PRECISION AGRICULTURE AND PRECISION IRRIGATION:

OPPORTUNITIES AND CHALLENGES

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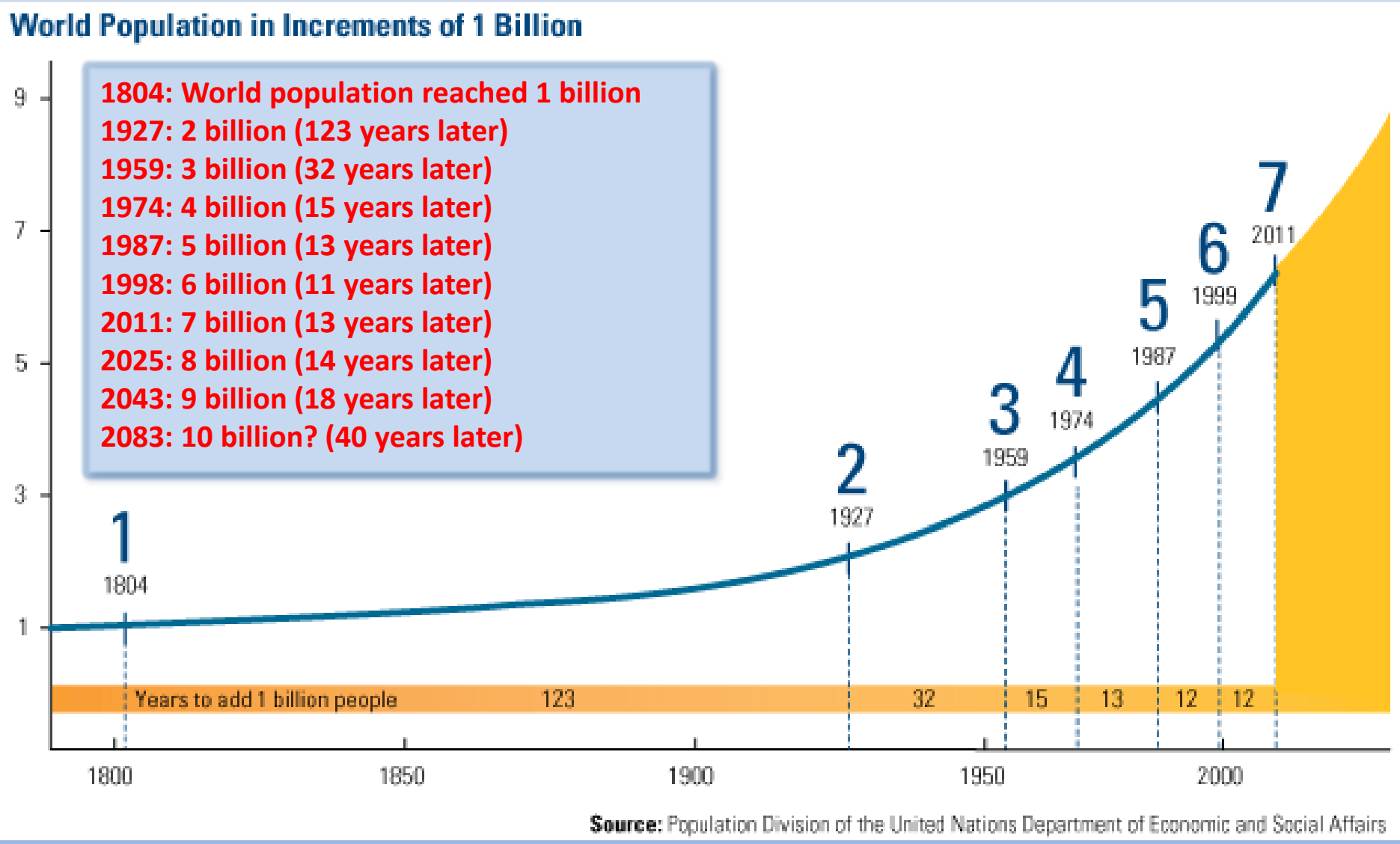
WORLD POPULATION



Can Precision Agriculture contribute to PRODUCE MORE WITH LESS?

