Promoting Sustainable Development through Innovative Cutting-edge Agricultural Technologies for Increased Production

Dr. Hassan Y. Al Ayedh (KACST/MEWA)
Ahmed Mohammed AlJabr (KFU)

Kingdom of Saudi Arabia

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Hunger Map 2019

821 million people - more than 1 in 9 of the world population - do not get enough to eat

Prevalence of undernourishment in the total population (percent) in 2016-18

<2.5% <5% 5-14.9% 15-24.9% 25-34.9% >35%

World Food Programme, 2019
Rural-Urban Population Trends in G20 Countries

- Rural population in G20 countries
- Urban population in G20 countries

World Bank, 2019
Total-factor productivity

Total-factor productivity (TFP), also called multi-factor productivity, is usually measured as the ratio of aggregate output (e.g., GDP) to aggregate input.
Sub-themes

1. Advanced Plant Breeding Tools for Crop Improvement
2. Farm Management Decision Support Systems (DSS)
3. Adoption of the technologies
Daily calories per person by type of food

Source: FAO
Cereals production targets

<table>
<thead>
<tr>
<th></th>
<th>Area (x10^6 ha)</th>
<th>Production (x10^6 tons)</th>
<th>Yield (t/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>158</td>
<td>792</td>
<td>5.0</td>
</tr>
<tr>
<td>Rice</td>
<td>156</td>
<td>660</td>
<td>4.2</td>
</tr>
<tr>
<td>Wheat</td>
<td>214</td>
<td>606</td>
<td>2.8</td>
</tr>
</tbody>
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Mark Tester and Peter Langridge, 2010. Science
Plant stresses

- Biotic and abiotic stresses especially in the face of climate change and intensive cultivation significantly affecting crops in terms of huge economic losses at various stages.

- Eco system need a synergic balance between living and nonliving parts, sunlight, temperature, wind, water, soil and naturally occurring as abiotic factor. And biotic factors such as plants, animals and micro-organisms.
Agricultural crops are typically developed for:
- higher yields
- better disease resistance
- hardier environmental resistance

**Two Principles of plant breeding**

- Genetic variation
- Selection

**Crop improvement approaches**

- Genetic Resources
- Genomics
- Genes
  - Marker-assisted selection
  - Genetic Engineering
  - Conventional selection
  - Genome editing

**Improved Germplasm**
Farm Management Decision Support Systems (DSS)

- Decision Support Systems (DSS), defined as: Farm management primarily based on the decision-making process, which affects farms and farmers.

- DSS are software-based systems that gather and analyze data from a variety of sources.

- Their purpose is to smoothen the decision-making process for management, operations, planning, or optimal solution path recommendation.
DSS in Agriculture

Per-cultivation
- Crop selection
- Land Selection

Cultivation
- Land preparation
- Swing
- Input management
- Water management
- Fertilization
- Pest Management

Harvesting
- Maturity
- Weather
- Harvesting
Future Perspective of DSS

- Being a key part of sustainable agriculture, DSS will become more and more robust.
- The increased connectivity of technologies and the multiplication of smart devices on the field stimulates the accumulation and storage of data.
- By integrating and analysing the captured data, DSS are meant to become more accurate as well as reliable.
- Actors from the sector have the ambition to make DSS more ergonomic and user-friendly.
- Companies already offer mobile interfaces on smartphones and tablets, that are easy to handle and can be used in real time, directly on the field.
Adoption of technologies

1. Ease of access
2. Affordability
3. Cost-effectiveness
4. Changing farmer’s behavior
Policies and Regulations

✓ Pro-poor policies, and actions are needed
✓ Ensure fair access to new technologies
✓ Policies should provide incentives to the farmers for the adoption of the technologies
✓ Government polices to support the farmers about innovative technologies
✓ Reduced migration from rural areas to cities
✓ Promote extension services through public sector
✓ Reducing the income gaps between urban and rural population
Proposed Actions at G20 MACS 2020

Planned Activity

✓ International Forum Innovation in Agri-Food Systems in collaboration with FAO and relevant International Organizations
Thanks...