Geospatial data analysis to design adaptive landscape system of agriculture

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Content

• Land System condition in Kazakhstan
• What is the adaptive landscape system of agriculture?
• Data and Methods
• Role of Statistic and Geospatial Data in Landscape Analysis
• Challenges
• Recommendations, solutions
Kazakhstan – Land Accounts System

9 Land Categories

2.72 million sq. km

The area of agricultural land affected by erosion, in total 100835.4 ha (2015)

By water erosion
4950 ha

By water erosion
124168,1 ha
What is the adaptive landscape system of agriculture?

The adaptive landscape system of agriculture is a land management tool allowing balance quantity and quality of crop production and the stability of the land and agroecosystems, which helps to prevent soil erosion and to maintain agricultural landscapes resistant to environmental changes.

- Plant adaptation to the land features
- Minimum system of soil processing
  - Crop rotation system
  - Fertilizer Regulation
Dataset

- **Relief**
  (height, inclination, aspect, etc.)
- **Soil**
  (soil type, humus content, texture, etc.)
- **Hydrology**
  (water resources: rivers, lakes, irrigation system)
- **Climate**
  (precipitation, humidity)
- **Geology**
  (age, structure) – additional, not essential.
- **Fauna and Flora**
  (population, types, area)
- **Human impact**
  (land use, areas)
Data and Methods

1. **Statistical Data:**
   - Land use data
   - Cultivated areas
   - Current crop in the fields
   - Harvested crop
   - Crop type

2. **Geospatial Data**
   - Remote Sensing (Landsat 4-8, Sentinel)
   - Indexes (NDVI, NDSI)
In summary, the following datasets can be found from various datasets which is useful for the approach:

<table>
<thead>
<tr>
<th>Institution / agency</th>
<th>Datasets</th>
<th>Variable</th>
<th>Spatial and temporal scale</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of National Economy / Statistics committee</td>
<td>Land use data, crop production</td>
<td>Percentage, number</td>
<td>National Level</td>
<td>Available, but with inconsistencies in time, until 2017</td>
</tr>
<tr>
<td>Ministry of agriculture</td>
<td></td>
<td>Acreage yield production</td>
<td>National Level</td>
<td>Not available on website. <strong>Available after</strong></td>
</tr>
<tr>
<td>National meteorological services</td>
<td>Agro-Climatic Indicators</td>
<td>Rainfall, temperature, evaporation</td>
<td>National Level</td>
<td>Climate datasets available, but only for specific time. There are restrictions in data sharing</td>
</tr>
<tr>
<td>Kazakh Space Agency</td>
<td>Land and crop indicators</td>
<td>Kazeosat 1, 2 (resolution 1, 6.5 and 17 m)</td>
<td>National Level</td>
<td>Available 3 Satellite data only for government organizations and departments</td>
</tr>
<tr>
<td>Automated Information System of the State Land Cadaster and Technical Support</td>
<td>Land use planning and documentation</td>
<td>Land Database, Cadaster, Management System</td>
<td>National Level</td>
<td>Available, but only for government organizations and departments</td>
</tr>
<tr>
<td>Research institutions</td>
<td>Varied</td>
<td>Soil types, structure, agronomic features, maps, crop production</td>
<td>National Level</td>
<td>Mostly new research data available only for specific local areas</td>
</tr>
</tbody>
</table>
Geoportals

http://www.map.kz/

Kazakh Space Agency info

30 geoportals
# Data

## What we have nowadays?

<table>
<thead>
<tr>
<th>Old Data</th>
<th>Statistic Agency – updates until 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not available</td>
<td>For Research Institutions and Universities (only after permission)</td>
</tr>
<tr>
<td>Less information</td>
<td>Available, but only for regional and national level</td>
</tr>
<tr>
<td>Paid</td>
<td>Available, only for specific period of time and for some features. New data cost a money</td>
</tr>
<tr>
<td>Observation stations</td>
<td>Old equipment, remote accessibility, most points closed</td>
</tr>
<tr>
<td>One side control</td>
<td>A large majority of subsidies and financing only one agency, company</td>
</tr>
<tr>
<td>Economic mechanisms</td>
<td>Weakened household farms segment</td>
</tr>
</tbody>
</table>
Recommendations, solutions

1. **Geoportal**: special access to the Universities
2. **Attracting scientists** (collecting data, analysis, assessment)
3. **Land Management Software Development**
   - *Land Accounts*
   - *Area*
   - *Quality (humus, structure, quality score attributed to land)*
   - *Vegetation Data*
4. **Climate Data** (prediction drought, fire, etc)
5. **Creating a Database** (results of the projects with information, data on it)
Thanks for your attention!