just visualization on the specific web page



Can the system be integrated into the slaughterhouse's existing IT systems? What requirements must be met for this?

- No requirement, link to the specific web page

Other considerations when using this technology?

- None

6 Feedback on animals' lifetime welfare

Factual background

The results of automated animal welfare monitoring at the slaughterhouse can only be used to improve welfare conditions on farms, during transport, and at slaughter if they are communicated to the relevant stakeholders. To ensure broad acceptance among farmers, transporters and slaughterhouse staff, it is important to choose a form of communication that is clear, easy to understand, and readily accessible. As part of the aWISH project, a digital data platform, including a feedback tool, was developed for this purpose, which is accessible to slaughterhouses, farmers and other stakeholders. This data platform stores the results from automated monitoring and assigns them to the corresponding animals, farms, transporters and slaughterhouses (batches). Each target group registered to use the data platform can access a section tailored to their needs (e.g., farmers can access data on their herds for specific batches, slaughterhouses can access all data collected at that facility, and researchers can access all data collected as part of the project). It is important that the collected data is not only available in raw form, but that the system immediately analyses important datasets — for example, by calculating frequencies in percent or means, and presents this information in a clear and accessible format (e.g., in graphs or clear and easy-to-read tables). The end user should be able to get a quick overview to assess the welfare status of their animals and identify where improvements are needed. To achieve this, it is advisable to define tolerance ranges and threshold values for individual animal welfare indicators. The latter must be based on scientific evidence and is no trivial matter. It is also interesting for users to see how their results rank in comparison to other farms, so they can assess their own situation critically and in a constructive way. The development of a data platform and feedback tool can present several challenges, as demonstrated by the aWISH project, which are intended to be addressed through the Best Practices that have been identified. The challenges that may arise are explained in Table 4. Subsequently, Best Practices for the development and application of a data platform and feedback tool are explained.

Table 4: Challenges for development and application of a data platform and feedback tool based on results of automatic monitoring of animal welfare at the slaughterhouse.

Stage	Challenges
Development process	Access control policies: make sure stakeholders can only access data relevant to themselves.
	Multilingualism: If the feedback tool is to be used in different countries, it should be available in different languages.
	Federation (integration) of different platforms into one system (often slaughterhouses have their own system)
	Real-time alerts or periodic reports necessary (depends on type of animal welfare indicator)
	Interlinking of data from different origins
Operation	Costs for maintaining the platform may be high

	Data security measures: risk of hacker attacks: emergency plan needed
	Uploading data: This should preferably be done automatically.
	Simplicity of use is essential: end-users may not be familiar with digital tools
	Training is needed for end-users

Best Practices for establishing a data platform and feedback tool

- **Simplicity for the end user** should be a top priority from the very start of development. A clear user interface and easy operation are very important.
- The platforms should be designed to **support multiple languages** from the outset if the system will be used in different countries.
- It must be determined from the outset **whether real-time feedback is required or whether periodic reports are sufficient**. Real time feedback can be important for slaughterhouses (stunning, human-animal-interaction) and for any operational, acute indicators (sound, serious injuries, etc.). Periodic reporting can be used for non-acute animal welfare indicators such as hock burns, tail lesions, etc.
- **Contact should be established with slaughterhouses** interested in installing such systems at an early stage of the development process. This is the only way to effectively address the needs of slaughterhouses and integrate the systems into their workflows.
- It is also advisable to seek **feedback from other stakeholders**, such as farmers, during the development process. This can help improve user-friendliness and enable the implementation of any additional features that may be needed.
- When developing a platform that is intended to be accessible to multiple stakeholders, a **registration process** must be implemented to ensure that only data intended for a specific target group is accessible.
- **Interlinking of data** obtained by different monitoring technologies at the slaughterhouse must be ensured. This can be solved with time stamps.
- It is recommended to **integrate data of different platforms into one system** when slaughterhouses had their own system before.
- It is advisable to **invest in application programming interface (API) connections** to automatically upload data.
- It is highly recommended to **invest in data security**. Useful: penetration tests and protocols if hacking occurs.

- **Measures to ensure the product's longevity** should be taken from the outset. Costs of maintaining the data platform should be considered.
- If necessary, **regular updates to the platform** should be provided. In particular, data security must be ensured at all times through regular updates.
- **Training on how to use the platform** should be provided for end-users (slaughterhouses, farmers, transporters, etc.). This can be done in face-to-face training sessions or using E-learning formats (online courses).
- The feedback tool must be **clearly structured** and provide various stakeholders with a **quick and easy overview** of their key results of animal monitoring.
- In the feedback tool, **data can be displayed as graphs and in simple tables**. In addition, farmers should be able to **compare** their own results with the average of other farms whose animals were inspected during the same period.
- **Collaboration with scientists** is essential for establishing **tolerance ranges and thresholds** for various animal welfare indicators. Only scientifically proven thresholds should be included in the feedback tool to ensure the accuracy of the results. If no science-based thresholds are available, threshold or alert ranges should not be displayed.
- A goal should be to **link the data collected at the slaughterhouse with the data gathered on farms** through automated monitoring (e.g., weight, coughing, etc.) in order to obtain a more comprehensive overview of animal welfare on the farms.
- The feedback should also include information on measures that stakeholders (farmers, transporters, slaughterhouses) can take to improve the results they have obtained from automated monitoring of the welfare status of slaughter animals. **Best Practice Guides** giving advice to ensure animal welfare on farm, during transport and at slaughter can be made available in digital form via the feedback tool.

6.1 aWISH data platform user manual

The following section provides a detailed overview of the functionality of the data platform developed within the aWISH project. The user manual explains all the functions of the data platform and the feedback tool and illustrates them with screenshots. From the authors' current perspective, the platform's mode of operation can also be regarded as a **Best Practice** for implementing feedback on the animal welfare status of pigs and broiler chickens along the production chain.

aWISH - Data Platform User Manual: Focus Companies Edition

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Figure 1. aWISH

Introduction

Welcome to the aWISH Data Platform, a centralized system for organizations involved in the aWISH project to upload, manage, and analyze data related to animal welfare indicators at the slaughterhouse. The platform provides secure access to data, with permissions based on signed data-sharing agreements. This guide provides comprehensive instructions for navigating the platform, from initial login to managing user and organizational profiles.

You can access the platform here.

Getting Started

Focus companies are registered as users within an existing Pilot organization. They will receive a registration invitation email containing a registration link. By following this link, they will be directed to the user registration page, where they will be asked to define their username, password, and some additional user attributes.

