DRG4FOOD

DIGITAL RESPONSIBILITY

REPORT 2024/2025

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a Horizon Europe project

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EXECUTIVE SUMMARY:

This concluding Digital Responsibility Report summarises how the DRG4FOOD project has **operationalised** the Digital Responsibility Goals (DRGs) in data-driven food solutions and proposes a pragmatic **framework for assessing Digital Responsibility** beyond the lifetime of the project.

Across two Open Calls, eight funded consortia designed, implemented and piloted digital solutions in real-world contexts along the food value chain. Digital Responsibility was embedded as a selection, coaching and evaluation lens, supported by the DRG4FOOD Toolbox, Playbook and mentoring activities. The resulting portfolio moves **beyond minimal legal compliance** and uses the DRGs as a structuring device for architectural choices, governance models and user experience design.

Part I of the report provides a cross-cutting look at this portfolio through the lens of the seven DRGs. Rather than documenting individual features in detail, it synthesises how the pilots interpreted each DRG, where they went **beyond common industry baselines**, and **which patterns emerged** across different application domains. This includes reflections on how Digital Responsibility influenced design trade-offs, how openness and participation shaped outcomes, and where implementation depth still varied.

Part II introduces a light-weight, DRG-based **measurement criteria, indicators and maturity framework** that distils these experiences into a **reusable assessment tool**. It defines four maturity levels (Baseline, Structured, Integrated, Transformative) and a small set of indicators for each DRG. The framework is intended for self-assessment, particularly by small teams and SMEs, and can be adapted to other sectors where trustworthy, human-centred digital technology is needed.

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Visit our project website at drg4food.eu

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INTRODUCTION

WHY THIS REPORT?

The “Digital Responsibility Goals for Food” (DRG4FOOD) research project (total funding: €4 million) kicked off in December 2022 under the EU’s Horizon Europe Programme. Its mission is to foster a data-driven food system that inspires trust throughout the food chain. To achieve this mission DRG4FOOD launched two Open Calls for funding - one in September 2023 and a second in spring 2024, for a total of €1.9 million. The funding was available to third parties interested in developing digital applications for the food sector, adhering to a framework based on IDENTITY VALLEY’s Digital Responsibility Goals (DRGs), seven guiding principles for creating responsible digital technology.

To validate the effectiveness of the project’s efforts relating to Digital Responsibility DRG4FOOD publishes regular reports detailing how the project contributed to Digital Responsibility and the creation of responsible technology, including recommendations for further progress.

Digital Responsibility Goals (DRGs)

This concluding Digital Responsibility Report covers the final phase of DRG4FOOD, from the end of 2024 to the project's closure in November 2025, including the completion of Open Call #1 & Open Call #2 projects. It builds on the 2023/2024 report, which analysed how the first cohort (Open Call #1) translated the Digital Responsibility Goals (DRGs) into concrete features and identified common patterns and challenges.

The aim of this concluding report is twofold:

1. Give a concise, cross-cutting account of what the eight funded consortia ultimately achieved in terms of Digital Responsibility, going beyond a baseline of software development and design.

2. Propose a pragmatic, DRG-based prototype for measurement criteria and a maturity model that can be reused by other actors in data-driven (food) systems.

DRG4FOOD Reporting Timeline

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WHAT IS DIGITAL RESPONSIBILITY?

Digital Responsibility encompasses the responsible design, provision and use of digital technology to enable a digital transformation prioritising human flourishing and well-being. It involves, among other things, protecting privacy, ensuring data security, fostering fairness, and promoting inclusivity, transparency and personal autonomy. For example, an organisation practicing digital responsibility might voluntarily implement strong data protection measures beyond legal requirements, regularly audit its algorithms for accuracy, and clearly and transparently communicate its data usage policies.

By upholding principles of Digital Responsibility, organisations are consciously addressing the societal and personal implications of their digital actions, aiming for a positive influence on a more sustainable and trustworthy digital ecosystem with the human at its center.