SPATIAL AND TEMPORAL VARIABILITY

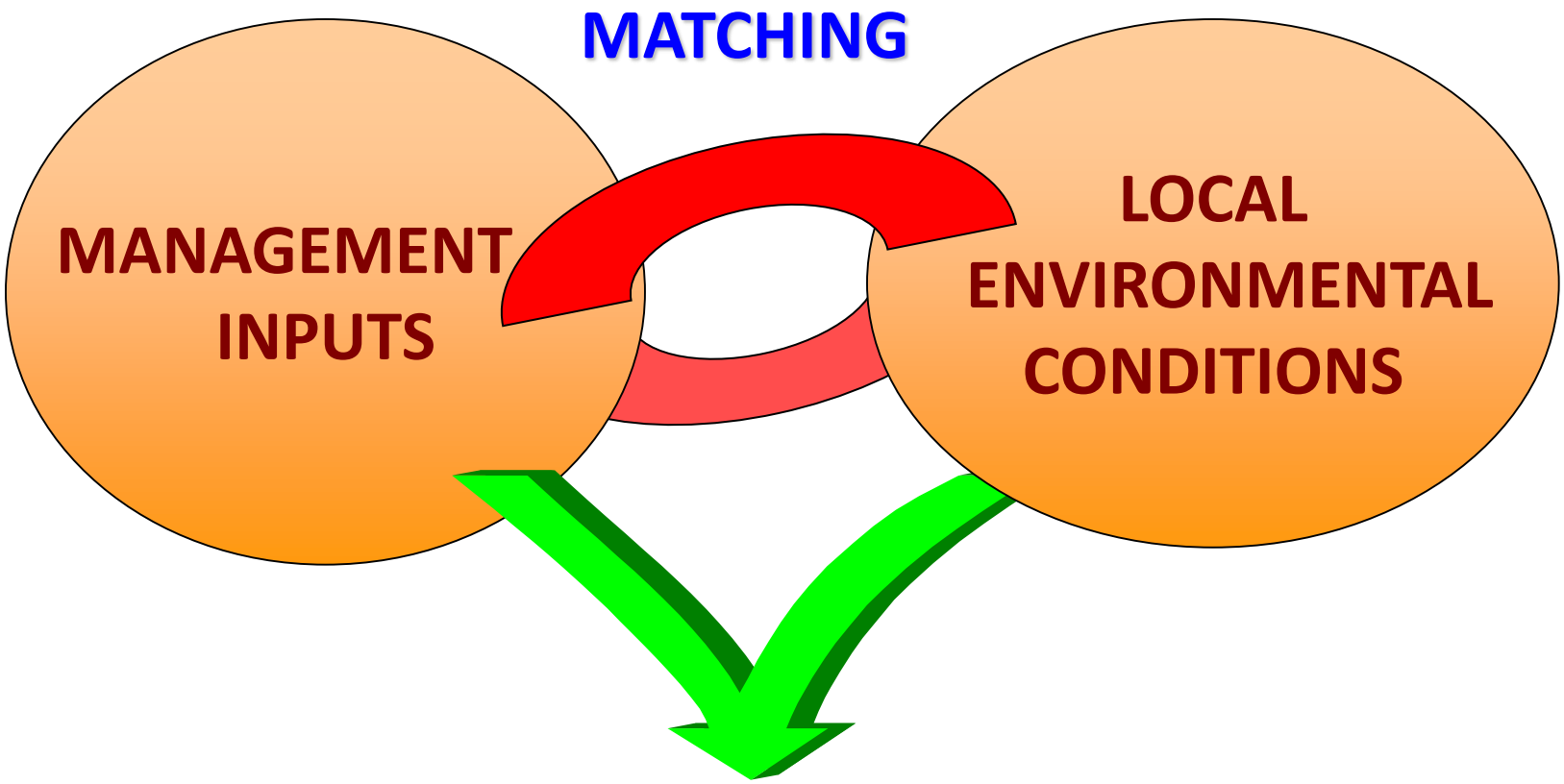
FIELD

growth

yield

quality

SITE-SPECIFIC MANAGEMENT



- INCREASING CROP PRODUCTION
- REDUCING ENVIROMENTAL IMPACT
- IMPROVING SOCIAL CONDITIONS OF RURAL PEOPLE

1° Step

ACQUISITION OF INFORMATION ON SPATIAL VARIABILTY

2° Step

ACTION

A) ONTIME THROUGH SENSORS

B) POSTPONED THROUGH PRESCRIPTION MAPS

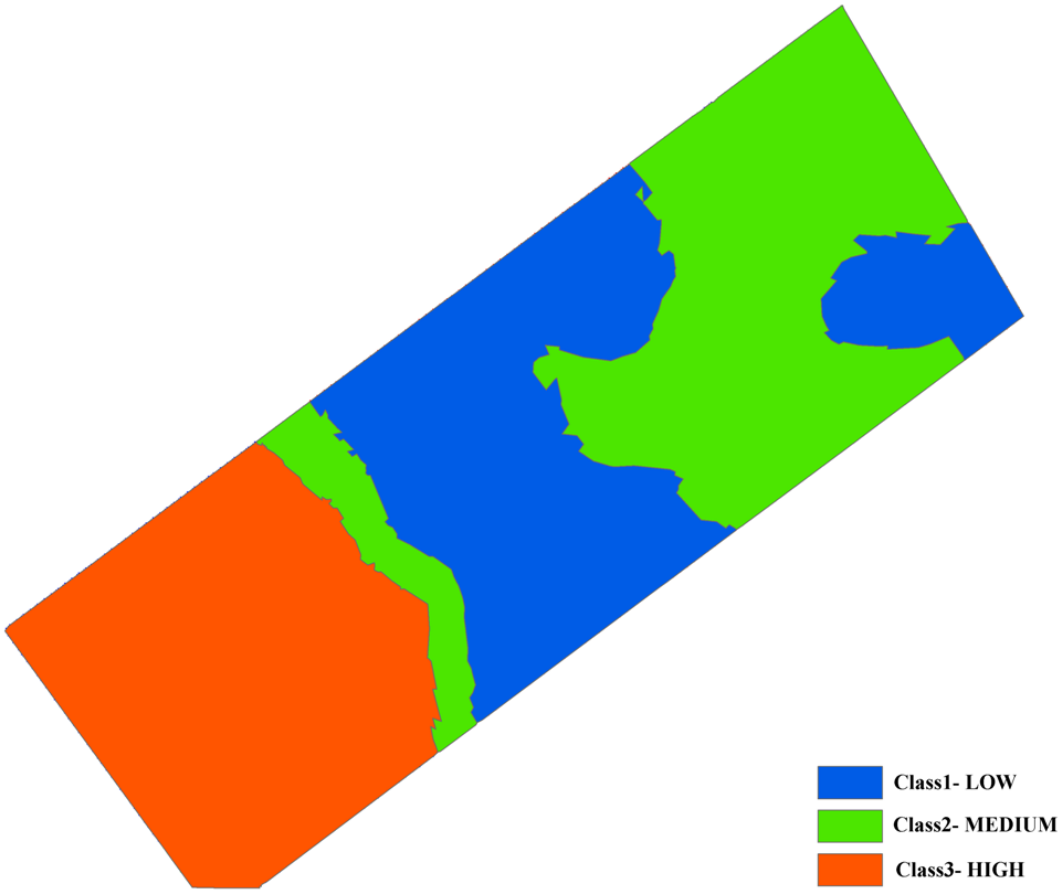
A) SENSORS

PARAMETER RECORDING

SYNCHRONIZATION

SPREADING REGULATION

B) MANAGEMENT ZONES



MANAGEMENT ZONES ***homogeneous subfield regions with similar attributes affecting yield***

