



## Work Programme 2012 “COOPERATION”

Theme 2: Food, Agriculture and Fisheries, and Biotechnology

Activity 2.3: Life sciences, biotechnology and biochemistry for sustainable non-food products and processes

Area 2.3.5: Environmental biotechnology

KBBE.2012.3.5-03: Biotechnological waste water treatments and reuse in agronomical systems

Water4Crops



**Integrating biotreated wastewater reuse and valorization with enhanced water use efficiency (WEF) to support the Green Economy in EU and India**



# The problem

- ◆ Around 205 million hectares of irrigated agricultural land providing about 40% of crop production in South America, Asia, Africa. Irrigated area expected to grow by 40 million hectares by 2030.
- ◆ Area equipped for irrigation expected to expand by a rate of 0.6% per year up to 2025. In parallel, the global potential irrigation-water demand will rise by 9.5% in 2021-25
- ◆ Climate changes will exacerbate an already critical situation
- ◆ The challenge of irrigated agriculture needs to be addressed both as an essential environmental issue and also as a precondition for sustainable economic growth.



# The challenge - 1

New approaches needed to cope with the imbalance between water supply and demand

- ✓ sustainable and efficient use of water resources,
- ✓ nonconventional water resources,
- ✓ demand management,
- ✓ minimizing input to agriculture through precise agriculture practice,
- ✓ minimizing wastes,
- ✓ recycling and reuse of natural resources in sustainable manner.



## The challenge - 2

Traditional concepts to increase waste water re-use in irrigated agriculture are **unlikely** expected to bring a breakthrough in economic developments at rural areas.

Greatest challenge in the water and sanitation sector over the next two decades (World Bank):

***the implementation of low cost sewage treatments that will at the same time permit selective reuse of treated effluents for agricultural (or industrial purposes).***

The comparable high costs for treated waste water, its spatially restricted availability and the limited return on investment in irrigating field crops call for new approaches and combinations of products. Time has come to explore new ways for development both in Europe as in India.



# The Water4Crops approach and objectives - 1

Technologies developed in India and Europe, both in the field of bio-treatment and increased water use efficiency are **basically comparable** but their applications are context specific and would require new adaptations and integration.

Water4Crops aims

- to provide a comprehensive set of individual key technologies (reflecting the highest state of the art in Europe and India),
- to understand the differences (at processing and application levels)
- to identify best possible modifications which would allow a higher and combined use of technological advances from both at both regions.



# The Water4Crops approach and objectives - 2

Water4Crops plans to:

- a) develop innovative **biotechnological wastewater treatments** for improved water recycling,
- b) initiate the co-creation of alternative combinations of **bio-treatment, recycling** of high value elements, and combinations for **bioproducts** leading to a better commercialization of biotechnology and agricultural products in Europe and India,
- c) improve **water use efficiency** at field level through agronomics, plant breeding and locally adapted new irrigation technologies and accurate crop water requirement measurements techniques.

Water4Crops will boost bio-based economy by applying a **double track approach**.



# The Water4Crops double track approach - 1

## A comprehensive set of key Green-Economy technologies

- 1) valorization of **volatile fatty acids**;
- 2) obtaining: natural **antioxidants** (polyphenols), **biopolymers** (PHAs), **energy** (biomethane), **new substances** for selective recovery of valuable products from wastewater;
- 3) **tailoring effluent properties** from decentralized innovative bioreactors;
- 4) **low bio-sludge production** by SBBG Reactors and removal of organopollutants by nanobiocatalysts;
- 5) **reduced clogging** of artificial wetlands;
- 6) suitable **precision irrigation systems** for reclaimed water;
- 7) new **monitoring** for increase water efficiency in irrigation;
- 8) understanding the genetic mechanisms regulating **drought-adaptive traits** across maize, sorghum, millet and tomato;



# The Water4Crops double track approach - 2

## Identification of new product market combinations.

The co-creation process will be organized by two Mirror cases

- i) Emilia Romagna area in Italy
- ii) Hyderabad region in India

within a specific Science-Practice Interface (INNOVA platforms).

Developing the new applications and business opportunities with regional enterprises and stakeholder will move India and Europe towards a Green Economy.





