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Food Security in the Arab Countries

Current Status and Future Scenarios

By

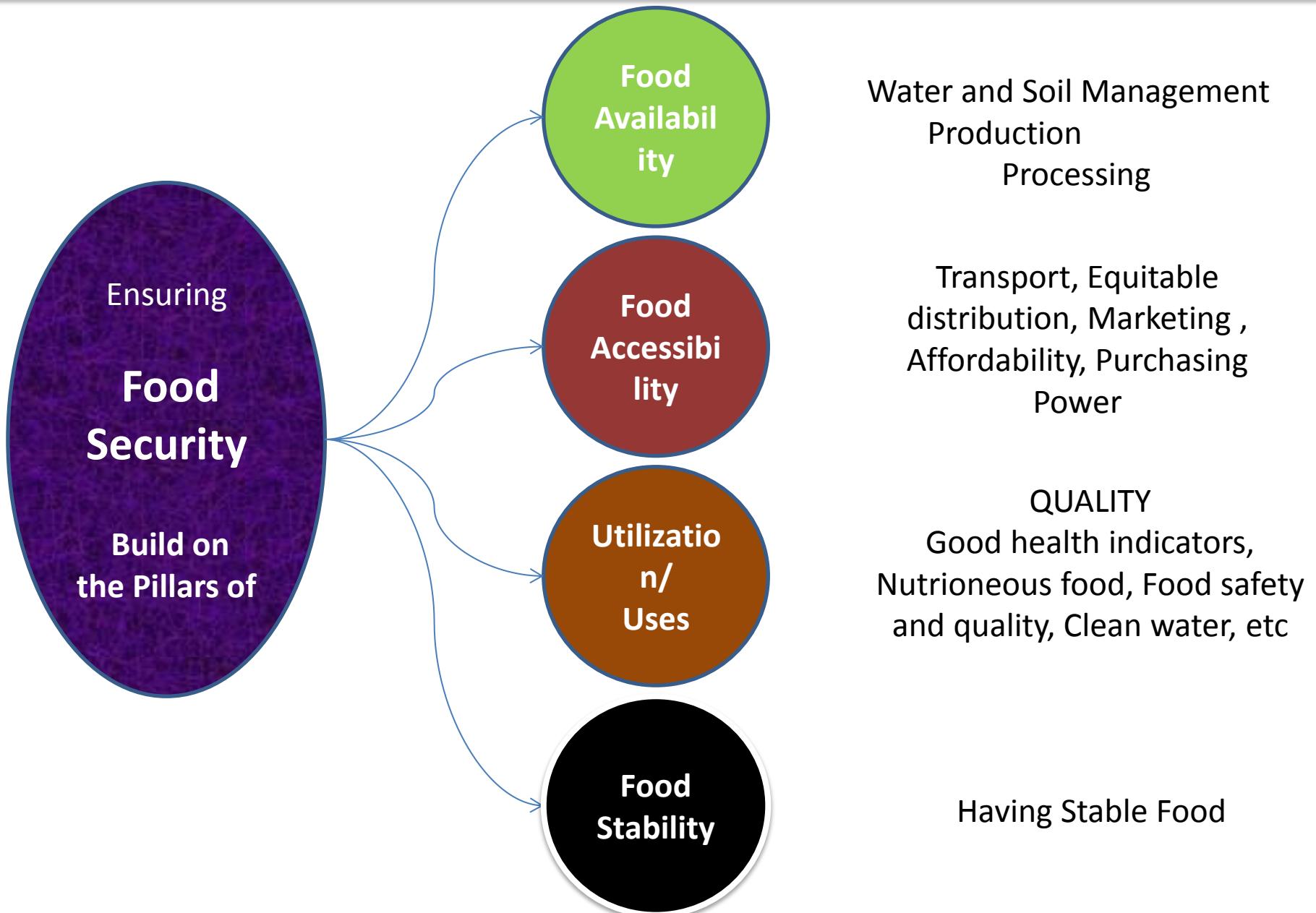
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What is Food Security?



Facts/ Arab Region

- Total Arab population = **420 Million** (2014 estimate).
- Total area = **1.42 bill. Ha**
- **92%** of the total area lies within arid and semi-arid region, and dry sub-humid areas (**Sudan**).
- Very limited cultivable land.
(Total cultivated area = Less than **5%**)
- More than **70%** of the food **IMPORTED**, especially with respect to **cereals**.
- The food gap is over **35 Bill. US\$.**



The Arab countries is highly vulnerable to food insecurity.