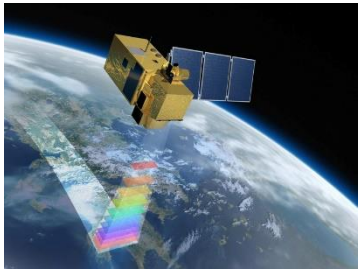
(Doerge, 1999)

Problem Statement

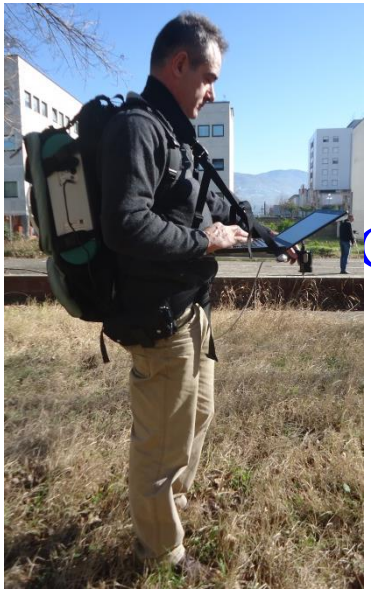
- Assessment of soil variability is one of the most important steps in site-specific management
- Assessment of spatial variability is preliminary to any effective sampling design
- Conventional means of direct sampling are incapable to accurately assess soil variability at an economically feasible cost
- There is a need to develop equipment for mapping soil attributes on-the-go
- On-the-go sensing technology must be reliable, rapid, simple, inexpensive and repeatable

