The status, challenges, opportunities and strategies to grow Agricultural Engineering: North-African Perspective

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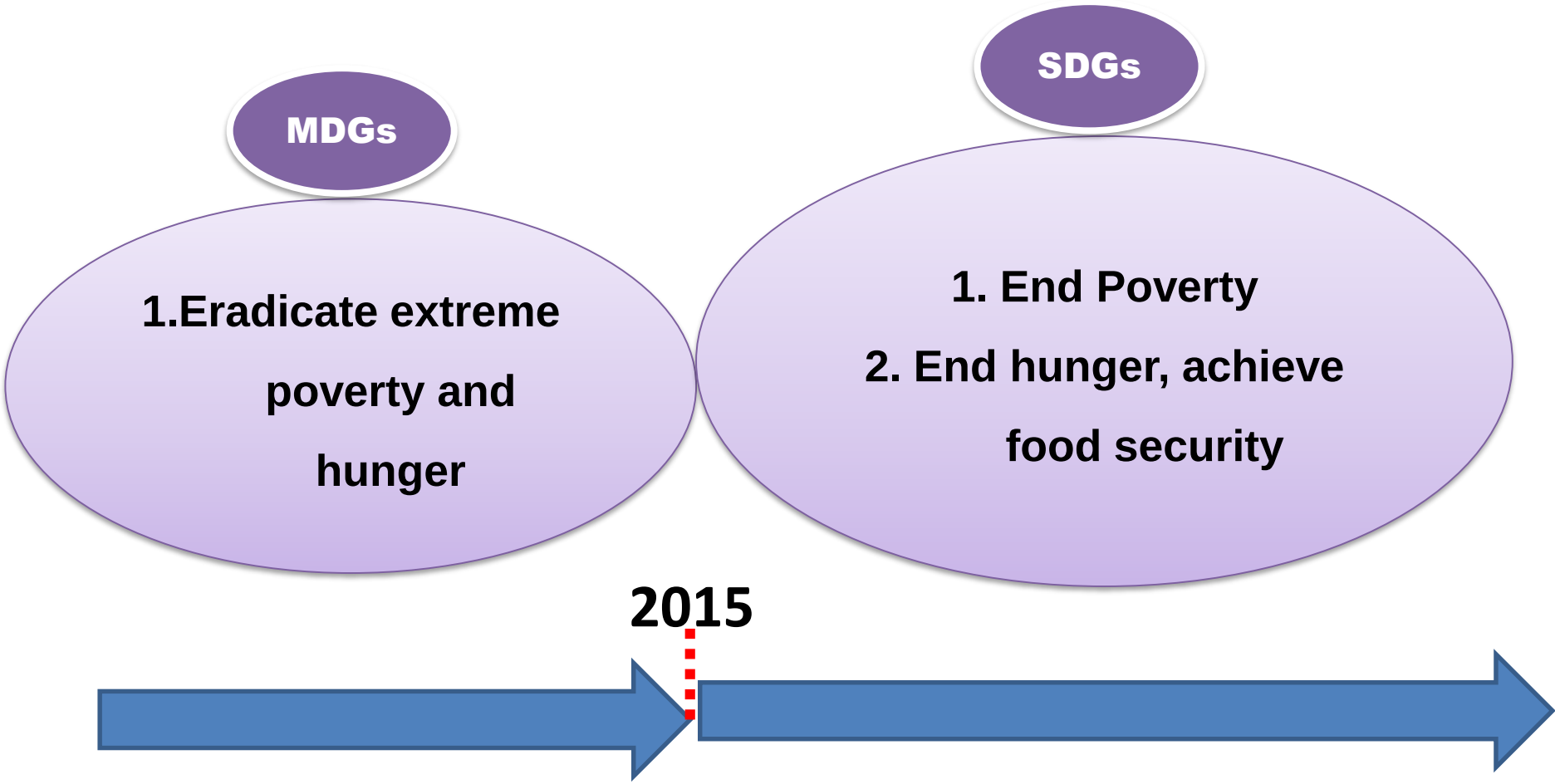
Sustainable Development Goals

UN 2030 Agenda



Constraints on Agricultural water Resources Management

- ✓ 60% more food is globally required by 2050, and 100% in developing countries.
- ✓ 75% of poor live in rural area and agriculture is the main hope for poverty alleviation in these regions.
- ✓ Cost of water supply is increasing beyond economical agriculture production frameworks.
- ✓ There is a very limited expected increase in irrigation water supply by the year 2050

traditional gravity irrigation by basins

traditional gravity irrigation with furrow

Irrigation in the Maghreb

The dominant model of family farming, on which most of the agricultural production in the Maghreb is based, is weakened (access to factors of production, water, land, credit, installation of young farmers ...) in the face of these changes and will need to be responsive in order to ensure the viability of irrigated agriculture.

