

Competency-Based Curriculum Design to Enhance the Employability of Agricultural Engineers in Water Sector in Tunisia

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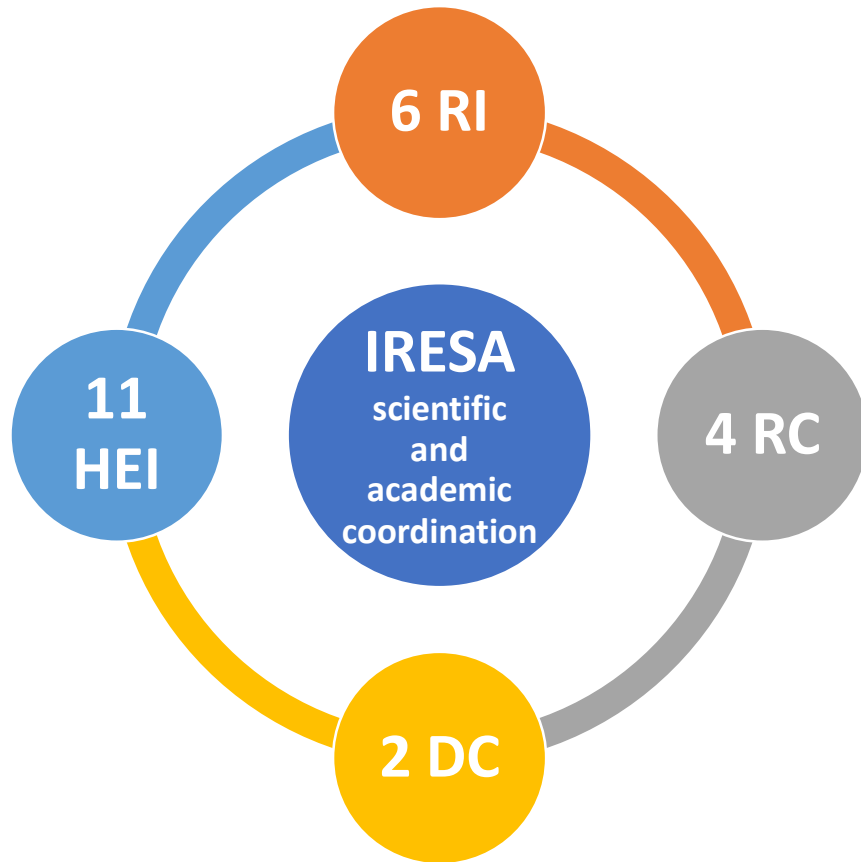
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Outline

- ❑ The Tunisian system of Agricultural Research and Higher Education (SARHE)
- ❑ Major problems and challenges facing agriculture and water sectors in Tunisia
- ❑ Competency-Based Curriculum (CBC) development: approach adopted by IRESA to review study programs of Engineers in agriculture and Water sector.
- ❑ Conclusion

Tunisian System of Research and Higher Education in Agriculture: (23) institutions



Institution of Agricultural Research & Higher Education (IRESA):

- *Founded in 1990* (Ministry of Agriculture, Water Resources and Fishery)
- **Mission:** to support the (23) agricultural institutions successfully achieving their missions in higher education, research/development (R/D) and innovation and transfer in the various fields of agriculture.

RI: Research Institutions (06)
RC: Research Centers (04)

HEI: Higher Education Institutions (11)
DC: Centers for development (02)

Challenges in Higher Education

- Employability of graduates

System of Agricultural Research and Higher Education (SARHE)



- Climate change
- Depletion of natural resources (soil, water)