REMOTE & PROXIMAL SENSING

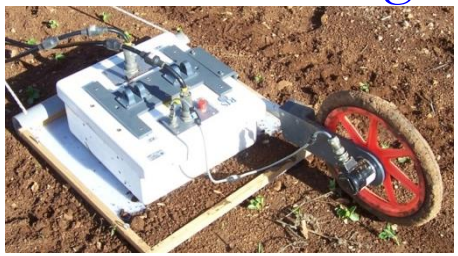
Sentinel 2



Field Spec



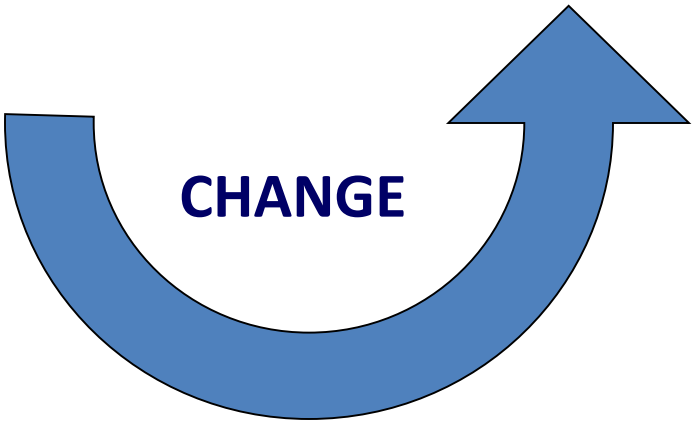
Ground Penetrating Radar



DGPS

Electromagnetic Induction

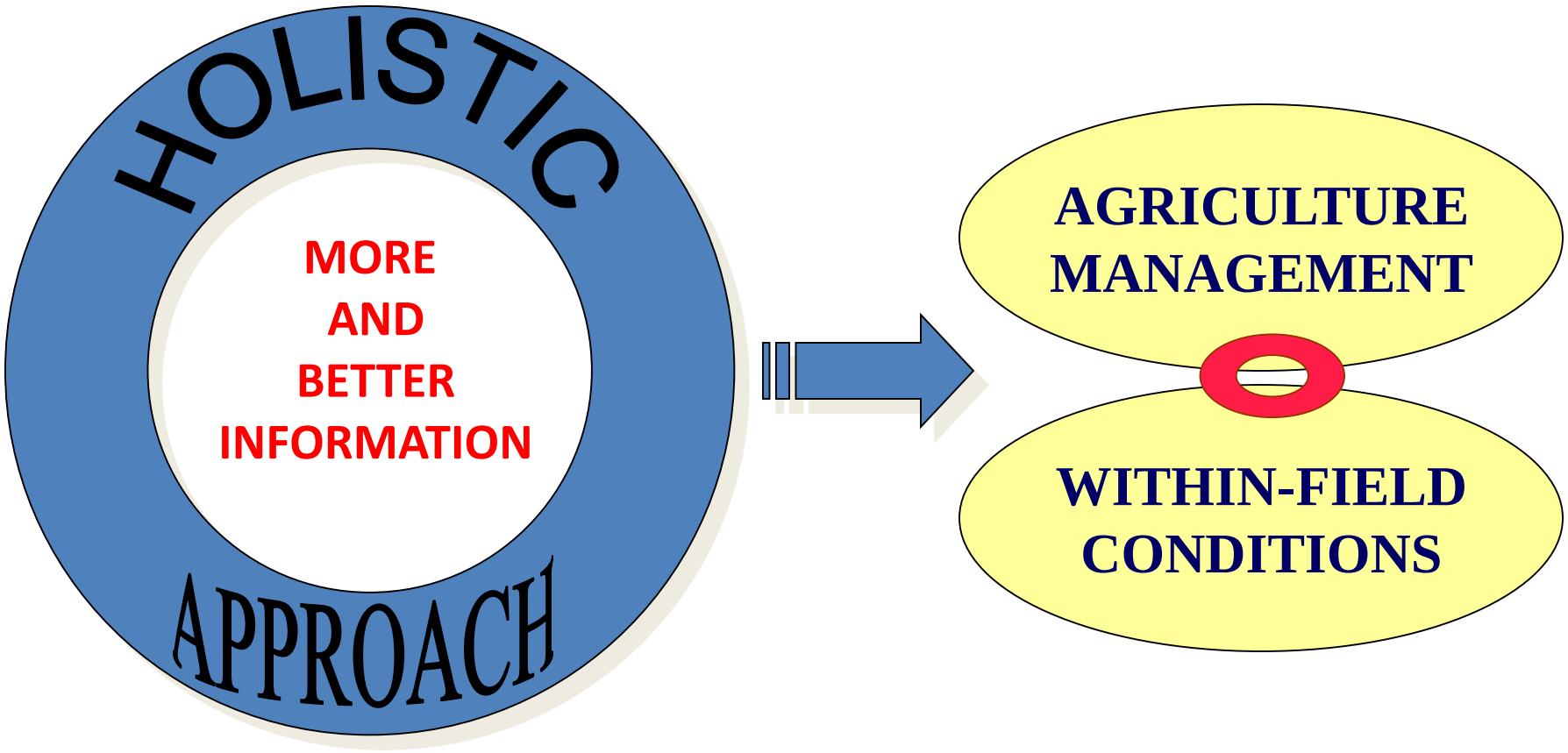
MUCH MORE than . . . TECHNOLOGY



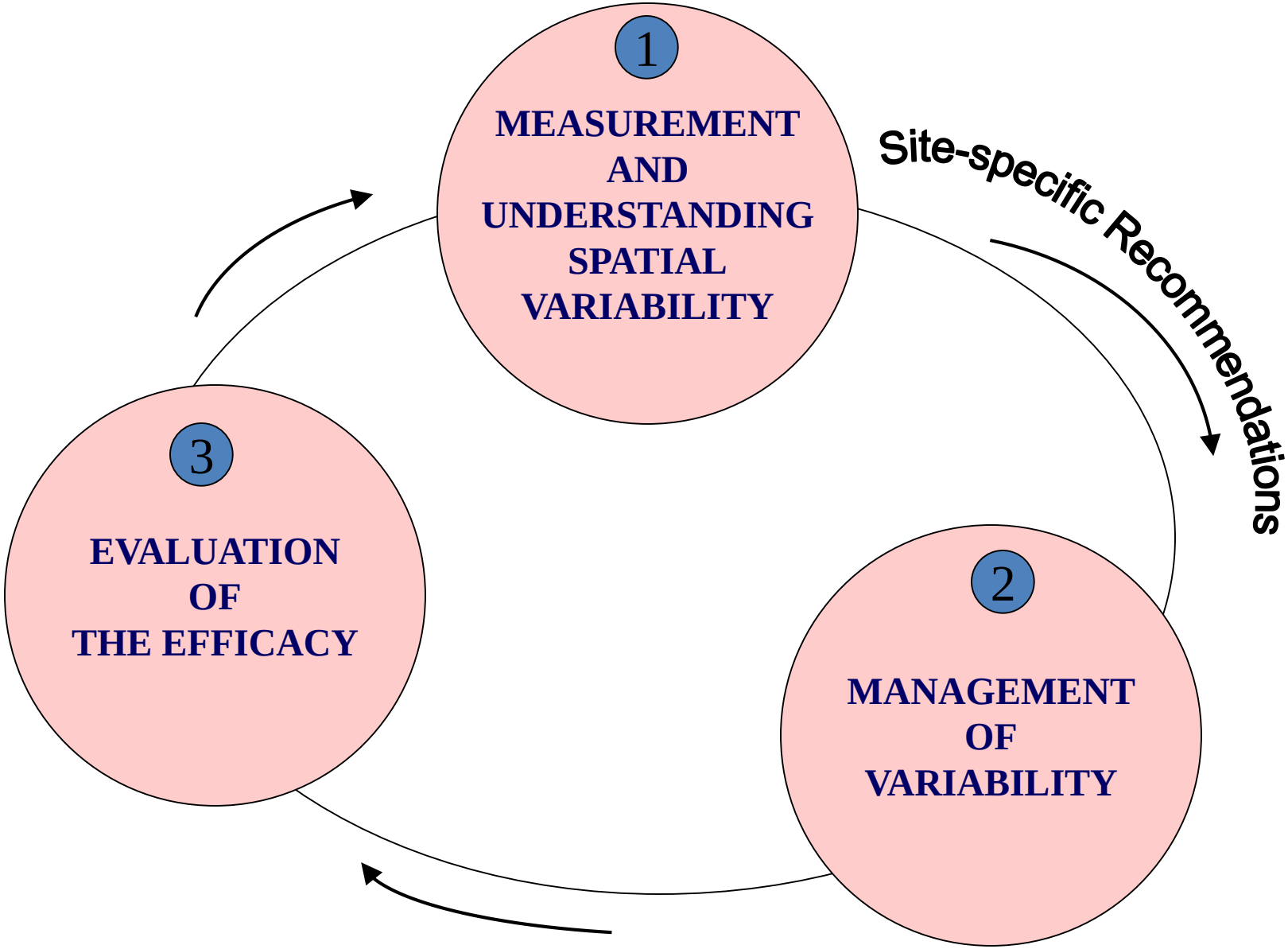
MANAGEMENT STYLE

AND

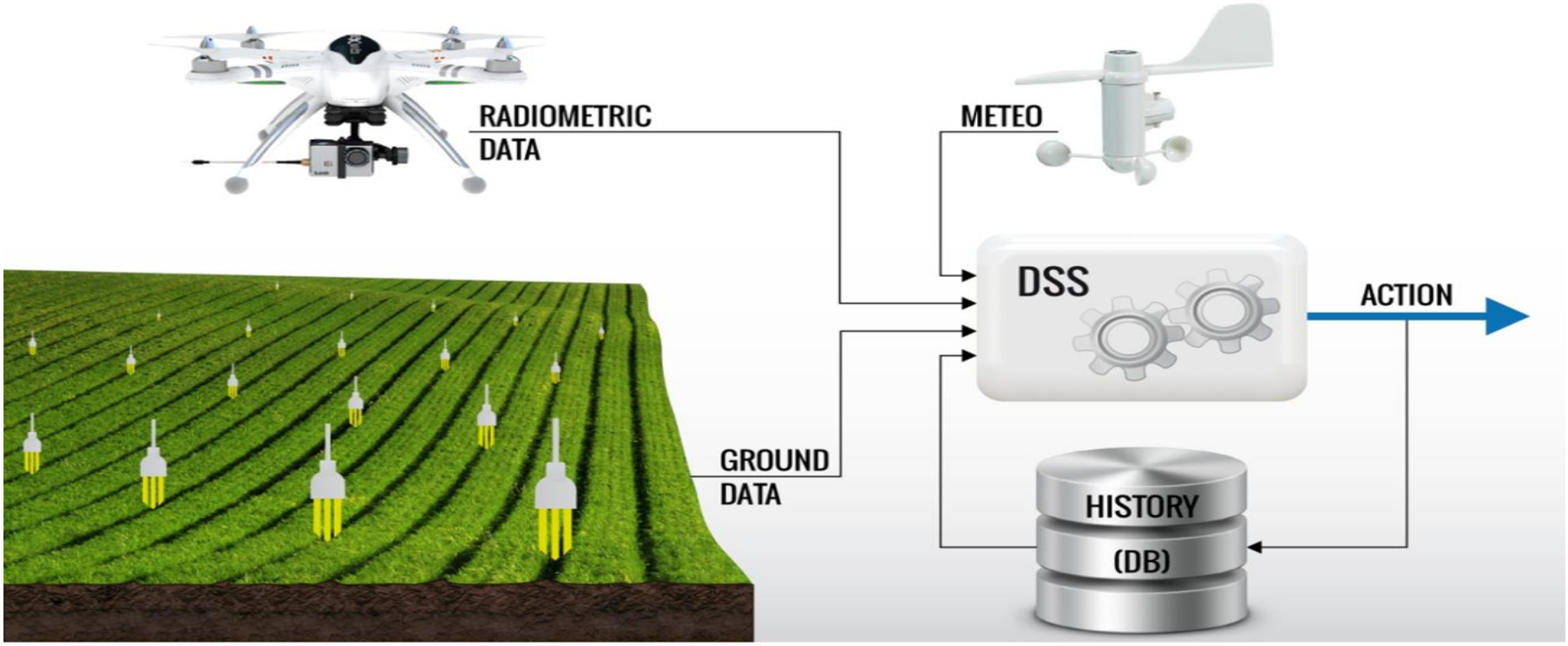
STRATEGY


HOLISTIC
MORE
AND
BETTER
INFORMATION
