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DECIDE

Data-driven control and prioritisation of non-EU-regulated contagious animal diseases

Deliverable 3.3

Report on evaluation of usability and usefulness of the decision support tools

WP3 – Integration of data tools in disease control programs

Authors Jenny Frössling (SVA), Gema Vidal (SVA), Wiktor Gustafsson (SVA), Luis Pedro Carmo (NVI), Victor Henrique Silva de Oliveira (NVI), Lars Erik Gangsei (NVI), Petter Hopp (NVI), Stan Jourquin (UGent), Yara Slegers (UU), Camille Delavenne (AUSVET), Lucía Dieste Pérez (GD), Sébastien Picault (INRAE), Carole Toczé (IDELE), Carla Gomes (AHI), Alison Burrell (AHI), Annette Boerlage (SRUC), Maria Costa (SRUC), Beatriz García Morante (IRTA), Charlotte Doidge (UoN)
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Abbreviations

Abbreviation	Description
API	Application programming interface — a software intermediary that allows two applications to talk to each other.
BRD	Bovine respiratory disease
EU	European Union
PCR	Polymerase chain reaction
SUS	System usability score
VDL	Veterinary diagnostic laboratory
WP	Work Package

Partner short names

Short name	Organisation
UU	Universiteit Utrecht
UGent	Universiteit Gent
UoN	The University of Nottingham
SVA	Statens Veterinärmedicinska Anstalt
INRAE	Institut National de Recherche pour l'Agriculture, l'Alimentation et l'Environement
IDELE	Institut de l'Elevage
NVI	Veterinærinstituttet – Norwegian Veterinary Institute
IRTA	Institut de Recerca i Tecnologia Agroalimentàries
SRUC	Scotland's Rural College
AHI	Animal Health Ireland Initiative
GD	Gezondheidsdienst voor Dieren B.V.
AUSVET	EpiMundi
accelCH	accelopment Schweiz AG
HFP	Human Factors Partners

Executive Summary

This deliverable presents results from the WP3 evaluations of DECIDE decision support prototypes, assessing both usability and usefulness with targeted user groups (farmers, veterinarians/advisors, industry and authority stakeholders). Evaluations combined task-based usability testing (where interactive tools existed), System Usability Scale (SUS) measurement, targeted usefulness items, and qualitative group discussions and workshops to produce actionable guidance for tool improvement, governance and further development.

Objectives of the Deliverable

- Assess how well DECIDE prototypes support real user needs by measuring usability (effectiveness, efficiency, satisfaction) and perceived usefulness for decision making.
- Identify priority usability fixes, data and governance constraints, and feature needs to increase operational uptake.
- Produce cross tool synthesis and prioritized recommendations to guide further development, deployment and sustainability planning.
- Contribute to the general understanding of users' requirements and preferences in using digital tools in animal health management.

Activities

- Secured ethical oversight (ERB Review Vet S24.0001) covering partner evaluations.
- Piloted the test instruments to guarantee clarity and appropriateness.
- Recruited participants to conduct tool evaluations.
- Evaluated 14 active prototypes (counting species-specific and multivariant tools separately) across cattle, pigs, poultry, salmon/aquaculture and precision livestock domains.
- Applied a core WP3 evaluation framework (task completion tests, SUS, usefulness Likert items, structured group discussions) for mature interactive tools; used usefulness focused interviews/workshops for early-stage prototypes or concept designs.
- Conducted analysis of quantitative and qualitative data to assess usability and usefulness of the tool being evaluated, and to collect insights for tool improvement.
- Scientific publication on tool evaluation is in preparation.

Outcomes

- Measured and provided quantitative and qualitative evidence produced per tool.
- Identified overarching and general findings regarding determinants of operational usefulness.
- Tool specific highlights.
- Actionable recommendations divided into short term fixes within the project, and priorities beyond the project.

Next steps

- Immediate implementation: roll out usability patches, add concise in-app guidance and publish "About statistics/data" panels; enable CSV/PDF exports for key outputs.
- Beyond the project: tune alert algorithms, add configurable benchmarking and peer groups, provide sample size/confidence indicators, build an exportable API and explore single sign on options.

1 Analysis and synthesis

1.1 Input sources for the evaluation of the prototypes of decision support tools

The evaluation of decision support tools within the DECIDE project focuses on two key dimensions: **usability** and **usefulness**. Together, these aspects provide a comprehensive understanding of how the tools are experienced by intended users and how effectively they support decision-making processes.

Usability refers to the extent to which a tool can be used by specific users to achieve defined goals effectively, efficiently, and satisfactorily. Usability testing evaluates a tool by observing real users as they interact with it, providing direct evidence of how users engage with a system in practice.

Key characteristics of usability testing include:

- **Focus on intuitiveness**: assessing whether the design is clear and easy to navigate, particularly for users with no prior exposure to the tool.
- **Observation under controlled conditions**: monitoring how participants attempt to complete tasks using the tool for its intended purpose.
- **Identification of barriers**: highlighting functions or features that are less intuitive, which can then be refined by developers.

In the DECIDE project, usability testing will be complemented by qualitative research methods. This combination allows us not only to observe user actions but also to explore their motivations, perceptions, and expectations. Together, these insights provide a richer understanding of the user experience.

Usefulness refers to a tool's perceived value in supporting decision-making. In this project, usefulness is defined as the degree to which the tools are considered helpful by their intended users in the context of **disease prioritisation and control**.

Evaluating usefulness involves examining:

- **Perceived relevance**: whether users believe the tool addresses their needs and decision-making challenges.
- **Practical application**: how the tool is actually used in real-world settings.
- **Impact on decision-making**: the extent to which the tool supports or improves prioritisation and control strategies.

By assessing both usability and usefulness, the project aims to investigate how decision support tools should be developed to not only be easy to operate but also be meaningful and effective in practice.

1.2 Methodology

The following evaluation framework was developed and used. An evaluation framework here means a structured set of methods, measures and procedures designed to ensure consistent, comparable and actionable assessment of a tool's usability and usefulness.

In some cases, the evaluation framework has been modified to accommodate different tool development stages, number of current users, outreach of the tool in multiple countries, country-specific context, or use of specific hardware.

General Questions	The objective of this activity was to provide background information about participants to be used for the demographic description and analysis of the evaluation data. Participants answered 1-4 questions on relevant characteristics: farm size, production type, role (e.g., farmer, advisor, veterinarian), age and gender.

Task Completion Test

The objective of this activity was to evaluate the **usability** of a given tool by placing participants in realistic usage scenarios. This allowed the observation of participants under controlled conditions. Realistic usage scenarios were selected to ensure they reflected everyday decision tasks for the intended users. Scenario topics were drawn from prior stakeholder consultations and focus groups, routine job tasks reported by farmers, veterinarians and advisors, selecting those that are frequent in practice, critical for decision-making, and representative of core tool functionality. For the tasks, we used either real anonymised data or mock datasets that preserved the statistical and contextual properties of operational data. Scenarios and task wording were pilot-tested with a small number of representative users (usually 2 or 3) and refined to remove ambiguity. Facilitators used standardised scripts to present tasks consistently across participants.

Performance was measured in terms of 1) efficiency or time needed to complete each task (task completion time), and 2) effectiveness or the degree to which each task is successfully carried out (task completion rate). Tasks were tailored to the specific functions of each tool.

Examples:

- *You are a farmer in the FriskKo program. You would like to know if, based on your laboratory test results, you are on the Green List. Looking at the app, can you tell if you are on the Green List?*
- *As a pig farmer, you would like to know how the feed efficiency on your farm is going. What was the feed conversion ratio (FCR) for finishing pigs in 2024, week 10?*
- *You are a salmon site manager working in PO3, responsible for monitoring mortality across several sites in this PO. Which neighbouring PO has higher mortality in December 2024: PO2 or PO4?*

The test was conducted remotely using Teams or similar platforms that support screen sharing and video recording. Sessions could be synchronous (real-time interaction between evaluator and participant) or asynchronous (participant working independently). Responses were typed into the chat box, enabling storage for later analysis alongside screen recordings.

Survey

The objective of this activity was to evaluate the perceived usability and usefulness of a given tool.

Perceived usability was measured by the System Usability Score (SUS). The SUS consists of 10 items rated on a 5-point Likert scale (from *strongly agree* to *strongly disagree*). For this study, the English version was slightly modified by replacing the word *cumbersome* from the original SUS with *awkward to improve survey completion by participants as suggested by Bangor et al., 2009*. Surveys were administered in the local language where applicable. The 10 items in the SUS are the following, where the word “tool” can be substituted by the actual name of the tool:

1. I think that I would like to use this tool frequently
2. I found the tool unnecessarily complex
3. I thought the tool was easy to use
4. I think that I would need the support of a technical person to be able to use this tool.
5. I found the various functions in this tool were well integrated
6. I thought there was too much inconsistency in this tool
7. I would imagine that most people would learn to use this tool very quickly
8. I found the tool very awkward to use
9. I felt very confident using the tool
10. I need to learn a lot of things before I could get going with this tool

Scores are assigned to each question following the grading system described by Brooke, 1996. The SUS yields a single composite score ranging from 0 to 100, with scores above 70 considered good.

Perceived usefulness of the tool was assessed through additional items rated on a 5-point Likert-scale (from *strongly agree* to *strongly disagree*) tailored to the functions of each tool. This allowed the assessment of perceived relevance and impact on decision-making.

Examples used to evaluate different functions:

- Temporal trend functions: *I would use this tool to get an overview of farm problems.*
- Benchmarking functions: *I would use this tool to compare my farm to others*.
- Welfare indicators: *I would use this tool to identify animal welfare problems in my farm*.
- Overall impression: *I think this tool would be helpful for managing youngstock health in my farm. I intend to use this tool in the future*.

The survey was administered after participants had used the tool but before any debriefing or group discussion.

Group Discussion

The objective of this activity was to gather qualitative insights into usability and usefulness, and identification of barriers for better tool usability and usefulness. Key themes included:

- General usefulness and usability of the tool

  Examples:

  - *Do you think you would use the tool? If yes, what would you use the tool for? If not, why not?*
  - *Which tool improvements would you like to see for you to use the tool?*

- Communication of information / messaging

  Examples:

  - *Does it display enough information to make a decision?*
  - *What information is missing for you to be able to make a decision?*
  - *Would you need a benchmarking function in the tool?*

- Impact of decision-making

  Examples:

  - *What would you do if the tool showed that you have had positive animals to Mycoplasma bovis?*

- Data privacy

  Examples:

  - *How would you feel about your data being used in the tool?*
  - *What information do you need to feel safe about sharing your data for this tool?*

All evaluation activities were conducted in the local language of the participating country. Transcripts and survey responses were subsequently translated into English in those cases where the evaluation was conducted in a language other than English. In cases where machine translation was used, a native speaker reviewed the translations to ensure accuracy. The translated materials were then shared with Work Package 3 (WP3) for combined analysis across all tools under development. Prior to participant recruitment, all test instruments were piloted locally to ensure clarity and appropriateness.

Participants received detailed information about the evaluation activities one week before the sessions. This allowed them to provide informed consent in advance. At the beginning of each session, the evaluator welcomed participants, explained the purpose of the evaluation, and reiterated that the focus was on assessing the tool rather than the participant. Participants were reminded that the information collected would be used to improve the usability and usefulness of the tool.

Following consent, participants were given two minutes to freely explore the tool before being asked to complete some tasks. After each task, participants submitted their responses via the chat function. To minimize distractions, participants were encouraged to keep their cameras and microphones turned off. At the end of the session, participants completed a digital questionnaire assessing perceived usability and usefulness. The entire task completion exercise lasted approximately 20 minutes.

1.3 Ethical considerations

The WP3 research protocol "Usability and usefulness evaluation of tools (DECIDE project)" received ethical approval from the Science Geosciences Ethics Review Board (SGERB) under reference ERB Review Vet S24.0001. This approval covers the evaluations conducted by DECIDE partner institutions across the EU.

Some partner institutions elected to submit or obtain additional local ethical approvals to satisfy their institutional or national requirements (for example, INRAE's national committee approval for BRD work and the University of Nottingham approvals no. 3741221213 and 4471 260925 that covered Cattle Barometer activities). Where local approvals were obtained, study procedures and participant materials were aligned with the WP3 protocol while meeting specific institutional conditions.

All participants were provided with written participant information one week before involvement and gave informed consent prior to participation. Information sheets explained the study aims, that participation was voluntary, the right to withdraw, how data would be used, and contact details for queries about the study.

Recordings, storage and access controls to evaluation data were implemented in compliance with applicable EU data protection rules (GDPR) and local data governance requirements and aligned with the DECIDE Data Management Plan.

1.4 Overview and assessment of prototypes

The total number of active prototypes evaluated in WP3 was 14, counting species-specific Barometers and multi-variant prototypes separately. These included the Cattle Barometer, Pig Barometer, Poultry Barometer, AbattoirInspect, Laksetap, Salmon Mortality Monitor, PigPeaks, Pig heard health dashboard, Pig HealthCheck System, Purchase Assistant (Swedish and Norwegian variants), Broiler Virus Circulation prototype, and two BRD sensor/tool prototypes (Eval'BRD and Connect'BRD).

Multiple species and domains have been covered in the evaluations: cattle (Cattle Barometer, Purchase Assistant), pigs (Pig Barometer, PigPeaks, Pig herd health dashboard, Pig HealthCheck system, AbattoirInspect, BRD tools), poultry (Poultry Barometer, Broiler Virus Circulation), fish (Laksetap, Salmon Mortality Monitor), and cross-cutting trade/use tools (Purchase Assistant), plus two precision-livestock/monitoring projects (BRD tools) (Table 1).

Based on development stage and purpose of the tools (classification done in D3.2) some tools (Broiler Monitoring Dashboard, Salmon SyS, Early Disease Warning Pigs, Early Warning Calf Mortality, Purchase Risk Meter, Lely Calf Health Support Tool) were not included in formal evaluations within the scope of this deliverable and are therefore not reported here.

Table 1. List of tools with an overview of evaluation activities. Animal icons indicate the species for which each tool is evaluated.

Tool [1]	Task Completion Test	Survey		Group Discussion	
		Usability	Usefulness	Usability	Usefulness
Barometer	✓	✓	✓	✓	✓
BRD tools (Connect'BRD, Eval'BRD)			✓	✓	✓
Abattoir Inspect	✓	✓	✓	✓	✓
Laksetap	✓	✓	✓	✓	✓
Salmon Mortality Monitor		✓	✓		
PigPeaks	✓	✓	✓	✓	✓
Pig herd health dashboard					✓
Pig HealthCheck System		✓	✓	✓	✓
Purchase Assistant	✓	✓	✓	✓	✓
Broiler Virus Circulation					✓

[1] Broiler Monitoring Dashboard, Salmon SyS, Early Disease Warning Pigs, Early Warning Calf Mortality, Purchase Risk Meter, and Lely Calf Health Support Tool are not conducting tool evaluations. Therefore, no results are reported for those tools.

The depth of the evaluation varied by tool:

Full evaluation (usability + usefulness): prototypes with working interactive interfaces and an identifiable user base were assessed with the complete WP3 framework (task completion tests, SUS, usefulness survey items, and group discussions). Applied for the following tools: Cattle Barometer, AbattoirInspect, Laksetap, PigPeaks, Pig HealthCheck System, Purchase Assistant, and BRD tools.

Usefulness focused evaluation only: early-stage prototypes, concept/prototype designs, or tools targeting small, hard-to-reach user groups were assessed mainly for perceived usefulness and fit with workflows (group discussions, stakeholder interviews, and tailored surveys). Applied for the following tools: Pig herd health dashboard, Broiler Virus Circulation, and Poultry Barometer.

Mixed approach: some prototypes combined elements according to readiness. For instance, Laksetap and AbattoirInspect ran full usability tests but included extra stakeholder consultations to prioritise visual changes and governance features.

The depth of the evaluation was accommodated to fit the level and conditions for each tool. The main considerations were:

- Development stage and functionality: fully implemented, interactive web apps were suitable for the full WP3 evaluation (task completion time, task completion rate, SUS). Conceptual prototypes or PowerPoint/wireframe artefacts were better evaluated through usefulness interviews and co-design discussions.
- Current user base and outreach: tools with large multi--country audiences or large current user base (e.g., Cattle Barometer, Pig HealthCheck system) were evaluated at scale and in multiple languages. Tools with single partner pilots or industry- -confidential datasets (e.g., Broiler Virus Circulation) used targeted stakeholder workshops.

- Data sensitivity and governance: tools built on sensitive diagnostic or commercial data required extra time and consultations about aggregation thresholds, access tiers and legal agreements; this influenced the evaluation scope and method (more emphasis on interviews and governance questions).
- Practical constraints: hardware-dependent tools (BRD sensor collars) necessitated prolonged on-farm trials and adapted in-person methods rather than short remote task completion tests.

The general evaluation framework was adapted when needed, based on the following:

- Codesign and scoping: early stakeholder meetings shaped which functions were tested and which usefulness items were prioritised. For example, Laksetap's meetings with NFSA and producers drove added mortality calculator items; Purchase Assistant design meetings with slaughterhouse/industry partners shaped which trading functions were prioritised.
- Local adaptation: evaluations were conducted in local languages; surveys and prompts were adapted to national terminology and data practices. Pilots used familiar local datasets or simulated data when necessary.
- Methodological tailoring: evaluators followed the WP3 core framework but modified it when needed:
    - Asynchronous remote usability testing was used for multi-country tools (Cattle Barometer) to reach broader samples.
    - In-person, longitudinal field testing (BRD tools) captured real-world hardware and alert behaviour across months.
    - Focus groups and workshops (Pig herd health dashboard, Poultry Barometer, Broiler Virus Circulation) emphasised needs, governance and business model discussions rather than single-session task metrics.
    - Survey instruments retained core comparators (SUS and usefulness items) where usable, but added tailored items (e.g., mortality-specific usefulness items for Laksetap; trading-specific items for Purchase Assistant).

1.5 Data Analysis

Sample size and sampling approach

Evaluations aimed for 5–8 participants per prototype evaluation following common usability practice to detect most usability problems while enabling rapid iteration (Nielsen and Landauer, 1993). However, larger samples were used where tools have multi-country audiences or an established large user base (e.g., Cattle Barometer, Pig HealthCheck) to increase representativeness and capture country-level differences.

Participants were recruited using convenience and network sampling appropriate to each tool and country (farmers, practising veterinarians, advisers, industry and authority representatives). Where applicable, users were stratified by role to permit disaggregated analysis (farmer vs veterinarian vs authority).

Measurements

- Task performance metrics:
    - Effectiveness: task completion rate (correct answers / attempts) was calculated per task and reported as a proportion and percentage.
    - Efficiency: task completion time was measured from screen -recordings (or timed session logs) and summarised as mean and standard deviation and median and interquartile range where distributions were skewed. Non-responses or technical recording failures were documented and excluded from time summaries for the affected tasks; denominators for completion rates are reported explicitly.

- System Usability Scale (SUS)
    - SUS scores were calculated following the standard Brooke (1996) procedure: for odd numbered items subtract 1 from the user response (on a 1–5 scale); for even numbered items subtract the user response from 5; sum the adjusted scores and multiply the total by 2.5 to yield a 0–100 score. Summary statistics (mean, SD, median, range) are reported for each evaluated tool and, where sample size allowed, by user group. Scores above ~70 are treated as indicating good perceived usability; values below ~55 are interpreted as indicating clear need for usability improvements.
- Usefulness items
    - Tool-specific usefulness statements were administered on 5point Likert scales and mapped to numeric values 1–5 (1 = strongly disagree … 5 = strongly agree) for positively worded statements unless otherwise stated. Item level means and SDs are reported; where multiple related items were combined into a composite usefulness index this is documented in the tool specific methods.
- Statistical handling and software
    - Descriptive statistics (counts, proportions, means, medians, SD, IQR) are used throughout to summarise quantitative findings. Where sample sizes were sufficient, subgroup comparisons (e.g., farmers vs veterinarians) are presented descriptively. Analyses were performed using spreadsheet tools.

