

SESSION #2

Industry applications



BBTWINS



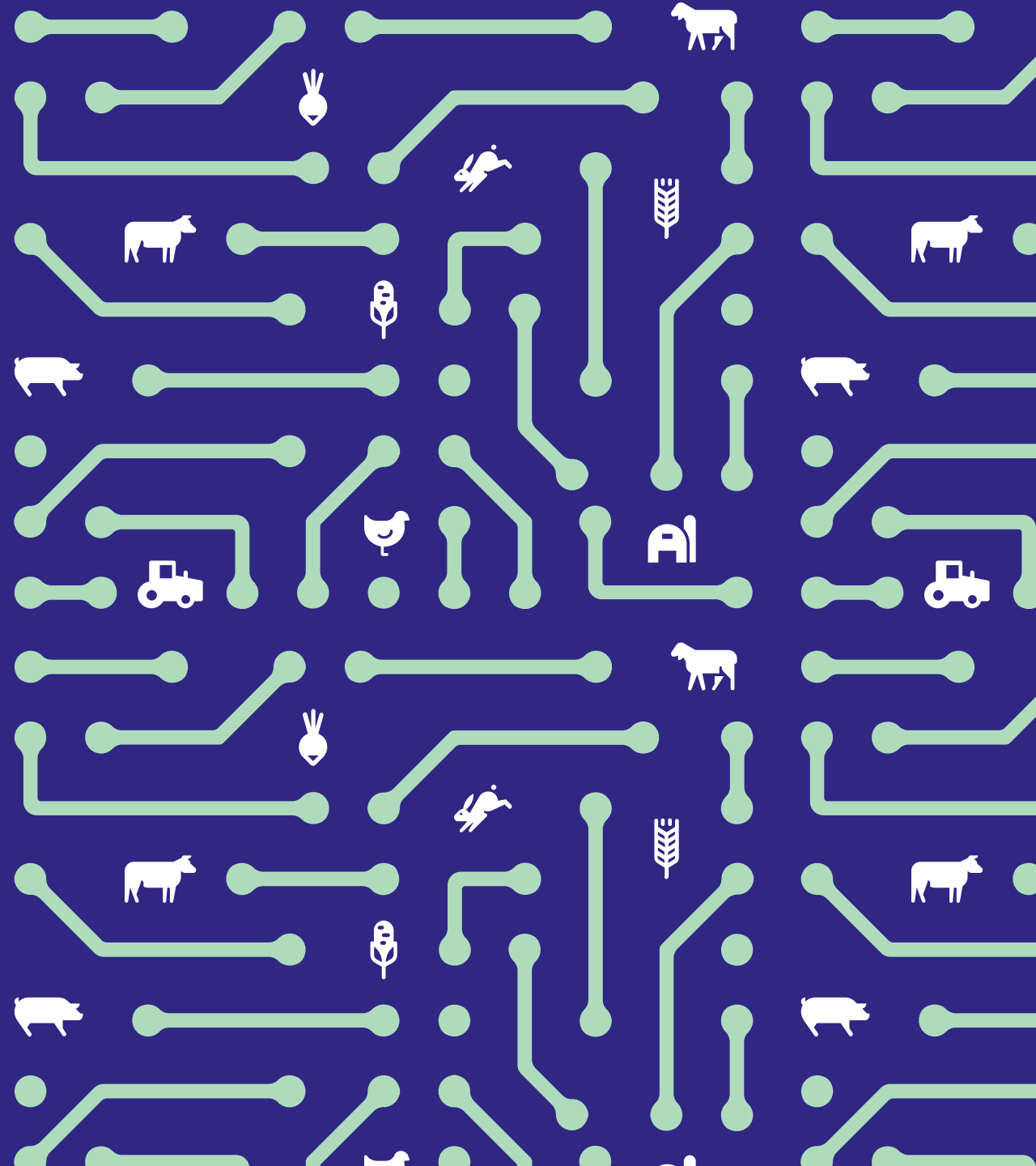
**Circular
Bio-based
Europe**
Joint Undertaking



Bio-based Industries
Consortium



Horizon 2020
European Union Funding
for Research & Innovation



Agrifood Waste Valorisation: Biorefinery and Circular Approach



André Ribeiro

RTD Researcher at CVR

aribeiro@cvresiduos.pt



CVR – CENTER FOR WASTE VALORISATION



Valorising Waste
**Creating Value and
Resources**

• INNOVATION

• TECHNOLOGY

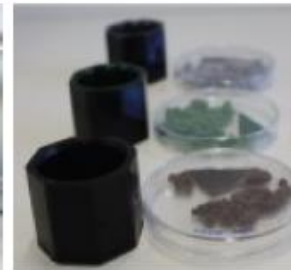
• VALORISATION

Waste is a resource that needs to be valued

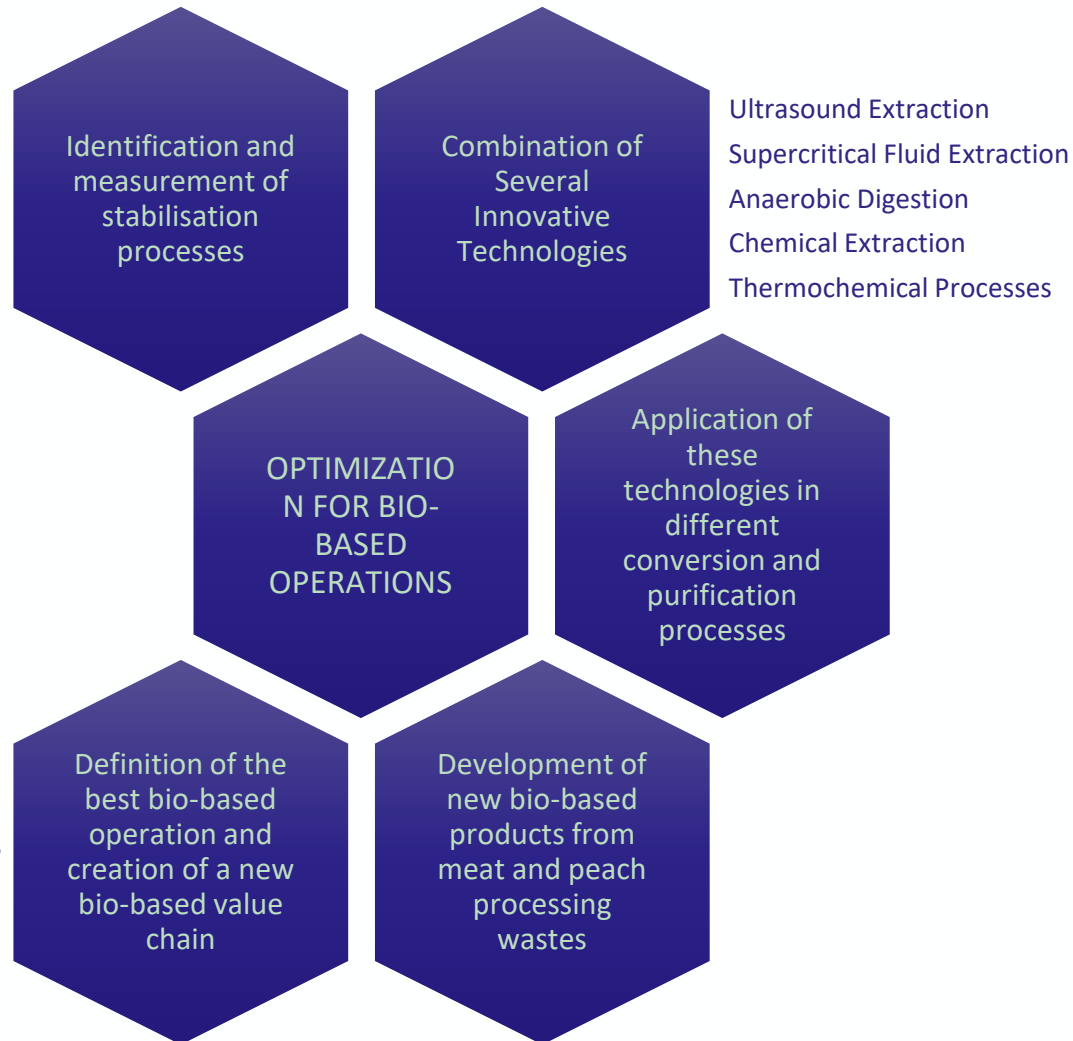
We support industry and municipalities in developing innovative waste management options, respecting the stages of the process in an economically and environmentally correct manner, tailored to each particular situation.



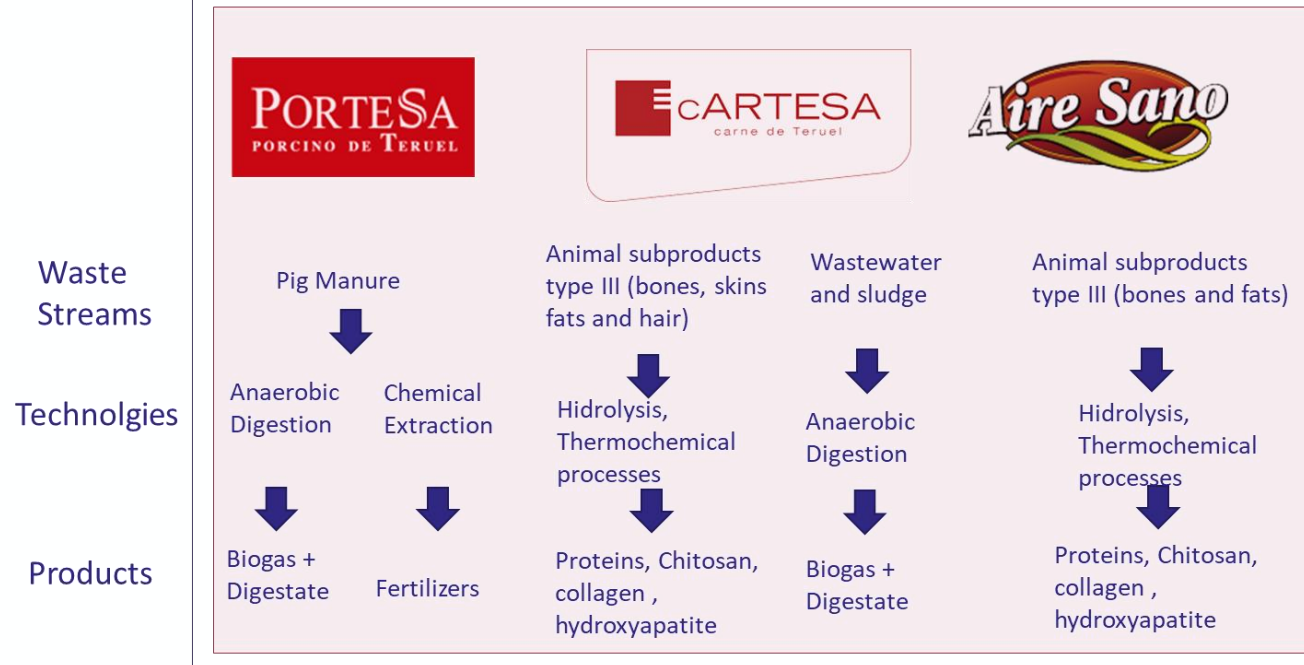
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AGRIFOOD WASTE VALORISATION: BIOREFINERY AND CIRCULAR APPROACH | OBJECTIVES



AGRIFOOD WASTE VALORISATION: BIOREFINERY AND CIRCULAR APPROACH | METHODOLOGY



The following wastes were considered for this study in the pork meat use case:

1. Pig Manure
2. Pig Bones
3. Fats
4. Pig Hair
5. Wastewater
6. Wastewater sludges
7. Other animal subproducts type III

The technologies selected for the valorisation of these wastes were:

- A. Anaerobic Digestion (Biogas Plant)
- B. Chemical Extraction
- C. Hydrolysis followed by extraction
- D. Thermochemical processes (calcination, pyrolysis)

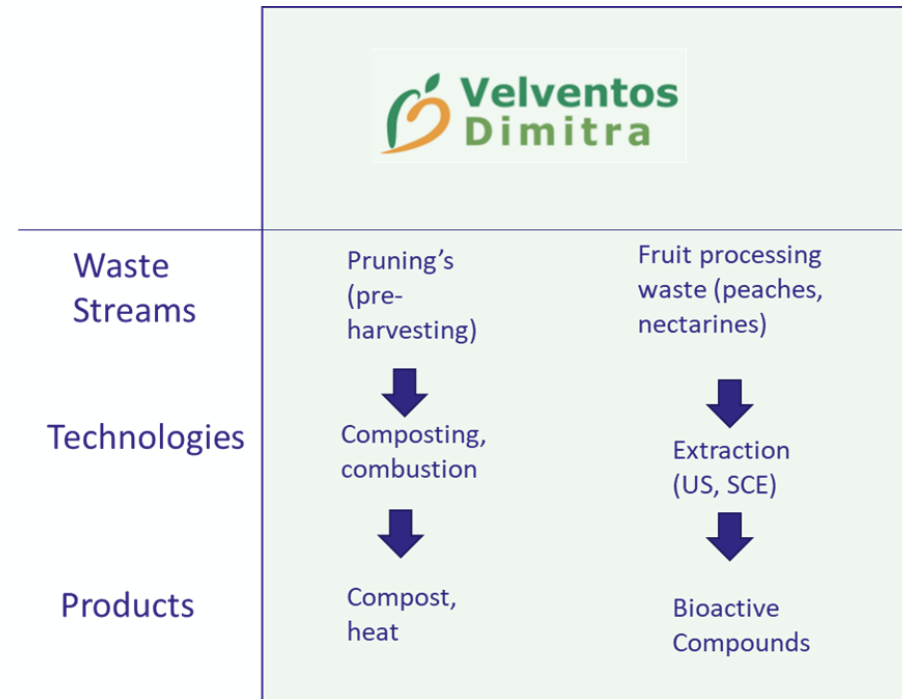
AGRIFOOD WASTE VALORISATION: BIOREFINERY AND CIRCULAR APPROACH | METHODOLOGY

The following wastes were considered for this study:

