



Food and Agriculture
Organization of the
United Nations

World Soil Day

Farm scale innovations and research needs in addressing soil salinization

Halt **soil** salinization,
boost **soil** productivity

5 DECEMBER 2021

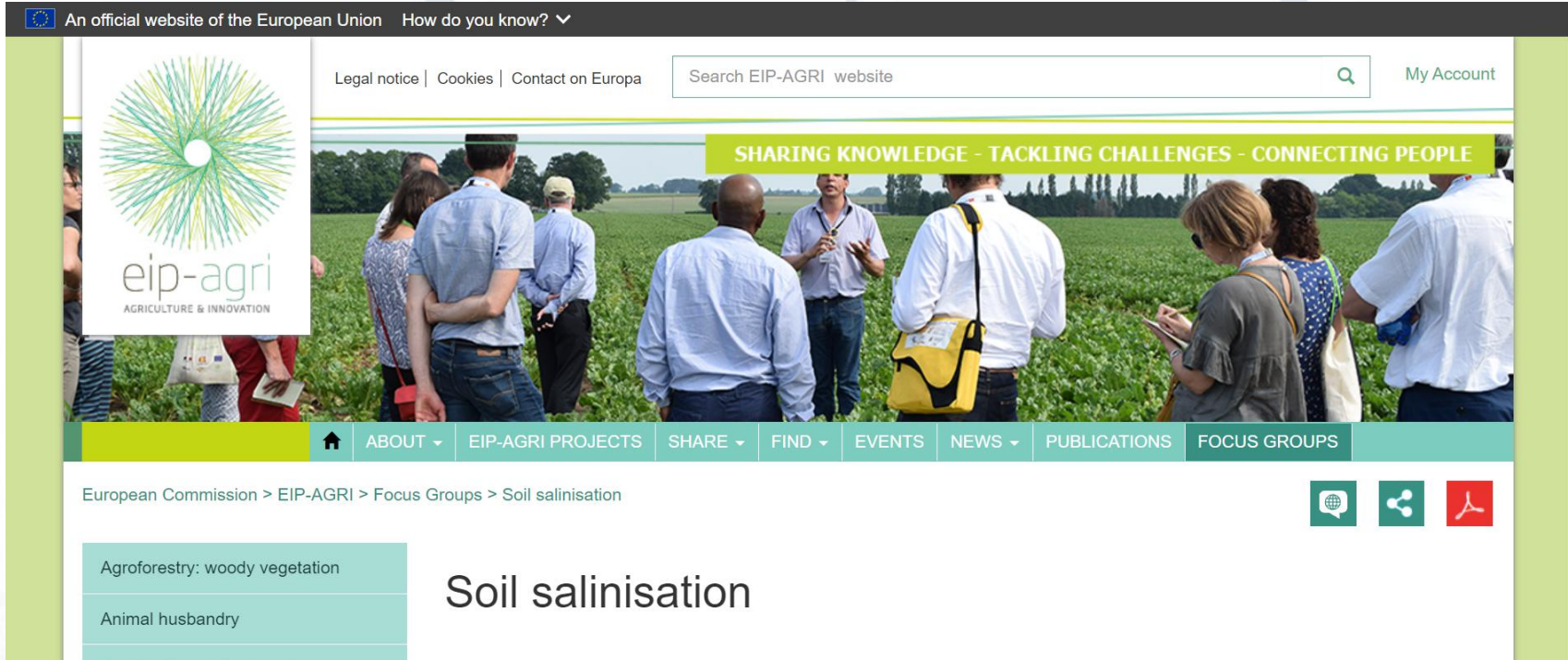

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IUSS President elect
CNR-IBE, Sesto Fiorentino, Italy



