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Water managment for climate-smart agriculture

Understanding The WEF Nexus At EU Level

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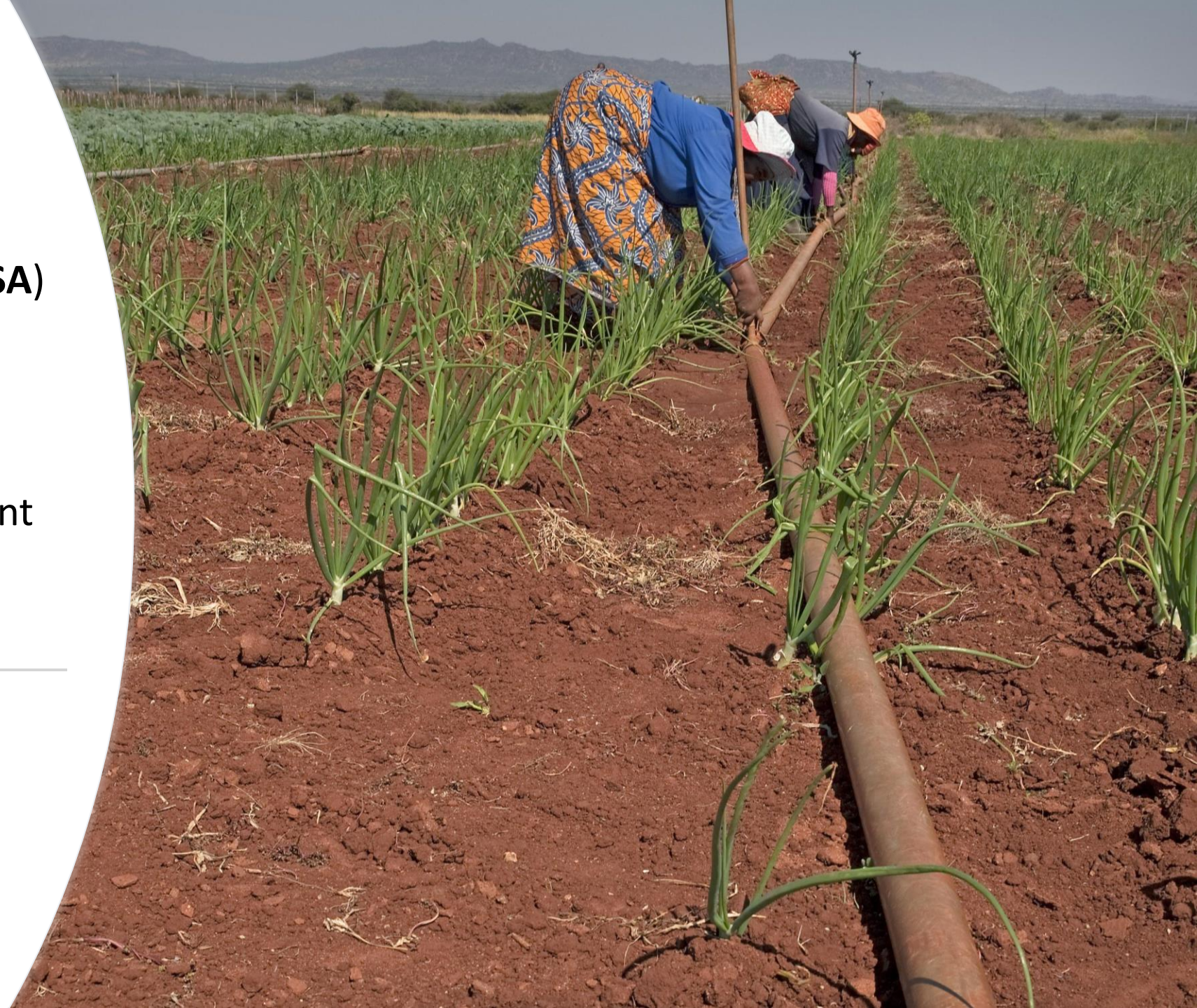