APPROACH
AGRICULTURE
MANAGEMENT
WITHIN-FIELD
CONDITIONS

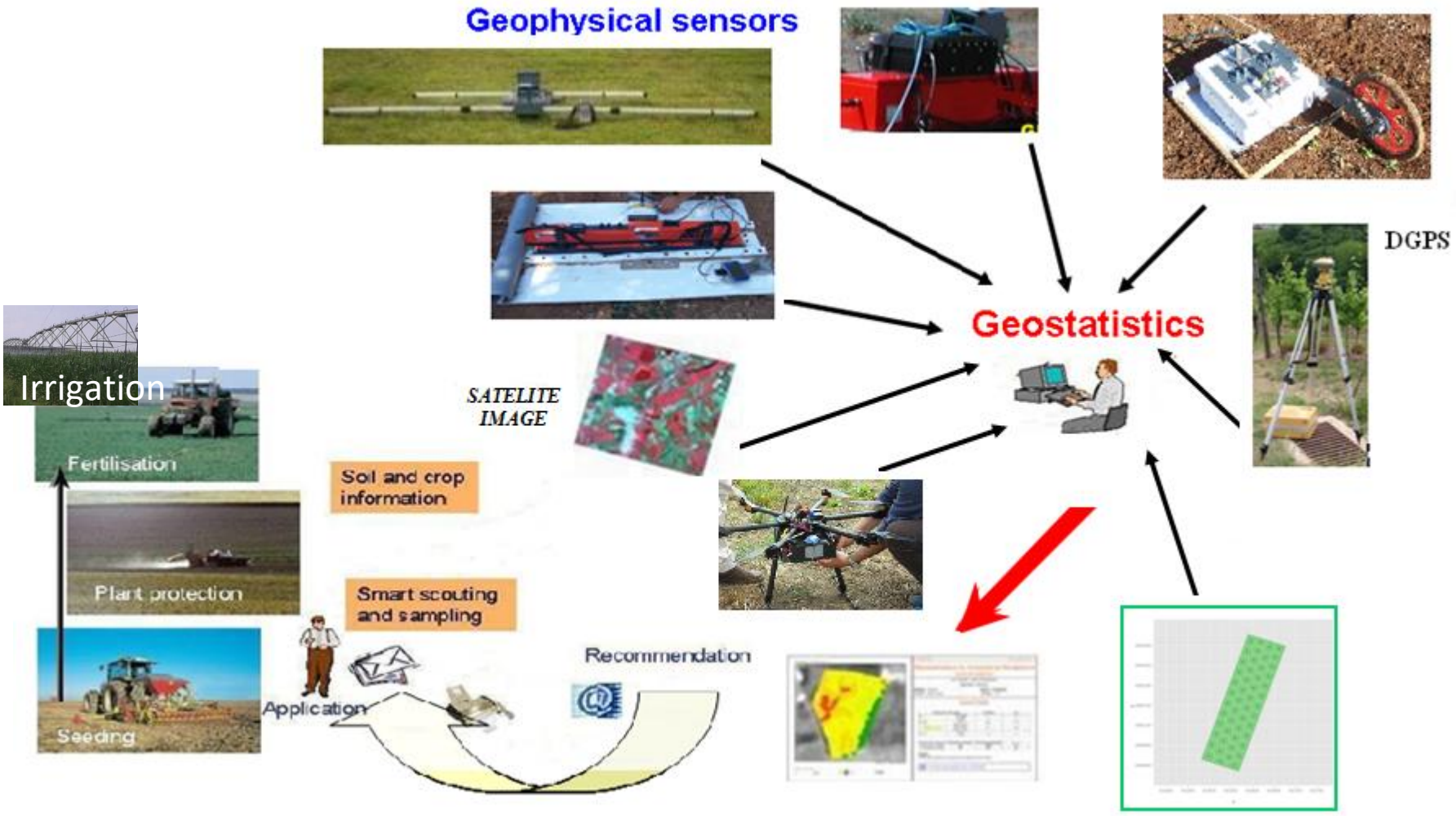
STEPS IN PRECISION AGRICULTURE



System components



Sensor Data Fusion



Possible impacts

- Smarter and more sustainable use of natural resources
- Rational use of fertilizers and chemicals
- Energy efficiency
- Self-diagnosis and planning capabilities
- Reduction of production costs with consequent increase of profit