In this deliverable, findings triangulate across three streams: measured usability (task performance and SUS), perceived usefulness (survey items), and qualitative insights from group discussions. Where measures align (for example, low SUS and low task completion corroborated by qualitative reports of confusing navigation), we treat the finding as high confidence and prioritise actionable fixes. Where streams diverge (for example high usefulness ratings but low task completion), we interpret this as signalling perceived value but operational usability barriers that require targeted design work.

1.6 Conclusions and recommendations from the evaluation of tools

Overall, the DECIDE prototype evaluations show that most tools demonstrate clear potential to improve surveillance, benchmarking and situational awareness for specific user groups (veterinarians, advisors, farm managers, and authorities). Usability and usefulness vary substantially between prototypes, largely driven by data timeliness, granularity, clarity of calculations, and fit with existing workflows. Where a tool matched user needs (clear, concise indicators; appropriate spatial/temporal resolution; easy export/benchmarking), intentions to use and recommend were high even when formal usability scores were moderate. Common barriers to adoption were: (1) insufficiently timely or granular data for operational decisions, (2) unclear or inconsistent presentation and navigation, (3) lack of transparent methods/metadata, and (4) unresolved data governance and privacy concerns.

Overarching key findings:

- Data timeliness and granularity drive usefulness: monthly or nearer real-time updates are needed for operational decisions. Annual or delayed updates limit tools to strategic/trend uses rather than operational decision support.
    - Farmers: need farm- or site-level, near-real-time data to act (operational decisions).
    - Veterinarians/advisors: accept slightly coarser (monthly/quarterly) data for planning but want the ability to drill down for clinical follow-up.
    - Industry/authorities: prioritize robust, reproducible aggregated data for benchmarking and policy, they tolerate lower frequency if methods are transparent.

- Consistent presentation of metrics and navigation is essential for tool usability: users struggled with crowded pages, unclear filters, inconsistent terminology, non-intuitive maps and missing “back/reset” controls reduce task success.
    - Farmers: navigation friction, crowded dashboards, unclear filters and missing onboarding reduce task completion and willingness to use in routine work.
    - Veterinarians/advisors: tolerate a steeper learning curve but ask for clear primary workflows, help boxes and exportable reports to use during consultations.
    - Authorities/inspectors: demand consistency (terminology, units, date formats) and reproducibility (versioning, provenance) to use outputs in reporting.
- Transparency and trust: clear metadata, calculation methods and sample-size indicators are required for confident action. Trust depends on transparency: all user groups (farmers, veterinarians/advisors, industry/authorities) want metadata, calculation methods, and clear statements on data lineage and aggregation. This affects willingness to act on outputs.
- Benchmarking, exports and integration are high-value features supporting advisory workflows. Benchmarking and export/printable reports are high-value features for many user types — they support advisory workflows and on-farm decision-making. Integration into existing workflows and systems (APIs, single-sign-on, data import/export) reduces user burden and increases adoption likelihood.
    - Farmers and veterinarians use exports and printable reports in on-farm visits.
    - Authorities use APIs and reproducible datasets for monitoring and policy analysis
- Data governance: tiered access and aggregation thresholds are essential to increase data sharing. Privacy and governance are recurring concerns.
    - Farmers: worry about re-identification and commercial consequences, need opt-in controls and clear audience rules.
    - Veterinarians/advisors: want tiered sharing (e.g., veterinary vs public view) so they can use data with clients.
    - Industry/integrators: more sensitive to aggregated vs farm-level visibility; business model and legal clarity determine willingness to share.
- Usability and usefulness often trade off: highly detailed tools require careful design (progressive disclosure, tutorials) so non-expert users remain effective.

Tool-by-tool takeaways:

- Barometers (Cattle / Pig / Poultry): Good value for regional surveillance and trend monitoring; users want finer spatial resolution, real-time updates, clearer filters, and separation of vaccine vs field strains for IBV (poultry).
- AbattoirInspect: Strong usability and perceived usefulness for benchmarking and farm-level discussions; requests focus on refining visualisations (full/partial rejections), sliding time controls, exportable reports and sustainable hosting. Additional evaluation results from ongoing piloting of this tool in the rest of UK is expected; updated results will be integrated in deliverable D3.4.
- Laksetap: Clear value for industry/regulatory trend monitoring; needs clearer terminology, calculation transparency, more frequent updates, and API access and downloadable outputs to increase operational use.
- Salmon Mortality Monitor: strong perceived usability and usefulness; needs mortality calculation transparency and addition of more regions.

- PigPeaks: High perceived usefulness for farmers and veterinarians (trend-following, benchmarking functions); usability improvements (navigation, instructions or tutorials) will raise SUS and task success. Evaluate the addition of treatments and other actionable data layers.
- Pig herd health dashboard: Early-stage usefulness confirmed by vets; next steps should prioritise integration, customization of data visualisations for veterinarians and data-sharing solutions before interactive prototype testing.
- Pig HealthCheck System: Useful for overview, benchmarking and alerts; users request real-time alerts, improved notifications, and easier login and user experience.
- Purchase Assistant: Useful for trade-oriented users (buying/selling animals); trust and perceived value hinge on update frequency, additional animal data (vaccination/treatments) and clear privacy controls for sellers.
- Broiler Virus Circulation: Stakeholders judge prototype useful; viability depends on business model and robust governance to enable data sharing while protecting commercial interests prior to full-scale development.
- BRD tools: Strong potential for early detection and farmer reassurance; key technical issue is high alert sensitivity (false positives requiring algorithm tuning) and burdensome hardware/usability aspects (collars).

Table 2. Short summary table with usability findings.

Tool	Average SUS[1]	Task completion rate
Barometer (cattle)	60	60%
Laksetap	67.22	55.6% - 100% (varies by task)
Salmon Mortality Monitor	72.5	67% - 100% (varies by task)
PigPeaks	48.9	37.5% - 90.9% (benchmark task 37.5%)
Pig HealthCheck System	53.5	no task completion test performed
Purchase Assistant (SE)	63.7	54.5% - 80% (varies by task)
Purchase Assistant (NO)	47.1	63% - 100% (varies by task)
AbbatoirInspect	78	100%

[1] The SUS yields a single composite score ranging from 0 to 100, with scores above 70 considered good.

Findings about tool-specific SUS align with the qualitative findings: moderate SUS (50 – 70) correspond to users seeing value but experiencing specific usability barriers (navigation, filters, maps), while lower SUS (~49) indicates clearer needs for interface simplification and guidance. Tools with SUS < 60 are flagged for targeted usability work (navigation, onboarding, filters). Tools with SUS below ~55 and low task completion rates should prioritize onboarding (info buttons, short tutorials), clearer filters, and simplified primary workflows before adding advanced features.

Changes that increase timeliness, clarity, transparency and integration—combined with robust data governance and iterative co-design—will convert the demonstrated potential of the DECIDE prototypes into practical, sustainable decision support used in day-to-day animal health management. Here there is a list of prioritised recommendations:

Short-term (release / next iteration, high priority)

1. Improve navigation and clarity across all prototypes: simplify start pages, add clear “home/reset/back” controls, improve filter UX and fix map drag/zoom issues.
2. Provide concise user guidance: add short on-page info buttons, 60–90s video tutorials, and task-oriented help boxes for first-use scenarios.

3. Publish basic metadata and calculation methods in-app: single “About statistics / data” panel with data sources, update frequency, aggregation rules and example calculations.
4. Add export/print functionality for tables and figures (PDF/CSV) to support advisory and reporting workflows.
5. Address critical data-timeliness gaps where feasible (move from annual to monthly or more frequent updates) for tools aimed at operational decisions (Laksetap, Pig HealthCheck, Purchase Assistant).
6. Implement tiered privacy controls and clearly communicate who can see what (e.g., public / vets / logged-in users) and the minimum aggregation thresholds to reduce re-identification risk.

Medium- and long-term (sustainability / governance / scaling)

1. Introduce benchmarking features with configurable peer groups and anonymous comparison options; allow users to opt in/out of sharing.
2. Improve visual interaction patterns: implement sliding time selectors, hover tooltips with exact values, and clearer colour-coding for categorical comparisons (e.g., full vs partial rejections).
3. Tune alarm/alert algorithms (BRD tools, others issuing alerts): reduce false positives, add adjustable sensitivity and provide rationale/explanations for each alert.
4. Implement an exportable API and explore single-sign-on or federated login where multiple existing systems exist (to reduce double data entry).
5. Add sample-size / confidence indicators and measures of dispersion where relevant (Barometers, PigBarometer) so users can assess robustness before acting.
6. Define and publish a project-level data governance framework (roles, responsibilities, legal basis, retention, provenance) and reusable consent templates for data providers.
7. Create a sustainability plan for hosting, maintenance and funding (identify whether tools will be hosted by public agency, consortium, or commercial partner).
8. Develop a roadmap for cross-tool interoperability (shared vocabularies, minimal metadata schema, and APIs) to enable integrated workflows and reduce fragmentation.
9. Engage user groups in iterative co-design cycles and usability testing (5–8 targeted users per iteration) to progressively refine complex features.
10. For commercial/industry-sensitive domains (e.g., Broiler Virus Circulation), define business models and access tiers early to balance data sharing incentives and competitive concerns.

Broader sustainability and commercial aspects are further addressed in the Roadmap for Exploitation (D6.8).

For more detailed description of materials, methods, and results from evaluation of each tool, please see full tool-specific sections below (2 and 3).

2 Prototype evaluation: material, methods and findings

2.1 Barometer – Belgium, France, Ireland, Spain, the Netherlands

2.1.1 Short description about tool and context

The **Cattle Barometer** visualizes pathogen-specific lab results of field samples obtained from cattle over Europe. It shows the historical trend, dynamics and current presence of specific pathogens per area. It holds the potential for early warning and to support decision-making on farm to control infectious diseases, such as antimicrobial use, vaccination, and purchase of animals. Currently, the dashboard includes data from Belgium, The Netherlands, and Ireland, provided by DGZ, ARSIA, PathoSense, Royal GD, GOV (Department of Agriculture, Food and the Marine) Ireland, and VigiGrippe.

The **Pig Barometer** is a decision-support tool to enhance disease surveillance and support evidence-based decision-making in pig production. Surveillance systems are essential for understanding disease dynamics and enabling early warning for infectious disease control. The Pig Barometer aggregates swine diagnostic data from Spanish veterinary diagnostic laboratories (VDLs) and displays them in interactive dashboards, describing pathogen detection trends by PCR-based assays over time, specimen type, age group, and geographical area. Data are anonymized, cleaned using Python, converted into RDF format, and structured with ontologies to ensure interoperability. Aggregated results are processed in Python and integrated into Tableau for visualization. Target users include veterinarians, farm managers, and advisors in the pig production sector.

The **Poultry Barometer** is a tool created by UU based on data from GD. The tool visualizes the different strains of infectious bronchitis virus (IBV) that were detected in lab submissions through PCR testing and sequence analysis. This data can help poultry veterinarians in their advice to poultry farmers, specifically broiler farmers, about the vaccination strategy against IBV, since available vaccines do not protect against all IBV strains. The dashboard provides an overview of the most prevalent strains each time period and region. Results can be filtered to show results from only broilers or layers.

2.1.2 Discussions with stakeholders

Prior to the development of the **Cattle Barometer** and led by WP5, dairy farmers' needs for a data driven decision support tool were identified via focus group discussions in Belgium, Ireland, the Netherlands, Norway, Sweden, and the UK (Doidge et al., 2024a). Similarly, vets' needs were identified using a qualitative survey approach in Ireland and the UK (Doidge et al., 2024b).

To identify the need and interest in a pig health monitoring system such as the **Pig Barometer**, two in-person focus groups were conducted between June and November 2022 at IRTA-CReSA (Zhou et al., 2024). During tool development, several meetings were held with six veterinary diagnostic laboratories (VDLs) in Spain to co-design the tool. Prior to collaboration, VDLs signed a Data Sharing Agreement (DTA). The first online meeting (April 2023) focused on requirements and data limitations, while the second (October 2024) followed the release of the first version. A key outcome was the recommendation to evaluate the tool with end-users.

The first version of the **Poultry Barometer** was discussed with members of the consortium during the WP5 workshop on tool design in January 2025. Based on the feedback received during this workshop, changes were made regarding tool design and functionalities, and these were presented in June 2025 to poultry veterinarians working at GD.

2.1.3 Participants

For the **Cattle Barometer**, survey invitations were emailed to veterinarians in Ireland (n=18) and the UK (n=25) who had previously participated in related research on farm technology, as well as 24 Irish farmers. In Belgium, veterinarians interested in using epidemiological data for professional or research purposes were invited via email. In the Netherlands, a QR code linking to the survey was presented during a lecture on calf respiratory infection to veterinary professionals at the University of Utrecht, and 25 veterinarians identified as potential end users of the cattle dashboard were also contacted by email, followed by personal reminders after two weeks. During a calf health day in the Netherlands, veterinarians were shown the dashboard and invited to complete the survey. In France, IDELE emailed veterinarians

experienced with online questionnaires and previously involved in interviews (n=6). No compensation was provided. The survey was open from October 2024 to March 2025.

For the **Pig Barometer**, a first-round evaluation was conducted in November 2024 via an online focus group with veterinarians who had participated in earlier discussions. The session lasted approximately 90 minutes and followed a semi-structured format to gather feedback on usability and functionality.

Inclusion criteria required experience in pig health management and decision-making roles.

- Evaluation focus group (online):
    - Participants: 6.
    - Roles:
        - veterinarians from integrator companies.
        - 1 independent practitioner.
        - 1 corporate veterinarian (consultancy).
        - 1 producers' association representative.

VDLs involved in co-design and data provision: Exopol S.L. (Zaragoza), Eurofins Convet S.L.U (Lleida), Biofar Laboratoris S.L. (Barcelona), Zootecnia® S.L.P. (Salamanca), Laboratorios Hipra S.A. (Girona), Labopat Nuzoa (Segovia).

For the **Poultry Barometer**, Dutch poultry veterinarians were recruited to participate in an **in-person discussion** that was held in September 2025. Recruitment was conducted through convenience sampling, using personal connections. Multiple veterinarians from one poultry practice were asked to participate. There were no additional inclusion criteria. The group discussion was held with three male poultry veterinarians. Questions focused mostly on usefulness of the tool and how the tool could be improved. Questions about general usability, communication of information, and data privacy were also included.

In addition to the in-person discussion, an **online survey** is planned in January 2026. This survey will include questions from WP3 (tool usefulness) and WP5 (trustworthiness) and focus on the **cattle, pig** and **poultry barometer**. It is led by WP5. It will be distributed through the newsletter of the Federations of Veterinarians of Europe (FVE). The inclusion criteria will be employment as a veterinary practitioner, state veterinary officer, or staff member at a food safety or veterinary institute, as well as involvement in farm work and working with cattle, pig and/or poultry.

2.1.4 Technical Setup

For the **Cattle Barometer**, the survey was hosted on the Ballpark platform (https://ballparkhq.com/). This platform has features which allows audio and video recording of participants screens. Consequently, we can watch and listen to participants' interaction with the Cattle Barometer.

For the **Pig Barometer**, the evaluation group discussion was held online via Microsoft Teams. Sessions were recorded, except for meetings with VDLs. Before the evaluation, participants received an email with:

- Contextual information.
- Pig Barometer User Manual (PDF).
- Direct link to the tool.
- Preliminary questions for reflection.

Participants explored the tool without time restrictions prior to the session and connected using their own devices and internet connections, simulating real-world conditions.

The in-person discussion for the **Poultry Barometer** took place at a veterinary practice in the Netherlands. The tool was shown on a digital board. Audio was recorded on the Voice Memos app from an iPhone. The recording was manually

transcribed by the first moderator. Then, the transcript was translated to English using Google translate with manual corrections. The planned **online survey** will be administered digitally through the survey platform Tivian and will be distributed through the newsletter of the Federations of Veterinarians of Europe (FVE).

2.1.5 Data Collection Procedures

To evaluate the **Cattle Barometer**, we used an Asynchronous Remote Usability Testing method. This method has been shown to be able to detect of a greater number of usability problems than synchronous methods, whilst also being more convenient for participants (Alhadreti, 2022). We also chose this method as we aimed to collect responses from multiple countries. Thus, Asynchronous Remote Usability Testing enabled us to collect responses in multiple languages without the need for the presence of several evaluators.

The evaluation of the **Pig Barometer** was conducted by IRTA researchers in line with the WP3 evaluation framework. Group discussion was recorded via Microsoft Teams. Rather than producing a full verbatim transcript, key insights and outcomes were extracted from the recording, anonymized to ensure confidentiality, and translated into English. These summarized findings were then shared with the evaluations (pig veterinarians) for validation and consensus on the final interpretation.

For the **Poultry Barometer**, two moderators led the in-person discussion. The first moderator was a broiler health researcher who developed the tool. The second moderator was a poultry specialist in training from UU, who was not involved in the DECIDE project but maintained professional connections with the participating veterinarians. The evaluation framework was loosely followed, meaning that the initial questions were selected from the framework, but an open discussion was encouraged.

2.1.6 Task completion test

The participants provided their first impressions of the **Cattle Barometer**. For this task, there was a link to the Cattle Barometer website, which opened in a new window. The participants were informed that their screen and microphone were being recorded during this task, and they were invited to speak to the microphone to tell us their thoughts and feelings when trying to use the website. There were no time restrictions for this task as the aim was for participants to try out different functions of the tool. After completing the task, the participants were asked to provide their first impressions of the tool using an open-ended text box.

The participants were then instructed to complete a specific task on the Cattle Barometer: find out the percentage of positive samples in Ireland in December 2022. Again, participants were informed that their screen and microphone were being recorded during this task. After completion of the task, the participants were asked to provide an answer for the percentage of positive samples in Ireland in December 2022.

No task completion tests were done for the Pig Barometer or Poultry Barometer, as the evaluation focused on perceived usefulness of the tool.

2.1.7 Survey

Four versions of the **Cattle Barometer** survey were developed: in French, Dutch, and two in English. The English versions were for participants in Ireland, Belgium, or the Netherlands who preferred English, and for UK participants. The UK version contained slight wording changes since UK data were not yet included, with an instruction to imagine UK farm data being available.

The survey collected the following demographic information:

- Gender (male, female, prefer not to say, other)
- Age (30 or under, 31 - 40, 41 - 50, 51 - 60, 61 - 70, 71+)
- Role (farmer, veterinarian, advisor, researcher, other)
- Sector (dairy, beef suckler, beef fattening/finisher, dairy calf rearing, veal)

The survey following the task completion test included the 10-item System Usability Scale (SUS) using 5-point Likert ratings as described in 1.2, and questions about participants' likelihood of using the tool, reasons for use or non-use, and suggestions for improvement through the following open-ended responses:

1. Would you use this tool in the future?
    a. if yes, what would you use the tool for?
    b. if no, why would you not use this tool?
2. How do you think the tool could be improved?

