FREEWAT

European Commission

ict4water.eu

Open Workshop
ICT tools for innovating Groundwater Management in a changing world

September 22nd 2017

IDAEA. CID - CSIC

16 Jordi Girona. 08034 Barcelona

ICT tools for sustainable agriculture

Anna Osann
(Universidad de Castilla-La Mancha
& AgriSat Iberia s.l.)

EIP Water Online Market Place
Matchmaking for water Innovation
MAR Solutions - Managed Aquifer Recharge Strategies and Actions (AG128)

50 anys CID CELEBRAR INNOVAR DEBATRE

Taken from: http://travessa-pirineus.blogspot.com.es/2014/08/dia-15-de-lespitalet-al-refugi-de-juclar.html


¡LLEGÓ EL
EQUINOCCIO
DE OTOÑO!

Balance…

… of water DIANA

… of nutrients FATIMA

Groundwater management…

… in a changing world

La Mancha Oriental, Jucar River Basin, SouthEast of Spain,

ICT tools for innovating…
…groundwater management…
… in a changing world

ERMOT since 1996

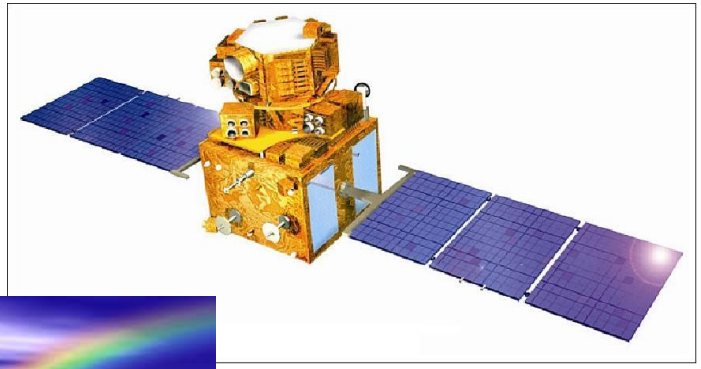
Information

Communication

Transparency

Junta Central de Regantes Mancha Oriental

ICT tools for innovating…
…groundwater management…
… in a changing world



"connecting Heaven….

….and Earth"

DIANA

FATIMA

Detection and Integrated Assessment of Non-authorized water Abstractions using EO

H2020-SPACE 01/2017-12/2019

DIANA

SERVICES

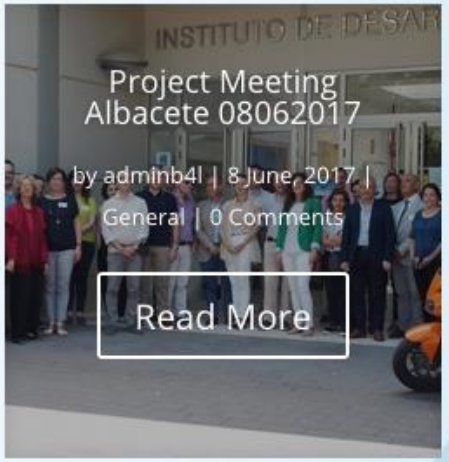
WATER ABSTRACTIONS MONITORING

SEASONAL DROUGHT FORECAST

WFD IMPLEMENTATION

STAKEHOLDERS

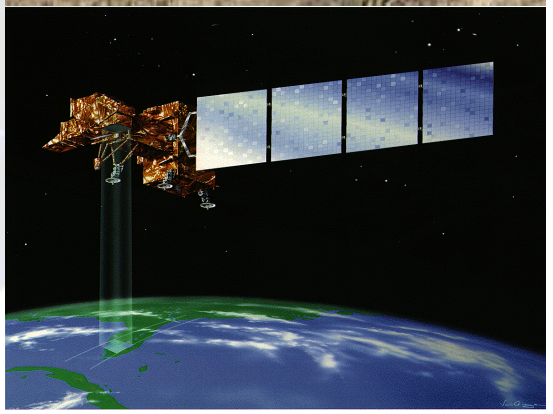
DIANA is aimed at co-designing and openly demonstrating a commercial service platform that will empower water managers and authorities to optimise the identification and inspection of non authorised water abstractions for irrigation as well as improve their water management policies and practices, especially in extreme conditions such as drought. DIANA will leverage EO data provided by Copernicus and other data sources as well as state-of the-art models for the identification of (illegally) irrigated areas and the estimation of abstracted water volumes in order to offer a value added suite of data products and services, that will be affordable and cost-effective.



bio by Deloitte.

in association with UCLM Universidad de Castilla-La Mancha

Applying Earth observation to support the detection of non-authorised water abstractions



Presentation of the project funded by the European Commission – DG ENV. (contract no. 070307/2013/SFRA/660810/ENV.C1)

Context

Policy context

- Increasing awareness of the need for a more sustainable water management and the issue of overabstractions
- WFD: Member States must control water abstraction through the maintenance of registers and a requirement of prior authorisation for abstraction from users
- In 2011, Roadmap for a Resource Efficient Europe: water abstraction should stay below 20% of available renewable water resources
- In 2012, the Blueprint to Safeguard Europe's Water Resources (Communication COM/2012/673):
  - reinforces the EU's commitment for better water management
  - stresses the importance of the issue of non-authorised abstractions
  - identifies GMES as a promising approach to complement field data and address water quantitative issues.

Technical context

- Successful practical implementation of EO for the detection of water abstraction through research projects like SIRIUS
- Copernicus program:
  - European Programme for the establishment of a European capacity for Earth Observation (EO), launched in 1998
  - land monitoring service including global, European and local components.
  - in 2014, new development stage of the Copernicus program, which will feature new operational services by 2020.
  - potential for an extension to additional areas of interest and further thematic services

European Commission

Copernicus

SEVENTH FRAMEWORK PROGRAMME

Definition

In the field of irrigation, non-authorised abstractions are considered as of two types:

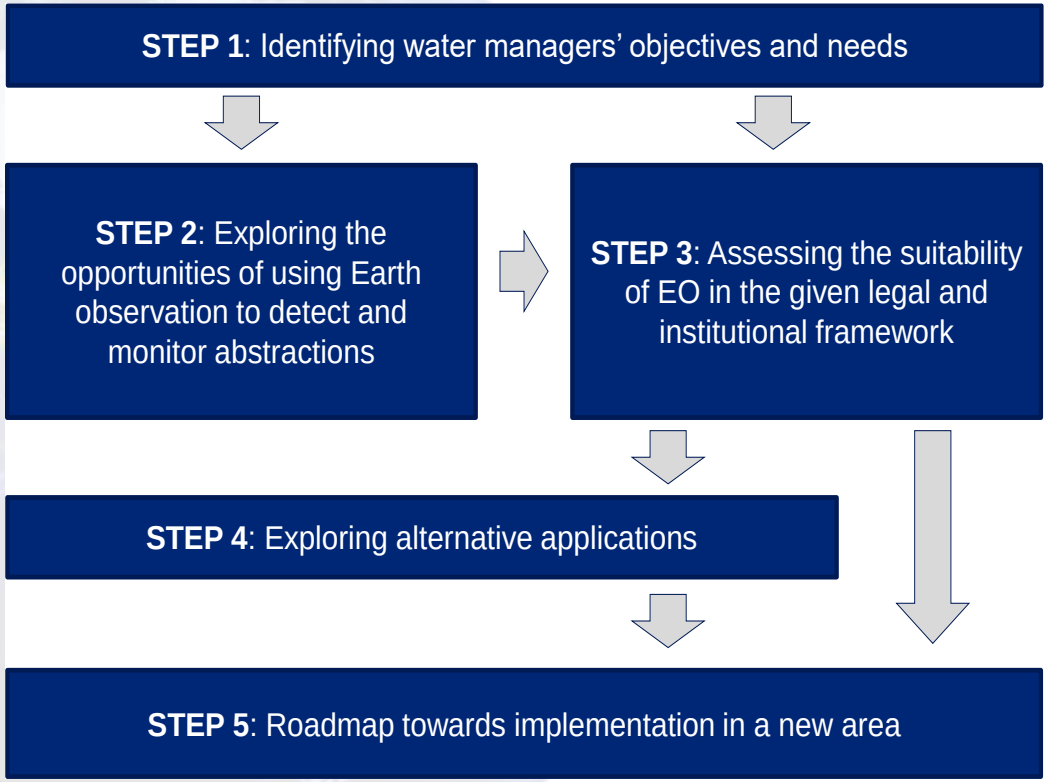
- Type 1: abstractions for irrigation of areas without official water rights;
- Type 2: abstractions of water beyond the authorised amounts.

