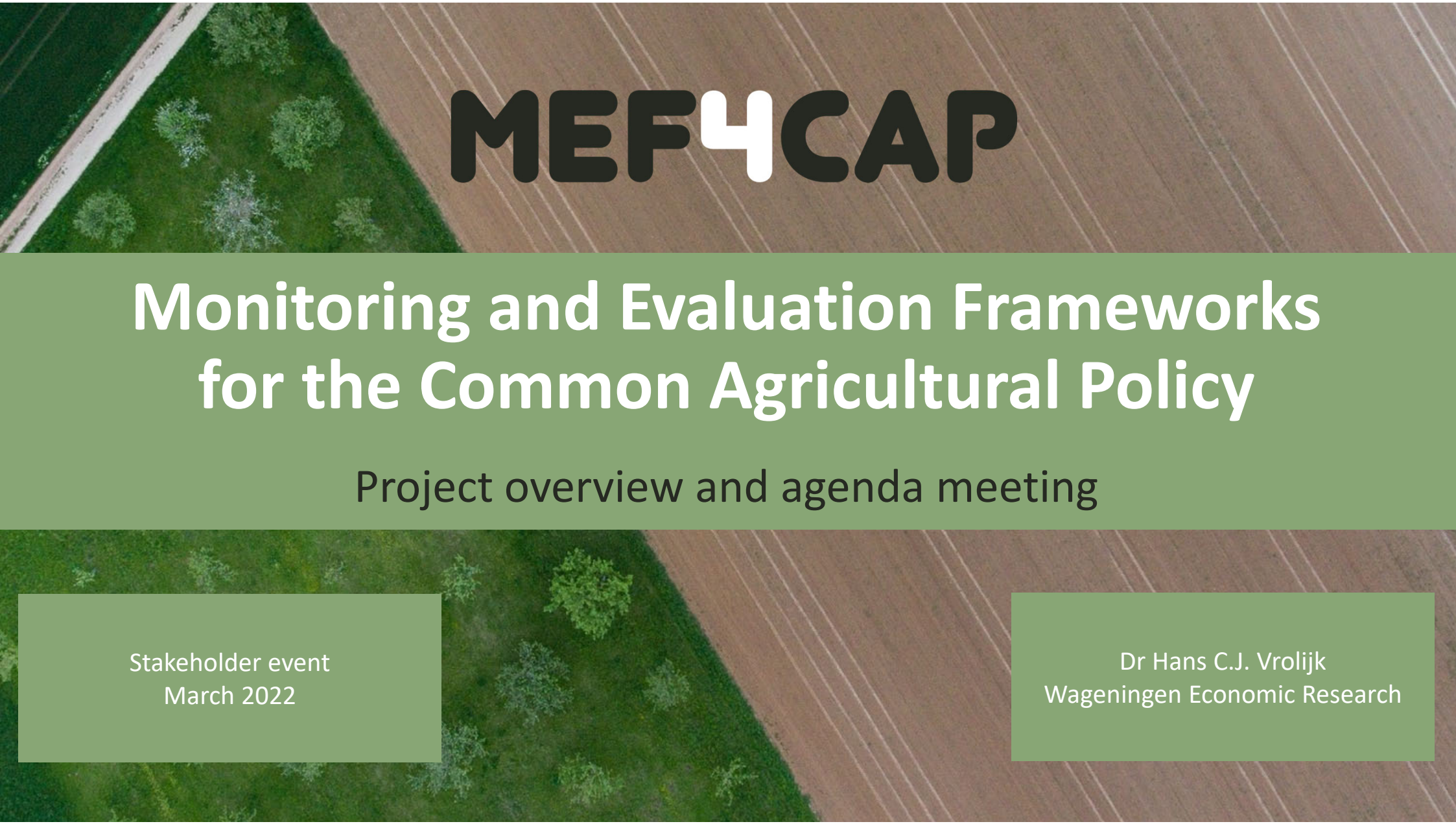


MEF4CAP

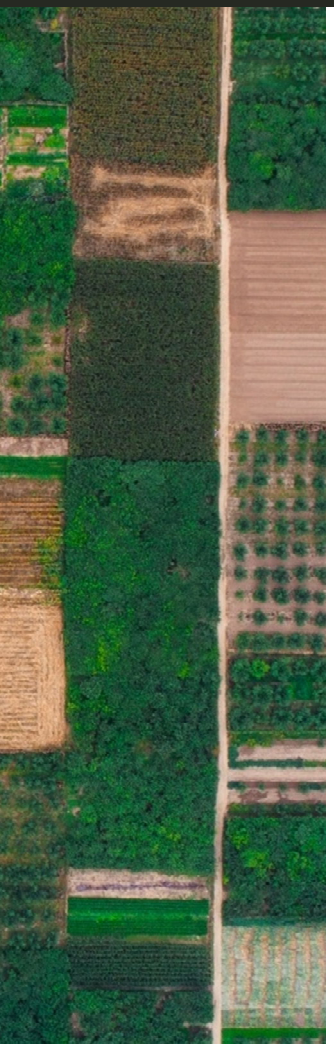
Monitoring and Evaluation Frameworks for the Common Agricultural Policy

Project overview and agenda meeting

Stakeholder event
March 2022

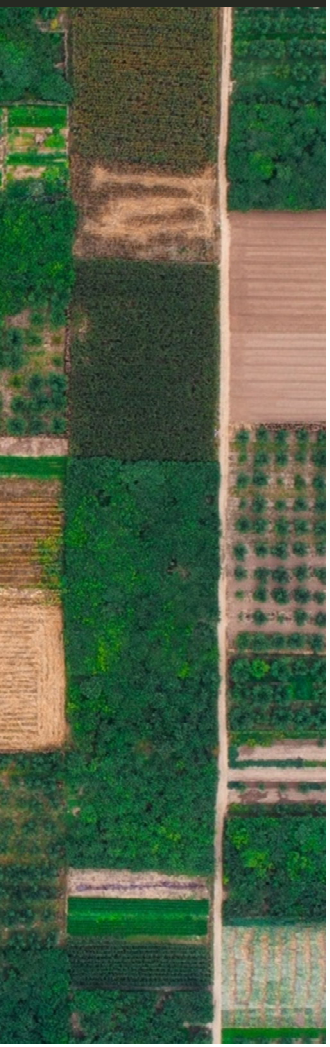
Dr Hans C.J. Vrolijk
Wageningen Economic Research

Overview



- **Need for information** on agriculture is increasing (government, sector and chain initiatives, farming)
- At the same time **availability of information** is increasing
- **No silver bullet**, one technology will not provide all answers, combinations are necessary
- **MEF4CAP will connect needs with opportunities**
  - Assessment of potential and limitations
  - Roadmap for future monitoring
    - and the potential of different technologies is fully exploited
    - while minimizing the associated cost and administrative burden
    - where the needs of different stakeholders are identified