TABLE 1

FOOD SELF-SUFFICIENCY RATIO IN ARAB COUNTRIES

Country/Sub-Region	Food Self-Sufficiency Ratio (%)			
	Total Food		Cereals	
	2005	2011	2005	2011
Bahrain	12.96	12.81	0.00	0.00
Kuwait	28.38	21.68	3.88	2.56
Oman	45.21	34.52	1.17	9.22
Qatar	12.18	9.90	3.12	0.37
Saudi Arabia	44.52	34.49	26.75	11.15
United Arab Emirates	21.13	18.66	0.85	1.06
GCC	37.40	29.45	20.25	9.12
Yemen	51.53	31.45	22.59	10.92
GCC & Yemen	39.74	29.74	20.54	9.46
Iraq	75.34	82.84	55.51	95.42
Jordan	56.26	53.09	5.05	3.66
Lebanon	73.23	61.03	18.05	10.96
Syria	85.23	80.62	74.00	57.98
Palestine	81.55	72.26	19.69	10.00
Levant	77.20	75.52	54.86	56.48
Egypt	83.68	78.96	69.63	56.30
Sudan	91.15	86.84	75.74	70.59
Nile Valley	85.51	80.80	70.74	59.09
Algeria	53.48	70.04	29.88	31.96
Libya	44.95	43.09	10.79	7.06
Mauritania	68.49	70.03	19.17	36.04
Morocco	89.60	80.40	46.09	58.91
Tunisia	71.78	68.49	47.82	46.79
North Africa	66.87	71.58	35.75	43.19
Comoros	-	-	-	-
Djibouti	4.04	2.00	0.00	0.00
Somalia	69.17	74.26	32.89	33.00
African Horn	64.80	63.52	28.46	26.70
Arab Countries	70.48	71.69	49.74	45.55

Facts/ Arab Region

Source: Arab Forum for Environment and Development (AFED) 2014

TABLE 2

FOOD SELF-SUFFICIENCY IN ARAB COUNTRIES (%)

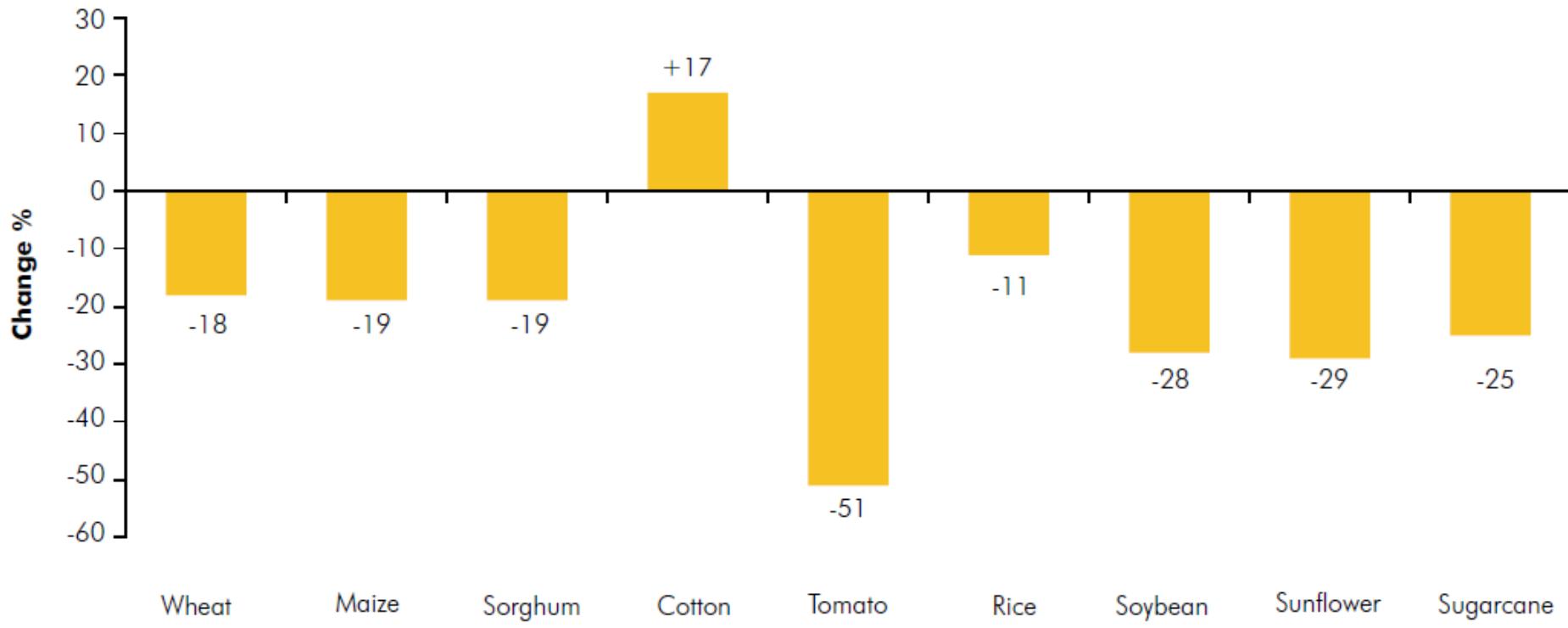
Food Commodity	2005	2011
Cereals	49.74	45.55
Sugar	38.47	36.85
Fats & Oils	28.12	54.35
Meat	80.80	76.19
Fruits & Vegetables	98.49	106.19
Fish	103.09	98.19
Other Commodities	77.78	82.50
Average	70.48	71.69

Source: Compiled by the author based on data in AOAD 2007 and 2012.

