Drought and Dzud monitoring capacity building of Mongolia

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Drought/dzud monitoring in Mongolia

- UNESCAP Support, CAS-TWAS
- Successful cooperation between AIR and IRIMHEM
- Projects
  - 2014-2018 DroughtWatch-Mongolia development
  - 2019-2021 DzudWatch-Mongolia

1. Joint field work
2. On-job training, 2 times per year
3. System Customization
4. Workshop on drought&dzud monitoring
Drought in Mongolia

Drought is a mainly natural disaster in Mongolia (global warming, climate change), and result in enormous economic losses.

- 30-70% areas happens drought in Mongolia.
- In 2010, one third of total livestock died. One reason is the poor condition of many pastures as a result of last summer’s drought (2009).

Distribution of the frequency map of Drought

Livestock losses, 2000-2012
Issues and Challenges

- The timeliness needed in drought information
- Mongolia underutilized low spatial information technique
- Paucity of appropriate drought monitoring system due to constraints of professional knowledge, financial capacity, as well as human resources.
- Mongolia is the first pilot for ESCAP’s Regional Collaborative Mechanism on Drought Monitoring and Early Warning by China service node
Objectives for Drought Monitoring in Mongolia

- Developing drought monitoring methods for Mongolia
  - Indicator selection
  - Validation
  - Localization
  - Building up the spatial information database

- Enhancing capacity for Drought Monitoring in Mongolia
  - On the job training and joint academic research
  - Customizing and deploying the drought monitoring system
  - Field campaign support and validation work
  - Academic workshops
  - Information services and technical support
Data processing and database

Data processing, building database, indices selection were achieved jointly by China and Mongolia experts in RADI (2014-2018)
Parameters: Soil moisture, vegetation biomass, height, coverage, biodiversity.

Participants: IRIMHE and AIRCAS.

2014 to 2017 (July to August)
Drought Models

- Drought products validation with field data from 2014-2017:
  - Soil moisture
  - Biomass
  - Regional drought affected data from field observation
  - Annual validation report

**Biomass (ce/ha):**

<table>
<thead>
<tr>
<th>Biomass</th>
<th>NORMAL</th>
<th>ANOMAL</th>
</tr>
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<tbody>
<tr>
<td>VHI</td>
<td>0.42</td>
<td>0.76</td>
</tr>
<tr>
<td>TCI</td>
<td>0.55</td>
<td>0.78</td>
</tr>
<tr>
<td>VCI</td>
<td>0.45</td>
<td>0.29</td>
</tr>
<tr>
<td>NDDI</td>
<td>0.29</td>
<td>0.09</td>
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<tr>
<td>VSWI</td>
<td>-0.13</td>
<td>-0.05</td>
</tr>
<tr>
<td>NDVI</td>
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<td>0.08</td>
</tr>
</tbody>
</table>

**Heatmap (Drought Map 30 Jul 2015):**

- **Soil moisture:**
  - TDR, 12CM: 0.542, 0.659, 0.757, 0.773, 0.817
  - TDR, 20CM: 0.765, 0.623, 0.823, 0.749, 0.890
  - EBA, 10CM: 0.073, 0.194, 0.171, 0.189, 0.204
Drought Models

Forest steppe & steppe & desert steppe

Natural zones and Ecosystem

“NDII - TCI - VHI” August

Legend
- Province boundary
- Undefined
- No data
- Slight drought
- Moderate drought
- Severe drought
-Extreme drought

Reference scale: 1:9,195,200
System Customization
Products dissemination to users

http://irimhe.namem.gov.mn

Servicing to organizations

Ministry of Nature, Environmental and Tourism +
Ministry of Food, Agriculture and Light Industry +

www.icc.mn
www.eic.mn

Drought product dissemination to local meteorological departments by internal network
Capacity building activities

- Technical advisory and support
- Technical Training
- On the job training
- Joint field work
- Customization
- Localization
- Ph.D fellowships
Dzuds in Mongolia have a detrimental impact on the herder’s prosperity of life. Frequent heavy snowfall and extreme weather under climate change poses significant dzud risks. Thus, how to do rapid response and reduce the impacts?

The basic step is timely access to the spatial information and changes of dzud risk.

The objective is to build the capacity of dzud early warning using the earth observation technology for Mongolia
Joint field works and models development

- Joint field work to obtain the ground biomass and snow depth data: 2020.8, 2021.2-3
- Develop remote sensing monitoring model for **snow depth & aboveground biomass (AGB)**

AGB (NDVI based & MVIM based)
DzudWatch: PCC and DZud risk mapping

- **Pasture carrying capacity**: AGB based on remote sensing, livestock, intake, grazing time were used to calculate PCC.
- **Dzud risk model**: 9 input variables, meteorological forecasting data, ground data (Rain, Temperature), satellite products (AGB, Snow depth, Snow coverage, Drought, PCC)

**Pasture Carrying Capacity**

**FY3C/MWRI Snow Depth**

**DZud Risk Model**

Dzud risk map, Nov 20, 2020
System training

- **Online training**: February 10th, 2022, 29 agricultural engineers
- **In-person training**: April 29-30th, 2024, 8 engineers

Dzud risk map, January, 2023
Thanks for your attention