UNDP MON / 01 / U01 project
Poverty Research Group

JEMR Consulting

February – December 2003

Study and Assessment Report:

"Impact of Current Climate Hazards on the Livelihoods of Herders' Households"

Report prepared by the experts of the Risk Study Working Group and JEMR Consulting Co., Ltd.
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Abbreviations:

MF&E	Ministry of Finance and Economy
MSU	Mongolia State University
MSUA	Mongolia State University of Agriculture
RSWG	"Risk study" working group
IMH	Institute of Meteorology and Hydrology
ICC	Information & Computer Center, MNE
MNE	Ministry of Nature and Environment
DMA	Disaster management Agency
NAMHEM	National Agency for Meteorology and Hydrology
MMS	Mongolia Meteorological Society
JEMR	JEMR Consulting Co., Ltd.

Content

1.0 INTRODUCTION

Since 1999 the livestock sector in Mongolia has been affected by severe drought, dzud disaster and epidemic disease, and one third of total head of livestock had been lost. Thousands of households have lost all their livestock or were left with few animals. Living standards for rural people rapidly plummeted contributing to an increase in unemployment and poverty.

1.1. Terms of Reference and their Implementation

Research Goal and Objectives[1]

The goal of the project is to study and assess impact of meteorological hazardous phenomena on pastoral animal husbandry, herders' households livelihood and poverty, to conduct research into related government policies, decisions, measures implemented, to analyze and describe their relationships in order to draft mitigating instruments and policy adaptations to climate changes encountered in Khangai, Steppe and Gobi zones and develop recommendations for implementation.

Specific objectives are:

1. To conduct a questionnaire survey among 500 herders' households of 5 aimags which have been most severely been affected by continuous harsh winter (Dzud) and ongoing droughts, in order to determine the adverse effects of the environmental crises on livestock, herders' household incomes, fallback assets and hence, on rural poverty levels.
2. To disaggregate the complex web of causes, which exacerbated these environmental events
3. To survey local officials and herders' opinions on how to mitigate the effects of climate change and adaptation of policies and decision-making at the state, central and local government levels in order to sustain sustainable livelihood of herders
4. To conduct research into related government policies, decisions, implementation measures, to analyze and describe their relationships in order to draft mitigating measures and policy adaptations to climate change in the Khangai, Steppe and Gobi zones, and develop recommendations for implementation. Recommendations should concentrate on the practical challenges of reducing vulnerabilities and provide useful policy advice to decision makers. The following considerations are pertinent to this:
   - What policies and decisions are required for the mitigation and adaptation of the impacts of climate change at the level of the state and local administration and the households?
   - Design an improved system for development strategy and policy for poverty reduction
   - Coping with regional and rural development policy

[1] Up-dated with PRG and UNDP Advisor's recommendations

- Practical measures to be taken for low income and poor households
- Social services to nomads migrating with animals seeking for better pasture

[NU2]Conducting the Research

The research focused on social and economic impacts, vulnerability of herders households under increasing risks of natural hazardous phenomena such as drought, dzud, extreme cold and hot, heavy snowfall, snow and wind storms, and negative consequences which have appeared in ecosystem such as an increase in of the insects and rodent population, a decrease in water resources, permafrost melting, forest fire and flood damage, and as well as the negative social affects such as mass loss of animals – herders' assets and a decrease of households' incomes, a dramatic increase of poverty, mass migration from rural to settled areas and an increase in epidemic diseases. This requires an investigation of the interactions of environmental, social and economic systems.

According to the TOR the task was for the outputs of the study to contribute to government policies on poverty reduction, rural development and risk management of the livestock sector. But, while the research was being conducted, a series of key policy documents such as "The State Policy for Food and Agriculture Development", "Programme for Regional Development - 2010" were approved by the Mongolia Parliament (June 2003). Also, Mongolia's Pro-poor Economic Growth Strategy has been approved by the World Bank and International Monetary Fund (September 2003). Therefore, in our study we more concerned about the methodological issues for implementing approved strategies and policies rather than policy development.

Within the research framework the following 10 activities were conducted to achieve the study's goals and objectives.

1. **Desk survey of related literature and documents:**
   - Survey of published material and secondary data sources of government organizations on society and economy, rural development, households livelihoods, and poverty, and reports of major projects funded by the intrenational organizations and donors in connection with the weather and environmental changes and variabilities.
   - Survey of the outputs of the research carried out by professional organizations such as Institute of Meteorology and Hydrology, the Civil Defence Board, JEMR Consulting and the Risk Study Working Group on climate change, disaster management, lessons learnt from the dzud disaster and vulnerability and risk of livestock sector in connection with the herders livelihoods and poverty.
2. **Questionnaire Survey, this included:**
   - 2 soums of Central aimag: Altanbulag, Bayan-O'njuul
   - 3 soums of Dundgobi aimag: Erdenedalai, Gurvansaikhan, O'lziit
   - 3 soums of Bulgan aimag: Bulgan Bugat, Teshig
   - 3 soums of Khentii aimag: Dadal, Bayan-Ovoo, O'mnodelger
   - 3 soums of Zavkhan aimag: Tosontsengel, Do'rvoljin, Aldarkhaan

   The Sample size was set at 6% of herders' households of the surveyed soums in the aimags, which have most severely been affected by continuous harsh winter and

ongoing droughts of years 2000-2003. Representation of different natural zones such as Khangai, Steppe and Gobi also were considered. A participatory approach with the broad involvement of local official, professional and herders was used.