Both types can be either permanent or occurring during periods of special restrictions (e.g. in case of drought).

Deliverable 1: Guidance document for stakeholders

Guidance document
for stakeholders in charge of water management and inspections

- Informs on the EO potential for supporting the detection and monitoring of water abstraction for irrigation, including the detection of non-authorised abstractions;
- Reviews the currently available EO tools and services and share the lessons learnt from their practical implementation in different countries;
- Provides guidance on whether and how these tools and services can be used to complement conventional approaches in different local contexts



Deliverable 2: Discussion paper for the EC services

Discussion paper
for the services of the European Commission

- Assesses the opportunities to develop a Copernicus service dedicated to the management of abstractions for irrigation
- Provides a basis for the discussion on its key technical specifications.

Table of contents:

Service:
Non-authorized water abstraction detection and monitoring for control optimization

Products:
Maps of Irrigated Areas
Maps of Irrigation Water Requirements

Implementation start in the Spanish pilot area

Maps of Irrigation Water Requirements,

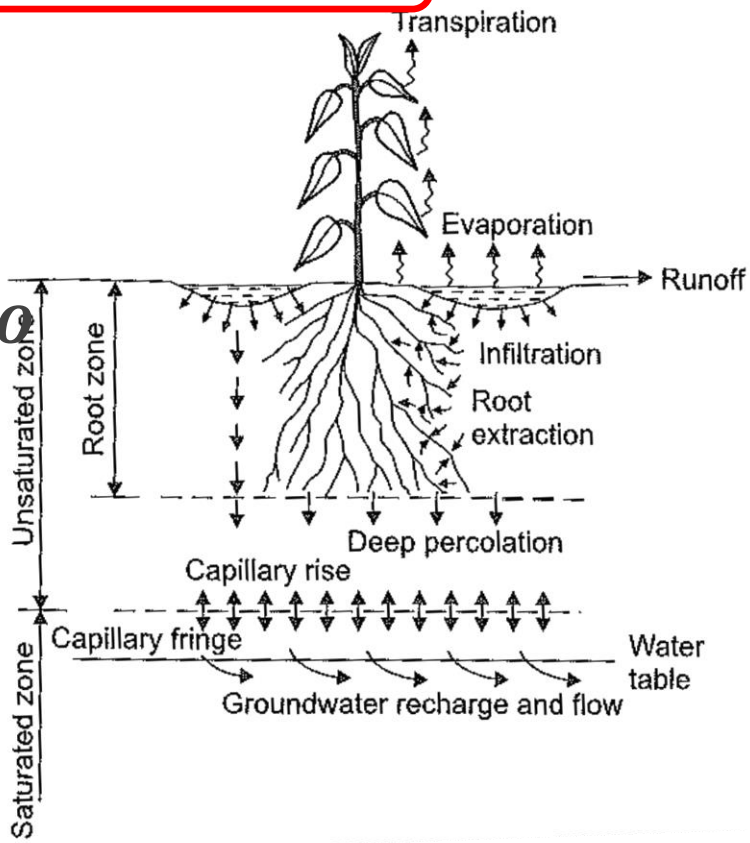
Water accounting based on Soil Water Balance

$$\Delta S = P + I + CR - ET - DP - RO$$

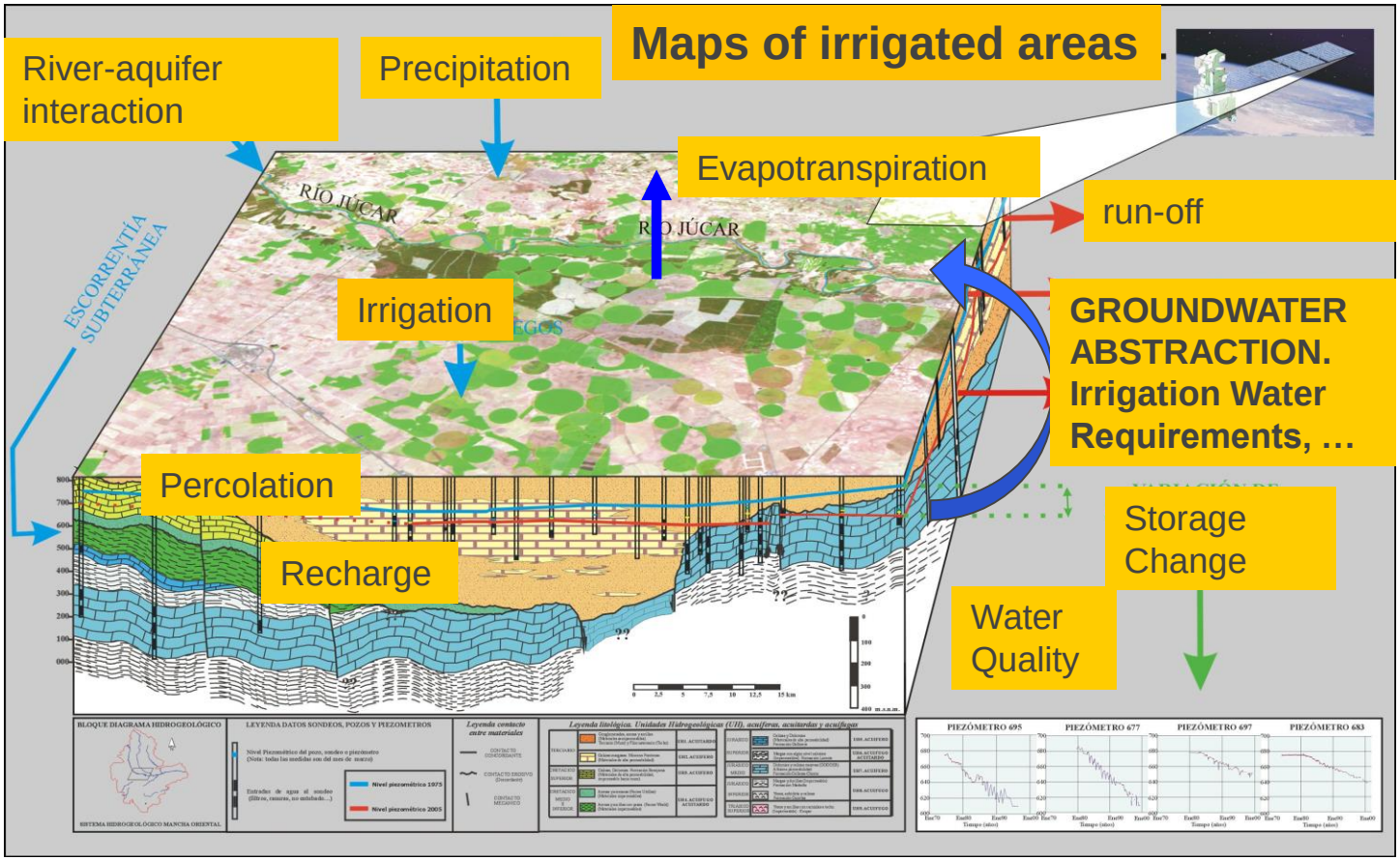
ET, Remote Sensing-based

I, Net Irrigation Water Requirements:

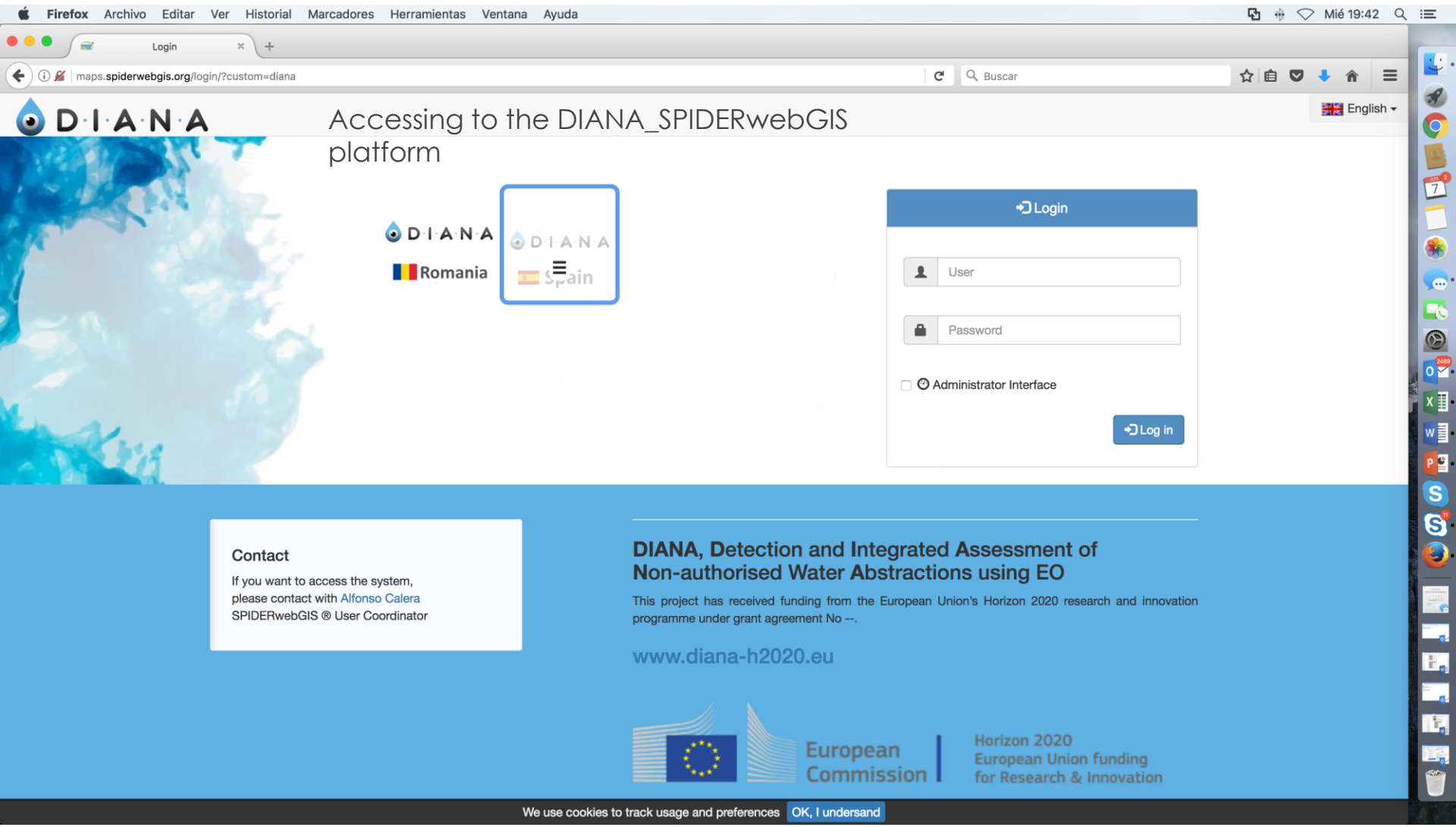
The amount of water that must be supplied by irrigation to satisfy evapotranspiration, leaching..., that is not provided by the water and precipitation that enters the soil



Spatially Distributed Soil Water Balance based on remote sensing



Accessing to the DIANA_SPIDERwebGIS platform

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FATIMA

THE CHALLENGE

GROWING FOOD DEMAND

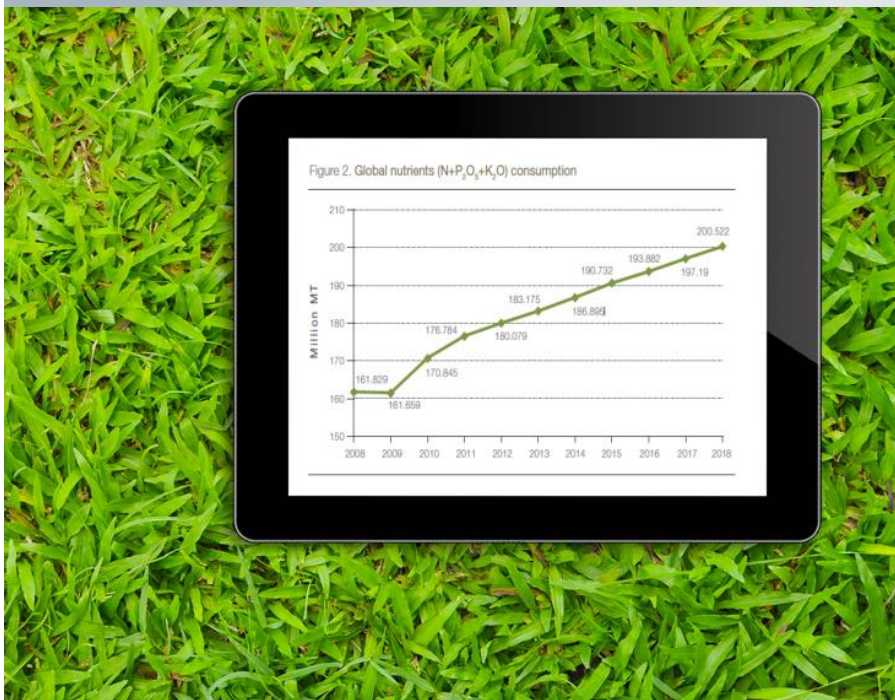
- Growing population (10 billion in 2050)
- Changing consumer habits (water footprint skyrockets)
- Climate change

INTENSIVE AGRICULTURE

- Increasing use of water & inputs
- Increasing pollution (soil, water)

IMBALANCE

- 80% small & family farms – 20% industrial farms
- More…



FOOD SYSTEMS

FAO calling for

"Fundamental change in ~~productive & agricultural systems~~"

FATIMA to show a way

for transition into new paradigms of agriculture & food production

Agroecology = umbrella framework

Agroecology is…

….the study of…

…..ecological processes…

…applied to…

… .agricultural production systems.

Agroecology >>> 5 levels <<< FATIMA

1- make current/intensive ag more efficient **PA / VRT**

2- transform to -> more soil conservation

-> less resource-intensive

long-term PA/VRT helps

3- explore opportunities of multi-functionality

4- redesign → local **permaculture**

5- redesign entire food system → global

System of Participatory Information, Decision-Support, and Expert knowledge for River-basin management