Employability of graduates: a major challenge to be tackled

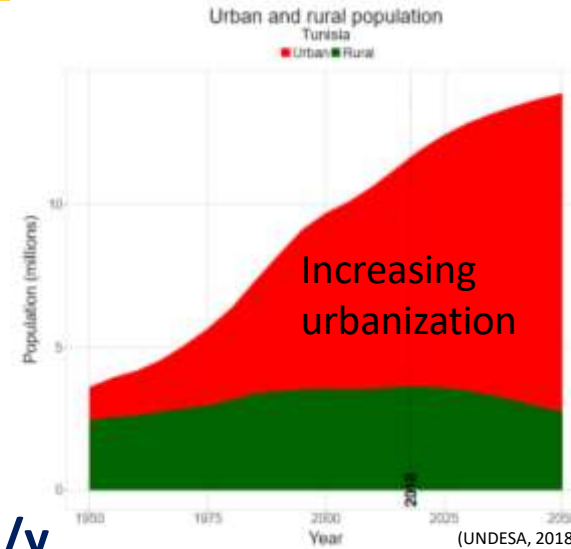
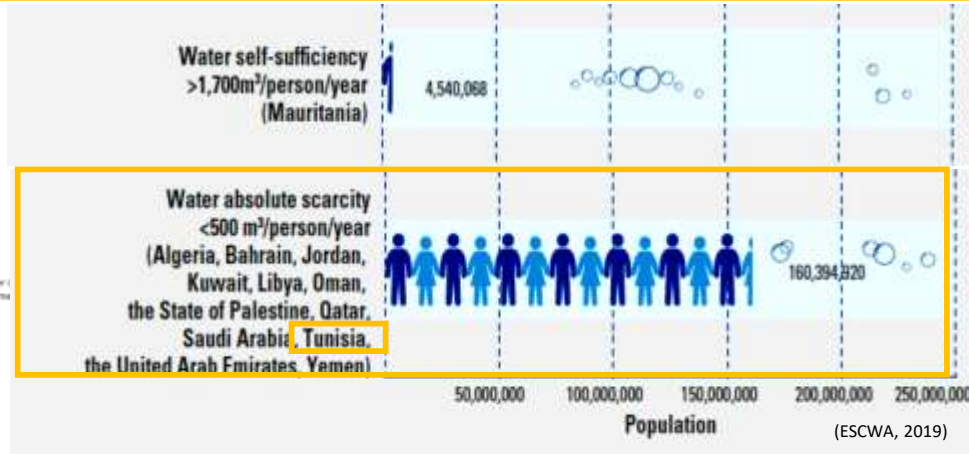
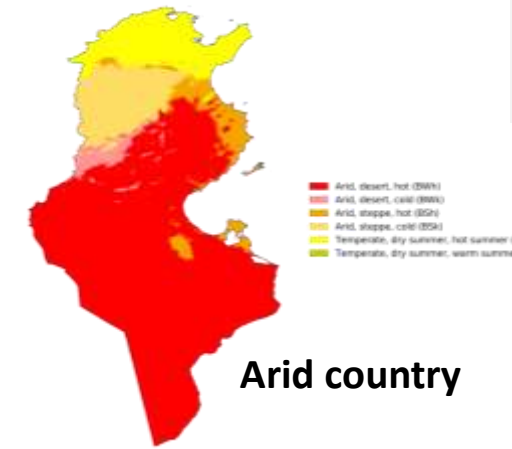
Skill gap and curricula design : one of the major problem as revealed by the strategic diagnostic made by the SARHE:

- ❑ Courses not aligned with the employers' needs
 - Employers are looking for workers with practical abilities and capable of innovating and tackling specific problems
- ❑ Discipline-based curricula approach
 - Training courses towards more specialized skills
 - Decline in capacity of integrating across disciplines
 - Low practical abilities and exposure to real world problems



Major challenges facing Tunisia's agriculture and water sectors

open-Geiger climate classification map for Tunisia (1980-2016)



