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## THE VALLEY OF NATURE AND TECHNOLOGY

## NZYMES<sup>4</sup>FUTURE

**Concise introduction to the start up of a bio region to be located in Tunisia**

Bologna 15<sup>rd</sup> March 2014

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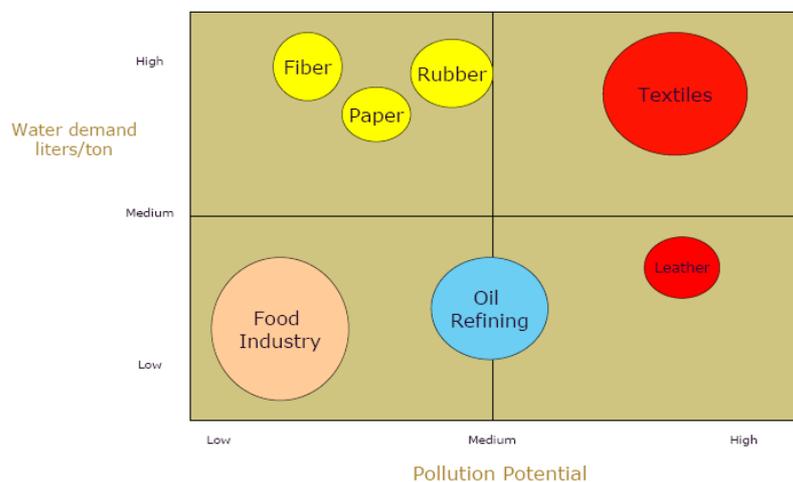
## Entering the KBBE era for African economies

**It will not be possible to mitigate the negative impacts of climate change and enter the bio economy era without developing scientific and technological capabilities responsive to the emerging economies of the Mediterranean Basin.**

Plant, environmental and industrial biotechnologies represent an enabling cluster of technologies, vital for the competitive and sustainable development of the whole Textile & Apparel industry as well as for many others.

This will require, at the minimum, the commitment of aware and competent people (scientists, technicians, plant-breeders, politicians,) the investment in physical infrastructure (properly equipped laboratories and well prepared and stable teams), the commitment of politicians in order to provide adequate financial investments.

Biotechnologies could represent a tremendous chance for Africa to increase yields, control food safety and security, unlock industrial, touristic and archaeological potential and valorise the precious tradition of arts and craft of the Mediterranean Basin. All these potential are although **hindered by a complex set of constraints**, among which barriers created by developed countries against access to appropriate, affordable, replicable technologies and the lack of awareness and capacities in both policy makers and civil society.





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**Change is not possible relying only on short term sectoral initiatives.** Biotechnology is a key asset for both Northern and Sub Saharan Africa. In the new millennium, underestimating this challenge may result in a serious structural deficit in a long term perspective.

**Developing a sustainable bio-based economy that uses eco-efficient bio-processes and renewable bioresources is one of the key strategic challenges for the 21st century for both Africa and Europe. A challenge to be faced together.**

**The project addresses 2 main challenges:**

- **Creating an enabling atmosphere for Plant Environmental and Industrial biotechnology development & application in Africa;**
- **Establishing and empowering a vibrant well networked research driven cluster fully embedded in the rural zones and linking industrial research with eco design and creative industry.**

**The major added value of this project resides in the nature and extension of the networks involved and in the nature of the available know how.**

The ARTES institute has promoted and coordinated a large international network and cooperative work, called **nzymes4future (n4f)** which aims to create research driven clusters in the field of plant, environmental and Industrial Biotechnology in emerging economies, fostering the smart development of the KBBE (Knowledge Based Bio economy) era in these countries.

This is a broad and expanding enabling technology field that includes scanning the microbial diversity of various environments (e.g. desert, oceans and deep seas) and deciphering their genetic information aimed at isolating micro-organisms that could be used in a variety of agricultural, environmental and industrial uses. This broad technological areas is articulated in 4 large field of research: 1, study of biomass; 2, bioprocessing & biorefining; 3, end products; 4 life cycle analysis, and a transversal subject area, 5) bioinformatics.