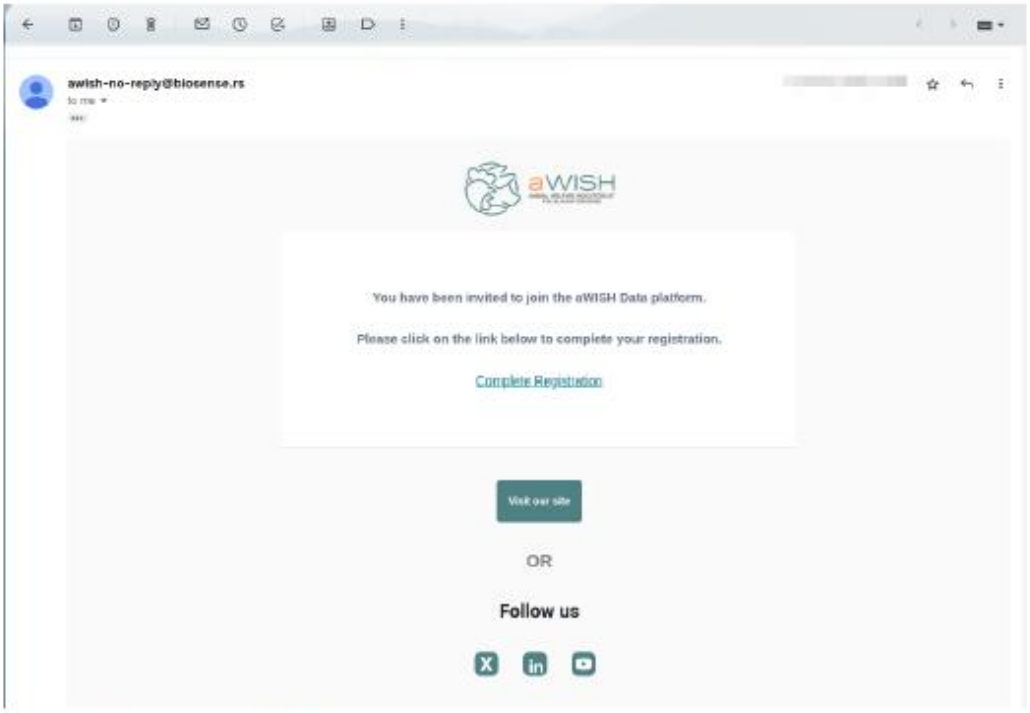

Figure 2. Registration Invitation Email

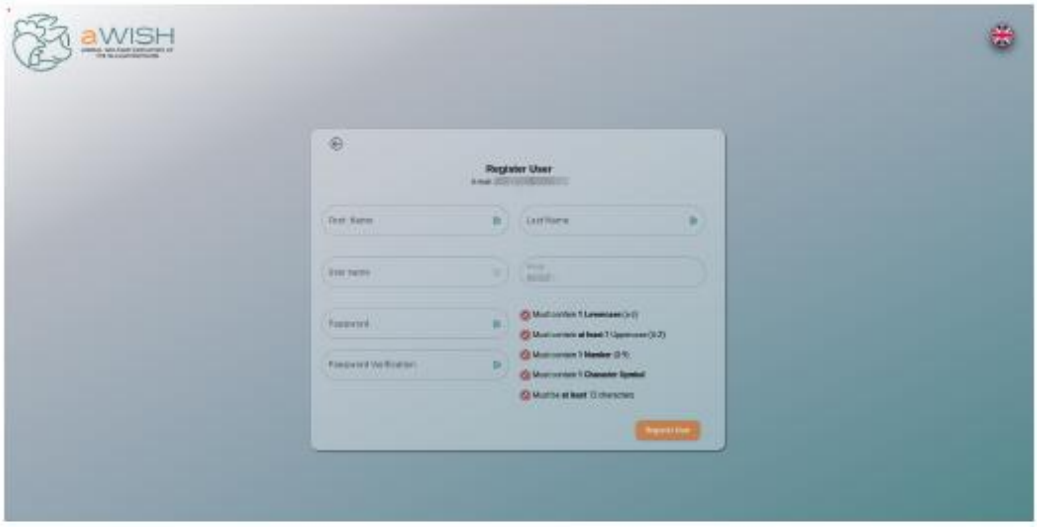

Figure 3. User Registration

Once registration is complete, users will be able to log in to the platform (see section Login and Registration) and access all the information they are authorized to view.

As a first step, users are prompted to set their preferred language (see section Logging In). By default, the home page will be empty, as no home dashboard has been selected yet. Users are advised to navigate to the dashboards page and choose one to set as their home dashboard. This will set the selected dashboard as landing page for the user. For more information, see section Dashboards.

Once they have access to the aWISH Data Platform, users can visit the Dashboards page, where they will find dashboards containing multiple visualizations related to their operations. These dashboards enable users to monitor performance across a wide range of metrics and compare their results with the aggregated metrics of other focus companies.

Users can also access the Visualizations page, which contains additional visualizations that may not be included in existing dashboards. If users wish to monitor specific visualizations together, they can group them into a new dashboard as described in Create/Update Dashboard.

Furthermore, focus company users are encouraged to visit the Best Practice Guides page, which provides valuable guidelines on improving animal welfare. Finally, users should pay close attention to their notifications, as other platform users may contact them to request feedback or invite them to participate in surveys.

Pages and Functionalities

Login and Registration

Logging In

To access the platform, enter your username and password in the designated fields on the login page. After entering your credentials, click the Log in button to proceed to the home dashboard.

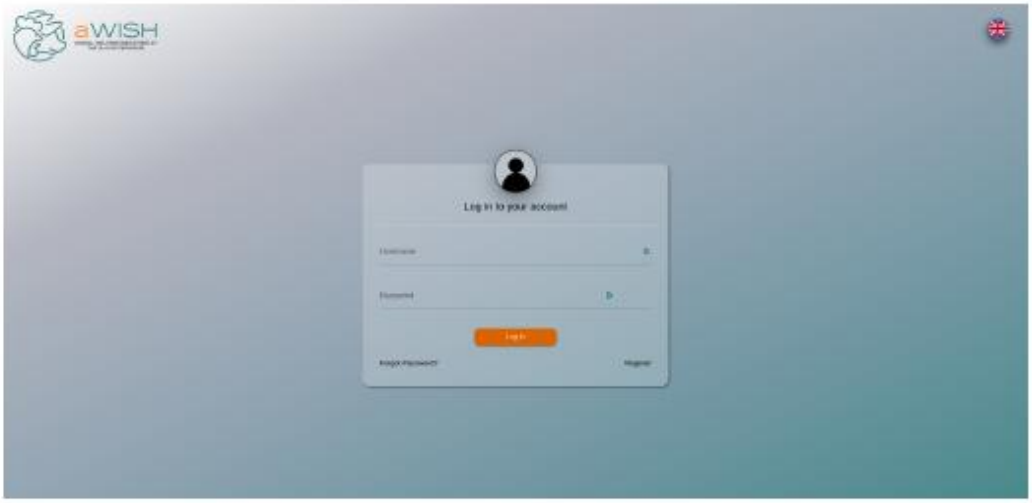

Figure 4. Login Page

Finally, the **flag icon** is available for quick language selection, allowing you to change the platform's display to your preferred language with a single click. The platform supports multiple languages. To change the interface language, click the flag icon located in the top-right corner of the screen. A dropdown menu will display a list of available languages. Select your preferred language to update the platform interface.

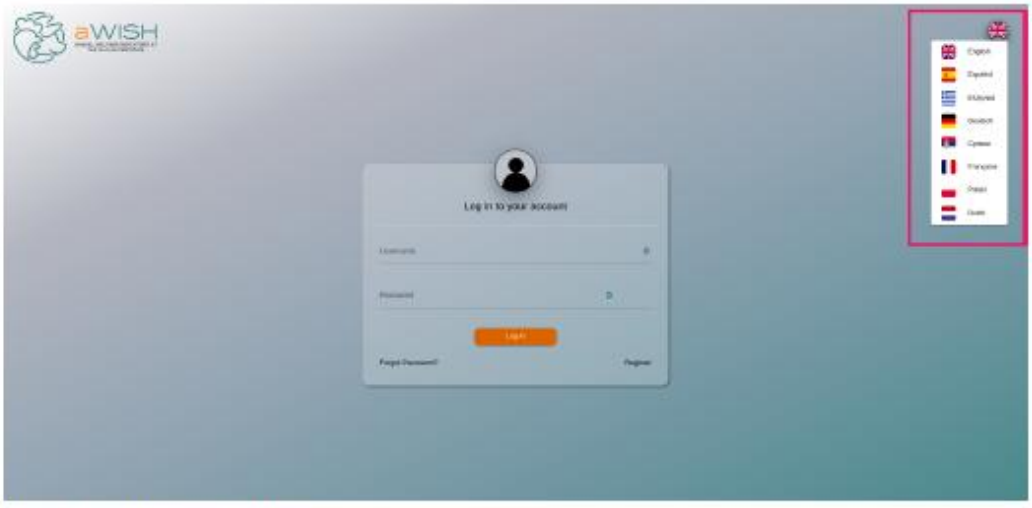

Figure 5. Language-Selection

Password Recovery

If you are unable to recall your password, select the Forgot Password link on the login screen. You

will be directed to a password reset page where you must enter the email address associated with your account. A password reset link will then be sent to your email.

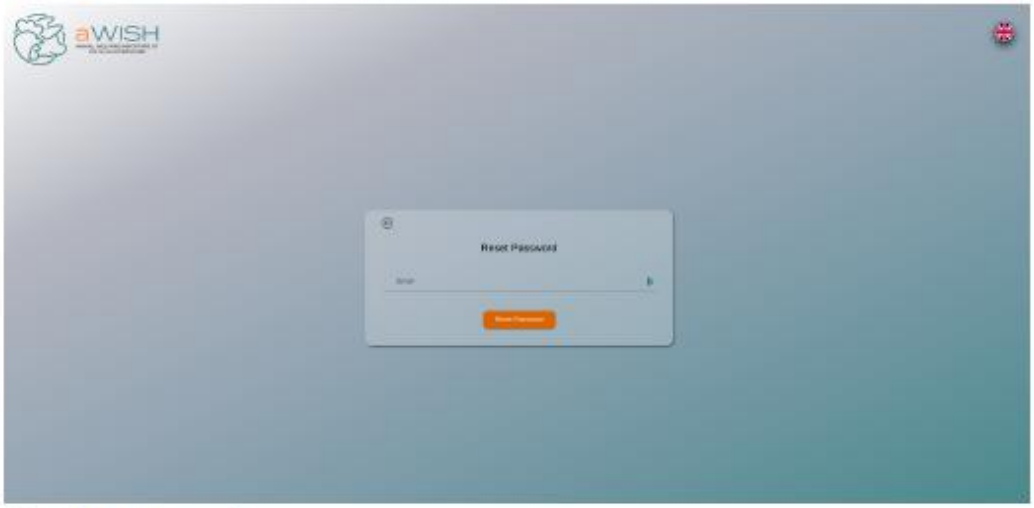

Figure 6. Reset Password

Upon clicking the link in the email, you will be taken to the "Reset Password" page. For security purposes, your new password must meet the following criteria: a minimum of 12 characters and include at least one lowercase letter, one uppercase letter, one number, and one special character. Enter your new password in both the "Password" and "Password Verification" fields, then click Reset Password to confirm the change.