Egypt as a case:

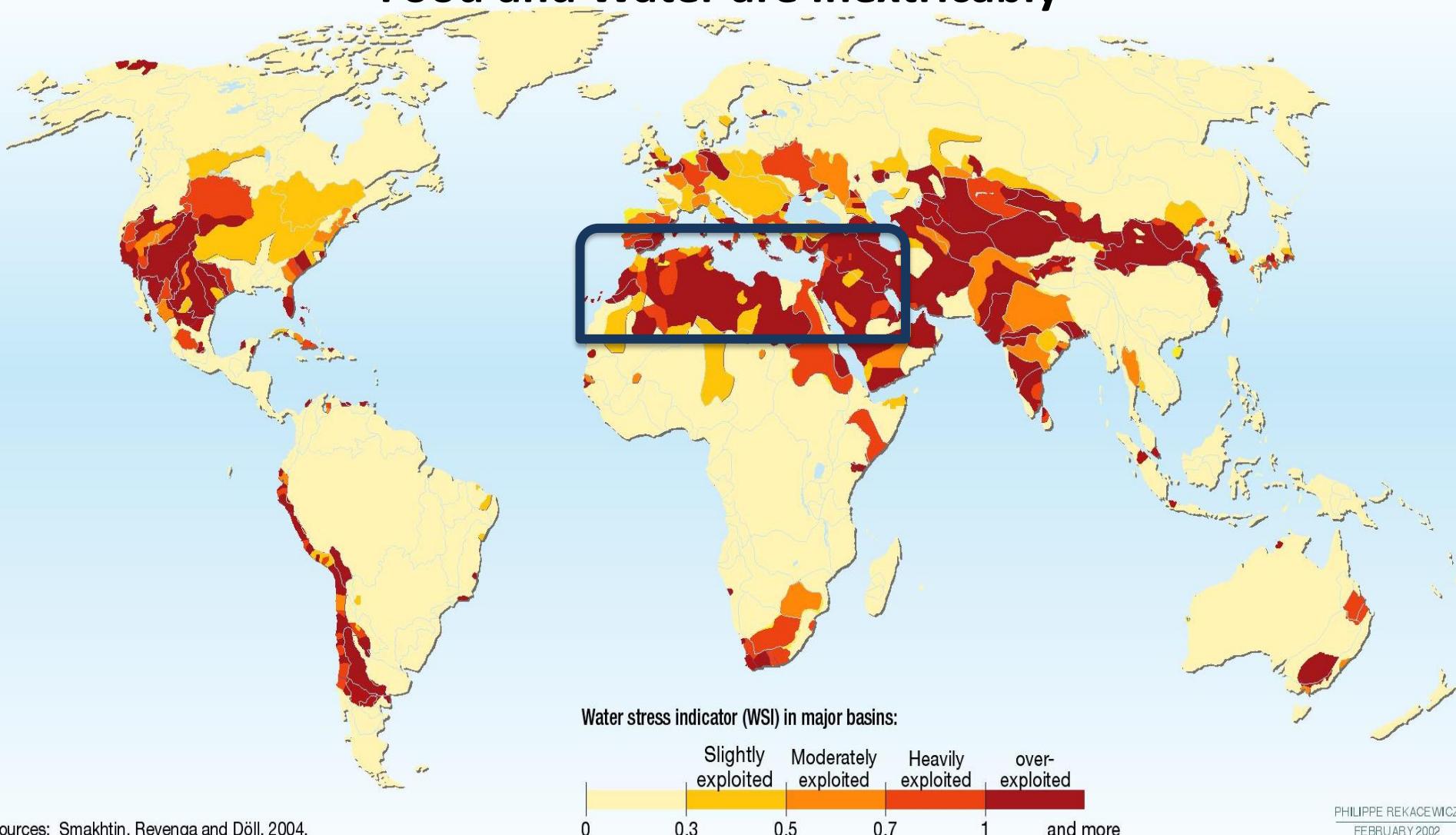
FIGURE 1

CHANGE PERCENT IN MAJOR CROPS PRODUCTION (EXCESS OR DEFICIT) IN EGYPT BY THE YEAR 2050 DUE TO CLIMATE CHANGE.



