SPACE-SOLUTIONS FOR EXISTING EUROPEAN INNOVATION PARTNERSHIPS: AN INTRODUCTORY CORRELATION ANALYSIS

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Space: an enabling tool and facilitator for existing European Innovation Partnerships (EIPs)

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A new EU policy environment

- Public opinion calling for more and more accountability
  - Necessarily more result/impact oriented policies
- Strong concentration on the competitiveness of EU, national and regional industry
  - Focus on excellence and leadership
- Wider (and stricter) application of the subsidiarity principle
  - A more *hands-on* approach

Smart specialisation: a new EU paradigm for regional innovation policy

"As most regions cannot reach the frontier of science and innovation, they would be better to **search for a suitable specialization** in the global competitive landscape.

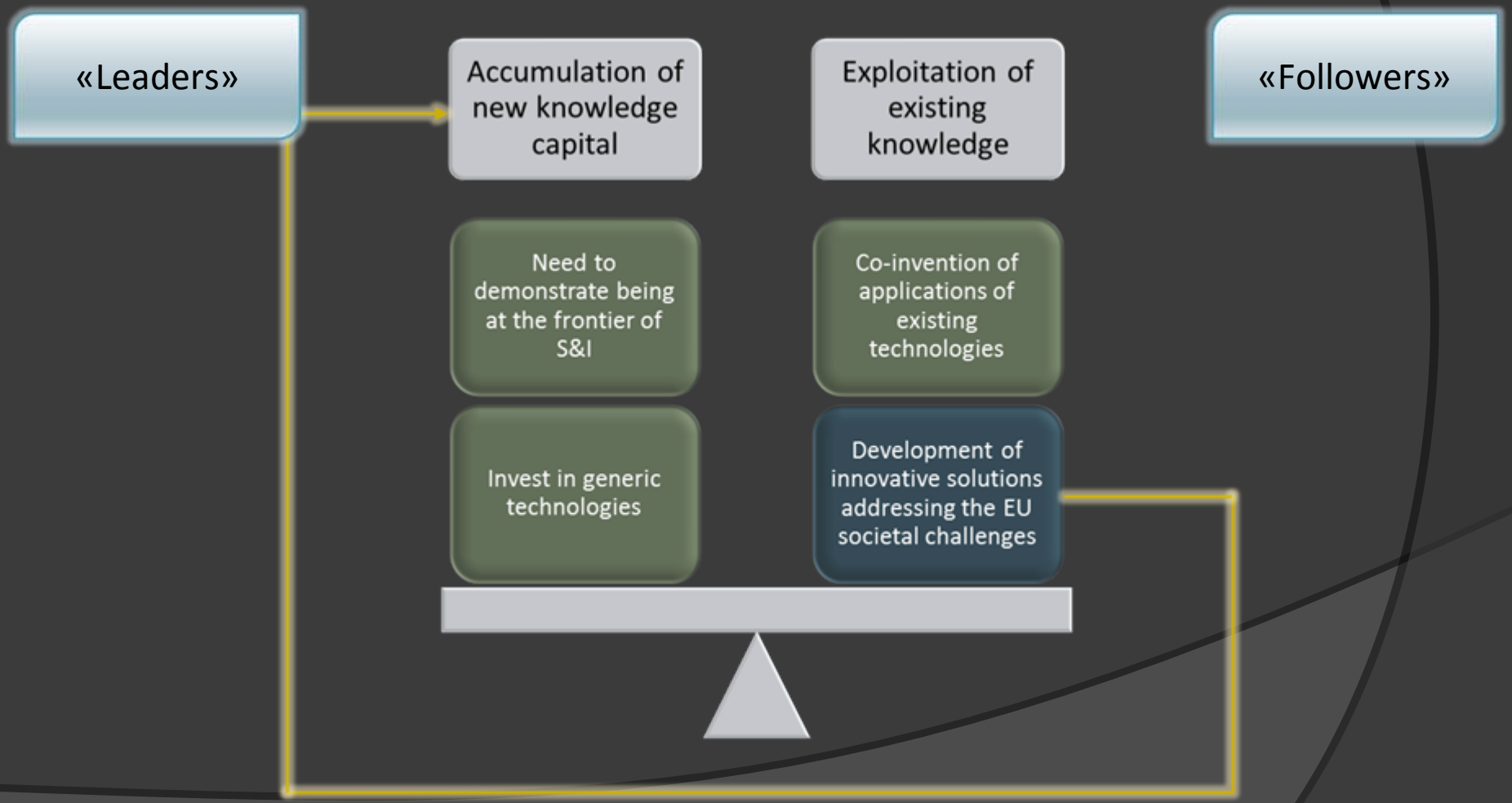
It is most likely that this specialization will take place along **applications**, exploiting business segments, niches, or markets that require adaptation of general technologies to specific user needs."