MEF 4CAP



SUSTAINABLE DEVELOPMENT GOALS

The European Green Deal

PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

Policy objectives

People — Planet — Profit

Sustainability dimensions

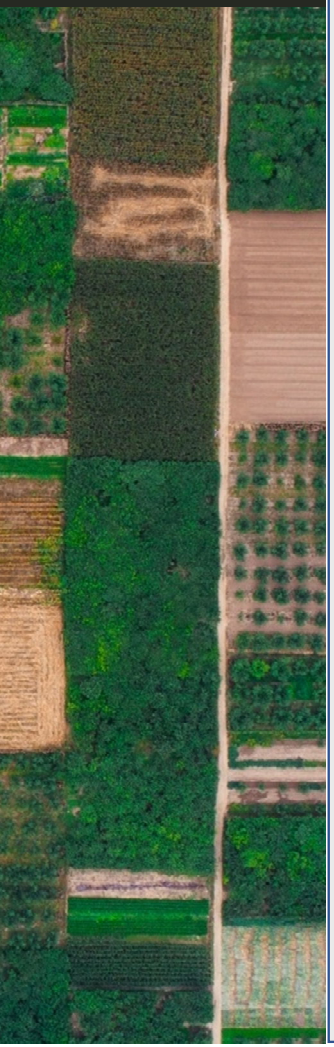
NATIONAL PAYING AGENCY

eurostat

DG AGRI

Monitoring and evaluation

MEF 4CAP



Policy objectives

Sustainability dimensions

People

Planet

Profit

Monitoring and evaluation

NATIONAL PAYING AGENCY

FSDN

eurostat

Revision IACS

PMEF

SAIO

DG AGRI

Data spaces

Partnership

MEF 4CAP

Policy objectives

suprema

Sustainability dimensions

People

Planet

Profit

MIND STEP

RE.CAP

sen4cap
common agricultural policy

FLINT

Sensagri

Monitoring and evaluation

NATIONAL PAYING AGENCY

FSDN

eurostat

envision

Revision

NIVA

SAIO

AICS

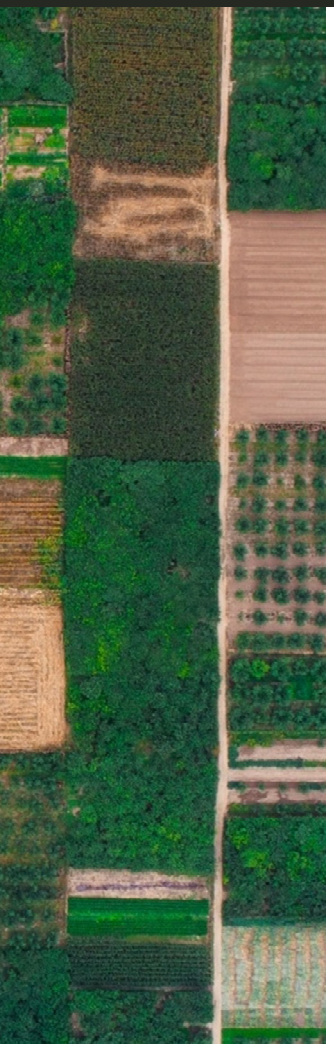
DG AGRI

D·I·A·N·A

Data spaces

Partnership

How can new technologies contribute



People

Planet

Profit

Policy needs

Technology developments

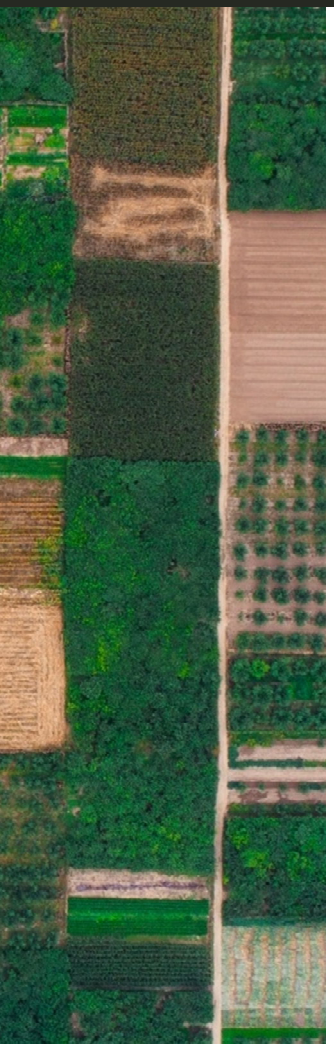
NATIONAL PAYING AGENCY

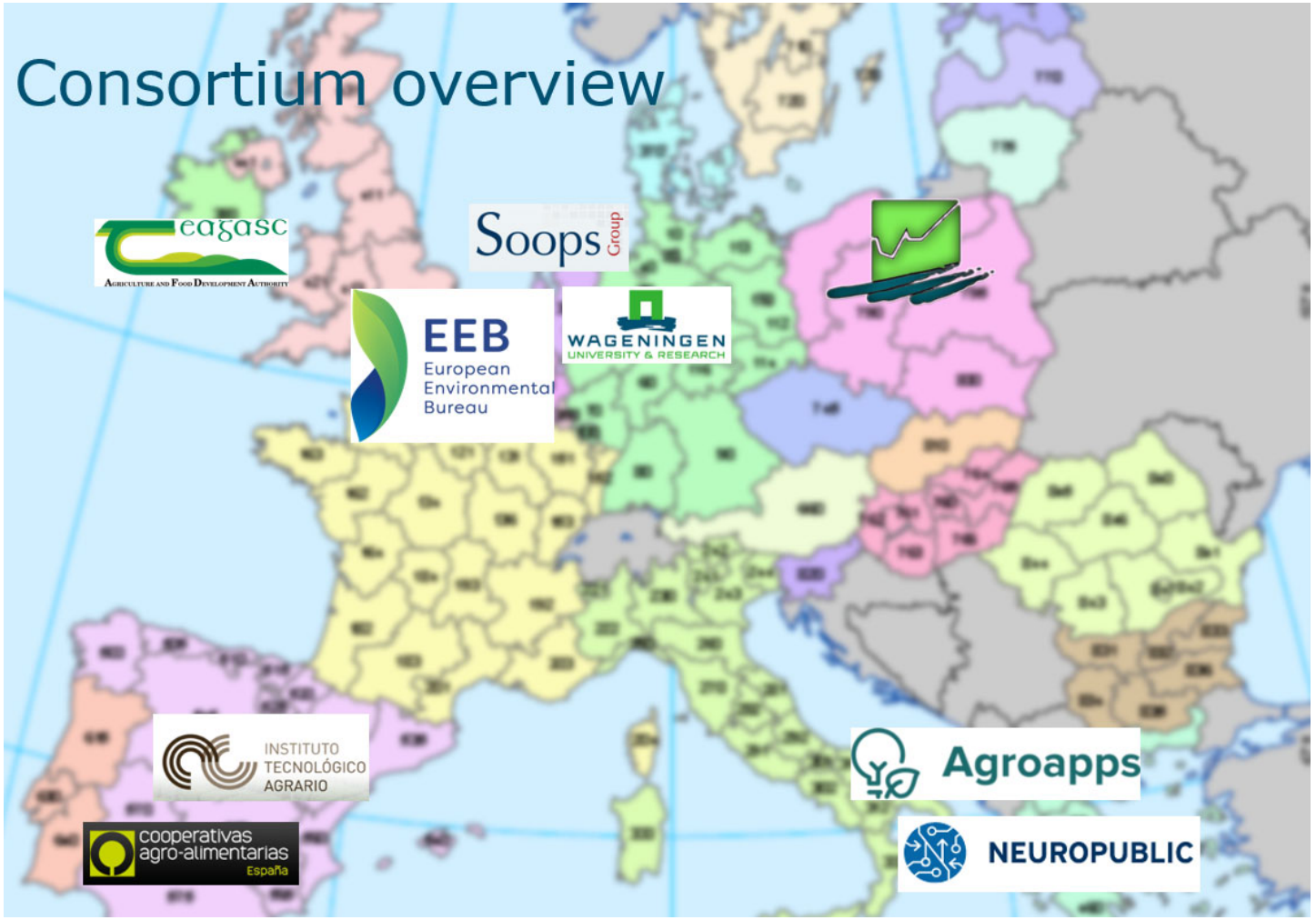
eurostat

Monitoring and evaluation

DG AGRI

Consortium





Background

Agricultural statistics

Advisory services

ICT

Earth observation

Farm accounting

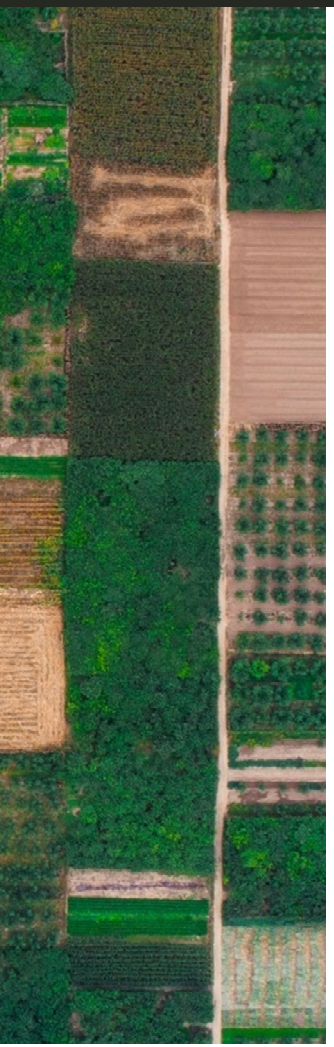
Monitoring

Policy evaluation

Farm cooperatives

Citizen organisations

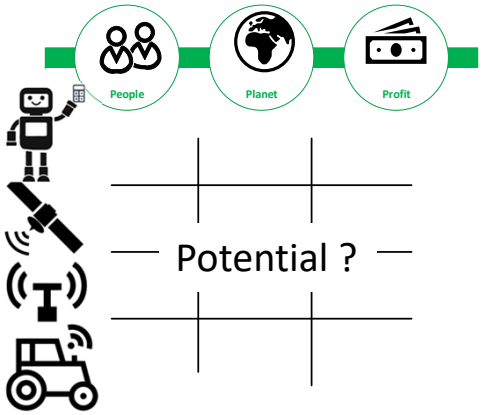
Agenda: key activities



- Future **monitoring and evaluation needs**

- Inventory of **technological developments**

- **Assess the potential** of technological developments to address information needs