**Biotechnological Waste Water Treatment**

WP1-EU: Valorization, treatment and reuse of agrofood industry wastewaters (VITO)

WP2-EU: Innovative municipal wastewater bio-treatment for agricultural reuse (IRSA)

**Biotechnological Waste Water Treatment**

WP1-I: Agrofood industry wastewaters valorization and reuse of (TERI)

WP2-I: Innovation in municipal wastewater bio-treatment and reuse (AUUP)

**Enabling Green Economy**

WP 5-EU: Identifying business opportunities and integration of solutions (Alterra)

WP 6-EU: Dissemination and technology transfer (STEP)

WP 5-I: Enabling green growth using water treatment and reuse innovations (TERI)

WP 6-I: Dissemination and technology exchange (EIRC)

**Water Quality & New application fields**

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**Improved Water Use Efficiency**

WP3-EU: Agricultural water management (CEH)

WP4-EU: Improving WUE and drought tolerance via genomics approaches and modelling (UNIBO)

**Improved Water Use Efficiency**

WP3-I: Agricultural water management (ICRISAT)

WP4-I: Development of water efficient crop varieties (ICRISAT)

**Joint coordination and interactions**

WP7 Management (IRSA)

WP7 Management (ICRISAT-EIRC)



## **Through the INNOVA stakeholder platforms, the Mirror Cases will:**

- Transmit stakeholders demands to technology developers;
- Reflect the achievements of technology developers to identify new solutions and business opportunities;
- Mirror the experience of Europe and India for mutual advancements.



## **WP4 - Efficient water use in Irrigated Agriculture**

Adapt advanced water saving irrigation technologies and strategies to water use and reuse at field scale (Regulated Deficit Irrigation or Partial Root Drying method; use of saline water)

Provide low and high tech, multi-functional solution tailored for field scale agriculture

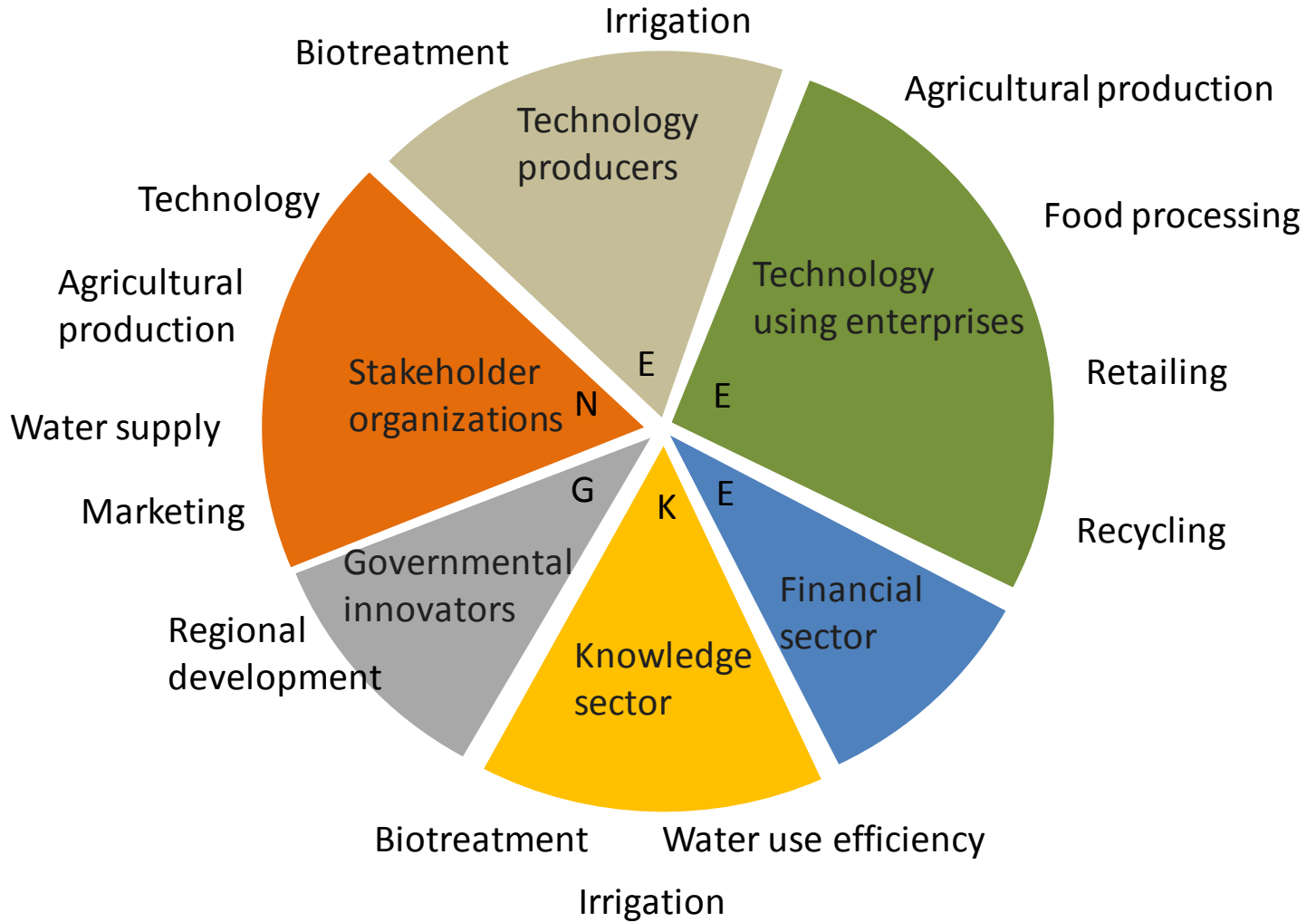
Further develop, test and adapt actual evapotranspiration, Eta and soil water sensor technologies (Scintillometry, Eddy Covariance, Cosmos)