Source: "The role of Community research policy in the knowledge-based economy." Expert group report DG Research

"**Most advanced** regions invest in the **invention** of generic technologies, **others** invest in the **co-invention of applications** of generic technologies in one or several important domains of their regional economies"

Source: Dominique Foray, *Polytechnique de Lausanne*

Smart specialisation: a new EU paradigm for regional innovation policy



Coming to space…

- Space technologies have a tremendous potential to be adapted in many non-space domains (naturally horizontal to many fields of application)

- There is a number of very famous examples from the past: Velcro, Teflon, Portable devices (Micro- and Nano-electronics), etc.

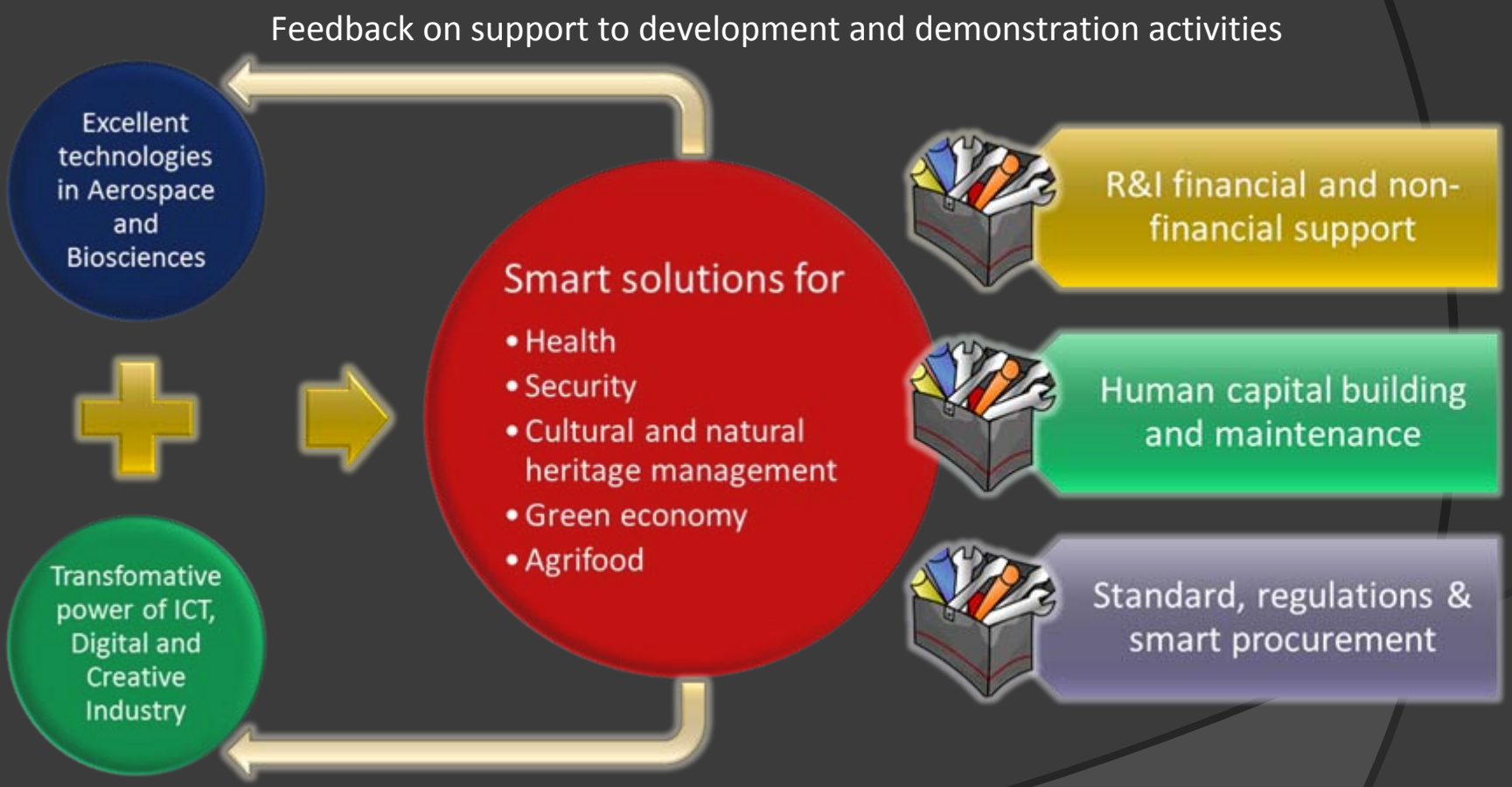
- Existing EIPs (AGRIWATER, RM, AHA, SCC, as they already focus on the EU key societal challenges, represent key partners to understand priorities, discuss opportunities, identify solutions