Water Scarcity Index:

Food and Water are Inextricably



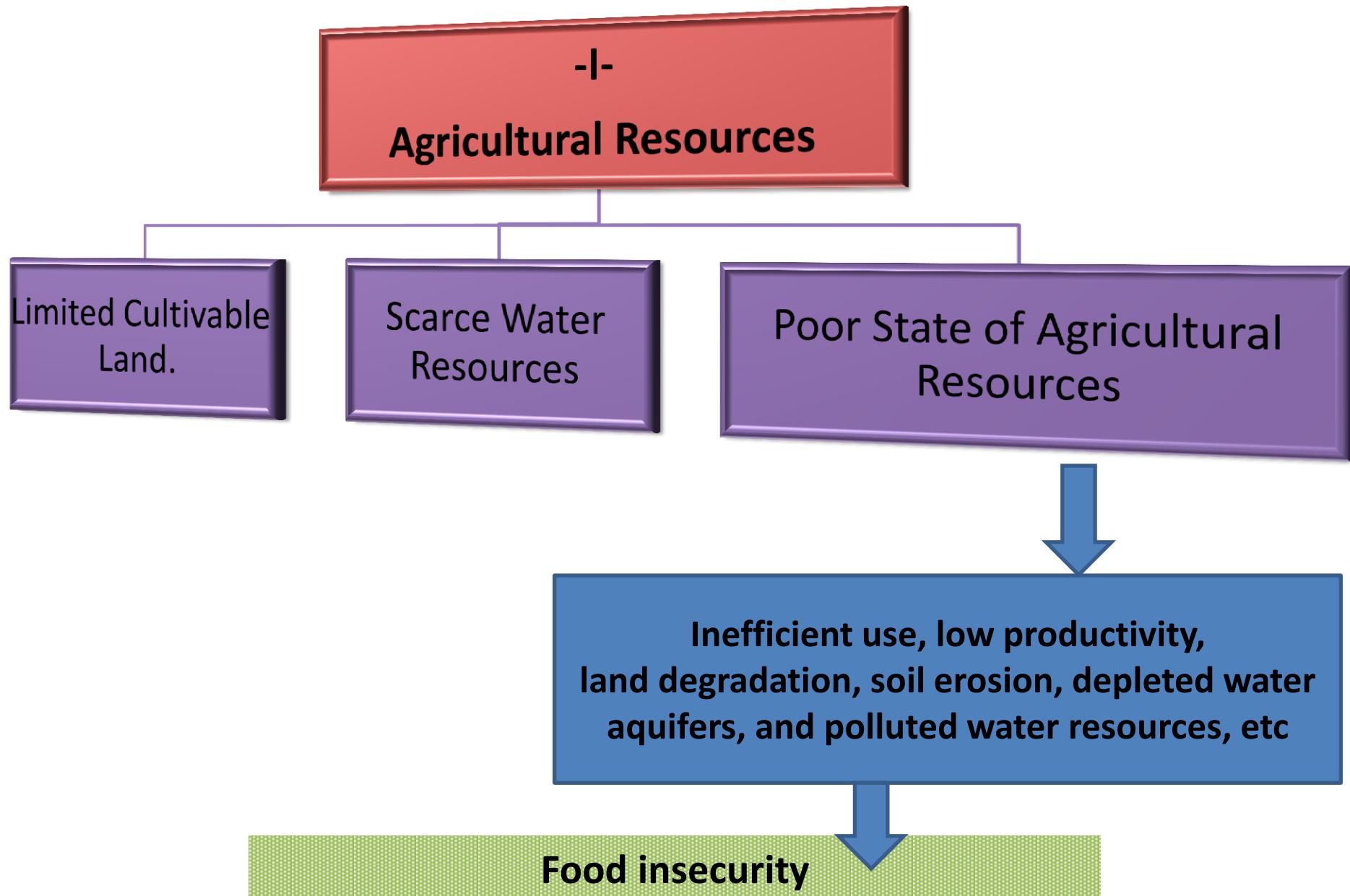
Water Scarcity Index:

- ❑ According to FAO, countries are in a critical condition if they use more than 40 percent of their renewable water resources for agriculture and, could be defined as water-stressed if they extract more than 20 percent of these resources.
- ❑ Based on this definition: 19 Arab countries could be defined as water-stressed, because their current abstraction rates from their renewable water resources for agriculture greatly overshoot the defined limits.