Consiglio Nazionale delle Ricerche
Istituto per la BioEconomia



<https://ec.europa.eu/eip/agriculture/en/focus-groups/soil-salinisation>



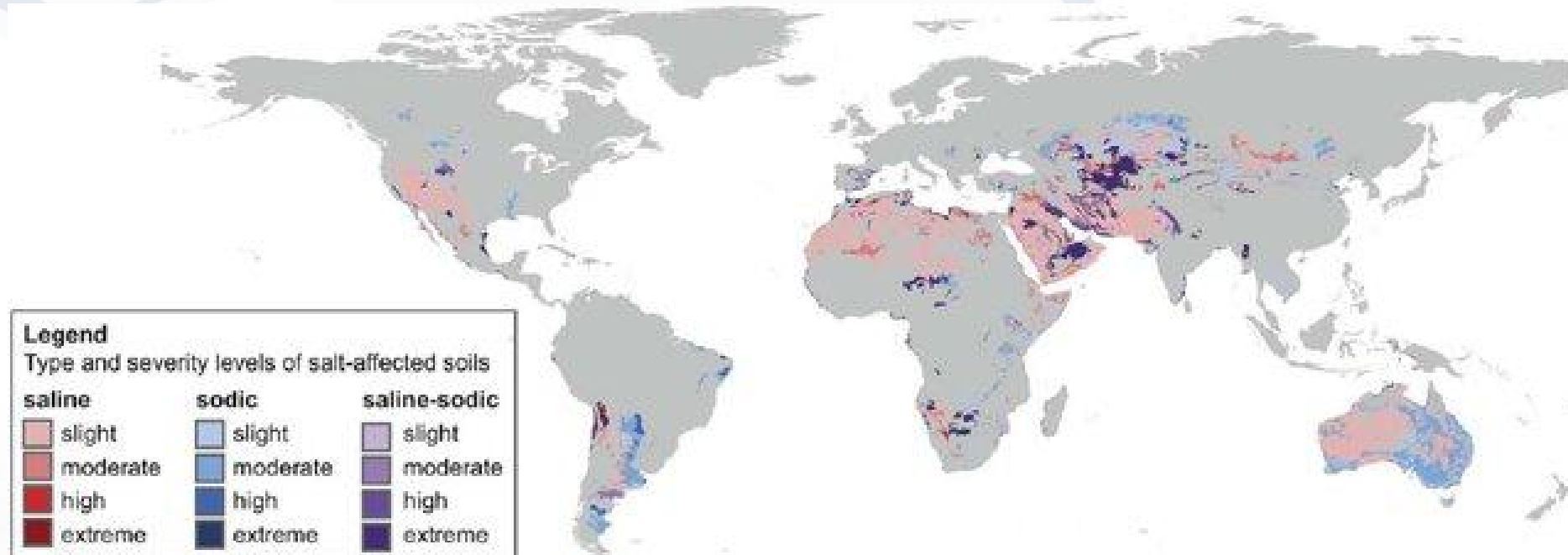
The screenshot shows the EIP-AGRI website interface. At the top, it identifies itself as an official website of the European Union. The main header features the EIP-AGRI logo and the tagline 'eip-agri AGRICULTURE & INNOVATION'. Below the header, a navigation bar includes links for 'ABOUT', 'EIP-AGRI PROJECTS', 'SHARE', 'FIND', 'EVENTS', 'NEWS', 'PUBLICATIONS', and 'FOCUS GROUPS'. The 'FOCUS GROUPS' section is active, displaying a list of topics: 'Agroforestry: woody vegetation', 'Animal husbandry', and 'Soil salinisation'. The 'Soil salinisation' page is currently selected, showing a large image of a group of people in a field and the title 'Soil salinisation'.

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A global threat

*Global salt-affected soils, by type and severity
(Wicke et al., 2011, based on data from the HWSD)*