Natural resources -environmental risks

Private irrigation (exploitation of groundwater via boreholes, and surface water via motor pumps) - a very strong expansion in the Maghreb - is a very dynamic sector, with profitable crops, but which generates a certain number of environmental risks (pollution, overexploitation of groundwater ...).

sewage treatment

Health Concerns
The aim is to provide wastewater with the necessary quality correction in order to minimize health risks after its release into the environment or during its possible exploitation.

Environmental Concerns
The aim is to eliminate or modify the state of wastewater pollutants so as to limit the negative impact they could have on the environment (aquatic, terrestrial and forest ecosystems)

Rural Infrastructure

- Opening up of rural areas is one of the priority projects of the countries, with the aim of involving the rural world in the integrated development of the country.
- The collaboration between stakeholders, among which the most active are Ministry of Agriculture and Maritime Fisheries, Ministry of Equipment, Transport and Logistics, the Rural Development Fund and the rural communities, development associations,
- Support of major donors (WB, EU ADB, AFD,..) allow to take a major step in projects of opening up and improving the accessibility of targeted villages
- Contribution of Agricultural Engineers is vital

Academic and Research Institutions

- **IAV Hassan II Institute of Agronomy and Veterinary Medicine (IAV**), Rabat is home of the agricultural engineering school which is one the major public academic and research institution in North Africa.
- **Similar institutions are found in Algeria (National Algerian School of Agronomy) and in Tunisia (National institute of Agronomy of Tunis).**
- These three institutions have developed strong collaboration through students and faculty exchange and research partnership.
- Subjects covered deal with main development issues such water management, environment protection, social aspects of irrigation, etc.

IAV HASSAN II
created in 1966

- Double affiliation Ministry of Agriculture for annual budget and Ministry for Higher Education for curriculum approval
- Delivers Engineering degrees and may deliver Master degrees (professional..)
- Its training system moved from bachelor level degree to Master level degree (first after 6 years and now after 5 years of university level studies)
- Delivers Ph D degrees (similar to an University)

Key issues for agricultural and rural development

- Among the north African countries, Morocco has made considerable progress in modernizing its agriculture.
- Ten years ago, Morocco has initiated "**the Green Morocco Plan**" aimed at improving agricultural production through water saving irrigation techniques **and valorisation of value chains.**
- This successful model supported by agricultural engineers is being exported by Morocco to other countries. **REMIG; FAO ToT workshop; Chtouka Ait Baha desalinization plant.**

Vision- Agricultural Engineering

- During the last COP 22 held in Marrakech in November 2016, **the 3A initiative was launched**: The aim is ensure Better Adaptation of African Agriculture to Climate Change.
- **Water scarcity** is hindering development of agriculture.
- Continuous efforts are needed **to mobilize non-conventional water resources (desalinisation of water, reuse of treated waste water),** water saving **through drip irrigation generalization**.

Capacity building

- In the last decades, agricultural engineers **have helped achieve major irrigation schemes in the Maghreb countries (Morocco, Algeria and Tunisia).**
- In Morocco, Irrigation of one million ha of land in Morocco was achieved in 1998 thanks to the skills and professionalism of agricultural engineers.
- Actual Figure: 1.6 million ha irrigated
- Target: 2 millions ha of irrigated land by 2030

Employement

- **Agricultural engineers are employed** in different key ministries in charge o**f water, agriculture, energy and infrastructure**.
- They are widely integrated and involved in decision making processes regarding the main **strategies of irrigated agriculture, water saving, water resources management, environment protection at central and regional levels.**

Professional sector

- Besides within **the professional sector**, agricultural engineers are implementing conducting major projects including:
  - irrigation projects,
  - **infrastructure projects in water supply and sanitation,**
  - **rural roads.**
- They are employed in main Board of Engineers who provides technical assistance to the Administration. **BIO-WASTE; TEMPUS; MISEAD**