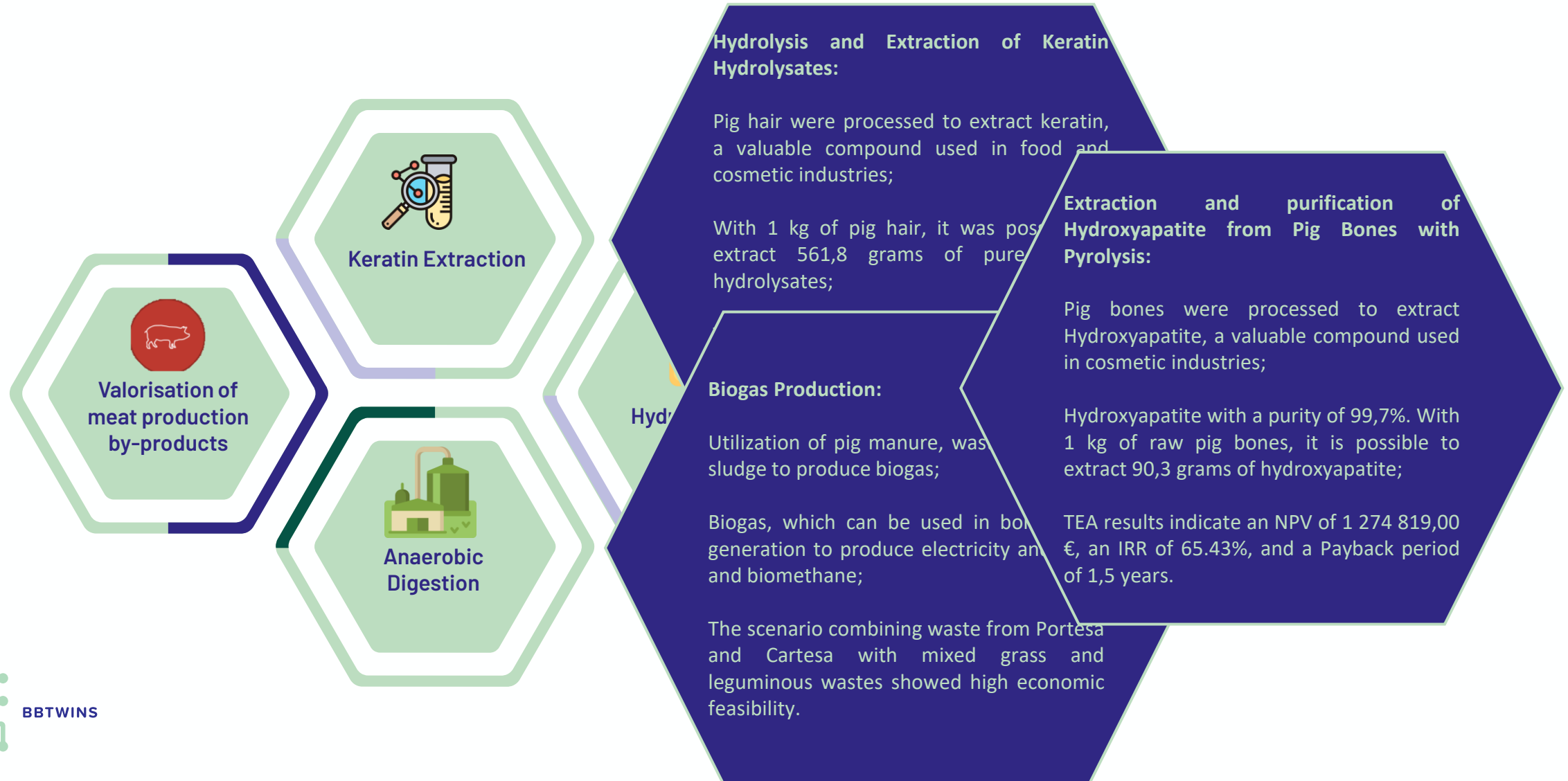
1. Pruning's wastes
2. Peach fruit processing waste
3. Nectarines fruit processing waste

These technologies were selected for the valorization of these wastes:

- A. Composting
- B. Combustion
- C. Extraction (Ultrasounds Extraction and Supercritical Extraction)

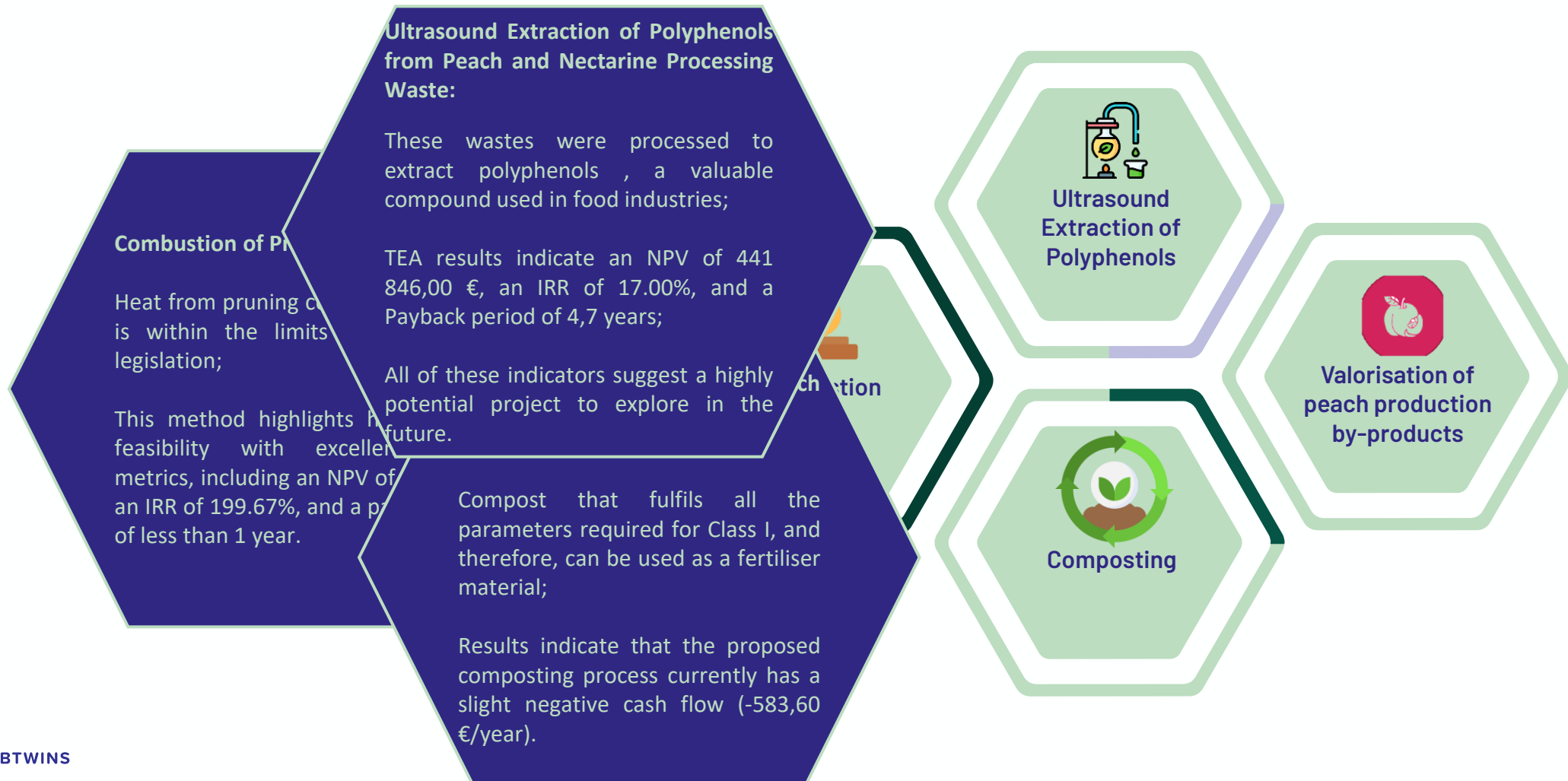


AGRIFOOD WASTE VALORISATION: BIOREFINERY AND CIRCULAR APPROACH | RESULTS



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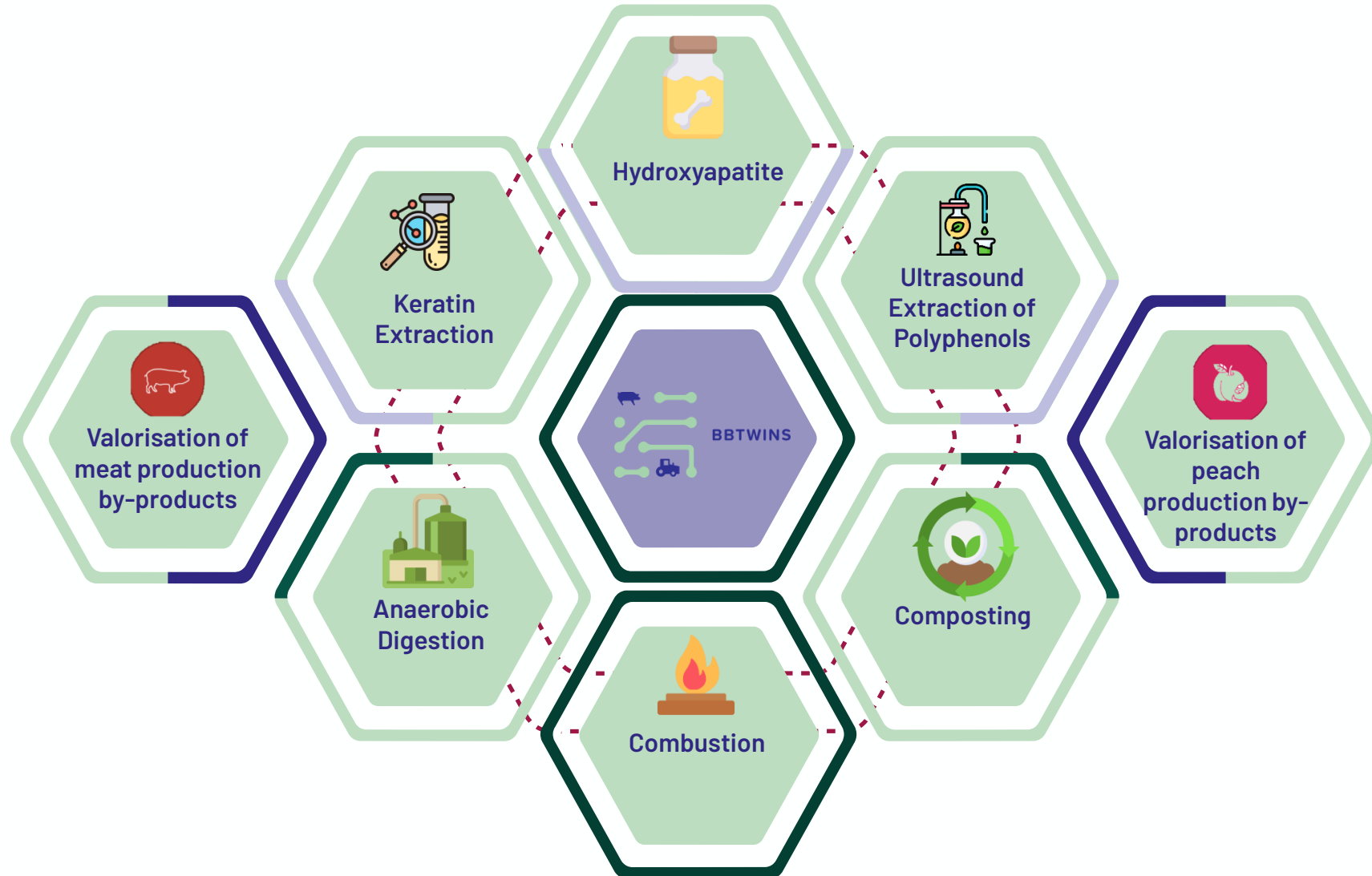
AGRIFOOD WASTE VALORISATION: BIOREFINERY AND CIRCULAR APPROACH | RESULTS



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AGRIFOOD WASTE VALORISATION: BIOREFINERY AND CIRCULAR APPROACH | RESULTS

BBTWINS Bio-Based Value Chain



AGRIFOOD WASTE VALORISATION: BIOREFINERY AND CIRCULAR APPROACH | CONCLUSIONS

- Creation of a new bio-based value chain that use wastes from meat and peach production involves the combination of several technologies or methodologies.
- In this work, it was identified, tested and applied several and different technologies to stabilize, convert and purify theses wastes into new bio-based ecoproducts.
- The technical and economic analyses (TEA) for each methodology were evaluated. Metrics such as Net Present Value (NPV), Internal Rate of Return (IRR), and payback periods were used to evaluate economic feasibility.
- Biogas, Keratin Hydrolysates, Hydroxyapatite, Combustion of Pruning Wastes, Composting and Polyphenols from Peach and Nectarine Processing Waste, demonstrated technical and financial viability.
- These methodologies offer significant contributions to sustainable bio-based operations within the agri-food industry, and for the creation of a new bio-based value chain using the wastes from meat and peach production.
- This new bio-based value chain (BBTWINS Value Chain) can be used as dissemination agent for other agrifood sectors across Europe.