SPIDER

FATIMA

FArming Tools for external nutrient Inputs and water MAnagement

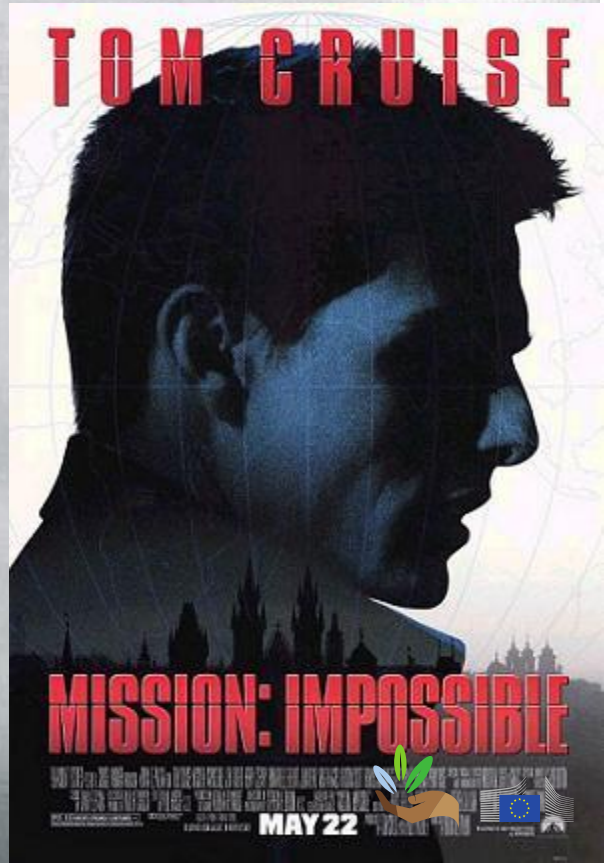
MAKE
INTENSIVE
AGRICULTURE
SUSTAINABLE

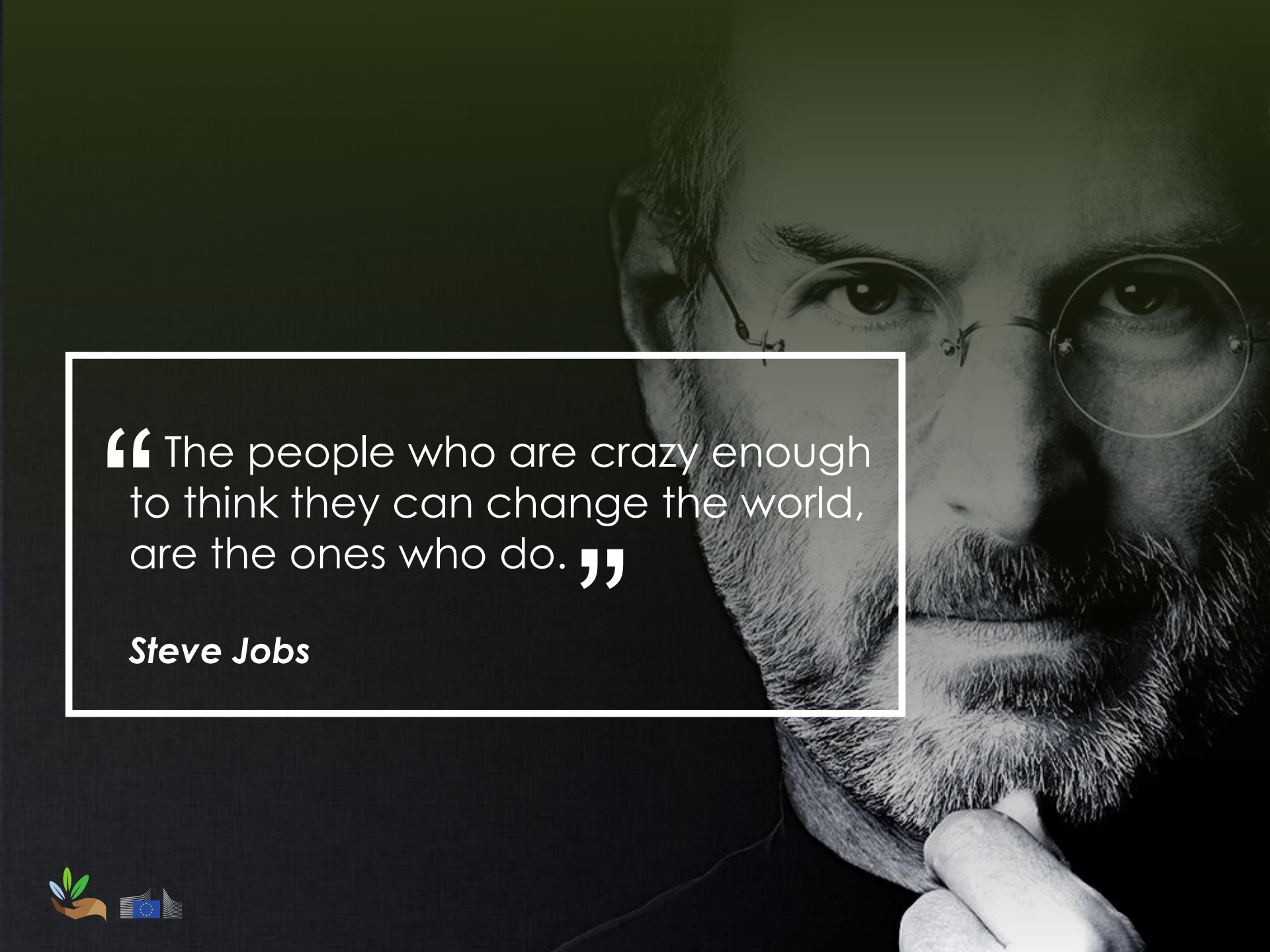
European Commission
Horizon 2020
European Union funding
for Research & Innovation

MAKE
INTENSIVE
AGRICULTURE
SUSTAINABLE

SUSTAINABLE
INTENSIFICATION

¿?




“The people who are crazy enough to think they can change the world, are the ones who do.”
Steve Jobs

¡GRACIAS!

Thanks
Teşekkürler
Grazie
Merci
Ευχαριστώ
Obrigad@s
Благодаря
Děkuji
Paldies
Danke
Dank u

FARMING TOOLS FOR EXTERNAL NUTRIENTS INPUTS AND WATER MANAGEMENT

FATIMA

ONLY 1 OF 58

8MEUR

PURPOSE AND VISION

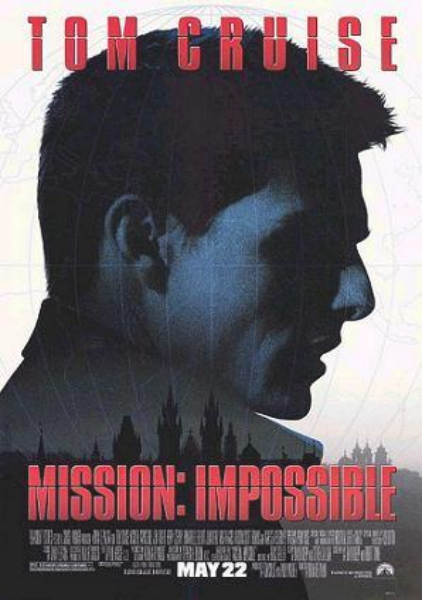
To establish new farm tools and service capacities
that help the EU intensive farm sector
optimize its external input management (nutrients and water)
and its productivity

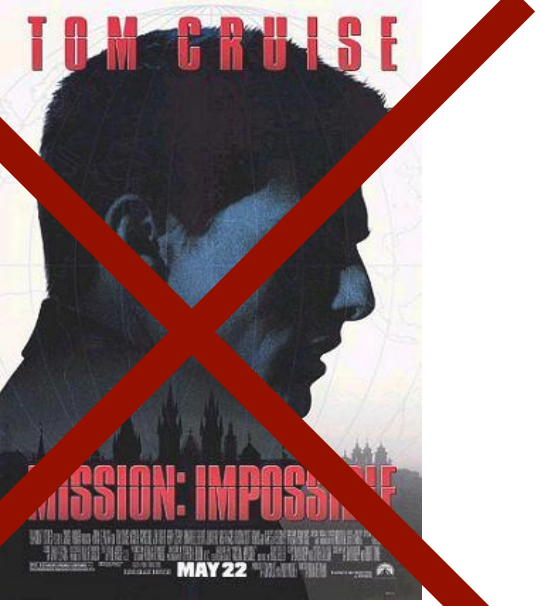
Bridging sustainable crop production
with fair economic competitiveness

3 years – now M30

Universidad de Castilla-La Mancha coordinator
(Anna Osann & Alfonso Calera)

Research and Innovation Action 2015-2018 co-funded by EU H2020 (8 MEUR, grant 633945)