DRG4FOOD CONSORTIUM

The DRG4Food consortium includes research institutions like the **Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA)** and non-profit organisations like the **European Food Information Council (EUFIC)**, responsible technology experts like **Identity Valley**, privacy experts like **Privanova**, food software experts from **Premotec**, and technology startups like **TWINDS Foundation** and the innovation consultancy **Inosens**.

The consortium's mission is to accelerate the development and adoption of data-driven business models in the food industry while prioritising trustworthiness of digital solutions. By leveraging their collective expertise and networks, the consortium is collaborating with various stakeholders, including open-source innovators, academic groups, startups, SMEs, and civil society. Through collaboration with entrepreneurial ecosystems and accelerator programs, the consortium aims to co-create a vision and develop practical solutions for a digitally enhanced, sovereign, fair, and trustworthy food system in Europe and beyond.

IMPLEMENTING DIGITAL RESPONSIBILITY

RESPONSIBLE TECHNOLOGY INCUBATOR

Across two Open Calls, DRG4FOOD funded eight consortia and embedded Digital Responsibility into selection, coaching and evaluation. Digital Responsibility was a formal scoring criterion, and projects were supported with a toolbox, playbook and mentoring to turn the seven DRGs into practical design and engineering decisions.

Open Call #1 focused on building reusable enablers; Open Call #2 emphasised full integration of these and other tools into “featured solutions” that must contribute back to the DRG4FOOD Toolbox with documentation, code and learnings.(drg4food.eu)

By the end of the project:

- Teams delivered working demonstrators deployed or piloted in realistic environments (e.g. farms, food processing facilities, food banks, supermarkets, households, schools).
- Teams contributed open-source components, documentation and methods back to the DRG4FOOD Toolbox for future developers to build with and benefit from.
- DRG coverage across the portfolio moved beyond minimal legal compliance, with multiple pilots

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IMPLEMENTING DIGITAL RESPONSIBILITY

implementing advanced practices such as privacy-preserving identity solutions, open data commons, systematic fairness checks and co-governance with user communities.

The following sections summarise achievements per DRG theme, highlighting where projects went beyond common industry baselines.

Presentation of the 8 pilot prjects at the DRG4FOOD Final Conference

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IMPLEMENTING DIGITAL RESPONSIBILITY

DRG #1 Digital Literacy

Several solutions directly target digital literacy and inclusive access:

SafeNutriKids developed an AI-powered nutrition-education app for children aged 6–12, combining personalised dietary guidance with digital literacy education. The project explicitly targets responsible digital citizenship and accessibility across different cultural and educational contexts.

NutriWell addresses older adults (65+) with a suite of AI-based enablers (nutrition data space, personal data wallet adapter, AI nutrition plan generator, cuisine allocator and social cooking organiser) and uses living labs to design services that are accessible to less digitally confident users.

ATTESTED involves small producers in Sicily and Crete through co-design workshops (e.g. “rich picture” exercises, interactions with QR codes and hardware prototypes) to ensure the resulting traceability system is understandable and practically usable by farmers and workers.

Collectively, these initiatives indicate that DRG4FOOD triggered not just safer technology, but tools that actively build users’ competencies and reduce exclusion in digital food services.

DRG #2 Cyber security

Across the portfolio, cybersecurity moved from generic HTTPS/SSL use to more context-aware and advanced protections:

PINACLE applies privacy-preserving digital identity (self-sovereign identity, verifiable credentials, zero-knowledge proofs) to represent health-related attributes of food donation recipients without revealing their full identity, reflecting both cybersecurity and privacy-by-design thinking.

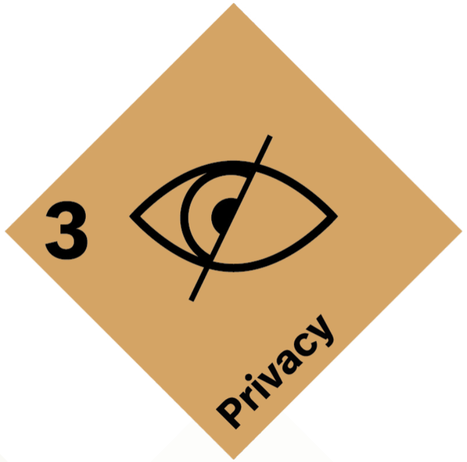
NutriWell builds on FIWARE, iSHARE and dataU components to create a trusted nutrition data space with secure, standardised interfaces and identity management.