Increased
resource
efficiency



Material savings



Energy savings



Water savings

Need to implement technologies – Pork case study



bbtwins.eu

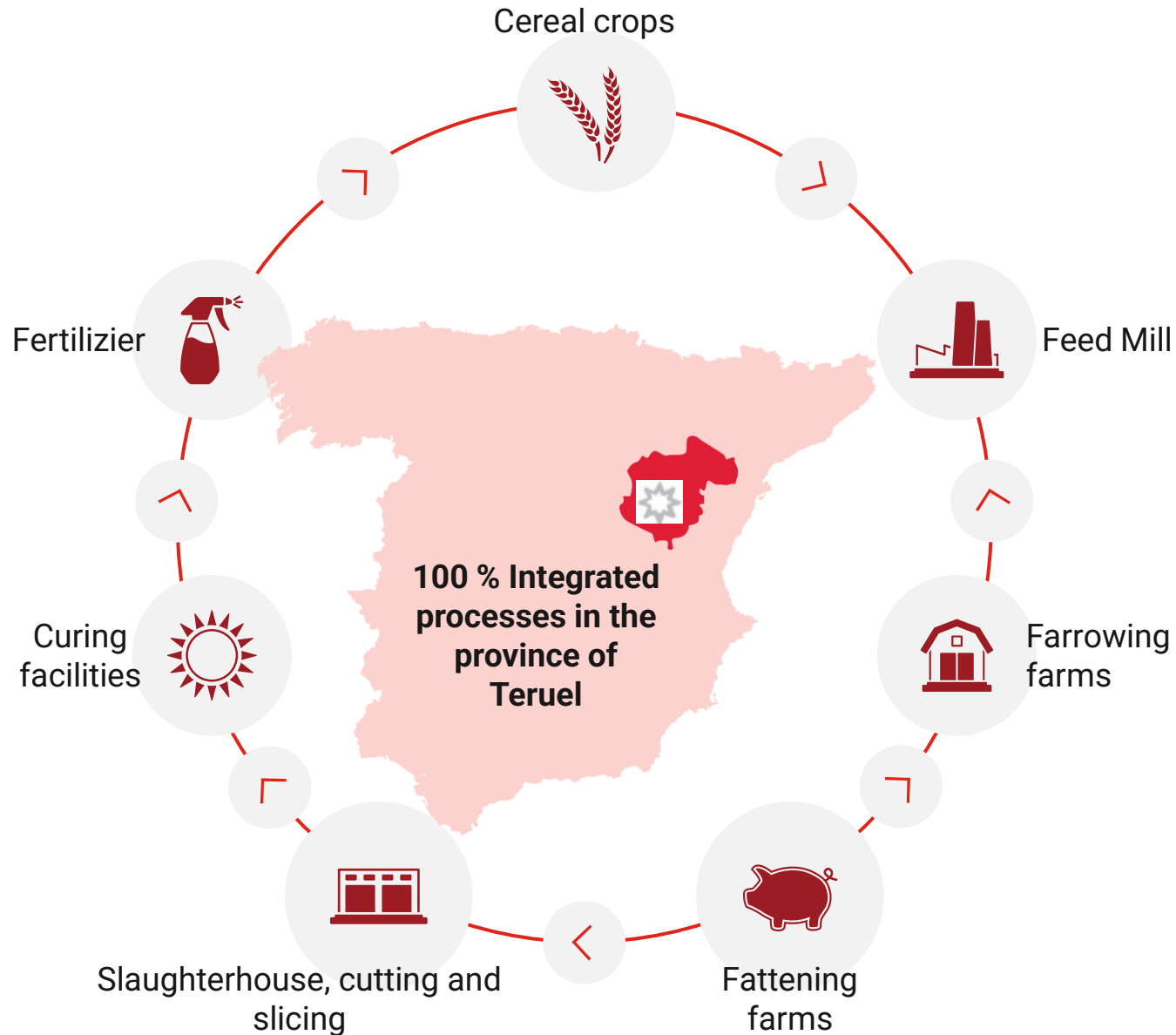


Sergio José Ramos

R&D&I Director of Naturuel S.L.



Our Project: Pork Value Chain

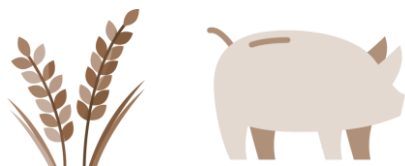


Our whole and exclusive traceability is a guarantee of safe, sustainable and nutritious products



TERRITORY
TRADITION
R&D TECHNOLOGY
MARKET: END CONSUMERS

Our Company



POR+COP



Naturuel
gourmet



Aire Sano

OTHER VALUE CHAINS IN THE COMPANY



Bio-Eco products



Truffle products



Fermentation Plant
(Food ingredients)

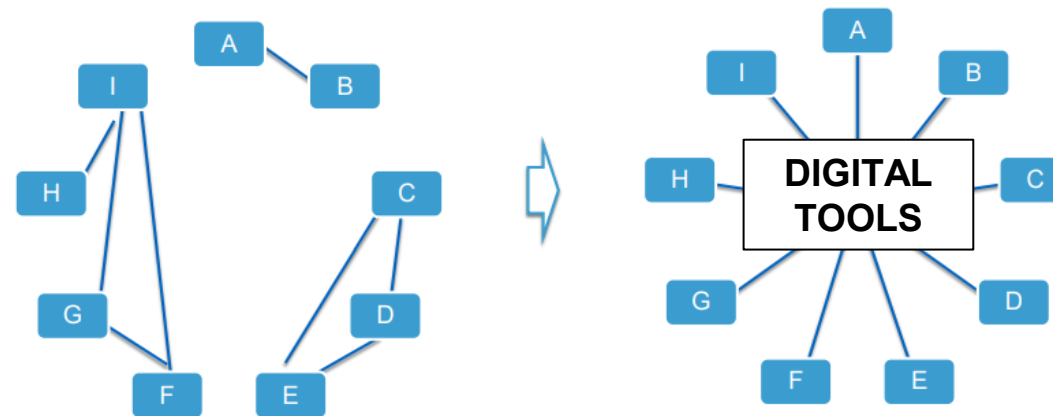


Winery

Role in the Project: Expected Objectives

- Test digital and enabling technologies for the optimization of our processes and help in the decision making in real time (Artificial Intelligence, Monitorization and Digital Twins)
- Study different scenarios of bio-based operations, contributing for instance to improving efficiency, logistics, quality, reduce waste and, trigger changes in consumption patterns and sustainability
- To provide end-to-end traceability of the products from raw material to our customers and end users in order to improve Food Safety (Blockchain Platform)

ORGANIZE AND CREATE INTERNAL RAPID-REACTION ECOSYSTEMS



Main results in the project

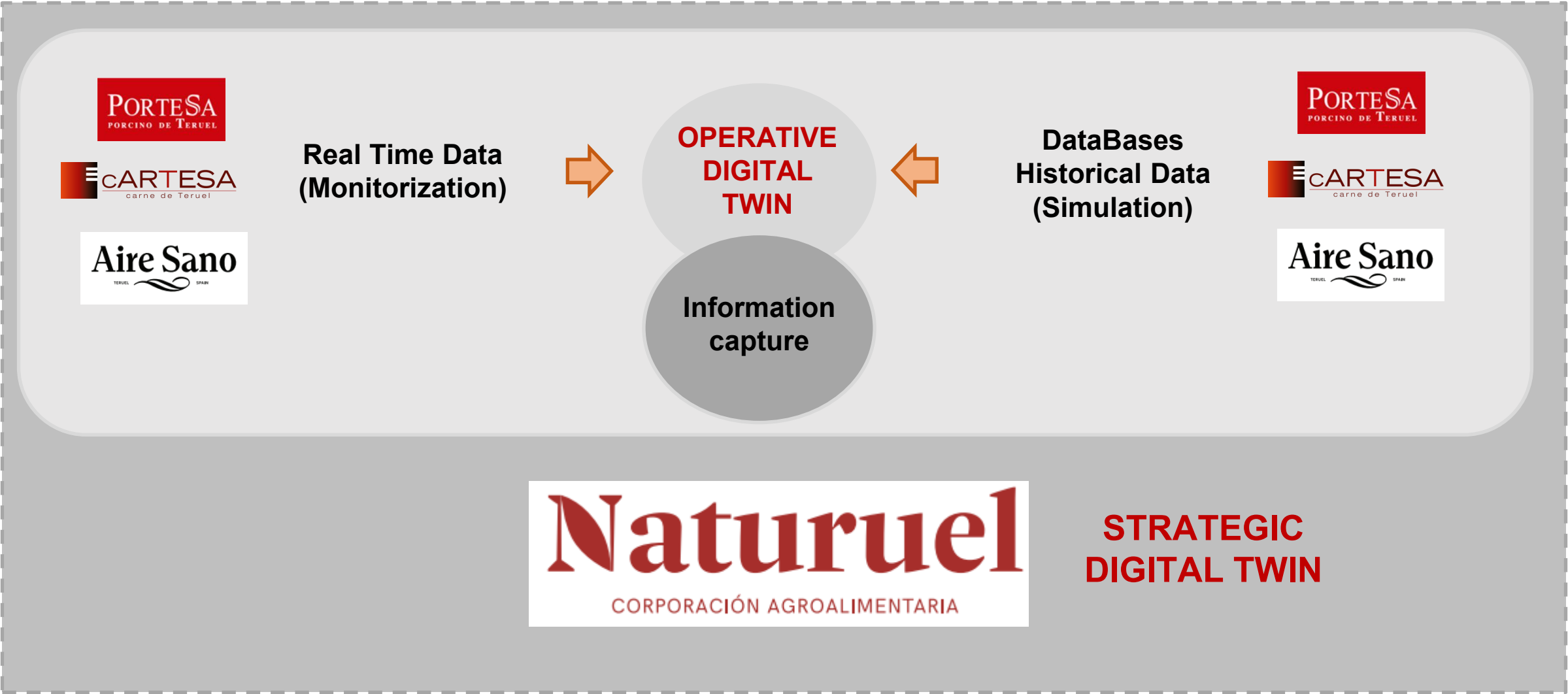
1. Digital Twin. Real Time Decisions

2. Blockchain. Food Safety-Traceability-Marketing/Sales

Main results in the project

1. Digital Twin. Real Time Decisions

2. Blockchain. Food Safety-Traceability-Marketing/Sales

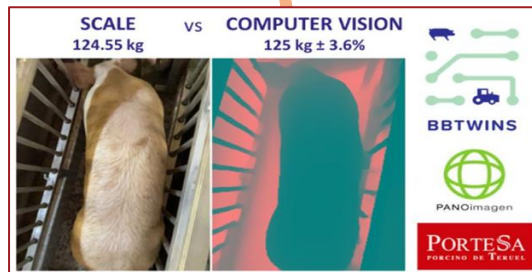


MAIN KPIs

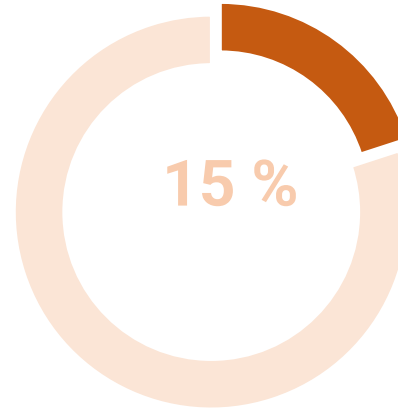


Productivity/Quality KPIs

AI
PIG WEIGHT



Current



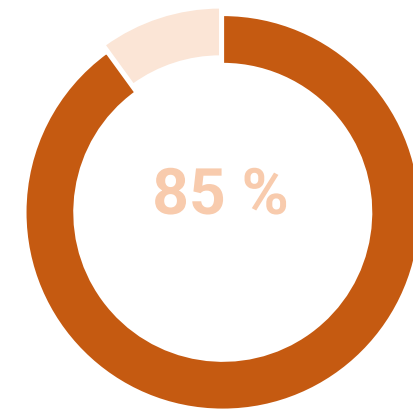
FORMULATION

Feed formulation vs pig growing

OPTIMIZATION-PRODUCTIVITY FARM

5-10 %

Computer Vision



GROWING CURVES TEST

Historical vs monitorization

SANITARY PROBLEMS

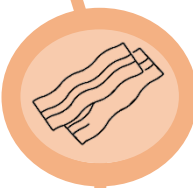
5 % reduction GHG

SLAUGHTERHOUSE

- Planification-Productivity
- Cost optimization (prod. vs quality)



AI
FAT BACK
THICKNESS



MANUAL

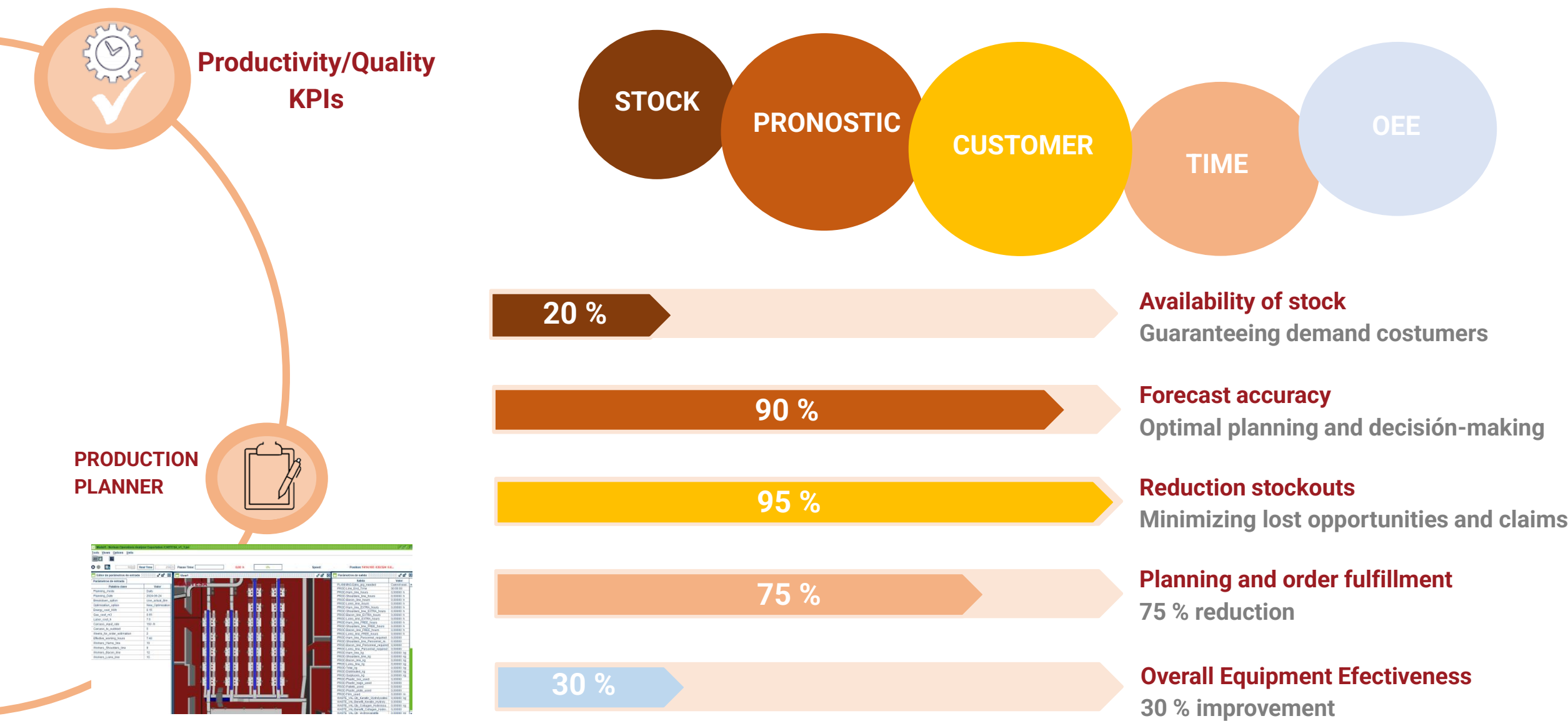
20 %

AUTOMATIC

100 %



Clasification by conformation
Statistic databases of rejected
quality by DOP and IGP