TOM CRUISE
MISSION: IMPOSSIBLE
MAY 22



FATIMA
MULTI-ACTOR community

STORY

Co-creation with all stakeholders

Transdisciplinary

Local champions/tipping point

Impact-driven

FATIMA
MULTI-ACTOR
LOCAL CHAMPIONS









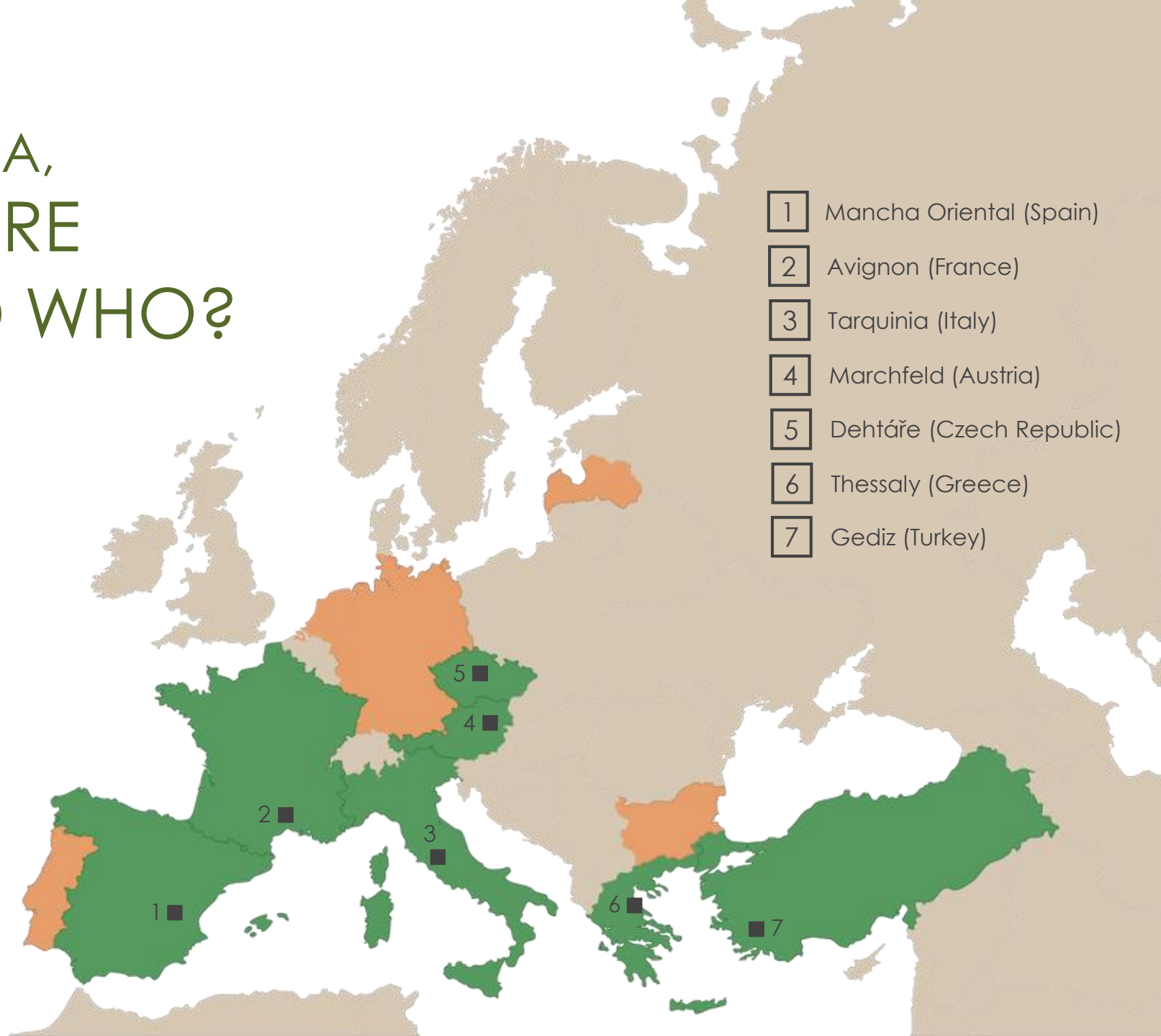

FATIMA, MULTI-ACTOR

LOCAL CHAMPIONS NEED:

OPERATIONAL
TOOLS & SERVICES:

1. **Maps** of crop status;
2. **Maps** of CWR next week (forecast + nowcast);
3. **Maps** of required fertilizer pre-&during season

FATIMA, WHERE AND WHO?



FATIMA HOW?

COMPREHENSIVE STRATEGY

1

2

3

4

5

PLANT-CENTERED
& PEOPLE-CENTERED

STORY

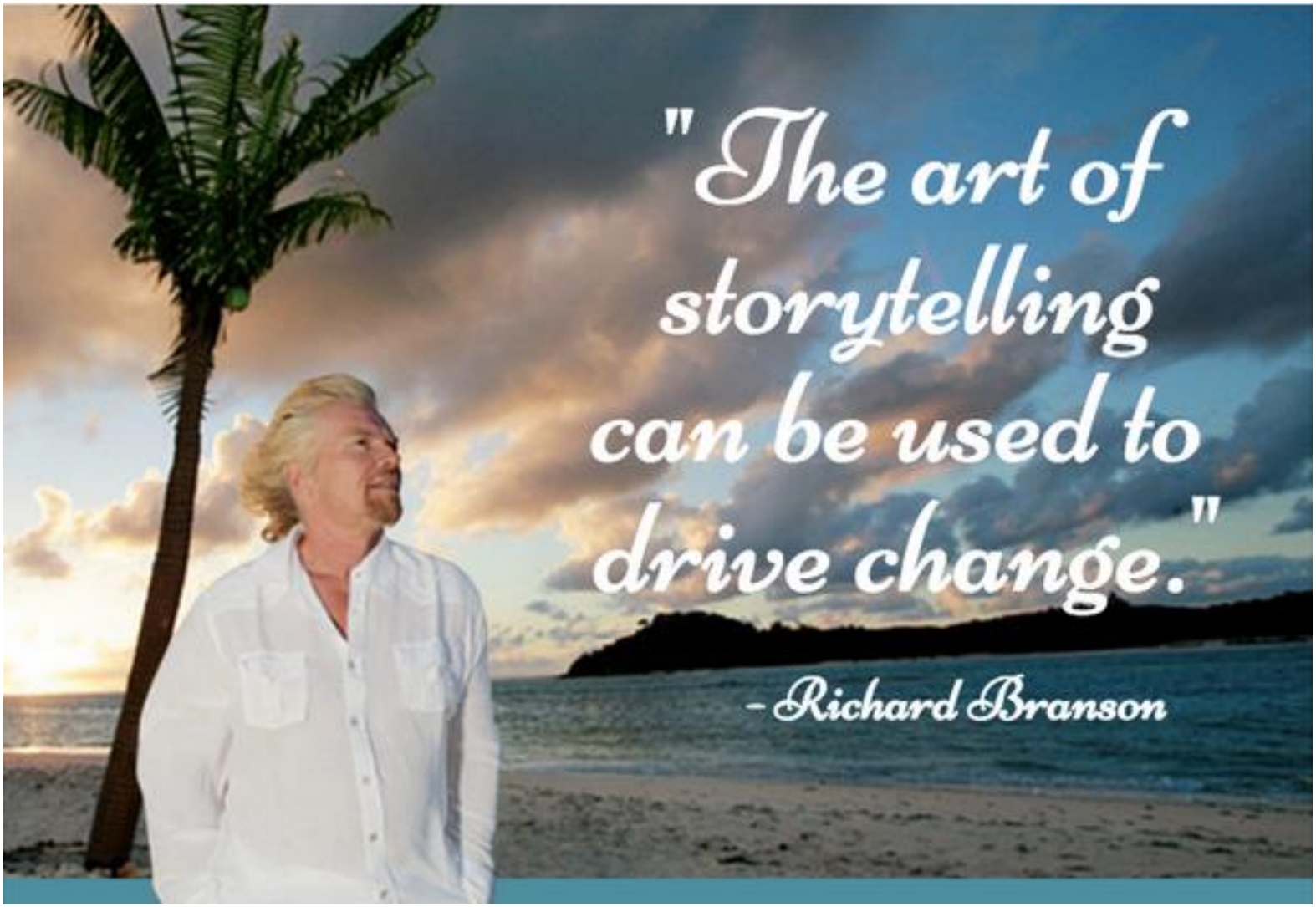
Technology: modular system (webGIS, EO, models, sensors)

Field: wide range of scales (precision farming….. organic)

People: multi-actor community in participative process

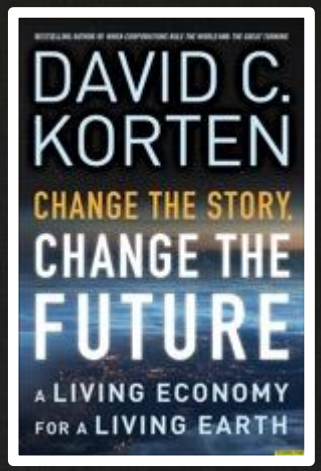
Economy: individual farm & societal scale

Policy: synergies, feedback loops, WEF (water-energy-food) nexus


"The art of storytelling can be used to drive change."
- Richard Branson

“When we get our story wrong, we get our future wrong.”