The final section asked participants to rate their comfort with the tool's data being available to different audiences—veterinarians, farmers, and the public—using a 5-point Likert scale with the following questions:

1. I am comfortable with the data outputs of this tool being available to vets
2. I am comfortable with the data outputs of this tool being available to farmers
3. I am comfortable with the data outputs of this tool being available to members of the public

No survey has been carried out for the **Pig Barometer** yet. A digital survey is planned for early 2026. The survey will assess perceived usability (e.g., ease of navigation, clarity of graphs, intuitiveness), and perceived usefulness (e.g., relevance for decision-making, added value for herd health management).

The survey will be distributed online to veterinarians and other stakeholders and analyzed within the WP3 evaluation framework to ensure methodological consistency.

For the **Cattle, Pig** and **Poultry Barometer** online survey, the following questions regarding usefulness of the tool will be included:

- How useful do you think this decision support tool would be in helping you decide about which vaccines to choose for broilers on your client's farm?
- How useful are the following features of the tool? (features adjusted for cattle and pig barometers)
    - The map that shows the prevalence of IB strains per region
    - The bar plot that shows the prevalence of IB strains per time period
    - Being able to choose the poultry type to inspect
    - Being able to choose which quarter to display in the map
    - Being able to choose which time periods to display in the bar plot
- Do you have suggestions for improvements or other functionalities for the dashboard?

2.1.8 Group Discussion

The evaluation of the **Cattle Barometer** used Asynchronous Remote Usability Testing method given the number of countries in which the evaluation was being performed. Therefore, the questions included in the discussion guide of the general evaluation framework were included as open-ended questions in the survey instead, as described in 2.1.7.

Participants were allowed to explore the **Pig Barometer** freely prior to the session, with no time restrictions, after receiving contextual information, a user manual (PDF), and a direct link to the tool. The evaluation focused on qualitative feedback regarding usability, clarity, and perceived usefulness.

The group discussion was structured around the following guide:

Usability	○ Would you use the tool if it were available?
	○ How intuitive is it? How easy is it to find specific information?
	○ Are the graphs easy to understand? Are there enough visual elements?
Usefulness	○ What improvements would you like to see?
	○ How would you feel if your data were included in the tool?

- What other information should be represented?
- How should access to this information be managed?

For the **Poultry Barometer**, the following questions were included in the discussion guide:

Context	○ How often do you give advice on IB vaccinations? ○ How do you choose which vaccines to advice? ○ Do you use the current IB monitoring report from GD?
Usability	○ Do you understand the tool functions at first glance?
Usefulness	○ Do you think the visualisations of IB strains are useful? ○ Would you use this tool when advising farmers on their IB vaccination schedule? ○ If not, what information is missing? ○ Is the tool useful for laying hens (compared to broilers)?
Communication of information	○ How specific do you want the geolocations to be? ○ Is the information updated frequently enough?
Privacy	○ How would you feel about your data being used in the tool?
Other	○ Would you want the tool to be a website? ○ If all neighbouring farms were included in the tool, would you still send in samples for IB testing and strain determination? ○ Would you be willing to pay for this tool?

2.1.9 Tailored Modifications of the General Framework Procedure

Given the different countries in which the evaluation for the **Cattle Barometer** was conducted, the questions included in the group discussion were instead included as open-ended questions in the survey.

For the **Pig Barometer**, the general evaluation methodology was adapted to the Spanish context by:

- Conducting initial focus groups in person to build trust and gather in-depth insights.
- Using online sessions for later evaluations to accommodate participants' schedules and geographic distribution.
- Providing preparatory materials (manual, link, reflection questions) to ensure participants could explore the tool before discussion.
- Emphasizing data governance and confidentiality due to sensitivity around diagnostic data sharing.

Since the **Poultry Barometer** is a newly developed tool without any prior evaluations, the evaluation focused most on general usefulness.

2.1.10 Results

There were 25 participants that evaluated the **Cattle Barometer** tool. Participant came from Belgium (n=6), France (n=7), Ireland (n=4), the Netherlands (n=5) and the UK (n=3). The roles of the participants included advisor (n=3), farmer (n=3), laboratory scientist (n=3), researcher (n=6) and veterinarian (n=15). Participants could select more than one role.

Fifteen participants provided the correct answer (15/25, 60%) to the task to find out the percentage of positive samples in Ireland in December 2022. The mean number of seconds to complete the task was 158 seconds (SD = 121 seconds). The median was 132 seconds (IQR 88-186).

The mean SUS score was 60 (SD = 19) and the median was 57.5 (IRQ 50-70). The ratings for each statement in the SUS are provided in Table 3. Nineteen (76%) participants said that they would use the tool in the future and 6 (24%) participants said that they would not.

Table 3: Ratings for each statement in the SUS for the Cattle Barometer

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Mean
I think that I would like to use this tool frequently	4 (16%)	5 (20%)	10 (40%)	3 (12%)	3 (12%)	2.84
I found the tool unnecessarily complex	2 (8%)	9 (36%)	8 (32%)	6 (24%)	0 (0%)	2.72
I thought the tool was easy to use	2 (8%)	10 (40%)	7 (28%)	5 (20%)	1 (4%)	2.72
I think that I would need the support of a technical person to be able to use this tool	13 (52%)	6 (24%)	2 (8%)	2 (8%)	2 (8%)	1.96
I found the various functions in this tool were well integrated	2 (8%)	5 (20%)	6 (24%)	10 (40%)	2 (8%)	3.20
I thought there was too much inconsistency in this tool	8 (32%)	10 (40%)	3 (12%)	3 (12%)	1 (4%)	2.16
I would imagine that most people would learn to use this tool very quickly	1 (4%)	2 (8%)	6 (24%)	11 (44%)	5 (20%)	3.68
I found the tool very awkward to use	8 (32%)	5 (20%)	7 (28%)	3 (12%)	2 (8%)	2.44
I felt very confident using the tool	2 (8%)	10 (40%)	5 (20%)	6 (24%)	2 (8%)	2.84
I needed to learn a lot of things before I could get going with this tool	12 (48%)	4 (16%)	6 (24%)	1 (4%)	2 (8%)	2.08

Open-ended questions allowed for the identification of areas for improvement for the tool. These have been split into design, navigation, content, and terminology factors. Each sub-factor has been given a severity rating, which relates to how problematic the factor is for completing a task.

Design factors

Crowded page (Severity – high): There is a lot of information on the start page of the Cattle Barometer, which can be overwhelming for users. Consider having a start page where users can select what they would like to see.

Difficulties using map (Severity – moderate): The map appeared difficult for the users to control in the recordings. The map seemed to zoom out very easily. The users seemed to have to scroll to move the map, but they tried to "drag" it with their mouse instead. The dragging using the mouse did not move the map.

Size of user interface (Severity – high): The users commented that the box that the Cattle Barometer interface appears in on the DECIDE website is too small. There is opportunity to increase the size of the user interface so that all the information is clearly visible at once.

Size or location of labels (Severity – low): There were a few comments regarding the size or location of labels that interfered with the visibility of the plot.

Navigation factors

Lack of "back" or "return" button (Severity – high): Once users select certain options, there currently is not a way to return to the original screen. This made it difficult for some users to complete the task. Consider including a back button, reset button, or/and a return to home button.

Improving filter function (Severity – high): Users found it difficult to filter information. They also did not know how to clear a filter once some options had been selected. The filter for the date was particularly problematic for users.

Content factors

Training or tutorial information (Severity – moderate): The tool may benefit from more specific guidance on how to use the tool. Some examples given by participants include video tutorials and providing information in task boxes on the user interface.

Terminology factors

For the ***Date (Severity – moderate)***: The date is currently in American format (MM/DD/YY) instead of European format (DD/MM/YYYY).

Language (Severity – low): Some users mentioned that they would like to see the tool available in languages other than English.

The participants thought that the tool would not be that useful for individual farmers or maybe advising farmers at the individual level. Instead, it could be more useful to make decisions at the regional level, to aid communication (e.g., providing disease prevention advice), or to help guide research.

Pig Barometer, the following key findings were as follows:

- Stakeholders recognized the value of a diagnostic data visualization tool, particularly for monitoring national health trends.
- Limited utility for daily decision-making was noted due to insufficient speed, precision, and data granularity.
- Users found the tool intuitive and easy to navigate, with clear and understandable graphs.
- Suggested improvements included:
    - Finer spatial resolution (e.g., municipality level).
    - Real-time updates.

  - Inclusion of negative cases.
  - Normalization by pig population density.
  - Measures of data dispersion.
  - Incorporation of additional pathogens.
- Participants supported data sharing, provided clear governance and tiered access were implemented.

To evaluate the **Poultry Barometer**, three poultry veterinarians from the Netherlands participated in the in-person group discussion that was held at their veterinary practice.

General Usefulness

The veterinarians had a mixed response regarding the usefulness of the tool. Their focus was on limitations of the tool which they deemed crucial before they would use it. The first limitation was the distinction between vaccine strains and field strains. The second was the number of samples included in the tool. Provided these problems were solved, they could see the tool being used to support advice on vaccination against IBV as a preventive measure. The tool would be more useful in broilers than in layers because layers are already vaccinated against many different strains. The tool was considered less useful when a farm already experienced problems with IB, because the veterinarians always submit samples in case of respiratory problems. In addition, while the tool was considered nice to have, it was not deemed essential. Because the tool's objective, knowing which strain is most prevalent, can already be achieved by regular contact between veterinarians and farmers, the veterinarians showed limited willingness to invest in this tool.

Communication of information

The veterinarians would like to see more information to make an optimal decision about vaccination strategy. First, as mentioned, they want to exclude vaccine strains from the graphs. Second, they would like to include more specific geolocations, although they recognize that it could lead to privacy problems. The preferred time scale and update frequency depends on the number of samples. Aggregation by quarter or month was adequate. Regarding additional tool functionalities, they indicated that reasons for submissions could be added. Adding data from other Dutch labs would increase tool usefulness, however, GD already covers most of the samples. In contrast, adding data from other countries or providing dashboards for other respiratory diseases was not seen as useful.

Data privacy

The veterinarians did not see a problem in using their data or the data of farmers, at least when the data is aggregated at province level.

2.1.11 How results from the evaluation were used for tool development / Next steps.

The **Cattle Barometer's** usability evaluation has provided direction for prioritizing the elements that will most enhance the user experience. Feedback showed that the interface currently presents too much information at once, creating a crowded and overwhelming first impression. Users also struggled with navigation because there is no straightforward way to return to the initial view after applying selections. In addition, many participants experienced difficulties with the filter functions, noting that the process of selecting and clearing options was not intuitive. These findings will be used in a first phase focussing on improving the clarity of the interface and the intuitive flow of navigation and filtering. In parallel, we have outlined the need for more technically demanding updates, particularly those related to device-specific display variability, browser differences, and constraints linked to the underlying visualisation platform (i.e. map configuration).

Next steps:

- Reorganise the interface to reduce visual crowding and improve clarity.
- Improve the behaviour and intuitiveness of the filter functions.
- Explore solutions for adding a clear return function to simplify navigation.
- Assess what technical adjustments are needed to ensure these improvements work consistently across different devices and browsers.

Feedback from the evaluation on the **Pig Barometer** was shared with VDLs and informed the development of Pig Barometer Version 2, which focuses on:

- Addition of more pathogens. The pilot version visualized results for three endemic pathogens: *Mycoplasma hyopneumoniae*, swine influenza virus (SIV), and *Lawsonia intracellularis*. The second version of the Pig Barometer will include seven pathogens of endemic importance.
- Improving data visualization and usability.
- Exploring options for finer spatial resolution and real-time updates.

Next steps include launching the planned usability and usefulness survey and continuing iterative improvements based on stakeholder input.

For the **Poultry Barometer**, the identified limitations should be tackled before the tool can be expected to be adopted. Firstly, field strains should be visualized separate from vaccine strains. With the current data collection, this is only partly possible. Using homology percentages, it should be possible to identify some strains as vaccine strains, but for other strains it is not. We will further investigate potential solutions. Currently, the sample size is also too low for more specific geolocations, which would increase tool usefulness. The feasibility and added value of including data from other labs will be investigated during the remainder of the project. In conclusion, the current tool is not yet sufficient for exploitation in the Netherlands. However, the tool could provide useful decision support in countries with sufficient data on strain determination and vaccination.

2.2 Abattoir Inspect – Scotland

2.2.1 Short description about tool and context

AbattoirInspect is an interactive data visualisation and reporting tool developed to transform pig abattoir meat inspection data into actionable insights for animal health, welfare, and public health monitoring. Built using R and RShiny, the tool enables users to explore trends in carcass rejections, identify common causes, and benchmark farm or abattoir performance over time and against their peers. The app features multiple analytical tabs—Basic, Advanced, and TimeSeries—offering both summary and in-depth views. The tool is designed primarily for use by pig farmers, veterinarians, and industry stakeholders in Scotland, where data are collected by the abattoirs directly and by the national authority - Food Standards Scotland (FSS).

2.2.2 Discussions with stakeholders

The development of AbattoirInspect was informed by several discussions with key stakeholders in the Scottish and UK pig industry to ensure the tool reflects national data flows and practical needs. Meetings were held with representatives from Food Standards Scotland (FSS), Wholesome Pigs Scotland (WPS), and Quality Meat Scotland (QMS)—the organisation that funds the Scottish Pig Health Network (SPHN), where trained assessors score pig carcasses quarterly to detect and monitor a defined set of health and welfare conditions.

SRUC was also involved with the British Pig Health Scheme (BPHS), a scheme similar to the SPHN but operating at a larger scale in England and managed by the Agriculture and Horticulture Development Board (AHDB). Following the conclusion of BPHS in 2022, the industry focus shifted toward utilising CCIR (Collection and Communication of Inspection Results) data. CCIR data are generated daily, and national authorities are required to collate these data and to communicated it back to farmers as feedback for health monitoring and improvement purposes; however, this process rarely occurs in practice.

Through these stakeholder discussions, it was agreed that a data visualisation and reporting tool with benchmarking capabilities would be a valuable asset to maximise the use of abattoir inspection data. The concept of AbattoirInspect

emerged as a practical solution to improve data accessibility, interpretation, and feedback for producers and veterinarians. Stakeholders also recognised the tool's potential adaptability to other species and national contexts, supporting wider goals in disease surveillance and industry benchmarking.

Once the prototype was ready, we have contacted the parties involved in these initial discussions to conduct pilot evaluations of the tool and gather feedback for its improvement.

2.2.3 Participants

Participants were recruited through two separate pilot activities led by SRUC (Scotland) and Innovation for Agriculture (I4Agri; UK).

In Scotland, four participants were identified through the Scottish Pig Health Network (SPHN), an established initiative where trained assessors monitor carcasses and plucks at slaughter on a quarterly basis. Recruitment followed a convenience sampling approach, targeting key industry stakeholders directly involved in managing the SPHN and using abattoir data for surveillance and feedback. Participants included:

- one representative from Quality Meat Scotland (QMS),
- one private pig veterinarian,
- one marketing and innovation specialist representing farmers, and
- one consultant who is also a private pig veterinarian.

All four participants had previous experience with abattoir data interpretation and reporting but no prior exposure to the AbattoirInspect tool. Evaluations were conducted on two occasions: the first during a pig producers' meeting for a national disease control programme in Scotland (group session), and the second through a one-to-one session. Each participant completed the evaluation questionnaire individually, with a researcher-to-evaluator ratio of 2:3 in the group session.

I4Agri conducted evaluations with 11 cattle veterinary practitioners, recruited through their professional network. These participants piloted AbattoirInspect alongside other DECIDE applications, using the same evaluation materials adapted to their context and species focus.

Across both pilots, the inclusion criteria required participants to have professional experience in animal health, meat inspection, or farm advisory roles, ensuring familiarity with slaughterhouse data and surveillance systems.

All participants were asked the same general questions:

1. Which production system do you work with? (e.g. beef cattle, dairy, pigs, etc)
2. What is the average herd size of the farms you work with?
3. What is your role within the livestock industry?

2.2.4 Technical Setup

All pilot evaluations of AbattoirInspect were conducted using participants' access to the web-based application via standard internet browsers. The tool was hosted online and required only a stable internet connection—no software installation was necessary.

For the group evaluation session led by SRUC, each participant used their own individual computer connected to the internet and accessed the tool directly through its web address. In the one-to-one evaluation, the researcher shared their own laptop screen with the participant to navigate the tool while evaluating it. Each session began with a brief video overview of the application, followed by hands-on interaction and completion of a structured questionnaire.

Sessions were held either in person and a Microsoft Teams meeting (or equivalent) was set up to record (audio only) the discussion with evaluators. These audio recordings were made with participant consent, primarily to capture feedback discussions. Required materials included printed consent forms, information sheets, and questionnaires for each participant.

Hardware requirements were minimal: a standard laptop or desktop computer with an internet connection and a modern web browser. Internet connectivity was sufficient for all sessions, and no significant issues related to bandwidth or rural connectivity were reported. One participant reported a blurry screen when shown the introductory video about AbattoirInspect – this video was shown using a projector. All hands-on evaluating activities were done directly on laptops and no issues were reported.

2.2.5 Data Collection Procedures

The evaluations of AbattoirInspect were conducted by SRUC researchers (two trained facilitators) following the standardised evaluation framework and accompanying documents developed within the DECIDE project. These materials included an information sheet, consent form, questionnaire, and structured discussion prompts to ensure consistency across sessions and evaluators.

For the group session, two SRUC facilitators led the exercise with four participants, following the same sequence of steps outlined in the evaluation script: introduction and consent, overview video, hands-on interaction with the tool, questionnaire completion, and guided discussion. A second evaluation was held as a one-to-one session using the same procedure.

Discussions were audio-recorded (with participant consent) using Microsoft Teams or equivalent software, and recordings were subsequently transcribed, anonymised and collated by a social scientist to produce a qualitative summary of the topics discussed. All physical documents (consent forms and questionnaires) were scanned and stored securely in a dedicated folder. Anonymised questionnaire answers have been inputted into a Microsoft Excel spreadsheet.

To ensure consistency, both facilitators adhered strictly to the evaluation protocol and used the same discussion guide and questionnaire format. Feedback was later collated in a shared results file for joint review and analysis.

The I4Agri team also conducted evaluations following the same DECIDE evaluation framework, and used the SRUC paperwork (information sheet, consent form, questionnaire, and researcher document/script) adapted for use with cattle veterinarians. Their facilitators collected questionnaire responses and discussion feedback following the same structure, ensuring cross-country comparability of data. Anonymised questionnaire answers have been inputted into the same Microsoft Excel spreadsheet template used by SRUC. A summary of the discussions held is being collated and will be sent to SRUC.

2.2.6 Task completion test

Participants were asked to complete the following tasks:

a) Enter the app and “continue with sample data,” exploring the National Overview and My Farm(s) tabs.
b) Compare the number of full and partial rejections for the first three months of 2019, 2020, and 2021.
c) Identify the condition associated with the highest number of partial rejections nationally in 2020.
d) Using the My Farm(s) tab, identify the condition associated with the lowest number of partial rejections in Lazy Day Farm during the first half of 2019.

As explained above, all evaluations were conducted in person, either in group sessions or one-to-one. Participants were not timed; facilitators observed and confirmed whether each task was successfully completed. After the tasks, participants were allowed to briefly explore the tool freely before answering the questionnaire.