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Thank you for your attention

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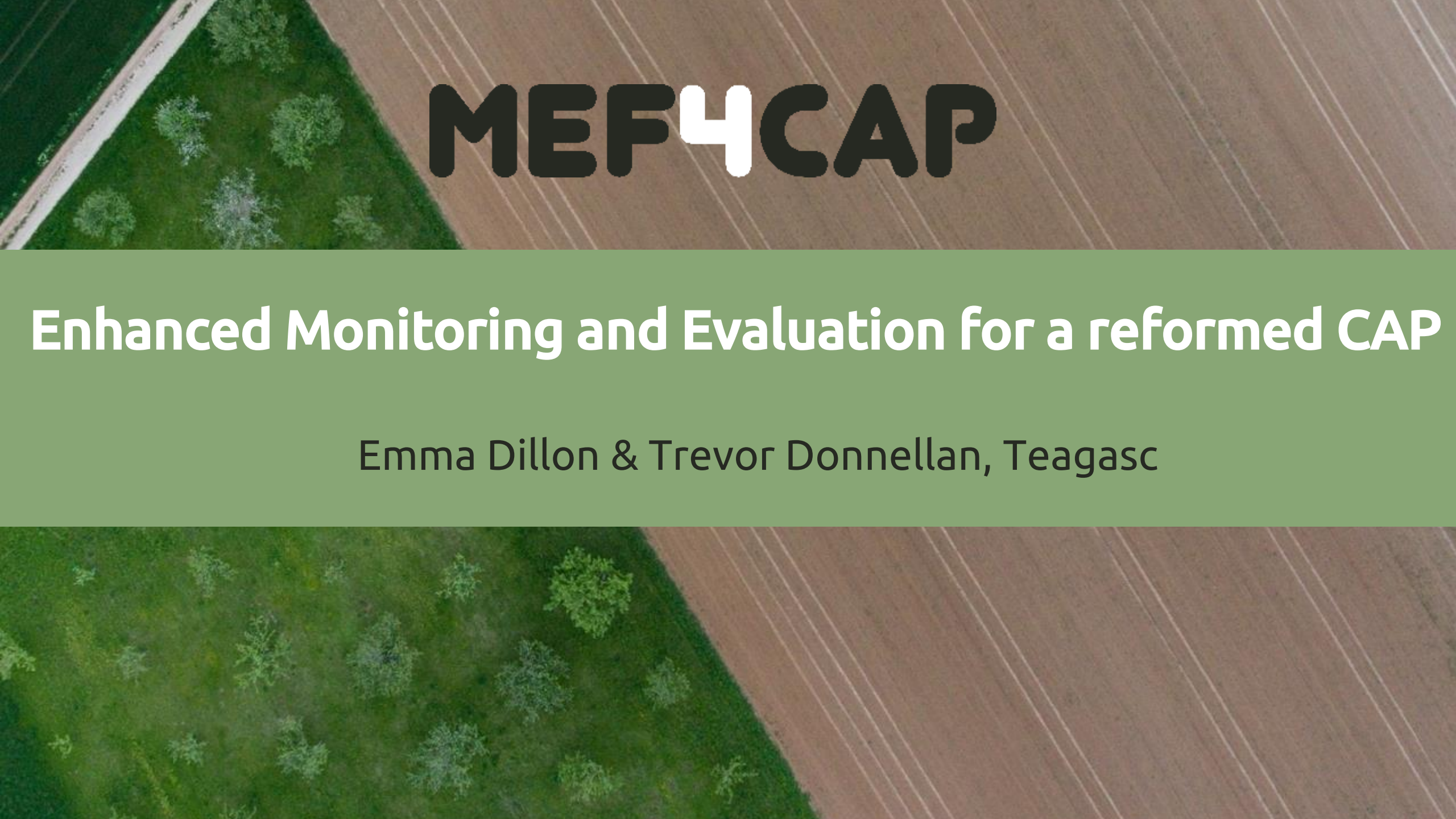
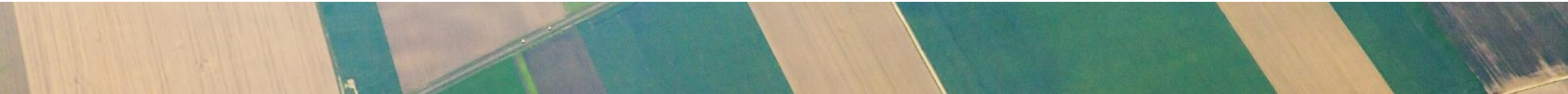


Enhanced Monitoring and Evaluation for a reformed CAP

Emma Dillon & Trevor Donnellan, Teagasc

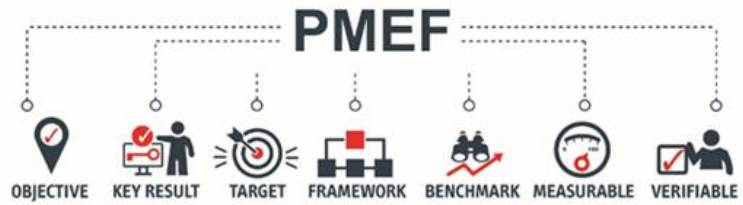
Direction of the new CAP

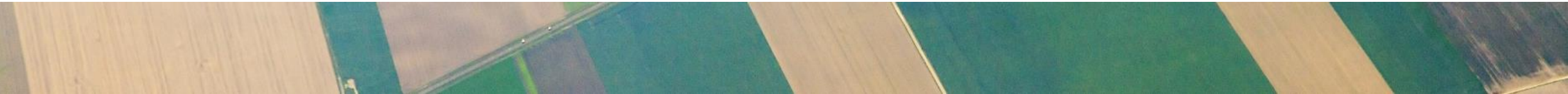
- CAP direction influenced by **emerging sustainability agenda**
  - Global, EU, national policy drivers & various stakeholder perspectives
  - EU Farm to Fork EU Biodiversity Strategy, UN SDGs & Paris Climate Agreement
- **Transformative change required** – changing societal expectations
  - Civil society seeking the promotion of environmental sustainability in EU policy
  - Agri-food sector seeking a slower pace for change – time to adjust
- These factors have **motivated the revision of CAP objectives**
  - **Environmental and Societal goals in particular**



Implications for monitoring & evaluation

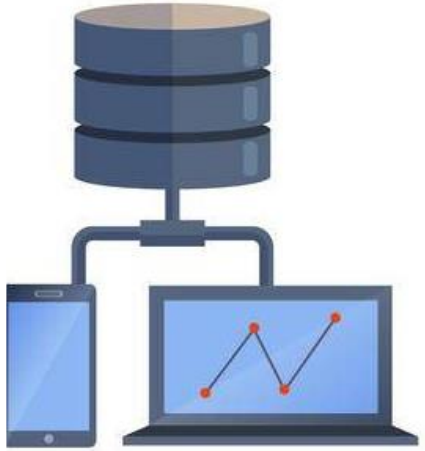
- Shift from **compliance to performance**
  - Compliance with actions or regulations (original approach)
  - Performance, or achievement of specific objectives (new delivery model)
- MS CAP **Strategic Plans -** greater autonomy at MS level
  - **But commonality with overarching EU indicator set**
- Existing indicators - considerable, but…
  - Not always fit for purpose – in need of update
- **Additional environmental and social data a particular priority**
  - GHGs, biodiversity, water, organics, pesticides, fertiliser usage etc.
  - Quality of life, gender issues and animal welfare etc.
- **Economic data** – some gaps remain
  - e.g. little information on use of risk management tools





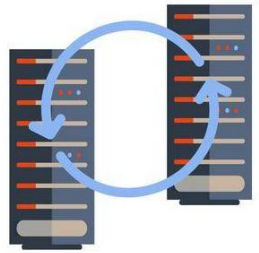
Impacts for administrators & data providers

- **Costs and benefits**
  - For administrators and data providers (farmers)
  - Obstacles, but also opportunities.
  - These will differ across Member States.
- **Increased capacity** to produce relevant indicators
  - Multiple sources of agricultural data
- **Evolving technology**
  - For data collection, processing, management, analysis
- Potential for **improved integration** of data sources
  - e.g. IACS, FMIS, LPIS.