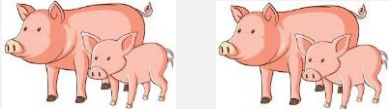
Current Feed
Distribution
Optimized

2 % shorter
routes
(flexible orders)

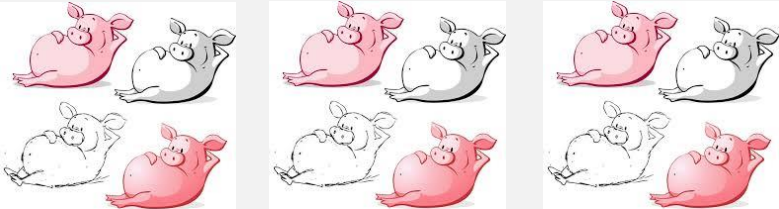
10 Tn CO₂
reduction



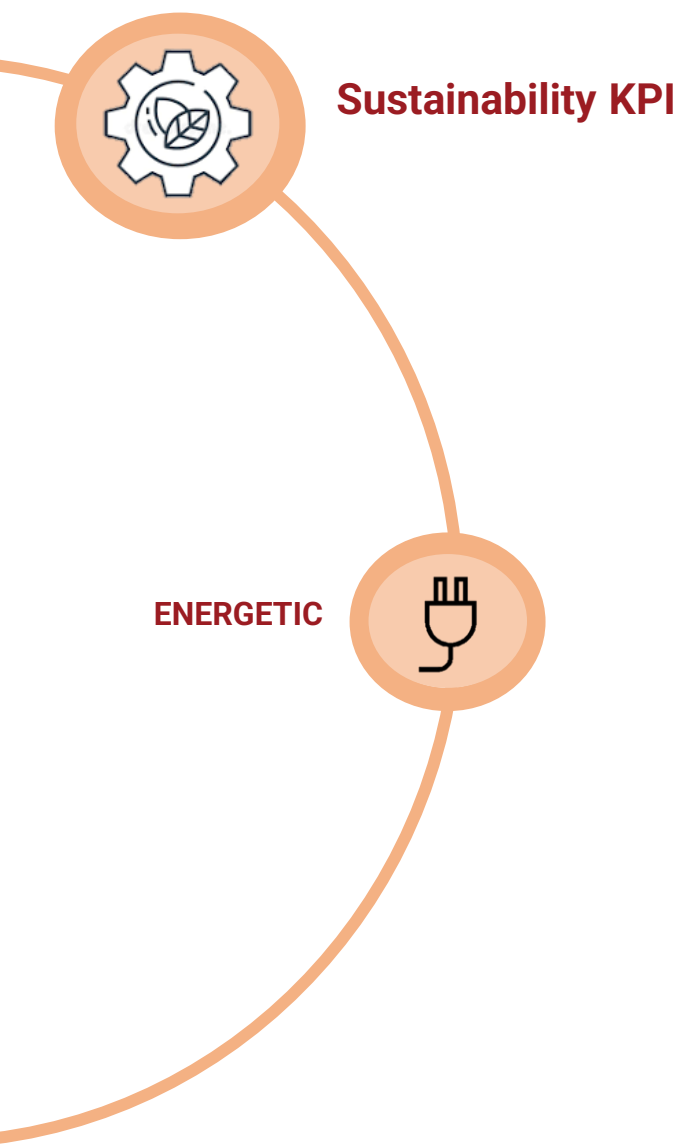
EXPANDING PRODUCTION
Current farms



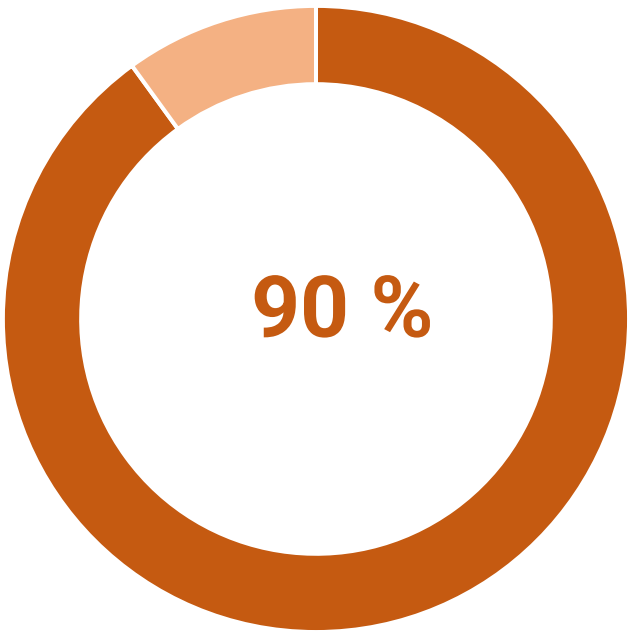
NEW SP FARM
2 in progress



NEW FF FARM
New in progress



Energy monitoring software



ENERGETIC EFFICIENCY
Better energy management

MONITORING EQUIPMENTS SHUTDOWNS
Predictive/Proactive maintaining
Reduction downtime

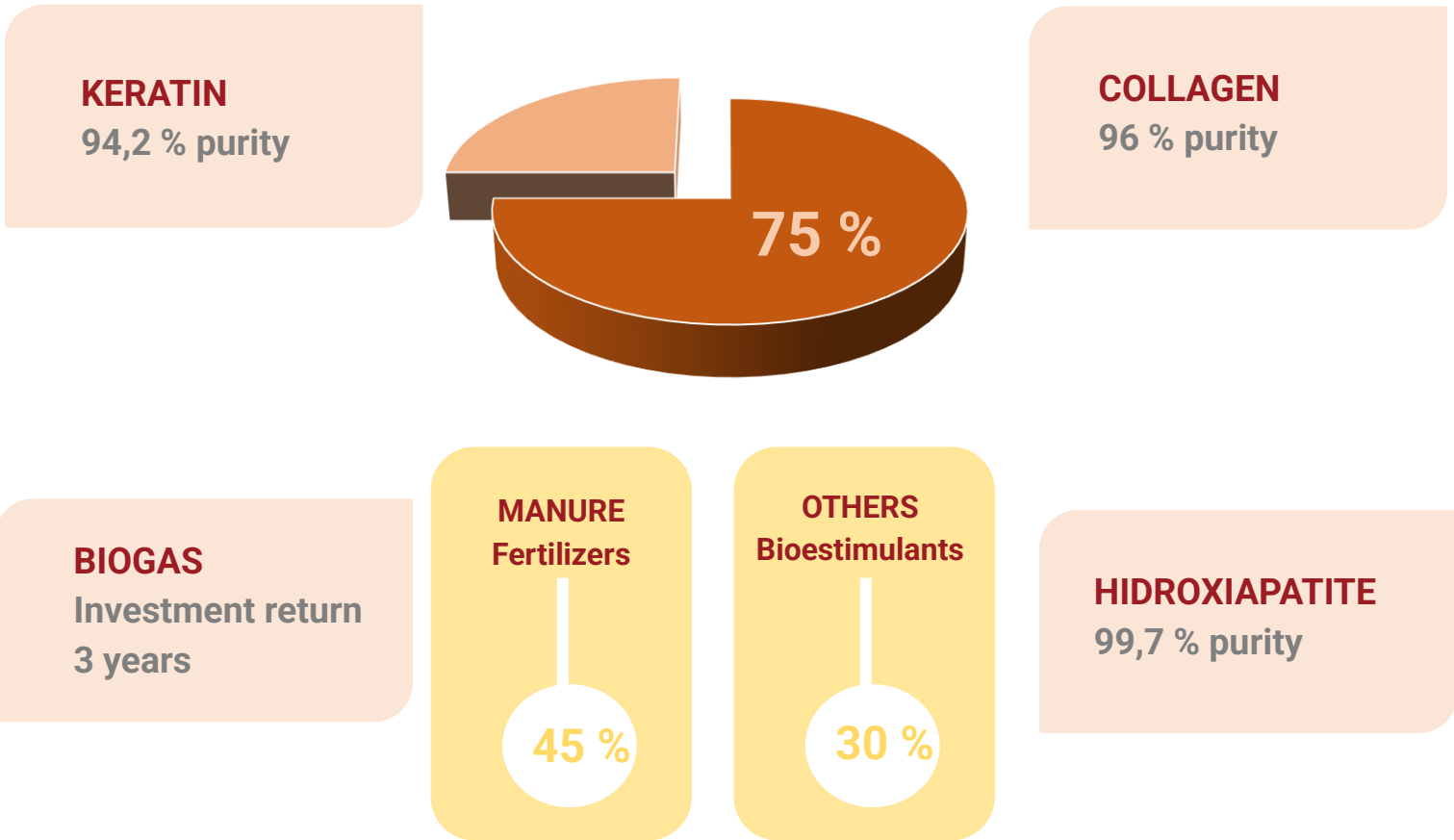
COSTS REDUCTION
10-15 %

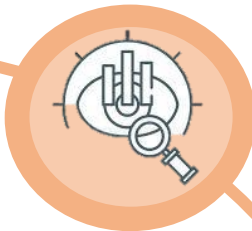
SUSTAINABILITY & ENVIRONMENTAL RESPONSABILITY
Higher energetic efficiency
10 % GHG



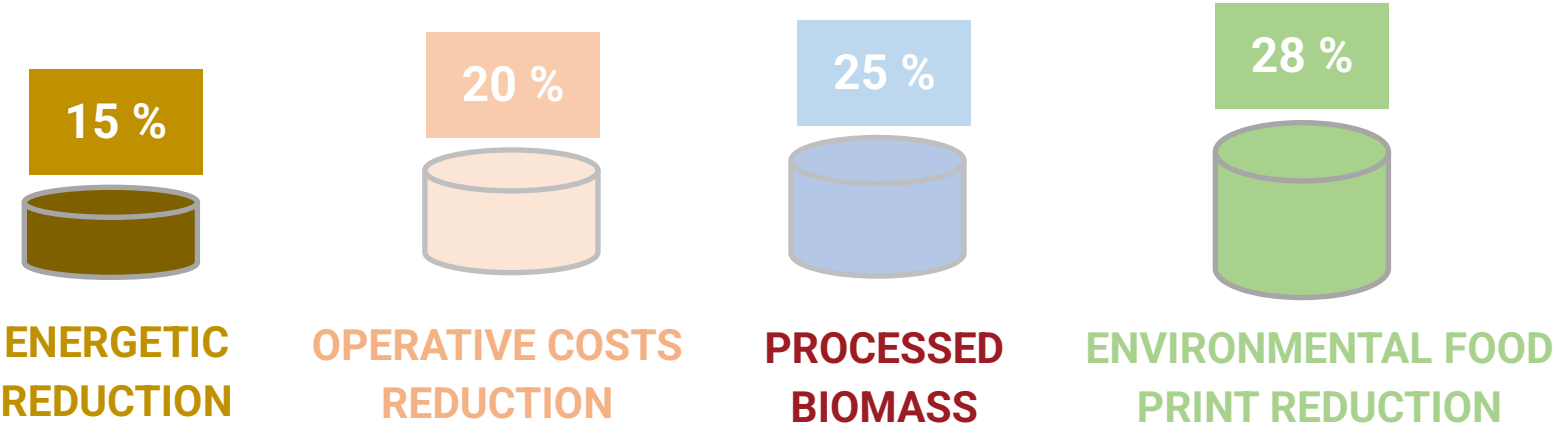
Sustainability KPI

Current Status





Estrategic & Financial KPIs



FINANCIAL MARGINS: 3-5 % NEXT 5 YEARS

CURRENT
WHAT HAPPENED AND WHY...