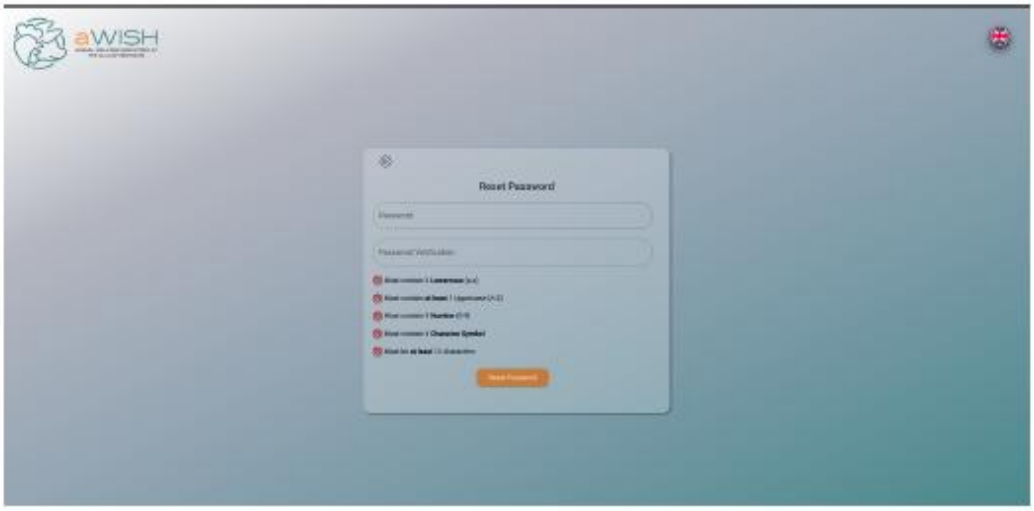

Figure 7. Set new Password

Navigating the Platform

The Home Dashboard

Upon successful login, you'll arrive at your home dashboard. At the top, you'll see a friendly greeting, "Welcome, Username," above your dashboard content. You can customize the home dashboard from the Dashboard section. If no home dashboard has been selected, an empty page will appear.

Upon your first login, navigate to the Dashboard page and set your preferred dashboard as the home dashboard.

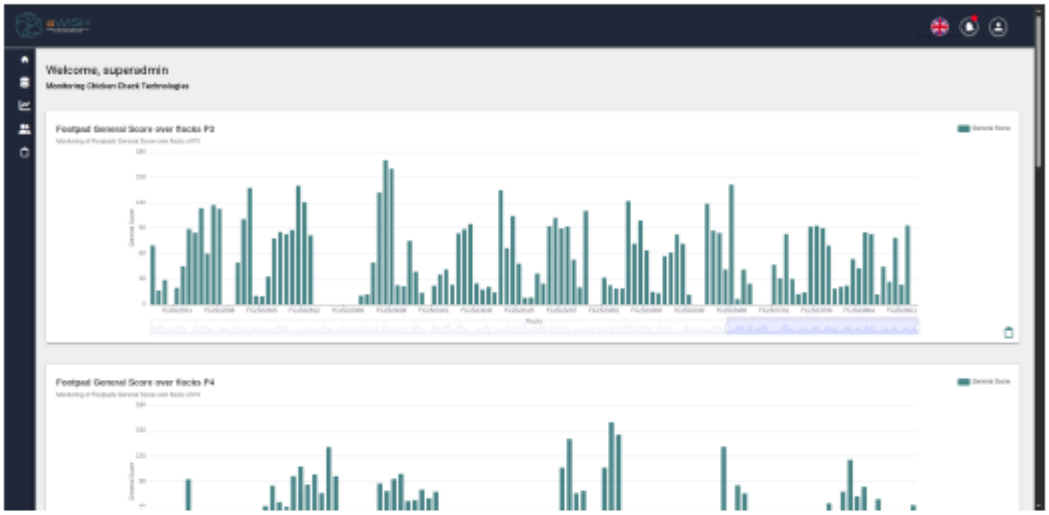

Figure 8. Home-Dashboard

Navigation Sidebar

A navigation sidebar on the left side of the screen provides quick access to key sections of the platform. The icons are as follows:

- **Home**: Returns you to the home dashboard.
- **Datasets**: Navigates you to the Datasets page.
- **Visualizations**: Navigates you to either the Visualizations or Dashboards page.
- **Partners Information**: Opens the Pilots' partners information page.
- **Best Practice Guide**: Opens the Best Practice Guide, which provides information on how to improve animal wellbeing.

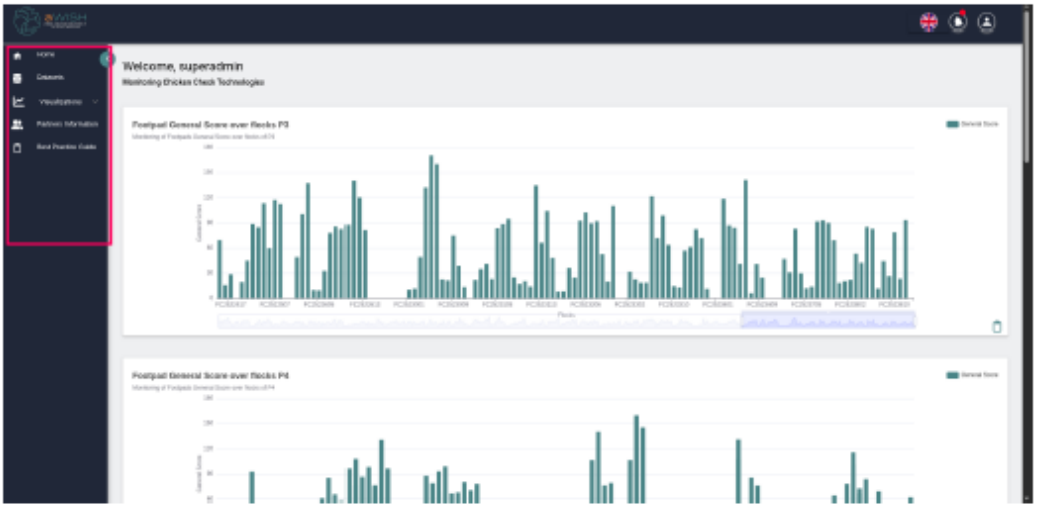

Figure 9. Navigation-Sidebar

Header

The aWISH platform's header provides a simple way to navigate your account and view notifications. Located in the top-right corner of every page, the header features a concise set of icons designed for quick access to key functions.

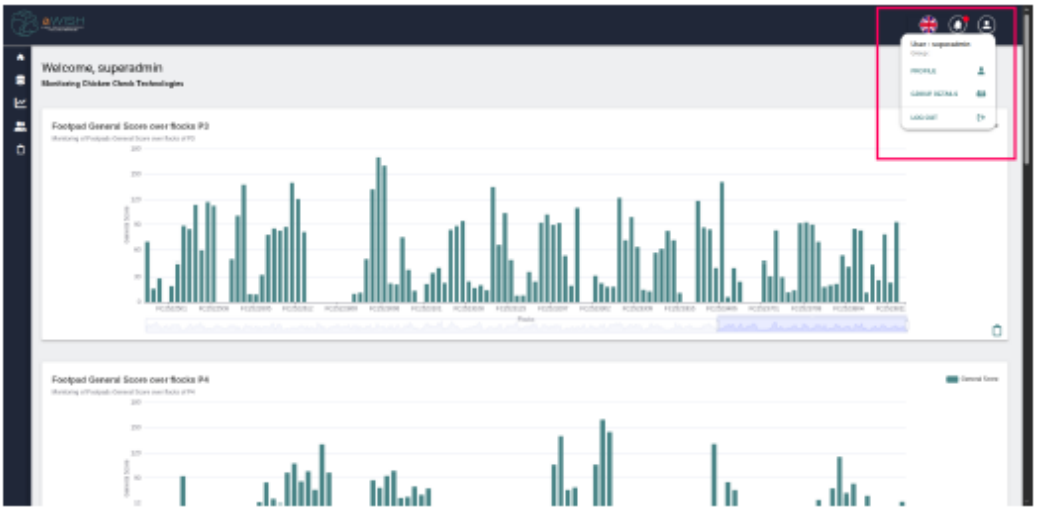

Figure 10. Navigation-header

Clicking the profile icon reveals a menu that allows you to:

- Access your personal **Profile** page to manage your details.
- View your organization's information on the **Group Details** page.
- Securely **Log Out** of the platform when you're finished.

Next to the profile icon, the **bell icon** provides a convenient dropdown menu to view all your

recent **Notifications**, ensuring you stay informed about any updates. Click the three dots and select **Read All** to mark every new notification as read. Users can also receive these notifications by email if they have allowed the platform to send them messages. This preference is configurable on the Personal Profile page.

