Scientific Research and Technology Management: An Imperative for the Arab World

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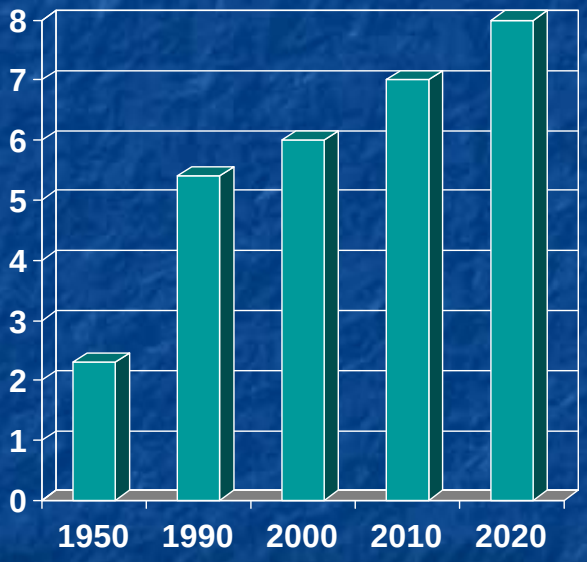
Introduction

- Old challenges.



- New challenges:
  - Globalization.
  - Knowledge-based economy.

Importance of R&D

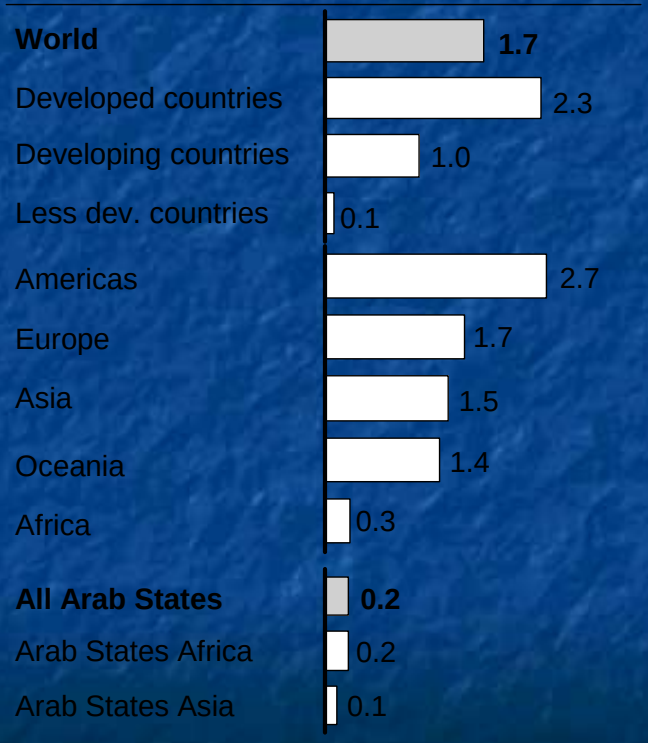
- Characteristics of R&D in the Arab World.
- Characteristics of the Arab World economies.
- Importance of investing in R&D

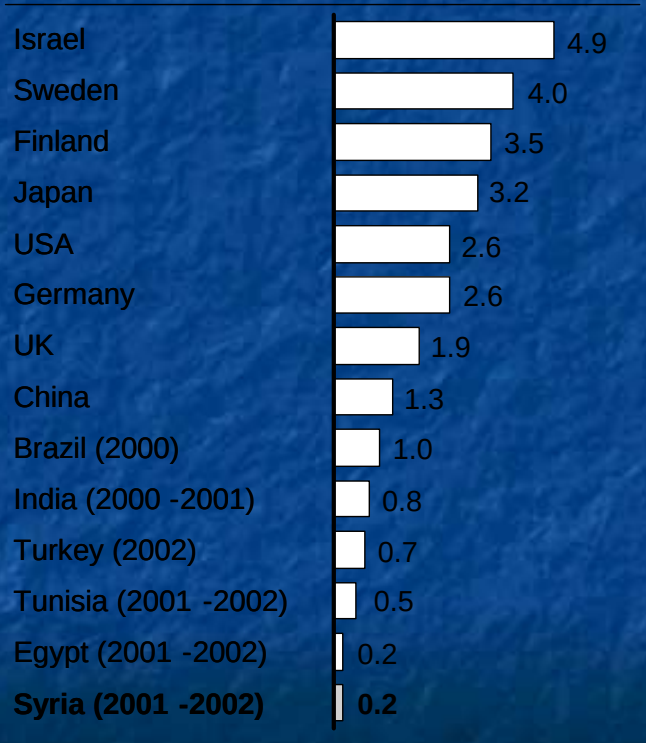
Characteristics of R&D in the Arab World