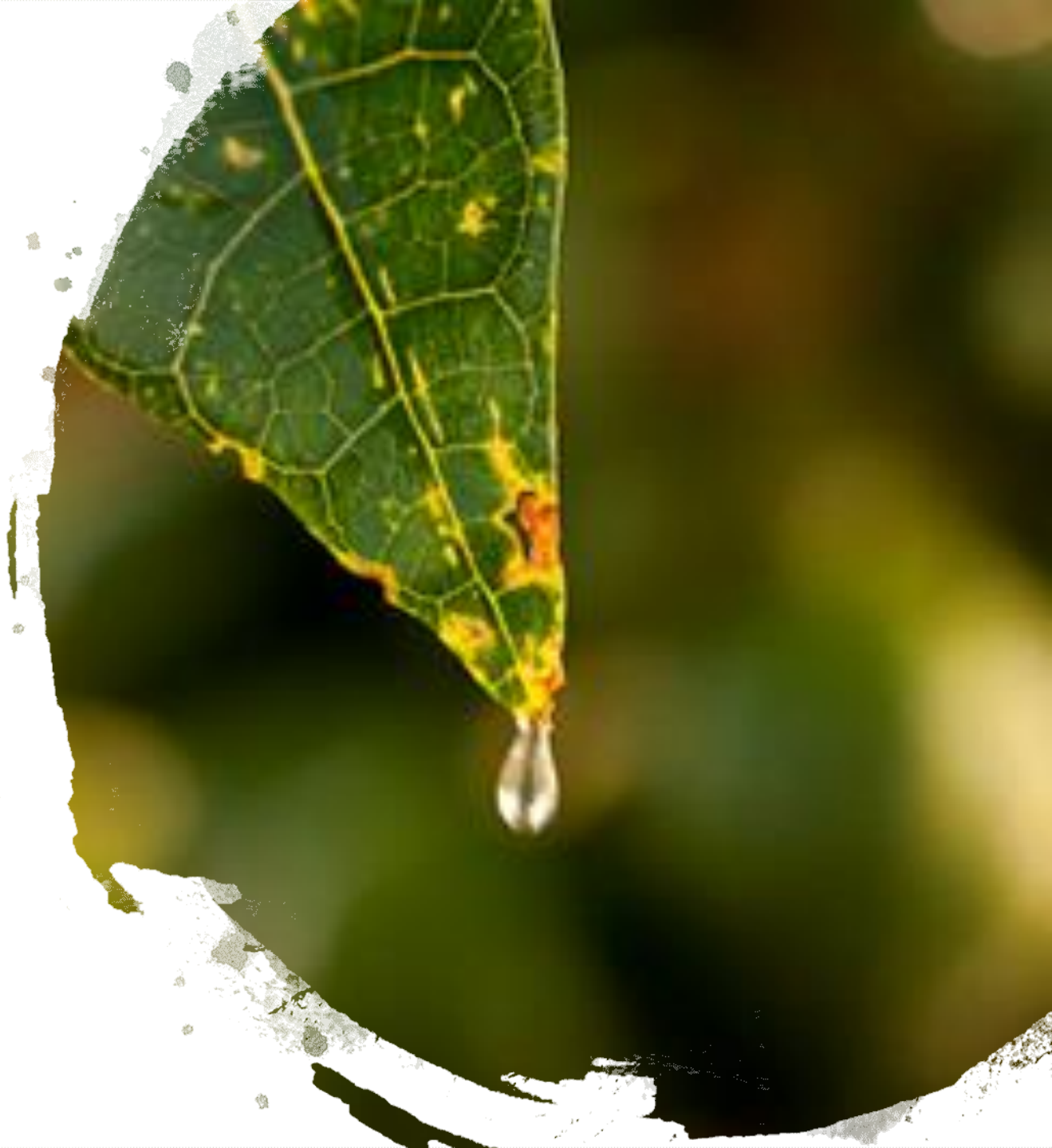
Climate smart agriculture (**CSA**) is an approach that helps to guide actions needeed to transform and reorient agricultural systems to effectively suport development and ensure food security in achanching climate