2.2.7 Survey

Participants were asked to rate their agreement with a series of 16 statements using a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). Items 1–10 focused on perceived usability of AbattoirInspect as described in section 1.2, and the following items 11–16 focused on perceived usefulness:

11. I believe my colleagues would find this tool useful
12. I intend to use AbattoirInspect during consultation with vets
13. I would use AbattoirInspect to give an overview of farm problems

14. I would use AbattoirInspect to compare farms
15. I would use AbattoirInspect to identify welfare problems
16. I would recommend AbattoirInspect to others

Participants performed this activity immediately after the task completion tests, either in group sessions or one-to-one sessions. Each participant completed the questionnaire on paper, and responses were later manually inputted into a Microsoft Excel spreadsheet and stored securely for analysis.

2.2.8 Group Discussion

Group discussions were conducted with a total of 4 participants in one group session, plus one additional one-to-one session. Discussions were audio-recorded with participant consent, and recordings were later transcribed and anonymised. All materials were in English, so no translation was required.

Answers were collected in person as part of a focus group or one-to-one session immediately following the task completion test. Facilitators used a structured set of discussion prompts to guide the conversation:

- What are the best things about AbattoirInspect?
- What could be improved?
- In what ways do you think AbattoirInspect would help with decision making?
- What could be added to make AbattoirInspect more helpful?
- What benefits do you expect as a result of using AbattoirInspect?
- What could be done to reassure users of AbattoirInspect that their data is being safely managed?

This approach allowed participants to provide detailed, context-specific feedback on the tool's functionality, usability, and perceived usefulness.

2.2.9 Tailored Modifications of the General Framework Procedure

The DECIDE evaluation framework was adapted for the Scottish pig industry context. Sample datasets reflected familiar farm- and abattoir-level metrics. Evaluations were conducted in person in group and one-to-one sessions, with participants using their own computers or the researcher's laptop and within the context of industry planned meetings. Discussion prompts and questionnaires were adjusted to Scottish industry terminology and practices. Participants were allowed brief exploration time after tasks to capture additional feedback. These modifications ensured the evaluation was practical and relevant while remaining comparable across countries and species.

2.2.10 Results

All respondents reported being able to complete the tasks, although this was not timed. The average SUS for the 15 respondents was 78 ± 7.5, with scores ranging from 65 to 90. The interquartile range was 75 to 85, indicating that the middle 50% of respondents rated the system within this usability band. The average SUS among the Scottish pig sector representatives was higher than that reported by cattle veterinarians consulted by I4Agri (86±4.3 and 75±6.5, respectively). Several factors may help to explain why the Scottish pig sector representatives reported higher SUS scores than the cattle veterinarians. One possibility is a degree of familiarity or established working relationships between the researchers and the pig sector stakeholders, which may have positively influenced perceptions of the tool during evaluation. Another explanation is that members of the Scottish pig industry had been anticipating such a tool for some time, potentially increasing their receptiveness and perceived value of the system once made available. Additionally, meat inspection data may hold more immediate or operational relevance for pig producers compared with cattle practitioners, which could translate into higher perceived usefulness and therefore higher usability ratings. These contextual factors should be considered when interpreting the differences between stakeholder groups.

Based on the four evaluations conducted by SRUC, and using the discussion summary written by our social scientist:

All users agreed that they liked the app and found it generally easy to navigate. Statements about willingness to use it frequently, ease of use, confidence in using it, and recommending it to others generally received high ratings ("Agree" or "Strongly Agree"). Users found AbattoirInspect easy to use, with low scores for complexity and inconsistency. Most disagreed that they needed technical support or had to learn a lot before using it.

Users generally agreed that functions are well integrated and that the tool could be used to compare farms, identify welfare problems, and give an overview of farm issues.

There was confidence that aspects which were considered to be initially less intuitive would be quickly picked up, such as the ability to hover over percentage figures to get the values and understanding what is provided under the different tabs.

Questions which arose included about who was expected to input the data. To save any additional burden on farmers or vets, there was a consensus that integration with other systems would be useful. This was relevant not simply in relation to how data was uploaded but also for consolidation of the various datasets and systems which are currently being used in the industry.

There was a consensus that whilst the app was not in itself a diagnostic tool, if used alongside data about genetics, health status, vaccinations, disease status and in conjunction with national data, it would not only be of interest to vets but also useful for their discussions with farmers. The ability to export data from the app into a spreadsheet for further analysis and to printable reports for use in discussion with farmers was suggested.

Whilst some users considered the provision of exact values in addition to percentages would be useful, others were less keen (because of a lack of confidence in the validity of the data at different levels). There was a consensus that benchmarking and identification of trends would be very useful, not least with national averages. Significant trends could help prevent avoidable 'witch hunts' and would rather alert farmers and vets to potential issues and prompt requests for further investigation. If alerts were automated, this could act as an effective 'early warning system'.

More detailed feedback from evaluation of the appearance and usability of the app was also obtained. Visually, some data ranges 'drop off' when others are selected. A suggested improvement was for the user to be able to 'slide' across data ranges rather than having to 'click' from one year to the next, for example. In addition, the visualisation of full and partial rejections wasn't intuitively clear to users initially. It was agreed that some colour coding may help.

The adaptability of the tool to be configured into desired categories which could reflect different datasets and focus on specific conditions or disease was considered to be a useful feature of the app.

Whilst the free / open access was welcomed, there was a consensus that further development to incorporate suggested improvements would require specific project funding. This would also involve ensuring that a sustainable method of hosting the tool was established, and not reliant on existing projects with uncertain future funding.

2.2.11 How results from the evaluation were used for tool development / Next steps.

The four SRUC evaluations showed that users liked AbattoirInspect and found it generally easy to navigate, with high ratings for ease of use, confidence, and willingness to recommend. Functions were considered well integrated and useful for comparing farms, identifying welfare problems, and providing overviews of farm issues.

Minor usability issues were highlighted:

- Visualisation of full vs partial rejections was initially unclear.
- Navigation across data ranges could be smoother, with suggestions for sliding options and colour coding.

Suggested functional improvements included:

- Exporting data and generating printable reports for discussions with farmers.
- Benchmarking trends against industry average figures and automated alerts to support decision-making.
- Integration with existing datasets to reduce data entry burden.

Participants confirmed the tool's adaptability for different conditions, datasets, or species. Next steps involve implementing these visual and functional improvements, enhancing reporting features, exploring system integration, and securing dedicated funding for sustainable/future-proof hosting and maintenance of the app.

2.3 Laksetap – Norway

2.3.1 Short description about tool and context

Laksetap ("salmonid losses", in Norwegian) visualizes national and regional mortality in farmed salmonids using standardized methods to support fair benchmarking. Mortality is the main welfare indicator, yet reporting has been inconsistent across the industry. Laksetap offers a transparent and comparable way to track mortality, helping highlight regional differences and inform better decisions. The methods applied in Laksetap have also supported ministry recommendations to the Norwegian Parliament in 2025. Laksetap is publicly available at https://connect.posit.vetinst.no/laksetap/.

2.3.2 Discussions with stakeholders

In addition to the evaluation framework (Section 1.2), we have been holding discussions with a broad set of stakeholders to understand needs for Laksetap. Participants included representatives from the Norwegian Food Safety Authority (regulation and welfare enforcement), certification bodies (responsible/animal-welfare standards), salmon-farm managers, researchers, journalists, and communications staff. These discussions occurred via email, industry events where the tool was demonstrated, and ad-hoc meetings on request. They informed the survey items on perceived usefulness and the interview guide for group discussions, and they also led to refinements to Laksetap. Examples include prioritizing which views are most visible, adding features, adjusting visual design, enabling data downloads, expanding methodological explanations, and improving options for mortality comparisons. Further suggestions from stakeholders are being noted for future tool development iterations.

2.3.3 Participants

We recruited eight participants working in Norwegian salmon farming. The group consisted of fish-health personnel (veterinarians and fish-health biologists), farm staff (production managers/staff and biology controllers responsible for production administration), and representatives of the Norwegian Food Safety Authority (NFSA) involved in farm data and/or inspections. Participants were recruited by convenience sampling. We offered participants a 1,000 NOK gift card (approximately €90) upon completion of all evaluation activities. To protect confidentiality, we did not record detailed demographics information from participants (e.g., age, exact years of experience, employer identifiers), although the group included both men and women with varied professional experience. The participants could be working with only Atlantic salmon, only rainbow trout sites, or both species. Below is the list of general questions answered via survey:

1. Where do you work? (fish health services, aquaculture company, Norwegian Food Safety Authority, the directorate of fisheries, other)
2. What is your role (salmon production manager, salmon production staff, fish health expert, health inspection for certification bodes, health inspector for government, salmon production administration, other)
3. Which species do you work with? (Atlantic salmon, rainbow trout, mixed salmonids, other)
4. How many marine sites do you follow up for health checks or inspection? (less than 5 sites, between 5 and 10 sites, between 10 and 20 sites, more than 20 sites, not relevant)
5. Did you have any technical problems with the app (unresponsive pages, results not loading, etc.)? (yes, no)

2.3.4 Technical Setup

The task completion test was conducted online via Microsoft Teams, using desktop computers. No internet connectivity issues were reported, and all responses were collected and submitted successfully.

We used *Nettskjema* (https://nettskjema.no/) as the web-based platform to collect responses to the survey, which included general questions, perceived usability and usefulness (i.e., the task completion test). Participants could complete the survey on their own devices (desktop computer or mobile).

Discussions were held online via Microsoft Teams after the task-completion test and survey, either on the same day or within the same week. Sessions were audio-recorded using *Nettskjema*'s recording feature and transcribed in Norwegian, then translated into English with the Microsoft Word Copilot add-in and checked for consistency by one evaluator.

2.3.5 Data Collection Procedures

Regarding the task completion task, two native Norwegian evaluators were trained in advance by the evaluation framework developers, who also assisted in designing an adapted protocol to the Norwegian salmon-farming context. Both evaluators moderated the task completion tests. A screen-only recording (no audio) was captured in Microsoft Teams during each task.

2.3.6 Task completion test

We gave each participant 2–3 minutes to explore the tool before the task-completion test. Two of the nine participants were already familiar with the tool and opted out of the pre-test exploration. We collected performance data on effectiveness (task-completion rate) and efficiency (task-completion time). These metrics were derived from screen-interaction recordings captured as participants completed each task.

We asked participants to complete the following tasks:

Task 1 Is the monthly mortality in PO3 (as of December 2024) higher than the national (Norway) mortality? Use the median as a reference. (Answer only Yes/No – no need to provide a numerical value)

Task 2 Which neighbouring production area had higher mortality as of December 2024: PO2 or PO4?

Task 3 Please write down the median mortality in the production area with the highest mortality based on your previous answer.

Task 4 Write down the number of escaped rainbow trout in PO3 in 2023.

Task 5 Which PO had the lowest annual mortality in 2024? Write down the annual mortality (%) for this production area.

Task 6 Which PO had the lowest production cycle mortality in 2024? Write down the median production cycle mortality (%) for this production area.

Task 7 Use of the "mortality calculator": A cage had a stock of 100,000 fish at the beginning of a week;
More fish were stocked during the week, and by the end of the week there were 180,000 fish in total;
250 fish died during the week; What was the mortality rate for this week?

Task 8 Use the "Mortality Calculator for Extended Period": You have a stock of fish in a cage over 4 weeks; The weekly mortality rates are: 0.1%, 0.5%, 1.5%, and 0.5%;
What is the mortality (%) over this four-week period?

2.3.7 Survey

An online survey on perceived usability and usefulness was administered right after the test completion test and before the group discussions were held.

Besides the general questions described in 2.4.3., we also included the 10 items from the SUS, as described in section 1.2, and the following 9 items related to the usefulness of Laksetap designed to get 5-point Likert scale (from *strongly agree* to *strongly disagree*):

11. I would use the Laksetap app to get an overview of health and welfare issues at the marine sites that I am responsible for.
12. I would use the Laksetap app to track progress of health and welfare issues in the marine sites over time.
13. I would use the Laksetap app to identify increased mortality in marine sites.
14. I would use the Laksetap app to help me detecting unusual or increasing mortality trends earl across the sites I am responsible for.
15. I would use the Laksetap app to support me in deciding which PO or sites to prioritize when responding to increased mortality.
16. I think having access to shared mortality trends in the Laksetap app improves communication and coordination with colleagues or external partners (e.g., health teams, wellboat operators).
17. I think the mortality trends shown in the Laksetap app are useful for reviewing past events and improving future production strategies.
18. I intend to use the Laksetap app in the future.
19. I would be recommending the Laksetap app to other stakeholders.

2.3.8 Group Discussion

We conducted three separate focus group discussions with fish-health personnel (n = 3), farm staff (n = 3), and the NFSA (n = 3). Discussions were held online via Microsoft Teams after the task-completion test and survey, either on the same day or within the same week. After initial introductions and warm-up of up to 5 minutes, perceived usability and usefulness were assessed using the following semi-structured interview guide:

General usability and usefulness	○ Do you think you would use the Laksetap app? ○ If yes, what would you mainly use it for? How often? ○ If not, what are the reasons you wouldn't use it? ○ Ranks the following from most to least useful (add missing important functions to your list) ○ Identify where mortality is increasing to help prioritize preventive actions ○ Explore historical mortality trends - to adjust management strategies and prevent future issues. ○ Supporting mortality calculations ○ What improvements or features would make you more likely to use the Laksetap app?
Communication of information	○ Does the Laksetap app provide the kind of information you need to monitor and make decisions about mortality, health, and welfare? ○ What information is missing or how should it be presented differently? ○ Are the calculator tools helpful for this, or could they be improved?
Real-world application	○ Imagine the app is updated monthly, and it shows a sharp increase in regional (PO) mortality (where you work), compared to the previous month or earlier periods. How would you use this information in your role?

- Can you think of any ways the Laksetap app could help when planning procedures (e.g., delousing, stocking moment, slaughtering moment)?
  - For example, would you check regional mortality trends or other patterns before deciding how to carry them out (e.g., wellboats)?
  - Would you use historical data? How?

Data privacy

- How would you feel about your data being included in a version with site-level details (with access controls)?
- What would make you feel comfortable sharing that kind of data?
- What kind of other sources do you use today for information you could get in Laksetap?

2.3.9 Tailored Modifications of the General Framework Procedure

Overall, we followed the general methodology. To streamline data collection, we integrated the general questions with the usability/usefulness items into a single survey round. We used *Nettskjema* as the web-based survey tool because participants were likely familiar with it from NVI's annual national survey. Additionally, *Nettskjema* is broadly adopted by public agencies and complies with relevant standards, including GDPR.

2.3.10 Results

Nine participants (6 female, 3 male) took part of the evaluation. They all worked with salmon species, either with Atlantic salmon or mixed salmonids. Three worked for the food safety authority, five were company-employed personnel, and one participant worked for fish health services. The number of sites for follow up for health checks or inspection was either less than 10 sites (n = 6), or not relevant (n = 3).

Complete description of the tasks included in the task completion test can be found in 2.3.6. The results from the task completion test are presented in Table 4.

Table 4. Results from the task completion test.

Task	Task completion rate (correct answers/number of answers, %)	Task completion time (avg. min:sec, SD)
Monthly mortality higher than the national mortality	5/9 (55.6%)	01:34 (01:00)
Area with highest mortality	7/9 (77.8%)	00:39 (00:31)
Median mortality in area with highest mortality	8/9 (88.9%)	00:24 (00:22)
Number of escaped rainbow trout	8/9 (88.9%)	01:27 (01:03)
Annual mortality (%) for area with lowest annual mortality	7/9 (77.8%)	00:35 (00:12)
Median production cycle mortality (%) for area with lowest production cycle mortality	7/9 (77.8%)	00:37 (00:18)
Mortality calculator	9/9 (100%)	00:56 (00:36)
Mortality calculator for extended period	8/9 (88.9%)	01:02 (00:26)

The lower correct response rate for Task 1, and incorrect answers in Tasks 2 and 5, appears to be related to participants' difficulty in distinguishing between the percentage of deaths out of total losses (which includes four different categories) and the mortality calculation itself. These elements were presented in separate tabs within the app. Another reason for incorrect answers in Tasks 5 and 6 was that, when attempting to find the answer in the table visualization mode, users did not expand the table to its full format, which was necessary to locate the correct information.

The System Usability Scale (SUS) scores had a mean of 67.22 (median 65; range 50–90).

The results (mean, SD) from the usefulness items in the survey were as follows (complete description of the items included in the survey can be found in 2.3.7):

I would use the app...	mean (SD)
11 To get an overview of health and welfare issues	3.1 (0.93)
12 To track progress of health and welfare issues over time	3.4 (0.88)
13 To identify increased mortality	3.1 (0.60)
14 To detect unusual or increasing mortality trends early	3.2 (0.97)
15 To support me in deciding which PO or sites to prioritize due to increased mortality	2.9 (0.78)
16 Having access to shared mortality trends improves communication and coordination	3.8 (0.83)
17 Mortality trends are useful for reviewing past events and improve future production strategies	3.6 (0.53)
18 I intend to use the app in the future	3.6 (0.88)
19 I would be recommending the app to other stakeholders	3.4 (0.88)

The usefulness item results, many of which had a mean value around 3, suggest that most responses were neutral. This may indicate a potential weakness of the app related to the timeliness of the information, which is provided annually with monthly updates. As a result, users may primarily rely on the app for trend monitoring rather than using it as a substitute for their current systems. Although those systems may have lower coverage, they often include a subset of sites from their companies with better data resolution and accessibility. These aspects are broadly consistent with the findings from the group discussions presented below.

From the group discussions, we found the following highlights:

Farmers:

Aspect	Discussion highlights
Usability	• Reasonably intuitive, but label overlap causes confusion. • Monthly updates not timely enough. • Calculators require too much manual input.
Usefulness	• Trends over time are important. • Useful for comparisons. • Possibly more relevant for smaller farms; less for large companies with own systems.
Information Sufficiency & Clarity	• Current data in Laksetap lacks detail for health/welfare decisions. • Causes of mortality missing. • Different mortality stats are confusing. • Uncertainty about calculation methods affects trust. • Farm-level data differs from area-level.
Improvements for New Functions	• Add causes of mortality. • Provide more granular data. • Simplify calculators. • Offer more frequent updates (not monthly). • Include more benchmarking features.
Decision-Making Impact	• Limited influence on biosecurity (procedures already exist). • Comparisons and trends could help prioritization. • Users rely on own systems for mortality calculations.

Data Privacy & Sharing	• Open to sharing if agreements and control exist. • Concerns about visibility and authority. • Benchmarking somewhat occurs anonymously. • Sharing causes of mortality may face privacy issues.

Fish health personnel:

Aspect	Discussion highlights
Usability	• Minor layout issues could be corrected. • Plotting connected to calculators feels cumbersome due to frequent data entry.
Usefulness	• Positive about usefulness overall. • Calculator seen as useful, but with limitations. • App less useful for site-level decisions but good for industry-level comparisons.
Information Sufficiency & Clarity	• Causes of mortality considered important for actionable insights. • Concerns about standardization of how causes are registered.
Improvements for New Functions	• Real-time or more frequent updates (not just yearly). • Monthly updates and municipality-level granularity suggested. • Login-based comparison feature (e.g., compare against averages anonymously). • API solution for secure data sharing between companies.
Decision-Making Impact	• Limited for mortality, health, and welfare decisions due to lack of site-level detail. • Useful for benchmarking and comparability within the industry.
Data Privacy & Sharing	• Uploading data as an alternative raises data-security concerns. • Positive about data sharing if agreements exist. • Concerns about hacking and control over access. • API suggested for secure sharing. • Fear of misuse by external groups (e.g., media).