FUTURE
REAL TIME DATA TO PREDICT WHAT WILL HAPPEN

Main results in the project

1. Digital Twin. Real Time Decisions

2. Blockchain. Food Safety-Traceability-Marketing/Sales

- Real time data of food products for our customers
- Blockchain platform created: historical and current data (tracking) avoiding gaps
- Food traceability: enhancing transparency, trust and safety

STELVIOTECH

Sustainability >

Supply Chain ▾

Tracking

Activity

Regenerative Finance >

Configuration >

PORTESA

> Tracking Details List

20 Tracking

Product	EAN	Batch Out	Creation Date	Current Step	Actions
 Cerdo Blanco Duroc	8413387305192	20240222-Pa0001	Feb 22, 2024	Packaging	
 Cerdo Blanco Duroc	8413387305192	20240222-Cu0001	Feb 22, 2024	Curing	
 Cerdo Blanco Duroc	8413387305192	20240222-Sa0001	Feb 22, 2024	Salting	

Completed steps

1. Insemination-gestation-farrowing

2. Weaning

3. Fattening

4. Slaughter

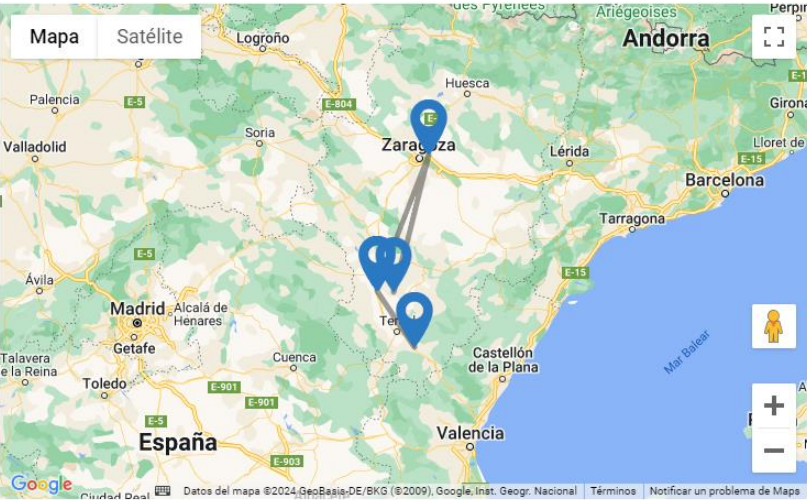
5. Cutting Plant

6. Salting

7. Curing

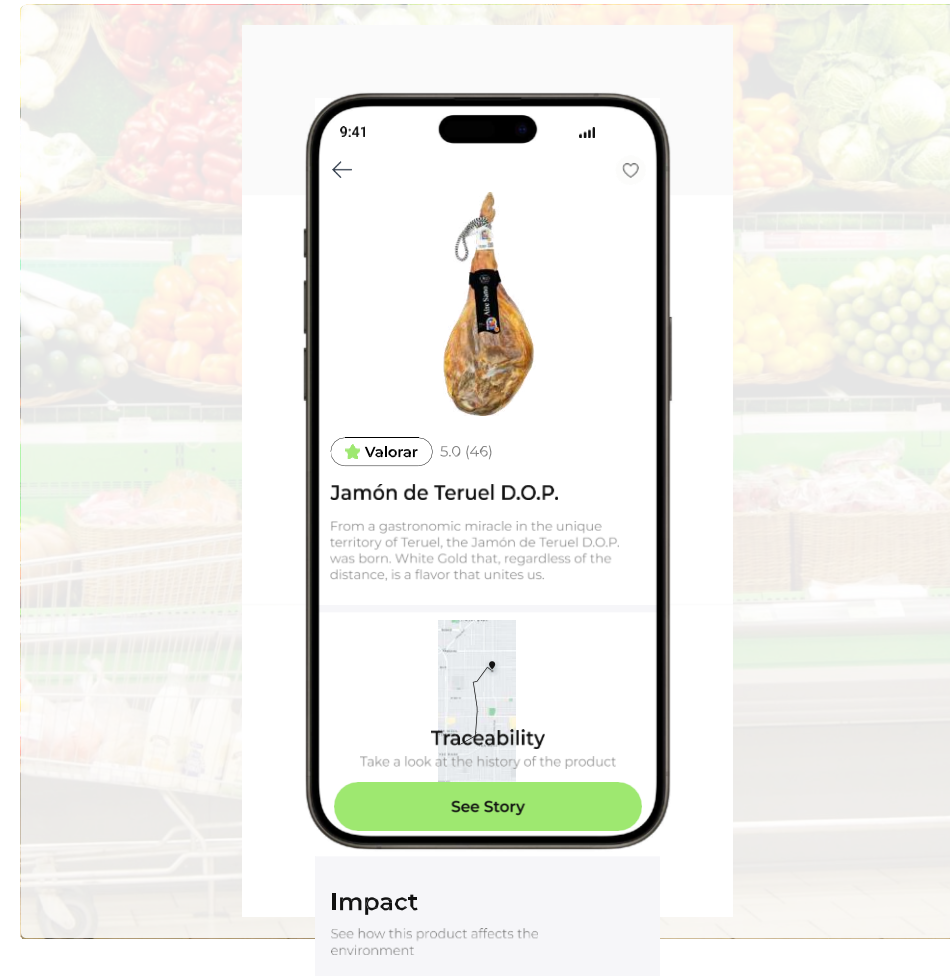
8. Packaging

Mapa Satélite



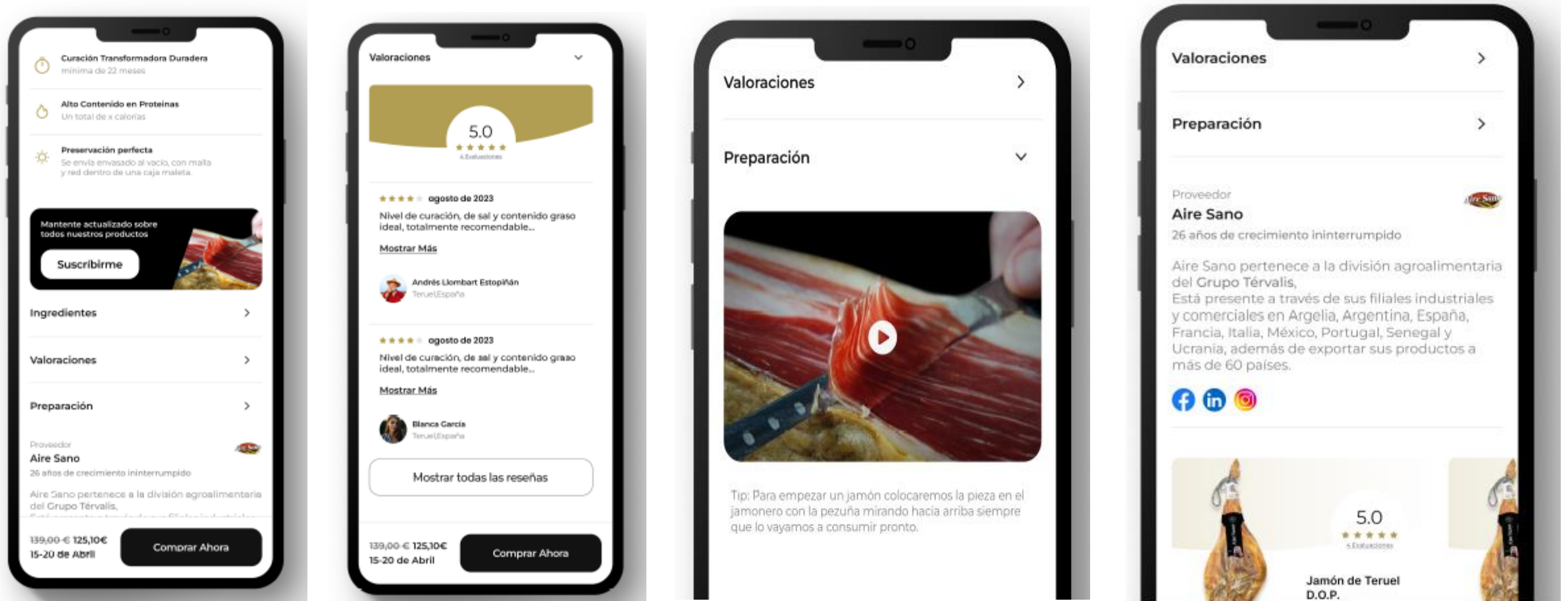
Herramienta Recortes

- Marketing Platform: QR code to end-consumers (digital Marketing)-Web App



Blockchain

- Web App Consumer: company web, newsletter, rewards, reviews, social networks, etc



Blockchain

- Sales Area: growing



Environmental and economic project impact assessment



Magdalena Jaskiewicz
Environmental Specialist at AngazTech
Magdalena@ANGAZtech.pl





ANGAZ's Role in BBTWINS

Who is ANGAZ?

ANGAZ is an SME located in Lodz, Poland. 📍 🌍

🔧 **We specialize** in sustainable engineering solutions and consultancy services.

🧠 🌿 **Our expertise** includes comprehensive sustainability assessment.

We provide services such as:

🌐 Life-cycle assessment / management

🔍 Material/waste flow analysis

📊 Business models and exploitation

🚀 **Our focus** is on innovation engineering, market decision-making, and business model innovation.

Responsibilities in BBTWINS:

🌱 **Life Cycle Assessment (LCA)** 🌍

- Measured the environmental footprint before and after implementing BBTWINS technologies.

💰 **Life Cycle Cost Assessment (LCCA)** 📈

- Evaluated financial feasibility of Digital Twin solutions.

🤝 **Collaboration with Partners:** 🤝

- Worked closely with partners **DIMITRA** & **PORTESA** to validate real-world sustainability improvements.



🌿 ✨ **ANGAZ – Driving sustainability through innovation!** 🚀 ♻️

LCA and LCCA for BBTWINS

Why LCA and LCCA?

 To quantify the **environmental footprint** and **economic feasibility** of Digital Twin solutions in agrifood value chains.

 Ensured **data-driven decision-making** for **sustainability** and **cost-effectiveness**.

The Process:

 **Data Collection** – Obtained **real-world data** from  **DIMITRA** (*fruit production*) and  **PORTESA** (*meat production*).

 **Modelling Scenarios** – Created **Digital Twin-based simulations**  and compared traditional vs. optimized operations.

 **Impact Measurement** – Analyzed **energy, water, waste, emissions, and cost savings** .

 **Validation & Reporting** – Assessed feasibility for **large-scale implementation** .

Standards Followed:

 **ISO 14040** for Life Cycle Assessment.

 **ISO 15686-5** for Life Cycle Cost Analysis.



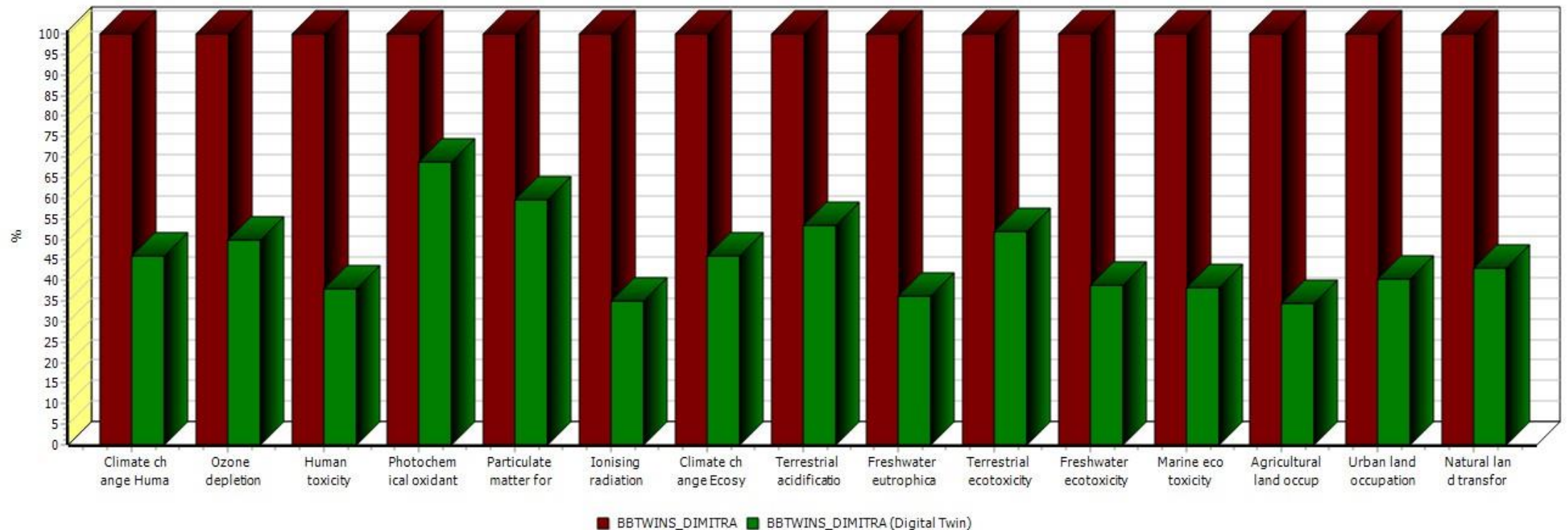
 **Our Mission: Innovating with purpose for a sustainable and resilient agrifood industry.**   

Environmental Outcomes (LCA)



Life-Cycle Assessment DIMITRA:

54% reduction in environmental footprint



Damage Assessment results per Impact category (ReCiPe Endpoint (E) V1.12 / Europe ReCiPe E/A) for DIMITRA cooperative.

