

Economic and Social Commission for Western Asia

Impacts of Climate Change on Water Resources, Agriculture and Food Security in the Arab region

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Koronivia Joint Work on Agriculture
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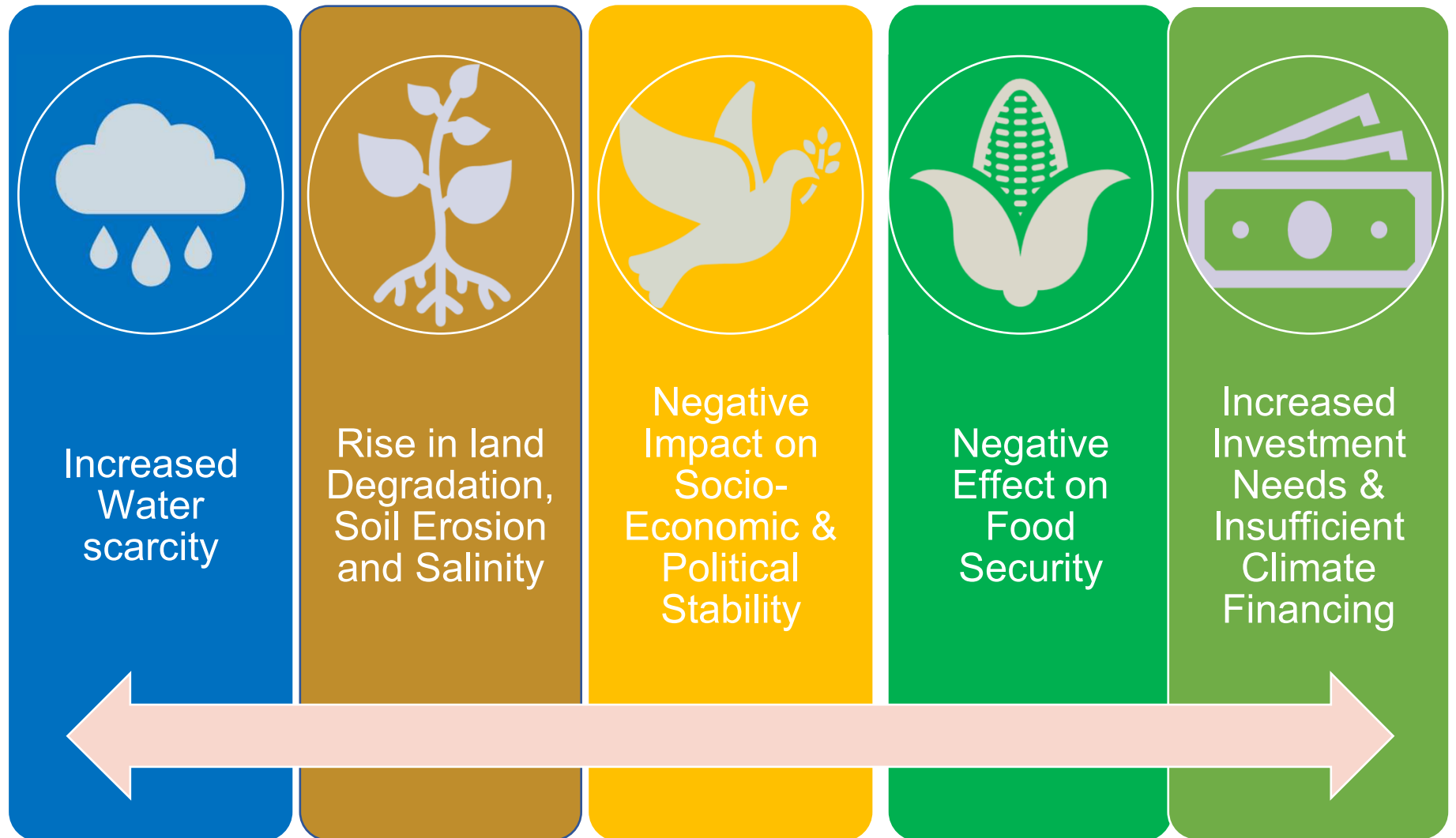
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Food Security, Agriculture, & Climate Change...