Norwegian food safety authority (NFSA):

Aspect	Discussion highlights
Usability	• Overall intuitive, but too many tabs; fewer tabs would improve navigation while keeping tables split. • Colour schemes too similar; harder to differentiate regions. • Hover-over display could be improved (e.g., number formatting with commas/spaces). • "Select all" option needed for multiple areas/years. • Tables hide some data unless "show more" is clicked. • Avoid redundant footnotes; standardize explanations. • Consistency issues: month names (numbers vs abbreviations), footnotes, and colour coding across tabs.
Usefulness	• App mainly used for historical trend validation, less for calculators. • Needs unique statistics beyond what NFSA already have in-house. • Regional data useful for higher-level roles; farm-level data more relevant for operational decisions. • App serves as a quick reference before deeper farm-level analysis. • Current design of plots (monthly mortality on single-year axis) limits interpretation; multi-year axis suggested.
Information Sufficiency & Clarity	• Calculation methods must be clearly explained and standardized.

	• Terminology improvements: use “production area” instead of “zone”; clarify “unallocated” definitions. • Inconsistencies in data display (merged areas, missing county-level data). • Mortality terminology inconsistent (rate vs risk); prefer “mortality risk” (0–100%). • Production type stats may be imprecise; explain limitations. • More statistical details desired; equations should be shown in calculators.
Improvements for New Functions	• Add download options for tables and figures. • If possible, include production system breakdown (broodstock, market fish, research). • Provide yearly mortality plots like monthly ones.
Decision-Making Impact	• Limited influence on immediate farm-level actions (e.g., sea lice thresholds override app alerts). • Timely data critical for preventive measures; yearly updates insufficient—monthly updates needed. • Requires links to contextual info (e.g., outbreaks, treatments) to interpret mortality spikes.
Data Privacy & Sharing	• Confidentiality concerns when few farms in an area; risk of indirect identification. • Benchmarking currently seems to mainly happen within companies; broader sharing with other stakeholders is desired to improve overall collaboration and decision-making. • Some companies have extra mortality cause data that could enhance benchmarking if shared.

Briefly summarizing some of the group discussion highlights, all groups agreed that the app was generally intuitive but needed usability refinements such as fewer tabs, better colour schemes, and clearer labels. Timeliness of data was a major concern as yearly updates are insufficient and monthly or more timely updates are preferred. Across discussions, the lack of detailed information, especially causes of mortality, and unclear calculation methods negatively affect trust and limit decision-making value. Benchmarking and trend analysis were seen as useful, but there was uncertainty about which calculation methods and data sources are used in the app compared to what is available to them internally (by their organization), and how benchmarking is defined, whether within companies, across the industry, or by authorities like NFSA. All groups expressed interest in more granular data. NFSA highlighted that the preferred level of detail depends on the user’s role within their organization, whereas farmers and FHP generally leaned toward farm-level or smaller-area data. Farmers emphasized simplification and benchmarking features, noting that granular data might matter more for stakeholders with smaller companies who may not have access to the same internal tools as larger companies. NFSA focused heavily on interface consistency, clarity of calculation methods, terminology, and visualization improvements such as multi-year plots and hover-over details. All groups pointed out the need for simplified calculators, though their practical value may be limited for those already relying on internal production system outputs, which seems to be most users. Further data sharing was seen positively by farmers and FHP if secure and controlled, though confidentiality and potential misuse remain concerns. NFSA valued sharing granular data more than the status and provided the most specific examples such as risks of indirect identification in regions with few marine sites.

2.3.11 How results from the evaluation were used for tool development / Next steps.

Results from the evaluation have been implemented as updates to Laksetap. Changes include a clearer colour palette and font, a more logical tab structure, improved instructions and error messages, and better screen-reader support across devices. The tool was updated to comply with Norwegian universal-design requirements and to support an accessibility statement, in line with guidance from the Communications Department at NVI. We switched from a seasonal (Jan–Dec overlaid) plot to a continuous multi-year monthly time series. County mortality is now available for the different tabs of the app. Monthly mortality now displays risk (0–100%) rather than intermediate rates, improving interpretability given changing population size during the production cycle. Further explanations are provided in the apps “About statistics” tab. The mortality calculators are temporarily unavailable while we align them with the new visualization approach for mortality in the other tabs. All changes are tracked in the Laksetap GitHub repository: https://github.com/NorwegianVeterinaryInstitute/laksetap.

Next steps include adding download buttons for figures and tables; moving to every four months data releases for monthly and annual mortality statistics; preparing metadata per WP1 guidelines to enable reproducibility and reuse beyond Norway; creating versioned, reproducible datasets derived from the Directorate of Fisheries source data (with clear lineage); adding a year-to-date plot for the current year; modularizing the codebase and introducing tests (including synthetic-data tests for new datasets/plots); relaunching the mortality calculators aligned with the new visualization; completing accessibility checks with the Communications Department prior to release; and updating/testing the API to serve the mortality data.

2.4 Salmon Mortality Monitor – Scotland, Norway

2.4.1 Short description about tool and context

The salmon Mortality Monitor provides an overview of salmon mortality in numbers and biomass and is a spin off from the AbattoirInspect tool that is being developed for pigs. It has a functionality to do this for all mortality estimates, but also categorized by context data, i.e. reason for mortality, such as predation by seals, or bacterial infections. It can be used for any fish farming operation that uses the appropriate data format but is especially build for salmonids. Users can be fish producers themselves, or overarching bodies such as authorities, certification bodies and salmon producer organizations. The tool is developed in Scotland in collaboration with Ireland and Norway.

2.4.2 Discussions with stakeholders

Initial surveys about a salmon mortality tool similar to Laksetap held in Scotland, Norway and Ireland (Zhou et al., 2025) revealed that many stakeholders were concerned that mortality data is useless without context. As a follow up, Scotland's Rural College (SRUC) had 3 online discussions with Irish stakeholders in collaboration with Animal Health Ireland (AHI) and Norwegian Veterinary Institute (NVI) about a mortality context visualization tool. Irish stakeholders were interested to use the tool in their own sector, while it was hosted by an independent source, which may be AHI or another.

After it became clear that Irish stakeholders did not want to pursue development any further, the tool was repurposed by SRUC with a few internal iterations for use by NVI as stakeholders to use as part of the Fish Health Report, and possibly Scottish stakeholders. With NVI the type of customer had changed from producers to authority, and the type of data from weekly to monthly. Differences were discussed in one tool evaluation between SRUC and NVI stakeholders who were not part of the tool development initially. The tool had been found useful and potential was seen to use the tool further by NVI.

2.4.3 Participants

Three participants in the evaluation event were identified by the NVI contact who was part of the initial tool development and an active participant of the DECIDE project. The three participants were thought to cover a useful range of expertise that together would provide a useful discussion about the potential to uptake the tool. They included a researcher with industry knowledge, a communication advisor/ web editor, and a Scientific coordinator.

2.4.4 Technical Setup

We used Microsoft Teams to hold the survey in a recorded session. Participants took part using their own laptop. They had been given access to the tool with a username and password on SRUC's server, send to them through separate means (email and Teams).

2.4.5 Data Collection Procedures

The two main tool developers from SRUC conducted the evaluation. One of these had been trained by WP5 researchers for the already published surveys early in the project. They followed the evaluation framework described in section 1.2. The discussion was recorded in English and transcribed in Teams.

2.4.6 Task completion test

Participants had to perform the following tasks:

1. Enter the app and "Use Sample Data"
2. Using the Industry Overview tab: What was the relative mortality in Q2 2019 in the entire industry.
3. Using the Industry Overview tab: in the years 2019 and 2020 combined, what was the main mortality cause by number and what was the main mortality cause by biomass in the entire industry? How do I know that 2019 and 2020 is combined?
4. Using the My Site(s) tab: in the first half of 2020, in the farms A and E combined, what were the second most important mortality causes by number?
5. Using the My Site(s) tab: in the second half of 2019, which site had more relative mortality due to seal predation, farm N or farm O?

Participants had not explored the tool previous to the evaluation, but they received a demonstration prior to performing the tasks. This took about 10 minutes and some parts of the tool were discussed before the tasks were performed online via Teams. As performance measures the effectiveness was evaluated, and wrong answers were discussed with participants, which led to valuable information on where the tool was not intuitive.

2.4.7 Survey

Usability and usefulness were evaluated by asking participants to answer 15 statements after the meeting. Answers were collected by email.

The survey included the following items:

1. General questions:
    a. What is your role within the salmon industry?
    b. Did you have technical problems with the video demonstration (poor image quality, low audio, etc.)? Yes, No.
2. Perceived usability (SUS items, as described in section 1.2).
3. Perceived usefulness (5-point Likert scale from 1 = strongly disagree, to 5 = strongly agree)
    a. I believe my colleagues would find this tool useful
    b. I intend to use SalmonMortMonitor during consultation with vets
    c. I would use SalmonMortMonitor to give an overview of farm problems
    d. I would use SalmonMortMonitor to compare farms
    e. I would use SalmonMortMonitor to identify welfare problems
    f. I would recommend SalmonMortMonitor to others.

2.4.8 Group Discussion

In the same evaluation a group discussion took place, loosely based on pre-determined questions but mostly led by questions from the participants about the tool, and took place after the tool demonstration and after the answers to the tasks were revealed. The transcript was generated by Teams and collected digitally.

2.4.9 Tailored Modifications of the General Framework Procedure

Given the early development stage of the tool, evaluation focused on gathering first impressions with participants familiar with the salmon industry, but not the end users. Therefore, general questions were simplified as compared to the general evaluation framework.

2.4.10 Results

The results are based on only three participants. The tool was found to be of high potential to be useful. The task completion rate ranged between 67% and 100%, depending on the task. That could be explained by an unintuitive feature

that we were aware of but had failed to point out clearly during the demonstration. Fixes for this feature were discussed after the answers were discussed.

Most participants agreed that the tool was user friendly, with SUS scores between 60 and 87.5 (mean: 72.4; sd: 14). The tool was also perceived as useful; most positive statements were answered with “agree”, two with “strongly agree”, and none with “disagree” or “strongly disagree”. The statement “I intend to use SalmonMortMonitor during consultation with vets” was the only statement answered once with “neutral”, which may have been because the participant does not consult with vets.

The potential for limited access for end users and adding regions were discussed. The need for clear information on how mortality was calculated was also discussed, as were the descriptions of missing fish.

2.4.11 How results from the evaluation were used for tool development / Next steps.

Next steps will depend on NVI. If there is interest in uptake of the tool, SRUC will provide support to transfer the code and implement some of the discussed needs. NVI will internally discuss how they want to progress.

2.5 PigPeaks – Sweden

2.5.1 Short description about tool and context

PigPeaks is a tool developed by SVA and aimed at Swedish pig farmers. The tool collects data from different sources in one place and presents a comprehensive overview of the farm’s health status, in a way that is more user-friendly and tailored to the farmers’ needs than existing systems. The tool currently consists of two tabs. The first provides production follow-up, displaying key production indicators in data from the PigVision management software. Here the user can see the development over time of these indicators, and benchmark themselves against the national average. Weather data (average temperature and humidity) can be overlaid to see potential weather effects. The second tab shows slaughter inspection results, allowing the user to filter and show the development of specific lesions over time for specific abattoirs, and compare with the national average in a table, a bar chart, or a map.

2.5.2 Discussions with stakeholders

Farm & Animal Health (G&D) is a Swedish animal health service organisation which is financed by farmers through membership fees. They administer testing and health surveillance programmes, provide member advice and produce annual statistics of their members’ production result. G&D already maintains the farmers’ data sources used in PigPeaks, making them the natural main stakeholder in this project. As representatives of their members, they have provided guidance on what data and indicators would be of interest to their members as well as giving direct feedback on the tool’s user-friendliness. There is also a data sharing agreement in place between G&D and SVA, which has been essential for the development. Collaboration has been done through regular meetings and discussions between the developers at SVA and advisors at G&D.

2.5.3 Participants

There have been two categories of participants in the evaluations of PigPeaks: Swedish pig farmers, and pig experts (government veterinarians) at SVA. Pig farmers were recruited through networking at an annual pig producers’ congress, while the pig experts at SVA were invited directly via email.

2.5.4 Technical Setup

Task-completion test was conducted via Microsoft Teams and recorded using Teams recording function. Participants used their own devices to perform the tasks. Online surveys were distributed through Questback, which ensured anonymity and secure data handling.

Group discussions were done online using Microsoft Teams, and transcript were automatically generated in Swedish. A native speaker reviewed the transcripts before translation into English with Google Translate.

2.5.5 Data Collection Procedures

Task completion tests were led by one of the developers of the tool. Group discussions were led by a moderator and an assistant to the moderator that took notes during the group discussion. All those involved in leading evaluation activities were trained by WP3 before the evaluation. All collected data were anonymized before data analysis.

2.5.6 Task completion test

Task completion tests were conducted online during 20-minute one-on-one meetings. Each participant was given up to 5 minutes to familiarize themselves with the tool. Tasks were shared with participants one at a time, using the Teams chat function. Once the participant found out the answer to a given task, answers were entered in the Teams chat. Video recordings were used to compute the time required to find the answer to each task (efficiency), and the chat records were used to identify whether the answers to each task were right or wrong (accuracy).

2.5.7 Survey

A link to the survey was provided on the Teams chat upon completion of the task completion test. A designated person from the development team received notifications and link to the survey data on Questback via email for posterior data analysis.

The survey included the following questions:

1. General questions
    a. What is your role?
    b. Which production system do you work with?
    c. What is our average herd size?
    d. Did you have any technical problems with the app?
2. Usability (SUS, 5-point Likert skale) as described in section 1.2
3. Usefulness (5-point Likert scale)
    a. I would use the PigPeaks app to have an overview of productivity performance in my farm.
    b. I would use the PigPeaks app to track the progress of slaughterhouse lesions from my farm over time.
    c. I would use the PigPeaks app to compare the slaughterhouse findings with those from other farms.
    d. I think the PigPeaks app would be helpful for managing animal health in my farm.
    e. I would review the information provided by the PigPeaks app with my veterinarian to direct farm practices.
    f. I intend to use the PigPeaks app in the future.
    g. I would be recommending the PigPeaks app to other farmers.

2.5.8 Group Discussion

Group discussions were held online using Microsoft Teams between one to two hours after the task completion test. 9 participants (4 farmers from different parts of Sweden, 5 veterinarians from SVA), in 3 total groups.

The following questions were asked:

1. General usefulness and usability

- Do you think you would use the data overviews provided in PigPeaks? If yes, for what? If not, why not?
    a. Rank these three applications of the tool, from most to least useful:
        i. Discover trends in production, reproduction and animal health.
        ii. Use as support for planning and follow-up of management measures and treatments
        iii. Compare the results of your farm with other farms.

   b. Which improvements of the tool would you like to see? How can it become better?
2. Communication of information
   a. Does the tool show enough information about your production and animal health for you to make decisions about measures and treatments? If not, what is missing for you to make decisions?
3. Importance for decision-making
   a. Imagine that your farm has never had problems with abscesses before. What would you do if the tool shows that your farm has an increasing prevalence of abscesses the latest year according to the registered slaughter lesions?
4. Data integrity
   a. What would you think about your data being used in the tool?
   b. What information do you need to feel safe about sharing your data in the tool?

2.5.9 Tailored Modifications of the General Framework Procedure

Describe how the general methodology for administering the different evaluation parts were tailored to the specific context of the tool / country.

2.5.10 Results

Nine participants were selected for the evaluation, all of them veterinarians (n = 5) or pig farmers (n = 4).

Table 5. Task completion test results for PigPeaks.

Task	Rate (correct/no. participants, %)	Time (avg., SD)
Farrowing percentage in 2024, week 10	8/11 (72.7%)	01:25 (0.03)
Number of stillborn last month	10/11 (90.9%)	00:53 (0.02)
Average temperature above or below 0 degrees	10/11 (90.9%)	00:49 (0.02)
Compare number of abscesses with other farms at slaughter	3/8 (37.5%)	02:05 (0.05)

SUS score was, on average, 48.9 (SD = 5.32).

Table 6. Results from participants (n = 9) to the perceived usefulness items included in the survey (average, SD).

Item	average (SD)
I would use PigPeaks to follow the development of my herd's production/reproduction	4.4 (0.53)
I would use PigPeaks to follow the development of abattoir findings in my farm	4.4 (0.73)
I would use PigPeaks to compare the occurrence of abattoir lesions in my farm with other farms	4.3 (0.87)
I would use the tool together with my herd veterinarian or advisor to plan management or treatments	4.4 (0.73)
I intend to use PigPeaks in the future	3.9 (0.78)
I would recommend PigPeaks to other pig producers	4.0 (0.71)

Insights from group discussion with **pig farmers**:

- The app is simple, and that is how it should be.
- The key indicators that are included in the app were considered relevant.
- Data granularity was considered good: monthly or weekly data analysis is preferred over current annual report.
- Features: being able to see trends was considered to be good, but they would like to be able to understand trends and add a benchmark function.
- Desired features not currently included in the app: 1) add options to give consent to share data with others (vets, advisors, collaborators) directly on the app; 2) add treatments to the app.

Insights from group discussion with **pig veterinarians** (veterinarians followed the guide designed for farmers):

General usability and usefulness

- The benchmarking function is good, and producers are asking about that.
- Producers usually have a sense about how things are going in their farm, but it is good to have confirmation from the results in the app.
- For veterinarians, it would be a good app to check before and during farm visits.
- Ranking of functions: trends (good for SVA) > follow-up (good for vets) > benchmarking (good for farmers)
- Improvements that are needed: navigation could be better, including user instructions such as info button or video tutorials.
- Overall, it is user-friendly, easier than WinPig.

Decision-making:

- Veterinarians provided suggestions of other data sources to be added to better support decision-making: diagnosis, antibiotic treatments, treatments administered, pig weights, weights at slaughter.

Data privacy:

- Functions like benchmarking are good to attract producers so they are willing to share their data.

2.5.11 How results from the evaluation were used for tool development / Next steps.

The next step is to investigate the possibility of adding veterinary treatments as an additional data source in the tool. We will also fine-tune the existing tool features based on the provided feedback - this includes adding a tool usage tutorial to further improve usability.

2.6 Pig herd health dashboard – The Netherlands

2.6.1 Short description about tool and context

The Pig Herd Health Dashboard is a tool meant for veterinarians where data from different sources will be collected and displayed in one single dashboard. The dashboard includes a main and single screen containing an overview of all data included to facilitate the integration and overview of the data). Data include lab results, monthly antibiotic use, monthly weather temperature, main health issues noticed by the veterinarians during the monthly farm and a selection of slaughterhouse data. Additionally, interventions applied in the farm can be pointed to compare parameters before and after the intervention. All this data can be filtered per period to show the whole historical view or to zoom-in in a certain period. This tool will support veterinarians in their advice towards the farmers.

2.6.2 Discussions with stakeholders

Previous discussions with veterinarians (Xiao et al., 2024) already gave some indications of the needs and preferences for the dashboard. Based on these discussions a first prototype was designed in PowerPoint to show potential features and layouts. Since it was no real tool that could be offered to users, only usefulness was evaluated.

2.6.3 Participants

Four Dutch veterinarians, three working as independent veterinary practitioners and one as feed company consultant in the Netherlands participated in the online focus group discussion. These participants were selected from our veterinary network and based on their interest on the topic and wiliness to participate in the project. Therefore, the project aim and tool development activities were already known to them.

2.6.4 Technical Setup

The focus group discussion took place online using the Microsoft Teams platform. The discussion lasted one hour and 25 minutes and it was recorded via the recording assistant of Microsoft Teams.