We have to support the inclusion of **climate smart water management** approach at all levels, from farms to national policies and legislation.

Water management and climate change

- **Impacts of climate change on the availability of freshwater resources for agriculture** and the overall context in which water is managed in agriculture.
- the **major impact of climate change on agriculture are expected to result from its effect on the water cycle,** and consequently on the availability of freshwater resources.
- ..but the **role that climate change will play** with regards to water in agriculture must be considered in the context of **rapid increase in water withdrawals**,**degradation of water quality**, and competition for at all levels.



In the past **50 years**, the extent of global irrigated land has more than doubled, increasing from **170 to 333 million hectares.**

- Globally**, agricultural water withdrawals represent 70 percent of all withdrawals**, and as much as 90 percent in some arid countries.
- **Irrigation has been a key factor in the intensification of agricultural production**, enabling agricultural output more than triple over the same period, to meet higher demand for food, fiber and other agricultural products.

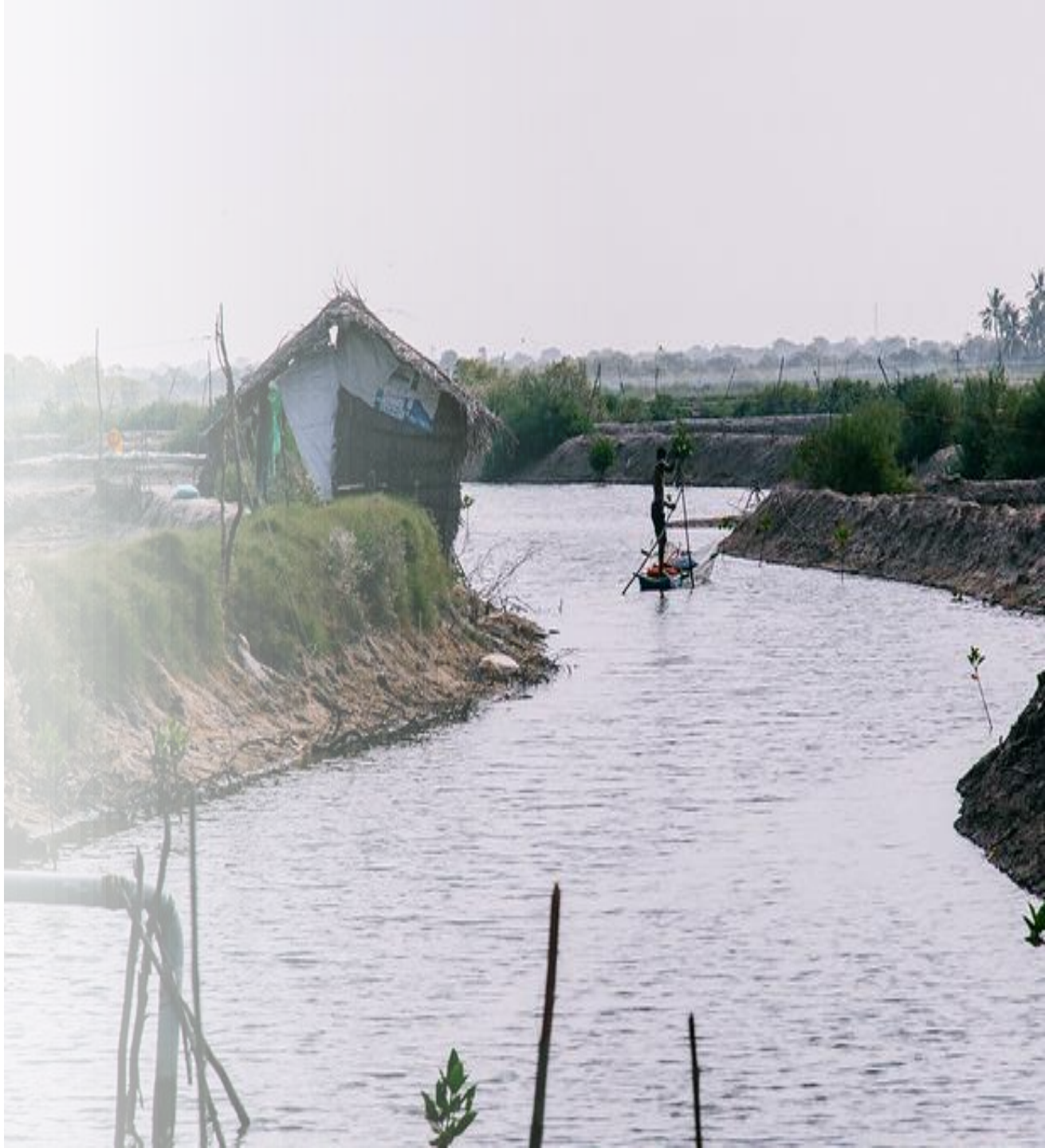
Climate change impact on water resources