Modelling the impact of the proposed irrigation technologies and strategies on crop, soil and groundwater at field scale

Assessment and benchmarking of the opportunities of water saving at field and basin scale



# Targeted Composition of the INNOVA platform at Mirror cases





# Water4Crops – EU Partnership

Participant number	Participant name	Short name	Country
1 Coordinator	Istituto di Ricerca Sulle Acque del Consiglio Nazionale delle Ricerche	IRSA	Italy
2	Natural Environment Research Council - Centre for Ecology and Hydrology	NERC	United Kingdom
3	University of Applied Sciences Northwestern Switzerland	FHNW	Switzerland
4	Università di Bologna - DiSTA Università di Bologna – DICAM	UNIBO	Italy
5	Flemish Institute for Technological Research	VITO	Belgium
6	Technical University of Crete	TUC	Greece
7	Helmholtz Centre for Environmental Research	UFZ	Germany
8	Università di Catania – GESA	UNICT	Italy
9	Centre National du Machinisme Agricole, du Genie Rural, des Eaux et des Forets	IRSTEA-CEMAGREF	France
10	Institut National de la Recherche Agronomique	INRA	France
11	Stichting Dienst Landbouwkundig Onderzoek	ALTEERRA	The Netherlands
12	Consorzio di Bonifica di Secondo Grado per il Canale Emiliano Romagnolo	CER	Italy
13	Deutsche Gesellschaft für Internationale Zusammenarbeit	GIZ	Germany
14	INOFEA GmbH	INOFEA	Switzerland
15	SIMA-tec GmbH	SIMA-TEC	Germany
16	BionActis International Group SA	BIONACTIS	Switzerland
17	PHYTOREM S.A.	PHYTOREM	France
18	BioPlanta GmbH	BIOPLANTA	Germany
19	Environmental Nutritional and Health Services S.A.	ENVINHEALTH	Greece
20	Horta srl	HORTA	Italy
21	S.T.E.P. Consulting GmbH	STEP	Germany
22	Università di Roma “La Sapienza”	UNIRM	Italy



## Water4Crops – India Partnership

<b>Participant no.*</b>	<b>Participant organisation name</b>	<b>Country</b>
1	International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)	India
2	The Energy and Resources Institute (TERI)	India
3	Amity University Uttar Pradesh (AUUP)	India
4	University of Agricultural Sciences Dharwad (UASD)	India
5	MS Swaminathan Research Foundation (MSSRF)	India
6	National Environmental Engineering Research Institute (NEERI)	India
7	Jain Irrigation Systems Limited (JISL)	India
8	Euro India Research Centre (EIRC)	India
9	SABMiller (SABM)	India
10	University of Agricultural Sciences Bangalore (UASB)	India
11*	PRAJ Matrix (PRAJM)	India
12*	Ugar Sugar (UGSG)	India
13*	Larsen & Toubro (L&T)	India
14*	ION Exchange	India

Thanks for your attention !!!

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