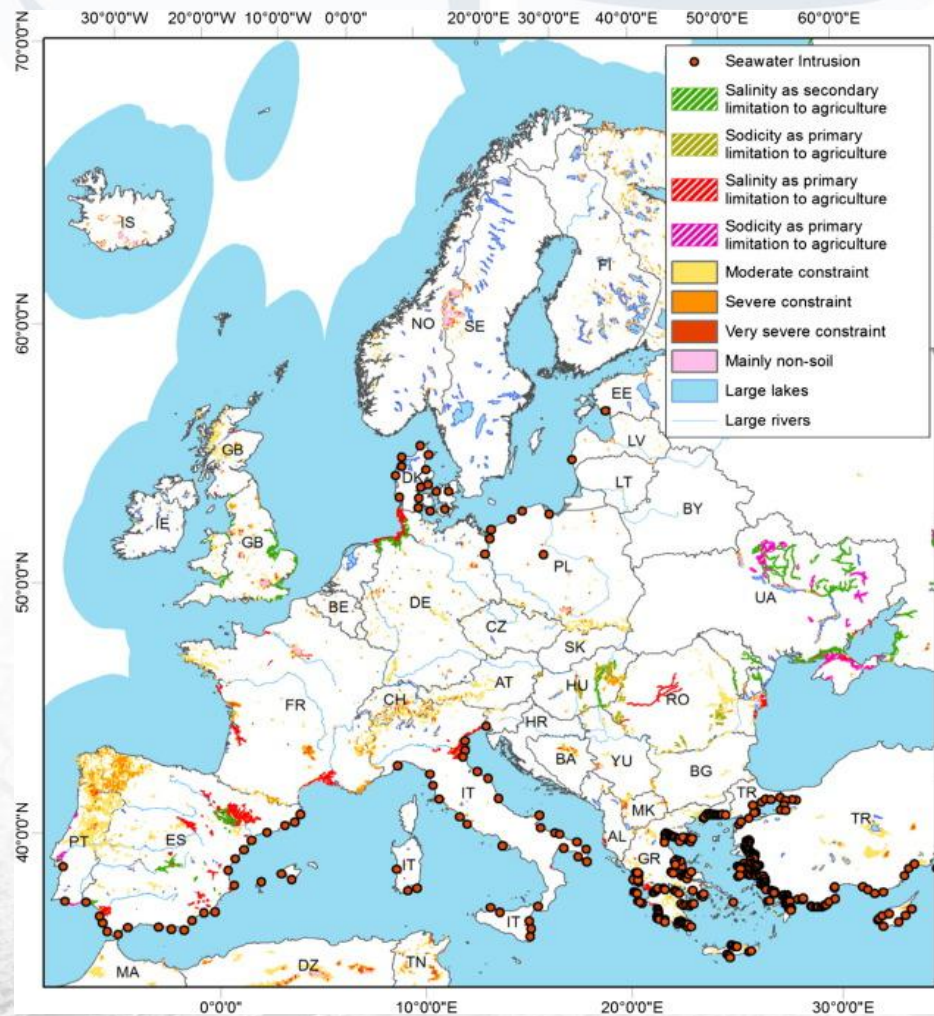
1,128 Mha (Wicke et al. 2011)
or 955 Mha (Szabolcs, 1989)
or 831 Mha (FAO 2008)



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Saline and sodic soils in Europe



79.4 Mha, (FAO, 1980)
30.7 Mha (Rengasamy, 2006).



(Daliakopoulos et al., 2016).