Role of regions…

Regions are the right level for these things to happen

- Diffusing innovation among SMEs
- Facilitating SMEs to acquire capability to work in highly innovative, international environments
- Regional innovation support measures and tools to facilitate collaborative projects / initiatives for the adaptation of space tech within innovative applications
- Acting as a transmission chain for a context-fitting articulation of EU and national policies

Lazio Smart Specialisation path



An all-winning game

A stronger emphasis on the application / commercialisation of space technology yields

- Socio-economic “return on investment” of large EU funded space programmes, such as Galileo and Copernicus
- Availability of more innovative solutions for the existing EIPs
- An enhanced, visible, recognised role of Space within the EU industrial and competitiveness policy
  - Advocate to secure European Space programmes budgets, both at national and European level
- Higher capability of space actors to attract EU funding for research (both from H2020 for Space and from H2020 Societal challenges)
- A clearer identification of missions, roles and responsibilities, in the ESA-EC relationship (sort of subsidiarity principle applied to space)

What we have been working on…

- Understanding where and how space technologies can be immediately of help in addressing the most urging challenges at EU level (as emerging from the existing EIPs' SIPs)
- Building a cross-correlation matrix to spot 'virtuous encounters' and define a playground for the development of market applications of space technologies
- Space technologies have been clustered in 5 macro-groups:
  - Galileo (geolocalisation)
  - Copernicus (earth observation)
  - Meteosat (weather)
  - SatCom (telecommunication)
  - SubSystems (life support, energy, materials, et al.)

Cross-correlation database

EIP	Priority	Description	Objective	Initial Actions	Market Maturity	Proposed space technology adaption	Space Technology involved	EIP Space Region involved
							Galileo / Copernicus / Meteosat / Satcom / Subsys	
AGRI	Primary production	Technical solutions to increasing productivity and economic viability	This area of innovation actions aims to increase agricultural output. The potential of green technologies, such as ICT, precision farming, and pest warning systems, should be explored	Efficient and sustainable use of resources. Low-input production systems Sustainable use of nutrients (including phosphorus and nitrogen) and pesticides Optimised use of energy, water and genetic resources Lower dependence on external inputs Integrated pest management, biological control of plant diseases and pests, improved use of plant protection products, and reducing GHG-emission from animal production and soils. Solutions for recycling and the reduction of post-harvest losses would alleviate pressures on natural resources.	2	earth oservation and monitoring satellite applications and services for area of agricoltural activities	Copernicus, Meteosat, Satcom, Subsys	
AGRI	Bioeconomy	Innovative technology for the bio-based economy bio-refinery; new products; reduction of post harvest loss	Innovative solutions should be adapted to the whole supply chain as well as the growing bio-based economy.	Solutions should be sought for bio-refinery and recycling and the smart use of biomass from crops, forest, and food waste, valorising its cascading potential without reducing soil organic matter. Substituting primary protein production by algae or bio-fermentation. Breeding of animals and plants could be explored for achieving higher outputs, reduced emissions and/or better resistance to diseases, as well as higher quality of final products (e.g. better nutritional profiles).	1		Copernicus, Subsys	
AGRI	Resource management	Eco-system services, soil functionality, water management, and genetic resources ("public goods")	Innovation that enhances sustainable farm management and forestry practices benefits also eco-system services and soil functionality.	Integrated agro-ecological systems, including the enhancement of soil biodiversity, carbon sequestration, water retention, ecosystem stability and resilience, and pollination functions. Improved land management (including low tillage and maintenance of green infrastructure), integrated spatial planning and new agro-forestry systems, as well as natural ecosystem conservation methods. Optimising the use of genetic resources, low input/organic systems, increasing genetic diversity used in agriculture, and developing bio-remediation for polluted soils, as well as innovative climate change adaptation strategies.	2	earth oservation and monitoring satellite applications and services for area of agricoltural activities	Copernicus, Meteosat, Subsys	

