

# National Research Centre Cairo, Egypt

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### The National Research Centre

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# NRC in Brief



## 60<sup>th</sup> Year Anniversary





# NRC 2016



- 12 Feddans (51000 m2).
- 11 Research buildings.
- **2** Administration buildings.
- 10 Store rooms.
- Animal houses.
- Green houses.
- 5 Experimental stations.
- Research farm 350 feddans.
- 14 Research Division
  - 109 Research Department





The major multi-disciplinary R&D Institute in Egypt

- Devoted to basic and applied research.
- The largest of all institutions affiliated to the Ministry of Scientific Research.
- Employs 70% of all scientists working in these institutions.
- Correspond to the country's key production and services sectors.



# **NRC Mission**



### NRC Objectives Contribute in national upgrading of science & dissemination of knowledge Contribute • The National Economy Guide scientific linkages and cooperation with local and international organizations S**trengthe**r • scientific services and consultations provide • Graduate students Training



# Organization Structure

## Organization structure





### Organization Structure (cont.) Research Divisions



 Health and Environment
 Industrial Research
 Agriculture and Biology Basic Science



# **NRC Strengths**

# Total: 7360 **Man Power** Research staff: 3150 Scientific assistance: 1650 Administrative staff: 2560



# Research and Development Research and Development Projects

*NRC* activities are *customer-oriented* in order to address the national needs more effectively through scientific and technical research.



### Research and Development (Cont.) Research Projects

Customer-Oriented

Addressed to national needs

In-house projects - Governmental budget (18%): 9<sup>th</sup> plan (2010-2013)
 National projects - contracts (30%)
 International projects (52%)



## **Current Strategy**

### Advanced Basic Scientific Research

### Interaction with Production and Service Sectors

### **Unternational Relations**

















### 8–Flours Building for Advance Research

### Outstanding Incentives for Research Staff





Egyptian – Indian Partnership



Major Activities The 11<sup>th</sup> Research Plan









Main Axiss	Sub-axes
1.1. Human medical researches	<ul> <li>1.1.1. Early detection of chronic diseases, cancer and autoimmune diseases among high risk individuals.</li> <li>1.1.2. Identification of new Biomarkers with high quality or lower cost and time for diagnosis &amp; assessment of disease prognosis.</li> <li>1.1.3. Evaluation of a new technique for diagnosis &amp; assessment of disease prognosis.</li> <li>1.1.4. Prevention, diagnosis and treatment of genetic diseases</li> <li>1.1.5. Fetal and maternal health</li> <li>1.1.6. Stem Cell research.</li> <li>1.1.7. Infectious Diseases (Early detect and treatment of virus C)</li> <li>1.1.8. Geriatric health</li> <li>1.1.9. Occupational diseases and early detection</li> <li>1.1.10. Health effects of environmental pollution</li> <li>1.1.11. Health awareness</li> <li>1.1.2. Drug addiction and treatment</li> <li>1.1.3. Mummies, their skeletons and nucleic acid studies</li> </ul>



Main Axis	Sub-axes
	<ul> <li>1.2.1. Stem cells</li> <li>1.2.2. Nanotechnology</li> <li>1.2.3. Polymers and natural materials</li> <li>1.2.4. Removable and fixed processes</li> <li>1.2.5. Dental genetics</li> </ul>



Main Axis	Sub-axes
1.3. Pharmaceutical and drug researches	<ul><li>1.3.1. Assessment of natural products against cancer, autoimmune and chronic diseases.</li><li>1.3.2. Synthesis of pharmaceutical compounds with</li></ul>
	<ul> <li>biological activities</li> <li>1.3.3. Chiral separation of enantiomers in pharmaceuticals</li> <li>1.3.4. New methods for the analysis of pharmaceutical products</li> <li>1.3.5. Recent developments and their application in the industry of pharmaceutical formulations</li> </ul>



Main Axis	Sub-axes
1.4. Development of diagnostic kits	1.4.1. Development of diagnostic Kits & supplement
<image/>	(Media, Growth Factors, IL, etc) 1.4.2. Production of primers and probes for genetic mutation detection