2.6.5 Data Collection Procedures

The evaluation was performed by two researchers. One acted as a moderator and the other one took notes and sometimes asked questions for further clarification. The discussion was held in Dutch.

After completion of the online discussion, the transcript was downloaded from Microsoft Teams streams in English and later reviewed by the researcher who was taking notes. Non-well translated sentences were corrected.

2.6.6 Task completion test

No task completion test was conducted.

2.6.7 Survey

No survey was conducted.

2.6.8 Group Discussion

Only usefulness was evaluated with a semi-structured interview based on the guideline developed by WP3 and WP5. This allowed us to cover all the planned questions, but also to provide flexibility to get more detail on certain topics or include any other topics of interest not *per se* included in the questions list. We wanted to allow the interviewees to think out of the box and to express what would be the ideal tool. For that purpose, at this early stage we believe it is important to show as many different examples as possible and not to narrow it to just one single prototype. In later stages, evaluation can be more focused on improving an already developed tool.

During the focus group discussion, a video showing and explaining two different dashboards with a similar aim (collecting pig herd health and management data) was used. The two dashboards were the Pig Herd Health dashboard developed by Royal GD (Dashboard A from now onwards), and the Pig HealthCheck dashboard developed by Animal Health Ireland (Dashboard B from now onwards).

The interview guide included the following questions:

1. I think that I would like to use tool A (5-point Likert scale)
2. Which aspect of tool A would you find useful? Why? (*Keep in mind: laboratory results, antibiotic use, weather temperature, (selected) post-mortem slaughterhouse data as well as farm visits records and implemented farm intervention*)
3. I think that I would like to use tool B (5-point Likert scale)

4. Which aspect of tool B would you find useful? Why? (*Keep in mind: regarding biosecurity, animal welfare (tail biting risk factors), ante-mortem slaughterhouse data, Salmonella and antibiotic use*)
5. Which aspects of tool A and/or B do you find completely useless and unnecessary? Why?
6. Please rank the three most relevant parameters that should be included in a dashboard
7. Having in mind both tools, which tool improvements would you like to see for you to use the tool? / How could we improve the tool? Think on data missing, additional analysis to be performed on the data, etc.
8. Having in mind both tools, how intuitive is the tool to use? How easy is to find information?
9. Having in mind both tools, would you prefer to have different features in different sheets (like tool B) or to have everything in the same page (like tool A)?
10. Having in mind both tools, are the figures and tables easy to understand? Are there enough visual aids? Do you have any general preference regarding the type of figures and tables? What level of detail would you like the information to be displayed? Would you like to be able to share the information displayed on the dashboard and if so, how?

2.6.9 Tailored Modifications of the General Framework Procedure

Given the early development stage of the tool, our evaluation focused on usefulness of the tool before developing the tool any further. Since we did not have a tool ready for participants to interact with, a task completion test followed by a survey was not conducted.

2.6.10 Results

The interview guide included general questions on the usefulness of the dashboard, as well as preferences and reasons to use one or the other; questions related to the parameters included in the dashboard, what would be the minimum necessary parameters to be included, analysis to be performed or ways to present the data. Interviewees were allowed to compare both dashboards and select applications and characteristics from both dashboards to describe the ideal tool.

The discussion revealed that veterinarians would like to have accurate and complete data, user-friendly and visually clear dashboards, with the ability to customize and zoom into specific data points. Regarding the parameters to include, they showed interest in tracking interventions and benchmarking performance. Practicality and integration with existing systems are crucial.

2.6.11 How results from the evaluation were used for tool development / Next steps.

We will try to perform additional evaluations to collect more input to have a final idea of what the ideal dashboard should look like. The next step, beyond the project, would be to explore options for automated data access from multiple sources and data owners.

2.7 Pig HealthCheck System – Ireland

2.7.1 Short description about tool and context

The Pig HealthCheck programme is an Animal Health Ireland (AHI)-led programme co-funded by pig producers and Department of Agriculture Food and Marine (DAFM), with the aim of improving the profitability and sustainability of the Irish pig industry through improved animal health and welfare. The programme started in 2019 and currently comprises five key areas: biosecurity; animal welfare; animal health (ante mortem and in the future postmortem data); antimicrobial usage (AMU); and veterinary public health.

A key element of the programme is the development of an online system where farmers, their veterinarians and other farm advisors can have access to farm data, which are benchmarked with the national data and allow users to monitor their status for a range of measures and to compare this with the national profile. Currently this online system receives data from the five areas mentioned above and these data are displayed in several dashboards with three common functions: displaying the latest results, comparison of those results with the national average, displaying the farm results over time. This system allows for better decision making by farmers and their advisors.

2.7.2 Discussions with stakeholders

Focus groups were held with pig veterinarians in 2022 which aimed to investigate veterinary practitioners' experiences, perceptions, and expectations of using digital decision support tools for pig health management. Informal discussions were held with farmers, farm advisors and veterinarians about their usage of the tool, and this has led to the development of the surveys to users and non-users (focused only on farmers) described below as a way to capture more feedback from a bigger population.

Two workshops were held with pig farmers to co-create a new area of the dashboard to succinctly and effectively display postmortem data in a farmer-friendly way.

Two workshops were held with pig farmers to re-design the "overview dashboard" to succinctly and effectively display live information given to them as a form of alert.

2.7.3 Participants

For the survey distribution (described in detail below), the AHI PHC database of farmers was used, to send to those which we had any data in our system (around 450 farms and 350 farmers). These include all the commercial pig farms in Ireland. Users were defined as farmers that had at least access one time to the PHC web system in the last 12 months before the survey was sent. While non-users were defined as farmers for which the web system contained data, but which had not accessed the online system in the previous 12 months. No demographic questions were asked in the survey.

For the postmortem dashboard development, two workshops were held. The first with a group of 4 farmers (all men, two less than 40 years old, while the remaining were over 40) and one farmer representative (female). The second workshop was with a group of 15 farmers (all men) and one farmer representative (female).

For the re-design of the "overview dashboard", two workshops were held, One in person in October 2025 with 3 farmers (all men, over 40 years old) and 2 advisors (both female and less than 40 years old). The second workshop was held online at the beginning of November with 5 farmers (all men, three less than 40 years old and the remaining over 40) and one farmer representative (female).

2.7.4 Technical Setup

Survey was administered asynchronously via email. Workshops were recorded via Teams or by VoiceRecorded using one of the facilitators mobiles phones.

2.7.5 Data Collection Procedures

For the postmortem dashboard development, the two workshops were facilitated by Alison Burrell from AHI (who is a trained facilitator). The workshops were structured with the steps of Design thinking, to ensure that end users are involved from the start in the design, evaluation and implementation of the new tool. The first workshop was recorded and a report summarizing the results was produced and provided to the dashboard development company. The second workshop was not recorded and focused mainly on showing the prototype developed based on the feedback from workshop 1. Participants of the second workshop were asked if they would use the prototype as developed or if they would change anything, with minor changes then made.

For the re-design of the "Overview dashboard", the first workshop was facilitated by Carla Gomes from AHI. The second workshop was facilitated by Carla Gomes and Alison Burrell from AHI. The second workshop was recorded as it was held online and the group was divided into two breakout rooms. The workshops were structured to go through the several existing dashboards and collecting the feedback from the users in terms of what works well what doesn't work well and what should be in the "Overview dashboard" from each component of the PHC tool.

2.7.6 Task completion test

The goal of the evaluation was to reach out to as many users and possible, therefore, task completion tests were not feasible.

2.7.7 Survey

From April 2024 to August 2024, we ran two online surveys for users and non-users of the PHC web system. The survey was sent by email in April 2024 (around 144 for users and around 200 for non-users) and a reminder was sent in May 2024. Additionally, the link to both surveys was advertised through newsletters targeting the industry and through a farmer WhatsApp group.

The survey for users included questions about usability and usefulness. The items related to usability are those in the SUS, as described in section 1.2. The following items (using a 5-point Likert scale) were added to evaluate usefulness:

- I used the Pig HealthCheck web system to give me an overview of my farm health status.
- I used the Pig HealthCheck web system to compare my farm to other farms.
- I used the Pig HealthCheck web system to track progress of my farm over time.
- I used the Pig HealthCheck web system to identify problems (animal health and welfare) on my farm.
- I used the Pig HealthCheck web system to see the impact of farm management or farm practice changes.
- I used the Pig HealthCheck web system to help me make an on-farm decision.
- I used the Pig HealthCheck web system to be aware of and/or monitor national trends.

Then users were asked to rank the different components of the PHC web system based on how useful they were to them (from "Extremely useful to "Not useful at all"). At the end participants were asked for suggestions in how to improve the tool.

The survey for non-users included a short video showing the features of the PHC web system and its several components and non-users where then asked about the perceived usefulness of such a system.
The questions related to usefulness were:

- Which component was perceived as useful to them (ranking from "extremely useful to nota at all useful)
- If they were to use the tool for what they would use it for (5-point Likert scale):
    - I would use the Pig HealthCheck dashboard to give me an overview of my farm health status.
    - I would use the Pig HealthCheck dashboard to compare my farm to other farms.
    - I would use the Pig HealthCheck dashboard to track progress of my farm over time.

- I would use the Pig HealthCheck dashboard to identify problems (animal health and welfare) on my farm.
- I would use the Pig HealthCheck dashboard to see the impact of farm management or farm practice changes.
- I would use the Pig HealthCheck dashboard to help me make an on-farm decision.
- I would use the Pig HealthCheck dashboard to be aware of and/or monitor national trends.

Then non-users were asked what would need to happen for them to start using the Pig HealthCheck dashboard.

2.7.8 Group Discussion

The first workshop for postmortem dashboard development aimed to address the first three steps of the Design Thinking process (Empathise, Define, Ideate) by identifying the needs and experiences of farmers and to articulate the problem that the dashboard will help to address. What data do farmers, their advisors and veterinary practitioners use most from the current dashboard? How will data be shared to ensure they are relevant and useful? How could a potential new tool align to current needs? What tools do end-users currently use that are useful, intuitive and free up resources?

The workshops main objectives were:

- To identify what current questions relating to carcass and offal could be answered using the data available.
- To choose what information points or data groups that made most sense to end-users.
- To determine participants' preferences regarding dashboards from other countries, and how data can be effectively displayed.
- To learn about apps that farmers currently use that are user-friendly, and what features could be taken from these.
- To gain suggestions on how the current PHC dashboard could be better utilised.

The meeting was recorded and a person was taking notes.

Examples of questions addressed during the first workshop:

- How might we ensure that the information on the dashboard is clear and easy for users to understand?
- How might we improve the display of the dashboard we currently have?
- Brainstorm apps that they use frequently (could be anything). What is it about these apps that is so useful? What about usability?

In the second workshop participants were showed the prototype developed and there was a group discussion about each graph showed in the tool in relation to how useful it could be and what need to be changed to improve usability and usefulness.

For the workshops for re-designing the "overview dashboard" smaller groups were done were participants had access to printed screenshots of the dashboards (in-person workshop), or the online version of the dashboards was showed (online workshop). Participants could scribble in the paper version and draw what they would like to see in the in-person workshop, while in the online workshop they could ask the facilitator to focus on specific areas and show different types of graphs.

2.7.9 Tailored Modifications of the General Framework Procedure

Given that the tool has been available to the users since 2019, we could not assume that participants were completely new to the tool. Therefore, participants were classified into two different categories based on their usage according to AHI PHC database, and the questions included in the evaluation differ slightly between the two categories of users.

2.7.10 Results

Survey results:

Twenty-nine users replied to the survey, while only eight non-users replied to the survey.

Users: the SUS varied from 0 to 82.5, with an average of 53.5 and a median of 55. In terms of usefulness the majority of the respondents found the tool useful to give an overview of their farm health status, to track progress over time for their farm, and to be aware of and monitor national trends. The components of the tool that were considered most useful for farmers were biosecurity, veterinary public health and AMU components.

Non-users: No questions about usability were asked to non-users. In terms of usefulness the majority of the respondents said that they would think the tool to be useful to give an overview of their farm health status, to compare their farm with other farms, to track progress over time for their farm, to identify problems on their farm, and to be aware of and monitor national trends. No feedback was provided in relation how the tool could be improved for them to start using it.

Post-mortem dashboard workshops:

When asked about how to access information, participants identified two requirements:

Live information given to them in the form of an alert, for example when an animal has been condemned so that they can act on potential issues promptly. Participants also highlighted the need for tailored features, where farmers could set preferences of how they wish to be notified (email, SMS or WhatsApp), and what to be notified on, for example if they set a particular goal or reach a threshold they have chosen. Where preferences are set, vets could also be alerted in real time, for pre-specified issues.

For review over time to reflect on trends: specifically within the dashboard, participants expressed the need for downloads of monthly, quarterly or yearly reports (e.g. data can also be displayed in an Excel file), the ability to input on-farm events (e.g. introduction of a new vaccine or medication), to compare results for the same farm from different factories or different farms with the same owner. They also appreciated a benchmarking feature, to compare national trends to individual farms.

Feedback on the current PHC dashboards

Participants felt that there would be more engagement with the current dashboard if real-time data was available and if the system would flag changes directly to the user. They also suggested increasing font size for some users.

They stressed the need for a system that can recognise the user and save their login details to save time, one that provides reminders via notification of what needs to be done at specific times and if possible, a system that could interact with other relevant systems, such as the Teagasc app.

In the second workshop, participants were happy with the prototype and suggested that a further enhancement would be to link animal health losses with economic losses to highlight farmers what they are losing from poor health.

Overview dashboard workshops:

For the re-design of the “Overview dashboard” participants flagged what were the graphics more useful to them, which ones required further explanation but should be kept and which ones should be removed. They also discussed what data display they would like to see in the overview dashboard.

2.7.11 How results from the evaluation were used for tool development / Next steps.

The post-mortem dashboard is being finalised based on feedback. Font size has been increased and detailed instructions are being developed to help users save their login details without compromising internet security. The “overview dashboard” for farmers is going to be re-design based on feedback from the workshops. One workshop with veterinarians is being planned to also collect feedback from this type of users in the tool and how to re-design the “overview dashboard”

for veterinarians. One workshop with abattoir's managers is being planned to discuss their data needs in relation to the PHC tool (mostly of the post-mortem dashboard).

2.8 Purchase Assistant – Sweden, Norway

2.8.1 Short description about tool and context

Purchase Assistant is a web-based app originally developed by the Swedish Veterinary Agency (SVA). It supports cattle trading and helps farmers monitor infectious disease status in their herds. The app targets farmers, veterinarians, and cattle dealers, offering four main features:

i) herd health overview,
ii) search for animals by breed, age, gender, and location,
iii) post animals for sale,
iv) check health status of other herds.

The Swedish version focused on *Salmonella spp.* and *Mycoplasma bovis*. In Norway, a translated prototype was created using simulated data for Bovine Coronavirus (BCoV), Bovine Respiratory Syncytial Virus (BRSV), hoof health (digital dermatitis and hoof abscess), and udder health (*Streptococcus agalactiae*).

2.8.2 Discussions with stakeholders

Meetings between the Swedish Veterinary Agency (SVA) and the main Swedish dairy farmer association (Växa) we held quarterly to discuss the data and user requirements for the Purchase Assistant (called FriskKo app in Sweden). Based on Växa's input, we prioritized which functions were going to be developed first, and those were the ones we did evaluations on. These meetings were also used to share results from the evaluation and the different participant groups. We also received suggestions from Växa regarding potential participants for the evaluation.

Monthly meetings between the Norwegian Veterinary Institute (NVI) and TINE SA (2023–2025) included discussions on adapting Purchase Assistant to Norwegian conditions. Topics included relevant diseases, pilot user groups, and risks in live cattle trading.

Norway's system differs from other European countries, with slaughterhouses (especially Nortura) acting as key intermediaries. Animalia AS plays a central role, managing databases and issuing health certificates.

A joint meeting on March 5, 2025, with NVI, TINE, Animalia, Nortura, and Fatland reviewed the prototype and discussed strengths and challenges in Norway's cattle trading system. A follow-up meeting on March 17 included a demonstration of Animalia's current system.

Key conclusions:

1. Purchase Assistant should not compete with Animalia's existing systems.
2. Some app features, like health-based purchasing decisions, are desirable.
3. Data privacy is a concern—herd health data cannot be freely shared.
4. NVI will conduct a prototype evaluation with farmers, dealers, and veterinarians within the framework of the DECIDE project.
5. Results will be shared with Animalia and other stakeholders.

2.8.3 Participants

In Sweden, recruitment was done based on farmers that were familiar with the project due to their involvement in the WP3/WP5 focus groups earlier in the project and based on Växa's contact network of dairy veterinarians and advisors familiar with the FriskKo voluntary program.

In Norway, recruitment was challenging, especially during summer. The evaluation included three farmers, one cattle dealer, and four veterinarians. Farmers were selected through convenience sampling. Despite contacting seven major

slaughterhouses, only one dealer participated. Veterinarians were recruited from TINE; outreach to private practitioners was unsuccessful.

2.8.4 Technical Setup

Task-completion test was conducted via Microsoft Teams and recorded using Teams recording function. Participants used their own devices to perform the tasks. Online surveys were distributed through *nettskjema.no* in Norway and *Questback* in Sweden, which ensured anonymity and secure data handling. Raw data were processed and shared with SVA for analysis.

In Sweden, group discussions were conducted online using Microsoft Teams, and transcripts were automatically generated in Swedish. A native speaker reviewed the transcripts before translation into English with Google Translate.

In Norway, group discussions were recorded using the Dictaphone app and transcribed with OpenAI Whisper V3, then manually reviewed by a native speaker and anonymized before English translation with Microsoft Copilot and submission to SVA for analysis.

2.8.5 Data Collection Procedures

In Sweden, task completion tests were led by one of the tool developers of the tool. Group discussions were led by a moderator and an assistant to the moderator that took notes during the group discussion. All those involved in leading evaluation activities were trained by WP3 before the evaluation. All collected data were anonymized before data analysis.

In Norway, Lars Erik Gangsei (NVI) led the test. The Norwegian prototype, built as an R-shiny app, is available at https://connect.posit.vetinst.no/purchase-assistant. Surveys were conducted via *Nettskjema.no*, transcripts were generated with Open IA Whisper V3, manually reviewed by a native speaker and anonymized before English translation with Microsoft Copilot and submission to SVA for analysis.

2.8.6 Task completion test

In Sweden, task completion tests were conducted online during 20-minute one-on-one meetings. Each participant was given up to 5 minutes to familiarize themselves with the tool. Tasks were shared with participants one at a time, using the Teams chat function. Once the participant found out the answer to a given task, answers were entered in the Teams chat. Video recordings were used to compute the time required to find the answer to each task (task completion time or efficiency), and the chat records were used to identify whether the answers to each task were right or wrong (task completion rate or accuracy).

Participants completed three tasks:

- **Task 1**: You are a farmer in the FriskKo program. You would like to know if, based on your laboratory test results, you are on the Green List. Answer the following questions:
  - Are you on the Green List?
  - Write down the last test date for those pathogens for which the last four test dates are infection free.
- **Task 2**: You would like to buy some animals, but you don't know who might have animals for sale. Go to the FriskKo app and find who, from any county in Sweden, is selling at least 10 weaned female calves less than 6 months old, from either Swedish Red or Svensk låglandsboskap. Also, you want them free of Salmonella, but you don't care about the *Mycoplasma bovis* infection status.
  - Write down the seller's herd ID, county, and number of animals for sale

- **Task 3**: You know about two different farmers (herdID 2155 in Hallands län, and herdID 12 in Östergötlands län) that are selling 3 animals. You might be interested in buying their animals, but you would like to check their health status first.
    - What is the overall health status of herdID 2155?
    - What is the overall health status of herdID 12?