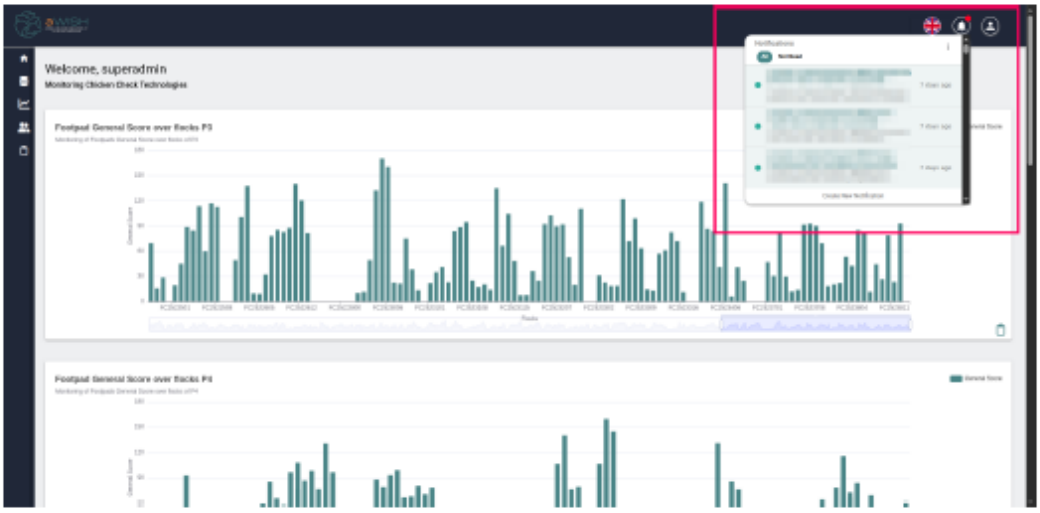

Figure 11. Notifications

It is important to pay close attention to your notifications, as you may receive requests to participate in surveys or messages from other platform users prompting you to take specific actions.

Profile and Group

Personal Profile

On your "Personal Profile" page, accessed by clicking the profile icon in the header, you have full control over your account information. In the "Profile Details" section, you can edit your first and last name by clicking the pencil icon. You can also choose to receive platform emails by toggling the "Allow receiving emails" option. Remember to click Save after making any changes. The "Password Change" section allows you to update your password with the same secure criteria used during the reset process.

If you belong to a Pilot organization, you can also see your Production Chain Stakeholder type (e.g., Farmer, Transporter, Catching Team, etc.) as well as whether you have manager access within the organization.

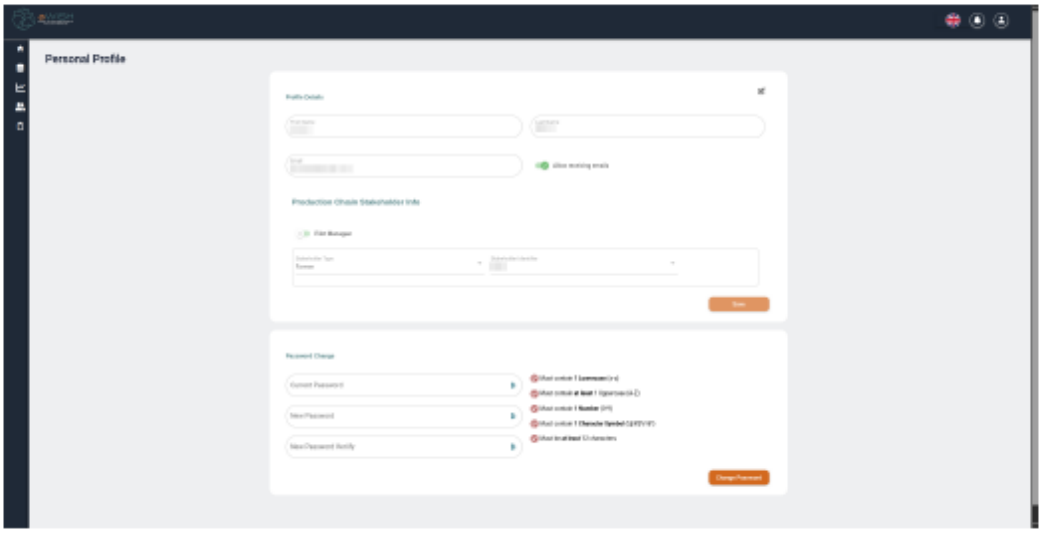

Figure 12. Profile

Group

If you want to view or manage your organization's information, go to the "Group Management" page by selecting **Group Details** from the profile menu. This page provides a comprehensive look at your organization's details and lets you see pending user invitations and a list of all registered users within your group.

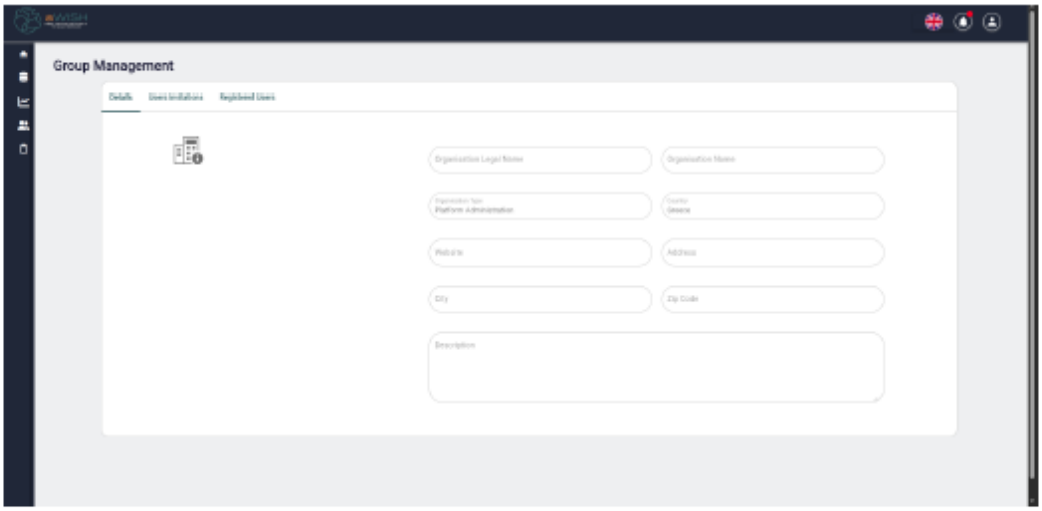

Figure 13. Group-Details

Only group administrators can access the full range of group management functionalities, while regular group users have view-only access to the group's details. The "Group Management" section is divided into three tabs: Details, Users Invitations, and Registered Users.

Visualizations

Available Visualizations

The "My Visualizations" page, accessible through the Navigation Sidebar, displays a list of all available visualizations. Each entry shows the visualization's name, creator, chart type, and creation date. The actions column provides a set of icons for managing each visualization:

- **View**: An eye icon allows you to view the visualization in a larger format, providing a detailed look at the data.
- **Edit**: A pencil icon enables you to modify the visualization's settings.
- **Delete**: A trash can icon lets you permanently remove the visualization.
- **Edit Policy**: A shielded document icon enabling you to change the access control policies of the visualization via the Policy Editor.