Environmental Outcomes (LCA)



◆ **54% Environmental Impact Reduction (LCA) achieved through:**

- Digital Twin integration
- Efficient logistics
- Optimized agriculture
- Renewable energy adoption
- Circular economy practices

Economic Viability (LCCA)



Resilient financial performance across market scenarios



- **Optimistic Scenario:** €16M NPV, 15% IRR, 4-year payback 
- **Realistic Scenario:** €6M NPV, 9% IRR, 5-year payback 
- **Negative Scenario:** €4M NPV, 7% IRR, 6-year payback 

Revenue Streams

-  Peach Sales
-  Waste Valorisation
-  Government Subsidies

Operational Stability

-  Logistics Optimization
-  Renewable Energy
-  Circular Economy



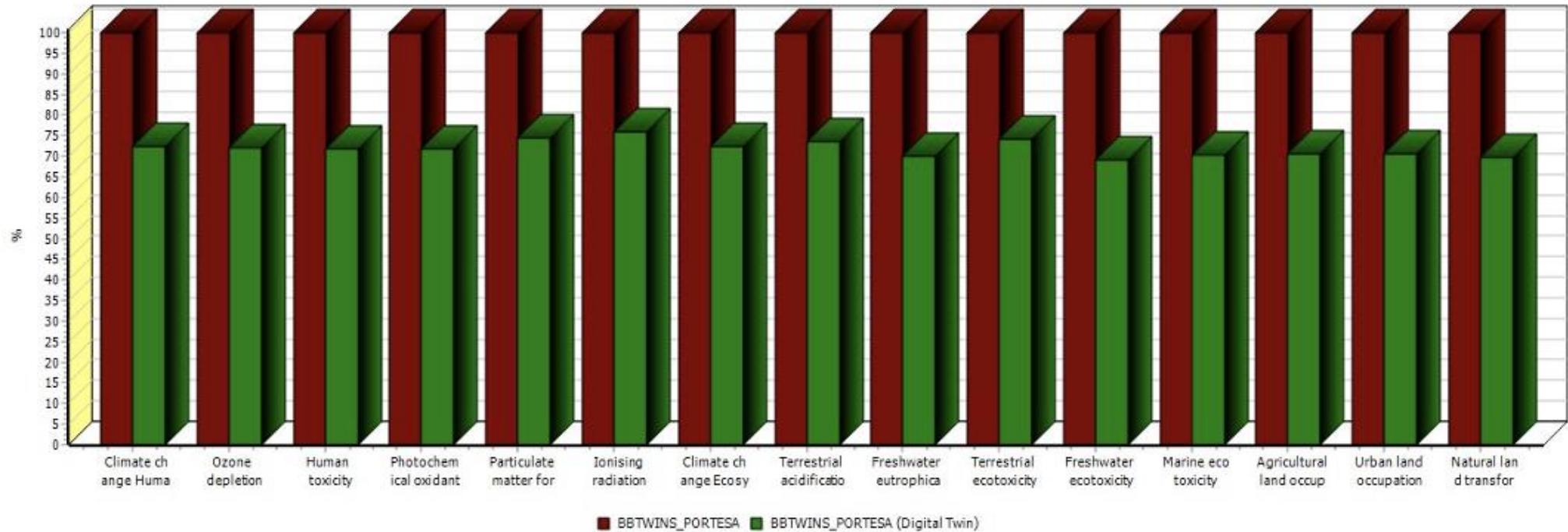
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Environmental Outcomes (LCA)



Life-Cycle Assessment PORTESA :

28% reduction in environmental footprint



BI

Damage Assessment results per Impact category (ReCiPe Endpoint (E) V1.12 / Europe ReCiPe E/A) for PORTESA

Environmental Outcomes (LCA)



- ◆ **28% Environmental Impact Reduction (LCA) achieved through:**
 - Digital Twin (DT) integration
 - Circular economy practices
 - Feed production efficiency
 - Optimized logistics
 - Energy-efficient processing
 - Sustainable animal rearing

Economic Viability (LCCA)



Strong financial performance across scenarios:

● **Optimistic Scenario:** €23M NPV, 16% IRR, 5-year payback 



● **Realistic Scenario:** €17M NPV, 14% IRR, 6-year payback 

● **Negative Scenario:** €11M NPV, 11% IRR, 6-year payback 

Revenue Drivers Operational Stability

 **Pork sales**

 **Waste Valorisation**

 **Government Subsidies**

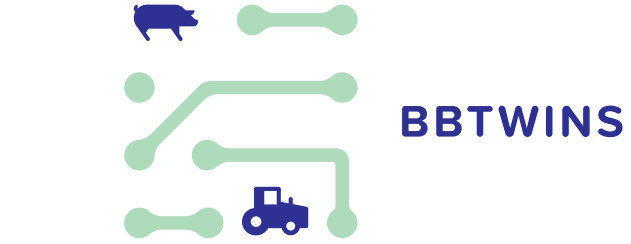
 **Feed Logistics Optimization**

 **Circular Economy**

 **Energy-efficient Processing**



BBTWINS



Conclusions

Revolutionizing Agrifood Production



Digital Twin Technology: A game-changer for efficiency & sustainability.



Optimized Processes: Lower costs, higher productivity & reduced impact.

Scalability and Market Readiness



Proven Feasibility: Success in DIMITRA & PORTESA demonstrates real-world impact.



Expansion Potential: Applications in logistics, waste valorisation, & predictive farming.

Future Prospects



AI & Blockchain: Enhancing traceability & decision-making.



Sustainable Growth: Expanding into new markets focusing on circular economy.



Policy Alignment: Supporting EU Green Deal & global sustainability goals.



BBTWINS = Reducing Impact, Maximizing Value!

THANK YOU FOR YOUR ATTENTION!

Aneta Blaszczyk Aneta@ANGAZtech.pl

Magdalena Jaskiewicz Magdalena@ANGAZtech.pl

Emil Lezak Emil@ANGAZtech.pl



Scaling Success: Replicating BBTWINS Digital Twin Solutions Across Industries

bbtwins.eu



Athanasios Lampropoulos

EU R&D Project Manager at Cluster of
Bioeconomy and Environment of Western
Macedonia

a.lampropoulos@clube.gr



BBTWINS in Industry: Expanding Digital Twin Applications

challenge/problem



solution/benefit approach



"BBTWINS: Smart, Scalable & Sustainable for Every Sector"



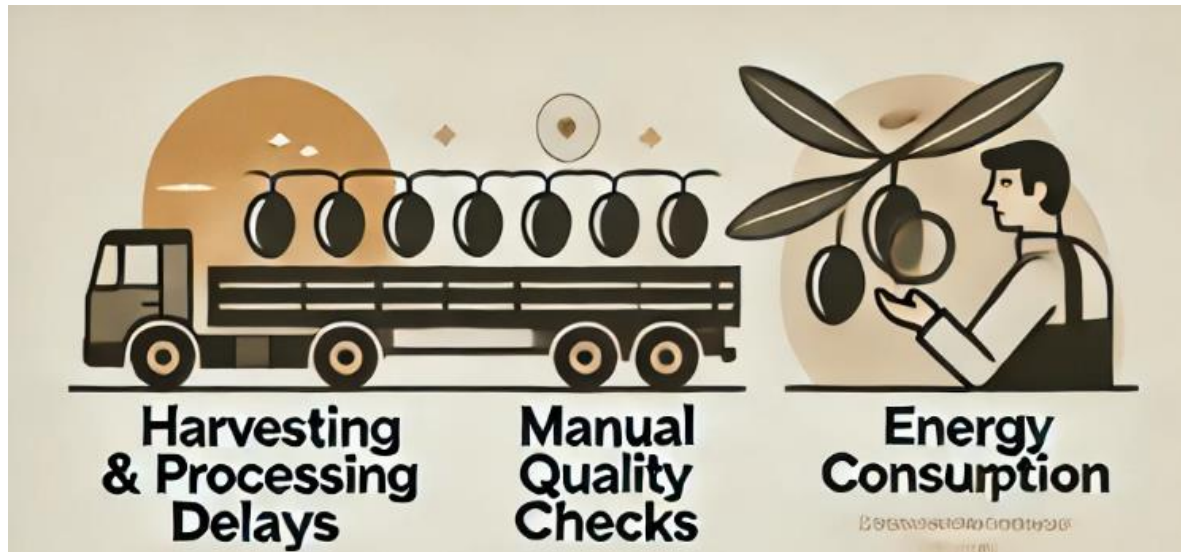
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Challenge: Process Efficiency

Challenge Statement

high costs, waste, and quality issues due to outdated workflows, limited automation, and poor real-time optimization.

Key Issues Across Industrial Sectors

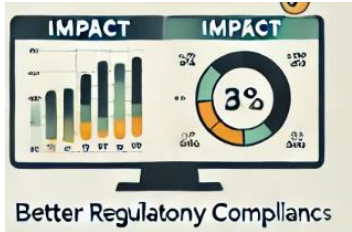
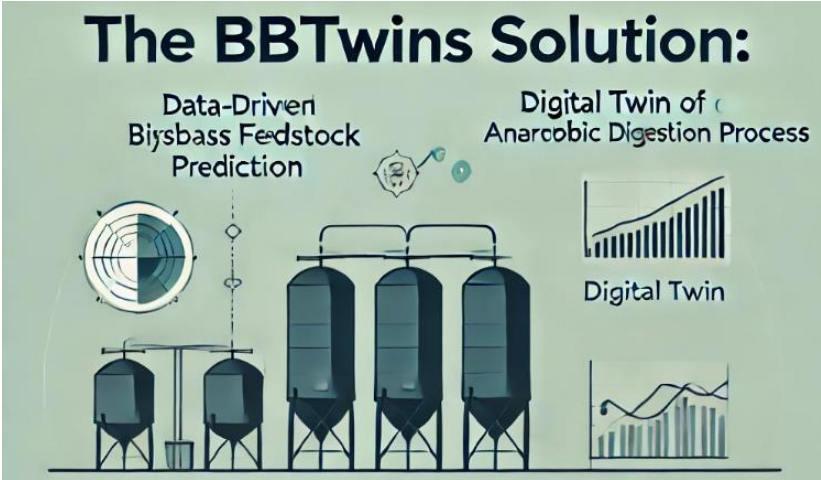
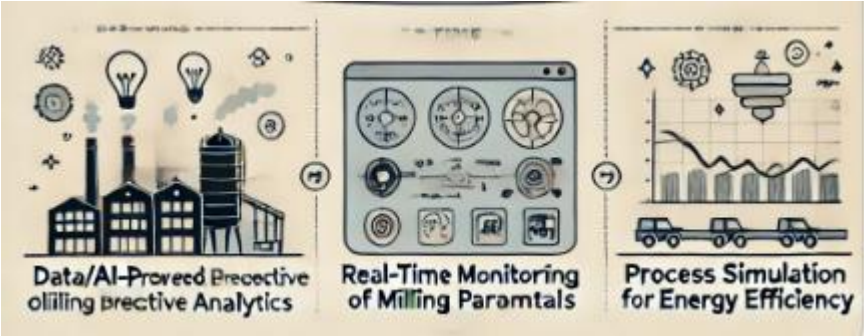


-  Industries lose money & resources
-  Regulatory compliance is at risk

BBTWINS Solution – Digital Twins & Data/AI-driven analytics

💡 How Do Digital Twins Work?

- ✔ Virtual Representation of Physical Systems
- ✔ Predictive Analytics



🎯 Why This Matters:

- 📌 reduce waste, energy costs, and inefficiencies
- 📌 Regulatory compliance

Challenge: Traceability & Compliance

Challenge Statement

lack full supply chain visibility, leading to regulatory risks, counterfeiting, and loss of consumer trust.

Key Issues Across Industrial Sectors



-  Consumers demand transparency & authenticity in the products they buy.
-  Industries must comply with EU sustainability & food safety regulations.
-  Without digital traceability, fraud, inefficiencies, and compliance risks increase.

BBTWINS Solution – Blockchain Traceability

💡 Solution Statement:

BBTWINS integrates Blockchain Traceability to ensure secure, transparent, and tamper-proof supply chains.

⚙️ How Does Blockchain Improve Traceability?

- ✅ Immutable Data Storage
- ✅ Smart Contracts for Quality Control
- ✅ Consumer-Facing QR Codes.



- ✅ Automated blockchain verification simplifies the process.

Challenge: Logistics & Resource Waste

Challenge Statement

Logistics inefficiencies drive up costs, increase environmental impact, and cause product loss across industries.

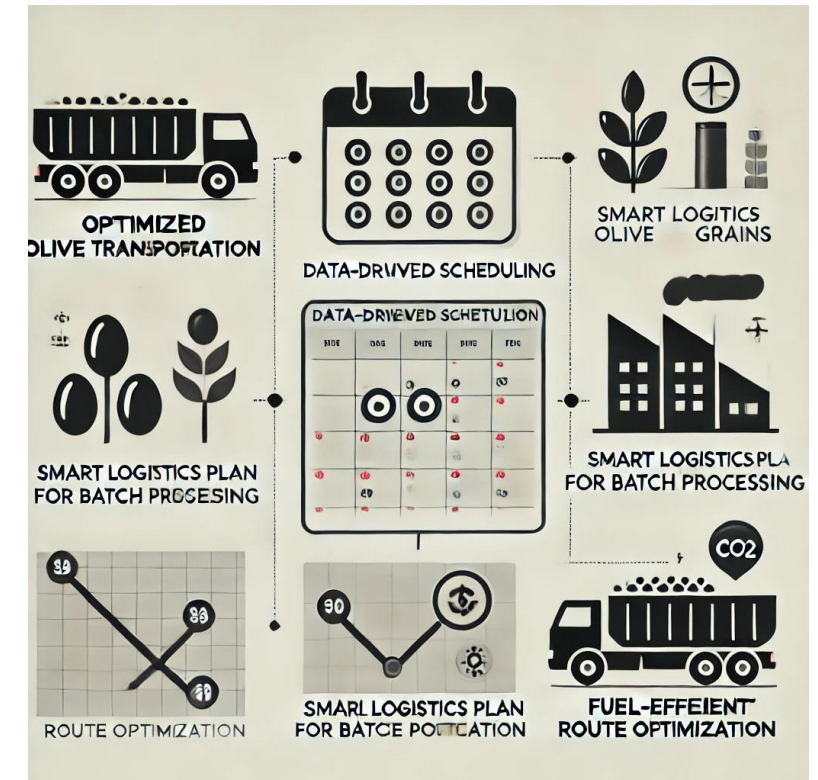
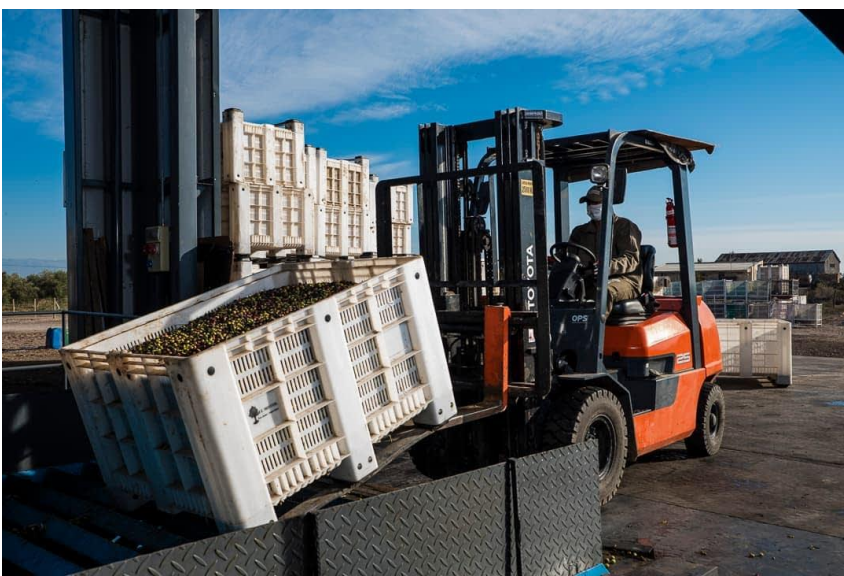


- 📌 Reducing transportation inefficiencies lowers costs & improves product quality.
- 📌 Smart logistics ensure industries can meet demand & reduce losses.