- ✓ Availability of renewable surface water and ground water resources
- ✓ Floods
- ✓ Droughts
- ✓ Streamflow seasonality
- ✓ Water quality, biodiversity and ecosystem services
- ✓ Sea level

Water management for climate - smart agriculture

- **Climate change affect each step of water cycle**, with negative impacts on water quantity and quality, both in time and space.
- The **strong impact of climate change** on water resources for agriculture will affect agricultural production, **reduce yields in many areas and increase the vulnerability of poor rural farmers**, especially in arid and semiarid areas.

The water-energy-food nexus in europe



1.Understanding the Nexus at EU Level

- **The sustainability of natural resources management, under economic, environmental and social perspective, needs to be assessed based on a fair balance between the use and the availability of resources.**
- **In agriculture, such an assessment must consider the main constraints of global trends**:
  - expected growth of population (impact of food production);
  - decreasing availability of natural resources such as soil and water (productive input)
  - and increasing GHGs emissions (related to Climate Change).

Stakeholders play an important role in assessing the WEF nexus

THIS APPROACH SUGGESTS THAT SUSTAINABILITY DRIVEN STRATEGIES AT ALL LEVELS (GLOBAL TO REGIONAL TO LOCAL), MUST BE PLANNED AND IMPLEMENTED CONSIDERING AND **ASSESSING THE LINKAGES BETWEEN WATER USES AND AVAILABILITY, ENERGY CONSUMPTION AND SOURCES, LAND USE AND FOOD PRODUCTION**.

STAKEHOLDERS PLAY AN IMPORTANT ROLE IN ASSESSING THE WEF NEXUS, **AS MANY POLICY CHOICES AFFECT THEIR POSSIBILITY TO MAKE USE OF ENVIRONMENTAL GOODS AND ECOSYSTEM SERVICES** (FAO, 2014).

assessing the WEF *nexus*

Food production needs different kind of inputs:

1. human (labor, time, management/administration);

2. socio-economic (money, governance institutions, participation);

3. natural (sunlight, soil, water, wind, petroleum, gas);