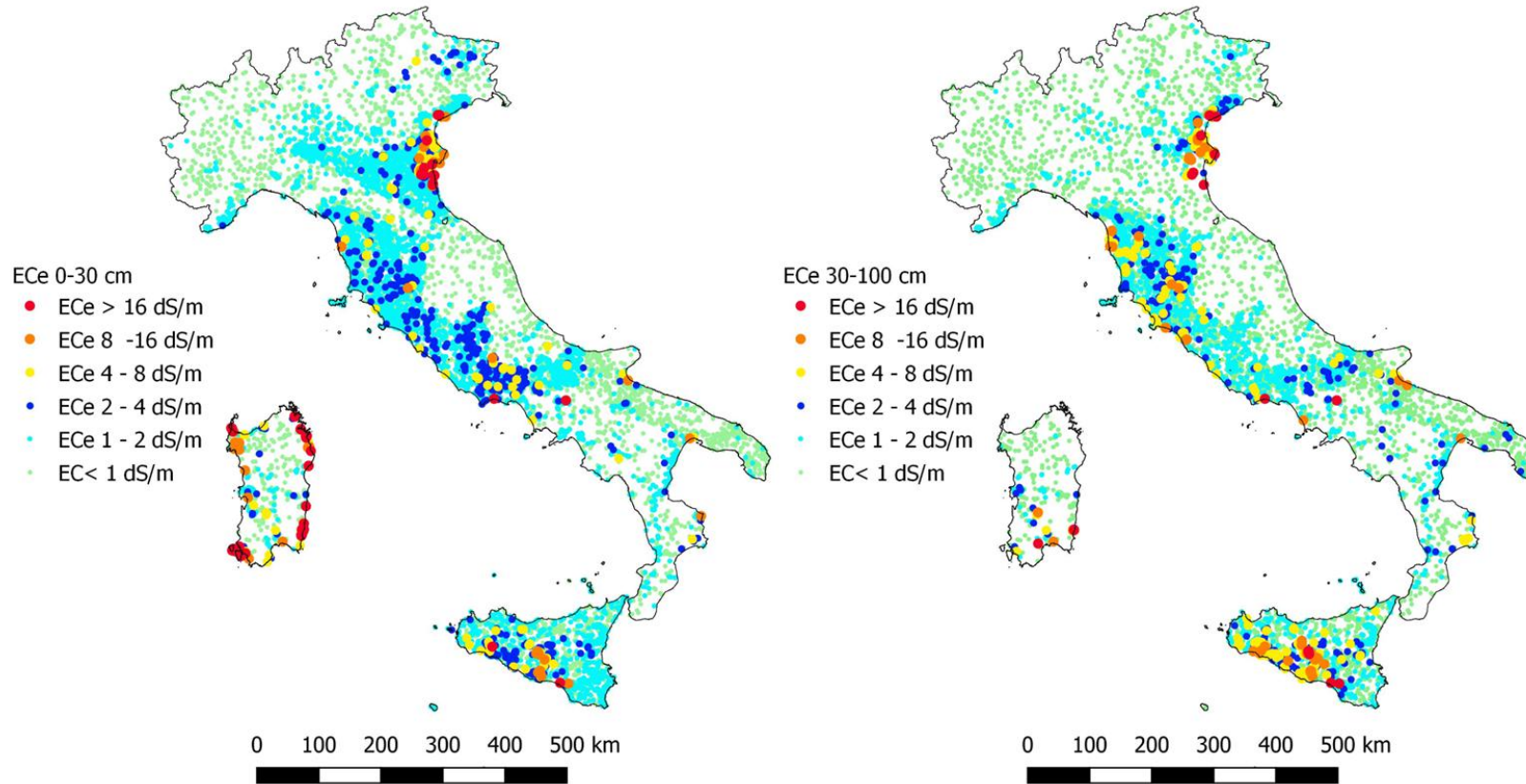
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Saline soils in Italy

Topsoil enriched by irrigation and depositions of Sahara dust

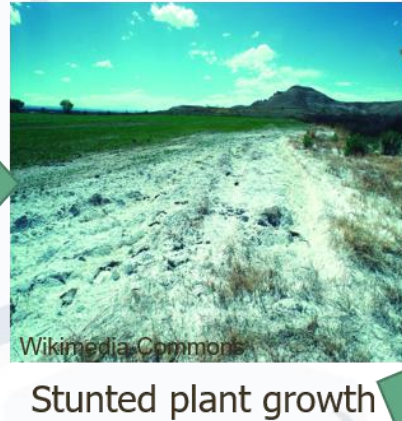
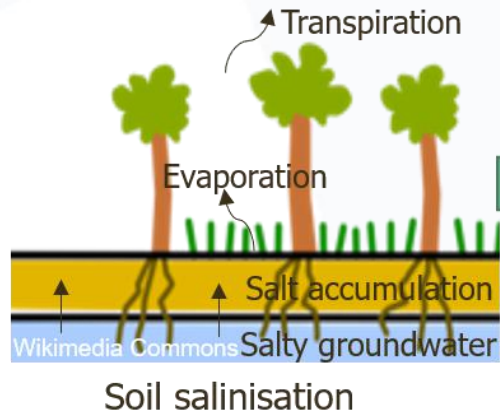
Inland soils may be Hyposalic or Hyposodic (saline or sodic in depth)



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Degradation of soil quality and ecosystem services in secondary salinised soils



Coarse texture (sand)



Coarse texture (sand)

