The Role of Science, Technology and Innovation in Ensuring Food Security - Interventions in Pakistan

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Pakistan

Pakistan- Some Basic Facts

- **Population: 184.4 million (6th largest)**
- **~ 60 % population consists of youth (<25 Yrs).**
- **Total area: 796,095 sq. km. (reasonably large)**
- **Cultivated area: 172,487 sq. km.**
- **Cropped area: 41,633 sq. km.**
- **5th largest milk producer country (**35.6 billion liters annually)
- **GDP: 236.6 US$ billion (26th largest)**
- **GDP growth rate: 4.71**
- **Per capita income: 1474 US$**
- **Domestic market size: 25th (144)**
- **Lower middle income: 128th (167)**

Sustainable Development Goals

The Goal of Food Security

#2: End hunger, achieve Food Security and improved nutrition and promote sustainable agriculture

Food Security

Food security exists when all people, at all times,

have physical and economic access

to sufficient, safe and nutritious food

to meet their dietary needs and food preferences

for an active and healthy life.

Dimensions of Food Security

availability	access	stability	utilization
• domestic production • import capacity • food stocks • food aid	• poverty • purchasing power • transport and market infrastructure • food distribution	• weather variability • price fluctuations • political factors • economic factors	• food safety and quality • clean water • health and sanitation

Food Security and Nutrition

Key determinants

- **food availability**
- **stability**
- **food access**
- utilisation of food
- care and feeding practices
- health and sanitation conditions

food security dimensions

determinants of good / poor nutrition

Challenges for Food Security

Some factors affecting Food Security includes:

Population growth- In 2012, world population **7 billion**.
By 2050, it is predicted to reach **9 billion**.

Climate change - **Warmer world** will affect what crops can be grown, where. Climate change can lead to more frequent extreme weather events (e.g. floods) which can damage crops.

Pests and diseases –Pests/diseases becoming resistant to pesticides/sprays. The climate change brings pest & diseases into new areas where they could not previously survive.

Changing diets - As people become richer they tend to eat a more varied diet, including more meat, which means more competition for the same types of food.

- **Impure/processed food and rising health issues**

- **Depleting/Wasting natural resources**
  - –Nutrient (soil), Water, Forests

Shortage of food or Inequality?

Food Shortage or Inequality?

- **805 M** people suffer-chronic hunger
- **161 M** children are stunted
- **2 B** people suffer - micronutrient deficiency, or "hidden hunger"

- > **500 M** adults are **obese**, while an estimated
- **42 M** children (<5) are **overweight**

Gross Comparison

non-communicable diseases related to diet, such as heart disease, cancer & diabetes growing with rapid pace, posing major health issues

Some Measures to Adopt

- **Make crops more efficient & resilient to climate change**
- **Rescue more farm land**
- **Help Biodiversity flourish**
- **Empower Smallholders (Land Reforms)**
- **Rural Development / De-urbanization**
- **Help People stay safe**
- **Exploiting high market of organic and functional foods**
- **Preserving water** (attitude as well as techniques)
- **Recycling crop/livestock waste** or treated human manure
- **Saving food through Educating public** – Nutritional aspects as well as consequence of overeating – Health issues

Saving Water for Next Generation

Australian water company, Active Organic Spring using Bottle Tag quoting Prophet Muhammad's Saying (Hadith) with each bottle of water.

"Do not waste water even if you were at a running stream "

Update: The bottle tags were created by the Macquarie University Muslim students Association in Sydney during the Islamic awareness week, the water company liked and applied