BBTWINS Solution – Data-Driven Optimization

💡 Solution Statement:

BBTWINS utilizes AI-powered predictive analytics, smart logistics, and real-time monitoring to optimize transportation



🎯 Why This Matters:

- 📌 Reduces transportation inefficiencies & lowers costs.
- 📌 Ensures food & bio-based product quality through predictive logistics.

Challenge: By-product Management & Circular Economy

Challenge Statement

A significant portion of industrial by-products goes to waste instead of being valorized into useful materials.



- ⚠ Environmental Impact
- ⚠ Economic Losses
- ⚠ Regulatory Pressure

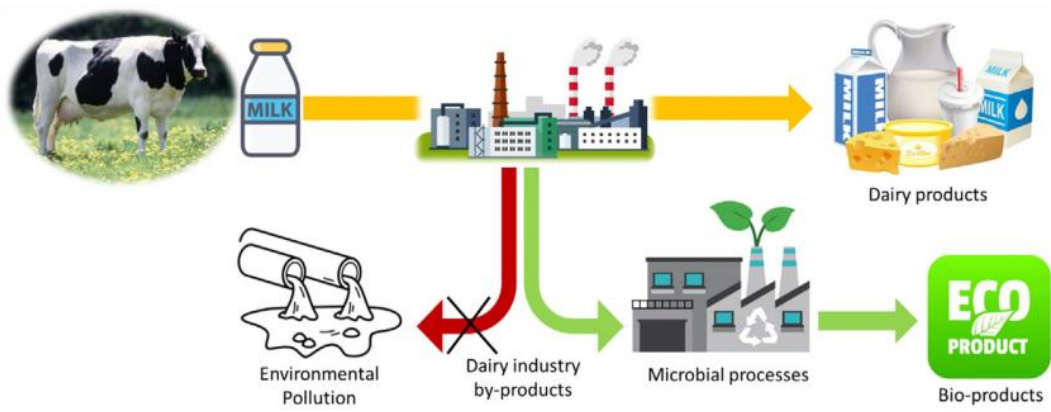
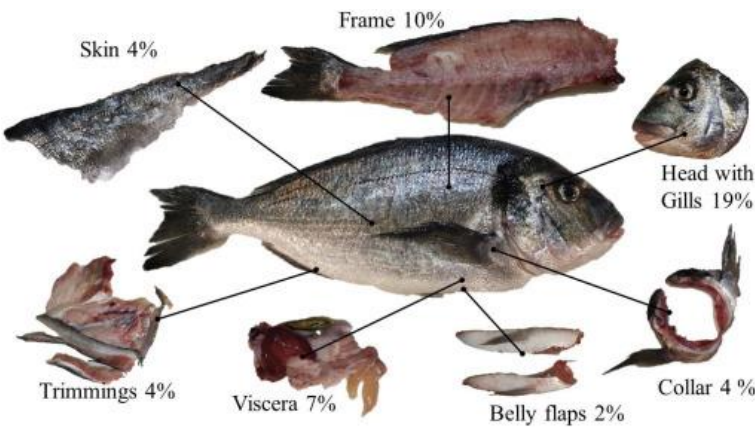
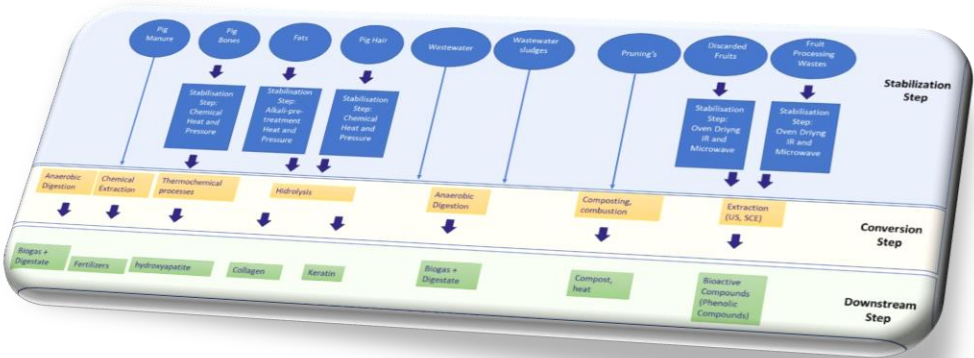


- 📌 Turn waste into revenue by adopting circular economy practices.
- 📌 Better by-product utilization reduces pollution & meets EU sustainability targets.

BBTWINS Solution – Data-driven Waste Valorization

 Solution Statement:

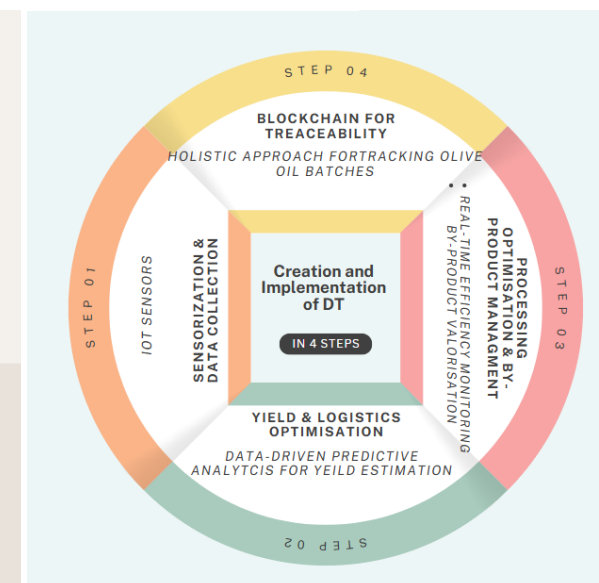
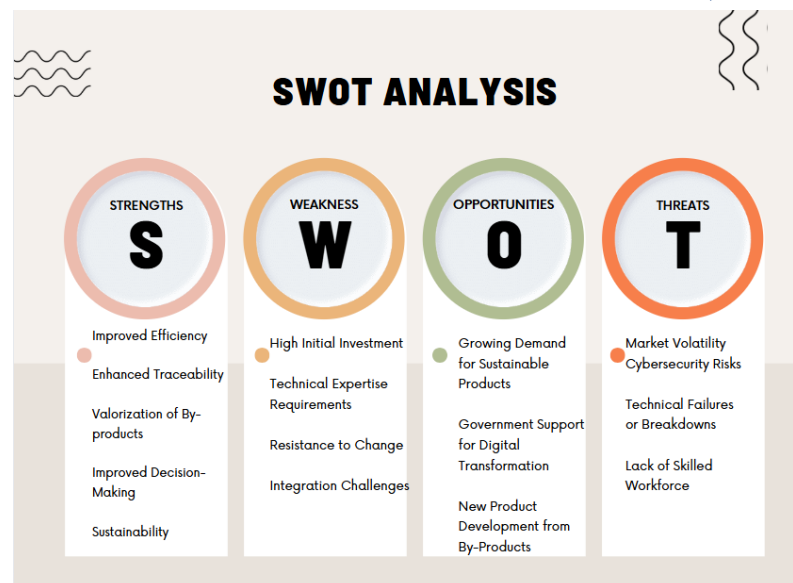
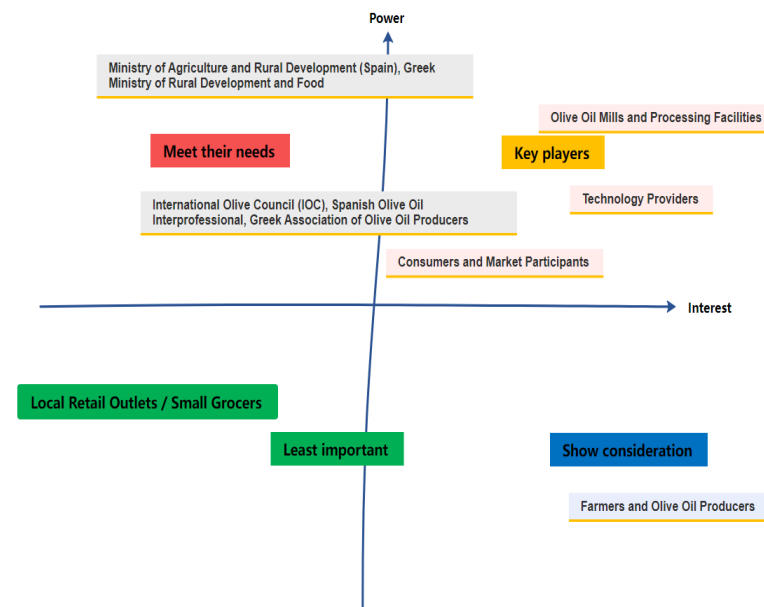
BBTWINS leverages data-driven analytics and AI to optimize waste valorization by identifying high-value by-product applications.



 Industries can turn waste into profitable bio-based products.
 AI-driven optimization reduces waste disposal costs & environmental impact.



D6.3 Replication Plan



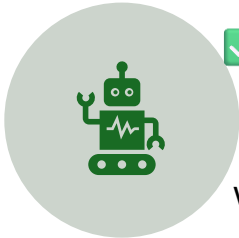
BBTWINS in Industry: Expanding Digital Twin Applications



Fruit Value Chain



Meat Industry



✓ **Optimizing Processes with AI & Digital Twins**

🏭 Reduce inefficiencies, automate workflows, and enhance decision-making



✓ **Blockchain Traceability for Transparency**

🔗 Combat fraud, ensure compliance, and provide real-time tracking



✓ **Smart Logistics to Reduce Waste & Costs**

🚚 Data/AI-powered routing & supply chain optimization



✓ **Circular Economy: By-Product Valorization**

♻️ Turn waste into value with AI-driven sustainability solutions

challenge/problem



solution/benefit approach



Olive Oil Value Chain



Fisheries & Seafood Processing



Food & Beverage Manufacturing



Logistics & Supply Chain



Renewable Energy & Bio-Based Processing



Grain, Seeds & Cereal Processing



Scaling BBTWINS from Agri-Food to New Sectors: Smart, Efficient & Sustainable



BBTWINS

Challenge: Process Efficiency

Challenge Statement

Many industrial sectors operate with outdated or inefficient workflows, leading to higher operational costs, waste generation, and inconsistent product quality. These inefficiencies stem from limited automation, lack of real-time insights, and poor optimization of key processes.

Key Issues Across Industrial Sectors

Olive Oil Processing (Milling & Extraction)

Challenge:

- Harvesting & processing delays
- Manual quality checks
- High energy & water consumption

Impact:

- Decreased extra virgin olive oil (EVOO) quality.
- Increased energy costs due to inefficient equipment usage.
- Waste generation (olive pomace, wastewater) remains underutilized.

Renewable Energy & Bio-Based Processing

Challenge:

- Fluctuations in biomass feedstock supply
- Lack of real-time process monitoring
- High operational costs & by-product underutilization

Impact:

- Lower biogas yield & energy losses due to poor feedstock management.
- Environmental challenges from untapped bio-waste in production.

Why Does This Matter?

-  Industries lose money & resources due to non-optimized production processes.
-  Regulatory compliance (EU Green Deal, Circular Economy Action Plan) is at risk.
-  Sustainability & competitiveness depend on data-driven, efficient workflows.



BBTWINS Solution – Digital Twins & Data/AI-driven analytics

💡 How Do Digital Twins Work?

- ✔ **Virtual Representation of Physical Systems** → Real-time data feeds into a virtual model, continuously learning and predicting outcomes.
- ✔ **Predictive Analytics** → Enables industries to test scenarios and optimize workflows before implementing changes in real production.

📌 Olive Oil Sector: AI-Powered Harvesting & Processing Optimization

◆ BBTWINS Solution:

- Data/AI-powered predictive analytics
- Real-time monitoring of milling parameters
- Process simulation for energy efficiency

✔ Impact:

- Higher quality extra virgin olive oil (EVOO), lower waste, and reduced energy costs.

📌 Renewable Energy & Bio-Based Processing: Biogas & Feedstock Optimization

◆ BBTWINS Solution:

- Data-driven biomass feedstock prediction
- Digital Twin of anaerobic digestion process
- Real-time efficiency tracking

✔ Impact

- Higher biogas production efficiency, reduced carbon footprint, and better regulatory compliance.



🎯 Why This Matters:

- 📌 Industries can reduce waste, energy costs, and inefficiencies.
- 📌 Regulatory compliance & sustainability targets are easier to achieve.
- 📌 Real-time monitoring enhances operational transparency & product quality.

Challenge: Traceability & Compliance

Challenge Statement

Many industries lack full supply chain visibility, leading to regulatory risks, counterfeiting, and loss of consumer trust. Products often pass through multiple intermediaries, making it difficult to verify authenticity, quality, and sustainability claims.

Key Issues Across Industrial Sectors

- ✓ **Regulatory Compliance Issues** → Industries must adhere to EU Circular Economy Action Plan, Green Deal, and Food Safety Regulations.
- ✓ **Consumer Trust is Declining** → Adulteration, fraud, and lack of transparency damage brand reputation.
- ✓ **Financial & Environmental Impact** → Supply chain inefficiencies lead to higher costs and sustainability failures.



◆ Why Does This Matter?

-  Consumers demand transparency & authenticity in the products they buy.
-  Industries must comply with EU sustainability & food safety regulations.
-  Without digital traceability, fraud, inefficiencies, and compliance risks increase.

BBTWINS Solution – Blockchain Traceability

💡 Solution Statement:

BBTWINS integrates Blockchain Traceability to ensure secure, transparent, and tamper-proof supply chains. By using immutable digital records, smart contracts, and consumer-facing verification tools, BBTWINS eliminates fraud, inefficiencies, and regulatory risks.

⚙️ How Does Blockchain Improve Traceability?

- ✅ Immutable Data Storage
- ✅ Smart Contracts for Quality Control
- ✅ Consumer-Facing QR Codes.