Projection & Monitoring Tools for Policy Formulation

Climate Change Impact on Agriculture in the Arab Region



Climate Change Impact on Agriculture in the Arab Region

- Most Arab countries dependent on rainfed Agriculture: Mashreq 57%, Maghreb > 80%
- Agriculture consumes up to 80% of fresh water
- low water productivity & inefficiency in irrigation causing 60% of water losses
- **By 2030, CC effects will reduce renewable water resources by 20%**
- **By 2080, CC will decrease agriculture output by over 20%**

- Agriculture's share of GDP 7 % (23% in Arab LDCs)
- 38% of population's main source of employment/livelihood
- Highest food importing region: spending \$110 billion/year, importing 25% of the global wheat markets
- **By 2050, 70 % of population will live in cities: decrease food production while demand & consumption will rise**

- Regional priority is adaptation, but bilateral flows for mitigation 5X the adaptation in 2016 & only 5/22 Arab States accessed the GCF
- In 2016, the region received \$4.6 billion bilateral flows: \$ 3.7 billion mitigation, \$ 0.7 billion adaptation, \$0.3 billion cross-cutting actions

Land degradation affect 92 % of hyper arid land & 73% of arable land, costing \$9 billion/year (2-7% of countries' GDP), most affected region by sand & dust storms

A Tool for Monitoring Food Security....Climate Change, Water & Agriculture as Key Indicators



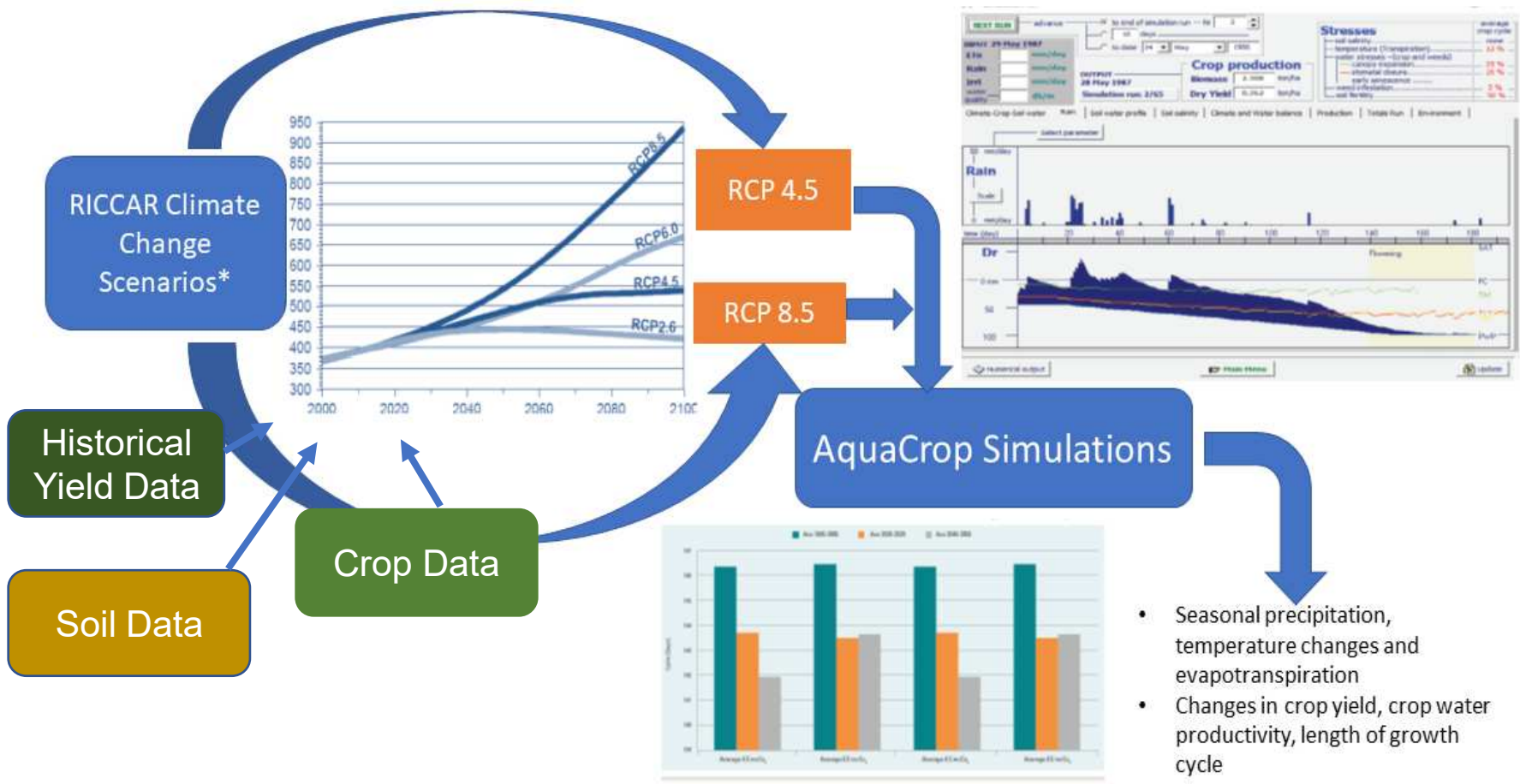
Key results

- Underperformance in three core indicators: undernourishment, food insecurity experience & obesity
- Hotspot areas in all 4 food security dimensions: yield gap, limited arable land, excessive water use in agri sector, high import dependency, poverty & unemployment levels, affected child and women nutrition as well political stability.
- Need for data collection at national & local levels

