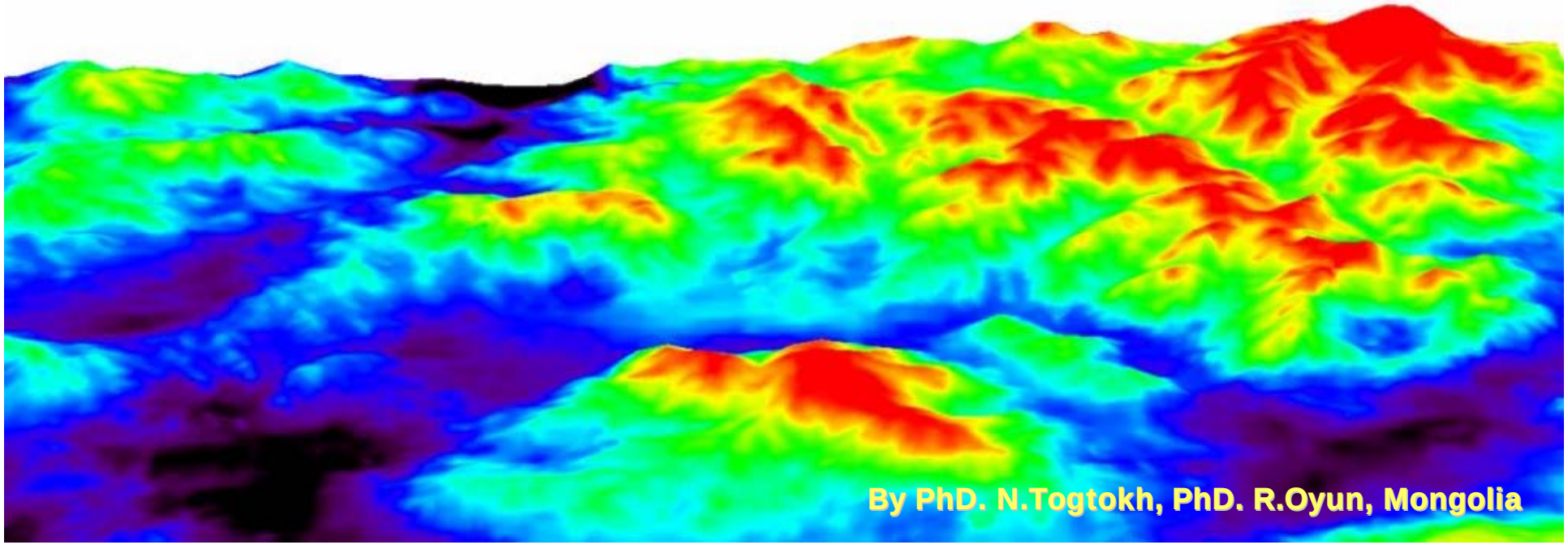
UNITED NATIONS OFFICE AT VIENNA

15th United Nations / International Astronautical Federation Workshop on
"Space Education and Capacity Building for Sustainable Development"

Space technology assists Mongolia herders & farmers to reduce disaster risk



By PhD. N.Togtokh, PhD. R.Oyun, Mongolia

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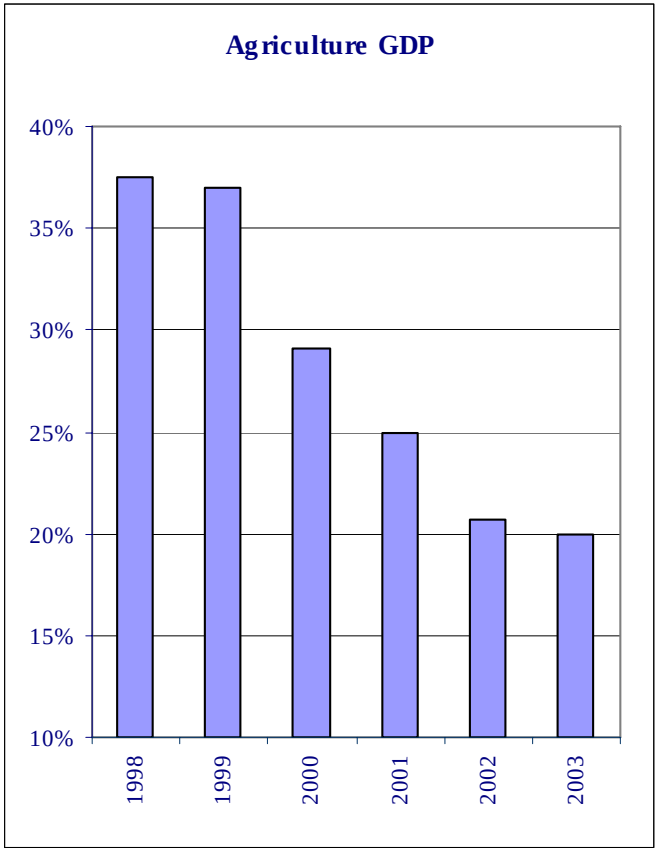
1. Global change affects the livelihoods of rural population

- Global change affects Mongolia:
  - Climate warming is twice as rapidly as the global average.
  - The epicenter of atmospheric pressure changes located in Mongolia
- The faster the climate changes, the greater the risk of disaster:
  - Increase of variability and extremes
  - Steppe grasslands are vulnerable to such changes,
  - Pastoral animal husbandry and arable farming is at great risk,
  - 1999-2003 severe droughts, dzud disasters caused :
- Increase in poverty:
  - 36 per cent poverty nationally,
  - 43 per cent in the rural population