SafeNutriKids implements an AI-based platform using zero-trust design principles for children's data, combining strong security with strict access control.

ATTESTED and Cacao-Tech use secure IoT, sensor and data management stacks for traceability in small and medium supply chains, benefitting from partners' cybersecurity experience in FAIR data systems and industrial data platforms.

Most projects acknowledge that comprehensive penetration testing and third-party audits remain resource-intensive, but the final solutions embed security decisions that are explicit, documented and tailored to risk profiles rather than minimally compliant.

DRG #3 Privacy



The final portfolio shows significant progress beyond baseline regulatory compliance:

NutriWell foregrounds user sovereignty by providing a Personal Data Wallet and explicit consent-based data sharing for nutrition profiles and health-related information.

Users can define detailed dietary and wellbeing profiles and are informed about how data is used to generate plans.

NutriSight limits personal data collection by design: the focus is on product images and labels rather than user profiles. The project uses Open Food Facts as an open data commons and keeps individuals in the role of contributors rather than subjects of profiling.

PINACLE's self-sovereign identity approach allows individuals receiving food aid to disclose only what is necessary (e.g. dietary constraints) while keeping control over their broader identity and sensitive attributes.

SafeNutriKids combines children's data protection with parental oversight and education, aiming to respect children's rights while still enabling personalisation.

As a result, privacy and user sovereignty are not treated simply as legal constraints but as design parameters influencing architecture, interaction flows and governance.

DRG #4 Data Fairness

Data fairness appears in several solutions:

NutriSight treat food data as a public good: nutritional data is released under open licences, training data and models are shared publicly on Hugging Face, and the community can inspect and reuse the outputs.

Cacao-Tech and **ATTESTED** make traditionally opaque agricultural data visible to small producers and cooperatives, using sensors, GPS and traceability to reward quality and compliance rather than leaving value capture to downstream actors only.

Overall, DRG4FOOD encouraged a shift from data being an internal asset to being shared in ways that benefit producers, intermediaries and citizens more symmetrically.

DRG #5 Trustworthy Algorithms

The final solutions show increased attention to explanation, validation and fairness:

NutriWell uses advanced personalisation (precise macro-nutrient calculations, multiple cuisines, gamification) but emphasises clarity about what is being optimised and how meal plans are derived, supported by ongoing user testing and living-lab activities.

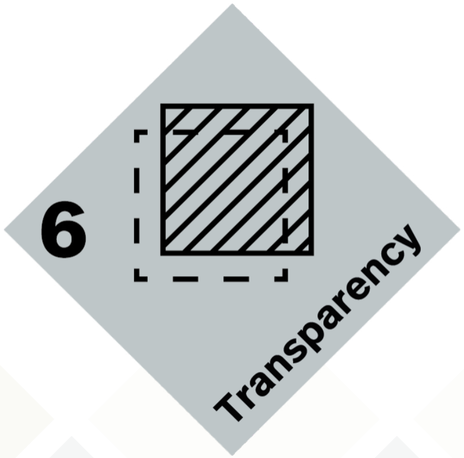
NutriSight's extraction model is tightly coupled with open data and open code. Contributors can inspect and test how nutritional tables are extracted from images and help identify and correct failure cases, which supports accountability and continuous improvement.

DISH combines a machine-readable recipe language and a "cooking graph" with a nutritional scoring model to adapt recipes to personal needs (allergies, lifestyle, sustainability), making the logic of substitutions interpretable and linked to nutritional data.

PINACLE and **SafeNutriKids** incorporate domain expertise (nutrition science, paediatrics, social work) into the design and validation of recommendations, combining algorithmic logic with expert review.

Trustworthiness is thus operationalised as a combination of technical measures, expert validation and user feedback, rather than model accuracy alone.

DRG #6 Trans-parency



Transparency was one of the clearest areas of advancement:

NutriSight is strong on transparency: open database, open APIs, open licensing (data commons) and public communication about how NutriSight works and why it was developed.