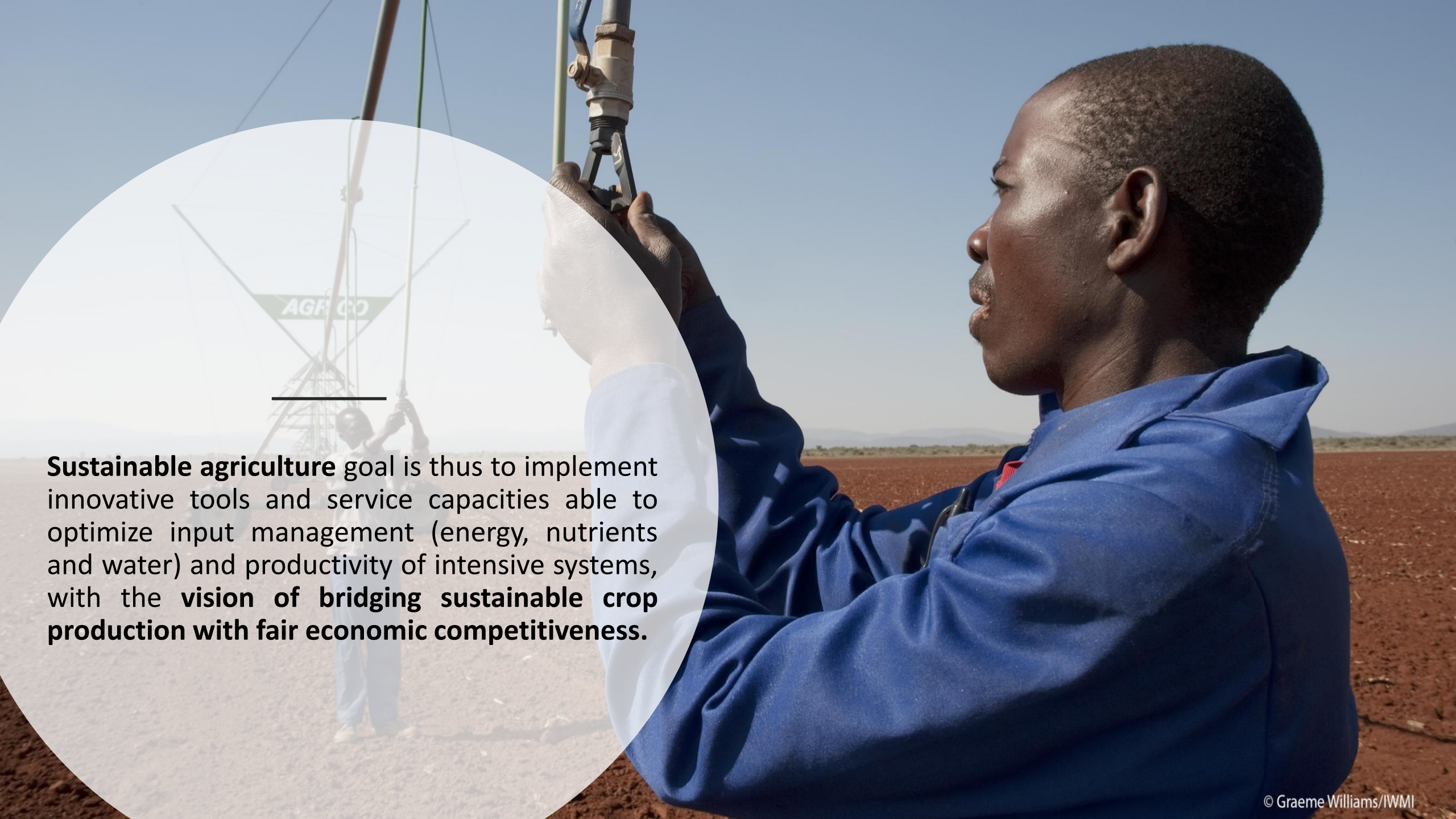
4. and human-made (electricity, alternative water, machinery, agrochemicals) resources.

water

Agriculture uses **water** from different sources: “**green water**”, the rain infiltrated into the soil and available to crops (Falkenmark 2003), and “b**lue water**” including surface water from rivers and lakes and groundwater from aquifers.

To make blue water and water generated from alternative sources (desalination, re-use) **available to crops, it is necessary to spend energy.**

Both direct (fuel consumption, electricity for pumping, etc.) **and indirect** (fertilizers, pesticides, seeds, etc.) **energy used in agriculture requires again water.**