- Inputs:
  - Budgets and investments
  - Human resources
  - Infrastructure

Budgets and Investment

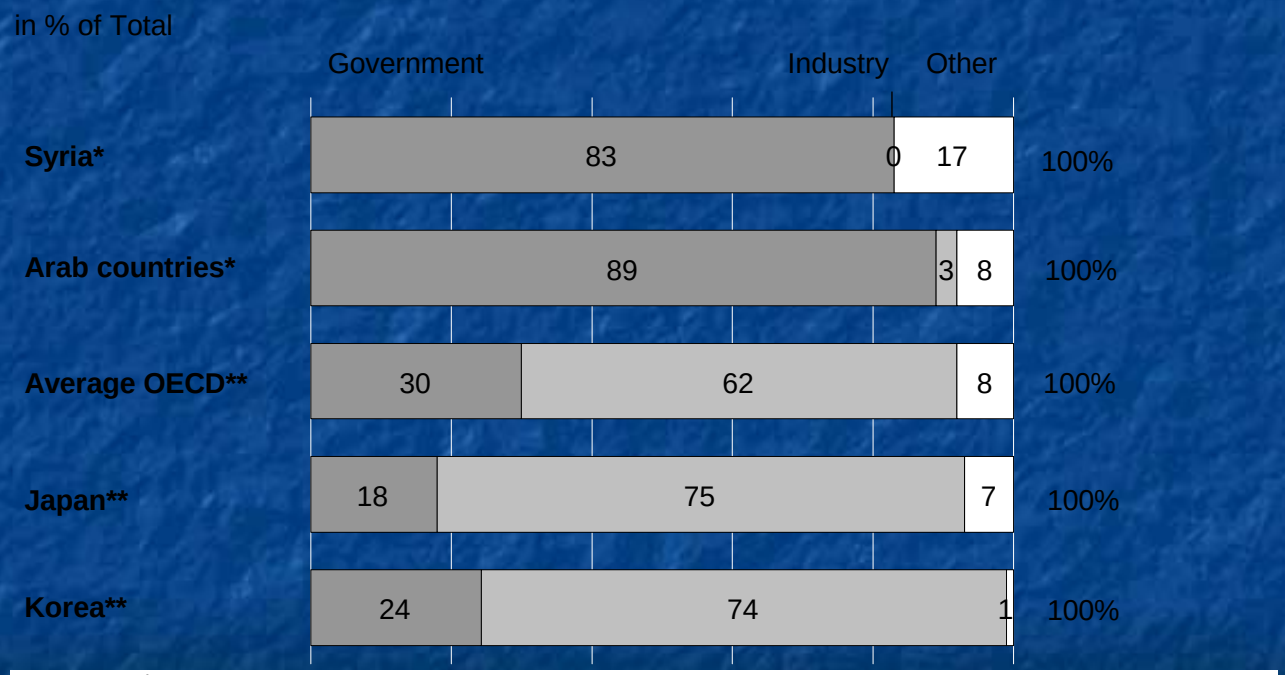
R&D expenditures as % of GDP





Source : UNESCO Institute for Statistics estimations , December 2004, European Trend Chart 2005

Most R&D financing is sourced from public sector



* For the year 1996
** For the year 2004
Source : Adapted from ESCWA -UNESCO, 1998, OECD Science, Technology and Industry Scoreboard , 2005

Human Resources and Infrastructure

- Moderate quality of scientists certified from Arab Universities.
- Brain drain: > 200,000 Scientists left the Arab World in the last 30 years.
- Existing institutions dealing with R&D are poorly staffed and funded.