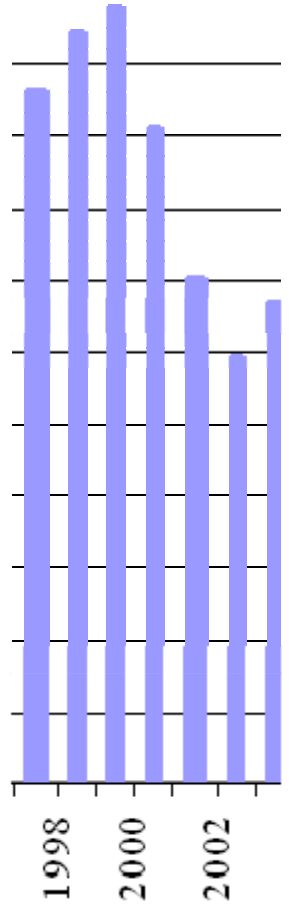
Animal husbandry is national wealth

Risk of animal husbandry

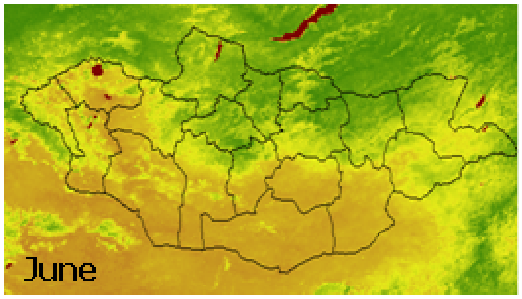
- Since 1999 in Mongolia consequent drought and dzud disaster have affected natural pasture resources and caused mass loss of animals.
- Mongolia had lost one third of its livestock
- Poverty incident in rural area has reached to 43%.

