The Potential Impact of Climate Change on Iran’s Agriculture

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outlines

- Interactions between climate and agriculture
- Iran’s agricultural circumstances
- Impact of climate change on agriculture in basin level scale (case study: Savojblagh plain)
- Assessing adaptation strategies to tackle the negative impacts of climate change in field level scale (case study: Tehran)
Interactions between Agriculture and Climate Change

- Enteric fermentation of livestock
- Rice cultivation
- Material left to rot
- Breakdown of both organic (manure) and inorganic (oil based) fertilizer.

**Annual Greenhouse Gas Emissions by Sector**

- Industrial processes: 16.8%
- Power stations: 21.3%
- Waste disposal and treatment: 3.4%
- Land use and biomass burning: 10.0%
- Residential, commercial, and other sources: 10.3%
- Agricultural byproducts: 12.5%
- Fossil fuel retrieval, processing, and distribution: 11.3%
- Transportation fuels: 14.0%

**Greenhouse Gases**

- Carbon Dioxide (20.6% of total)
- Methane (18.1% of total)
- Nitrous Oxide (6.6% of total)
Interactions between Agriculture and Climate Change

**Direct effects:**
- Temperature
- Precipitation
- Wind
- Evapotranspiration
- Soil moisture
- ...

**Indirect effects:**
- Quantity of water
- Quality of water
- Soil erosion
- Sea level rise
- ...

Total GHG Emissions Indexed Using GWP

- 86.95%
- 11.21%
- 1.25%
- 0.59%
Iran agricultural circumstances

<table>
<thead>
<tr>
<th>No.</th>
<th>Irrigated Crop</th>
<th>Area</th>
<th>Rainfed Crop</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Wheat</td>
<td>2634.1</td>
<td>Wheat</td>
<td>4136.6</td>
</tr>
<tr>
<td>2</td>
<td>Rice</td>
<td>628.1</td>
<td>Barley</td>
<td>1051.7</td>
</tr>
<tr>
<td>3</td>
<td>Barley</td>
<td>607.5</td>
<td>Chickpea</td>
<td>522.1</td>
</tr>
<tr>
<td>4</td>
<td>Alfalfa</td>
<td>559.9</td>
<td>Lentil</td>
<td>213.5</td>
</tr>
<tr>
<td>5</td>
<td>Corn</td>
<td>275.9</td>
<td>Canela</td>
<td>73.5</td>
</tr>
<tr>
<td>6</td>
<td>Potato</td>
<td>186.9</td>
<td>Alfalfa</td>
<td>56.3</td>
</tr>
<tr>
<td>7</td>
<td>Sugar beet</td>
<td>152.9</td>
<td>Soya</td>
<td>25.6</td>
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<tr>
<td>8</td>
<td>Cotton</td>
<td>143.2</td>
<td>Clover</td>
<td>21.3</td>
</tr>
<tr>
<td>9</td>
<td>Tomato</td>
<td>138.0</td>
<td>Cotton</td>
<td>16.3</td>
</tr>
<tr>
<td>10</td>
<td>Watermelon</td>
<td>116.3</td>
<td>Watermelon</td>
<td>15.1</td>
</tr>
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</table>

Impacts of climate change on agriculture in basin level scale (Savojbalagh plain) in Future periods (2012-2100)
The crop pattern of the basin using IRS(LISS III) images

The crop pattern of the basin using IRS(LISS III) images

a: wheat, b: barley, c: maize, d: alfalfa, e: not cultivated, j: building, i: rangeland, h: trees, g: vineyard

The crop pattern of the basin using IRS(LISS III) images
Methodology (AEZ/GIS)

Soil classification of Savojblagh plain
AOGCM projections procedure

Growth in population, energy demand, changes in technology and land-use/cover

- Energy-economy models
- Greenhouse gas emissions
- Carbon cycle and other chemical models
- Atmospheric GHG concentrations
- Climate models
- Future climate projections

Precipitation and Temperature in the future (HadCM3-A2)
ET0 in the future

ETc of crops in future

y = 1.8306x + 384.6

y = 2.5724x - 485.8

y = 1.8981x + 255.33

y = 1.3816x - 182.8
Alfalfa Yield in the future

Barley Yield in the future
Maize yield in the future

Wheat yield in the future
Final Results

1) Based on HadCM3-A2 output, temperature will increase 0.04 °C/year and precipitation will decrease 20 mm/year by the end of this century.

2) The rate of changes of Crop yield (kg/ha), ETc (mm/y), net irrigation demand (mm/y), net volume of irrigation demand (cm/year), and volume of irrigation demand (cm/year) from 2005 to 2100 are as follows:

<table>
<thead>
<tr>
<th></th>
<th>ETc (mm/year)</th>
<th>Net irrigation demand (mm/year)</th>
<th>Net volume of irrigation demand (m³/year)</th>
<th>Volume irrigation demand (m³/year)</th>
<th>Crop yield (kg/ha/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa</td>
<td>+15</td>
<td>+20</td>
<td>+5500</td>
<td>+1630</td>
<td>-21.2</td>
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<tr>
<td>Barely</td>
<td>+18</td>
<td>+19.6</td>
<td>+41700</td>
<td>+32880</td>
<td>-23.6</td>
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<tr>
<td>Maize</td>
<td>+0.8</td>
<td>+4.1</td>
<td>+7600</td>
<td>+5810</td>
<td>-7.8</td>
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<tr>
<td>Wheat</td>
<td>+22</td>
<td>+26.7</td>
<td>+44800</td>
<td>+33210</td>
<td>-125.4</td>
</tr>
</tbody>
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Assessing adaptation strategies to tackle the negative impacts of climate change on Maize in field level scale (case study: Tehran)