Outputs of R&D in the Arab World

- Economic impact.
- Patents.
- Published scientific papers.

Number of patents registered in the US from Arab and non-Arab countries during the period 1980-2000

Arab countries		Other countries	
Country	**No. of Patents**	**Country**	**No. of Patents**
Saudi Arabia	171	Korea	16,328
Egypt	77	Israel	7,652
Kuwait	52	Chile	147
UAE	32		
Jordan	15		
Syria	10		
Bahrain	6		
Oman	5		
Yemen	2		

Source: Arab Human Development Report 2003

Published Scientific Papers

- Less than 1% of the total published papers:
  - 26 papers/M in 1995: increased 2.4 times / 1981
  - 11 times in China and 24 times in Korea
- Moderate quality: poor content in basic sciences.
- Publications for Promotion.

Characteristics of the Arab World Economies

- Low economic diversity
- Low growth rate
- Unemployment: the highest in the world!
- Leakage of main growth factors:
  - Brain Drain
  - Capitals
- Products with very low added value

Importance of investing in R&D

- Some Developing Countries became New Industrialized Countries (NICs).
- Foresights and Objectives/Targets.
- Examples: Korea, China, Malaysia, Brazil, Argentina, South Africa, Ireland and Finland…

Importance of investing in R&D

- Industrial progress through technological breakthrough.
- Economical Growth through Technological Growth.
- New Growth Theory:
  - Economic growth directly related to technology and capitals.