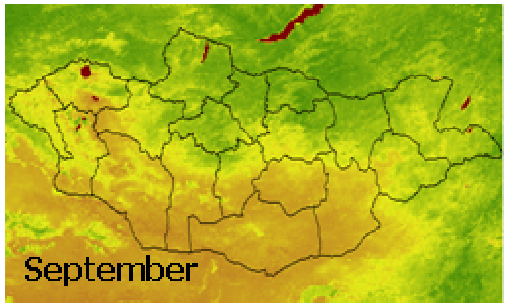
Heavy Snowfall (White Dzud), 2000

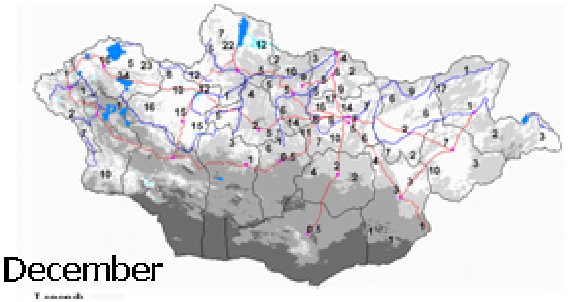
Head of livestock

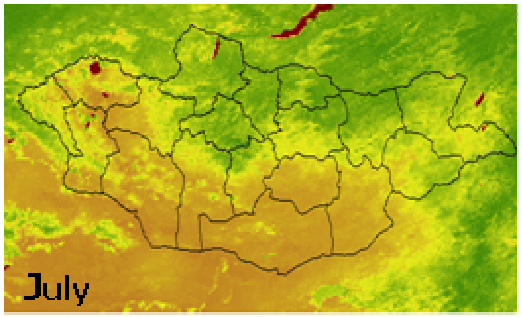


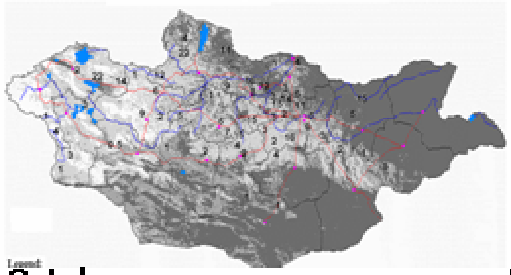
Assessment of Dzud disaster of 2000

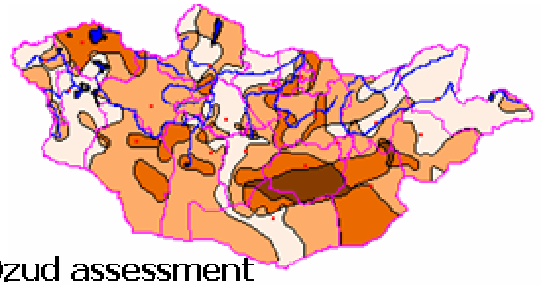


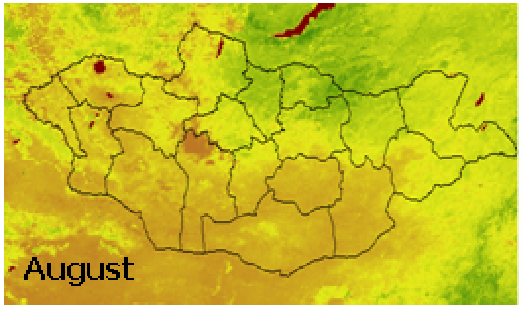


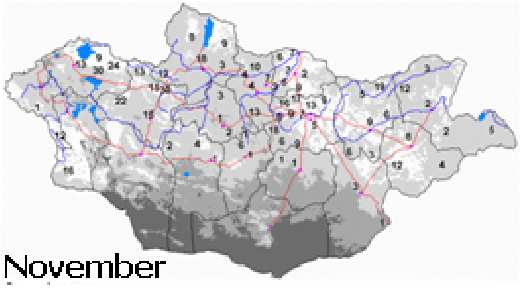


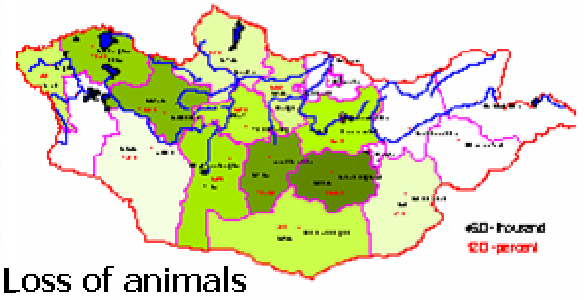










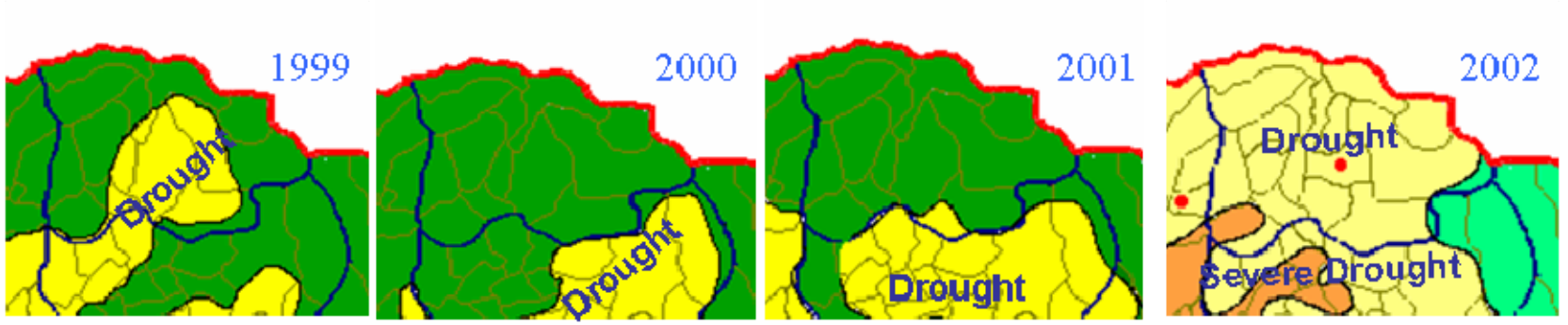


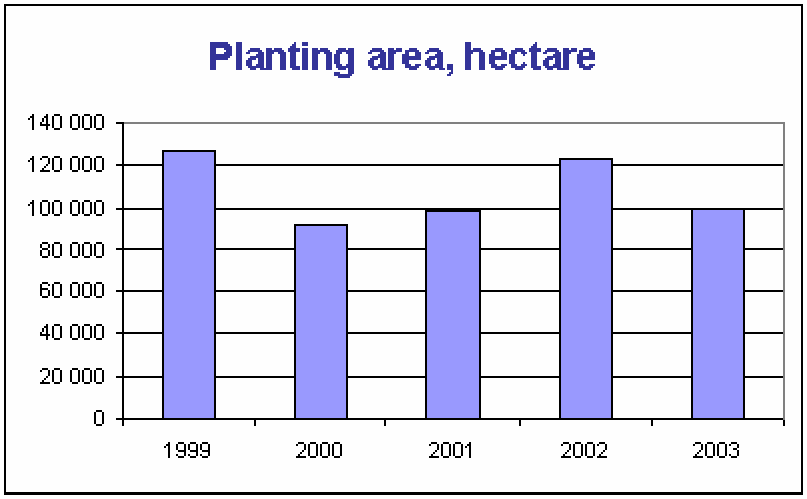
with use of NOAA AVHRR data

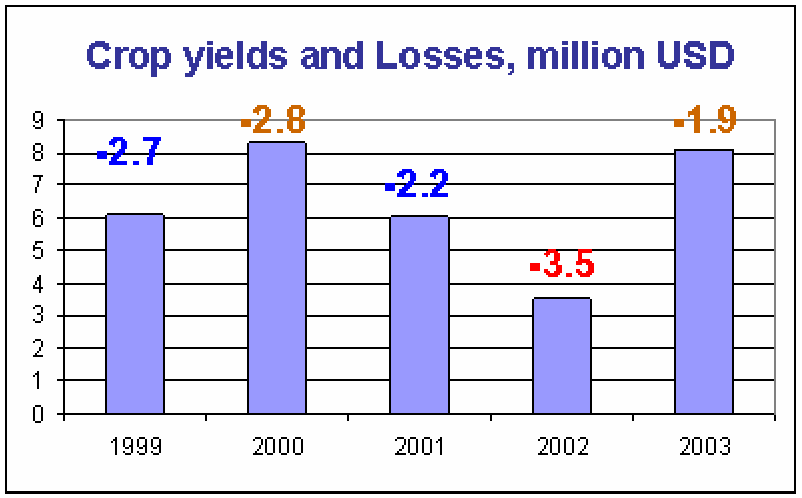
Crop is a strategic food product

Risk of crop farming

- Drought caused loss of crop yields in 1999 - 2002
- Losses: US$13 million in the main crop province - Selenge

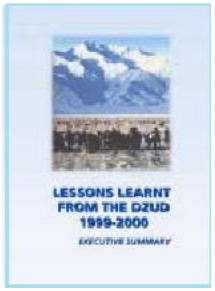


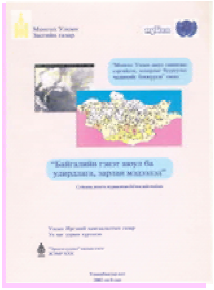


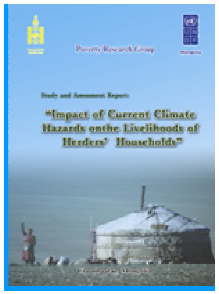


2. DRR: “Ideas - Actions – Achievements”

- “Lessons Learnt” case studies:
  - Dzud of 1999-2000
  - Drought of 2002
  - Hazardous windstorm of 2001 and 2002
  - Early warning and emergency management system
  - Disaster management information system
- Risk studies and assessments:
  - Impact assessment of climate change
  - Livelihoods of herders and farmers
  - Policy recommendations
- “Ideas - Actions - Achievements” pilots:
  - Methodology to assess hazard, vulnerability and risk
  - Risk prediction for coming winter and spring
  - Introducing liquid gas to rural herders and small restaurants
  - Restocking the herders with high productive sire
  - Carpet knitting with “male” wool of camel
- “Risk manager” information system development:
  - Integrated database for rural county
  - Community information center at rural county
  - Partnership for communication and information sharing
  - Integrated information processing techniques and software
  - www.agronet.mn Internet web site