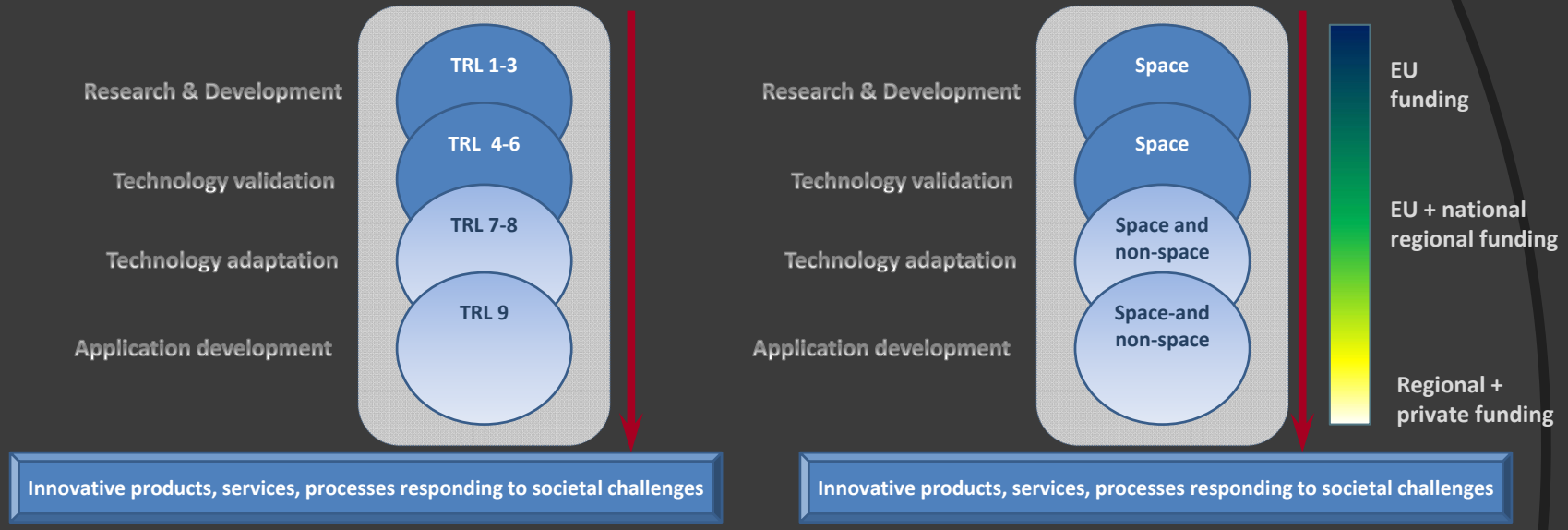
Preliminary results from c-c analysis

	Initial Actions
WATER	29
AGRI	22
AHA	42
SCC	10
RM	24
TOTAL	127

Galileo	Copernicus	Meteosat	SatCom	SubSys	TOTAL
1	9	2	2	13	27
3	11	7	1	15	37
15	1	0	12	18	46
5	1	0	1	2	9
5	6	0	0	4	15
29	28	9	16	52	134

1. Active and healthy ageing is the most promising co-development domain
2. Water and Agri share a similar profile (potential for capitalisation of efforts and suitable for “smart” adaptation of successful solutions)
3. Galileo, Copernicus and SubSystems appear to be rich basins of potential solutions