Data utilisation

- Strong case for the **benefits of data sharing**
  - Make better use of existing data
  - Reduce collection cost and burden
  - Richer data analysis possible
- But **obstacles to data integration**
  - Issues around trust, sensitivity and potential legal impediments
- Policy can influence decision making at the farm level
  - Indicators should reveal farm specific differences
- **Farmer buy-in is crucial** - uptake of sustainable practices
  - Data must be used in a way that returns benefits to farmers too
  - Role for farm advisory in the demonstration of such benefits



Developing an Indicator Wish List

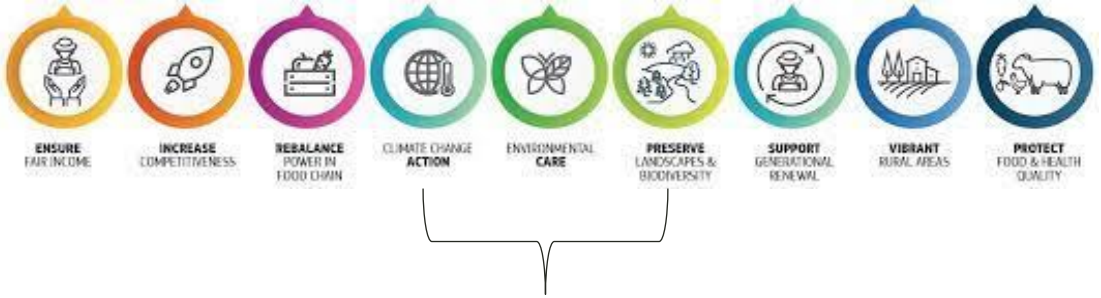
- A **Wish List** of indicators **reflecting priority data needs**
  - **To fill current data gaps**
- Indicator definitions are provided
  - But expert input may be required to refine these further
- Metrics are grouped into three categories
  - To reflect their principal **association with economic, social or environmental CAP objectives**
  - Some may be of relevance to more than one category - multipurpose in nature
- **A long list of indicators (88) further reduced to a short list (41)**

Refining the Wish List

- **Topics have been excluded** from the short list for a number of reasons:
  - Either data already exists in some form e.g. FADN;
  - A greater degree of granularity is thought unnecessary;
  - The required data may be prohibitively difficult to collect;
  - There is uncertainty over what is actually required;
  - Where the requirement is of a lesser priority or not of widespread relevance at an overall EU level.
- The **wish list is assessed in WP3** on the basis of **technologies identified in WP2** to develop a **final list of indicators and associated technologies** that might be used to produce data.
  - Emergence of a roadmap for the collection of relevant data for CAP monitoring and evaluation.

Environmental

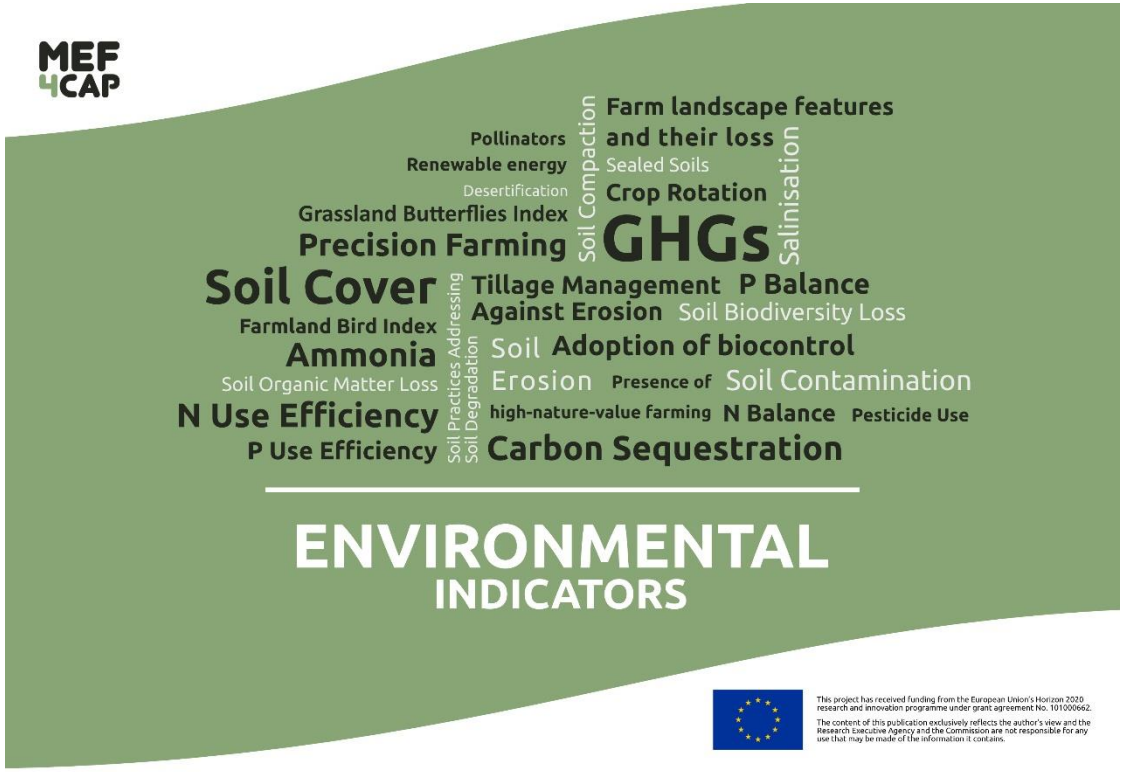
Sample indicator



- Environmental metrics a key priority area
- A number of important themes identified in Farm to Fork

Table 12: Greenhouse Gases per Farm

Indicator Name	Farm Level GHGs
Type of Indicator	Environmental
Definition	GHGs produced per farm
Unit of Measurement	Tonnes of CO_2 eq. per farm
Methodology/Formula	Total farm GHGs in tonnes / farm
Data Collection Level	Farm level
Data Reporting Level	National, regional, farm level
Frequency	Annual
CAP Objective	4. Agriculture & Climate Mitigation
Proposed Prioritisation	High



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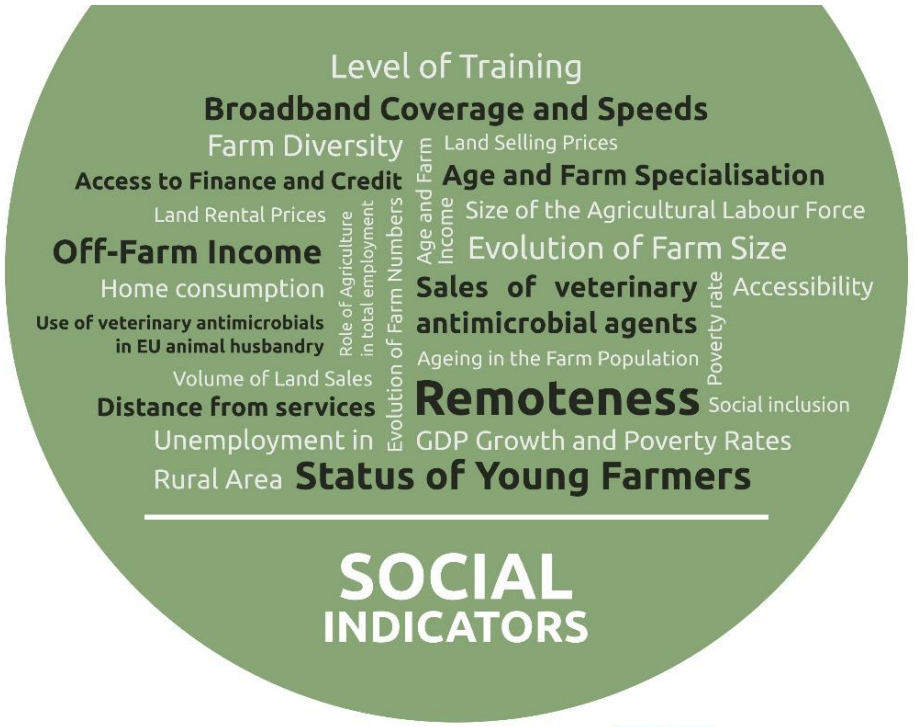
Social

Sample indicator

- A need for more holistic measures of sustainability around broad ranging societal concerns.
- Human, animal and (rural) community aspects.