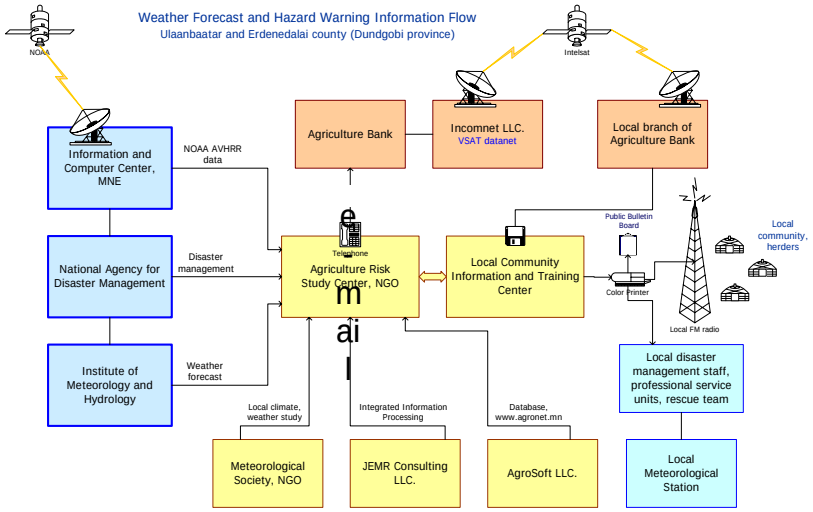




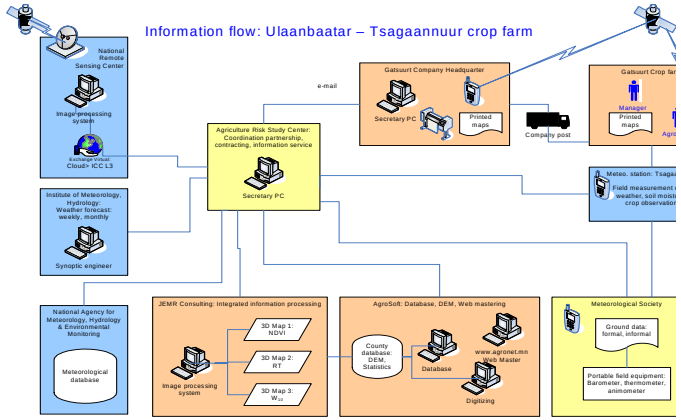
3. Space technology assists the herder & farmers

- Communication:
  - Data network with VSAT
  - Mobile phone
- Positioning of ground true data provided by the herders, farmers:
  - Notes on local weather
  - Vegetation biomass
  - Animal bodyweight
  - Air pressure, temperature
  - Hazards, extreme events
- Positioning and mapping of data provided by the local government:
  - Wells
  - Livestock location by winter stand
  - Crop fields
- Mapping of local environment:
  - Cloud, weather, climatic norms
  - Pasture vegetation
  - Snow coverage
  - Extreme temperature
  - Soil moisture

Information to the herders



Information to the farmers



4. Community participation in disaster risk reduction

- Monthly and seasonal weather prediction around the living area:
  - Indigenous knowledge of nomads on astrology and nature has been accumulated over thousands of years and passed from generation to generation
- Local climate, weather and hazard monitoring:
  - Observation and notes
  - Use of barometers, thermometers
- Interpretation of satellite images, verification of class maps:
  - Name of local land represent their specifics and in some cases match well with natural color composite of images
  - Easy interpretation of images and verification of classification results with good knowledge on their native land

Discussion with local government and community of Erdenedalai county

The herders notes on local weather

5. Indigenous knowledge of the herders used to predict risk of coming winter and spring

- Herders' observation:
  - Every year in full moon night of middle month of the autumn the herders D.Bor, S.Dashdorj and D.Tavanjin from Gobi-Ugtaal and Tsagaandelger counties of Dundgobi province claim up the Bagazalaa mountain
  - They observe the moon, stars, airflow and morning sun rise;
- They determine:
  - What is the most risk of coming winter and spring?
  - Is there any threatening hazards expected (snowfalls, extreme cold, epidemic diseases, etc.)?
- Predicting time:
  - 6-7 months a head, from October of current year to March-April of the next year.
- Observing area:
  - Visible area with approximate radius of 100 km around the mountain.

Herders' observation at Bagazalaa mountain

Participatory risk prediction and decision making

- Next morning discussion is important to conclude risk prediction, formulate management tactics, make decision.
- The herders introduce their prediction
- Risk study team introduce:
  - Official weather prediction for coming 6 months
  - The results of vegetation index, pasture capacity and animal bodyweight monitoring
  - The results of evaluation of previous year risk prediction
  - What lessons was learnt from past winter, spring and summer
- The local government and the herders make decision on:
  - Animal and pasture capacity is sufficient for predicted winter and spring condition?
  - If no?
    - Amount of additional fodder for vulnerable part of the herds
    - Where is the new location to move herds? Where will be less snowfall and less cold?
    - If above 2 measures are not appropriate, so to slaughter animals and sale on the market, and restocking again next spring