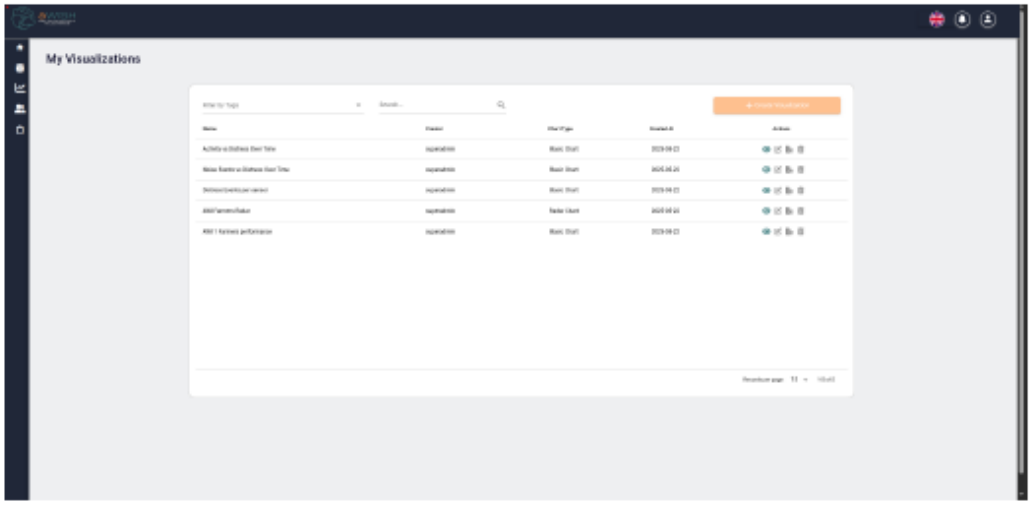

Figure 14. Visualizations Page

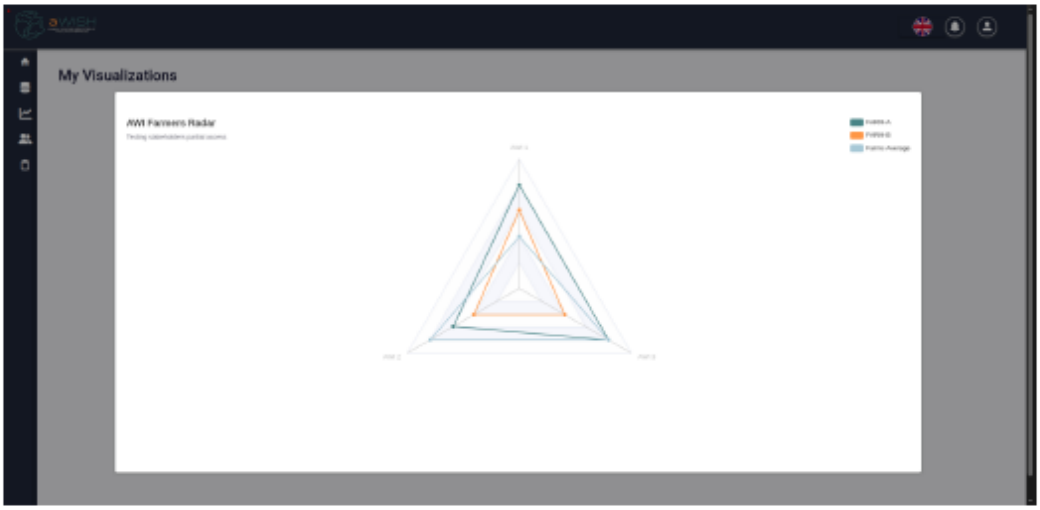

Figure 15. Viewing a visualization

Focus companies have access to only a subset of the platform's visualizations and are limited in the actions they can perform. By default, they can view only the visualizations associated with their own activities or batches, and there are cases where they can only access a striped down version of a visualization. Even for those visualizations, their permissions (e.g., edit, delete, etc.) remain restricted unless a Pilot Manager explicitly grants them the corresponding rights.

Dashboards

Available Dashboards

The "My Dashboards" page lists all the dashboards you have created or you have access to. Each entry provides the dashboard's name, creator, and creation date. The actions column offers several management options:

- **Set Home Dashboard**: A house icon enables you to set the dashboard as your home dashboard.
- **View**: An eye icon allows you to open the dashboard.
- **Edit**: A pencil icon lets you modify the dashboard's layout and content.
- **Delete**: A trash can icon allows you to permanently delete the dashboard.
- **Edit Policy**: A shielded document icon enabling you to change the access control policies of the dashboard via the Policy Editor.

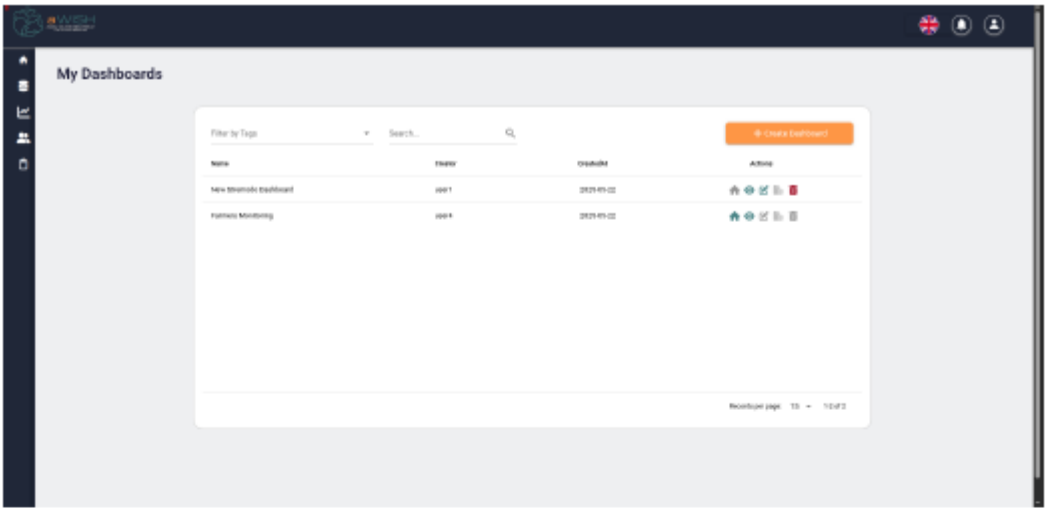

Figure 16. Dashboards Page

Similar to Visualizations, focus companies have access to only a subset of the available dashboards and are limited in the actions they can perform. By default, they can view only dashboards that contain visualizations related to their own activities. If a dashboard includes visualizations that are not available to them, those visualizations will be masked and hidden, preventing access to unauthorized information. Even for accessible dashboards, their permissions (e.g., edit, delete, etc.) remain restricted unless a Pilot Manager explicitly grants them the corresponding rights.

Create/Update Dashboard

To create a new dashboard, click the **Create Dashboard** button. This will take you to the dashboard creation screen where you can:

- Provide a Dashboard **Name** and a brief Dashboard **Description**.
- Assign relevant **Tags** and select which groups the dashboard will be **Accessible To**.
- Add visualizations to your dashboard by clicking the **Add Visualization** button. For each visualization, you can select it from a dropdown list and adjust its **Width** and **Height** to customize the layout.

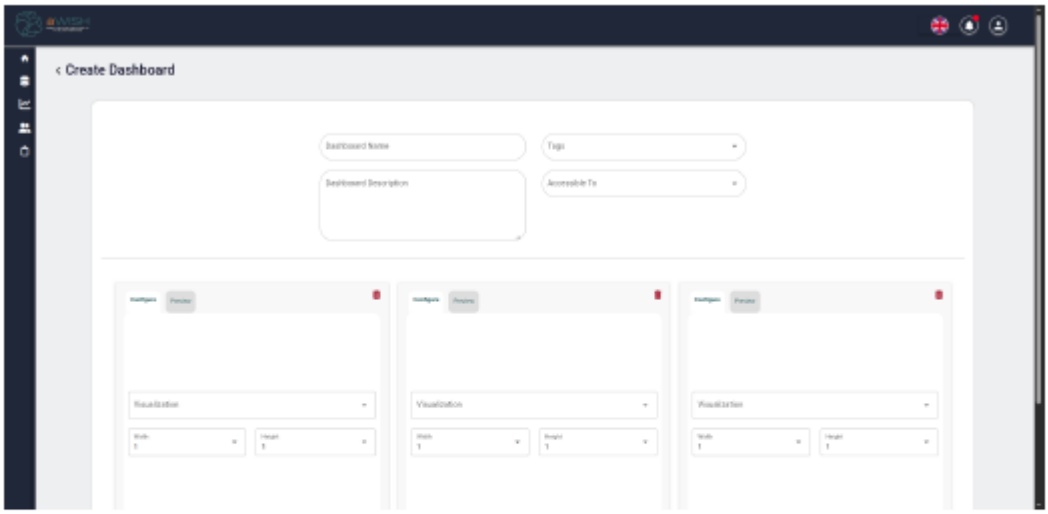

Figure 17. Create Dashboard

If you have update access, you can also update existing dashboards. The "Update Dashboard" page allows you to modify all of the dashboard's settings, including its name, description, tags, accessibility, and the arrangement of its visualizations. You can use the red trash can icon to remove a visualization from the dashboard.

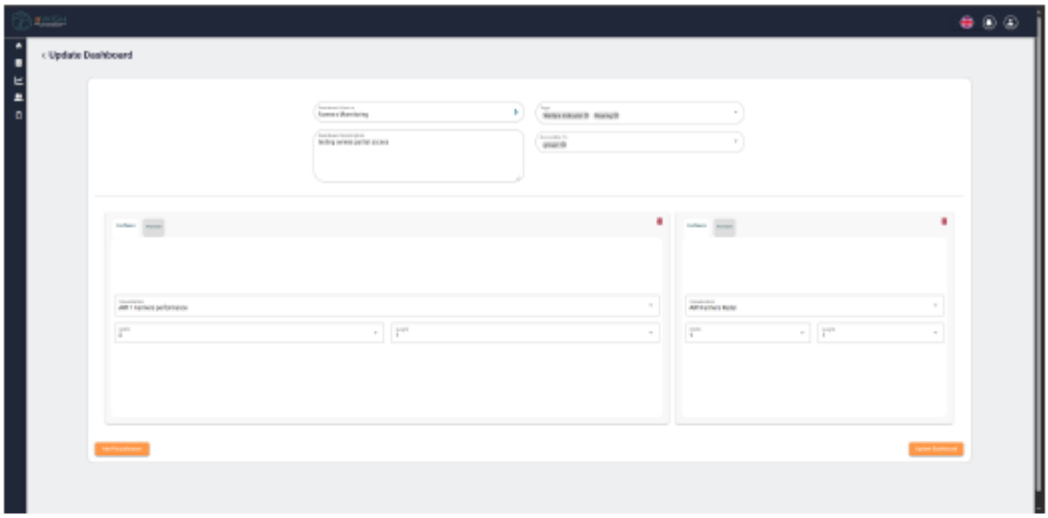

Figure 18. Update Dashboard

Best Practice Guides

Overview

The Best Practice Guides (BPG), accessible via the clipboard icon in the navigation sidebar, provide valuable information and recommendations related to animal welfare. The purpose of this component is to inform focus company users about practices aimed at improving the welfare of

their animals. By visiting this page, users can find useful guidance on mitigating potential issues related to animal health, welfare, transportation, or slaughtering.