In Norway, the task completion test was conducted via Microsoft Teams, with screen recordings of participants as they completed the tasks. Each participant had up to 5 minutes to familiarize themselves with the app. Performance metrics included accuracy (correct answers) and efficiency (time spent).

Participants completed the following tasks:

- **Task 1**: Check if herd ID 2150 is on the green list based on lab results.
    - Overall herd status
    - Last BCoV test date
- **Task 2**: Identify sellers in Trøndelag offering at least 3 NRF bull calves aged 8–16 weeks.
    - Seller herd IDs
    - Herd with red BCoV status
- **Task 3**: Check health status of two known seller herds.
    - BRSV status for herd 2149
    - Overall status for herd 2156

2.8.7 Survey

In Sweden, a link to the survey was provided on the Teams chat upon completion of the task completion test. A designated person from the development team received notifications and link to the survey data on *Questback* via email for posterior data analysis.

The survey included the following questions:

1. Background questions:
    a. What is your role? farmer, veterinarian, farm advisor (not vet), animal broker, other (specify)
    b. Which production system do you work with? dairy, beef, fattening herds, mixed
    c. What is your average herd size? Less than 50, between 50 - 99, between 100 - 199, more than 200
    d. Did you have any technical problems with the app (unresponsive page, results not loading, etc.)? yes, no
2. Usability (SUS) using a 5-point Likert scale as described in section 1.2
3. Usefulness (5-point Likert scale):
    a. I would use the FriskKo app to have an overview of health problems in my farm
    b. I would use the FriskKo app to track progress of health problems in the farm over time
    c. I would use the FriskKo app to identify Salmonella or Mycoplasma bovis infections in the herd
    d. I would use the FriskKo app to decide which herds I want to purchase animals from
    e. I would use the FriskKo app to sell animals to other farmers
    f. I think the FriskKo app would be helpful for managing animal health in my farm
    g. I would review the information provided by the FriskKo app with my veterinarian to direct farm practices
    h. I intend to use the FriskKo app in the future
    i. I would be recommending the FriskKo app to other farms

In Norway, the survey had three sections:

1. Background questions (6 items)

   a. What is your role? farmer (primary seller), farmer (primary buyer), farmer (both buyer and seller), veterinarian, animal broker
   b. Which production system do you work with? dairy, beef, fattening herds, mixed
   c. What is your average herd size? Less than 50, between 50 - 99, between 100 - 199, more than 200
- Is health status important for you when buying live cattle? Scale with 10 grades from "not important" to "totally crucial".
- How important is information regarding health status in Buyer and seller herds for life stock trade? Scale with 10 grades from "not important" to "totally crucial".
- How important is information regarding health status in Buyer and seller herds for life stock trade? Scale with 10 grades from "not important" to "totally crucial".

2. Importance of factors in cattle trading. All questions could be given values on a 3-point ordinal scale + "Not relevant"
   a. The seller's herd also purchases animals.
   b. Size of the seller's/buyer's herd.
   c. Biosecurity routines in the seller's/buyer's herd.
   d. Calf mortality in the seller's/buyer's herd.
   e. Proportion of animals treated for disease (health events per cow per year) in the seller's/buyer's herd.
   f. The seller's/buyer's herd has documentation proving it is free from contagious hoof diseases.
   g. The seller's/buyer's herd has documentation proving it is free from contagious mastitis.
   h. The seller's/buyer's herd has green status for BRSV and BCoV.
   i. Disease incidence among calves in the seller's/buyer's herd.
   j. Does the seller's/buyer's herd vaccinate calves?
   k. Does the seller's/buyer's herd treat calves for parasites?
   l. Does the seller's/buyer's herd maintain good udder health and have good monitoring of udder health?
   m. Does the seller's/buyer's herd use a certified hoof trimmer?
   n. Does the seller's/buyer's herd have good genetics/breeding plans?
   o. Does the seller's/buyer's herd achieve good production results?
   p. Is the seller's/buyer's herd located in geographical proximity?
   q. Does the seller's/buyer's herd have fixed agreements for live animal trade?
   r. Does the seller's/buyer's herd deliver to the same slaughterhouse/dairy?
   s. Does the seller's/buyer's herd have a specific operational setup? (e.g., milking robot, loose housing, etc.)

3. Evaluation of the app, including the 10 items from the SUS as described in section 1.2, and added the following items to assess perceived usefulness (5-point Likert scale, except for first question where alternatives where yes/ no):
   a. Did you have any technical issues with the app?
   b. I think this type of tool is important and useful when buying live animals.
   c. I think this type of tool is important and useful when selling live animals.
   d. I would recommend others to use this type of tool when buying/selling cattle.

Participants accessed the survey immediately after the task test. It was conducted digitally via *nettskjema.no*, and responses were downloaded into a spreadsheet for analysis.

2.8.8 Group Discussion

In Sweden, group discussions were held online using Microsoft Teams between one to two hours after the task completion test. 13 participants (9 farmers, 4 veterinarians) from different parts of Sweden, in 4 groups.

The following prompts were included in the discussion guide:

1. **General usability and usefulness**:
    a. Do you think you would use the FriskKo app?
        i. If yes, what would you use the app for?
        ii. If not, why not? what would you need to happen for you to start using the tool?
    b. Rank the following from most to least useful:
        i. Checking your farm's health status for Salmonella and/or Mycoplasma bovis
        ii. Finding herds that are selling animals and what is their health status
        iii. Announcing animals for sale and their health status
    c. Which improvements would you like to see for you to use the tool?
2. **Communication and information**:
    a. Does the app display enough information to make a decision about your own farm health status?
        i. If not, what information is missing for you to be able to make a decision?
    b. Does the app display enough information to make a decision about which farms you would like to buy animals from?
        i. If not, what information is missing for you to be able to make a decision?
    c. Imagine your herd has always been negative to Salmonella. What would you do if the app shows you that the last sample is positive to Salmonella?

- Imagine you want to buy animals. What would you do if the app shows that, based on your search criteria, all the selling herds are positive to Salmonella?

3. **Data privacy**
    a. How would you feed about your data being used in the tool?
    b. What information do you need to feel safe about sharing your data for this tool?

In Norway, group discussions were limited due to participant dropouts. Only two veterinarians joined one session, and one farmer joined another. Discussions were held in September 2025 after the task test and survey.

Discussion guide included the following prompts, all of them regarding general usefulness and usability of the tool:

1. **General usability and usefulness:**
    a. Would you use Purchase Assistant if available?
    b. Rank the three main features by importance:
        i. own herd health status,
        ii. finding sellers and their health status,
        iii. posting animals for sale with known health status.
2. **Communication and information:**
    a. Suggest improvements, such as:
        i. Additional diseases beyond BCoV, BRSV, hoof and udder health
        ii. Features to ensure safe transport and contact

2.8.9 Tailored Modifications of the General Framework Procedure

Given the prior discussions with stakeholders from Norway, it was decided to include more items to the questionnaire that were tailored to the specific context of the live animal trade in Norway, its current stakeholders, and its current software.

2.8.10 Results

In **Sweden**, a total of 13 participants filled out the survey (farmers n = 9, veterinarians/advisors n = 4). We obtained the following results from these participants:

Task completion test results (differences between number of participants and sample size are caused by missing data due to technical issues while recording the task completion test) are shown in Table 7.

Table 7. Results of task completion test of the Purchase Assistant in Sweden.

Task	Rate (correct/no. participants, %)	Time (avg., SD)
Are you in the Green List?	7/11 (63.6%)	01:05 (00:47)
Write down the last test date for infection free pathogen	7/11 (63.6%)	
Find animals for sale	6/11 (54.5%)	02:22 (01:14)
Overall health status for herd ID 2155	8/10 (80.0%)	02:06 (00:54)
Overall health status for herd ID 12	8/10 (80.0%)	

Veterinarians had less problems finding the right answers to the task completion test (between 75 - 100% of participants found the correct answers. Farmers between 42 - 83% of participants with correct answers).

SUS: average of 63.65 (SD = 10.49). When separated into groups, SUS for veterinarians was, on average, 70.63, while for farmers, SUS was, on average, 60.5.

Questions on perceived usefulness were assigned values from 1 to 5, where 1 = strongly disagree, and 5 = strongly agree. Overall, the answers are between “neutral” and “agree”. The detailed results for each item are presented in Table 8 (average, SD).

Table 8. Results for questions on perceived usefulness of the Purchase Assistant in Sweden.

Item	average (SD)
I would use this tool to have an overview of health problems in the farm	3.1 (1.12)
I would use this tool to track progress of health problems in the farm over time	3.2 (1.14)
I would use this tool to identify Salmonella or Mycoplasma bovis infections in the herd	3.2 (1.07)
I would use this tool to buy animals to other farmers	3.5 (0.97)
I would use this tool to sell animals to other farmers	3.7 (1.18)
I think this tool would be helpful for managing animal health in my farm	2.8 (1.21)
I would review the information provided by the tool with my veterinarian to direct farm practices	3.1 (1.26)
I intend to use this tool in the future	3.1 (1.19)
I would recommend this tool to other farmers	3.3 (0.95

All 13 participants took part in group discussions, and they were distributed into 4 different discussion groups. Insights from the discussion group:

- **Usability**: Overall, the app was easy to use. It can be difficult to find all the filter options if the screen is zoomed in and scrolling up and down is not ideal. Trouble understanding what 'unknown' status is.
- **Usefulness**: the tool is not useful for Salmonella, and it would be better to focus on other pathogens. Overall, it is useful for those farmers that trade animals.
- **Improvements, new functions**: participants would like to see more information about the animals for sale (vaccination status, deworming, dehorning, treatments), add testing results from other pathogens, be able to save a search criterion and receive an alert if an animal for sale matches the criteria, add a list of farmers wanting to buy animals.
- **Information sufficiency and clarity**: add total animals for sale per farm instead of having the results disaggregated by categories), information about the type of Salmonella is missing, as well as information about the sampling program. It would be good to add the absolute value of antibodies, graphs of titres and thresholds, as well as benchmark function.
- **Decision-making based on app information**: notify the veterinarian at the same time as the farmers, information regarding actions to be taken based on laboratory results (legal consequences, follow-up exams, etc.), get SMS notifications.
- **Data privacy and sharing**: add contact details of the sellers, good to know other farmers' status, but they are reluctant to share their own status, lack of understanding who sees the data in the app, able to remove your own information if selling animals.

In **Norway**, a total of 8 participants did the task competition test and 6 participants filled out the survey (farmers n = 3, veterinarians n = 3). We obtained the following results from these participants.

Table 9. Results of the task completion test of the Purchase Assistant in Norway.

Task	Rate (correct/no. participants, %)	Time (avg., SD)
What is the overall status of your herd?	6/8 (75%)	01:29 (00:38)
What is the last sampling date for BCoV?	5/8 (63.5%)	
Farms selling male calves	7/8 (87.5%)	02:03 (01:10)
Which potential seller herds have red status for BCoV?	7/8 (87.5%)	
What is BRSV status of seller ID2149	7/7 (100%)	02:08 (00:55)
What is 'total status' for seller ID 2156	6/6 (100%)	

SUS score was, on average, 47.1 (SD = 4.01).

Results from participants (n = 9) to the perceived usefulness items included in the survey are shown in Table 10.

Table 10. Results for questions on perceived usefulness of the Purchase Assistant in Norway.

Item	average (SD)
I would use this tool when buying livestock	4.2 (0.75)
I would use this tool when selling live animals	4.2 (0.75)
I would recommend this tool to other producers	3.8 (1.17)

Highlights from group discussions (1 farmer, 2 veterinarians)

- General usability and usefulness
  - Overall, easy to navigate
  - Good that it has filters to search for animals based on some criteria
  - It is an initiative that connects well with other initiatives to ensure safe animal trade
  - It won't be helpful if the information about selling animals is not updated
  - The tool may not be that helpful when it comes to organizing trade
  - The most valuable function is the search for animals for sale for both veterinarians and farmers.
- Improvements
  - consider adding more diseases
  - add vaccination status of animals for sale
  - add information of trading patterns from selling herds because it may be linked to risky behaviour.

2.8.11 How results from the evaluation were used for tool development / Next steps.

In Sweden, the evaluation has highlighted the fact that the underlying data and app need to reach the right users. For further development, the dialogue would benefit from including farmers specialised in meat production. In contrast to Swedish dairy farmers, these regularly purchase animals, both from dairy and suckler beef herds. Potentially, this could involve another main animal health organisation in Sweden (Gård & Djurhälsan).

The tool will probably not be a "standalone" tool but be integrated or linked to existing platforms. Further dialogue with the private stakeholders and the Board of Agriculture will guide decisions of development focus onwards; both the health monitor part and the animal trade part should be expanded to become useful and popular among user target groups.

As part of the evaluation process, in particular the communication with stakeholders, it is clear that the Purchase Assistant app will not be a "standalone" tool in the Norwegian marked. The current solution for buying and selling cattle, administered by Animalia AS, will likely remain the preferred, probably the only, and certainly the dominant solution for trading live cattle. However, the evaluation of Purchaser Assistant has been valuable; it has revealed functionality that should at least be considered for inclusion in Animalia AS's current solution—particularly the option to order live cattle based on the health status of the seller's herd.

The results presented in this report will be compiled in Norwegian and forwarded to Animalia AS, Nortura SA, and TINE SA, all of which play a central role in cattle trade in Norway.

2.9 Broiler Virus circulation – Poland

2.9.1 Short description about tool and context

Poland is the biggest producer of broiler chickens in Europe. Several endemic viral diseases (i.e., infectious bursal disease virus, avian infectious bronchitis, and avian metapneumovirus) circulate in the population. The main prevention for those diseases is vaccination. However, limited information is available on viruses and their variants circulating in the population, despite the need for producers to make effective, costly decisions to prevent infections.

In this context, the tool prototype was developed by AUSVET and SLW Biolab, with a focus on two specific goals. First, the tool aims to support farm health technicians and veterinarians in determining whether one of these viruses has circulated on the farm, based on various information (virology test results, serology test results, and vaccination history) combined in a decision tree designed by GD/UU, AUSVET, and SLW Biolab. Second, the tool provides users with information about the circulation of diseases and strains in their vicinity, offering essential guidance for selecting an appropriate vaccination protocol. Depending on the user and agreement with the data provider, this information can be anonymised and aggregated. The prototype was designed in Figma (https://www.figma.com/), allowing future users to discuss the tool's usefulness before its full development.

2.9.2 Discussions with stakeholders

The initial concept of the tool was developed in collaboration with multiple stakeholders. First interviews were conducted with two integrators and SLW biolab to gather information on stakeholders' needs and capabilities for data collection and analysis. Then, the data collected from stakeholders were analysed to define not only what data were available but also what information they could provide if analysed using a tool to address the stakeholders' needs described in the first interviews. All this information was used to define a prototype. Following the initial phase of stakeholder consultation and prototype development, the tool's usefulness was evaluated during three group meetings. They took place online in spring 2025, with representatives from AUSVET and SLW Biolab. These meetings were in English, with possible support/ translation done by SLW Biolab. The last meeting occurred in September 2025, in Polish with only representative of SLW Biolab present.

The first meeting occurred on February 26th, 2025, with three Polish poultry veterinarians who worked in different contractual settings (either part of a Polish (semi-)integrated company or part of private vet practices). None of the participants had attended the previous meetings to define the prototype tool.

The second meeting took place on April 4, 2025, with two representatives from a Polish semi-integrated company, including a poultry veterinarian. This veterinarian has regularly participated in discussions since the project's inception, initially to define the needs and capabilities of the Polish poultry sector and subsequently to identify the primary area of interest for defining the tool.

The third meeting took place on 29th of September 2025, with two representatives from a Polish semi-integrated company, including a poultry veterinarian. The stakeholders highlighted in more details their needs regarding the future tool. Also, they have demonstrated interest in further investment into tool development.

Overall, the co-construction process defined allowed the development of a prototype that fitted not only the needs of the stakeholders but also their technical capacities and the data they collect. This was validated in the second run of the interviews. In this meeting stakeholders highlighted not only the tool's usefulness and their willingness to continue discussing its development but also how the different features could better address their information needs and fit into their workflows. Unlike other tools, the researchers developing it are not affiliated with any public institutions; hence, the tool's sustainability depends on stakeholders' interest and investment. The second round of meetings, therefore, ensured with stakeholders the usefulness of the tool and is the stepping stone to start follow-up discussions on defining the tool's business model.

2.9.3 Participants

All participants were identified and recruited based on convenience sampling as collaborators of the SLW Biolab. Their willingness to participate was also taken into consideration. The inclusion criteria were being a potential user of the tool, either as a Polish poultry veterinarian or a decision-maker in a Polish poultry integrator. No exclusion criteria were defined. All participants were Polish.

2.9.4 Technical Setup

The sessions were held online and not recorded. No specific technical setup was in place as participants were not given access to the prototype tool during the spring meetings.

2.9.5 Data Collection Procedures

The evaluation was conducted by the tool designer (AUSVET and SLW Biolab) and local partner (SLW Biolab), and the evaluation framework was not followed due to constraints and informal setting. The team consisted of three researchers who were all present at all spring meetings, among which one also conducted the September meeting. The goal of the evaluation was to first get the main feedback and second, identify potential partners. Due to these settings, the meeting was not recorded and relied solely on notetaking by the DECIDE participants.

2.9.6 Task completion test
Not done.

2.9.7 Survey
Not done.

2.9.8 Group Discussion
For the spring interviews, all participants began with a presentation of the tool, which included its goals and main features. The demonstration of the prototype tool was used as a basis for discussion. Three main questions were used to guide the discussion:

- Could such a tool be useful for you, your client, and others?
- Would you use it?
- Do you have any suggestions to make it better?

The sessions were not recorded; however, notes of the intervention were taken by all DECIDE partners participating in the meeting.

2.9.9 Tailored Modifications of the General Framework Procedure
The Polish poultry industry is highly competitive and fragmented, resulting in limited access for stakeholders. Only stakeholders who had previously collaborated with the local partner (SLW Biolab) responded to the request for feedback on the prototype. In this context, the evaluation questions were part of a broader discussion on the tool's viability and future development. The general evaluation procedure was adapted to the context by combining discussions of tool presentation and evaluation with consideration of future tool development and its potential impact on the tool's sustainability and usability.

2.9.10 Results
All participants in the group discussion confirmed the tool's usefulness. The tool was deemed sufficient to provide relevant information to stakeholders and to support the definition of vaccination programs.

Regarding the first feature of the tool, partners' feedback focused on the possibility of limiting manual data entry by building data flows. The possibilities, however, were very different depending on the partners present in the discussion, as the definitions of users and business plans identified differed between the two groups (a set of Polish veterinarians with varying employers/ work statuses vs. employees of the same integrator).

Regarding the second feature of the tool, which provides information on the circulation of the virus and its strains in nearby farms. The usefulness of the feature was not questioned, but the conversation quickly shifted to data governance and privacy concerns. In the feature, data privacy protection was based on a query that ensured anonymity, given the amount of information available. Such a query enables the definition of aggregation to vary according to the amount of information, for example, allowing dense areas with a high volume of data to provide information at a higher resolution without compromising data privacy and security. The discussion highlighted that stakeholders felt more at ease with a presentation of results for a fixed minimum radius (for example, 50 km), than with the complex query they couldn’t fully control. This question group's discussion with employees of a single integrator, who didn’t bring it up.