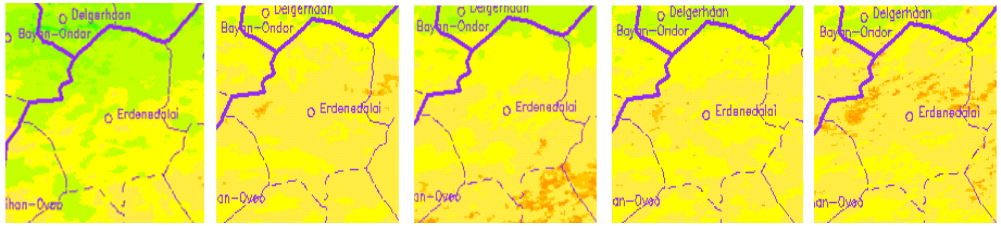
6. Partnership and Capacity building

- Series of workshops on community information center, disaster risk reduction and training on use of thematic maps and computer conducted with support of public and private stakeholders:
  - National Agency for Disaster Management,
  - National IT Park
  - National Remote Sensing Center
  - Mongolia Development Gateway NGO
  - MIDAS/MONITA NGO
- Local government of 15 counties encouraged participation of rural communities in activities towards disaster risk reduction

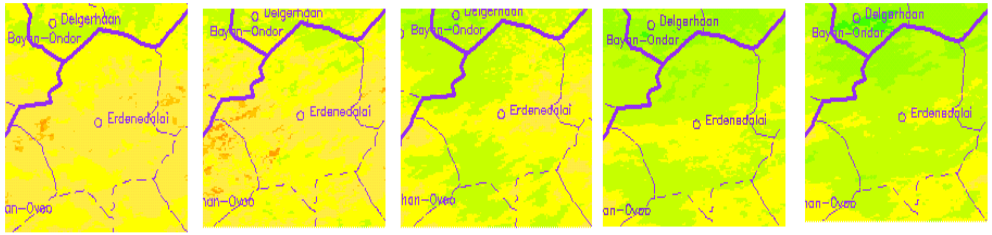
Workshop at Erdenedalai county

7. Pasture vegetation monitoring, 2004

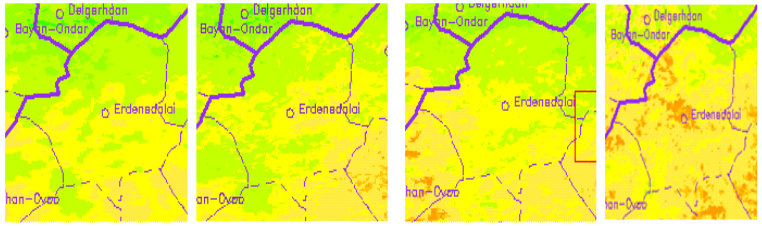
Weekly vegetation index map, June-July



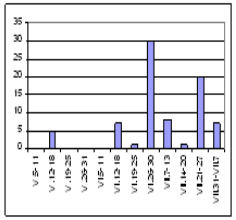
July - August



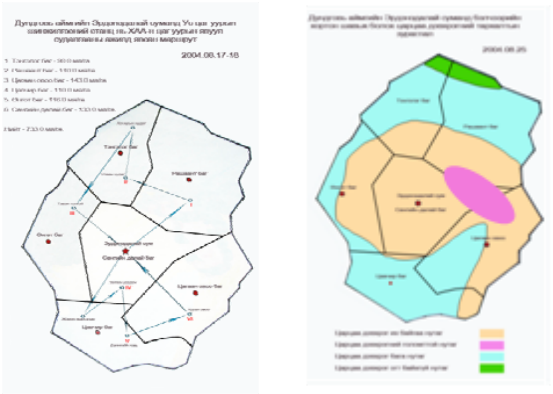
August - September



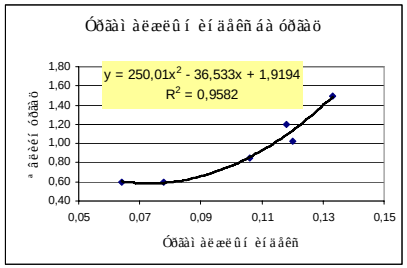
precipitation



Vegetation map produced at the county meteorological station with ground data



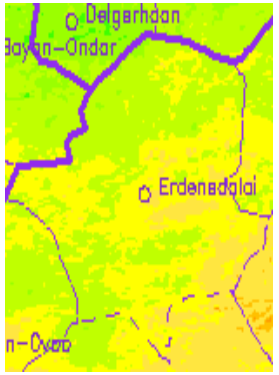
High correlation between biomass and vegetation index