Table 39: Use of Veterinary Antimicrobials in EU Animal Husbandry

Indicator Name	Use of Veterinary Antimicrobials in EU Animal Husbandry
Type of Indicator	Social
Definition	Frequency of use of medicines on farms
Unit of Measurement	Amount of medicines delivered by animal
Methodology/Formula	N/A
Data Collection Level	Farm level
Data Reporting Level	National, regional, farm level
Frequency	Annual
CAP Objective	9. Health, Food & Anti-microbial Resistance



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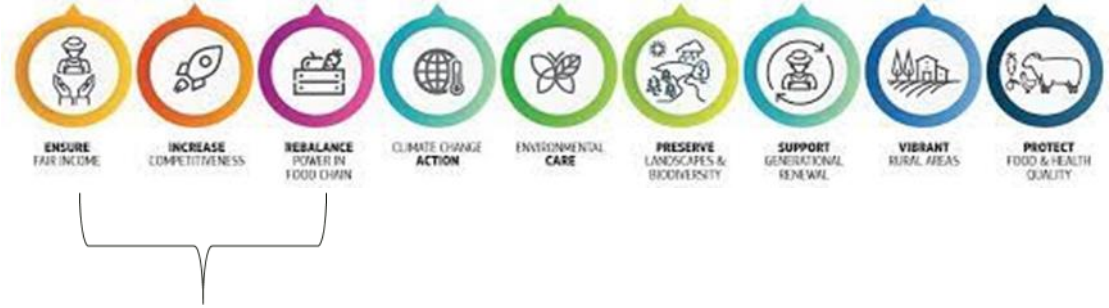
Economic

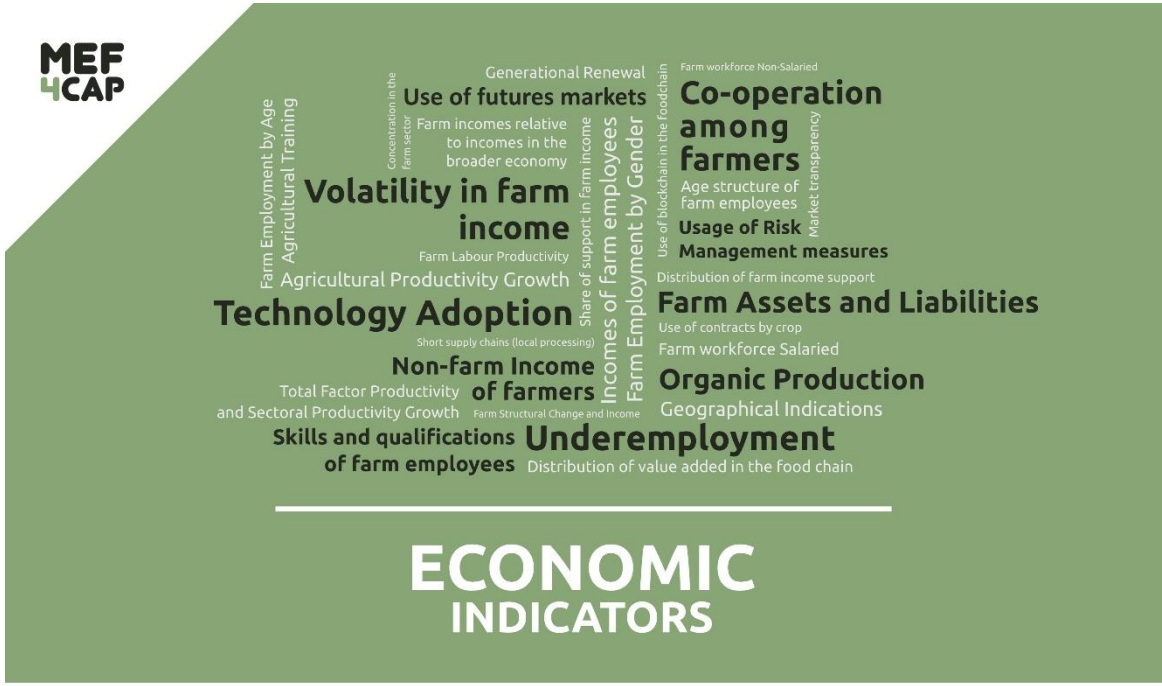
Sample indicator



- Economic dimension relatively well established, although:
  - Further detail required in some instances, and;
  - Newly emerging areas of interest need should be considered.

Table 6: Use of Forward Pricing

Indicator Name	Use of Forward Pricing of Farm Output
Type of Indicator	Economic
Definition	Share of farm output by volume that is forward sold
Unit of Measurement	Percentage of output
Methodology/Formula	Volume of farm output forward sold / total farm output
Data Collection Level	Farm level
Data Reporting Level	National, regional, farm level
Frequency	Annual
CAP Objective	3. Strengthening Farmers' Position in Value Chains
Proposed Prioritisation	High



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Conclusion

- Sustainability now firmly embedded in CAP
  - **Environmental focus** will be especially critical
- **New Delivery Model**
  - **New obligations and opportunities** for data administrators and providers
- **Data** will demonstrate the direction for agricultural sustainability
  - Emerging technological solutions can assist
  - Farm level dimension is crucial
    - Decisions to change farm practices are taken by farmers
- **Preliminary Indicator Wish List**
  - Further assessed in the context of identified feasible technologies

MEF4CAP

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MEF4CAP

Online workshop
4th March, 9:30 – 11:30 CET

Exploring new data and technologies to measure sustainability in agriculture

Nikos Kalatzis – NEUROPUBLIC
Sokratis Kaprelis – NEUROPUBLIC

Promising technologies as new sources of data for monitoring and evaluation

Workflow of “WP2 ICT Developments”

- Objective: **To identify and assess digital agri technologies** useful for **CAP monitoring** and **evaluation**

1. **State of the art** review of technologies and **assessment** in the context of **CAP monitoring**
   - Legacy, Current, Future
2. Review of **agri data models** and **agri data sharing approaches**
3. Continuous **monitoring** and **collaboration** with related **EU initiatives and projects**
4. Analysis of selected cases of best practices on agri-tech utilisation serving also CAP Monitoring and Evaluation

Promising technologies as new sources of data for monitoring and evaluation

List of technologies evaluated

- Telecommunication technologies
- Field Sensors
- Farm Management Information systems (FMIS)
- Field Machinery
- Earth Observation
- Livestock Management
- Pasture Management
- Financial management

Promising technologies as new sources of data for monitoring and evaluation

Agricultural data sharing and data models

Experts from different disciplines setting up the **rules** and **mechanism** for **fair** and **responsible** agricultural data sharing on EU level

- Farmers, farmers associations, data scientists, regulatory bodies, legal experts, information security officers

➢European Strategy for Data

- EU Initiative for Common European data spaces - targeting various sectors including Agriculture
- Legislative measures on data governance, access and reuse → users to stay in control of their data

➢GAIA X – Agri Gaia

- Aims to create an ecosystem for the SME on agricultural and food industry based on GAIA-X data sharing mechanisms

➢FAO-UN on farm data management and sharing

Promising technologies as new sources of data for monitoring and evaluation

Collaboration activities with selected EU projects

- H2020 DEMETER: Building an Interoperable, Data-Driven, Innovative & Sustainable European Agri-Food Sector
- H2020 ENVISION: Monitoring of Environmental Practices for Sustainable Agriculture Supported by Earth Observation
- H2020 DIONE: Advanced monitoring for modernising CAP
- H2020 MIND STEP: Modelling Individual Decisions to Support the European Policies Related to Agriculture
- H2020 NIVA: New IACS Vision in Action
- CONNECTING EUROPE FACILITY (CEF) “Open IACS: Open LOD platform based on HPC capabilities for Integrated Administration of Common Agriculture Policy”
- FaST: Farm Sustainability Tool

Overall outcome: Mainly Earth Observation based data products, efforts for integrating in situ data, interoperability, regulation