3. **Professional Research:** In order to adopt a sound theoretical basis for the outputs of the herders questionnaire survey, the research team studied weather, climate, pasture soil and vegetation, socio- economy and policy.
4. **Impact assessment:** Impacts on herders' assets and incomes caused by weather phenomena such as drought and dzud, heat wave, extreme cold were studied and assessed by both experts and the herders. On this basis the methodology and guidelines for regular assessment of impacts, study of lessons learnt and risk management were developed, piloted and the findings were discussed within aimags and soums.
5. **Hazard, vulnerability and risk assessment:** Research on disaster and risk conducted by the JEMR Consulting and the Risk Study Working Group since 2000 was undertaken with more concern for herders' livelihoods. Methodology to assess vulnerability at household's level and a risk at soum level has been improved in collaboration with the "Strengthening of the Mongolian Disaster Management System" project. The improved methodology was piloted in O'mnodelger soum of Khentii aimag and 10 soums of Zavhan aimags.
6. **Development and Piloting of Recommendations:** Research yielded two sets of recommendations to mitigate the negative impacts of meteorological hazards, reduce both the vulnerability of herders and risks of livestock sector, and promote short- and mid-term adaptation to climate change. The titles of the recommendations are listed below:

   - Poverty Reduction
   - Economic strengthening of herders' communities
   - Manage risk of animal husbandry under changing climate and environment

   We piloted some recommendations in several soums of Dundgobi, Zavkhan and Khentii aimags to ensure their practical benefits. Recommendations were discussed at the seminars and workshops organized by the UNDP, PRU MFE and Mongolia Emergency Agency with the broad involvement of rural stakeholders, and were improved.
7. **Data and Information Processing:** Information gathered from the surveyed soums was integrated and analyzed with the information from the National Statistical Agency, the Institute of Meteorology and Hydrology, and data collected from the field surveys conducted by JEMR consulting and the Risk Study Working Group since 2000.

   A methodology to enable us to calculate some indices for households and climate variability was developed and tested.

   Information on weather, pasture, livestock breeding and herders' incomes that differ on a temporal scale were linked with each other on the basis of traditional 24-season calendar.

   The integration of information and data processing was done at the Geo-Information centre of JEMR Consulting.
8. **Partnership Development and Collaboration:** The research team closely collaborated with the Mongolia Meteorological Society, the Institute of Meteorology and Hydrology, the Information and Computer Center of the MNE, and coordinated the

study, delivery of information and piloting of recommendations with activities of other projects such as "Strengthening of Mongolia Disaster Management System", "Potential Impacts of Climate Change and V&A Assessment for the Grassland Ecosystem and Livestock Sector in Mongolia" and the "Mongolia Development Gateway".

9. **Report:** Research progress reports were submitted to the PRG. The final report in both Mongolian and English were prepared and submitted to the PRG also.

Research Methodology

TOR for Methodology

The TOR required the methodology to focus on the empirical, but also adopt a sound theoretical basis. The study was to have three essential stages; evidence gathering (a literature review, followed by empirical evidence collection); analysis of the data and provision of findings, finally, the reporting and presentation of policy recommendations. More detailed notes of the approach to be adopted are provided below:

1. Carrying out of a literature review and collection of empirical data.
   - Collection of published material and secondary data sources, including obtaining the views of official organizations. The research was asked to take note of existing surveys and studies including Keith Griffin's and Daniel Miller's report; 'The Living Standards Measurement Survey' carried out by the National Statistical Office (1998), the survey, `Lessons from the Dzud` conducted in 2000, as well as analyzing the report titled 'The National Programme on Prevention of Drought' published by the Government of Mongolia, 2001.
   - Poverty research needed to focus on the real-life impacts of environmental situations, through primary data collection, surveys, questionnaires, focus groups, structured interviews etc.
2. Carrying out of analysis and provision of useful policy recommendations.
   - Analysis was required to measure the poverty effects of environmental events on the practice of herding and rural life in Aimags and Soum centers.
   - Consideration was also to be given to other exacerbating factors.
   - The evaluation was also to make use of indicators of environmental conditions and compare these against incomes and fallback positions (i.e. realizable assets that can be liquidated in crisis situations)
   - Regard was also be paid to safety nets and support mechanisms.
3. Results were to be used to develop policy recommendations.
   - Recommendations were required to concentrate on the practical challenges of reducing vulnerabilities and provide useful policy advice to decision makers.
   - The final report was to be drafted to be comprehensive and accessible to a variety of audiences.
   - Analysis and data on incomes, fallback assets, and vulnerabilities to environmental shocks, will be made available with the final report. It is envisaged that this data will be made available to others (potentially via the internet).
   - The researchers were also asked participate in a series of workshops and seminars organized by the PRG to publicize the results.