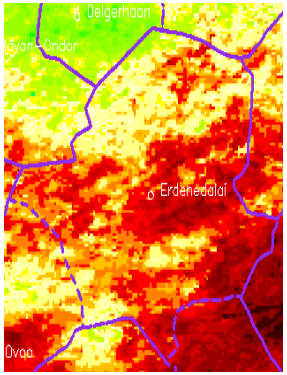
Pasture, affected by locust

Pasture for winter

Vegetation index

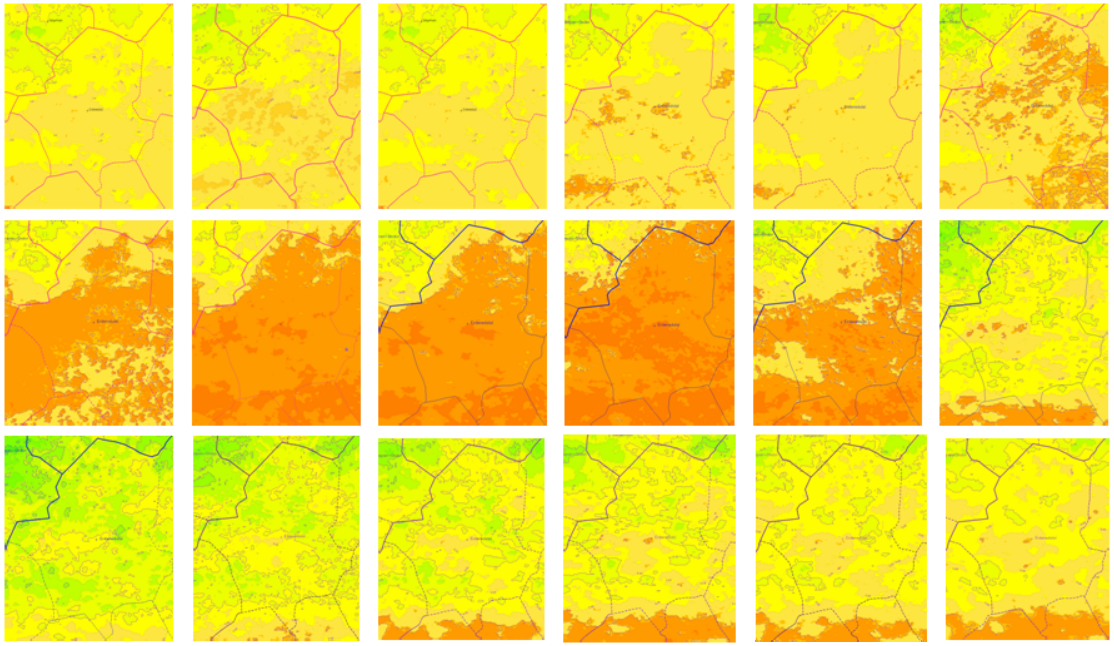


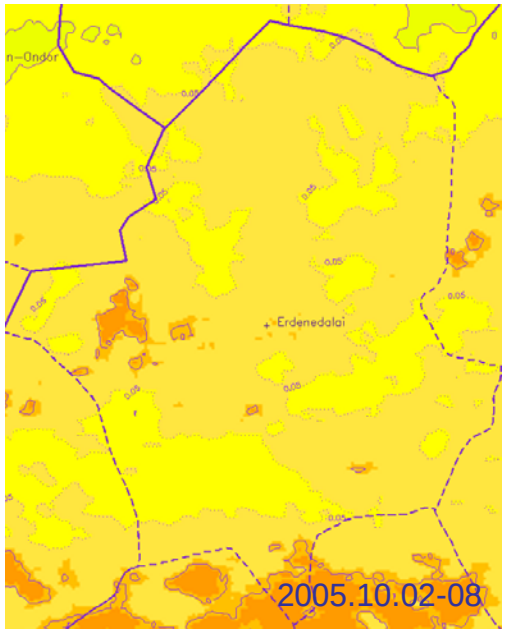
Biomass, c/h



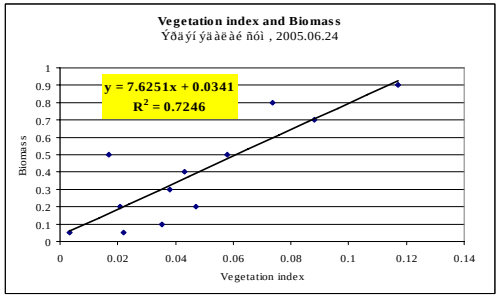
Pasture vegetation monitoring, 2005

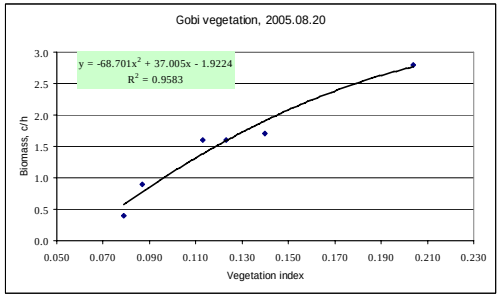
May-October weekly vegetation index maps