Importance of STI

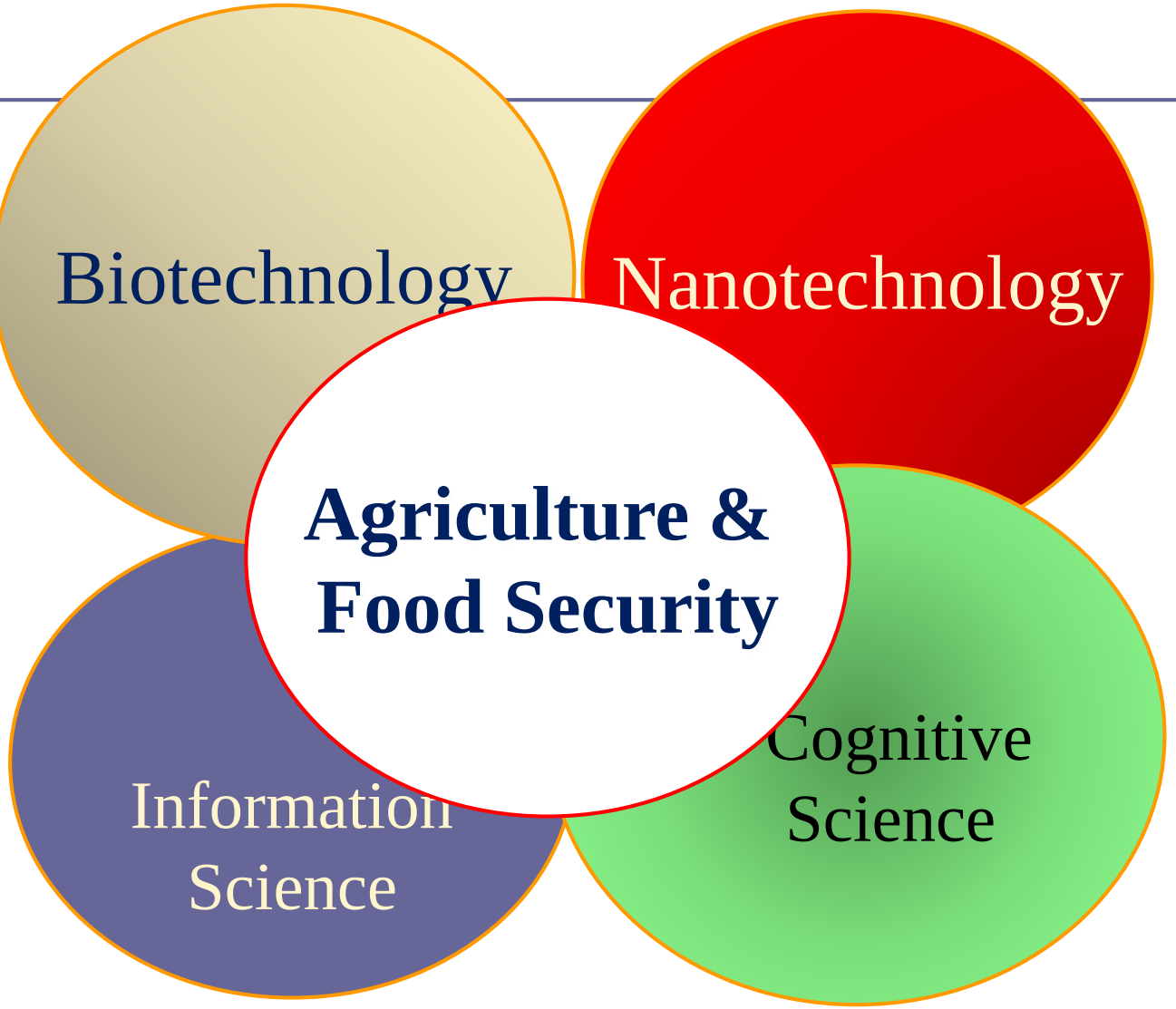
For -

- knowledge, profit, growth, competitiveness
- employment, wellbeing & quality of life
- safety, security & social cohesion
- climate change challenges, sustainability & resilience
- improving productivity, diversifying production
- developing & diffusing new energy sources building infrastructure
- organizing mega-cities (smart cities)

STI and Food Security

- **STI can play a major role**
  - Technology creation for economic growth to reduce poverty
  - Food security to reduce hunger through improvements in agriculture
  - **Biotechnology** and **Nanotechnology** have applications multidisciplinary in nature.