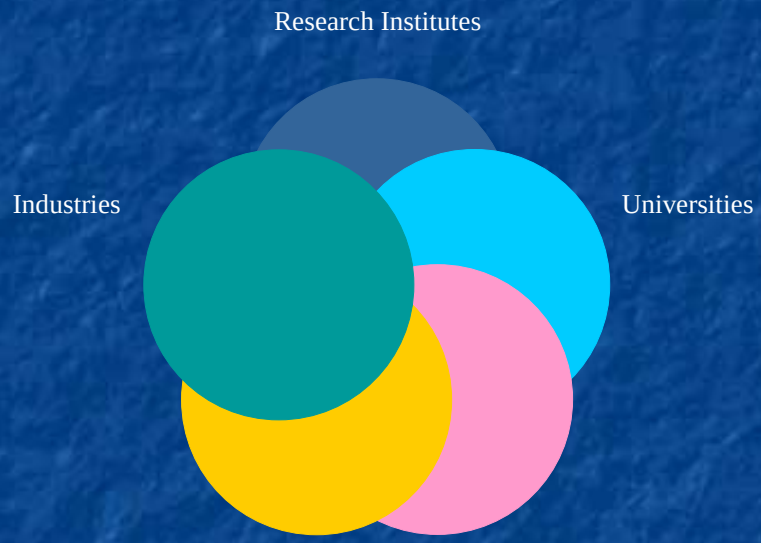
Knowledge-Based Economy

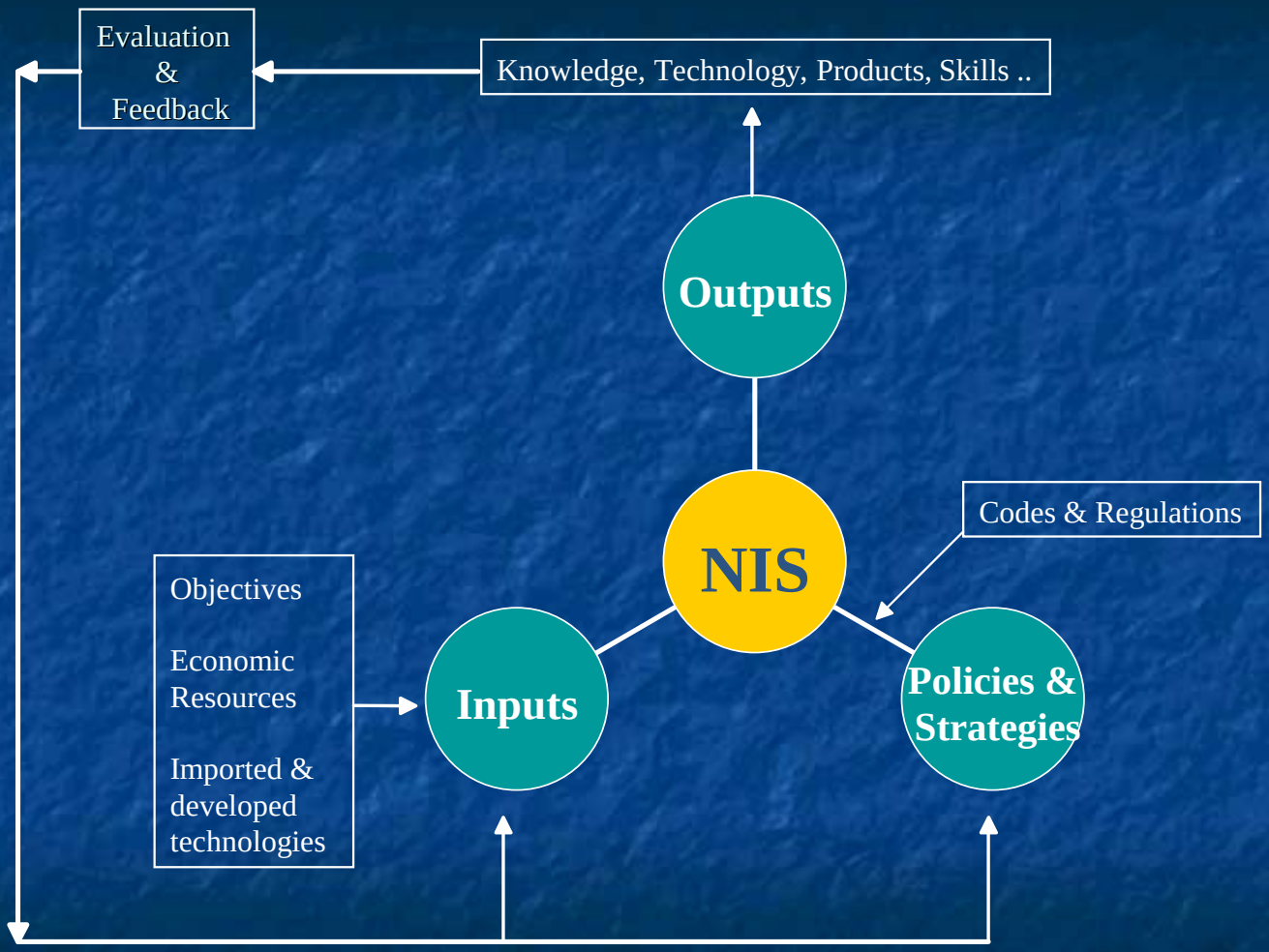
- >50% of historical growth in per capita income in USA is related to technological advancement.
- >50% of GDP is knowledge-based in OECD countries.
- 43% of Ireland exportations are knowledge-based.

National Innovation System (NIS)

- S&T policy
- R&D strategy
- Win-Win

NIS Components:




Evaluation & Feedback
Knowledge, Technology, Products, Skills ..
Outputs
NIS
Codes & Regulations
Objectives
Economic Resources
Imported & developed technologies
Inputs
Policies & Strategies

What kind of Innovation?

- Radical Innovation
- Incremental Innovation

Technology Management

- Technology Acquisition:
  - Transfer of Technology
  - Implementation of Technology
  - Production of Technology

Transfer of Technology Management

- External Transfer of Technology
  - Selection.
  - Licensing, Strategic Alliances, Technical Assistance …
  - Application.
- Internal Transfer of Technology
  - Failed in the Arab World: Problems in NIS.