OTHER EFFECTS



CO₂ emissions from soil



Change of the water cycle



Compaction



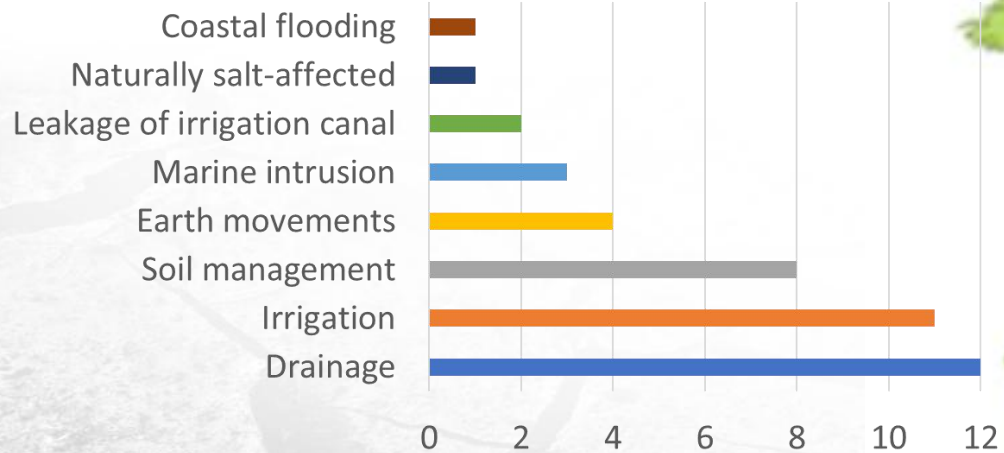
Fine texture (clay)

on, b

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EIP-AGRI Farm scale innovations

25 locations with
salinisation
problems due to:



Irrigation scheduling

Problems:

- Fulfilling crop water requirements,
- Promoting salt leaching from the root zone
- Controlling the ground water level
- Dealing with limited water availability

Goal:

- Store salts in upper soil layers, but beyond the root zone of active uptake

Innovative solutions:

- Developing and using simulation models and Decision Support Systems to define adequate volumes of water and irrigation frequency



Water harvesting

Problems:

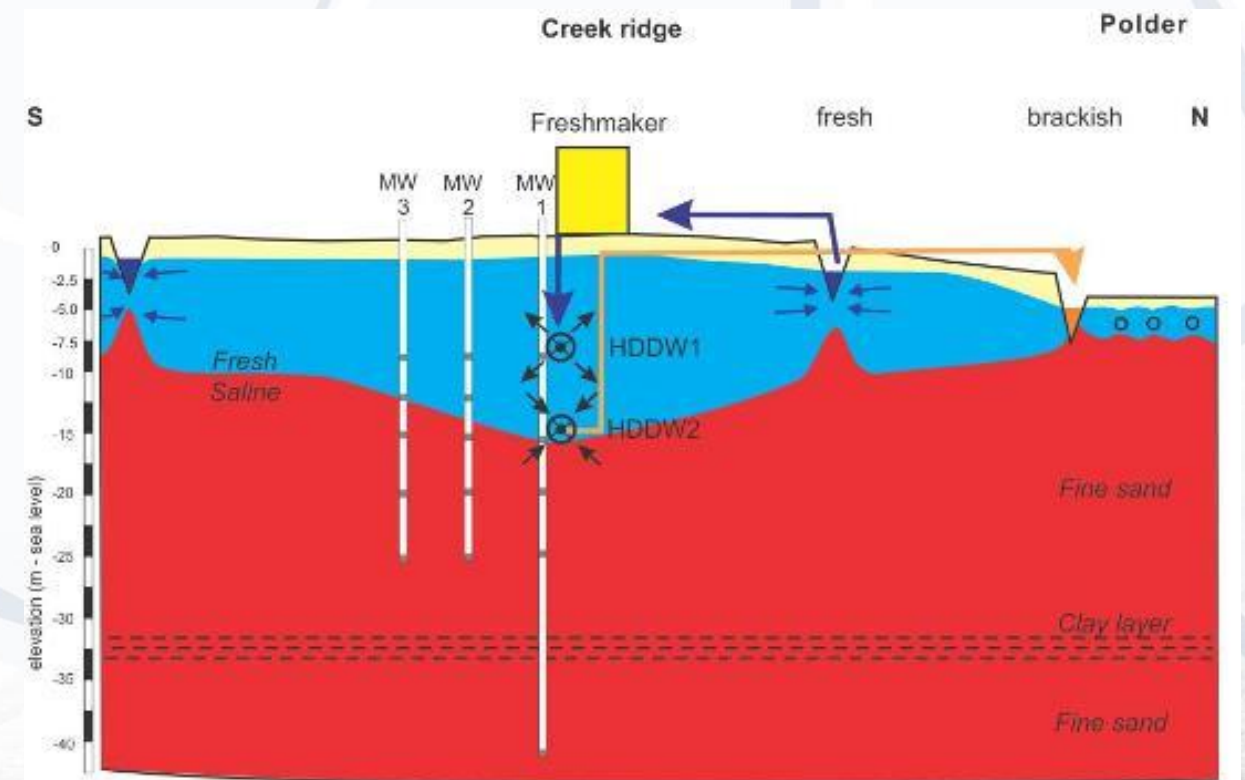
- Lack of fresh water

Goal:

- Satisfy crop needs at crucial phases

Innovative solutions:

- Storing fresh water in winter to use it in the most sensitive phenological stages of the crop



Chemical amendments

Problem:

- Sodicity

Goal:

- To substitute Na on the CEC and then leach it

Innovative solutions:

- Testing of mined-gypsum, coalgypsum, lactogypsum, in comparison with sulfuric acid



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Phytoremediation

Problem:

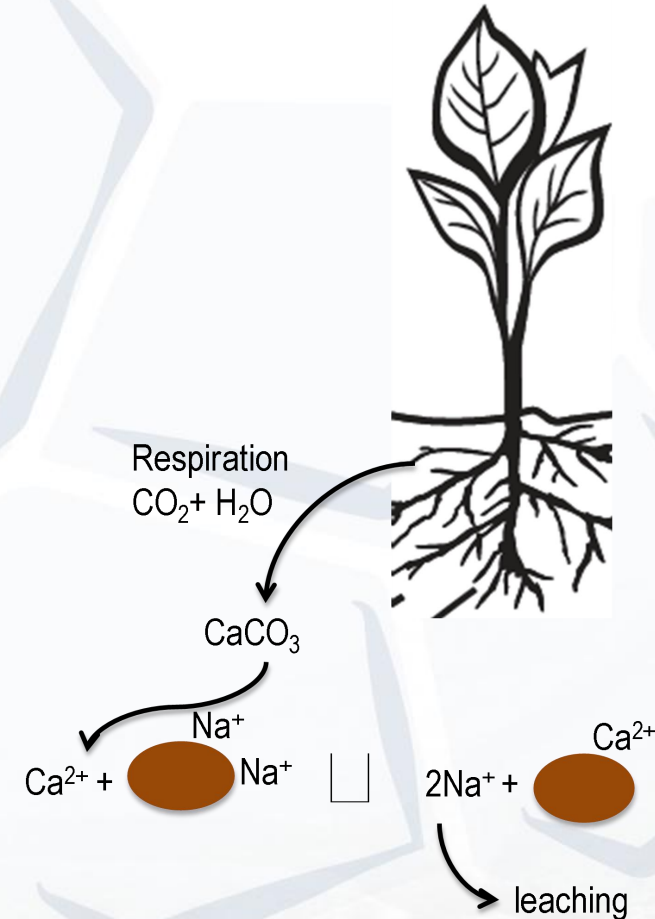
- Salinity and sodicity

Goal:

- To remove Na in depth

Innovative solutions:

- Testing phytoremediation for low to medium sodicity
- Cheaper and more sustainable than chemical remediation
- Improving carbon sequestration in soil.