Converging Technologies (NBIC)



NBIC - Multidisciplinary scientific field at the crossroads of nanotechnologies (N), biotechnologies (B), information technology (I) and cognitive sciences (C) http://www.nbic.info/

Biotechnology

- **Biotechnology to improve yields**
  - Modern biotechnology – develop improved varieties faster
  - Today's Intellectual Property rules may be a hindrance
  - Seed market -multinationals- inability to use harvest as seeds
- **Biotechnology to improve quality**
  - Genetic modification to enhance nutritional value of foods
    - Prevent malnutrition, anaemia by Introducing vitamins, iron etc
    - e.g. Vitamin A enriched rice, high protein potato
  - Genetic modification to find new uses for traditional foods
    - e.g. Introduce gluten substitute in rice to make rice bread
- **Risks from biotechnology – precautionary principle**
  - Risks to human/animal health, food safety, environment

Nanotechnology

- **Nanotechnology to improve yields**
  - Nanotechnology to produce more effective **agrochemicals**
    - Nano-porous materials can be used for slow release
    - Reduce consumption/improve effectiveness- fertilizer, pesticides etc
    - Pesticides in nano-capsules release triggered by pest chemicals
    - Can improve productivity and help improve food supply
- **Nano-sensors to monitor crops**
  - Can improve crop monitoring services
    - Early warning of pest attack and crop growth
- **Nano-antimicrobial agents-** to protect food, increase shelf life
- **Nano-additives-** to improve nutritional value of foods
- **Risks –** Nanoparticles from non-toxic materials may be toxic

STI Policies

STI policy is fundamental to achieve food security as well as to implement the Sustainable Development Goals (SDGs).

- Therefore, STI policies should be aligned with the universal 17 SDGs.

- Research & Innovation investments will accelerate economic transformation, promote technology uptake and adaptation & strengthen governance capacities.

- STI policies can also turn SD into a huge business opportunity.

Some Success Stories in Pakistan

Farm Mechanization & Indigenous Tractor Industry

- **Millat Tractors Limited (MTL**), was established in **1964** to introduce and market Massey Ferguson (MF) Tractors in Pakistan

- An assembly plant was set up in **1967** to assemble tractors imported in semi-knocked down (SKD) condition

- The company was **nationalized** in **1972** under Economic Reforms Order and started assembling and marketing tractors on behalf of Pakistan Tractor Corporation (PTC) for import of tractors in SKD condition

- In **1980,** Government decided on **indigenization of the tractors** and entrusted this task to PTC, who transferred this role in 1981 to MTL

- The Company undertook this new role with enthusiasm and proved its engineering capabilities. Just in one year's time, the company took a giant step towards self-reliance by setting up the 1st engine assembly plant.

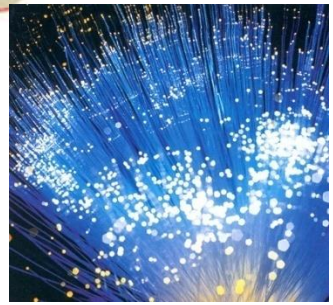
Indigenous Tractor Industry

- In **1992, the company was privatized**. The employees joined hands & took over the management by winning an open bid.
- The plant **started its production in the same year (1992).**
- The Company made a strategic decision right away to bring those manufacturing facilities **in-house** for which capabilities did not exist in the country and for parts which required high precision and investment.
- **In 1984**, sophisticated manufacturing facilities for the machining of intricate components were set up.
- **M/s Millat** Tractors Ltd. and **M/s Al-Ghazi** Tractors Ltd. are producing
- **8 models of tractors in the range of 50 to 85 hp**

- **M/s Millat Tractors** Ltd. is producing **45,000 units annually** while
- **M/s Al-Ghazi tractors** Ltd., has installed capacity of over **30,000 tractors**
- Two of these local manufactures **meet 95 % of local market demand**

Progress in IT Sector

139 M mobile phones
40 M smart phone users



SDH/PDH (525/622 Mb/s) backbone being upgraded to DWDM

10 Gb/s

Progress in IT Sector

- **Pakistan's share of global I.T. sales is now $2.8 billion (up from $ 30 million in year 2000). (*New York Times*, Aug. 10, 2015)**