David Korten



FATIMA

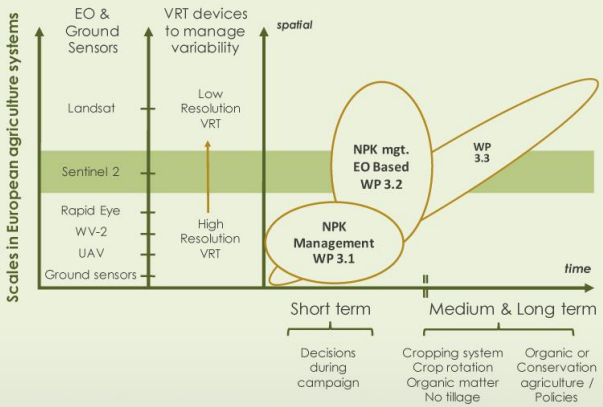
COMPREHENSIVE STRATEGY

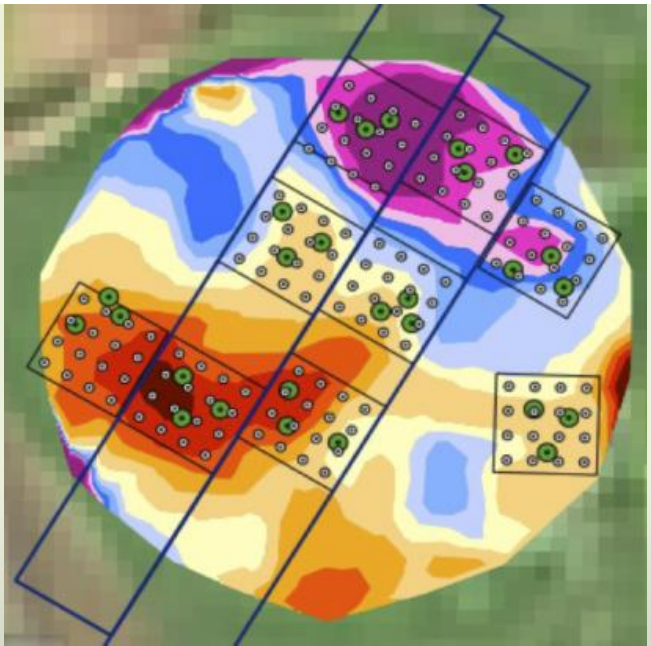
STORY

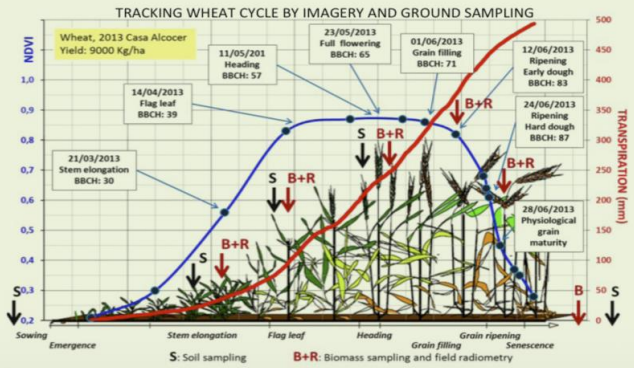
People-centered
multi-actor community; economy; policy

PLANT-CENTERED & PEOPLE-CENTERED

Plant/soil-centered
all about variability (space, time)





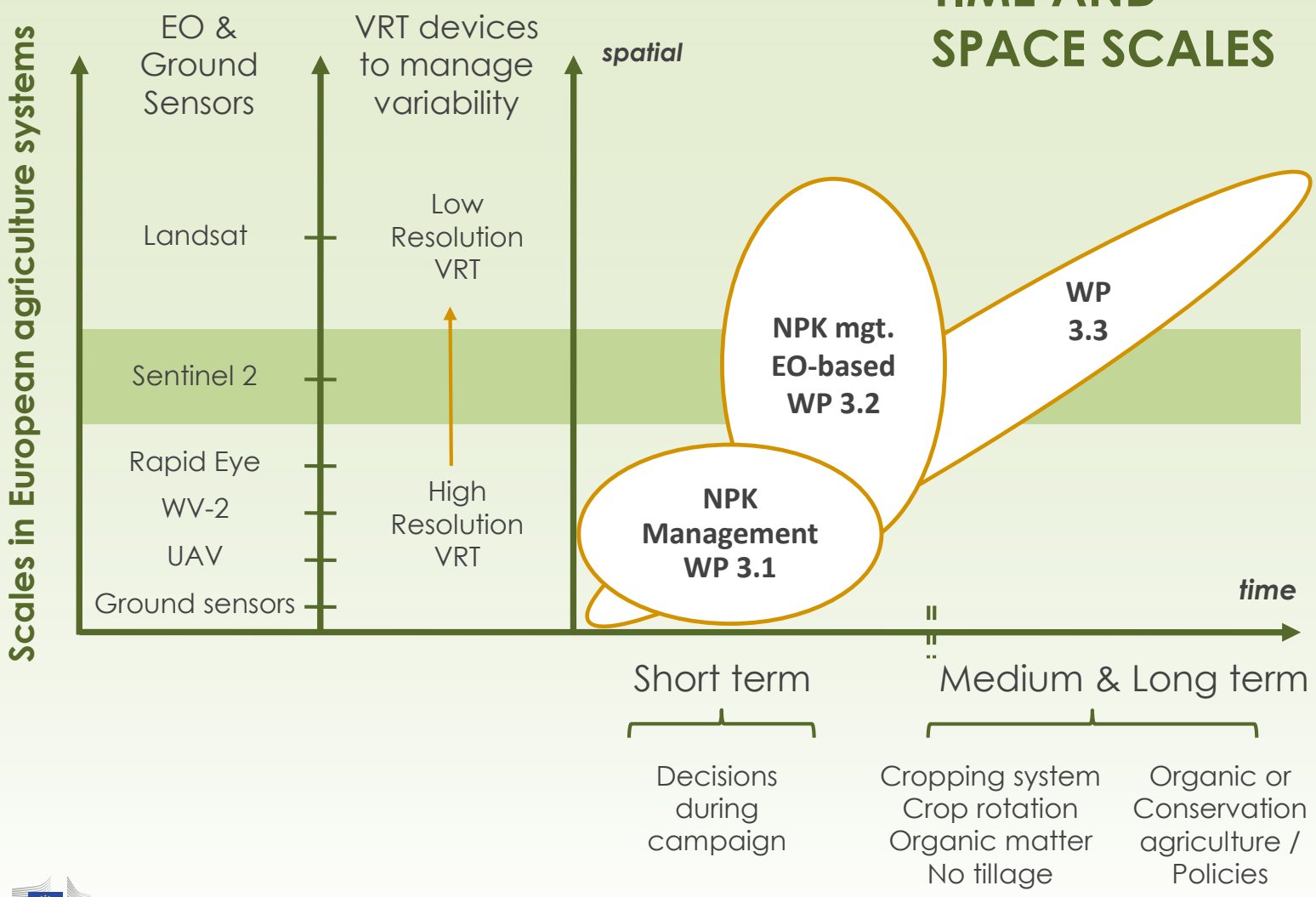


FATIMA
HOW?

CORE TOOL
SPIDER webGIS

FATIMA HOW?

TIME AND SPACE SCALES

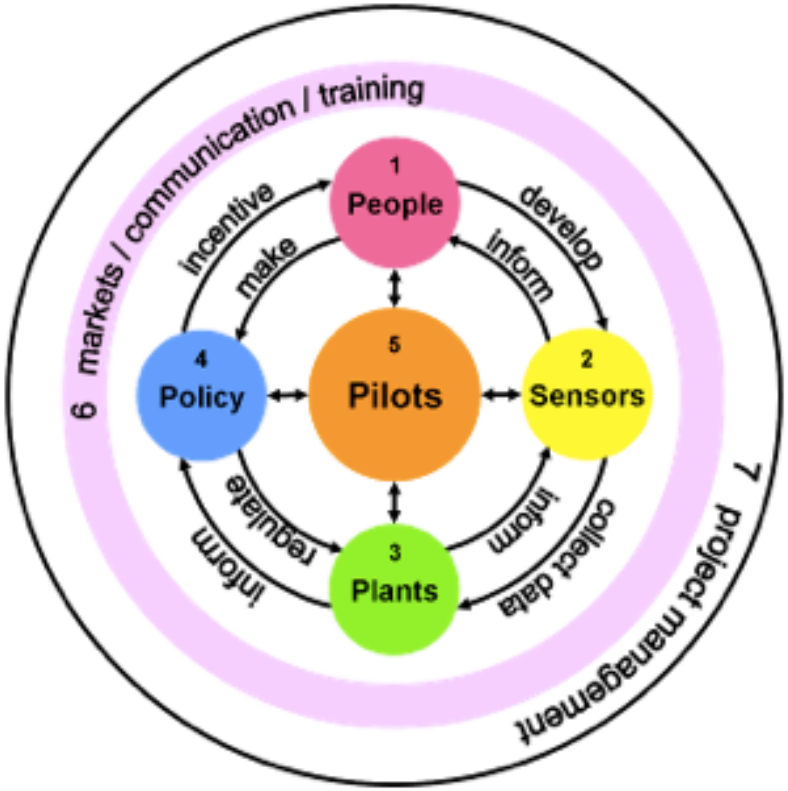


WP recap:

WP5 = Pilot-implementation of FATIMA services & evaluation with users,
plus integration

WP2 = Technology to measure crop status
WP2.1 webGIS
WP2.2 EO+models
WP2.3 Sensor networks

WP3 = Strategies to improve crop management & sustainability
WP3.1 In-field VRT for precision farming
WP3.2 Remote VRT for precision farming
WP3.3 Field trials/cropping systems



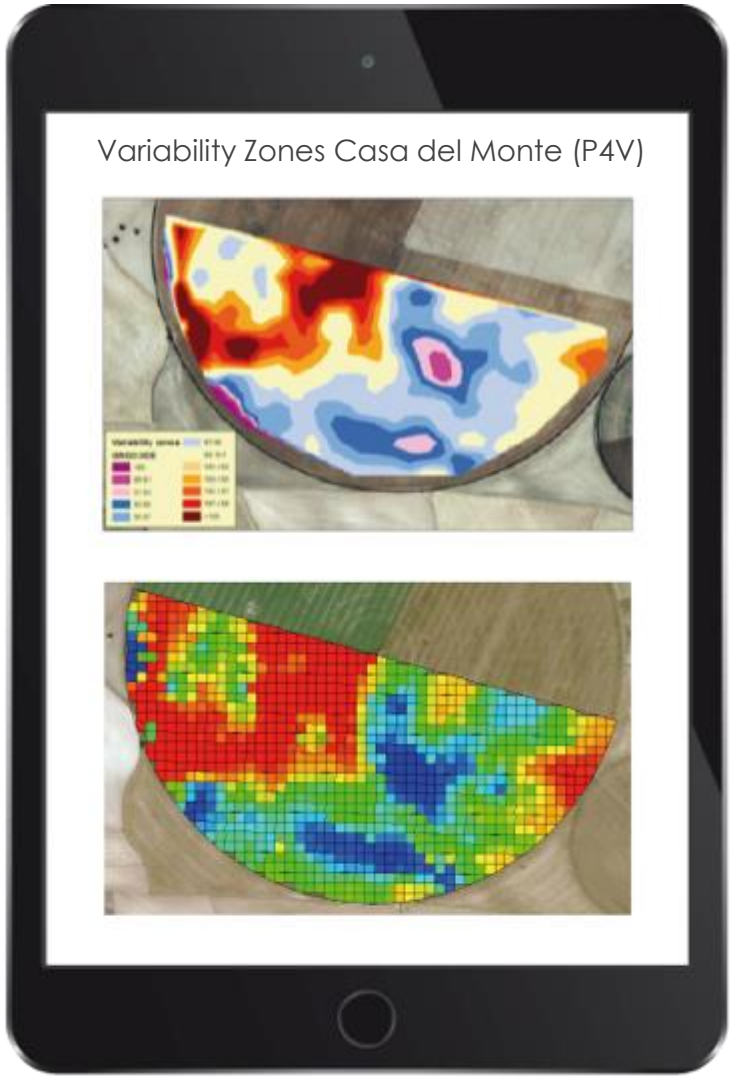
WP1 = Local context
WP1.1 Stakeholder community
WP1.2 Socio-economic analysis