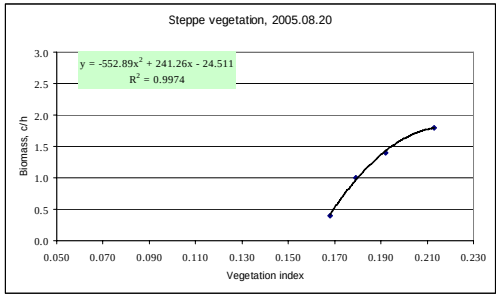




Relationships between vegetation index and biomass

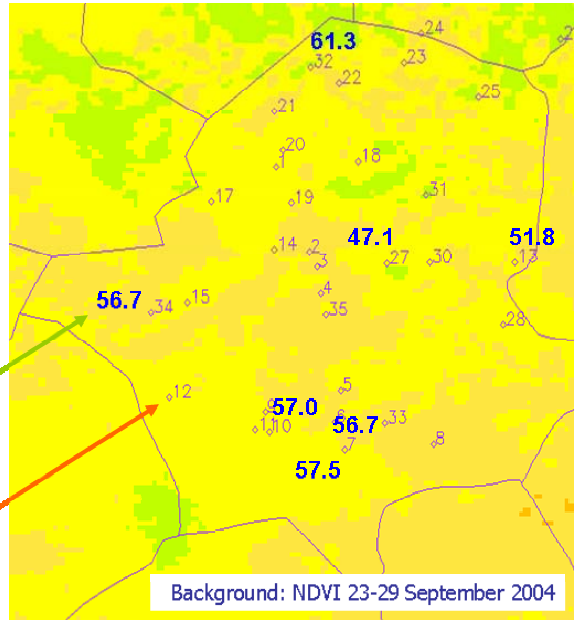


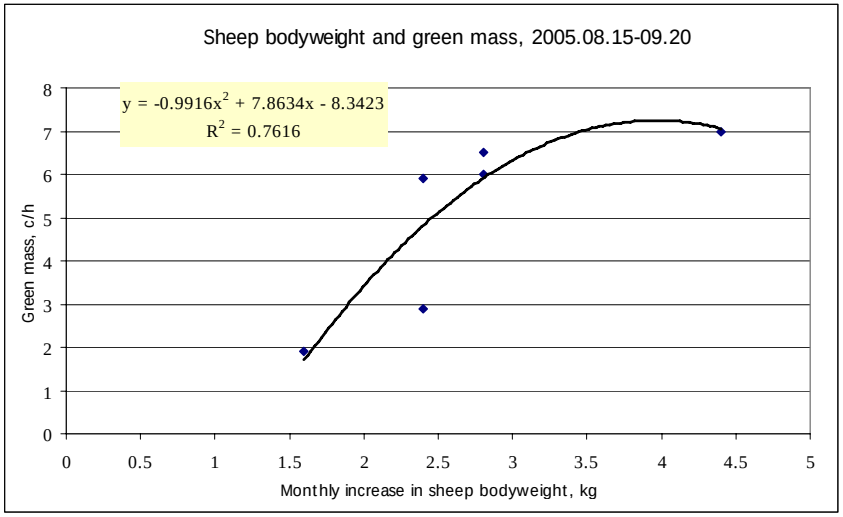




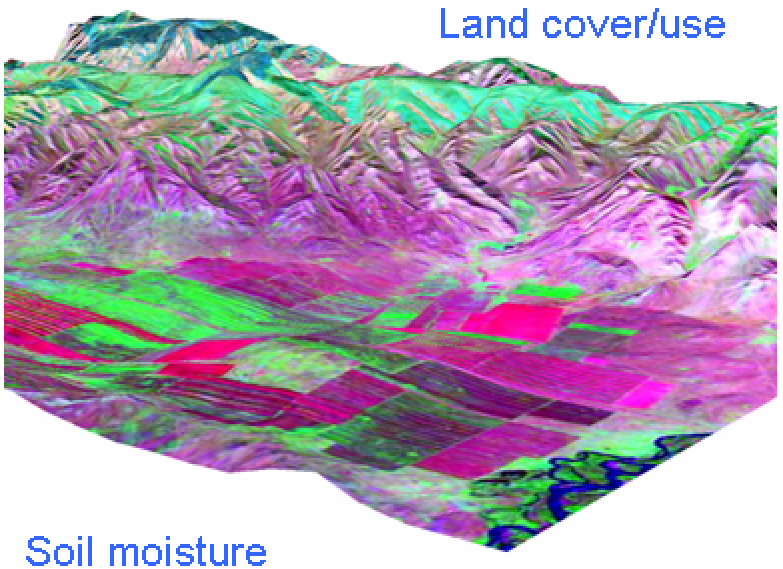
Animal bodyweight monitoring, 2004-2005

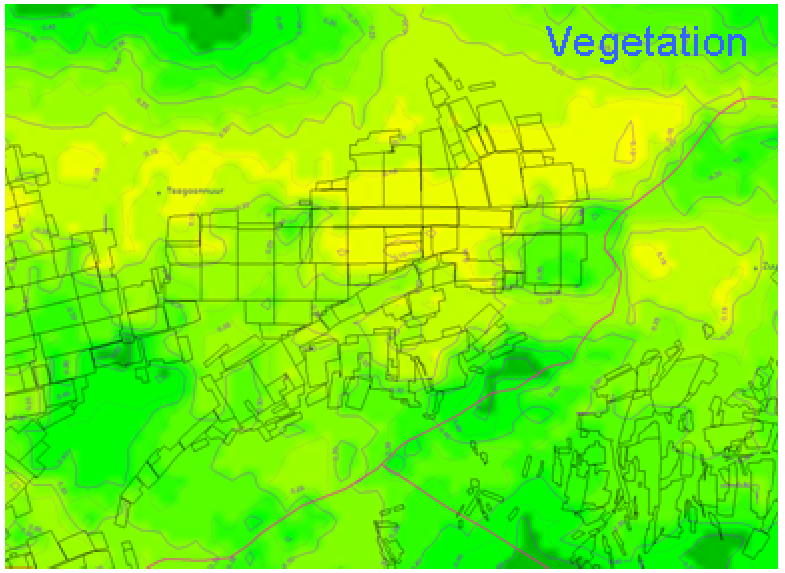
Pasture vegetation resources and livestock bodyweight is highly correlated with each other. Better pasture condition – higher vegetation index - more forage resource, and animals accumulate more fat and have more weight, and become less vulnerable to cold and windy weather and shortage of forage.