- **Pakistan growing : About 1,500 registered firms and 10,000 IT grads entering the market annually (*Washington Wire,* 18th May 2015)**

- ***Pakistani programmers market ranks as No. 3 country in the world for supplying freelance programmers — behind only the USA and India.***

- **Pakistan's freelance programmers already account for $850 million of the country's software exports (*New York Times*, Aug. 10, 2015)**

Recent
Initiatives by Pakistan

Initiatives by Pakistan

Sustainable Development Goals (SDGs)

South – South Cooperation

- **China-Pakistan Economic Corridor (CPEC)**
- **Turkmenistan–Afghanistan–Pakistan–India Gas Pipeline (TAPI)**

Pakistan Vision 2025

China-Pakistan Economic Corridor

"China-Pak Economic Corridor projects span across the provinces and areas of Pakistan and the two sides have also made it clear that they will include the Central and Western lines of the Corridor in the long and midterm plans, and I believe this will help the comprehensive balance and steady growth of the corridor building."

Xi Jinping
President of the People's Republic of China

"China-Pak Economic Corridor will equally benefit all provinces and areas of Pakistan, and transform our country into regional hub and pivot for commerce and investment."

Muhammad Nawaz Sharif
Prime Minister of Islamic Republic of Pakistan

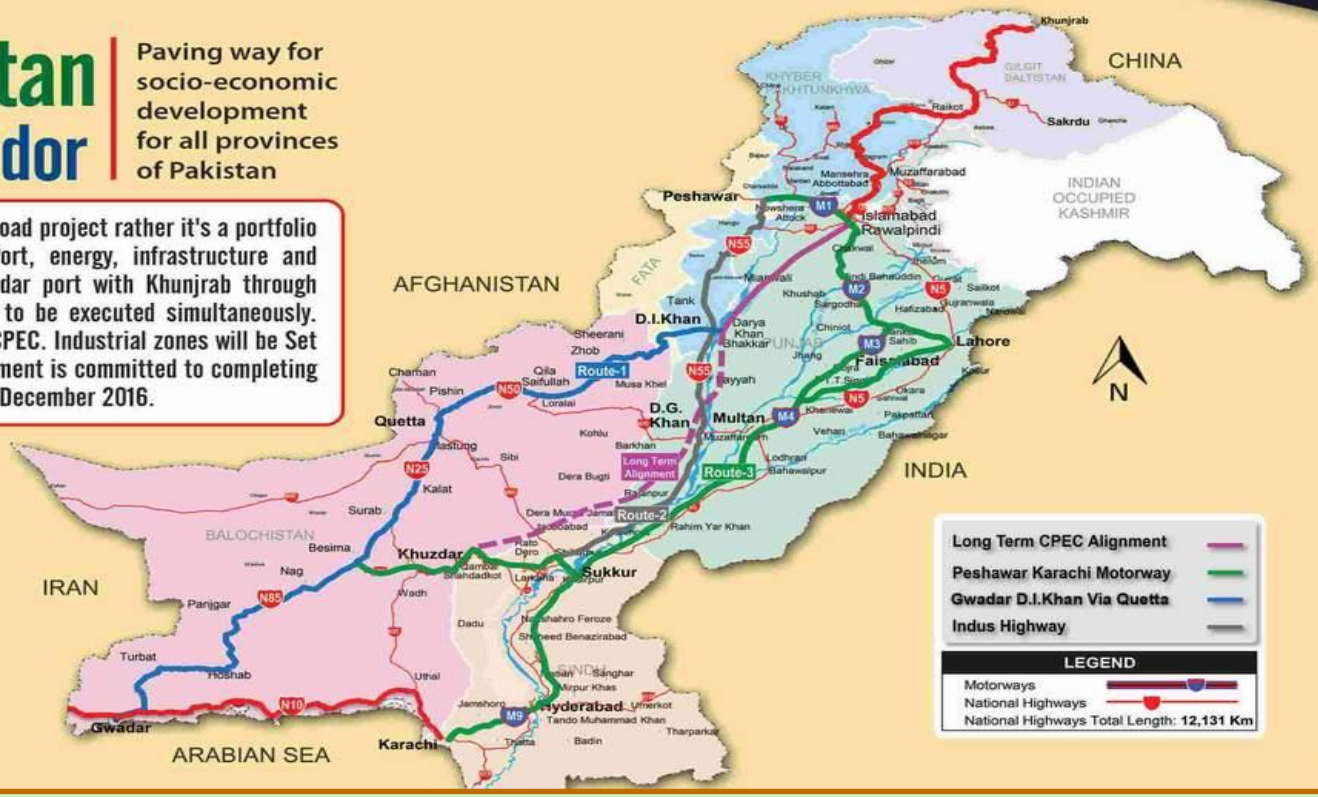
China-Pakistan Economic Corridor

Paving way for socio-economic development for all provinces of Pakistan

CPEC is not just a name of any single road project rather it's a portfolio of projects which include Gwadar Port, energy, infrastructure and industrial zones. It will connect Gwadar port with Khunjrab through Western, Central and Eastern routes to be executed simultaneously. There is no change in original plan of CPEC. Industrial zones will be Set up in all the provinces. Elected government is committed to completing the western route on priority basis till December 2016.

Salient Features:

- 16,400 Mega Watt additional electricity through coal, hydel, wind and solar energy;
- 2400 km trade corridor between Kashghar (China) and Gwadar through different routes;
- Upgradation and modernization of Karachi-Peshawar Railway track (ML-1);
- Establishment of new economic zones in all 4 provinces and regions;
- Development of port infrastructure and construction of new airport at Gwadar.



CPEC - A GAME CHANGER FOR PAKISTAN