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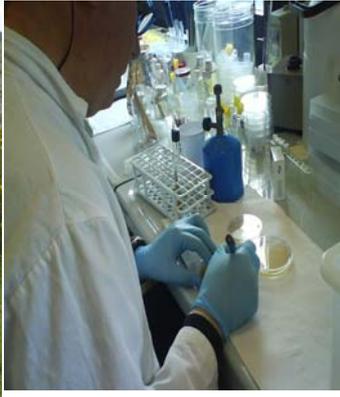
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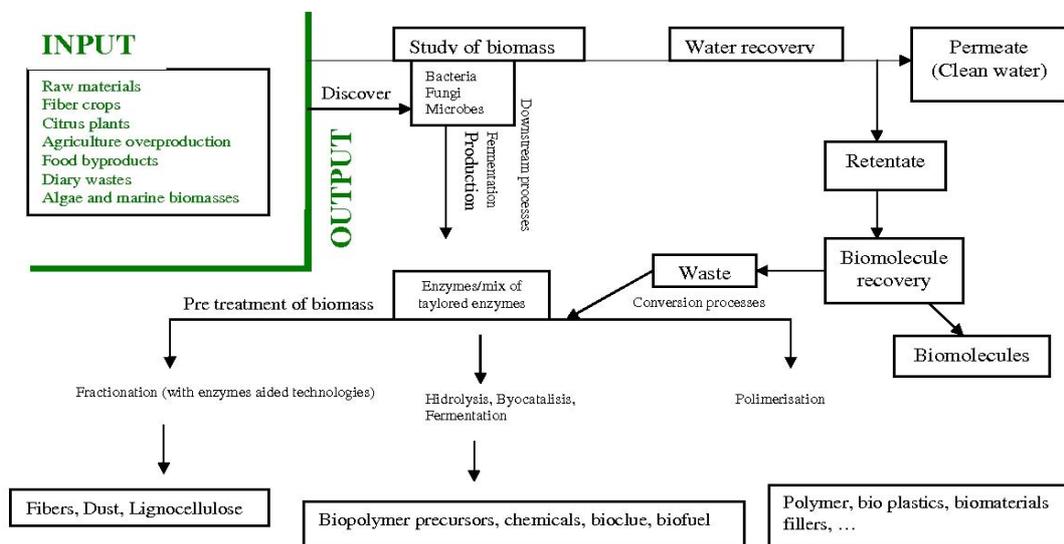
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## White Biotechnology Value Chain Research Excellence for Competitiveness



### Concise outlook of the project

This concise outlook is a summary of more than 300 pages of detailed technical specification written by a committed team of European and African scientists, believing in a Mediterranean renaissance.

The cluster start up will represent the first pilot experience in the Mediterranean Basin and will entail 6 components.

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## 1 / BIOTECH LAB

Industrial research laboratory addressed to public and private market of research. It will be equipped with the most advanced technologies and instruments. It should attract the best Tunisian researchers but also a mix of Africans and Europeans and foster return of emigrated scientist, researchers and entrepreneurs. It will start from the complete exploitation of the 10 years industrial research already developed by the ARTES institute on Spartium Iunceum<sup>1</sup> (a Mediterranean scrub which could be cultivated in arid and marginal land, at any climate conditions) and focus on biomasses, such as Halfa, and other non food biomasses specific of Tunisia and in general of the Mediterranean macro region.

The laboratory will study and select the most promising biomasses, which could sustainably be grown or be available in the Mediterranean Macro Region and specialise in their bio processing from pre-treatment to fractionation, hydrolysis, fermentation, conversion (multi purpose biorefining) unlocking the innovation and competitive sustainable development of the fragile Euromediterranean regions and open the door to their leading role in the emerging bioeconomy.

Strategic objectives are:

1. To identify the status of research, world wide, concerning the most promising biomasses for biomaterials production fostering highly profiled debate among stakeholders (science, business world and society, with a primary attention to balance interests of fragile and strong regions);

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<sup>1</sup> The intense research activity has produced, in 2008, remarkable results presented and recognized internationally and in particular by the technology platform SusChem , including: - an unprecedented process of enzymatic retting of Spartium junceum stems. The process is based on the discovery, isolation and characterization of a microorganism; - the construction of a biotechnological pilot plant (on a small scale - for the extraction of 5 kg per day of crude fiber) with low power consumption (patent registration N ° 1396855 20 December 2012) tested and installed at ARSSA the experimental regional research center located in San Marco Argentano, - the creation and registration of the brand GINEXTRA (record date: March 16, 2009, registration number: 7055312, classes 01, 07, 16, 22 , 23, 40), non-disclosure agreements and cooperation among a wide network of laboratories, research centers and universities in Europe, now co promoters of n4f project.



