

D.2.1.1.SWOT & PESTLE.

**Integrated prioritisation of quality preservation in agro-food
supply chains (NWE)
Cereals**

PM3.

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Strengths

- **Structured and mature supply chains**

NWE countries benefit from highly organized grain logistics systems with established actors (cooperatives, ports, transport operators)

- **Multi-modal transport capabilities**

Strong availability of road, rail and inland waterways enables flexibility and potential optimization of flows.

- **Advanced storage infrastructure**

Presence of silo networks (inland + port) with large capacities and integrated handling systems.

- **Existing quality control procedures**

Standardized practices such as sampling, sieving, and traceability systems are widely implemented.

- **Strong institutional ecosystem**

Collaboration between research institutes (e.g., Arvalis), cooperatives and logistics actors supports innovation.

Weaknesses

- **Fragmented data across the supply chain**

Lack of harmonized data on quality losses, costs, and performance indicators.

→ Even cost analysis is considered a “pioneering work” with limited available data

- **Limited visibility on quality degradation during transport & storage**

Quality monitoring is often punctual (sampling-based) rather than continuous.

- **Inefficient insect detection methods**

Current detection (manual sieving) is not systematic at all stages, unreliable for low infestations and unable to detect hidden contamination.

- **Complex and multi-step logistics chains**

Multiple handling steps (collection → storage → transfer → shipping) increase risk of quality loss.

- **High dependency on operational practices**

Quality preservation strongly depends on silo management, sampling quality and operator experience

- **Return trips often empty in collection logistics**

Limits efficiency and increases costs and emissions.

Opportunities

- **Digitalization & real-time monitoring**

IoT sensors (temperature, humidity, insects), predictive analytics for spoilage risks
→ Move from reactive to preventive quality management

- **AI-based prioritisation tools**

Ability to identify critical nodes (silos, routes, hubs) and to prioritize interventions where losses are highest

- **Improved detection technologies**

Optical detection, acoustic sensors, multi-parameter devices (quality and contamination)

- **Modal shift towards rail and IWT**

Reduced handling, more stable transport conditions, lower environmental impact

- **Harmonization at NWE level**

Shared standards, cross-border logistics optimization, common data frameworks

- **Reduction of food losses (policy-driven opportunity)**

Strong alignment with EU Green Deal and Farm to Fork strategy

Threats

- **Climate variability**

Higher humidity, increased pest proliferation, storage instability.

- **Increased regulatory pressure**

Stricter limits on pesticides and storage treatments, higher compliance costs.

- **Market competition (e.g. Black Sea region)**

Pressure to reduce costs while maintaining quality.

- **Infrastructure constraints**

Aging silos, bottlenecks (ports and rail capacity), climate-related disruptions (low river levels, etc).

- **High cost of quality failure**

Example: unloading a contaminated barge can exceed €30K.

- **Resistance to change**

Operational habits, skepticism towards new detection technologies, fear of false positives.

PESTLE,

Quality preservation in cereal supply chains (NWE).

Political

- **Strong EU policies**

Green Deal, Farm to Fork, food waste reduction targets.

- **Cross-border cooperation programs**

Interreg, Prima, Horizon Europe, etc.

- **Public support**

For sustainable logistics and modal shift.

Economic

- **High logistics costs across the supply chain**

Transport, handling, storage (e.g. storage costs ~6.4 to 15 €/t).

- **Increasing pressure on margins**

→ need to improve efficiency and reduce losses.

- **Cost of non-quality**

Rejected, batches, reprocessing, contract penalties.

- **Investment barriers**

High CAPEX for modern silos or sensors, uncertain ROI for new technologies.

Social

- **Growing awareness of food waste and sustainability**
- **Skills gap**

Need for digital/logistics expertise, reliance on experienced operators.

- **Stakeholder complexity**

Farmers, cooperatives, transport operators, ports have different objectives that don't always align; partial visibility of product history; responsibility is blurred.

- **Resistance to technological change in traditional sectors**
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Technological

- **Emerging technologies**

IoT sensors (temperature, humidity, CO2), AI predictive models, digital twins of supply chains.

- **Current limitations**

Lack of interoperability, fragmented IT systems.

- **Detection technology challenges**

Need for high sensitivity and low false positives.

- **Opportunity for integrated platforms**

Legal

- **Food safety regulations (EU and national)**

Strict contamination thresholds, traceability requirements.

- **Increased restrictions**

On pesticides and fumigation methods.

- **Liability risks**

Contamination during storage or transport, cross-contamination in shared facilities.

Environmental

- **Climate change impacts**

Increased pest risks, moisture variability.

- **Pressure to reduce**

CO2 emissions, energy consumption in storage (ventilation, drying).

- **Push towards**

Modal shift, optimized logistics flows.

- **Environmental footprint becoming a key performance indicator**

Value chain mapping,

Quality preservation in cereal supply chains (NWE).