Regional cooperation

- Agricultural engineering is making a **significant contribution to south – south cooperation**.
- Technical assistance projects are carried out by Morocco in collaboration with FAO, China.
- Moroccan agricultural engineers are implementing irrigation development projects and water supply **projects in sub-Saharan countries**. **CRESA**

Basic plan: regional focal-point approach

Provide substantial investments to strengthen selected existing institutions based on a regional focal-point approach. Institutions identified and supported to be centers of excellence will be engaged in agriculture and agricultural engineering efforts in order to improve their capabilities in:

- adaptive research: – finding the most appropriate methods, machines and equipment;
- education and training: – creating a cadre of trained and specialized technicians, farmers and operators;
- extension services: – providing farmers with the technology they need, under farmers' terms;
- communication: – extending successes achieved to a wider audience

International Research Program in Irrigation and Drainage

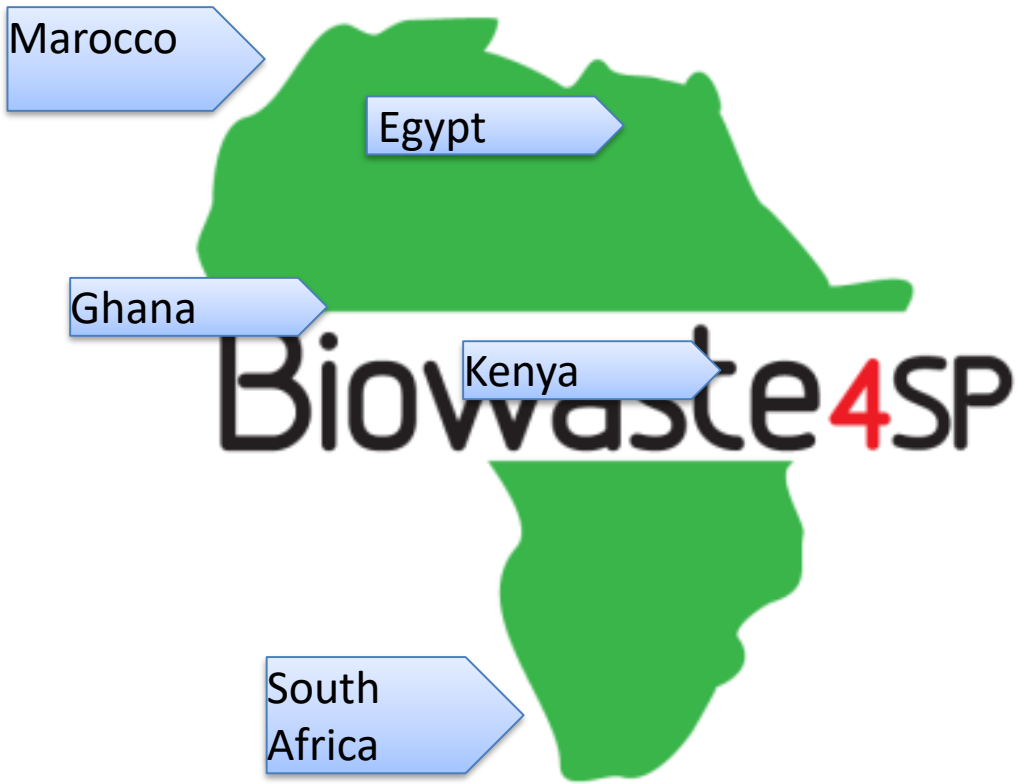
- International Research Program for Irrigation and Drainage (IRPID) is conceptualized by ICID as a program for developing and implementing research agenda in the irrigation and drainage sector to meet the challenges of water security and food security.

- Mission of the Program is to enhance research activities in irrigation and drainage science, technology, and management aspects in order to develop capabilities of member countries in order to achieve water security, food security and poverty alleviation while preserving the environment.

- Two regional nodes, one in Tehran (Iran) and another in Beijing (China) have been established and successfully undertaking their responsibilities.

- Morocco in collaboration with Egypt are prepared be members of a regional node.