Stability Indicator: climate Change Index, 3 major impacts

The Hague Centre for Strategic Studies (HCSS)

Tool for Projecting Agricultural Productivity within Climate Change..... AquaCrop Model and RICCAR Data



*EC-Earth, CNRM-CM5, and GFDL-ESM2M

- Seasonal precipitation, temperature changes and evapotranspiration
- Changes in crop yield, crop water productivity, length of growth cycle
- Irrigation scheduling and deficit irrigation

AquaCrop Tool for projecting Agricultural Productivity

Key Results 20 Workshops, 9 Case Study Reports in 9 Countries, advisory service

Rainfed wheat yield in Morocco projected to decrease between 9 & 26%

Irrigated tomato yield in Iraq projected to decrease 7 %

Rainfed Sorghum yield in Sudan projected to decrease 7 -11 %

**Irrigated wheat yield in Yemen decrease between 4 -7 % ,
Rainfed Sorghum yield to decrease 8 -16 %**

Irrigated potato yield in Palestine projected to decrease 3 %

supplementary irrigated wheat Yield in Lebanon projected to increase 4- 17 %

Rainfed wheat yield in Jordan to increase by 34- 48% due to CC shift in rainfall mid-wheat growing season

Rainfed wheat yield in Jordan to increase by 34- 48% due to CC shift in rainfall mid-wheat growing season

Rainfed wheat in Tunisia to decrease by 7.0% while irrigated wheat yield will not vary

In Egypt important amounts of water saved (up to 40%) through deficit irrigation for wheat and Maize



AquaCrop Tool for Projections to Results & Policy Recommendations..... Morocco Case Study

- 2 localities selected (Zemamra & Marchouch)
- Crop types identified (**rainfed** soft wheat, **irrigated** sugarbeet and soft wheat)
- 2 scenarios: RCP 4.5 & 8.5 consider the periods 2020-2030, 2040-2050

Methodology

Projections & Results

- Crop growth cycle will decrease
- Crop yields will decline, food production affected significantly
- Shortage of growing-season length have a negative impacts on grain yield (quantities and quality)
- Rainfed crops will be more sensitive to climate change than irrigated crop
- A rise in the need for water of irrigated crops by 7-12 %



AquaCrop: a Tool for projecting Agricultural Productivity Data Input to Projections, Results to Policy Options

Institutional & Financial Arrangements

- Adopt and scale up conservation-agriculture practices in rainfed agriculture
- Promote investments to modernize irrigation systems
- Water accounting systems to monitor water availability and water allocations
- Promote research and assessments on use of crop varieties suited to new climate conditions

Technical Arrangements

- Adjusting sowing dates according to temperature and rainfall patterns
- Modify irrigation depth & application time
- Applying conservation agriculture such as (minimum tillage, applying crop rotation)
- Promote rainwater harvesting, application of supplementary irrigation

Evidence Generation

- Research to compare yields, soil properties development and plant growth phases
- Produce interactive map using geographic information systems to see impacts of climate change on agriculture areas
- Unified & reliable database between institutions (Agriculture – Water-Meteo – Statistics authority)

AquaCrop: Added Module on Irrigation Water Management....An Adaptation Measure

Application of deficit/supplementary irrigation

- An **adaptation measure** to optimize crop productivity & water yield
- Used for both Irrigated or Rainfed
- optimum irrigation timing & water quantities
- Allows maximizing water use efficiency for higher yields per unit of irrigation water applied
- Crop is exposed to certain level of water stress either during a particular growth period or throughout the whole growing season without reduction in yield

Impact of deficit irrigation on crop productivity: Egypt

Yield	Adaptation measures	Yield change [%]	Yield productivity /water unit [%]	Irrigation water savings [%]
Wheat	60% DI	0.2	67	40
	80% DI	0.2	25	20
Maize	60% DI	-1.6	64	40
	80% DI	-0.1	25	20
Tomato	60% DI	-43	-6	40
	80% DI	-22	-20	20

- **Minor yield changes for wheat & maize**
- **Major reduction in yield for tomatoes**

Towards a Resilient Agriculture Sector...

Recommendations for Agriculture Strategies & Policies

Cross sectoral coordination (ministerial & technical levels), ensuring stakeholders engagement, & building solid partnerships

Formulation of adaptation measures with identified priority areas within the impact of Covid-19 pandemic (short and long terms ones)

Use of innovative and improved agricultural technologies: affordable, adaptable to the region & improve crop & water productivity

Investing in nature-based solutions: use of drought-resistant varieties, efficient water storage methods & practice crop rotation

Adoption of innovative digital solutions

Mobilizing resources for investment in agriculture value chains

Improving data collection, reporting, and sharing

Performing periodic risk assessments to evaluate short, medium & long-term decision-making

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Thank you



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