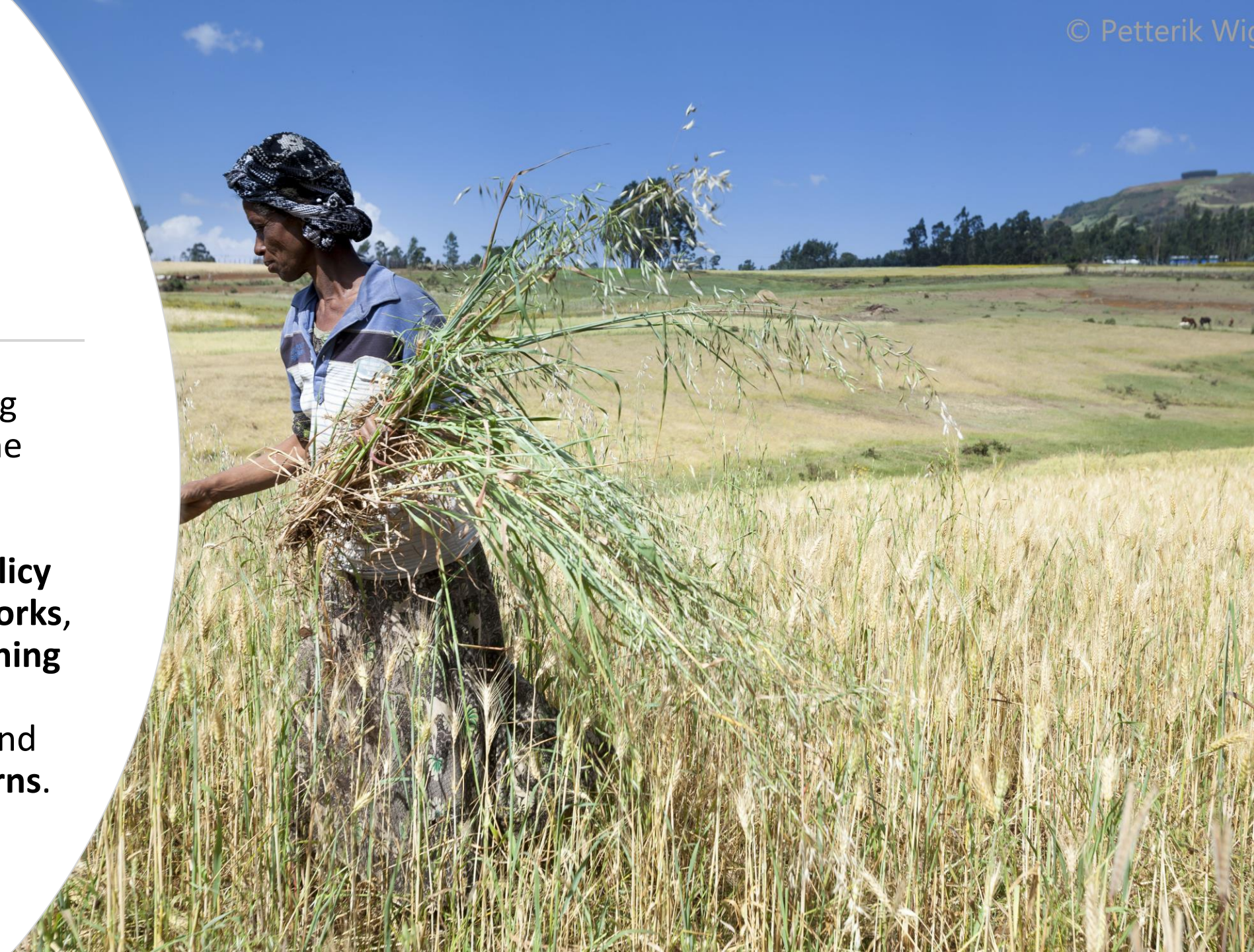


Sustainable agriculture goal is thus to implement innovative tools and service capacities able to optimize input management (energy, nutrients and water) and productivity of intensive systems, with the **vision of bridging sustainable crop production with fair economic competitiveness.**