Building a catalogue of opportunities…



- Looking at medium-high TRL space technologies to be adapted in the co-development of applications addressing one or more existing EIPs' priorities (key EU societal challenges)
- Going for space / non-space players to cooperate
- Going for space / non-space regions to coordinate policies and support tools
- Going for large scale initiatives to develop scalable solutions

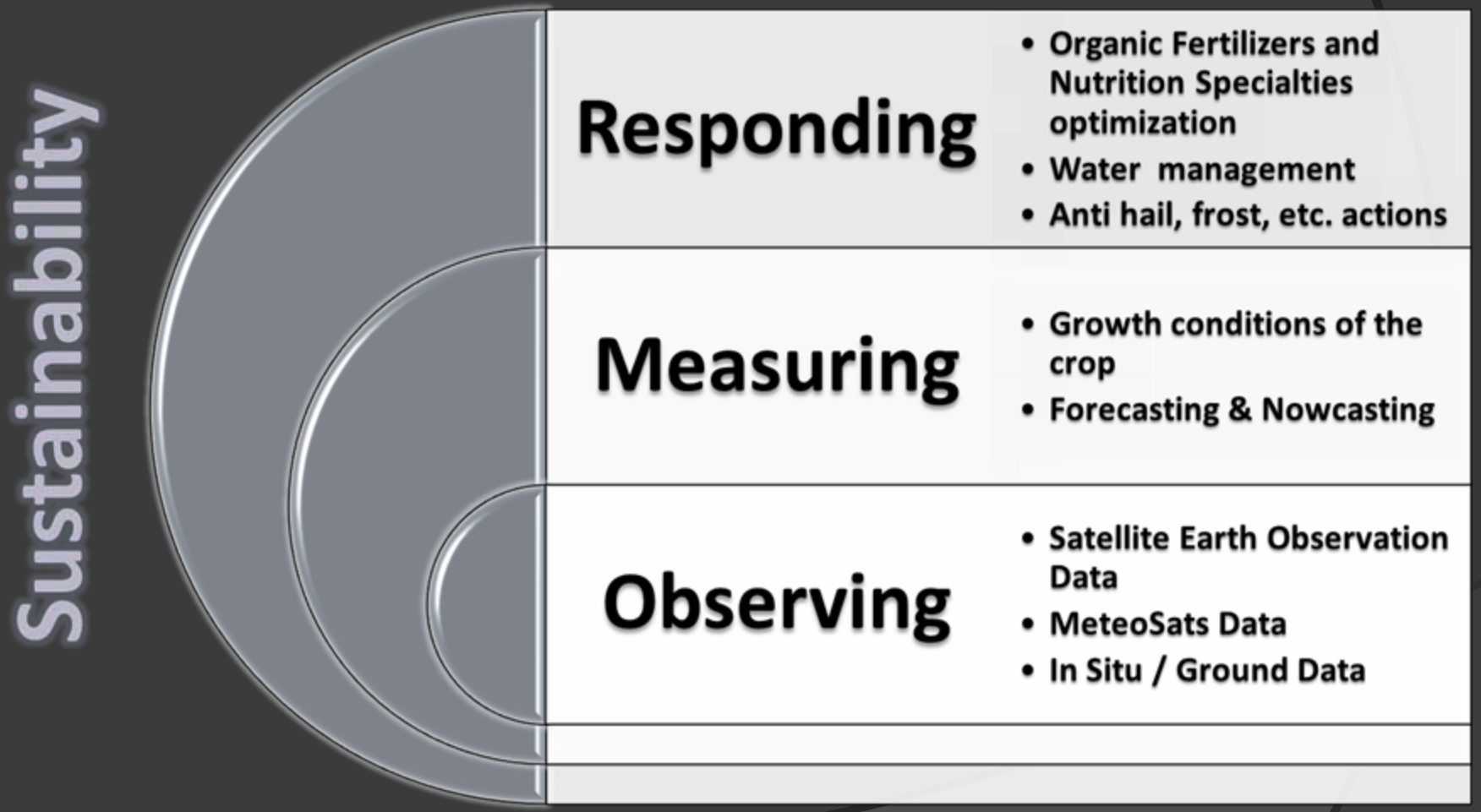
Precision Farming

- *Precision farming is a farming management concept based on observing, measuring and responding to inter and intra-field variability in crops. Crop variability typically has both a spatial and temporal component. So we are referring to a whole farm management with the goal of optimizing returns on inputs while preserving resources*[1].
- **Benefits**: costs reduction, pollution reduction, food quality improvement (in fact, disease reduction), effective water management:

Sustainable Agriculture

[1] Wikipedia – The free Encyclopedia

An integrated solution



Observing & Measuring

- Earth Observation Satellite Systems + Galileo/GPS signal + In situ measurements systems for evaluation of ***Primary Production***, thus obtain a ***Sustainable use of nutrients***
- Data fusion of hyper spectral data (optical and radar) by satellite / by air / by land, with proper geo-referencing and correlation with weather events for the evaluation of soil, humidity, sun irradiation, crop growth condition, etc.
- Production of updated precision farming map from different indicators (ndvi, lai, chlorophyll density, soil…), to be made available both for farmers and firms producing fertilizers and nutrition specialties
- Evaluation of Crop Ripeness, Crop Inventory, Yield Prediction Cereals for the correct use of organic fertilizers, nutrition specialties, fungicides and pesticides, etc.

Timely response to weather

- Meteo Satellite Systems, ground meteo stations and ground meteo radars for precise evaluation of medium and long term meteo ***Forecasting*** and high spatial resolution real time ***Nowcasting***
- Data fusion of meteo (visible, IR, Radar) by Satellite / by air / by land for production of updated precision meteo predictions at high spatial resolution (~1Km^2)
- Estimation of Crop Ripeness Time, weather forecasts to 7 - 15 days, 3-6 hours early warning for extreme weather events such as hail, snow, ice , etc.
- Optimization in the use of water resource; increase effectiveness in the use of organic fertilizers, nutrition specialties, fungicides but much more of natural solutions, opportunity to develop a specialized agriproduct logistics, potentially opening the market for the products to be sold as futures

Water management

- Earth observation data, GPS/Galileo signal, in situ measurement systems and technology transfer of space subsystems for the definition of a ***smart water management system***
- Data fusion of meteo data (visible, IR, Radar) by Satellite / by air / by land for production of updated water map (turbidity, polluted water, density…) and, as example, technology transfer of power supply system for organic fuels or life support for countermeasures in the case of weather extreme events
- Production of an application (android, Ios) with Galileo connection for the management of water systems, technologies for water treatment and energy production from bacteria metabolic activity, “intelligent” valves (shape memory alloys) to avoid pipes icing.
- Optimization in the use of water, reduction of water contamination from fertilizers or fungicides, smart management of water and energy for farmers or agricultural consortia

Precision Farming

Space Technologies

Techniques of Remote Sensing, Geolocation and Meteorology, all integrated with in situ measurements and adapted space subsytems

Technology Transfer

Applications aimed at improving the supply chains of high-value crops production through the development of a platform for an integrated monitoring of the crops (identification of anomalies and implementation of contingency plans

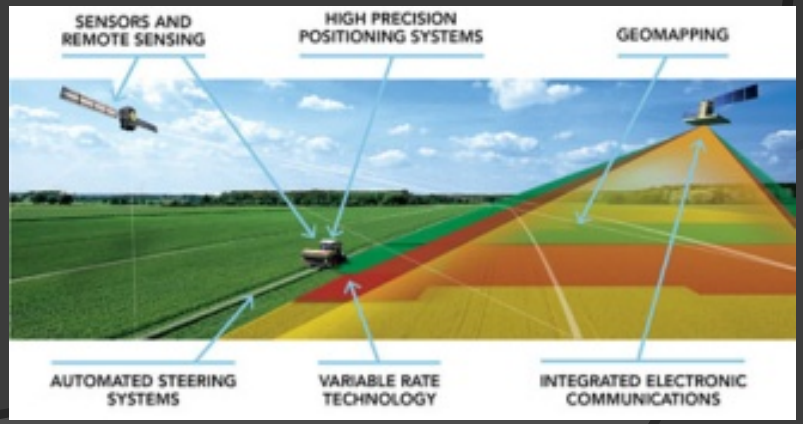
Expected Benefits

Objective assessment of the growth conditions of the crop

Rapid assessment and intervention in case of failure of the state culture or critical environmental

Improving the quality of high-value crops

Qualification and certification of the production chain



Thank you

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