Plant selection and crop rotation

Problem:

- Pressure increase on crops

Goal:

- Adapted varieties and crop systems

Innovative solutions:

- Genetic development
- Grafting
- Cover crops
- Improved rotations, according to sensitivity to drought



Land-use change

Problem:

- Unfeasible agronomic solutions

Goal:

- Implementing soil ecosystem services beyond food production

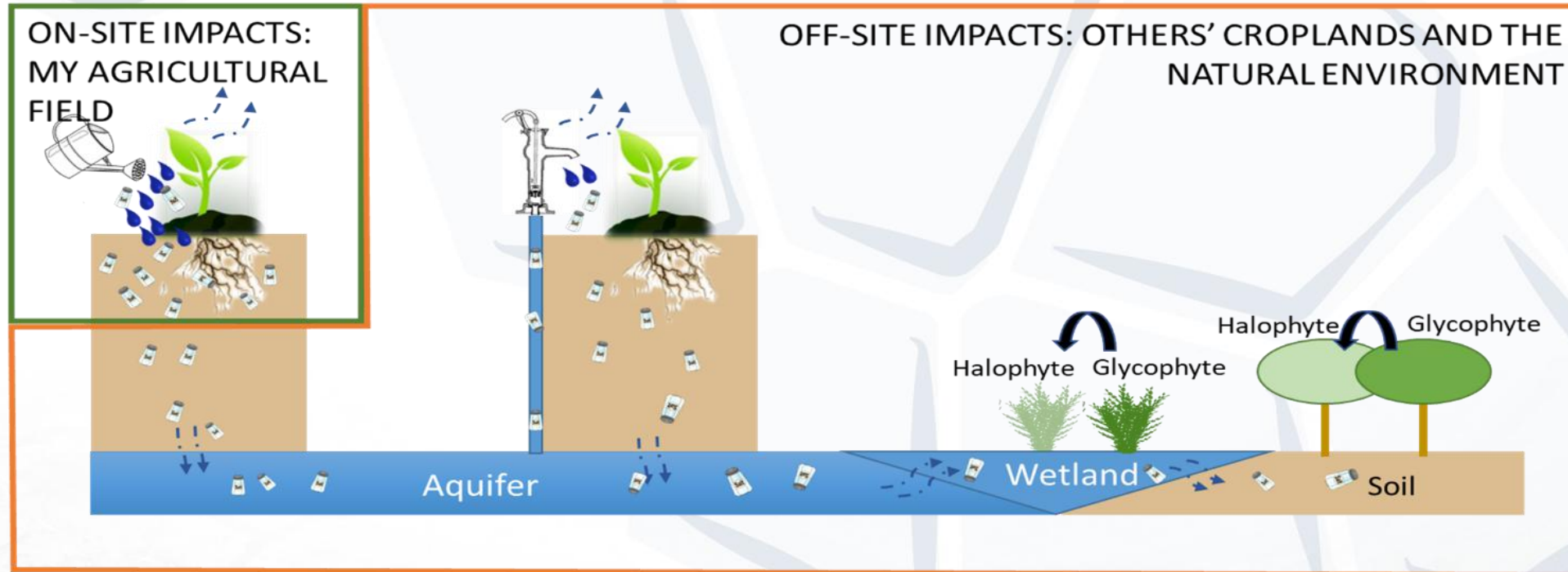
Innovative solutions:

- Land-use planning through conversion to recreation and ecotourism, cultural heritage, or natural protection areas.



Research needs from practice

Off-sites impacts of saline soils management



- **Analyse salt transport and deposition processes in experiments at the regional scale (watershed) considering their impact on ecosystem services**

Strategies to prevent soil salinization

Consequences of excessive earth movements before the plantation of a vineyard: salt efflorescence and death vines



- ***Which procedures should be followed for the proper dimensioning of slope reshaping and earth movements before crop plantation?***

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Elucidating the physiological and molecular basis of crop tolerance to salinity



- ***Development of salt tolerant/ resistant varieties***
- ***Profiling the nutritional content of crops grown under saline conditions***

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Explore marketing opportunities for halophytes or for crops with special properties

Seed potato varieties adapted to saline conditions are exported in north Africa and the Middle East