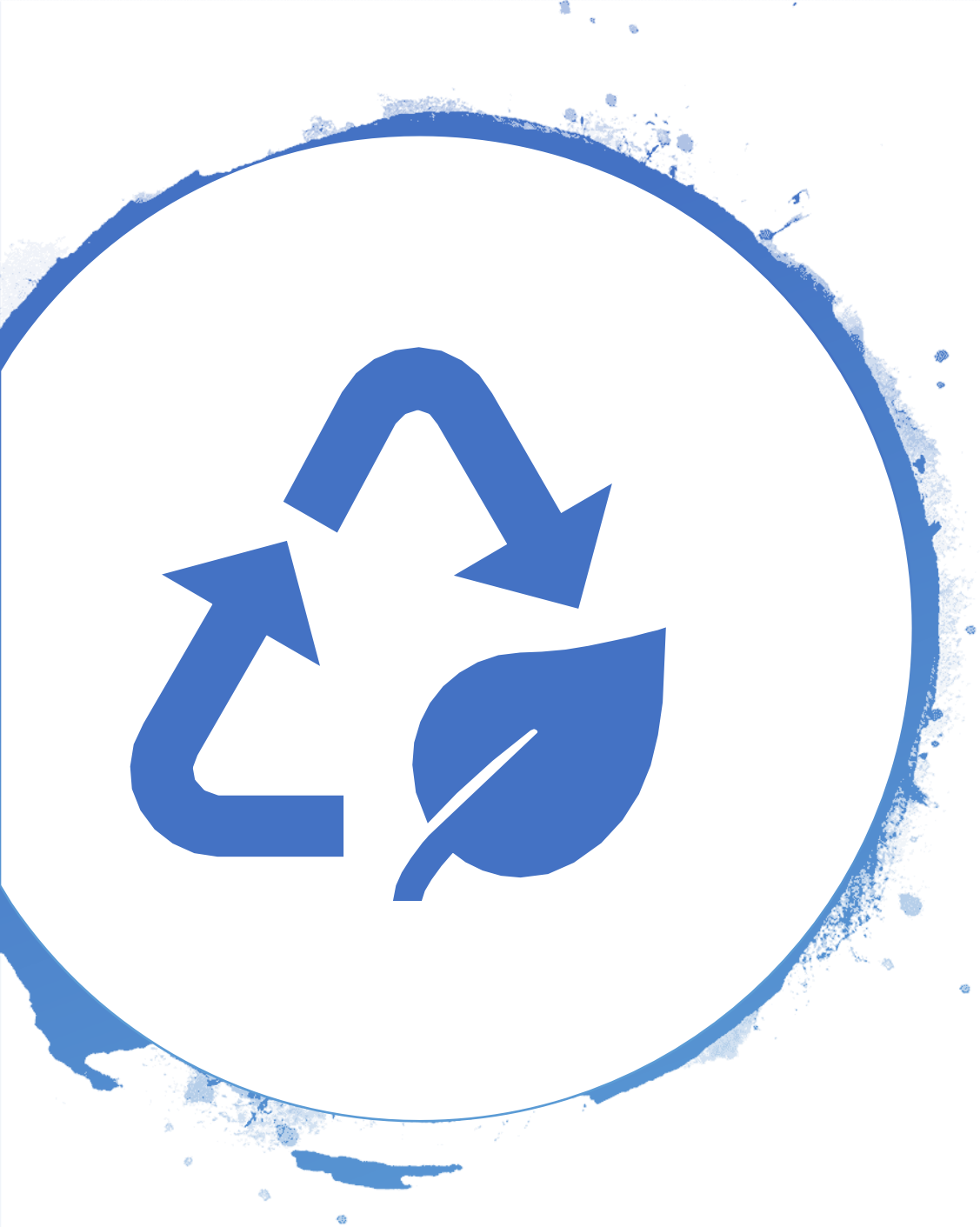
At EU level in a business as usual scenario by 2030 **water, energy and food demand is expected to increase by 30-50%** (US National Intelligence Council, 2012).

Based on this projection, achieving **universal access to food, drinking water and modern energy** within the “planetary boundaries” **can be considered the main challenge of our society.**

This requires considering the interconnections, the vulnerabilities and the finiteness of natural resources within the **policy and regulatory frameworks**, **the governmental planning mechanisms**, the **production processes** and the **consumption patterns**.



2. Water-Energy-Food Nexus as a concept to describe and address the complex and interrelated nature of global resources



WEF is a conceptual approach developed to better understand and systematically analyze the interactions between the natural environment and human activities, and to work towards a more coordinated management and use of natural resources across sectors and scales.

"..This can contribute to identify and manage trade-offs and to build synergies through our responses, allowing for more integrated and cost-effective planning, decision-making, implementation, monitoring and evaluation.." (FAO, 2014).

The Bonn conference, organized in preparation for the Rio+20 summit, provided evidence **that improved water, energy and food security can be achieved through a nexus approach**. **The nexus approach can also support the transition towards a Green Economy**, which aims, among other things, at resource use efficiency and greater policy coherence (Hoff H. 2011).

nexus approach is becoming a key tool

I) Scarcity of water and other natural resources,

II) Climate change,

III) Degradation of the resource base,

and **IV)** Water, energy and food security.

Scarcity of water, land and other resources.

Scarcity of resources is rapidly escalating due to increasing demand, resource degradation and pollution.

By 2050 agricultural production would have to grow by another 70%, and **agricultural land** would have to expand by about **10% globally**, **by 20% in developing countries** and by **30%** in Latin America (Bruinsma J., 2009).

Even the most optimistic scenarios of improvements in productivity through technological development, still project an **increase in agricultural water demand of at least 20% by 2050** (De Fraiture et al., 2007).

Climate change.

Climate change and variability add further pressures, by **accelerating degradation of drylands**, **reducing glacier water storage**, increasing frequency and intensity of extreme events (such as droughts o floods), and **decreasing reliable water supplies**, as well as reliable and stable agricultural productivity.