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2. To select the already available high potential biomasses in the Mediterranean Macro Region and develop a cost effective and sustainable exploitation strategy, in a multi disciplinary and multi actor perspective;
3. To explore and benchmark with developments in methods for sustainable supply of renewable feedstock for processing of fuels, chemicals, and materials to support the development of a competitive biobased economy in the Mediterranean Macro region;
4. To build a cell factory of EuroMediterranean habitats samples (including the African great lake region), representing a novel source of biological active compounds and selected according with their biotechnological interest, such as marine environment, plant rhizosphere, metal polluted, by-products from agro-food industry.

## 2 / CO-OPs NETWORK

The co-ops will preferably employ under-employed and unemployed people. They will be properly trained according to a multi skilled profile. The co-ops will work for the public and private market in a multifarious set of activities (from cultivation to harvesting of biomasses, in-field agronomic research, territorial monitoring and maintenance, landscape management, rural community tourism, art & craft, etc.) providing the necessary raw materials for the experimentations and productions and ensuring an excellent maintenance of the territory landscape and basic infrastructures (electrical maintenance, gardening, ...).

## 3 / CLUSTER MANAGER UNIT

A specialised cluster management unit will design and coordinate the whole bio-region start up. Artes is ready to build a partnership for the management of the programme (from start-up to development) and leverage 20-years of know-how to manage community regeneration strategy in fragile areas. The centre will support the territories involved and its key actors in the socio-economic

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regeneration process. Within a decade this unit will operate as a key actor in the zone, generating and attracting innovative enterprises, with intense scientific-technological know-how.

## 4 / TERRITORY

According to the Alliance model<sup>2</sup> a community regeneration focused on environmental re-qualification programmes and entrepreneurial development will complement this action in order to regenerate social and economic environment for the cluster sustainability.

## 5 / DESIGN LAB

A design laboratory, which will develop competitive green concepts, brands and prototypes using the cluster bio processes/products and starting from the Tunisian heritage and peculiar identity.

Strategic objectives are:

1. Becoming a recognised centre of excellence in eco design;

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<sup>2</sup> A specific proposal complements this text and introduce to the Alliance community regeneration model. For a more in-depth knowledge: Infelise L., *Apprendere e cambiare in una comunità locale (Learning and change in a local community)* in Amietta, Pierluigi (Ed.) *I luoghi dell'apprendimento - metodi, strumenti e casi di eccellenza delle nuove formazioni*, Franco Angeli, Milan (2000). Infelise L. Le Mans – 12-13 June 1998, *Diagnosis/development of innovation potential in rural areas throughout innovative networking strategies. A critical appraisal of theoretical works and innovative experiences, which presents an extensive research and study of theoretical models and best practices*; Infelise L., ALLIANCE – *An alliance for the development of business and employment in rural areas: a community learning model*. Dortmund – August 2002; 42nd Congress of the European Regional Science Association; Infelise L., ALLIANCE - *an alliance for the development of business and employment in rural areas: a community learning model*. April 2003 – Pisa, Italy Regional Studies Association – *Reinventing Regions in the Global Economy Gateway*, 4 – Rural Development and the new Rural Economy Infelise L., *Nuove relazioni tra approcci cognitivi ed economici, nuovi spazi e forme di democrazia partecipativa. Per una pedagogia del cambiamento in aree fragili*, in: *La crisi dei confini. Verso un'ingegneria dello sviluppo regionale*, a cura di Claudio Del Don, Franco Angeli, Milano (2007).



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2. Providing an inspiring milieu for creative thinkers to generate and simplify dynamic models for White Technology systems and using these models in the design of complex systems;
3. Ensuring competitive green concepts, brands and prototypes using the cluster processes/products through Design for Sustainability;
4. Ensuring excellent training for people to develop a strategic vision with new ways of looking and thinking from a design perspective in order to lead effective initiatives and projects;
5. Strengthening eco-design clusters amongst potential centres in the region;
6. Ensuring an integrative design thinking centre to serve each of the areas in the Nzimes for Future system;
7. Developing of specific methodologies and tools to support a systematic approach to collaborative design and open innovation in a context of technology transfer in eco-design.

## 6 / EDUCATION SYSTEM

An education/training unit will support the cluster in all its activities, by training all the occupational profiles needed (cluster managers, biotechnologists, scientists, technician, designers, trainers, etc.).

Trainees will learn and practice thanks to a wise mentoring of the senior scientist of n4f.

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