Number of agricultural holdings 260,000 possession (Estimated to 1M hectares)

The number of workers in the agricultural sector 900,000

Sector provides about 30% of the total food (available for consumption in the Kingdom)

*Detailed results of the Agriculture census, 2015*
CHALLENGES IN KSA AGRICULTURAL SECTOR

Confrontational risks in the food security

Low efficiency of production and marketing

Low efficiency of agricultural land use

High incidence of animal diseases and agricultural insects, pests rate

The low water use efficiency for agricultural purposes and reliance on scarce and non-renewable sources

*Ministry of Environment, Water and Agriculture
### AGRICULTURE PRODUCTION IN KSA

<table>
<thead>
<tr>
<th>Production (kg/m²)</th>
<th>Water (l/kg)</th>
<th>Production (T)</th>
<th>Water (l/kg)</th>
<th>Production (T)</th>
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<td>9,359,772</td>
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<td>67,033</td>
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<td>0.6</td>
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<td>119,548</td>
<td>278,167</td>
<td>91,222</td>
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<tr>
<td>2.4</td>
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<td>5.6</td>
<td>143</td>
<td>143</td>
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</tr>
</tbody>
</table>

*Ministry of Environment, Water and Agriculture*
HISTORY


• (2011) An agreement was signed between Ministry of Environment, Water & Agriculture and King Saud University to establish Estidamah at Riyadh Techno Valley.

• (2013) An agreement was signed between SABIC and Ministry of Environment, Water & Agriculture for SABIC to manage the design and construction activities of Estidamah center.

• (2016) An agreement was signed between SABIC and Ministry of Environment, Water & Agriculture for SABIC to operate the center for the first 5 years.
INTRODUCTION

Purpose:
To establish an agricultural research center that will perform applied research on innovative techniques for sustainable agriculture with primary focus on:

• Increase production per unit area
• Improve quality and minimize usage of pesticides
• Improve water use efficiency

Location
In Riyadh Techno Valley located in the campus of King Saud University, Riyadh, Saudi Arabia.
VISION & MISSION

Vision:

“To be a leading research and innovation organization in sustainable agriculture in the arid region”

Mission:

“To conduct research and facilitate innovation in protected cultivation, biological control, water use efficiency and fertilization processes”

To achieve this vision, ESTIDAMAH will strive to:

• Achieve **excellence in agricultural research** to enhance national sustainable agricultural development, policies and practices.
• Promote the take-up and **application of innovative technologies** for increased productivity, water use efficiency and minimize pesticide use in Saudi Arabia’s agricultural sector.
• Spread **knowledge of sustainable agriculture practices** and related techniques and methods among the Kingdom’s growers.
• Provide **practical solutions** to public and private enterprises for enhanced efficiencies and effectiveness through collaboration and technology extension.
RESEARCH AGENDA AND THEME

• **Climate Control**
  • GH covering, cooling, heating, shading, dehumidification, CO2 enrichment, illumination,
  • Vertical farming and plant factories

• **Water Irrigation and plant nutrition**
  • Irrigation schedule and strategies, fertilizer application, water resources, soilless culture, recirculation
  • Water use efficiency

• **Integrated pest management (IPM)**
  • Soil disinfection, optimum pesticide application, biological control, disease control and suppression in water and soil

• **Crop Management**
  • Plant and stem density, high wire system, effect of temperature, humidity, light and CO2

• **Pesticides**
  • Pesticides Residue Analysis, Environmental Monitoring

• **Food Safety and Chemicals**
  • Organic Fertilizers, Agriculture Practices and Food Safety
### Key Research Themes and Cross-Cutting Programs