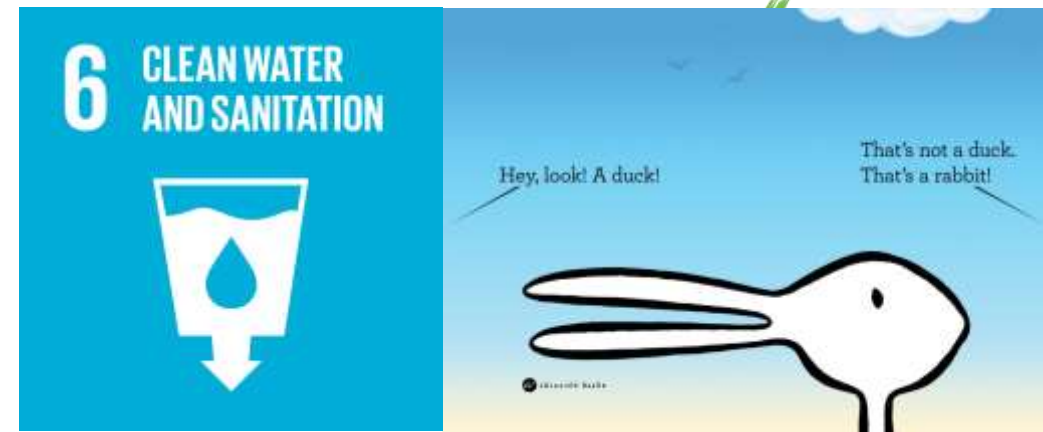
Forecasted decrease of water allocation in agriculture (m^3/ha) by 2030 by 20 to 43%

Tunisia is under absolute water scarcity: $< 500\text{ m}^3/\text{cap}/\text{y}$

- ❑ **Scarcity of renewable water resources** → Alternative resources to grow food and non-food crops.
- ❑ **Degradation of water quality:** salinization and release of anthropogenic contaminants → Advanced treatment technologies.
- ❑ **Mismanagement of water resources:** low water use efficiency ($\sim 10\text{ USD}/\text{m}^3$)



❑ Achieving SDG6 by 2030 and setting new goals requires a **paradigm shift** to be promoted through new and innovative approaches to be put into practice by the **future generations of Agricultural Engineers.**



❑ **Agricultural institutions** are in a perfect position to foster next generation of professionals and leaders to address the above challenges.