ATTESTED and **Cacao-Tech** provide farm-to-fork visibility by exposing data on origin, quality parameters and supply-chain steps to both producers and consumers, supporting compliance with regulations like the EU Deforestation Regulation.

NutriWell, PINACLE and **SafeNutriKids** all implement in-context explanations ("Why this recommendation?", info points and pedagogical content) to clarify how recommendations are generated, and what data is used.

The DRG4FOOD Toolbox and Playbook, published as public resources, extend this transparency to methods and reference technologies, making the responsible design approach itself visible and reusable.

DRG #7 Human Agency & Identity

Lastly, human agency – keeping people in control and involved – is a recurring design principle:

ATTESTED aims to support, not replace, producers' work. Traceability tools are co-designed so that farmers retain control over how their practices are represented and can negotiate with buyers from a more informed position.

NutriSight keeps contributors in charge of data capture. The goal is to "strengthen the quantity, quality and fairness of open food data" while preserving community agency over the commons.

NutriWell combines personalised plans with social features (social cooking, community interaction), and allows users to adjust, override and question plans, linking algorithmic suggestions to personal goals and identities.

SafeNutriKids involves parents, educators and children as active participants in shaping how the app is used in schools and households, keeping educational goals and child agency central.

Compared to typical consumer apps, these solutions show an above-baseline effort to keep humans informed, empowered and able to contest or override digital decisions.

SUMMARY & LESSONS LEARNED

Looking across both Open Calls and the full project lifecycle, several conclusions can be drawn:

Digital Responsibility is implementable at SME/ start-up scale. Despite resource constraints, all eight projects implemented tangible DRG-aligned measures (encryption choices, control panels, open governance, bias checks), indicating that Digital Responsibility is compatible with early-stage innovation.

Open practices correlate with stronger DRG coverage. Projects that embraced openness (code, data, processes) generally showed more mature transparency, fairness and user agency practices, exemplified by NutriSight.

Privacy-preserving techniques are moving into practice. PINACLE's self-sovereign identity and zero-knowledge proofs, NutriWell's data-wallet and SafeNutriKids' children-focused privacy show that privacy-enhancing approaches can be embedded in working systems, not only in research prototypes.

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Implementation depth varies. Not all pilots achieved the same level of DRG maturity; some features remained at prototype level or were only partially deployed. This variation is typical for early-stage innovation and reinforces the need for realistic, incremental maturity assessment rather than binary “responsible/not responsible” labels.

Context matters. The way DRGs translate into features differs between, for example, a farm-level traceability system, a children’s education app and a supermarket recommender. DRG4FOOD confirms that any assessment model must allow for contextual tailoring rather than prescribing uniform checklists.

In summary, DRG4FOOD demonstrates that Digital Responsibility can be a practical design and innovation driver in food data solutions, rather than an after-the-fact compliance exercise.

MEASUREMENT CRITERIA, INDICATORS & MATURITY MODEL

DESIGN PRINCIPLES

The framework is built on four simple principles:

1 **DRG-aligned:** Measurement dimensions follow the seven Digital Responsibility Goals.(dotmagazine.online)

2 **Light-weight:** Each DRG uses only a small number of indicators to avoid over-burdening small teams.

3 **Mixed-methods:** Combine quantitative signals (e.g. coverage of encryption, share of features with explanations) with qualitative evidence (e.g. existence of governance processes, user research).

4 **Context-sensitive:** Projects interpret indicators in their domain (e.g. “vulnerable users” differ between an elderly nutrition service and applications for farmers).

FOUR-LEVEL DRG MATURITY MODEL

- **Level 1 – Baseline**

a) Focus on legal compliance and ad-hoc decisions.

b) Documentation is minimal; Digital Responsibility is implicit or reactive.

- **Level 2 – Structured**

a) DRGs are explicitly mapped to project goals and risks.

b) Basic processes exist (e.g. security checklist, short DPIA), but coverage is uneven.

c) Some user-facing features for transparency and control are present.