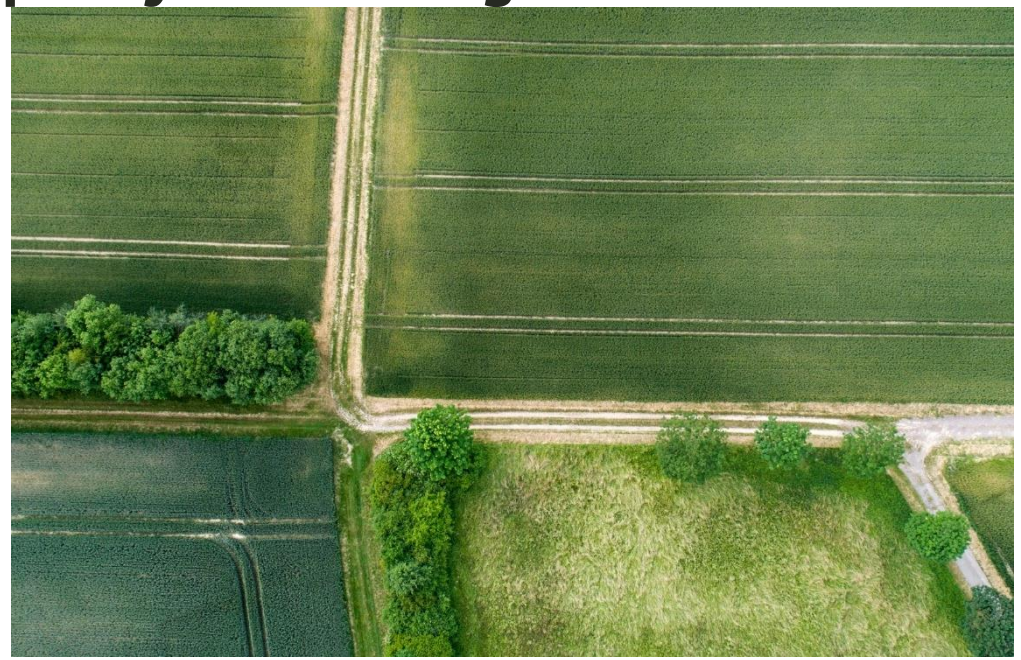
Promising technologies as new sources of data for monitoring and evaluation

Key outcome:
Convergence of smart agriculture practices with policy monitoring and evaluation

Digital agricultural technologies can concurrently serve two objectives:

- Implementation of optimised and sustainable agricultural practices → clear benefits for farmers, climate, ecosystems

- Provision of farm level ground truth evidences of applied agricultural practices → support for CAP monitoring and evaluation



Promising technologies as new sources of data for monitoring and evaluation

High level outcomes on agricultural technologies (I)

Technology/solution	Agricultural practices	CAP M&E
Earth Observation	Intra field zoning Monitor crop growth stages (e.g. NDVI) Moisture/Irrigation monitoring (e.g. NDWI) Soil quality Grass biomass and grass growth rate	Crop type identification Crop rotation Cultivation activities Pasture management
FMIS, farm book, farmers digital calendar (combined with IoT)	Pesticides applications Fertilization applications Irrigation applications Phenological growth stages	Evidences related with PPP monitoring Evidences related with Nitrates monitoring Evidences on water use Evidences on crop type
Geotagged photos of cultivation	Recording and identifying: Crop type, growth stage, disease, remote provision of advice	Crop type identification (especially for small parcels or crops not detected by satellite images)

Promising technologies as new sources of data for monitoring and evaluation

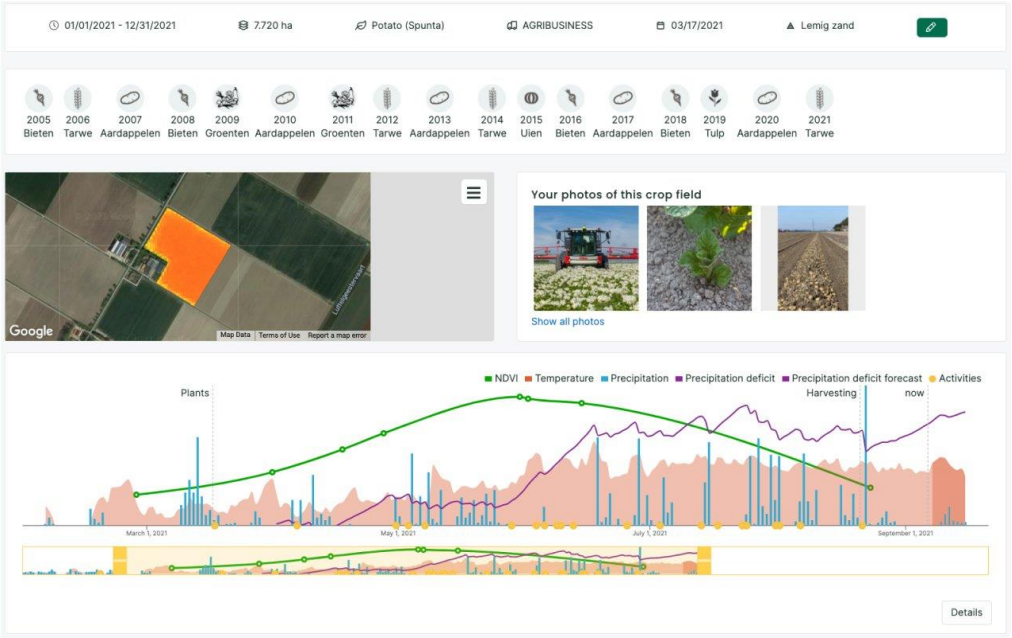
High level outcomes on agricultural technologies (II)

Technology/solution	Agri production	CAP M&E
Farm machinery (tractor) automations	Optimization of inputs (fertilizers/pesticides/seeds) through Variable Rate Application	Ground truth evidence of applied chemicals (date, parcel, volume and type of chemical applied, nitrates monitoring)
Pasture monitoring (in situ data sources) Paddock Recording, Automated plate metering	Grass covers measurements, grass biomass, silage production, grazing times, grass growth prediction models	Grazing intensity, Grasslands monitoring
Animal behaviour sensing technologies & Herd management book keeping	Animal movement, Lameness Detection, Heat Detection, Grazing detection, cow localization, Rumen Condition, Enviromental conditions	Number of animals, Type of animals, consumed inputs (water, food, medicine), GHGs Emissions
Accountancy data – eInvoices	Monitoring and management of production materials Purchase and sales data (paper invoices, self-created bills, dispatch notes)	Evidences on purchased inputs (chemicals, seeds, fuel) Sustainability report (including material balances)

Promising technologies as new sources of data for monitoring and evaluation

Example: Farm level data monitoring through agricultural decision support systems

FMIS – IoT based data-driven advisory services



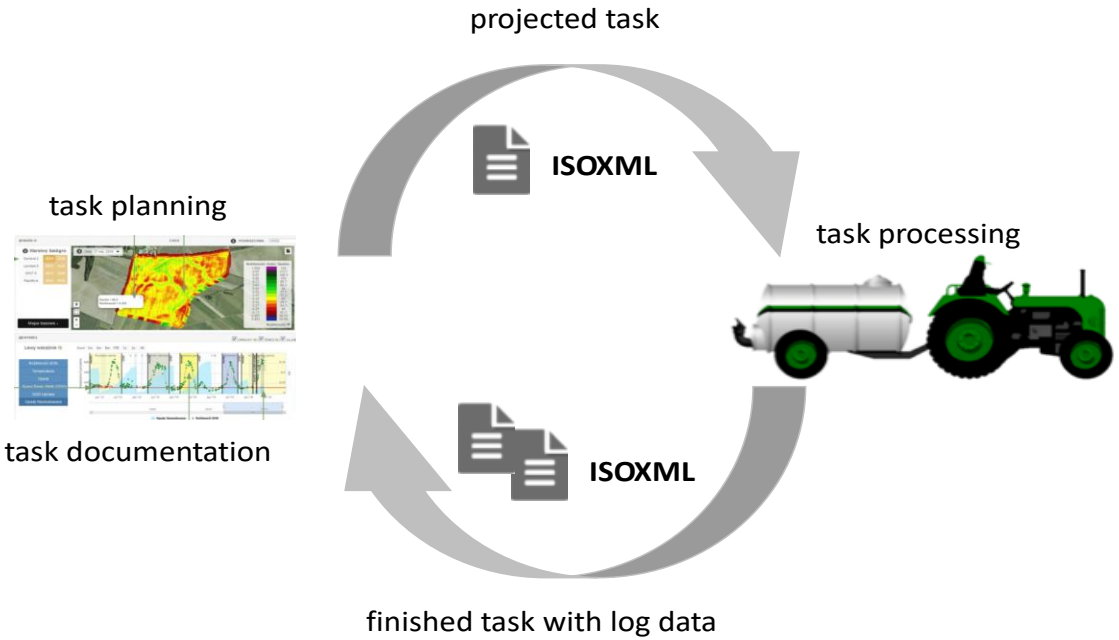
Combination of Technologies	Benefits for the farmers	Benefits for CAP Monitoring & Evaluation
Earth Observation data **IoT sensors** **Decision models** **Data analytics**	Optimised used of inputs (plant protection products, fertilisers, irrigation, fuel) Reduced environmental impact/better farm performance Automated documentation of activities	Applied inputs: irrigation/ pesticides /fertilisers on a field level. Crop type, parcel location, dates, yield