Africa partner countries



Marocco
Kenya
South Africa
Egypt
Ghana

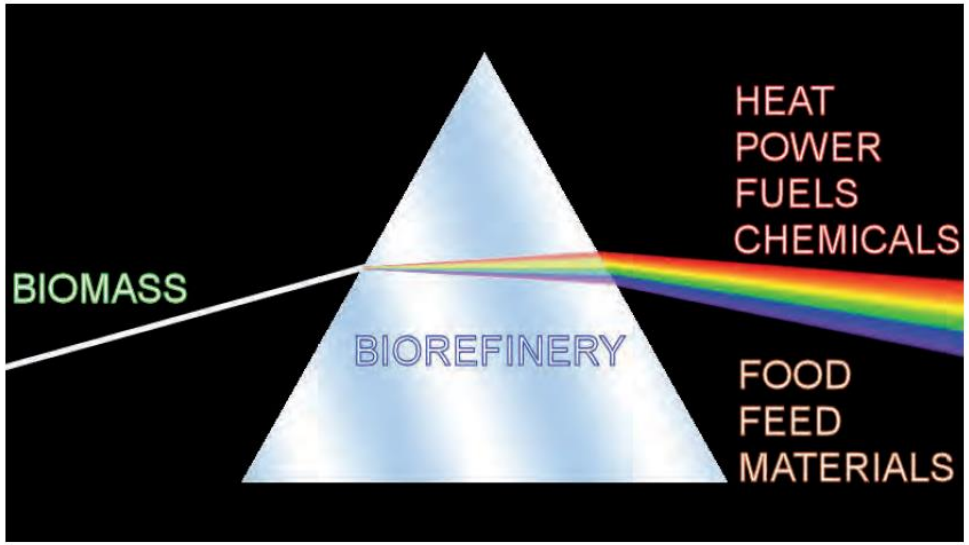
Potentaial of Biowaste

There is a great potential for efficient technological utilisation of selected significant biowaste Northa African countries derived from both the industrial and agricultural sector, thus, turning biowaste into a new resource for sustainable products.

Biorefinery of African biowaste feedstocks

Definition of biorefinery:

Integrated and **combined processes** for the **conversion** of **biomass** into a variety of **food, feed, chemicals, biomaterials (e.g.fertilizer), and energy** – at the same time **maximising** the **value of the biomass** and **minimising the waste**



PERSPECTIVE

- As a perspective Agricultural Engineering can play an **active role in Water-Energy Food Nexus.**
- Objectives and delivered products include**:**
  - **Water security**
  - **Energy security**
  - **Food Safety**
  - **Land productivity**
  - **Increased resilience**

Frame work of actions

- The Frame work of actions include:
- **Governance,**
- **economics,**
- **technology,**
- **eco-systems,**
- **society.**

DRIVERS

For this the following drivers need to be considered:

- **Globalization**
- **Urbanization**
- **Climate change**
- **Population growth**
- **Economy**
- **Social Development**-

Major Disciplinary Fields

- Irrigation, drainage, resource management water,
- environment,
- infrastructure,
- hydro-agricultural development,
- drinking water, sanitation,
- solid waste.
- Biowaste valorisation

Major tools

Major tools of agricultural engineering will remain

- ***Capacity Building:**
- ***Management,**
- ***Research and Innovation.**

Accreditation of a new training curriculum Ministry of Higher Education

-Selection criteria
-Registration of new students
-Training Planning
-Teaching Schedule Volume and Knowledge assessment
-Workforce and Origin of Students
-Validation by the professional sector
-Follow-up of the alumni

ASSESSMENT CRITERIA
Ministry of Higher Education

-Admission procedure
-Conduct of the training program
-Cross-Curricular Teachings and thesis work
-Methods of setting up, organizing, monitoring and evaluating
-Knowledge control
-Adequacy of Human Resources
-Adequacy of material and logistical resources
-Partnership and Cooperation
-Management of the sector
-Other elements of appreciation
-Grid of the Curriculum Proposal for modification, if applicable

Pan African Society of Agricultural Engineering (North Africa Branch)

Within established **Pan African Society of Agricultural Engineering**, we are in north Africa branch committed to promote:

* links and networking among the African countries

* as well as regional and international institutions for enhancing cooperation and coordination to ensure efficient input of agricultural engineers to sustainable development.

THANK YOU

FOR YOUR ATTENTION