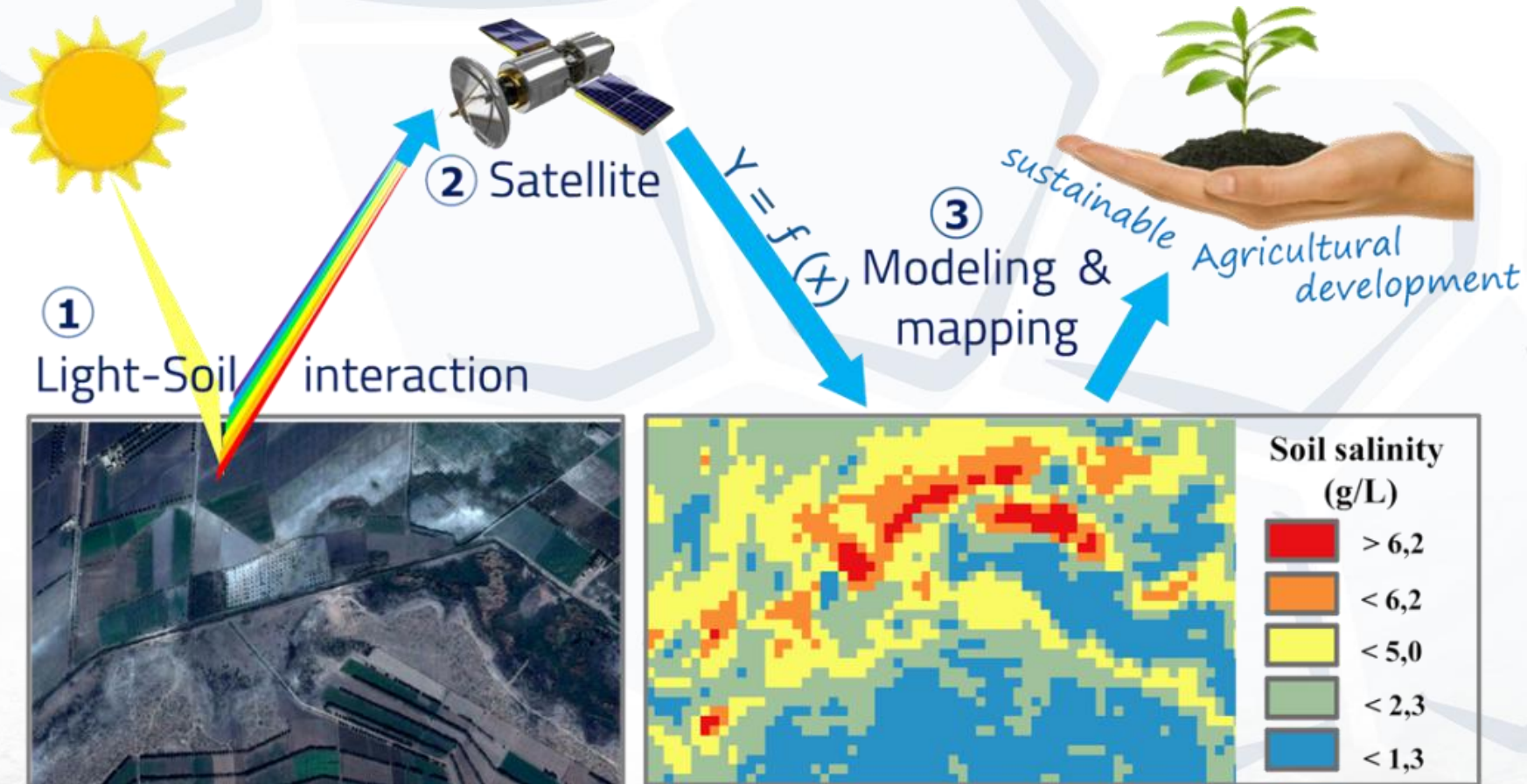


- ***Defining thresholds of commercial return for quality traits improvements vs. yield loss in saline environments***
- ***Profiling the biosynthesis of biofunctional molecules that may have beneficial health implications***

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Integration of remote sensing, modeling and mapping



- How can we implement soil ecosystem services beyond food production in modelling?

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Soil microbiology in salt-affected soils



- ***Biofertilizers to improve soil quality and the delivery of ecosystem services***
- ***Study of microbiota functions under different saline conditions and agronomic practices***

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Thank you for your attention!





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