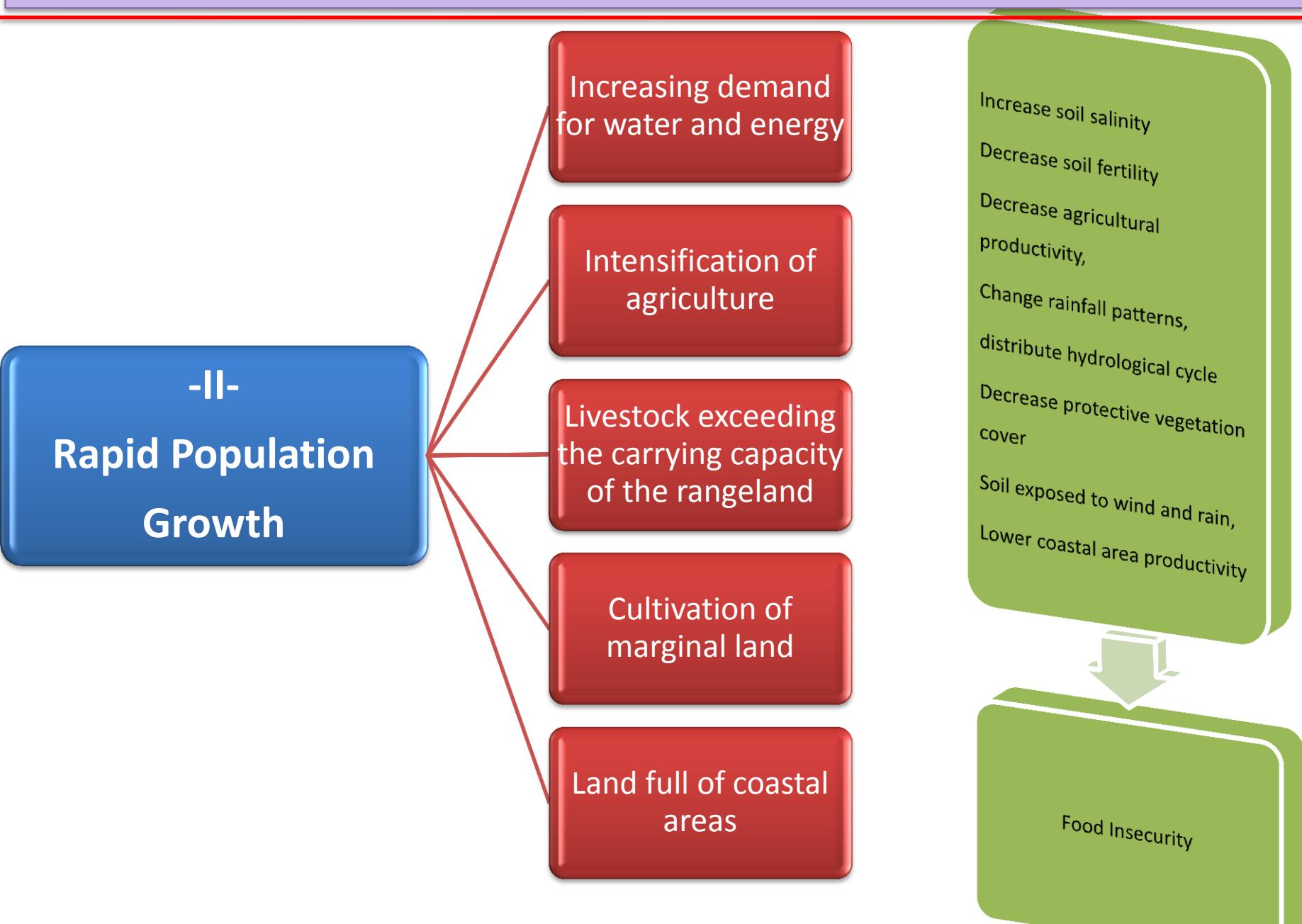
Barriers to Food Security in the Arab Countries