- Improved product quality and safety
- Scalability of the irrigation and/or ferti-irrigation system

Matching

MANAGEMENT INPUTS

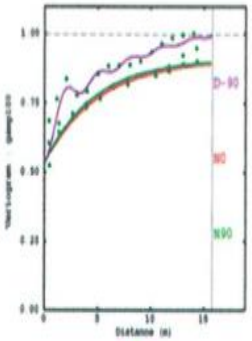
LOCAL ENVIRONMENTAL CONDITIONS

- Increasing crop production
- Reducing environmental impact
- **Rational use of resources**

Water

Monitoring

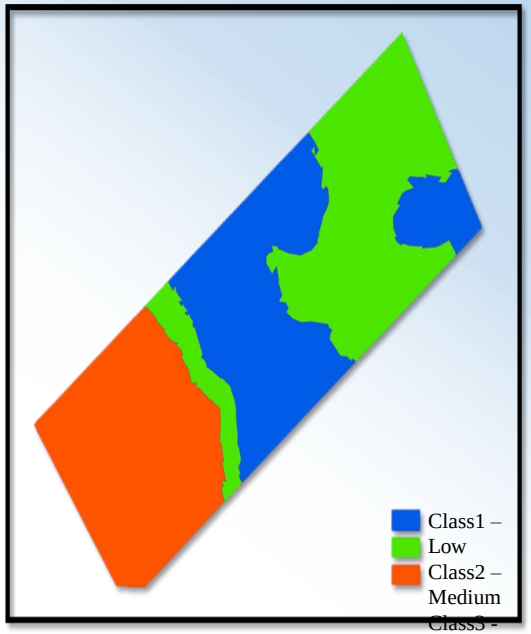
Interpretation



Testing

(Castrignanò & De Benedetto, 2015)