- **Animal Selection**: The initial screen presents a choice between Pigs and Chickens. Select the animal relevant to the information you require.
- **Guide Content**: After selecting an animal, you will be directed to a page that provides detailed guides for different stages, such as Rearing, Transportation, and Slaughter. Each guide contains detailed information, including best practices for several cases. Clicking on a specific item, such as "Liver Lesions," will open a detailed guide with recommendations for reducing pathogens and infections.

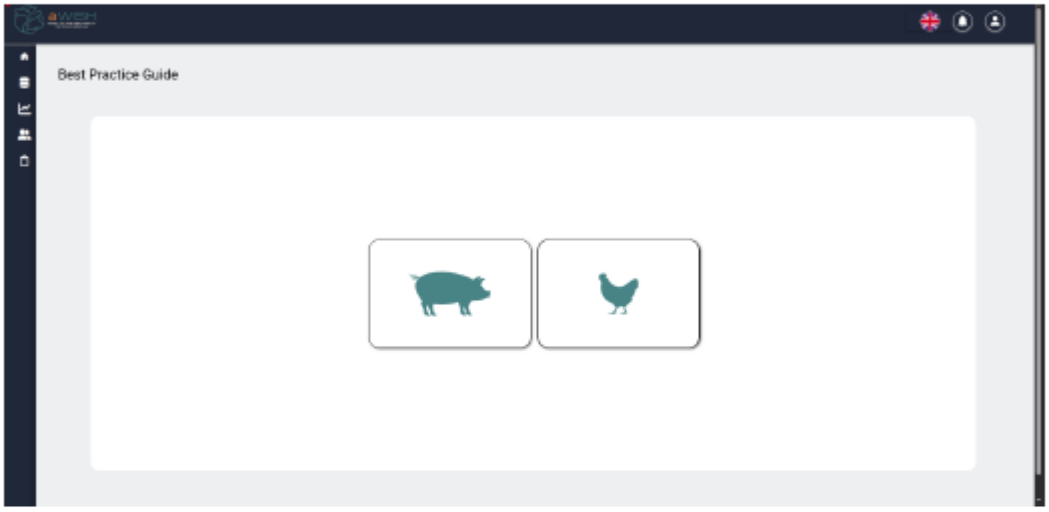

Figure 19. Best Practice Guide - 1

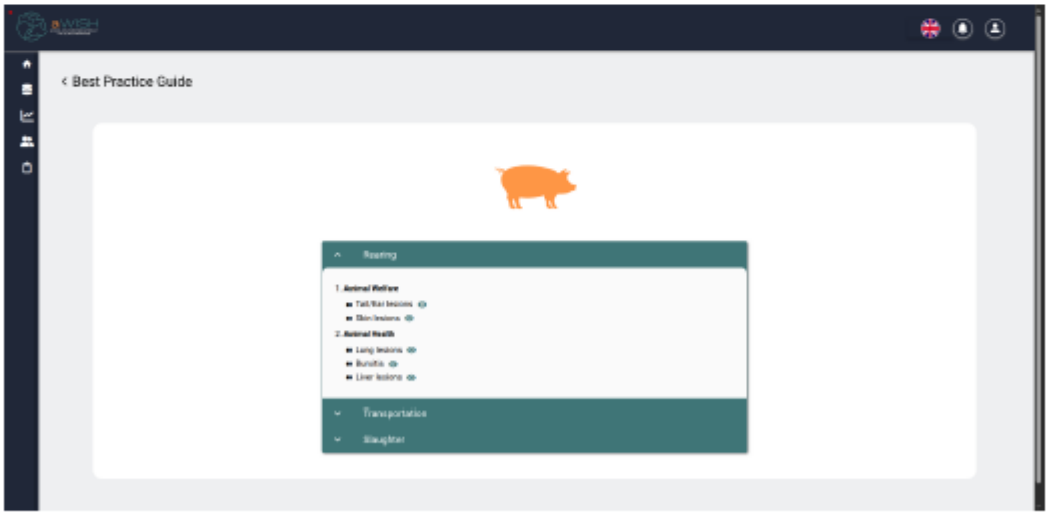

Figure 20. Best Practice Guide - 2



Figure 21. Best Practice Guide - 3

Best Practice Guides in Visualizations

Best Practice Guides (BPGs) can be attached to visualizations, giving users direct access to actionable recommendations for improving the specific measurements displayed. This ensures that both stakeholders who are underperforming and those seeking further improvement can easily discover how to take the next steps.

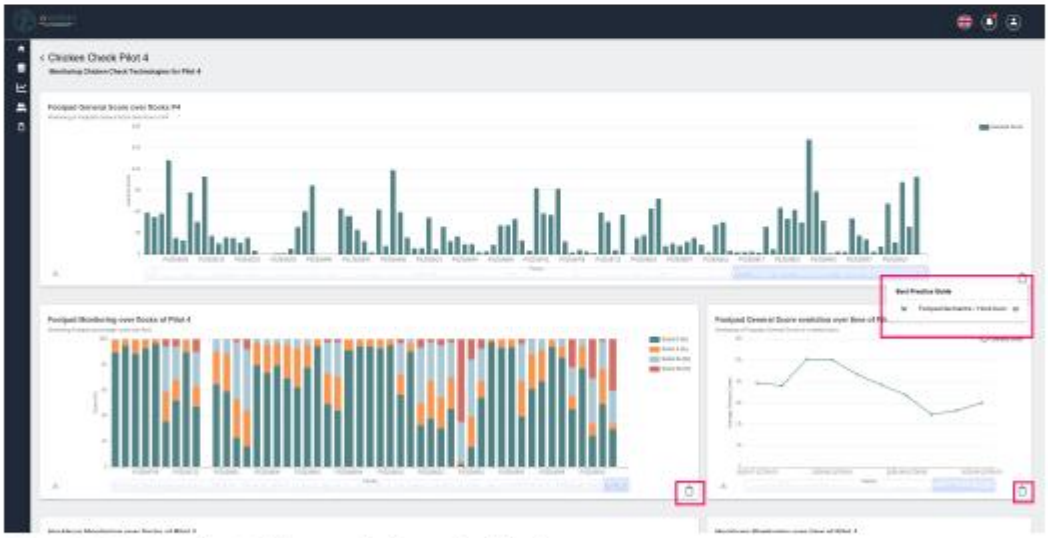

Figure 22. Best Practice Guide - attached to a visualization

Dataset Management

The Datasets section, accessible via the stack icon in the navigation sidebar, allows users to manage, view, and upload data. It is important to note that not all focus companies have access to this page. If the stack icon does not appear in the navigation sidebar, it indicates that the user does not have

the necessary permissions. Access to this section requires that focus companies be granted data provision rights, which are managed by the administrator of their group.

Datasets

The Dataset page provides a comprehensive overview of all available datasets, serving as the central repository for data management.

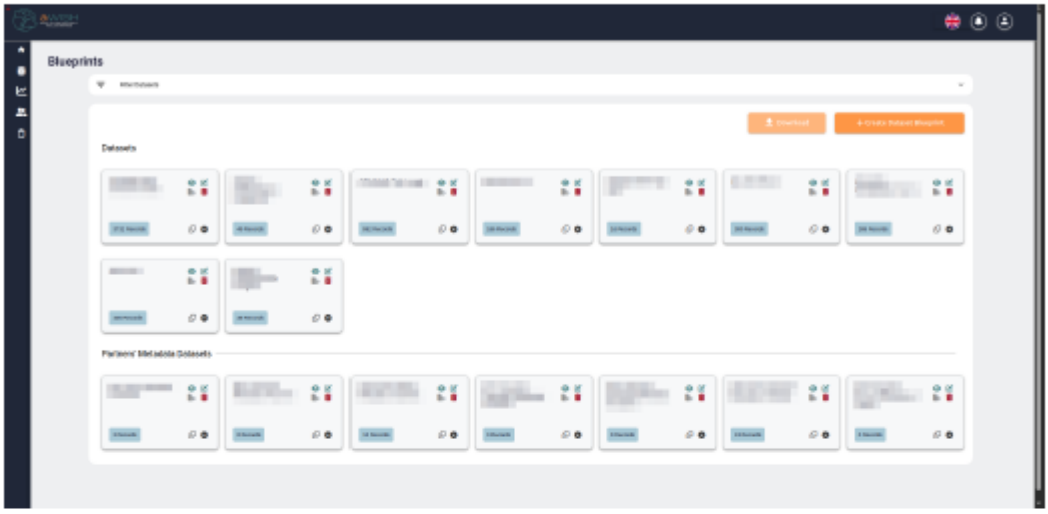

Figure 23. Datasets

There are three types of datasets:

- **Dataset Blueprints**: Regular datasets uploaded by platform users. The term 'blueprint' refers to the collection of metadata describing a dataset.
- **Partners' Metadata Datasets**: Datasets that provide information about pilot operations, such as farms, employees, and related details.
- **Derived Datasets**: Datasets created by processing, cleaning, and merging one or multiple datasets. These datasets are designed to serve a specific purpose and are used for creating visualizations. They are optimized for analytical models and dashboards, making it easier to extract meaningful insights.