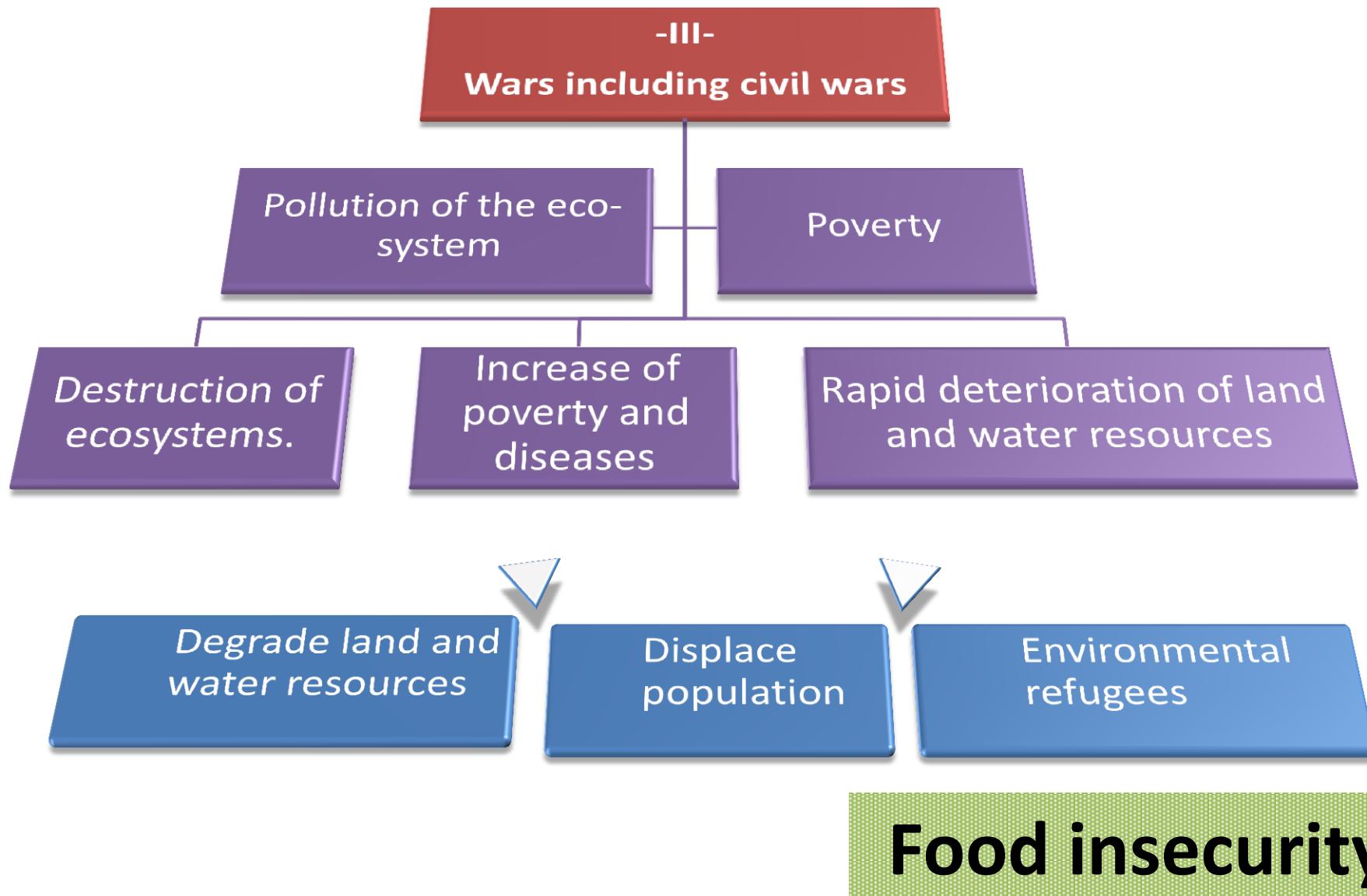
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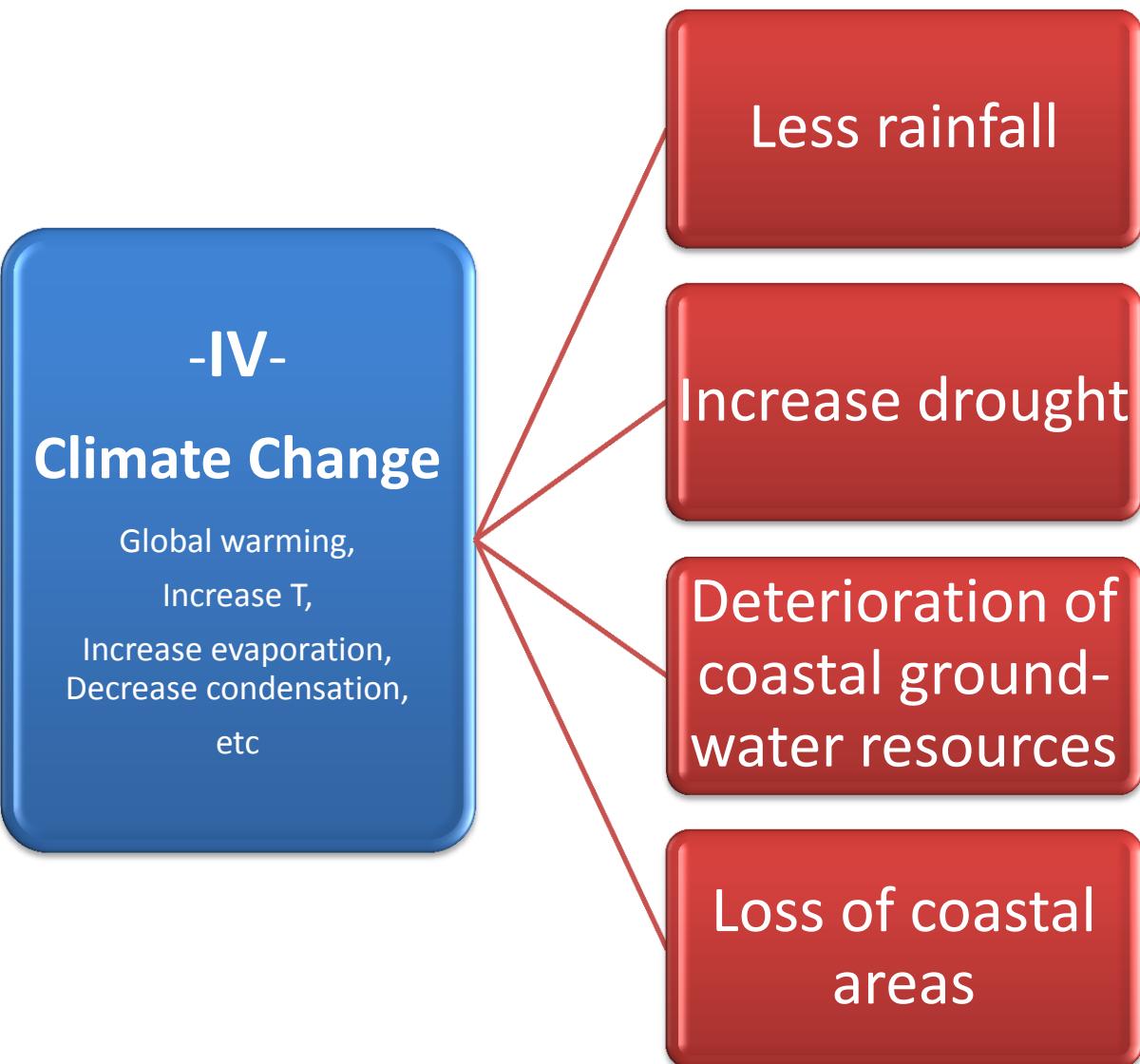
Barriers to Food Security in the Arab Countries