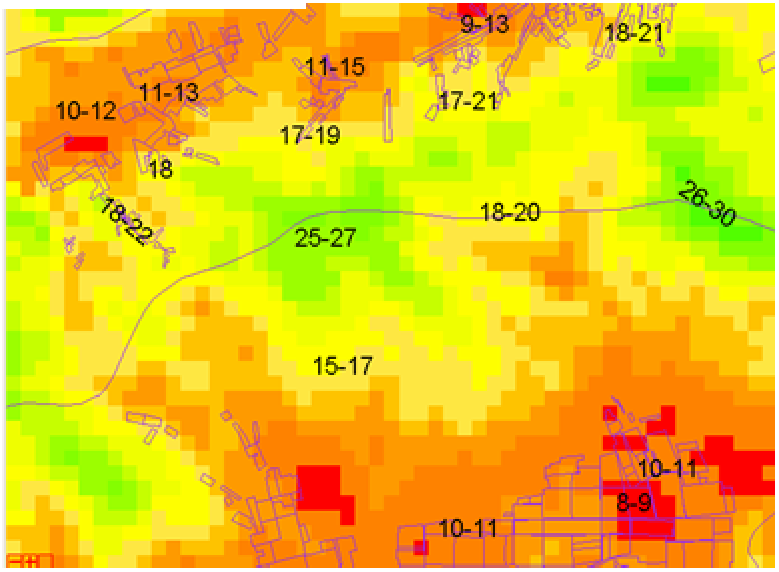


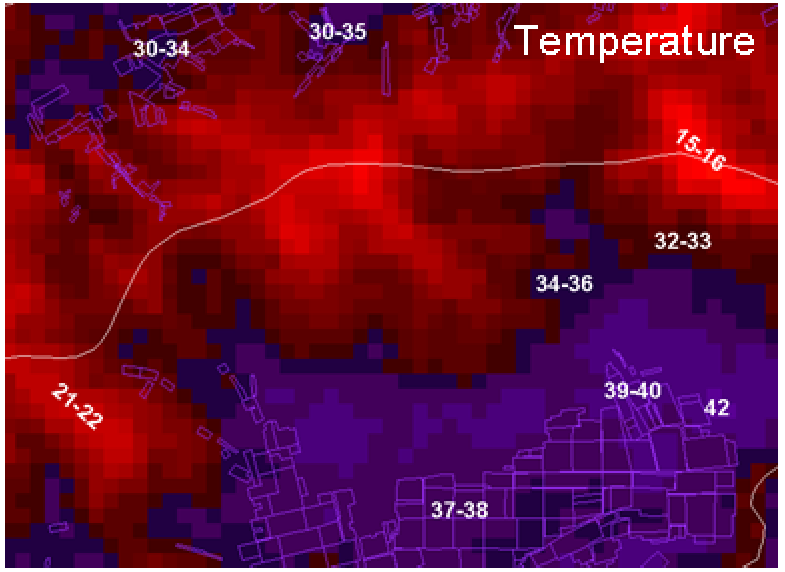


Crop field monitoring, 2005



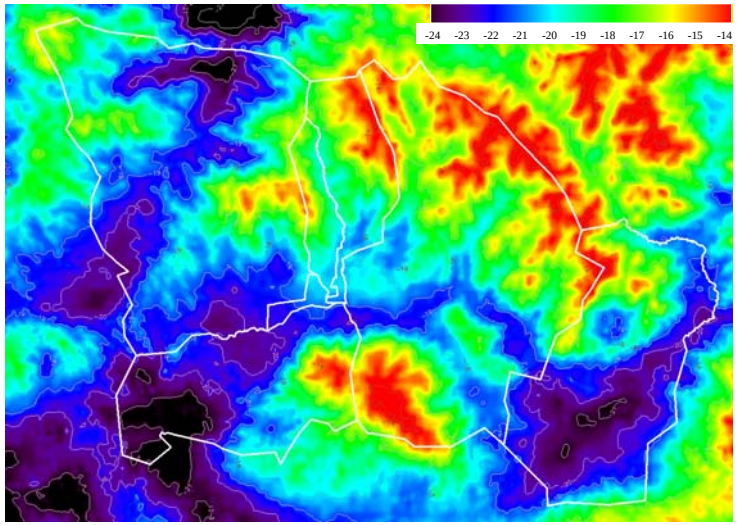




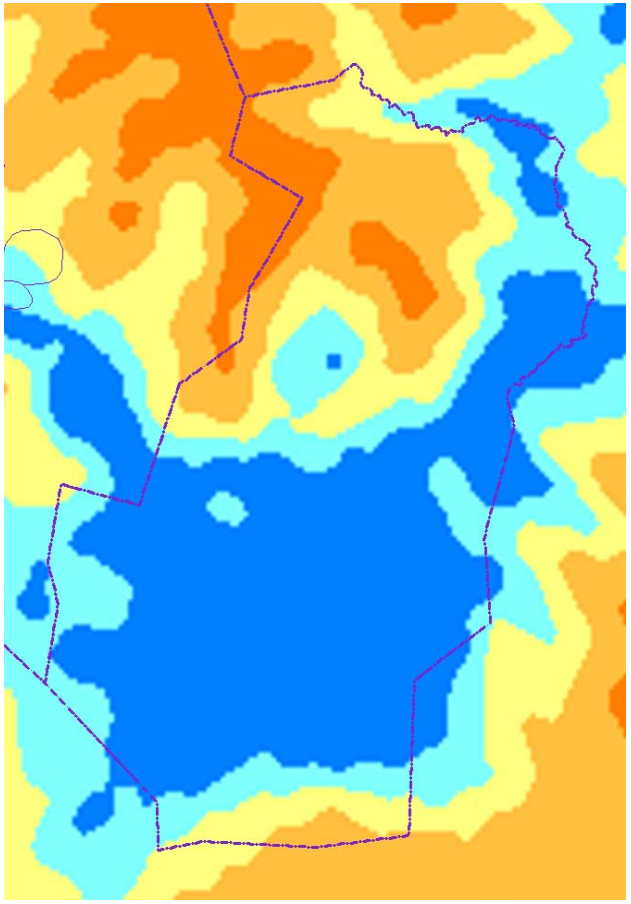


Climatic norm and micro-climatic class maps

January climatic norm: Air temperature



Micro-climatic class map



Ulaanbaatar city, Nalaikh district

Micro-climatic class parameters

Class number	Altitude, m	Slope angle, º	January air temperature norm, ºC
1	1387 ± 126	2 ± 2	- 23.5 ± 0.86
2	1416 ± 136	4 ± 3	- 19.9 ± 0.71
3	1520 ± 146	6 ± 3	- 18.6 ± 0.82
4	1711 ± 189	8 ± 4	- 16.2 ± 0.98
5	1861 ± 183	8 ± 4	- 14.2 ± 1.16

8. *e-Soum* initiative is new challenge for space technology

- Mongolia's IT community and Risk study team have initiated 'e-Soum' project proposal:
  - to establish a sustainable system that enable the monitoring, assessment, prediction and warning of changes both natural and human-made environments, structures and systems with use of advanced information and communication technology.
  - to assist people in understanding, evaluating and coping with complex systems, sharing knowledge to create new ones, and actively participating in management and decision-making processes in order to achieve sustainability
  - Meanwhile more than 50 organizations are supporting e-Soum

Information and Communication Technology Authority of Mongolia supports e-Soum

Event for launching e-Soum web site and partnership for e-Kara Korum

Signing of MoU to collaborate towards establishing e-Kara Korum as model for e-Soum

National Petroleum company NIC/Petrovis supports e-Soum