Each dataset is represented by a card that displays the total number of records it contains. The card also includes several icons that provide quick access to key actions:

- **Edit**: A pencil icon allows you to modify the dataset's configuration.
- **Delete**: A trash can icon lets you remove the dataset.
- **View Details**: An eye icon opens a detailed view of the dataset's metadata.
- **Edit Policy**: A shielded document icon enabling you to change the access control policies of the dataset via the Policy Editor.
- **Upload Data**: A plus icon allows you to upload new data files to the dataset.
- **Duplicate**: A duplicate icon enables you to duplicate a Dataset Blueprint, without duplicating its

content.

At the top, users can find the following actions:

- **Create Dataset Blueprint**: Click the Create Dataset Blueprint button to begin the process of creating a new dataset. This action initiates a three-step wizard.
- **Download**: Select multiple datasets by clicking on them, then click the Download button to download the selected datasets. The download is a compressed folder containing the selected files as CSVs.

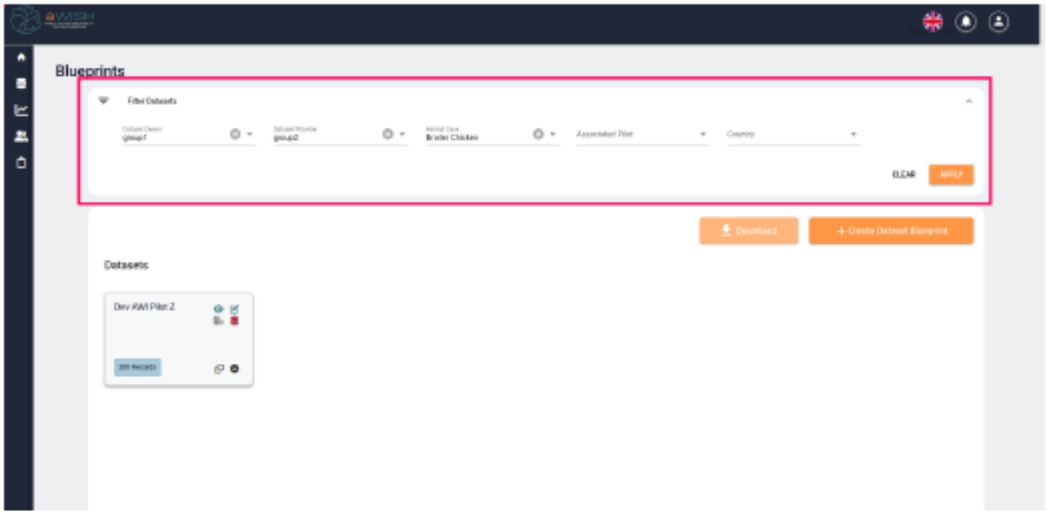

Figure 24. Datasets Search

To effectively locate specific datasets, you can use the search functionality at the top of the "Blueprints" page. This feature allows you to filter datasets based on various criteria. Simply select your desired filters, such as Dataset Owner, Dataset Provider, Animal Case, Associated Pilot, or Country. Once you have set your filters, click Apply to refine your search results. You can also click Clear to reset all filters and view all available datasets again.

Users from focus companies can access datasets only if they have been granted data provision rights. Even then, from all available datasets, they can access only those that either reference them in their metadata or those to which they have been explicitly granted access. To manage such access, group administrators can customize access policies using the Policy Editor, a component available only to a limited set of users.

Creating a Dataset

Before adding data to the platform, you must first create the Dataset Blueprint, which includes essential information about the dataset such as its structure and input file properties. Start this procedure by clicking the Create Dataset Blueprint button.

Step 1: Basic Information

This step requires you to enter the core information for your new dataset. * **Basic Information**:

Provide a Name and a detailed Description for the dataset. * **Domain Information**: Specify the Pilot use case, the Animal Case, the Production Stage, and the Stakeholder Identifier relevant to the data. * **Geospatial Information**: Select the Country and Region where the data was collected. * **Access Information**: Define the Dataset Owner and indicate whether the data should be designated as Open Data.

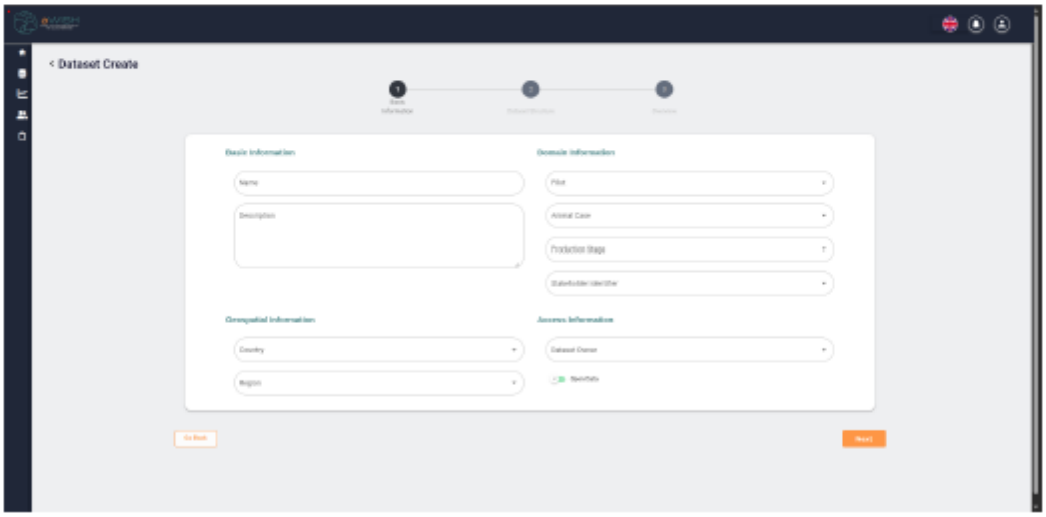

Figure 25. Creating Dataset: Basic-Information

Click Next to proceed to the next step.

Step 2: Dataset Structure

This step allows you to define the structure of your dataset.

- **Object Configuration**: Specify the File Type (e.g., CSV, Excel) and, based on that selection, provide any additional fields that instruct the system on how to load data from the input files.
- **Table Schema**: The table schema defines the columns of your dataset. Click Add Column to create a new column. A pop-up will appear where you must provide the Name, Data Type, Field Type, and Pretty Name for the column. The **Name** field must match the initial data, while the **Pretty Name** can be a more human-readable version. Click Submit to add the column to the schema.

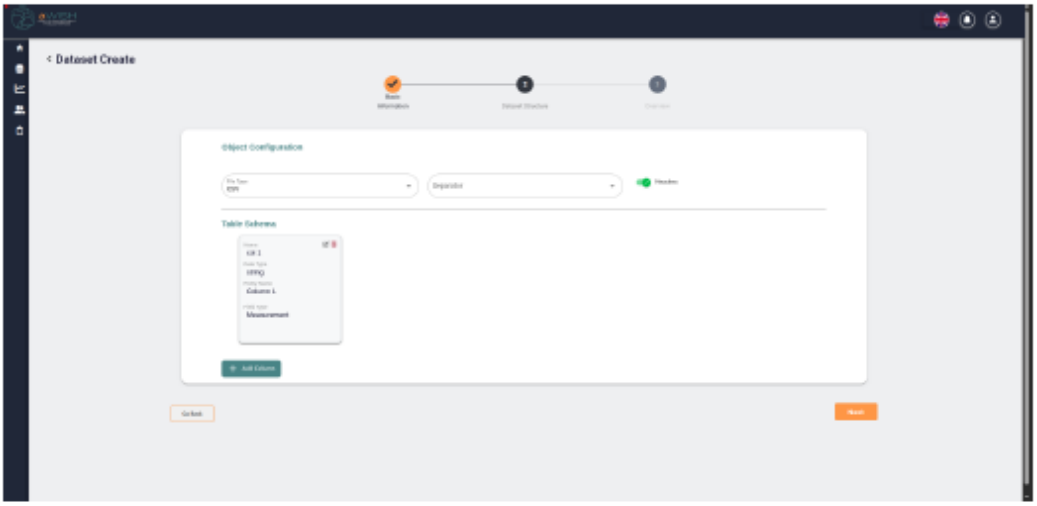

Figure 26. Creating Dataset: Dataset Structure

After defining all columns, click **Next** to proceed to the final step.

Be **extremely careful** when defining the dataset structure, as it must match the input data exactly and cannot be modified later. Column names, data types, and temporal information in the table schema must precisely describe the input data, and the Object Configuration must include all necessary details to load the incoming files correctly.

Step 3: Overview

The final step provides a complete overview of all the information you've entered. Review the Basic Information, Domain Information, Geospatial Information, and Object Configuration to ensure all details are correct. If you need to make changes, use the Go Back button. Once you have verified the information, you can finalize the Dataset Blueprint creation.