## Animal Wealth Development

Main Axes	Sub-axes
2.1. Animal, poultry, and fish production	<ul> <li>2.1.1. Ruminant development</li> <li>2.1.2. Management of low fertility in animals</li> <li>2.1.3. Fishery, poultry, and farm animals' production through genetic improvement</li> <li>2.1.4. Identification of animal, poultry and fish breeds with a natural resistance to diseases through genetic selection.</li> <li>2.1.5. Improvement of the applications of artificial insemination and sire selection in farm animals under local conditions.</li> </ul>
2.2. Diseases diagnosis and control	<ul><li>2.2.1. Development of veterinary diagnostic kits</li><li>2.2.2. Vaccines &amp; sera development &amp;production from local strains.</li><li>2.2.3. Zoonotic diseases</li></ul>
2.3. Alternative veterinary medicine	<ul> <li>2.3.1. Medicinal and aromatic plant extracts</li> <li>2.3.2. Antibiotic substitutes</li> <li>2.3.3. Probiotics</li> <li>2.3.4. Bee products</li> <li>2.3.5. Biological control</li> </ul>







## Food Safety

Main Axis	Sub-axes
4.1. Functional Foods	<ul> <li>4.1.1. Natural, processed and flavored food &amp; drinks used in disease Prevention and therapeutic</li> <li>4.1.2. Development of flavours and food additives from natural resources</li> </ul>
4.2. Food safety	4.2.1. Bio and organic production of horticultural crops 4.2.2. Food production, transportation, and handling
4.3. Cleaner production	<ul> <li>4.3.1. Cleaner food production through health controls on products of animal origin.</li> <li>4.3.2. Detection of meat, milk and other foodstuffs adulteration.</li> <li>4.3.3. Identification of hormonal residues , heavy metals and insecticides in foods of animal origin.</li> </ul>



## 5- Renewable Energy

Main axis	Sub-axes
5.1. Renewable Energy	<ul> <li>5.1.1. Solar energy and solar cells</li> <li>5.1.2. Wind energy</li> <li>5.1.3. Hydrogen</li> <li>5.1.4. Biofuel</li> <li>5.1.5. Systems of energy generation, storage and control</li> </ul>
	5.1.6. Lithium battery 5.1.7. Fuel cells



### 6-Water

Main Axis	Sub-axes
6.1. Water	<ul> <li>6.1.1. Water purification</li> <li>6.1.2. Recycling</li> <li>6.1.3. Rational use of water</li> <li>6.1.4. Desalination</li> <li>6.1.5. Membranes development and evaluation</li> <li>6.1.6. Waste Management</li> </ul>



### Environmental Research

Main Axis	Sub-axes	
7.1. Environmental researches	<ul> <li>7.1.1. LASER, and nanotechnology applications in air and physical pollutions</li> <li>7.1.2. Development of effective low-cost materials for removing hazardous contaminants from water</li> <li>7.1.3. Advanced or new technologies to remove pollution from industrial and sewage water</li> <li>7.1.4. Sensors for climate changes</li> <li>7.1.5. Sensors for pollutants</li> </ul>	
7.2. Waste	7.2.1. Management and/or recycling of solid and liquid	
Management	wastes	



#### 8- Proper Utilization of Natural Resources

Main Axis	Sub-axes
8.1. Raw materials and mineral resources	<ul><li>8.1.1. Applications of geophysics</li><li>8.1.2. enhancing the efficiency of productivity</li></ul>
8.2. Conservation of germplasms	<ul><li>8.2.1. Conservation of medicinal plants</li><li>8.2.2. All other disciplines</li></ul>
8.3. Climate changes	<ul> <li>8.3.1. Impact on agriculture production</li> <li>and soil</li> <li>8.3.2. Impact on health and epidemics</li> <li>8.3.3. Biodiversity and environment</li> <li>8.3.4. Water resource and water</li> <li>consumptive use</li> </ul>



### 9- Innovation in industrial development and enhancement of its competitiveness

Main Axis	Sub-axis
	9.1.1. Intermediates chemical, auxiliaries, and functional colorants
	9.1.2. Generation of ozone
9.1. Product/service-oriented projects	9.1.3. Polymers, biomaterials, and synthetic materials
	9.1.4. Technical and smart textiles and composites
	9.1.5. Technological systems in production sectors
	9.1.6. Safe data transfer
	9.1.7. Software Programs
	9.1.8 Food industry
	9.1.9. Development in agricultural machinery
	9.1.10. Mechatronics (product design or product depends on
	integration of mechanical and electronic systems
	9.1.11. Cleaner production in industry