Open issues:

- Farm calendar with manually entries may also introduce inaccurate data (un)intentionally.
- Farmers' acceptance on data sharing is still an issue
- Sharing of FMIS generated logs already integrated in certification audits e.g. GlobalGAP
- Interoperability

Promising technologies as new sources of data for monitoring and evaluation

Example: Variable Rate Application technologies and monitoring of applied phytochemicals



Technologies	Benefits for the farmers	Benefits for CAP Monitoring & Evaluation
Remote sensing for scanning the field/canopy of plants **Field zoning algorithms** **Variable Rate Application sprayers** **Satellite navigation systems**	Optimised use of inputs (agrochemicals, seed, fuel) Reduced environmental impact Reduced cost for farmers Automated documentation of activities	Farm level digital evidences of applied inputs (PPPs, seeds, fuel) Increased transparency of applied practices useful also for food retailers/processors

Open issues:

- Interoperability and connectivity issues. There is still no dominant approach for communicating generated ISOXML datasets with third parties.
- No mechanisms to verify the actual composition of the inputs (fertilisers, pesticides, seeds)
- Penetration and utilisation of VRA enabled farm machinery is rather low in EU countries where small and fragmented farms are the majority (e.g. South Europe).

Promising technologies as new sources of data for monitoring and evaluation

High Level Outcomes

- There is no one-fits-all technological approach to support CAP Monitoring & Evaluation
  - A combination of different technologies that are able to interact is necessary
  - Increased heterogeneity needs to be addressed
- CAP M&E and optimised farming practices can both be supported by agri-tech
- The way forward: Landscape monitoring
  - Aggregation of information on regional bases generates additional data products and knowledge
    - Area/region based sustainability performance monitoring
  - Support for policy makers and policy monitoring - Incentivize farmers to share data

Promising technologies as new sources of data for monitoring and evaluation

Deliverables' description of WP2 – ICT Developments

D2.1 - Landscape of agri-food ICT technologies within EU (submitted)

D2.2 - Best practices on the adoption of ICT agricultural technological solutions (submitted)

D2.3 - Identified new technological opportunities from collaboration with EU projects and initiatives (submitted)

D2.4 - Emerging ICT technologies for the agricultural domain (ongoing)

There will be public soon.

MEF4CAP

Thank you for your attention

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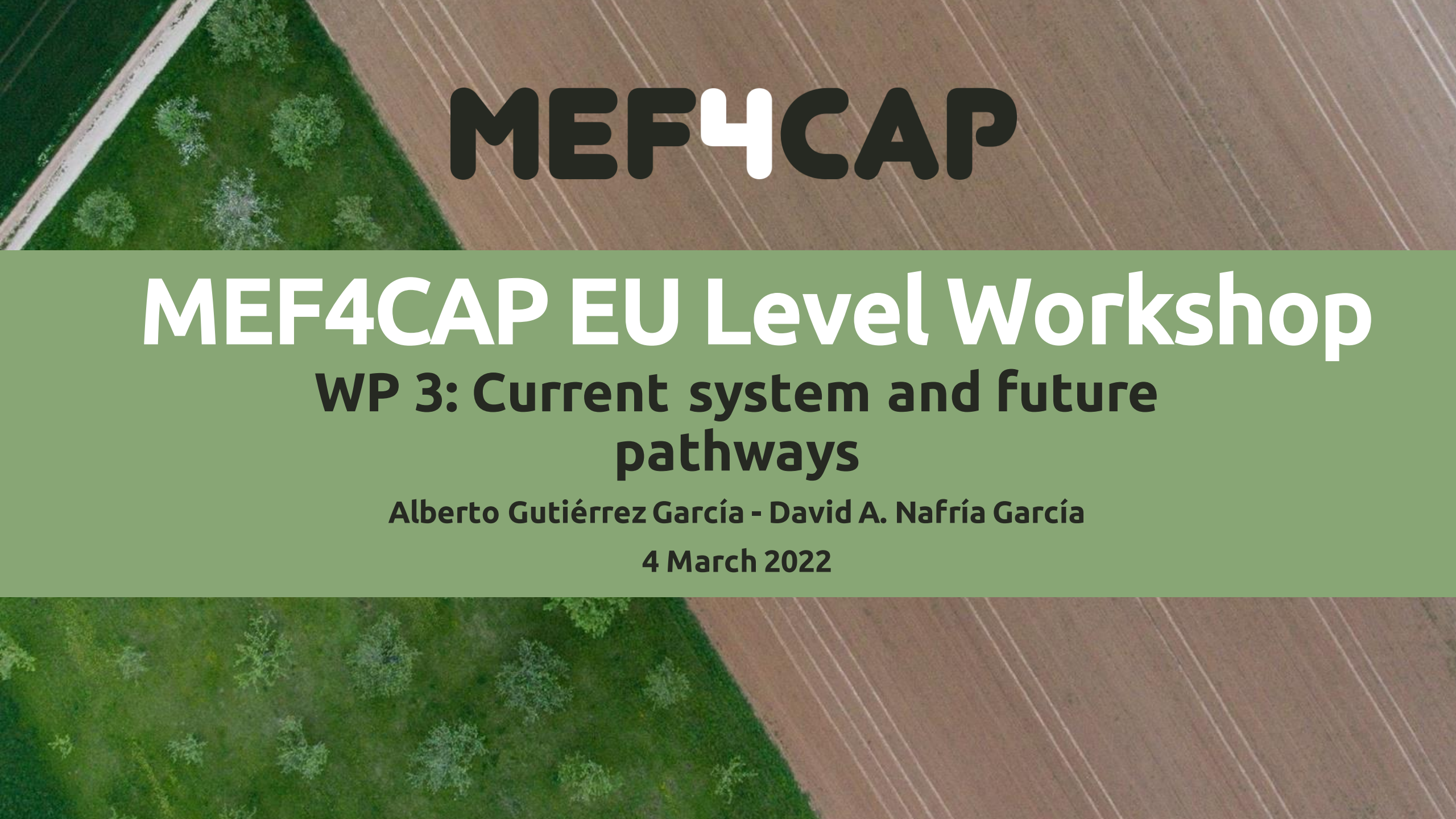


MEF4CAP

MEF4CAP EU Level Workshop

WP 3: Current system and future pathways

Alberto Gutiérrez García - David A. Nafría García

4 March 2022

WP3 Current system and future pathways

Objectives

- Identify **potential solutions** to meet the data requirements for the Common Agriculture Policy Monitoring and Evaluation.
- Identify and define the most promising **pathways** to achieve the detected data needs for each indicator.

Pathway is a combination of several data sources and/or technologies that ease the computation of the indicator's metric

WP3 Current system and future pathways

Structure

✓ Task 3.1: **Review of current monitoring systems** -> Deliverable 3.1

On going Task 3.2: **Potential of current systems and ICT developments for future data needs** -> Deliverable 3.2

On going Task 3.3: **Identification of potential pathways for the monitoring and evaluation framework for future policies** -> Deliverable 3.3

WP3 Current system and future pathways

Task 3.1: Review of current monitoring systems - Conclusion

Regarding CMEF:

- EC highlights the impact of the timing and frequency of data (indicators) availability.
- Data gaps to characterize the real effects of the Policy mainly regarding environment.
- Little detail on information at parcel/farm level.

Statistical Databases used in CMEF

- Follow statistical methodologies on sampling and aggregation -> (+)Robustness; (-)Burden.
- Based on samples of the whole population of farmers in the EU -> (+)Beyond CAP beneficiaries; (-)Bias commercial farms.
- Typically collect information related with accountancy.