Management



Management Zones Delineation

Site-Specific Management

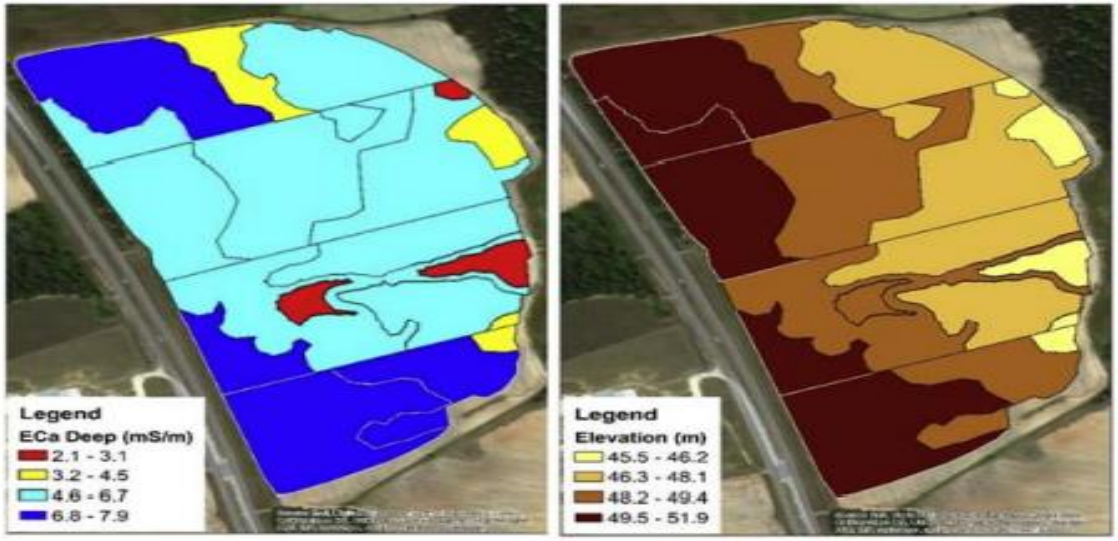
Precision Irrigation

Smart Irrigation in Georgia, USA. A case study on cotton

University of Georgia

Vasileios Liakos, George Vellidis

Monitoring



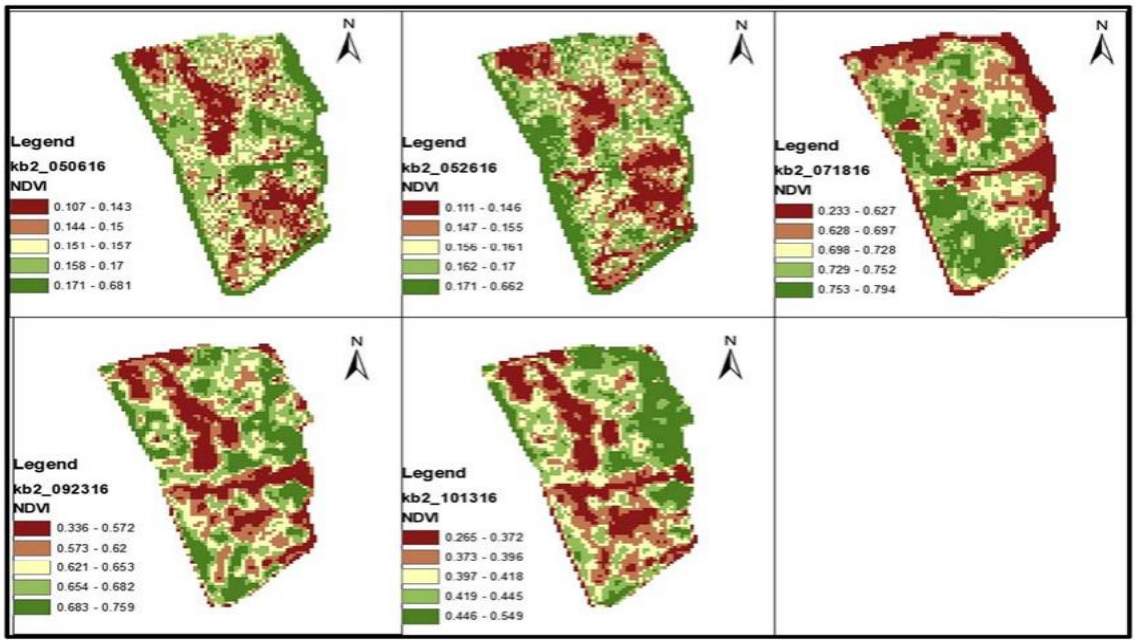


FIGURE 7.4.3 Examples of the NDVI variability of the crop canopy from May to October of 2016. The spatial resolution of the images is 10 m.

Recommendation

FIGURE 7.4.6 Picture taken from the UGA SSA web portal showing the irrigation recommendations. The aerial image of the field is overlaid by the irrigation management zone layer and the strip layer. The legend at the bottom right shows the irrigation recommendations for shallow rooted plants (roots up to 0.38 m) and deep rooted plants (roots up to 0.76 m) plants respectively.