At the same time climate adaptation measures, such as **intensified irrigation or water desalination**, **are often energy intensive**.

Degradation of the resource base.

Growing demand of natural resources and their unsustainable management have **increased human ecological footprint** and **caused degradation of the natural resource** base in many regions, including severe modification of ecosystems.

Water, energy and food security

Resource limitations in all sectors require moving towards increased resource use efficiency, demand management and more sustainable consumption patterns.

3.synergies between Water, Energy and Agriculture in the european policy framework

- Energy policies
- Agricultural policies
- Water policies

energy policies (1)

Over the past two decades, reducing energy consumption, **improving energy efficiency and promoting production from renewable sources** have become more and more important.

Energy efficiency is at the heart of the European strategies to boost the transition to a resource efficient economy, **cardinal principle of Europe 2020 strategy.**

energy policies (2)

Europe is definitely boosting energy policies, and it is shown by the fact that in the "Climate Energy pack" (known as **EU 20-20-20 goal**) the first target set for 2020 of primary energy saving of 20% through energy efficiency.

If energy targets will be achieved, economic analysts talk about :

- ✓60 billion Euro on imports of oil and gas that could be saved by 2020
- ✓600,000 jobs in the EU, by boosting innovation and technology sectors

energy policies (3)

Renewable energies sector is a typical example of this process, driving the green growth of EU economies, reducing environmental impacts (lowering CO2 emission) and generating positive socio-economic effects, mainly on occupation.

Such sector affected particularly agriculture in a positive way, allowing farmers to re-use waste and optimize sub-products for bioenergy production. **In this framework, agricultural policies played a key role in supporting farmers**.

agricultural policies (1)

- The second pillar of the Common Agriculture Policy **(CAP) provides specific measures**, included in national Rural Development Plans (RDP), supporting the production and use of renewable energy in agriculture as well as energy efficiency.
- Although CAP does not provide direct support for the production of biomass for bioenergy (EU, 2016), **EU makes it available a set of instruments to boost bioenergy production, ranging from investments in physical assets, to the support of basic services and village renewal in rural areas, to measures aimed at helping actors in the agriculture and forestry sectors** to work together, such as farmers, forest owners and business organizations.

agricultural policies (2)

More generally, at global scale, **water is strictly linked with energy production also because “traditional” thermo-electric plants require massive amounts of water for cooling**, that’s why reduction of energy consumption as well as use of alternative energy sources must be well connected with water policies, mainly the Water Framework Directive (WFD) 2000/60/UE.

water policies (1)

The **European water legislation has been deeply transformed with the WFD** that enacted in 2000 and went into full operation by 2012 (CEC 2000), becoming one of the main environmental EU legislations.

It responds to the environmental **goals of the EU SDS** (Sustainable Development Strategy) in relation to **water use and water ecosystems protection**.

Its objective is to **achieve the good ecological status** of all water bodies in the EU for 2027, and maintain and promote sustainable water use in a long-term perspective.

water policies (2)

On the other hand, the **WFD socio-economic component that seeks to enforce cost-recovery for all water services can strongly affect the agricultural sector**.

In fact, if the **WFD is fully implemented to recover all water-related costs, water tariffs will raise considerably causing water use reductions and inflicting substantial losses to farm income**.

Thus, the application of the WFD might question the viability of certain irrigated areas in many European regions.

conclusion

The water, energy and food (WEF) nexus means that **the water security, energy security and food security are linked and interact with each other and with the environment**. Under this approach, the sustainability of natural resources management must be assessed by taking into account a fair balance between uses and availability of those resources.

In agriculture, such an assessment must consider the main constraints of global trends, as with the growth of global population, **consumption of water, energy, and food will also increase, placing stresses on these three sectors, and raising the importance of the WEF**.

- **The renewable energy system plays an important role also in irrigation management and more specifically in water pumping**.
- **Water resources are among the most valuable resources of the natural environment, and their sustainable and integrated management is at the basis of European water policy**.
- With the adoption of the Water Framework Directive (2000/60/EC), EU water policy has undergone a process of restructuring. **The WFD is supplemented by international agreements and legislation relating to water quantity, quality and pollution.**

Thank you for your attention !