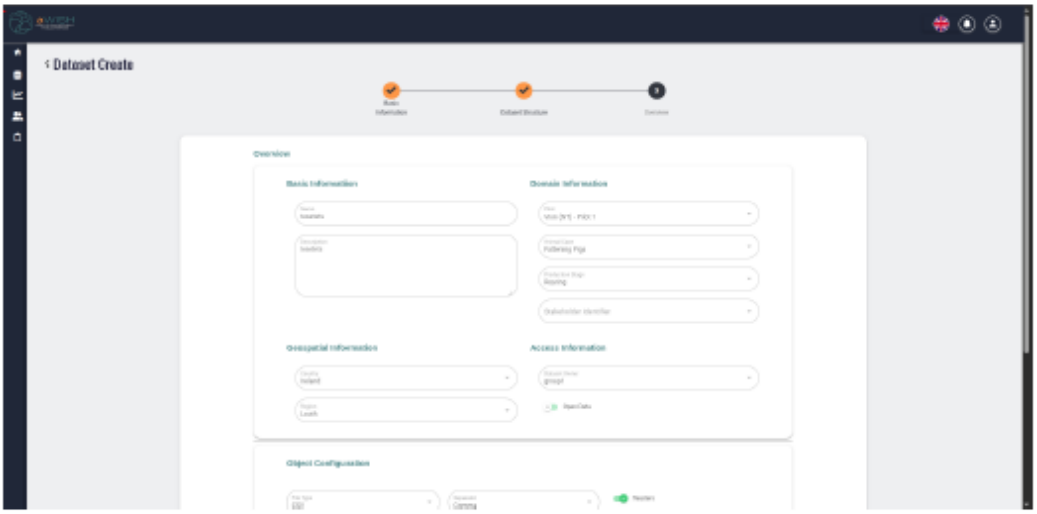

Figure 27. Creating Dataset: Overview

Ingesting Data

After creating your Dataset Blueprint, you can upload data to it. The "Dataset Ingestion" page provides a drag-and-drop interface.

- **Instructions**: The instructions section reminds you to drag and drop files into the Drop Zone.
- **Expected File Properties**: This table displays the file format properties, such as the File Type, Headers, and Separator, which must match the file you are uploading.
- **Expected Dataset Structure**: This table provides a detailed breakdown of the expected data structure, including the Name, Type, and Temporal Format for each column, ensuring your data is correctly formatted.

Once your files are in the drop zone and you've confirmed they match the expected structure, click the Upload button to ingest the data into your dataset.

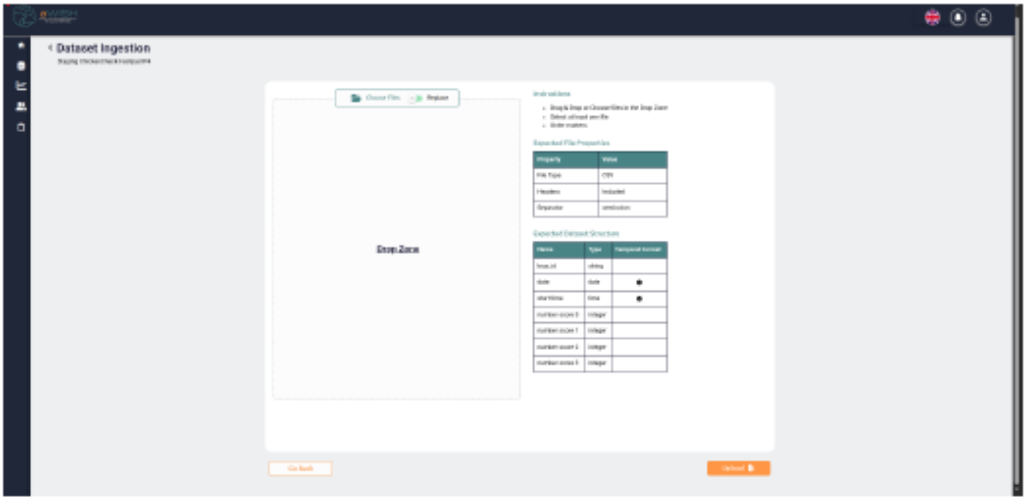

Figure 28. Adding data to dataset

To entirely replace a dataset's content, users can enable the **Replace** switch. This action will permanently delete all existing data in the dataset and replace it with the new content, so exercise extreme caution when using this function.

Partners Information

The "Partners Information" section is a key resource for accessing detailed metadata about the project's collaborating Pilot partners.

- **Information Tabs**: The page is organized into several tabs, providing specific information on different aspects of the partners' operations, including Farms, Farm Employees, Transports, and Slaughter Process.
- **Data Table**: Each tab displays a table with various data points, such as "Farm Identifier," "Farmer Age," and "Number of Employees," allowing you to browse and understand the operational context of the data providers.

- **Search and Download**: You can use the search bar to find specific information or click the Download button to export the data in a CSV file format for offline analysis.

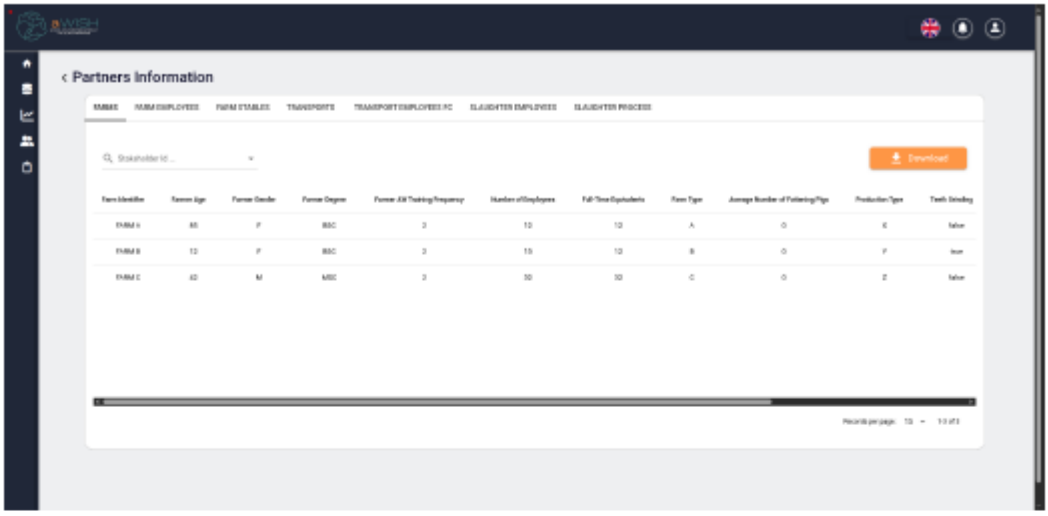

Figure 29. Partners' Information

Glossary

Account Attribute

A property describing a user, such as their organization, country, role, or stakeholder type. Account attributes are used in policy definitions and conditional access configurations.

Animal Case

Refers to the specific animal category (e.g., pigs, chickens) for which data is uploaded or analyzed in the platform.

Dataset Blueprint

A metadata structure that defines a dataset's configuration, including its schema, file type, and descriptive information. Before uploading data, a Dataset Blueprint must be created.

Dashboard

A collection of visualizations displayed together on a single page. Dashboards provide users with a high-level overview of specific aspects of animal welfare data.

Data Owner

The organization responsible for the data — typically a pilot group. The data is collected on their



premises and reflects their activities.

Data Provider

A user or organization that supplies data on behalf of the Data Owner. For example, a technology provider collecting sensor data for a pilot farm.

Dataset

A structured collection of related data uploaded to the platform. Datasets are created based on Dataset Blueprints and can be accessed, viewed, or analyzed.

Ingestion

The process of uploading and integrating data files into a dataset within the platform.

Pilot Organization

An organization representing a project pilot, usually linked to a specific slaughterhouse or production chain. Pilot organizations manage data and users related to their specific case.

Pilot Managers

Users within a Pilot Organization who have unrestricted access to all resources associated with this Pilot.

Production Chain Stakeholder

Users within a Pilot Organization who are identified by a Stakeholder type (i.e., Farmers, Transporters, Catching Teams and Slaughterhouse) and an identifier. Stakeholders may have limited access to data relevant to their own activities.

Policy Editor

A tool within the platform that allows authorized users to configure access control rules for datasets, visualizations, and dashboards.

Research Group

An organization with full access to all datasets, visualizations, and dashboards. Research groups are responsible for analysis and producing best practice recommendations.

Resource

Any managed item within the platform that can have access policies applied to it — such as a

dataset, visualization, or dashboard.

Role

A classification describing the organizations and their users. Examples include Pilot Manager, Technology Provider, Production Chain Stakeholder, and Researcher.

Visualization

A graphical representation of data (e.g., bar chart, line graph, map) created from one or more datasets. Visualizations can be combined into dashboards.

Best Practice Guide (BPG)

A collection of recommendations and guidelines related to improving animal welfare at different stages of production. Best Practice Guides can also be linked to visualizations.

Contact

For any additional help or for visualization requests, you can send an email to awish@ubitech.eu.

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