Administrative Databases used in CMEF

- Data from all individual farmers applying for CAP aids -> (+)Include small farms; (-)Trustable.
- Information on the requirements to obtain subsidy.

WP3 Current system and future pathways

Task 3.2: Potential of current systems and ICT developments for future data needs

- Bring together the needs detected in WP1 (indicators) and the ICT developments analyzed in WP2 to make a **judgement** on the potential of each ICT solution to derive data for an specific indicator.
- Practically this will be a **matrix** whose rows represent the indicator's metric and columns show the data provided by a specific technology.
- Each combination will be evaluated in terms of **potential**:
  - ✓Proven technology: Technology does provide data for the indicator requirements
  - ✓No potential: Technology does not provide data for indicator's requirements
  - ✓Some potential: Technology provides with data but still some work is needed to address the indicator requirements.

WP3 Current system and future pathways

Task 3.2: Potential of current systems and ICT developments for future data needs

WP2

Technologies:

EO, Sensors, FMIS, Pasture, herd…

Technology - Data

WP1

Data needs

Indicator (metrics)

Potential

- **Data** provided by the technology
- **Requirements** for the data to address the indicator's metrics.

EXAMPLES

WP3 Current system and future pathways

Data need

Indicator:
Carbon Seq.
Metric:
CO_2 eq/ha

Technologies

Earth Observation

Source
- Land cover + biomass
- Spectral soil modeling

Requirements
- ML algorithm
- Agri. Data Model
- CO_2 seq. ~ veg. cover

Digital Soil Mapping

Source
- Soil properties records (samples)
- Soil properties maps

Requirements
- Geostatistics
- Environmental and EO data covariates
- Data Sharing

Paddock Manag. Grass cover

Source
- Grass cover records

Requirements
- CO_2 seq. ~ Grass cover
- Agri. Data Model
- Data Sharing
- GDPR Compliance

Crop monitoring

Source
- FMIS Records of crop type, tillage practices, yield, residues and manure.
- Environmental data

Requirements
- Crop models
- Agri. Data Model
- Data sharing
- GDPR Compliance

Pathway

WP3 Current system and future pathways

Data need

Indicator:
Pesticide Use
Metric:
To be defined

Technologies

Machinery

Source
- Records of the volume of pesticide applied

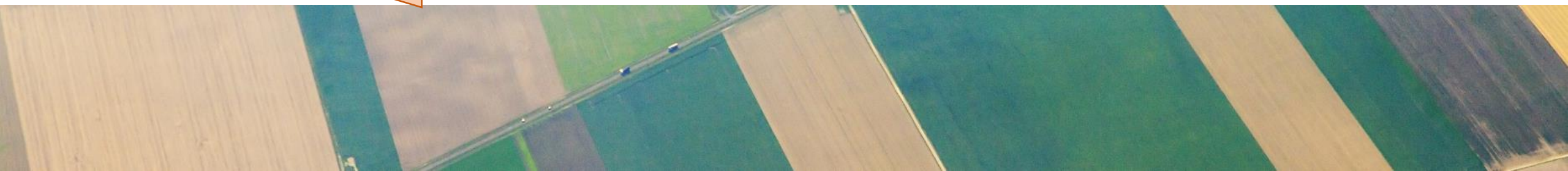
Requirements
- Agri. Data Model
- Data sharing

Farm Management Systems

Source
- Records in digital farm book

Requirements
- Agri. Data Model
- Data sharing or IACS integration
- GDPR compliance

Pathway



WP3 Current system and future pathways

Data need

Indicator:
Farm GHGs
GHGs per ha
Metric:
T of CO2 Eq./farm
T of CO2 Eq/ha

Technologies

Machinery (FMIS)

Source
- Records of working hours
- Records of fuel consumption
- Records of GNSS tracks
- Records ISOBUS TC-BAS (fertilizer and manure volume)

Requirements
- Input (kg)~ CO2 equiv.
- Agri. Data Model
- Track recording
- GDPR compliance

EO and Crop monitoring

Source
- Records of crop type

Requirements
- ML algorimth
- GHG emission ~ Crop type
- Agri. Data model
- Data sharing

Herd Management

Source
- CH_4 emmision based on the # of animals and feed

Requirements
- CH_4 emision ~ #of animals
- Agri. Data Model
- Data sharing
- GDPR compliance

Pathway

WP3 Current system and future pathways

Data need

Indicator:
Farm landscape features and their loss
Metric:
Number of farmland features relative to previous period

Technologies

Earth Observation

Source
- Land cover features identification/change. VHR images.

Requirements
- Definition of the minimun size of the features
- ML algorithms

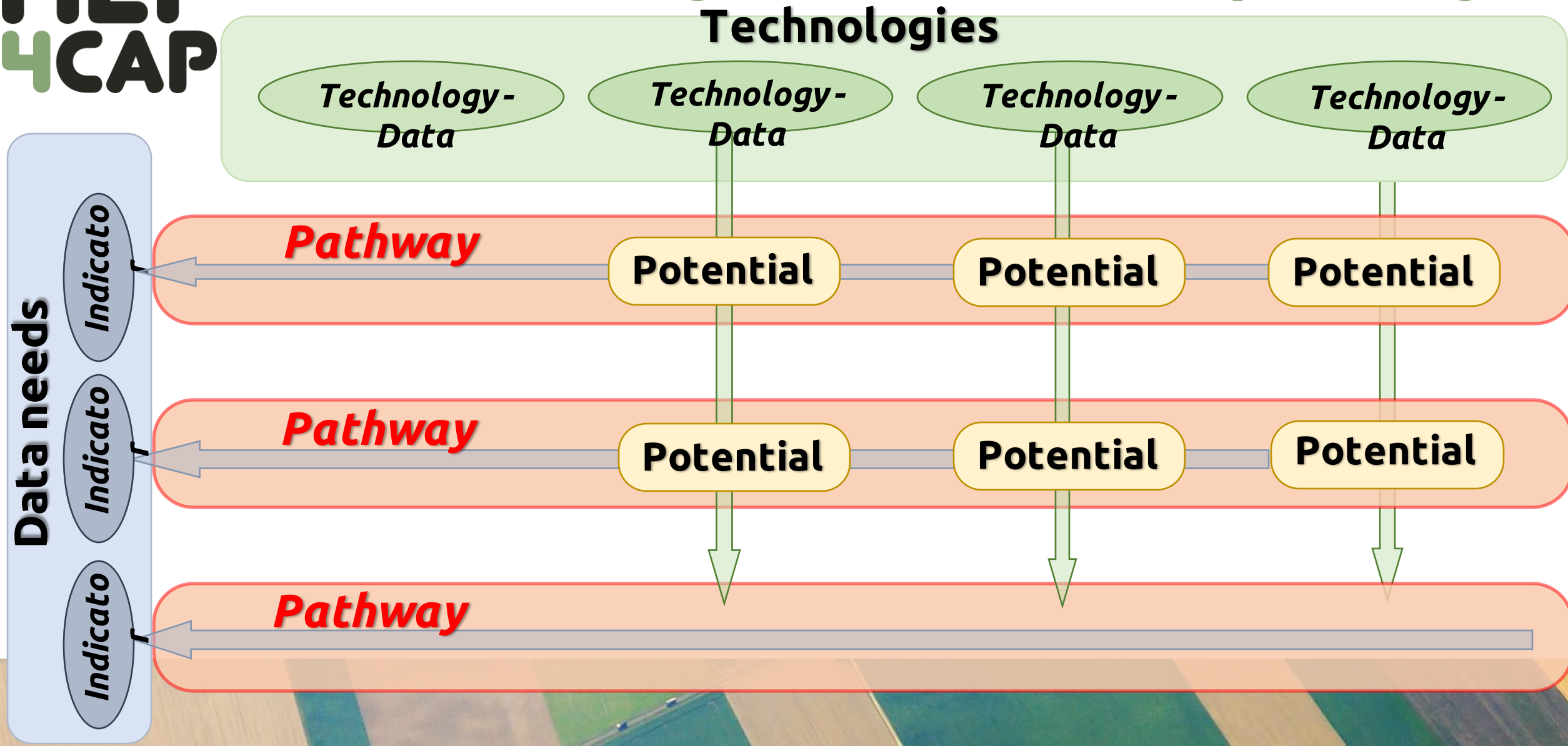
Geo-tagged photos

Source
- IACS

Requirements
- Adoption of model for data sharing
- Data sharing compliance with GDPR

Pathway

WP3 Current system and future pathways



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Thank you for your attention

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