🏭 Real-World Applications

📍 Olive Oil Sector

- ✅ Batch-Level Blockchain Traceability
- ✅ Consumer Verification via QR Code

📍 Bio-Based Products & Renewable Energy

- ✅ Real-Time Feedstock Traceability
- ✅ Automated Carbon Footprint Reporting
- ✅ Waste Valorization Certification

🎯 Why This Matters:

- 📌 Fraudulent practices and mislabeling cost industries millions in losses.
- 📌 Regulatory compliance is becoming more complex—automated blockchain verification simplifies the process.
- 📌 Consumers & businesses demand full transparency in supply chains.



Challenge: Logistics & Resource Waste

Challenge Statement

Logistics inefficiencies drive up costs, increase environmental impact, and cause product loss across industries. High transportation costs, inefficient routes, cold-chain failures, and poor supply chain coordination create major waste and quality issues.

Key Issues Across Industrial Sectors

- ✓ **High Costs & Inefficiency** → Poor planning leads to longer transport times & unnecessary fuel consumption.
- ✓ **Cold-Chain Failures** → Inadequate temperature control causes spoilage & food safety risks.
- ✓ **Supply Chain Delays** → Slower deliveries lower product quality & reduce market competitiveness.

Logistics Inefficiencies in Olive Oil & Grain Processing

◆ Challenge: Inefficient Logistics & Supply Chain Delays

 Unoptimized Transportation Routes

 Harvesting & Processing Delays

 Manual Inventory Tracking & Poor Route Planning

◆ Why Does This Matter?

-  Reducing transportation inefficiencies lowers costs & improves product quality.
-  Sustainable logistics planning supports EU climate & circular economy goals.
-  Smart logistics ensure industries can meet demand & reduce losses.



BBTWINS Solution – Data-Driven Optimization

💡 Solution Statement:

BBTWINS utilizes AI-powered predictive analytics, smart logistics, and real-time monitoring to optimize transportation, inventory management, and supply chain efficiency.

⚙️ How Does Blockchain Improve Logistics?

- ✅ **Predictive Analytics for Demand & Supply Forecasting** → Prevents stock shortages & reduces overproduction.
- ✅ **AI-Powered Smart Routing** → Cuts transportation costs & minimizes delays.
- ✅ **Real-Time Cold-Chain Monitoring** → Ensures food safety & reduces spoilage risks.

🏭 Real-World Applications

📌 Optimized Olive/Grains Transportation 🚚

- ✅ Data-driven scheduling optimizes harvest-to-mill transportation.
- ✅ Smart logistics plan batch processing in real time.
- ✅ Fuel-efficient route optimization reduces costs & CO₂ emissions.

📌 Data-Driven Biogas Feedstock Planning 📅

- ✅ Models predict biomass availability & optimize feedstock mix.
- ✅ Smart logistics ensure stable, efficient feedstock supply chains.
- ✅ Automated resource allocation minimizes waste & maximizes energy conversion.

🎯 Why This Matters:

- 📌 Reduces transportation inefficiencies & lowers costs.
- 📌 Ensures food & bio-based product quality through predictive logistics.
- 📌 Supports EU sustainability & circular economy goals.



Challenge: By-product Management & Circular Economy

Challenge Statement

A significant portion of industrial by-products goes to waste instead of being valorized into useful materials. Many industries lack economic incentives, technology, and regulatory support to implement circular economy solutions that turn waste into valuable resources.

Key Issues Across Industrial Sectors

- ✓ **Environmental Impact** → Large-scale waste disposal increases pollution & CO₂ emissions.
- ✓ **Economic Losses** → Valuable by-products remain underutilized instead of generating additional revenue.
- ✓ **Regulatory Pressure** → EU Circular Economy policies demand higher sustainability standards.

Waste Valorization in Olive Oil & Grain Processing

◆ Challenge: Large quantities of by-products are discarded instead of being repurposed

- ✓ Increased waste & environmental impact
- ✓ Higher disposal costs
- ✓ Missed revenue opportunities

◆ Why Does This Matter?

-  Industries can turn waste into revenue by adopting circular economy practices.
-  Better by-product utilization reduces pollution & meets EU sustainability targets.
-  BBTWINS' Data/AI-powered optimization can identify the best valorization strategies.



BBTWINS Solution – Data-driven Waste Valorization

💡 Solution Statement:

BBTWINS leverages Data-driven analytics and AI to optimize waste valorization by identifying high-value by-product applications. By simulating valorization pathways and automating extraction processes, industries can convert waste into profitable bio-based products.

⚙️ How Does AI-Driven Waste Valorization Work?

- ✅ Digital Twins analyze & simulate waste repurposing options.
- ✅ AI-driven extraction & classification
- ✅ Predictive modeling for circular economy integration

🏭 Real-World Applications

📌 Olive Industry: Pomace Valorization 🌿

- ✅ Digital Twins assess pomace composition & optimal reuse applications.
- ✅ AI-driven extraction isolates valuable compounds (antioxidants, polyphenols).
- ✅ Optimized pathways convert waste into biogas, fertilizers, and sustainable cosmetics.

📌 Food Processing: Repurposing Cheese Whey into High-Value Nutraceuticals 🧀

- ✅ AI-based filtration optimizes whey protein extraction.
- ✅ Predictive analytics match supply with market demand for nutraceuticals.

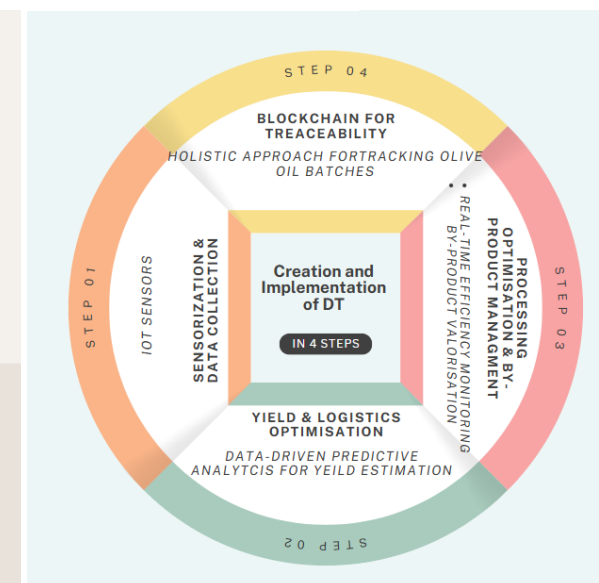
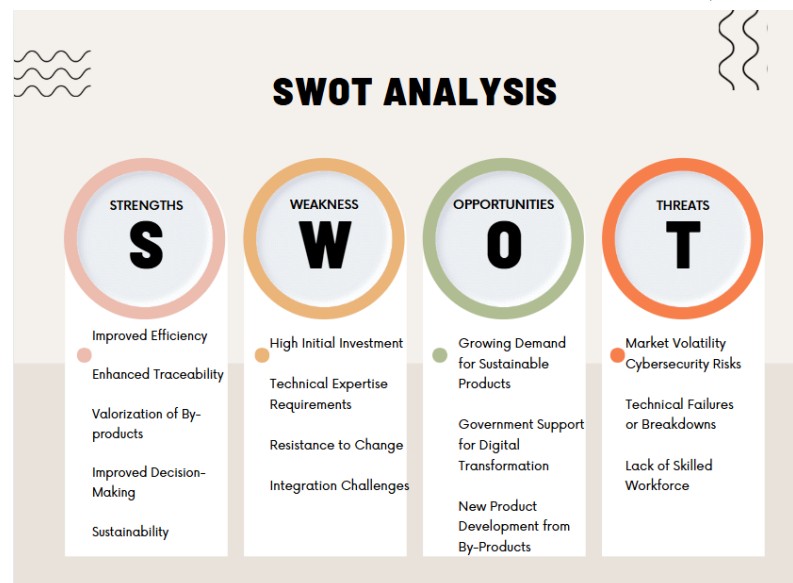
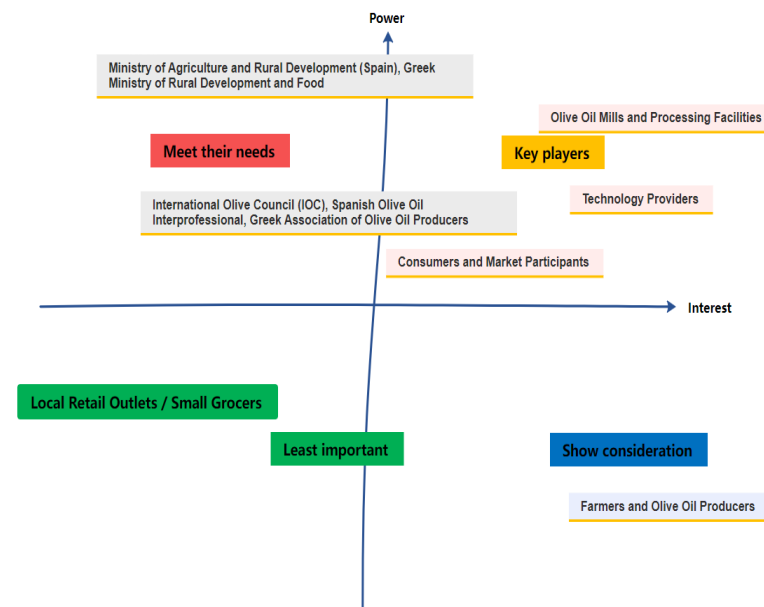


🎯 Why This Matters:

- 📌 Industries can turn waste into profitable bio-based products.
- 📌 AI-driven optimization reduces waste disposal costs & environmental impact.
- 📌 Supports EU Circular Economy policies & enhances industrial sustainability.

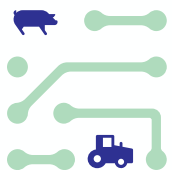


D6.3 Replication Plan



Do you have any questions?

For those participating online, please use
the Zoom Q&A section



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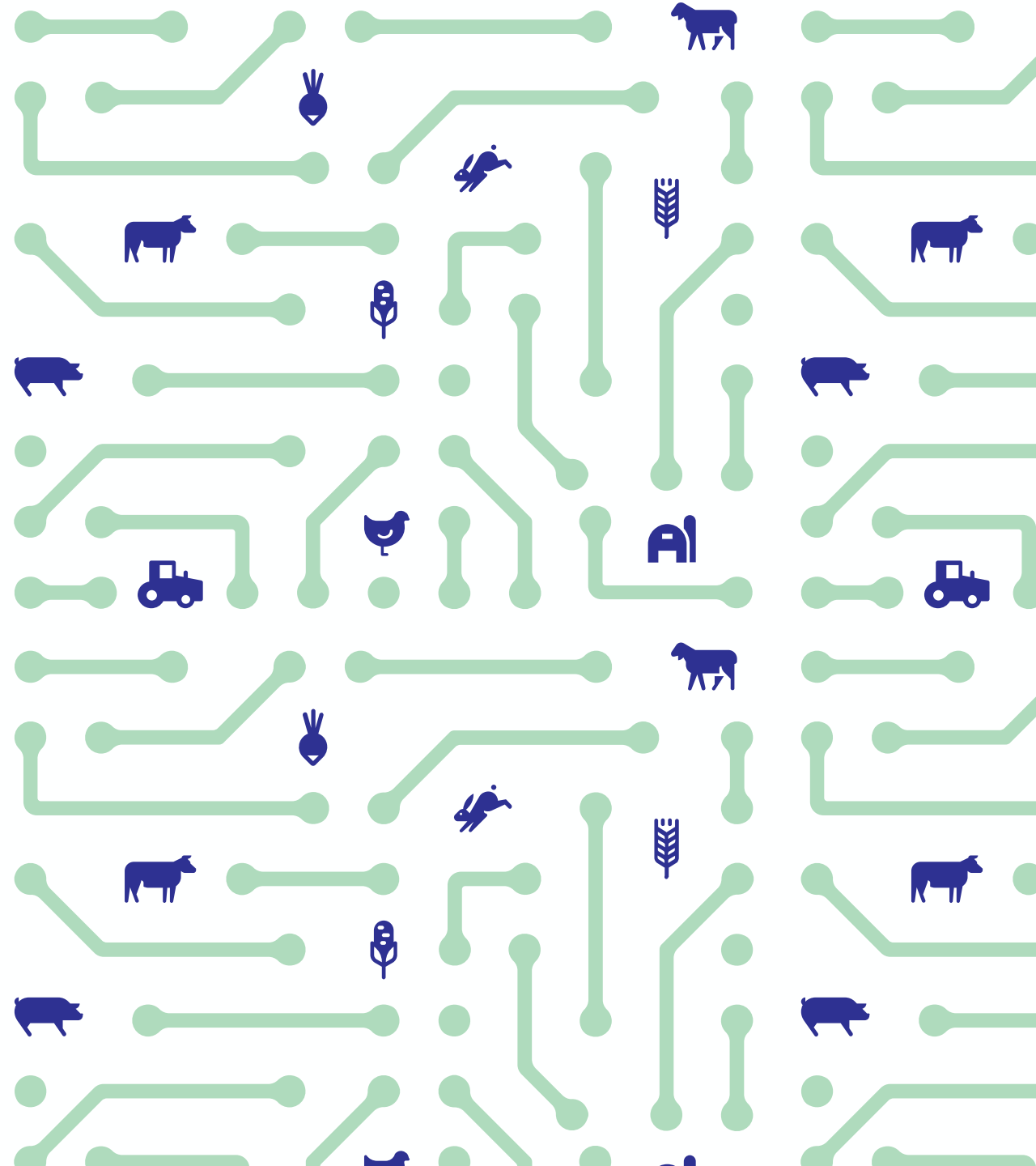
**Circular
Bio-based
Europe**
Joint Undertaking



Bio-based Industries
Consortium



Horizon 2020
European Union Funding
for Research & Innovation



Beyond BBTWINS



Jürgen Vangeyte
Scientific Director of
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Hermann Bohrer
BBTWINS EAB, former
executive
BMW Group



Malamati Louta
BBTWINS EAB, Professor
in Telecommunication
Networks
**University of Western
Macedonia**



**Athanasios
Lampropoulos**
EU R&D Project Manager &
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Thank you for your attention



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