<table>
<thead>
<tr>
<th>Cross-Cutting programs</th>
<th>Key Research Themes</th>
<th>Other Area of Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Climate Control</td>
<td>Pesticides</td>
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<tr>
<td></td>
<td>Water Irrigation and plant nutrition</td>
<td>Food Safety and Chemicals</td>
</tr>
<tr>
<td></td>
<td>Integrated pest management (IPM)</td>
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<tr>
<td></td>
<td>Crop Management</td>
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<tr>
<td>Agriculture Technology Innovation programs</td>
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<td></td>
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<tr>
<td>National Agriculture Research program</td>
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<tr>
<td>Agriculture Future Program</td>
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<td>Contract Research</td>
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<td>Estidamah System Laboratories</td>
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**Sub Themes**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Sub Themes</th>
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<tbody>
<tr>
<td>Energy efficiency</td>
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<tr>
<td></td>
<td>Biological control</td>
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<tr>
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<td>Plant density</td>
</tr>
<tr>
<td></td>
<td>Pesticides Residue Analysis</td>
</tr>
<tr>
<td></td>
<td>Organic Food Supply Chains</td>
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<tr>
<td>Soilless production</td>
<td>Fertilizer and irrigation management</td>
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<tr>
<td></td>
<td>Pest prevention program</td>
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<tr>
<td></td>
<td>High wire systems</td>
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<tr>
<td></td>
<td>Environmental Monitoring</td>
</tr>
<tr>
<td></td>
<td>Agriculture Practices and Food Safety</td>
</tr>
<tr>
<td>Cooling systems</td>
<td>Micro-irrigation</td>
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<tr>
<td></td>
<td>Pest monitor and control</td>
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<tr>
<td></td>
<td>Bio-pesticide</td>
</tr>
<tr>
<td></td>
<td>Organic Fertilizers</td>
</tr>
</tbody>
</table>
MAIN BUILDING
ESTIDAMAH CENTER

- Total site area is (50,134 m²)
- Main Building (5,641 m²)
- Common Facility Building (1,230 m²)
- Greenhouse complex (7,820 m²)
- Utilities Building (1,101 m²)
- 91 parking spaces
- 2 gates: main and service
MAIN BUILDING

- Entrance double height leading to atrium
- Open Offices 105 work stations
- Closed Offices 16 closed offices
- General Manager Office located in second floor
- Amenities: prayer room, kitchen, cafeteria
- Meeting Rooms
- Library
- Multi-purpose hall
The common facility building is located between the main building and the greenhouse complex.

There is a glazed link connecting the common facility building with the main building. Another aligned link leads to the greenhouse.

The common facility building consists of the following:

- Labs used as support for works in the greenhouse.
- Workshop to house the maintenance works.
- Storage.
- Meeting room.
The center contains 21 separately controlled greenhouses:

- Greenhouse complex that includes:
  - 4 High-Tech (closed) greenhouses
  - 9 Mid-Tech greenhouses
  - 2 low-Tech greenhouses
  - 6 Insect breeding compartments
ADVANCED CLIMATE CONTROL SYSTEM
CLIMATE CONTROL, TOMATO PRODUCTION

Yield kg/m².year

- OPEN FIELD: 4 kg/m².year
- UNHEATED MULTI-TUNNEL: 20 kg/m².year
- HEATED MULTI-TUNNEL: 30 kg/m².year
- HIGH-TECH WITH CO2: 55 kg/m².year
- HIGH-TECH WITH CO2&LIGHT: 75 kg/m².year
Kg production per m2 per year

Outdoor production system

4

Mid-Tech GH system

35

High-Tech GH system

53
Water Use Efficiency in relation to technology

Liters of water per kg tomato

1Kg > 

Outdoor production system

Closed GH system (Holland)
Water Use Efficiency in relation to technology

Liters of water per kg tomato

1Kg

Outdoor production system

350

Closed GH system (Estidamah)

6.9
## The Effect of CO2 Enrichment on Tomato Crop Production in a Closed Greenhouse

<table>
<thead>
<tr>
<th>CO2</th>
<th>l/kg</th>
<th>kWh/m²</th>
<th>Kg/m²</th>
<th>Kg/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>6.1</td>
<td>414</td>
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<tr>
<td>800</td>
<td>6.9</td>
<td>410</td>
<td>15.2</td>
<td>69</td>
</tr>
</tbody>
</table>
Thank you