Step-by-step mapping of risks & levers (1/2)

- **Farm (harvest & on-farm storage)**
 - Risks: high moisture at harvest, initial contamination (insects, fungi), poor temperature storage.
 - Levers: harvest timing optimization, on-farm drying, early quality screening.
 - **Collection (primary transport and reception)**
 - Risks: mixing of heterogeneous batches, lack of systematic quality control, transport delays
 - Levers: better batch segmentation, digital traceability, smart routing.
 - **Inland storage (Silos/platforms)**
 - Risks: insect development during storage, moisture/temperature variation, poor rotation of stock (storage cost ~6.4 to 15 €/t, showing its central role).
 - Levers: continuous monitoring (IoT sensors), ventilation optimization, predictive risk models.
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Step-by-step mapping of risks & levers (2/2)

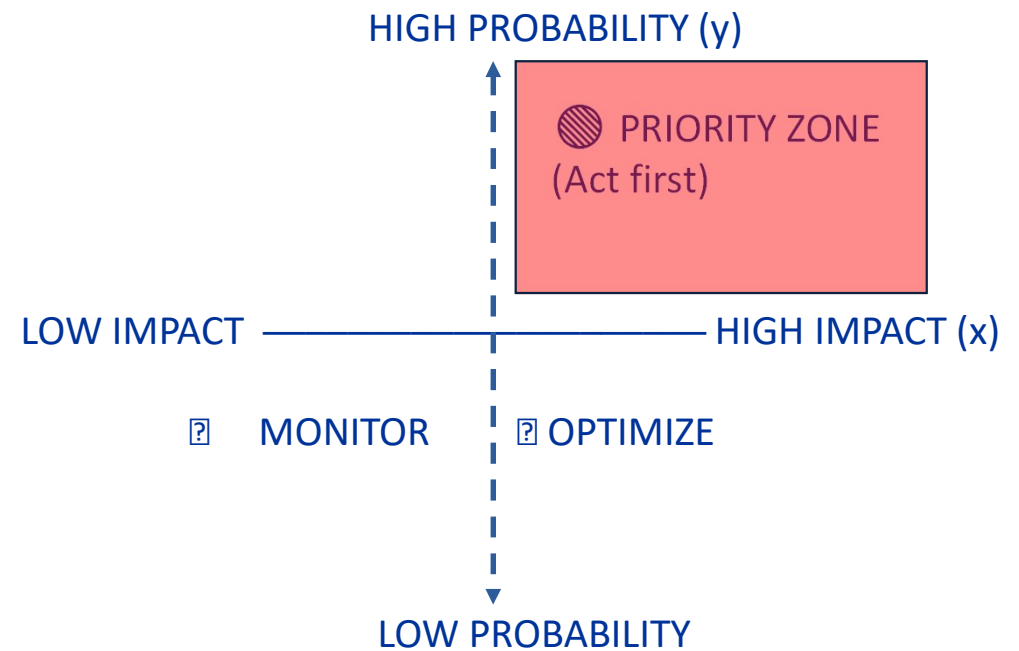
- **Transport (Road/Rail/IWT)**
 - Risks: temperature fluctuations, long transit times, Lack of monitoring.
 - Levers: Modal shift (rail/barge), real-time tracking, reduced handling steps.
 - **Port storage & handling**
 - Risks: high volumes equal high impact of errors, cross-contamination, late detection of issues (cost failure can exceed €30K).
 - Levers: advanced detection systems, strict entry controls, batch isolation strategies.
 - **Export/Processing**
 - Risks: final rejection, contract penalties, loss of reputation.
 - Levers: certification systems, end-to-end traceability.
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Prioritisation Matrix, Where should DODILOG focus first?

Prioritisation Matrix: High Priority

Act immediately

Area	Why
Inland storage (silos)	High probability (insects, moisture) + high impact (large volumes)
Port storage	Lower probability but very high impact (financial + contractual)
Detection systems (all nodes)	Current methods unreliable → systemic risk