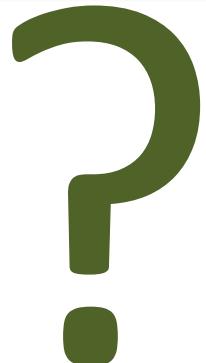
Barriers to Food Security in the Arab Countries



Barriers to Food Security in the Arab Countries



**Impact of
Climate
Change on
Food
Security in
the Arab
Countries**



Model Projections and Observations:

- ❑ Climate change will be one of the main drivers for **reducing food security levels** in the Arab world in the next few decades.
- ❑ The main **impacts on food security** will result from the following expectations:
 - ❑ Lower agricultural productivity,
 - ❑ Increased temperatures,
 - ❑ Reduced precipitation,
 - ❑ Increased risk of extreme weather events and heat waves.
- ❑ IPCC's Fifth Assessment Report (2014) concluded that arid and semi-arid regions are highly vulnerable to climate change.

- By the end of the twenty-first century, the Arab region will face an increase of 0.9 to 4.1 °C in surface temperature.
- This increase will be coupled with sharp decreases in precipitation and increases in evaporation, which are likely to reduce available water by half by 2100.
- These projected changes will lead to shorter winters and drier, hotter summers, more frequent heat wave occurrences, and more variability and extreme weather events occurrences.
- The dominant agricultural system in Arab countries is rainfed agriculture, with the total irrigated area in the Arab world being less than 28 percent (FAO, 2008b). Therefore, annual agricultural productivity and food security are highly correlated to the annual variability of precipitation, which has exhibited major changes in recent decades.

Climate change / Model Projections and Observations

- ❑ Average surface temperatures in North Africa have increased 1-2°C between 1970 and 2004 (IPCC, 2007).
- ❑ In North Africa, with a 3°C rise in temperature, an additional 100 million people may suffer increased water stress.
- ❑ Climate change will cause world food prices to rise, with negative effects on food security.
- ❑ Egypt expects to lose 15 percent of its wheat crops if temperatures rise by 2°C, and 36 percent if the increase is 4°C.
- ❑ Most North African countries traditionally import wheat and are therefore highly vulnerable to price shocks and droughts elsewhere.
- ❑ The crop modeling results indicate that climate change will have a negative effect on crop yields in the Middle East and North Africa in 2050.

- The region will face yield declines of up to about **20** percent for **wheat** and **47** percent for **maize** (IFPRI, 2009).
- Unless effective **Adaptation Strategies** are developed and implemented, this decrease in crop yields and food production could result in **millions** more people facing food insecurity.