NEW GENERATION

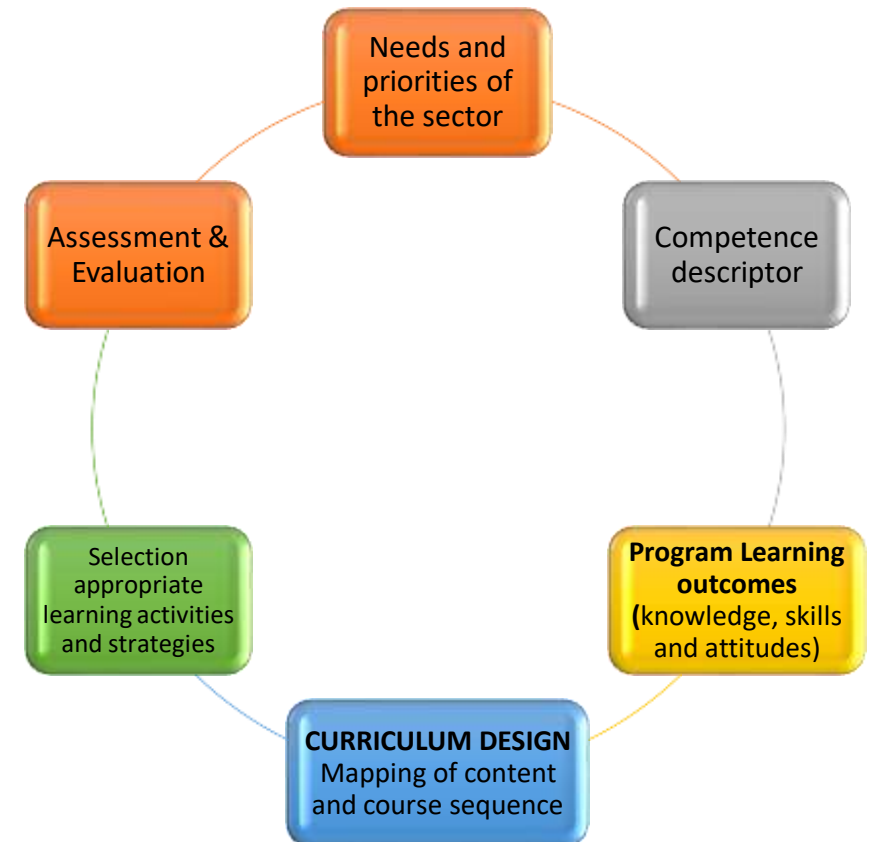


Competency-Based Curriculum (CBC) development

❑ To overcome the skill gap and better prepare future Engineers to address agriculture and water's challenges, we adopted CBC development in three disciplines including **Rural Engineering, Water and Forestry**, in four among our (11) institutions of AHE.

❑ *A process of (06) steps based on a participatory approach*

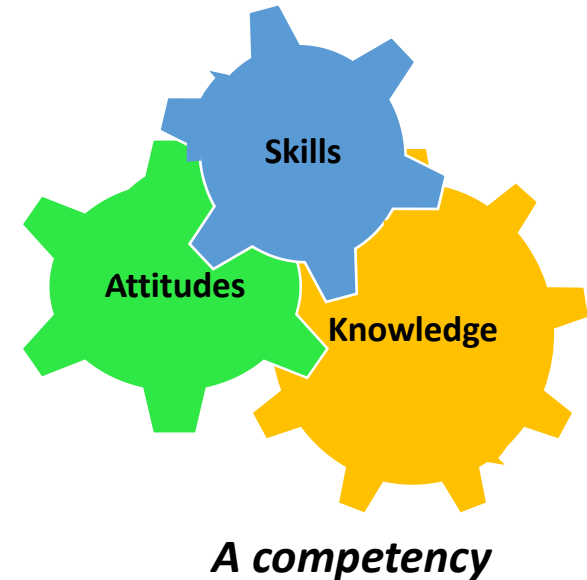
- *Analysis of job markets and employers' requirements to plan and develop appropriate programs*



Formulation of Competencies

A wide variety of sources for information and techniques for data collection **(2019/20)**:

- Policy reports (national and international); socio-economic reviews; job descriptions; Experts (judgments).
- Surveys** with around **100 professionals and 400 graduates**.
- Moderated **workshops** (03) with **focus groups** of professionals of the agricultural and water sector
- A **benchmarking** with Universities (Canada, France and Morocco).



Major findings

□ **Three domains** of Professional development identified in *Water's sector*:

- **Water Resources and Development (WRD)**
- **Water, Sanitation and Hygiene (WASH)**
- **Irrigation**

Domain	Competencies (specific)	Program Learning Outcomes	Learning Units
Water Resources and Development	07	18	20
Water, Sanitation and Hygiene (WASH)	08	20	29
Irrigation	07	13	24

Design and management of conventional and non-conventional water treatment plants and valorisation of by-products

Elaboration of environmental impact assessment (EIA) studies of water resources and development projects

Design and implementation of a telemetry system for Water Resource management.

Management of irrigation and drainage for water and energy efficiency and conservation

❑ **Generic Competencies (06), including:**

- Entrepreneurship and Innovation
- Project management
- Communication and Language
- Effective use of ICT

❑ **Generalized curricula** with more practical training courses and capacity for integrating across disciplines are essentially needed.

- **Core courses** include social sciences, soil chemistry and microbiology, climatology, meteorology, climate change, ecology, data analysis, modelling, cropping systems etc...
- Hands-on skills, problem-solving and critical thinking are essentially needed (teaching methods have to be improved).

Conclusion: CBC an innovative approach to Agriculture Higher Education

To Bridge the gap in skills and empower students to tackle water and food issues of the agricultural sector in order to meet economic and societal needs and enhance the employability of engineers in Water sector in Tunisia.



Thank You For Your Attention

ACKNOWLEDGEMENTS

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➤ Faculty members of Agricultural Research and Higher Education and the institutions



Institut National Agronomique de Tunisie



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