Action

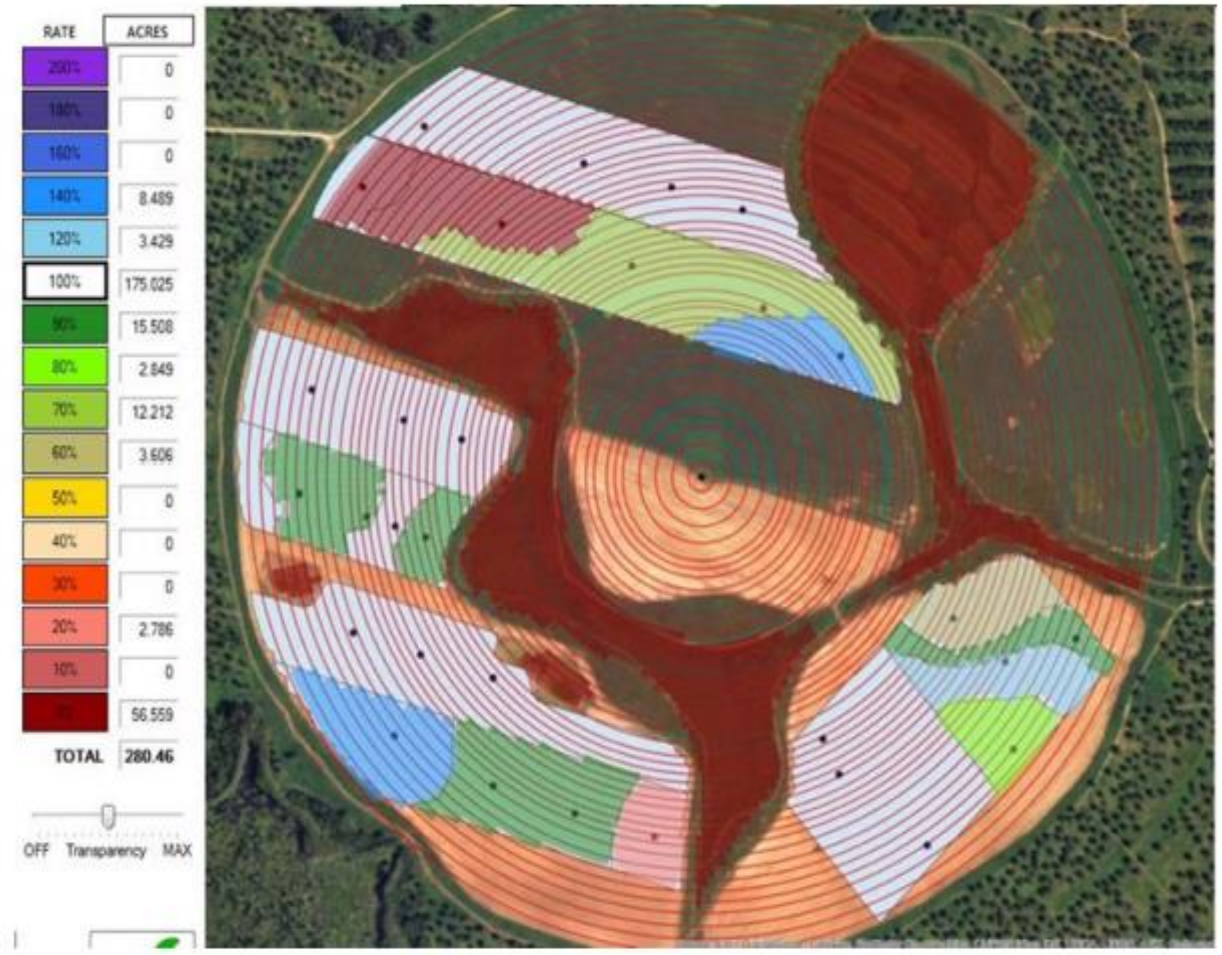


FIGURE 7.4.7 An example of a prescription. Users should assign a specific colour to each cell of the grid. Each cell is associated with a specific percent which represents how long the sprinklers will stay on. At 0% the sprinklers are off and at 100% the sprinklers are always on. The time that the sprinklers stay on determines the actual irrigation rate.

Promising results compared with standard method

- Less irrigation water
- Much higher irrigation water use efficinecy
- Higher or equal yields

Agricultural Internet of Things and Decision Support for Precision Smart Farming

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AP

OPPORTUNITY

- CREATE NECESSARY INFORMATION FOR MAKING GOOD CHOICES

- GIVE FARMER A DETAILED AND COMPLETE PICTURE OF HIS FIELD

- ACCUMULATE EVER-INCREASING AMOUNT OF DATA ON AGRICULTURAL OPERATIONS

CHALLENGE

- GIVE INFORMATION TOOLS TO THE FARMERS TO IMPROVE THEIR PRODUCTION AND ECONOMIC SITUATION

- QUANTIFY THE CONTRIBUTION OF INFORMATION AND TECHNOLOGY TO AGRICULTURE PRODUCTION

- MINE, ORGANISE, EVALUATE DATA TO CREATE RECOMMENDATION FOR FARMER COMMUNITY

CONCLUSIONS

- PRECISION IRRIGATION CAN HELP FARMERS TO IMPROVE CROP PRODUCTION AND WATER MANAGEMENT

- TECHNOLOGIES AND PRACTICES OF SUCCESSFUL OPERATIONS CAN BE SHARED AMONG THE FARMERS

- THE CONTINUOUS IMPROVEMENT AND INTEGRATION OF PRECISION IRRIGATION INTO THE FOOD SUPPLY CHAIN WILL CONTRIBUTE TO FOOD SECURITY AND WATER SUSTAINABILITY IN A COUNTRY AND THROUGHOUT THE WORLD

Thank you for attention!