- **Level 3 – Integrated**

a) DRGs are embedded into the development lifecycle (requirements, design, testing, release).

b) Clear roles and responsibilities; recurring reviews (e.g. threat modelling, bias checks).

c) Metrics are collected and used to improve the system.

- **Level 4 – Transformative**

a) The project uses DRGs as a strategic feature and contributes back to the ecosystem (open source, open governance, sector guidance).

b) External stakeholders (users, civil society, other companies) can scrutinise and influence decisions.

c) DRG performance is regularly documented and, where possible, published.

d) A small team can apply this by scoring each DRG from 1–4 and concisely justifying the score, resulting in a simple “DRG profile”.

MEASUREMENT CRITERIA, INDICATORS & MATURITY CUES

DRG#1 DIGITAL LITERACY

Criteria & Indicators

- **User-centered design & Inclusion:** Evidence of target-group involvement in design and testing (e.g. living labs, co-design workshops, school pilots).

- **Support for User Understanding:** Presence of embedded educational content, onboarding or tooltips that explain core concepts (nutrition, data use, digital skills).

- **Accessibility:** Documented attention to accessibility (e.g. language options, simple modes, WCAG alignment, offline or low-bandwidth support where relevant).

Maturity cues

- L1: No systematic user education/ support; only generic help or FAQs.

- L2: Some targeted content (e.g. onboarding) and limited user research.

- L3: Iterative co-design with key user groups; education and accessibility are part of core feature design

- L4: Project shares open educational materials or methods for others to reuse.

DRG#2 CYBERSECURITY

Criteria & Indicators

- **Security-by-Design:** Coverage of basic controls, encryption in transit/at rest, authentication, authorisation, logging, secure update management.

- **Security Governance:** Existence of a simple threat model or risk register and assigned security responsibility.

- **Security Assurance:** Evidence of security testing (e.g. code review, vulnerability scanning, third-party assessment where proportionate).

Maturity cues

- L1: Basic Encryption/HTTPS and passwords; no formal risk assessment.

- L2: Security checklist and some hardening; responsibilities informally assigned; basic incident response procedure.

- L3: Threat modelling and periodic security reviews integrated into development; at least one external or independent security check

- L4: Security practices and findings are openly shared where possible; project contributes tooling or patterns to others.

DRG#3 PRIVACY

Criteria & Indicators

- **Data Accountability:** Presence of a “data inventory” (what is collected, for what purpose, on what legal basis).

- **Data Rights & Control:** Extent of self-service controls: users can access, correct, delete and export their data where applicable.

- **Privacy-by-Design:** Design measures for minimisation, local processing, pseudonymisation or PETs (e.g. self-sovereign identity, ZKPs, data wallets).

Maturity cues

- L1: Privacy policy exists but is generic; deletion or export may be manual.
- L2: Clear mapping of data uses and basic self-service controls for users.
- L3: Privacy-by-design decisions documented (e.g. minimisation, local processing, PETs), with regular review.
- L4: Advanced privacy approaches are piloted and documented; the project shares patterns or code (e.g. wallet adapters, PET libraries).

DRG#4 DATA FAIRNESS

Criteria & Indicators

- **Data Representativeness:** Analysis of dataset composition and potential biases (e.g. gender, geography, language, socio-economic status, product categories).
- **Stakeholder Governance:** Mechanisms for affected stakeholders to correct or contest data (e.g. producer corrections, community moderation, complaint processes).
- **Data Governance:** Policies on access, licensing and benefit sharing (e.g. open data, tiered access, feedback to contributors).

Maturity cues

- L1: No explicit fairness review; data sources taken “as is”.
- L2: Some descriptive statistics and manual checks; basic correction channels.
- L3: Systematic bias checks for key use cases and stakeholder groups; updated data governance agreements.
- L4: Public reporting on fairness metrics; open datasets or models where feasible; explicit benefit-sharing provisions.

DRG#5 TRUSTWORTHY ALGORITHMS

- **Model Documentation:** Model cards or equivalent documentation describing purpose, inputs, training data, limitations and known failure modes.
- **Model Performance:** Tests for

robustness and, where applicable, fairness across relevant user groups.