Implementation of Technology Management

- Better understanding
- Improve the product or the process
- Reverse Engineering and Local Development

Production of Technology Management

- New Competitive Product
- Advanced stage
- Mature NIS:
  - R&D&I + Industry + Budget + HR + IP + Alliances + Marketing

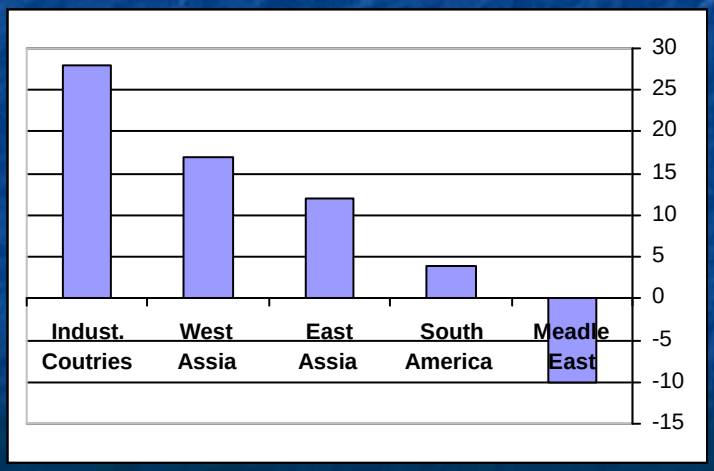
Technology Management

- National Policy for Science and Technology:
  - Define Axes: ICT, Biotech., Nanotech., New Materials …
  - Weak and Strong Points.
  - Opportunities and Threats.

- Define the R&D&I structure.

Remarks regarding the Transfer and Implementation of Technology

- Transfer of Technology evaluation:
  - How to measure transferred Technology?
  - Critical factor: Capacity to contain/integrate technology.



Contribution of Technical Progress to Economic Growth (1960-1992)
(World Bank)

Conditions for Successful Implementation of Technology

- Qualified and skilled Human Resources.
- Adequate financing: Venture capital.
- Codes and Regulations.
- Adequate environment.
- High education in mother language.

R&D&I Networks

- Importance:
  - Multidiscipline / Multi-sectors
  - Creating critical mass of qualified persons
  - Improve R&D activities and products
  - Sharing Cost, Risks and Benefits
  - Avoid duplicate efforts
  - Decrease time in developing new products

R&D Networks Versus R&D&I Networks

- R&D Networks
  - Pre competitive
- R&D&I Networks
  - Competitive:
    - Technological cooperation
    - Manufacturing
    - Marketing