#### 9- Innovation in industrial development and enhancement of its competitiveness

Main Axis	Sub-axes
9.2. Carbon Nanotubes	9.2.1. Preparation, characterization, and
	application
	9.3.1. Nanotechnology
	9.3.2. Information technology
	9.3.3. Biotechnology
9.3. Applications of Frontier Sciences	9.3.4. New Materials
	9.3.5. Nano-biotechnology
	9.3.6. Semiconductors
	9.3.7. Biomaterials
	9.4.1. Research proposals illustrate the urgent
	need for action to reach for the manufacture of a
	final product of the tenth plan research outputs. It
9.4. Upgrading of research outputs of	should proposed summary of the research
10 <sup>th</sup> Research Plan	presented in this axis contains a clear scientific
	justification to show the expected return from the
	application of obtained results in the previous
	plan during eleventh research plan



### Applied Research Outputs within the past12 Months

Field	Number of applied	Income (Million EGP)		
	Protocols			
Chemical industries	22	20.30		
Health	1	0.50		
Textile Industries	4	0.12		
Pharmaceutical Industries	4	0.72		
<b>Environmental Field</b>	7	8.44		
Engineering Field	9	1.98		
Food and nutrition industries	4	10.22		
Total	51	42.28		





# Biotechnology Plant Unit

















#### A multipurpose Pilot Plant, a Chinese Grant





# Some Plant Equipment



#### Distillation



#### 2 Reactors



#### **Multi-speed Centrifuge**



#### **Extraction**



Filtration





#### Dryer

#### Absorption



# Current Strategy (Cont.)

### INTERNATIONAL RELATIONS



# **International Relations**



#### International Relations Office:

Scientific channels with regional and international universities and research centers.

Projects, contracts and scientific agreements.

#### African Relations Office:

Promotes the Scientific cooperation with African countries

#### **European Relations Office:**

Promotes the Scientific cooperation with European countries



# NRC Networking

### International Organizations:

- **Center of excellence** (2004) by the Commission on Science and Technology for Sustainable Development in the South, **COMSATS** & for Biotechnology (2007)
- **The interim regional hub** in Biosciences for North Africa by the New Partnership for Africa's Development, **NEPAD**
- Third World Academy of Science, TWAS
- Third World Network for Scientific Organizations, TWINSO
- World Association of Industrial and Technological Research Organizations, WAITRO
- 🐴 Middle East and North Africa **(MENA)**
- African Network for Drugs and Diagnostic (ANDI)
- African Academy of Sciences (ASF)



### NRC Networking (Cont.) Recently Signed International Protocols

The National Research Council in Italy

Korean Industrial Technology Foundation

National Engineering Academy of Kazakhstan

Yarmuke University in Jordan

Sudanese Centre for Res. & Indust. Consultations

Arab Union of Textile Industries

Technical University of Liberec, Czech Republic

National Cancer Institute, USA



# NRC Networking

NRC Scientific Cooperation (2000/2010)



# Scientific Records



### Number of published articles (scopus)





### Number of Accepted Patents





#### No . of Research Projects







No . of National Prizes

Apart from many other International and NRC prizes



### Applied Research opportunities

The National Research Centre of Egypt has reputable contributions in many fields. The NRC is willing to promote collaboration with the staff of the akin disciplines in the COMSATS' member states in the following fields

# Applied Research opportunities 1- Health

Triplet PCR kits for HCV	, TB and toxo	plasma		
Production of immunoassa	y kits for HCV an	tibodies and anti	igens	
Early detection of b	iochemical genetic	diseases		
	Stem cells	Obesit	ty	
	Diabetes	нсу	Cancer	

Applied Research opportunities 2- Solar Cells



# Applied Research opportunities <u>3</u>- Nanotechnology



Applied Research opportunities 4- Renewable energy



# Applied Research opportunities 5- Industrial Research

Purification of industrials water from heavy metals and other

contaminants

Functional Food from traditional experience to modern production

Functional polymers for various applications

# Applied Research opportunities 6- Agriculture





# Thank You