Proposed Scenarios to Cop with Climatic Change toward Food Security

Working on **adaptation strategies** that may contribute to adapting agriculture to the impacts of climate change and addressing problems of food insecurity could includes:

- Using **nuclear techniques** for crop improvement (e.g. cereals).
- Genetically engineered climate resilient seeds (cereals, vegetables)**.
- Stable carbon isotope analysis for determining the drought resistant plant genotypes (e.g. fruit crops “olive”).
- Reducing postharvest losses
- **OTHERS (already covered yesterday in the 1st session)**
 - Water harvesting techniques
 - Promoting water reuse in agriculture
 - Improved irrigation techniques

FIRST APPROACH:

Using nuclear techniques for crop improvement

“Improved Crops via Induced Mutation”



Techniques

- Gamma Rays
- X-Rays
- Neutrons
- Chemicals

Target

- Drought Resistance Varieties
- Early Flowering
- Shorter growing period
- Suitable for rotation
- Increased tolerance or resistance to abiotic and biotic stresses



Crops

- Wheat
- Barley
- Peanuts
- Beans
- Cotton



IAEA
Vienna-
Austria

IAEA-Active projects in the AC: Palestine, Algeria, Morocco, Sudan, and Yemen.

SECOND APPROACH:

Genetically engineered climate resilient seeds

- ❑ For thousands of years, farmers have adapted to changes in climate through a process of **seed selection** (**SLOW PROCESS**-need many years)
- ❑ Agricultural biotechnology and particularly **genetic engineering** has in recent years directed attention to the development of climate-resilient seeds and crops (**FAST PROCESS**).
- ❑ It allows the **TRANSFER** of **specific genetic traits** from one seed to another, with the objective of developing seeds with resistant traits. Seeds that are **genetically engineered** to require less water to grow crops, for example, could be useful in maintaining adequate food production in periods of drought (**GMOs**).

THIRD APPROACH:

Stable Carbon Isotope Analysis

The collaboration:

- Hebron University, Palestine (Dr. Rezq) and Kansas University (Dr. Joy Ward).
- Via the **ARAB-AMERICAN FELLOWSHIPS** provided after the Kuwait-symposium.

This study provides a foundation for beginning to determine the degree to which olive responds to water availability and may allow us to choose the most appropriate genetic sources for continued success of olive production in the face of a rapidly changing climate in the whole Mediterranean countries.

Future potential:

This study could be used as a model that could be up-out scale for all of the other fruit trees suitability mapping.

THIRD APPROACH:

Stable Carbon Isotope Analysis

The technique:

- Carbon isotopes are indicative of plant ci/ca (inter-cellular [CO₂] / atmospheric [CO₂]) ratios, which are **driven by** **stomatal regulation** (usually the primary factor), as well as **leaf photosynthetic capacity**.

Results:

- *The oldest tree (possibly greater than 3,000 years old) had carbon isotope ratio values that were different from all of the other younger trees. More specifically, this tree had an very high isotope value that likely reflects higher stomatal conductance and higher ci/ca values.*
- *This study provides a foundation for beginning to determine the degree to which olive responds to water availability and may allow us to choose the most appropriate genetic sources for continued success of olive production in the face of a rapidly changing climate in the whole Mediterranean countries.*

Future potential:

- *This study could be used as a model that could be up-out scale for all of the other fruit trees suitability mapping.*

FOURTH APPROACH:

Reduces the postharvest losses:

- ❑ The main causes of these losses are attributed to **improper methods** used in the harvesting, processing, transportation, and storage of the crops, as well as inefficient import supply chain logistics.
- ❑ It is estimated that the annual losses of grains in Arab countries amounted to about 6.6 million tons in 2012.
- ❑ Loss in imported wheat in some Arab countries translates to about 3.3 million tons due to inefficient import logistics.
- ❑ The combined value of grain PHL and wheat import losses amount to about **US\$3.7 billion** at 2011 import prices, which represents **40 percent** of the wheat produced in all Arab countries in value terms.

Follow...FOURTH APPROACH: **Reduces the postharvest losses:**

- ❑ Because such losses represent a **waste in food supply** and **other natural resources**, including land, water, energy, fertilizers, pesticides and labor. This is intensified by environmental damage, including excessive greenhouse emissions from agricultural activities along the food chain.

RECOMMENDATIONS:

- ❑ Without one Arab union and breaking down the boundaries between them, Arabs will never be food secure.
- ❑ Arab countries need to adopt policies and take real actions toward the problem of food insecurity.
- ❑ Establishing an integrated food value chain is of paramount importance to the achievement of the entire food security components comprised of availability, accessibility, stability, and utilization.
- ❑ Urgent Adaptation Strategies must be taken via the different research collaboration especially with USA universities and research institutes (That's one of the main goals of such great conference).



Many Thanks

Note- Most of the diagrams, tables and the charts as well were extracted from the last report published by the Arab Forum for Environment and development, 2014