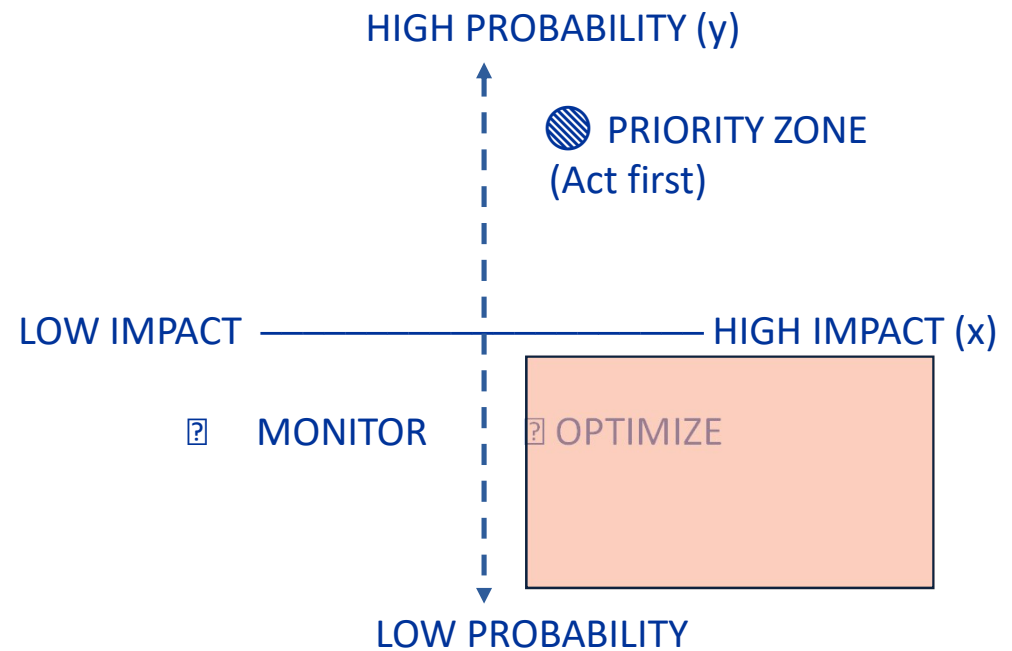


X-axis: Impact of quality loss (economic and operational)
Y-axis: Probability of occurrence

Prioritisation Matrix: Medium Priority

Optimise

Area	Why
Transport conditions	Moderate risk but frequent
Collection phase	Quality variability introduced early

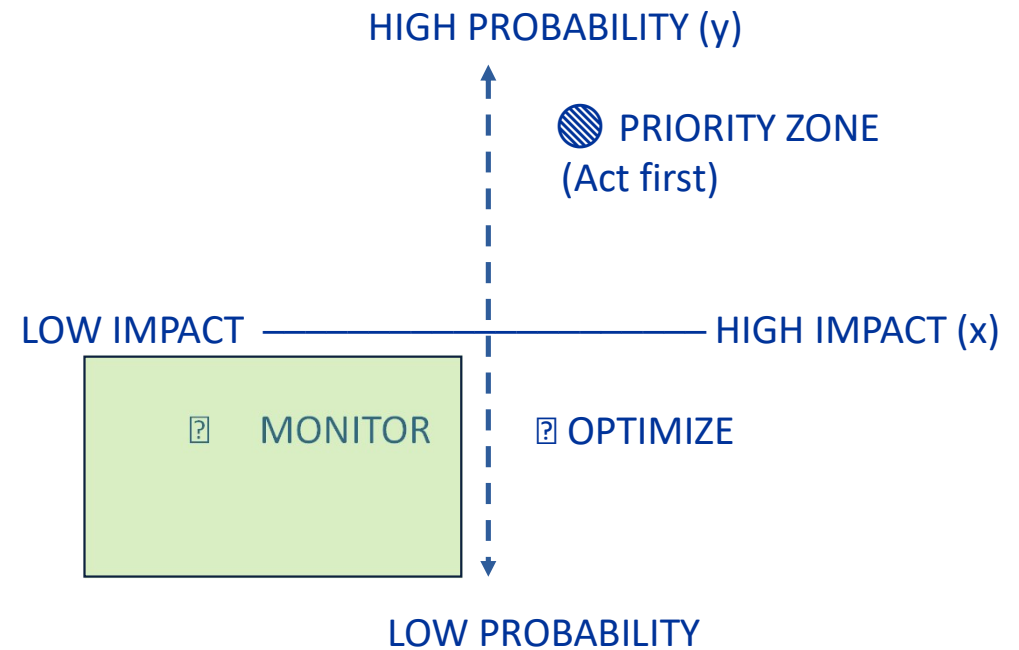


X-axis: Impact of quality loss (economic and operational)
Y-axis: Probability of occurrence


Prioritisation Matrix: Lower Priority

Monitor

Area	Why
Farm level	Risks exist but often managed locally
Final delivery	Too late to act (issues already embedded)



Priority Zones:

-  High Priority: Inland Storage, Port Storage, Detection Systems
-  Medium: Transport, Collection
-  Lower: Farm, Final Delivery

X-axis: Impact of quality loss (economic and operational)

Y-axis: Probability of occurrence

Prioritisation scoring model

Prioritisation analysis

- **Risk score**= Probability X Impact X Detectability
 - Probability: 1 to 5
 - Impact: 1 to 5
 - Detectability: 1 to 5 (low detectability = higher risk)

Step	Probability	Impact	Detectability	Score
Inland silo	4	4	4	64
Port silo	3	5	5	75
Transport	3	3	3	27

- **Result:** Port and Inland silos = top priorities
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Interreg



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Thank you