Regarding further development, for the group with employees of a single integrator, the possibility of accessing historical information entered the tool was considered an important asset to make the tool more useful. This is particularly true for vaccination history. Furthermore, the possibility of creating an alert when a new virus circulation/ strain was identified in the proximity of the location was proposed as a useful addition to the tool.

The difference in focus between the two groups highlights their different perception of the tool and the business model possibilities. In one case, for employees of a single integrator, if they decide to invest, they consider that they are big enough and they don’t need to share the information. Hence, the tool would be an addition to support their current workflow, for example, by recording the vaccination history of the farms. On the other hand, the second group, based

on actors currently competing, is more concerned about protecting their data and information. Hence, it is crucial to define the direction for the tool's development before any further development, and to determine who will lead and manage it.

2.9.11 How results from the evaluation were used for tool development / Next steps.

The general feedback from the discussion was that the tool was considered useful by the stakeholders, indicating that its development could be continued. The feedback from the evaluation helped define more specifically the different features to be developed or not, depending on the various tool users: a single integrated company or a diversity of independent stakeholders from the Polish poultry industry could indeed get access to different features of the tool to make it more relevant to their specific needs. The discussions were also useful for identifying data flows and data privacy concerns, depending on the user and the data owners. The next steps include defining a business plan to identify stakeholders willing to invest in the development and maintenance of the tool.

3 Experimental study on reactions to alarms and data deviation

The evaluation framework was adapted to fit the experimental design of evaluating the BRD tools. This relates to the own nature of these tools that are hardware dependent (relying on BRD sensor collars). Instead of short remote task completion tests, these tools required on farm trials and adapted in person methods to be properly evaluated.

3.1 BRD Tools (Eval'BRD, Connect'BRD) – France

3.1.1 Short description about tool and context

The BRD tools were created by INRAE and ONIRIS to improve the early detection of bovine infectious bronchopneumonia (BPI) by French farmers, particularly in young cattle fattening. However, it is conceivable that in the longer term, and subject to specific adaptation, this tool could also be used as a tool for exchanges between farmers and veterinarians, advisors, cooperatives and producer groups that are partners of these user farmers. This tool combines real-time data from sensors reflecting the health status of young cattle with a connected tool based on a mechanistic epidemiological model of BPI that runs various algorithms. The tool thus issues individual health alerts in real time, accompanied by personalised recommendations for intervention for the animal in question.

3.1.2 Discussions with stakeholders

IDELE led preliminary, in-person stakeholder engagement to adapt the provided evaluation framework to the French young beef context.

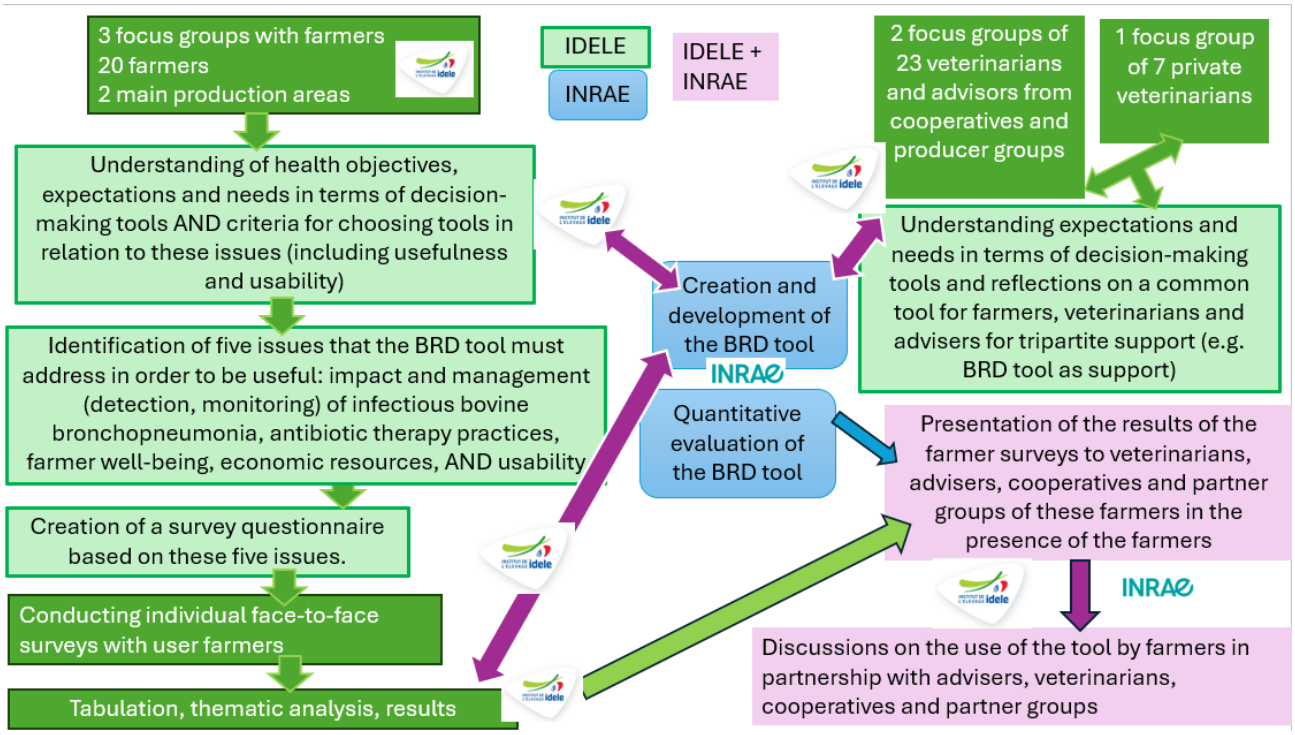

Figure 1: Stakeholder engagement workflow used to adapt the evaluation protocol: farmer and adviser/veterinarians focus groups informed five priority themes, which guided survey and discussion-guide development and were validated in multi-stakeholder field meetings (IDELE led engagement; INRAE led parallel quantitative validation).

Engagement proceeded in two stages:

- Step 1: identified the context of use by gathering views from farmers and their advisory partners (veterinarians, advisers, cooperatives, farmer groups) through focus groups to define priority health objectives and criteria used by farmers to choose tools. Analysis of these focus groups data highlighted five priority themes for the evaluation: respiratory disorder management (detection, prevention, treatment), antibiotic use, farmer welfare, management of technical and economic resources, and usability.
- Step 2: IDELE used these themes to tailor the supplied survey and group discussion guide and piloted the adapted materials in field meetings. INRAE ran a parallel quantitative survey to check convergence between approaches. IDELE held four multi-stakeholder meetings in 2024 – 2025 to discuss the tool with farmers and advisors.

3.1.3 Participants

For context-mapping (focus groups), IDELE recruited farmers, veterinarians and advisors, cooperatives and producer groups using convenience sampling via its veterinary and cooperative/breeder networks in two main production areas (West, East) to ensure national representativeness. Twenty farmers (three farmer focus groups) and twenty-three veterinarians/advisers (two advisor/veterinarian focus groups) and seven private veterinarians (one focus group) were enrolled. Farmers and veterinarians/advisors were aged between 30 and 60, with an average age of 45.

For the evaluation and testing stage, IDELE and its partner cooperatives (BOVINEO, TERRENA) recruited farmers to conduct evaluations on their farms. Once the tool had been evaluated by the farmer users, the results were presented to the farmers and their partners (veterinarians, cooperative advisors and partner farmers' groups) to discuss the tool and consider developments for joint use.

Recruitment criteria for farmers were as follows: livestock farms where fattening is the main activity, farm is located less than two hours from INRAE, there is Wi-Fi in the buildings or nearby, the farm has a quarantine building in which animals remain for more than six weeks, and the farm has a restraint corridor with access from both sides. In terms of animal batches, the eligible farms had to have at least three batches of 7 to 20 animals arriving simultaneously, as well as the possibility of repeating batch placements on the same farm. The animals arriving were male weanlings, preferably Charolais, aged between six and a half and nine months.

The advisors/veterinarians recruited were required to work with the farmers involved in testing the tools in order to see how the BRD tools could not only be used by farmers but also serve as a basis for discussion with the veterinarians/advisors partnering with these farmers with a view to monitoring the accuracy and quality of livestock farming. IDELE carried out this recruitment process using information provided by farmers and farmer cooperatives.

In the end, eight farmers tested the BRD tool, and their advisors and partner veterinarians joined the farmers at follow-up meetings to discuss and report on the trial.

3.1.4 Technical Setup

IDELE conducted all testing in person to facilitate the expression of respondents and exchanges. Prior experience with the evaluation of other tools that were recoded, participants found camera recording intrusive and communication was impaired. Subsequently, IDELE conducted the evaluations in person.

Individual farmer interviews for the main evaluation were audio recorded with a handheld dictaphone for transcription. Multi-stakeholder meetings with farmers, veterinarians, advisors, cooperatives, and farmer groups were not recoded at participant's request.

The BRD tool required on-animal sensors and local connectivity for data upload; farms selected for testing had on-site or nearby Wi-Fi to support multi-month deployment. Hardware and connectivity constraints influenced participant selection and in-field testing logistics.

3.1.5 Data Collection Procedures

IDELE led qualitative and semi-quantitative data collection: a primary IDELE facilitator co-facilitated all group sessions with a second co-facilitator; both were trained in participatory methods and one had sociology expertise. Individual IDELE farmer interviews were conducted by a veterinary PhD student, who had been trained in advance by IDELE facilitator with sociology expertise.

INRAE conducted a parallel quantitative survey on farms; data collection was performed by an INRAE-supervised veterinary PhD student.

Questionnaires and discussion guides were co-developed by IDELE and INRAE to align with the WP3 themes (usefulness and usability). Regular IDELE/INRAE coordination meetings ensured consistency and iterative instrument refinement.

IDELE individual interviews were audio recorded (handheld Dictaphone) for transcription and thematic analysis. INRAE quantitative sessions were not recorded because they were intended to collect quantitative data. Multi-stakeholder meetings were not audio-recorded at participant's request; instead, two facilitators attended each meeting so one could facilitate while the other took comprehensive notes to preserve data.

3.1.6 Task completion test

Farms used the BRD tool for more than six months. Tasks focused on realistic workflows, for example: install or fit collards, view individual animal activity curves, interpret health alerts, and decide on follow-up or treatment actions based on alerts and recommendations issued by the tool and clinical observations by user farmers.

Farmers received these health alerts or not, depending on the health status of their young beef cattle. They had to register all the treatments administered (cattle number, date, name of the medicine, duration of treatment, etc.) in their health log or in a document provided by INRAE/IDELE and indicate the factor(s) that motivated or did not motivate the administration of treatments (BRD tool alert, clinical condition, etc.).

3.1.7 Survey

INRAE collected farm-level quantitative data on recorded health alerts and corresponding treatment decisions. Data were gathered on-farm by INRAE-supervised veterinary PhD student and analysed by INRAE to compare alert occurrence with whether treatment was administered.

IDELE conducted in-person, 1.5-hour individual interviews after at least one month of tool use. A trained veterinary PhD student conducted and analysed these interviews under IDELE's supervision. The survey combined open qualitative prompts about usability and funnelled open qualitative prompts and semi-quantitative items addressing four stakeholder-identified themes: respiratory disorder management (detection, prevention, treatment and animal welfare), antibiotic use, farmer welfare, and technical/economic resource management. For each theme farmers reported current practice, observed impact of the tool, and perceived potential after improvements; impact was rated on a -5 to +5 scale (-5 = strong negative, 0 = no impact; +5 = strong positive) to produce semi-quantitative scores comparable across participants.

Core usability questions (asked to farmers after tool use):

- What did you think of the tool's usability?
- What improvements would you like to see for this tool?
- Who do you think is the target audience for this tool? Could it be made available to a large number of farms, or is it only suitable for a specific audience?

Example usefulness questions (antibiotic use, same format applied to other themes):

- Before using this tool, how did you use antibiotics to treat respiratory disorders?
- What impact has the tool had on these practices, and what do you think of the management recommendations proposed by the tool? Can you rate this impact on a scale of -5 to + 5 (-5 = strong negative impact, 0 = no impact, + 5 = strong positive impact)?
- What potential do you see for such a tool in relation to the use of antibiotics?

3.1.8 Group Discussion

IDELE ran 2-hour group discussion sessions in person with indirect users ((veterinarians, advisors, cooperatives, livestock farmer groups) together with farmers at two points during the evaluation: mid-experiment and at the end.

Early-stage focus groups (context mapping) informed questionnaire construction and are summarized in 2.2.3 and 2.2.2. The group discussions in the evaluation stage aimed to (a) present farmer's experiences from individual testing, (b) gather advisor/veterinarian's perspectives on tool fit for advisory workflows, and (c) identify barriers and conditions for joint farmer – advisor/veterinarian use.

The general questions asked to the farmers were as follows:

- What are your medium- and long-term objectives for your young beef cattle fattening in terms of health and welfare?
- In your daily work, do you use technology to help you? Which technologies work best on the farm?
- What is your experience of recording and using data on your farm? What are the advantages of recording data? Are you willing to share your data?
- How do you identify sick animals?
- What do you expect from technology? What tools do you need to manage disease in young bulls?
- What are your criteria for choosing new technologies?
- What are your expectations of a decision-making tool to help you decide whether to treat an animal?

The general questions asked to veterinarians and cooperative/group advisors were as follows:

- During the initial visit when young cattle arrive for fattening, and then during the monitoring of the batches:
    - What steps do you follow?
    - When do you use data? Which data? Which technologies? Which ones?

- What data do you use? What data is available?
- What data are you missing? What do you need?
- How do you use the data and for what purposes? Are you prepared to share your data?
- In your daily work, how do you use new technologies? Which ones do you use?
- On the farm, have you seen/noticed any technologies that you found interesting? What do you see as the limitations of these technologies?
- In livestock farming and allotment centres:
    - What are your needs and expectations with regard to new technologies?
    - What are the obstacles to using these new technologies?
    - What tools would you need to ensure accurate and high-quality technical and health monitoring with the farmer?

The general questions asked to veterinarians in private practice were as follows:

- In your daily work, what data do you use? Do you use it often? In what contexts? How? What data are you missing? Are you willing to share your data?
- In your daily work, what tools do you use? Do you use them often? In what contexts? What other tools do you need?
- In your daily work, what would be the ideal tool to support young cattle farmers?

The general questions asked of the farmers testing the BRD tools were as follows:

- Can you tell us about your farm?
- What do you think are the main challenges facing the young cattle fattening sector today?
- What data do you currently use, what data are you missing and in what context? What do you expect from data recording on your farm?
- What is your opinion and experience of new technologies on your farm? What do you expect from new technologies on your farm?
- Are you concerned about respiratory disorders in your fattening operation? To what extent are they a problem or a priority?
- What are you currently doing in terms of prevention and treatment of respiratory disorders? What improvements need to be made in terms of managing respiratory disorders?
- Who do you turn to for advice/information?

The general questions asked of the veterinarians and partner advisers to farmers using the BRD tool were as follows:

- In your daily work, what data do you use? Do you use it often? In what contexts? How? What data are you missing?
- In your daily work, what tools do you use? Do you use them often? In what contexts? What other tools do you need?
- What tools would you need to ensure accurate and high-quality technical and health monitoring with the farmer?

We will therefore focus here on the second stage of evaluation and testing of the tools, which aimed, among other things, to assess perceptions of the tool's usability and usefulness.

3.1.9 Tailored Modifications of the General Framework Procedure

The BRD tool was evaluated using the evaluation framework but adapted methods to the BRD tool and French young-beef context. Key adaptations were: all engagement and testing were conducted in-person to respect stakeholder preferences and encourage open discussion; on-farm testing used prolonged real-world deployment (several months) rather than simulations; individual farmer interviews were tailored to five stakeholder-identified themes and included a semi-quantitative -5 to +5 impact scale to align DECIDE comparators with the BRD context.

INRAE ran parallel quantitative survey to validate health alerts and compare with IDELE's qualitative and semi-quantitative findings. IDELE also provided ongoing information to partners (livestock farmers, veterinarians, advisors, cooperatives/farmers' groups, etc.) as well as to INRAE and held four multi-stakeholder meetings to ensure the evaluation remained aligned with advisory workflows and acceptability constraints.

3.1.10 Results

Table 11 summarises the numerical responses from farmers regarding the usefulness of the BRD tool in its current configuration. Farmers were also asked about the tool's potential, after considering suggestions for improvements. This is summarised below.

Table 11. Responses from farmers surveyed regarding the usefulness of the BRD tool on a scale of -5 to +5.

Usefulness of the tool	Breeder A	Breeder B	Breeder C	Breeder D	Breeder E	Breeder F	Breeder G	Breeder H
On the impact and management of respiratory disorders	1.5	2.5	1.5	0	0	3	2	4
On the use of antibiotics	-1	0	0	0	0	0	0	1
On economic resources	0	0	0	0	0	1.5	0	0
On the farmer's wellbeing	1.5	2	3 then -2	0	0	1	0	2.5

Farmer's semi-quantitative ratings indicate the BRD tool is perceived as beneficial for respiratory-disease management (earlier detecting and improved monitoring), but alerts were judged overly sensitive. Nevertheless, the tool remains an aid to the farmer's decision-making process thanks to the health alerts it issues, which the farmer can compare with their clinical observations and knowledge of the animal's health history.

The main findings from farmers can be summarized as follows:

- Early detection and monitoring: farmers reported the tool detected sick animals they had missed and provided useful alerts during busy periods.
- Sensitivity and false positives: frequent/over-sensitive alerts reduced trust and increased perceived workload.
- Limited short-term impact on antibiotic use: no clear change in antibiotic consumption during the pilot, farmers expect potential benefit after sensitivity tuning and longer follow-up.
- Impact on costs: the tool has good potential for cost control by enabling earlier detection and earlier treatments, limiting relapses and reducing the number of new treatments. Longer term studies that consider farm-specific parameters would be needed.
- Reassurance and farmer welfare: the tool provided monitoring reassurance, supporting farmer well-being when alerts were reliable.
- Practical usability issues: collars were seen as time-consuming and potentially hazardous to fit; farmers preferred ear tags which are more secure for farmers.
- Desire for control and transparency: farmers want clearer information about how alerts are generated and the ability to adjust alert thresholds.

INRAE's analysis corroborated farmer's perception of high sensitivity (elevated alert rate). Both qualitative and quantitative steams therefore point to the same primary technical issue: tuning of alert thresholds and/or specificity.

Advisor / indirect-user perspective:

- Not ready for advisory workflows in current form: veterinarians, advisers and cooperatives viewed the tool as primarily for farmers and not yet fit for integration into their own systems.
- Interest in data sharing: advisors, veterinarians, cooperatives, farmers' groups expressed interest in selective transfer of processed indicators (e.g., alert counts) into batch-management systems to trigger visits or follow-up.

3.1.11 How results from the evaluation were used for tool development / Next steps.

IDELE collected farmer feedback during interviews and group meetings and communicated prioritized requests to INRAE for implementation during the trial. The following changes were implemented during the trials:

- Alert delivery: added weekend email delivery (SMS alerts already sent on weekdays).
- Activity visualization: provision of individual activity curves generated by collars for each animal.
- Alert management: suppressed repeated alerts or chronically ill animals; added an option to deactivate alerts during respiratory epidemics to reduce notification overload.
- Improve transparency: a new presentation of the tool was made to all stakeholders.

The following usability improvements will be considered:

- Algorithm tuning to reduce false positive and improve specificity of health alerts.

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