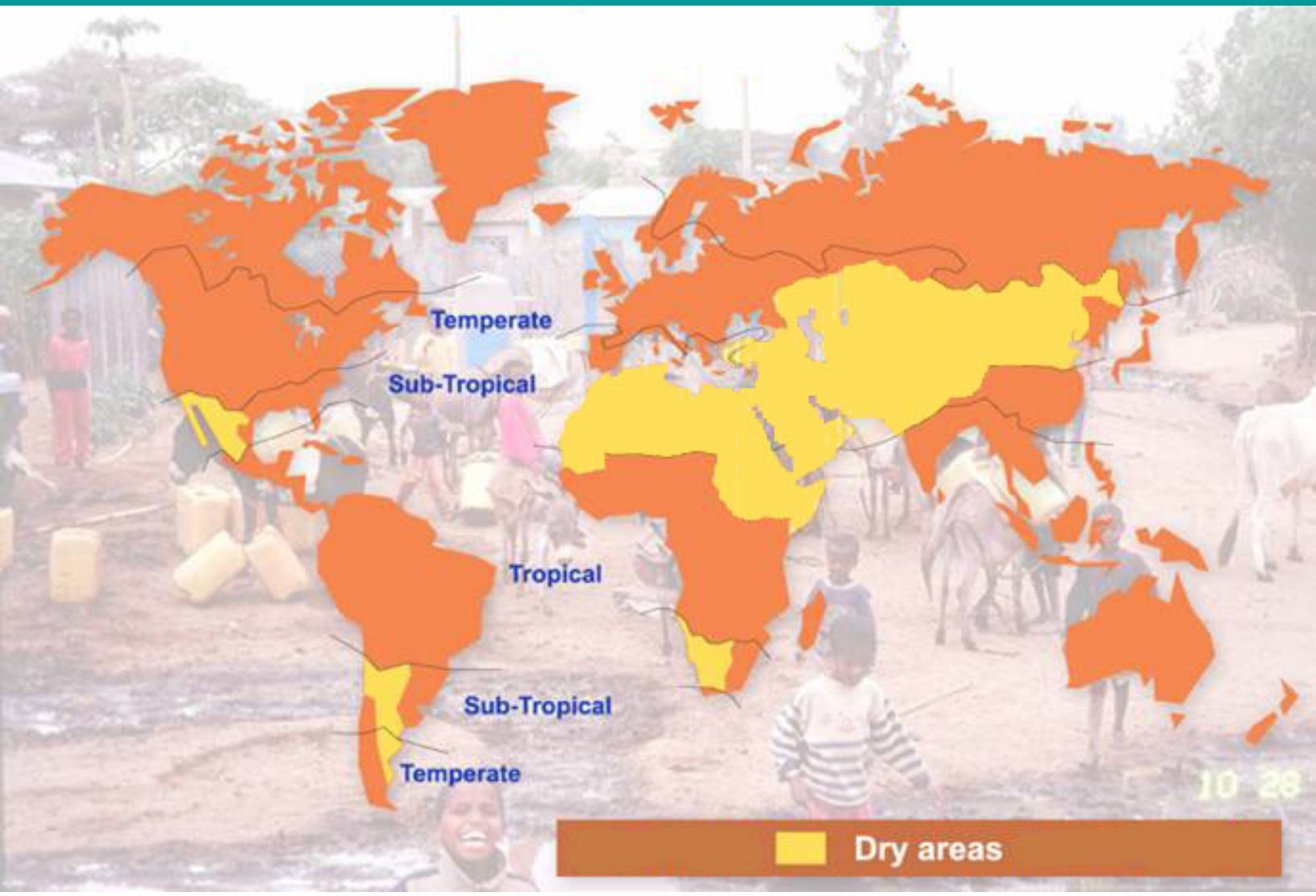
Arab R&D&I Networks

- Nothing in the past
- Nothing Now
- Imperative in the future

Scopes of Priority

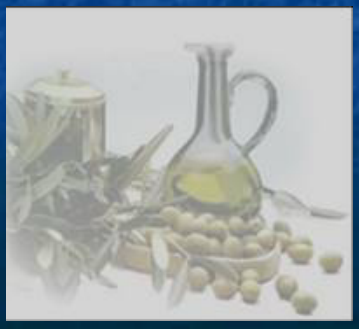
- Water Desalination
- Agriculture
- New Materials
- Renewable Energy

Dry Areas of the World



Agriculture

- Strategic field crops.
- New adapted varieties:
  - Irrigated Wheat: 1.9 Ton/Hectar to 4.2 Ton/Hectar
  - Rain-fed Wheat: 0.7 Ton/Hectar to 1.5 Ton/Hectar
- Application of Biological and integrated Control.



New Materials

- New technologies.
- New raw materials.
- Environmental regulations to be respected.
- Necessity to improve high education and R&D.

Renewable Energies

- Oil will not last for ever.
- Clean Energy:
  - Photovoltaic

Mechanisms to Enhance Implementation of Technology in the Arab World

- Prospecting the future
- Filling the gap in the NIS structure
- Providing the proper financing mechanisms
- Human Resource development
- Codes & Regulations
- Promote all kind of cooperation

Thank you