WP4 = Global context
WP4.1 Water-energy-food nexus
WP4.2 Policies

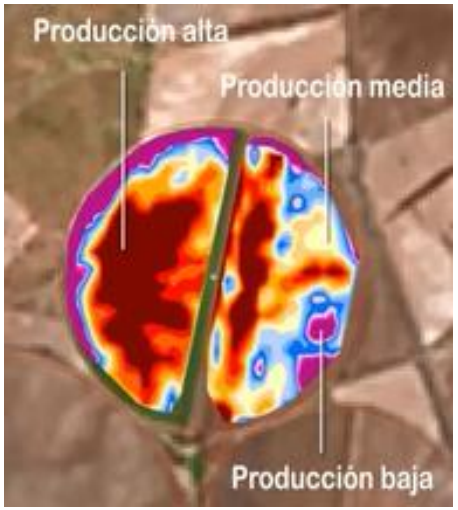
MAP OF "BULK" N REQUIREMENTS READY TO BE USED AS GUIDANCE FOR VR MACHINERY

SCHEDULING N APPLICATION

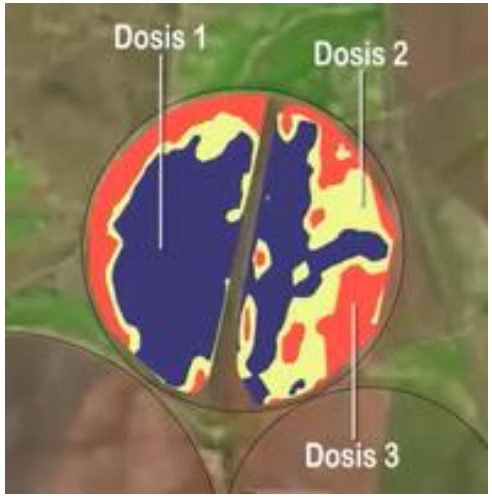
POTENTIAL PRODUCTIVITY MAP



EO-generated map of potential productivity



transformed (using models) into map of fertilization requirements

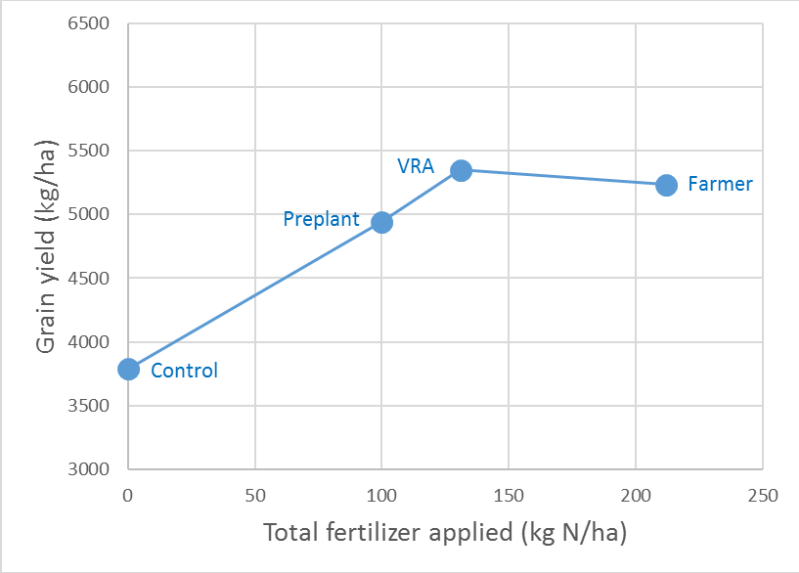


Introduced into variable-rate spreader intelligence

Tractor in field spreading differential N rate

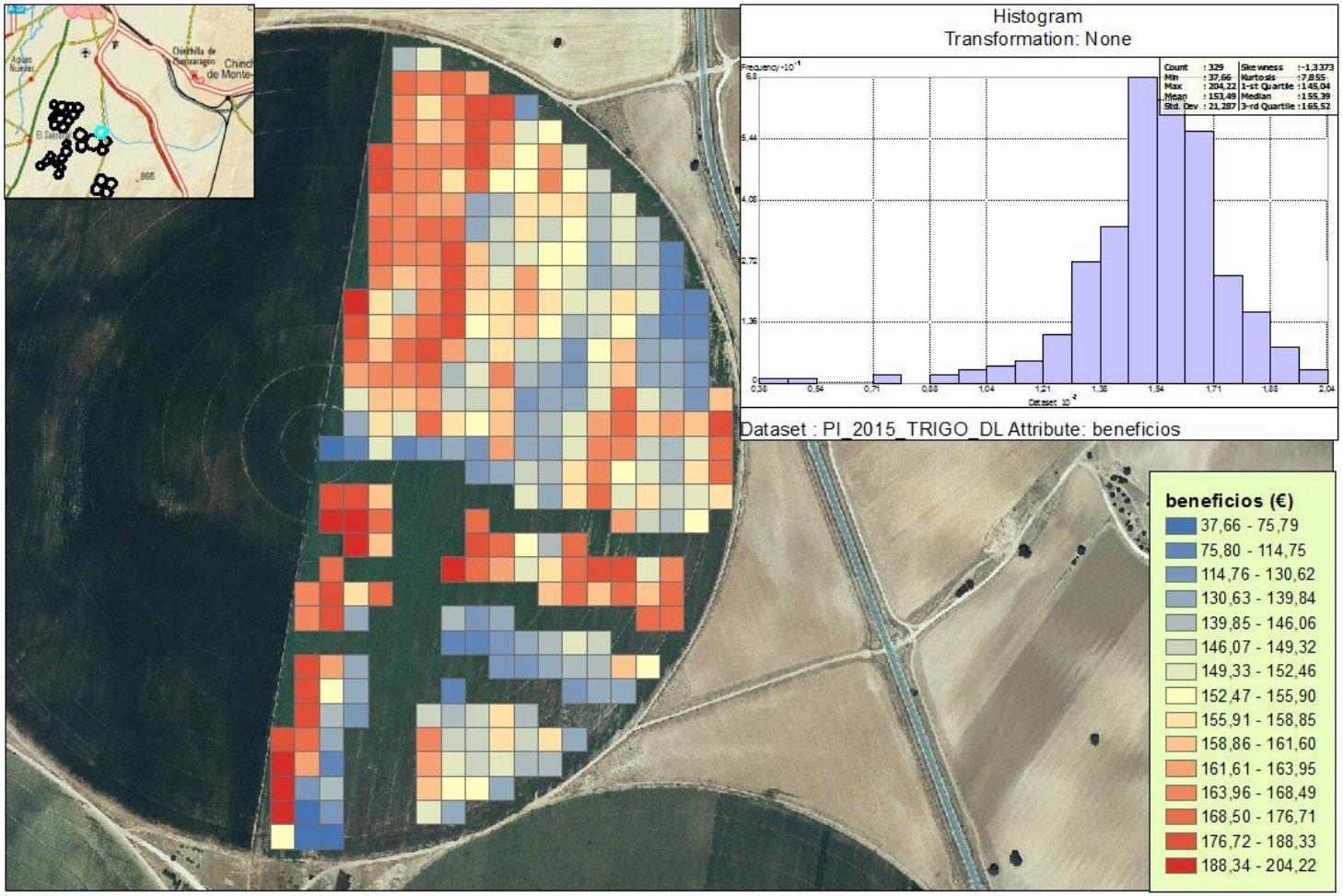
Integration of different technologies into a practical variable-rate delivery system of high resolution

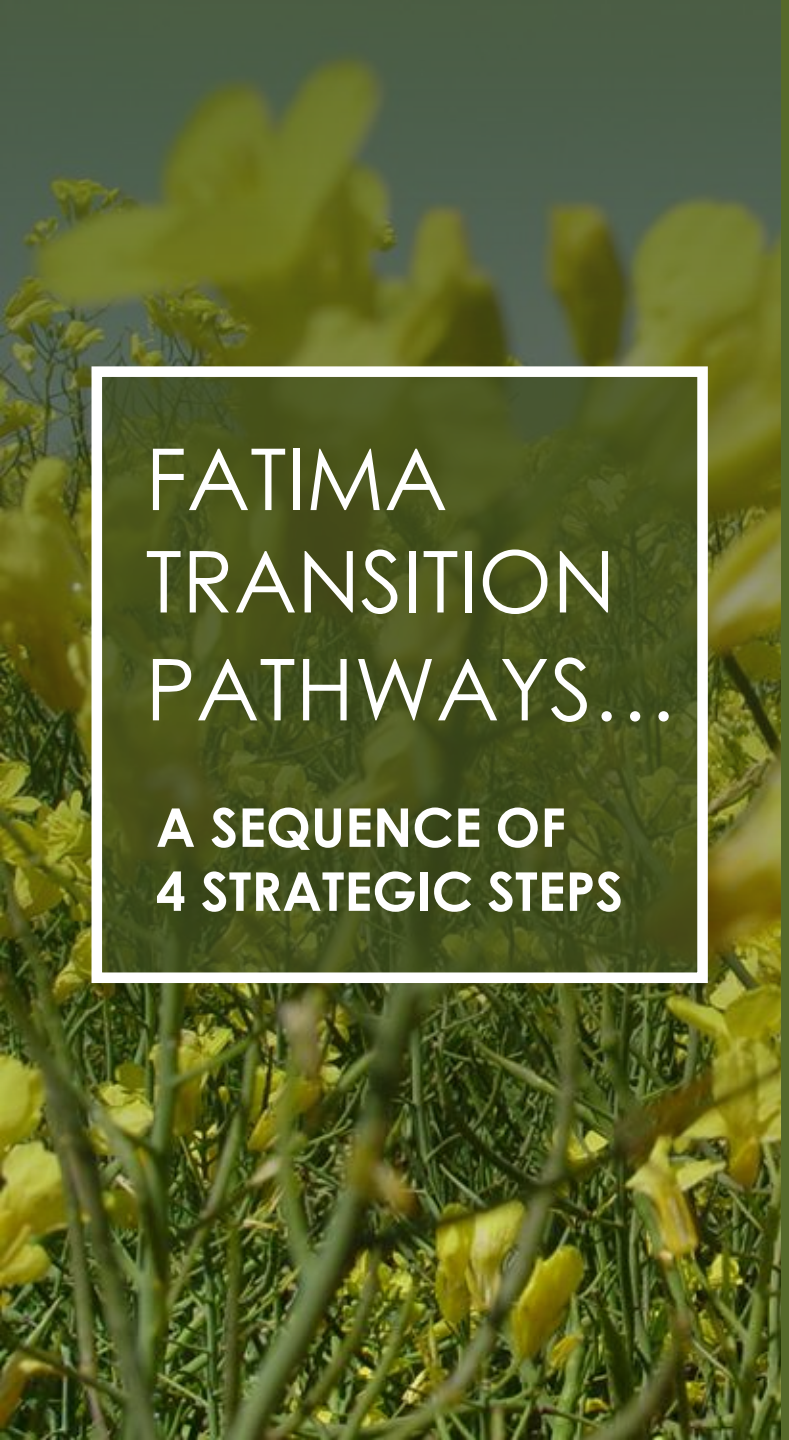
VRA decreased N inputs by 38% without any losses of grain yield in replicated wheat strips.



Winter wheat (February 2016)

Beneficios (€). Ingresos - gastos Unidades Fertilizante. Dehesa de Los Llanos





FATIMA TRANSITION PATHWAYS…

A SEQUENCE OF 4 STRATEGIC STEPS

…into NEW PARADIGM

1. Short term techniques to optimize inputs & yields
2. Long-term strategy to transform to no-till/organic
3. Assessment/modeling of results & impacts
4. Change the story
   One farm at a time… Fibonacci

Technology = incentive, tool, policy instrument

FATIMA long-term strategy

NEW paradigms

1. Crop rotation
2. Compost / cover crops
3. Conservation agriculture
4. Organic / biodynamic

→ **permaculture**

→ **local production/ consumption**

FATIMA

ROUTE TO SUCCESS

Pragmatic/operational approach

Rigorous/excellent science by brilliant teams

Out-of-the-box thinking & acting

HOLISTIC | "ALTERNATIVE" | NONLINEAR | CIRCLES

PERMACULTURE | SACRED DIMENSION | WEAVING/Q'IPU

ICT tools for innovating…
…groundwater management in a changing world
Conclusions & Outlook

* Hybrid system (satellite+sensors+models+ICT) for aquifer management operational at large scale

* Same for nutrient management

* **P**ICT People+Innovation+Communication+Transparency

* Legal issues are being resolved

* Digital Farming / Internet of Food…

DIANA

UCLM

agriSat Iberia, s.l.

FREEWAT
Free and Open Source Software Tools for Water Resource Management
EU HORIZON 2020 Project

ict4water.eu

European Commission

EIP Water Online Market Place
Matchmaking for water Innovation
MAR Solutions - Managed Aquifer Recharge Strategies and Actions (AG128)

idaea CSIC

¡GRACIAS!

Thanks
Teşekkürler
Grazie
Merci
Ευχαριστώ
Obrigad@s
Благодаря
Děkuji
Paldies
Danke
Dank u