www.pc.gov.pk

Pakistan Vision 2025
(to align with SDGs)

Pakistan Vision 2025

Important 4th Pillar of Vision (2025) –

Security: Energy, **Water and Food Security**.

Objectives for achieving food security are to:

- **Protect the most food-insure segments of the population.**
- **Create a modern, efficient and diversified agricultural sector-align with associated water & energy infrastructure.**
- **Optimize production and supply mix in-line with current and projected needs by leveraging unique strengths.**
- **Ensure that the entire supply-chain related to food security is geared towards provision of stable and affordable access to adequate, nutritious and safe food for a healthy life.**
- Use the resource base in an efficient and sustainable manner – with outcome-based benchmarks agreed in-line with regional & global standards.

Pakistan Vision 2025

Measures to ensure food security include:

- Improving access to food by the poor households.

- Targeted productivity enhancement programs will be introduced for farmers livestock owners below subsistence level.
- Increasing production of critical food items mainly in the remote areas of Pakistan.
-
- Promoting nutritional education for high risk groups (both under and over nourished).

From Vision to Action

Pakistan reshape itself with global pace of development as well as to meet SDGs goals and targets.

The **National STI Strategy and Action Plan (2016)** has been prepared in-line with the Vision 2025 to align the national R&D activities with the global SDGs in local scenario.

National Science, Technology & Innovation Strategy and Action Plan (2016)

An Efforts towards Sustainable Development

- Total Actions: 44 (22 short , 17 medium & 5 long-terms)
- Total Implementing Agencies: 24
- Total Stakeholders: 180
- Total cost estimate: Rs. 84.00 billion (~ 0.80 billion USD)

Implementing Agency	Major Stakeholders	Duration	Estimated Cost	Milestones	Key Outcomes

Action Areas

- Overarching Actions
- STI Policy & Management Infrastructure
- Education & Learning
- Triple Helix Linkages
- IPRs & Innovation
- Industry
- Quality & Productivity
- **Natural Resources and Food Security**
- **Climate Change & Environment**
- Health & Pharmaceuticals
- Biotechnology & Nanotechnology
- Fuel Cell Technology, Robotics & Automotive
- Space Technologies

Thank you

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