- **Explainability:** Meaningful explanations available to end users for important decisions or recommendations (“why this?”, “what if I change X?”).

Maturity cues

- L1: Algorithms are documented only informally; trustworthiness assessed mainly via accuracy.
- L2: High-level documentation and some scenario-based testing; simple user explanations.
- L3: Regular evaluation against fairness/ robustness criteria; expert and user-panel review before major changes.
- L4: Transparency of models and evaluation (open code/data/tests where appropriate); opportunities for external audit or benchmarking.

DRG#6 TRANSPARENCY

Criteria & Indicators

- **Public Transparency:** Clarity and accessibility of information on what the system does, what data it uses and how decisions are made, in terms understandable by non-experts
- **Open-Source:** Public technical documentation (e.g. architecture overviews, API docs, open repositories) where feasible.
- **Feedback Mechanisms:** Feedback, inquiry and complaint channels, with documented response processes.

Maturity cues

- L1: Standard legal notices; limited additional explanation; limited information on technical or organisational aspects.
- L2: Additional in-context explanations in key interaction points (consent, recommendations, data entry).
- L3: Comprehensive documentation for both users and developers; clear and monitored feedback channels.
- L4: Open development practices (public

repos, open APIs, changelogs, public reporting on DRG-related aspects).

DRG#7 HUMAN AGENCY & IDENTITY

Criteria & Indicators

- **Human Autonomy:** Important decisions can be understood, questioned and, where needed, overridden or changed.
- **Human Dignity & Wellbeing:** People are not reduced to a single label or score, and the system is clearly aimed at supporting wellbeing (not just clicks or sales).
- **Sustainability:** At least one design choice reflects environmental/ sustainability concerns (e.g. lighter models, green data centres etc).

Maturity cues

- L1: No explicit attention to agency, identity, wellbeing or sustainability; users can mostly only accept or reject the service.
- L2: Basic safeguards (no dark patterns, simple opt-outs/overrides etc.) and at least one concrete “lower impact” design choice.
- L3: Human control, respect for identity and sustainability are stated design goals with clear override options in key flows.
- L4: Shared governance structures with users and/or communities; identity and agency considerations influence strategic decisions (e.g. business model choices).

OPERATIONALISATION

A DRG4FOOD-style project can use this prototype in three simple steps:

1. Initial self-assessment:

For each DRG, answer the indicative questions and assign a maturity level (1–4), with a short justification.

2. Prioritisation:

Identify DRGs that are both low-maturity and high-impact in the project context (e.g. privacy for genetic data, data fairness for global datasets) and set concrete improvement goals.

3. Iteration and reporting:

Re-assess periodically (e.g. at key development milestones) and report changes qualitatively (what improved, what remains open) rather than chasing precise numeric scores.

This approach keeps Digital Responsibility visible and comparable across heterogeneous solutions while remaining light enough for SMEs, research consortia and early-stage innovators. It complements the more detailed examples from DRG4FOOD's eight pilot solutions and can serve as a starting point for broader sector adoption and future standardisation work.

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CONCLUSION

CONCLUSION

DRG4FOOD's final portfolio confirms that Digital Responsibility is implementable in practice, even for early-stage consortia and SMEs working under time and resource constraints. The eight pilot solutions show that the Digital Responsibility Goals can guide concrete choices in architecture, data governance, user experience and business logic, rather than remaining abstract principles or purely compliance-oriented checklists.

The DRG-based maturity framework presented in Part II distils these experiences into a structured, reusable lens. It offers four levels of maturity and a small set of indicative metrics per DRG that organisations can use to reflect on their current practices, identify priorities and track progress over time. The framework is intentionally light-weight so it can also be adopted by small teams, and flexible enough to be tailored to different domains and solution types.

As DRG4FOOD concludes, responsibility for embedding and evolving Digital Responsibility practices shifts to the broader ecosystem of developers, innovators and policymakers working on data-driven food systems and beyond. This report and the accompanying framework are intended as inputs to that ongoing work: a shared reference point for those who wish to make trustworthy, human-centred and sustainable digital technologies the norm rather than the exception.