Implementation

The general methodology that has been followed in the study is based on the above, and makes use of the professional knowledge and experience of the team, using complex system analysis and modeling with use of science and advanced information technology, and participatory approaches with the broad involvement of herders and local authorities.

A systems approach was followed consisting of the following interrelated components (Figure 1.1)

a. Climate, its extremes and changes
b. Pasture, forage and fodder
c. Livestock and animal breeding
d. Herder and his family livelihood

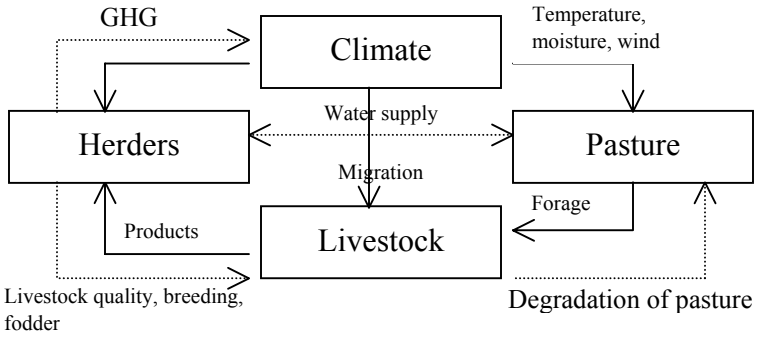


Figure 1.1. System of climate-livestock sector

Following the TOR, primary data was gathered and the negative impacts of climate hazards on herders' livelihoods were assessed using a participatory approach with a questionnaire of soum and bag governors and herders. Meteorological, hydrological, soil, geobotanic and socio-economic factors were considered by the experts within the research team, to ground theoretically the outputs of the questionnaire survey and to conduct a professional study and assessment. We piloted 4 sets of tests in order to develop methodological and practical recommendations that would be realistic for implementation and to assist the local authorities and herders to resolve the issues they face today.

The study was conducted in three stages:

1. Desk and field surveys to gather primary and secondary data and information:
   - In total, 27 pieces of relevant literature and documents including those listed in the TOR were surveyed.
   - Primary data on herders' livelihoods was gathered through the interview and survey of herders and local authorities using a structured questionnaire, roundtable discussions and workshops. Statistical information on population and animal census, and households' incomes were used.
   - Data from regular meteorological observation, and field sampling and laboratory analysis of soil and pasture vegetation were used for professional study and assessment.
   - Thematic maps such as topography, vegetation, soil, fodder resource, drought, vegetation index and snow coverage were prepared and used.

2. Information processing and analysis, and policy recommendation development followed on:
   - The negative impacts and the root causes of herders' livelihoods, food structure, health and out-school children were studied in detail.
   - Meteorological events were ranked by the affects and impacts were verified after review by experts.
   - The function and structure of the hydro-meteorological and environmental monitoring network, organizations for disaster management, labor and social welfare, agriculture, and systems land use mapping, vegetation and soil study, environmental impact assessment were studied in order to establish a system and mechanism that would serve to reduce the vulnerability of herders' households and the risk of livestock sector. Based on this study the methodology for vulnerability and risk assessment, and planning of risk reduction and mitigation measures at soum level were developed and tested using the examples of dzud, drought, hazardous windstorm, animal diseases and plague at O'mnodelger soum of Khentii aimag, steppe and gobi soums, and Ider soum of Zavkhan aimag.
3. Report results and policy recommendations:
   - Practical recommendations to use incubation for restocking; liquid gas as new fuel source for herders; and to encourage the rearing of camels to supplement the dramatic loss of cattle,;and a methodological recommendation to establish a system for risk monitoring and management at soum level; were developed, tested and dicussed at seminars.
   - This final report with detailed and simplified description and illustrative graphics and tables was prepared. This report includes details of the studies undertaken, thus providing readers with the information, make their own conclusion and to draw their own lessons.
   - Work to create the results database and put this on the Internet has been started.
   - The results of the study were delivered and discussed at regional and national seminars. JEMR Consulting funded expenses for 10 experts (9 experts in Dundgobi, and 1 expert in O'vorkhangai) to encourage their participation in the seminars and to discuss their findings with the local people.

Listed below are the methodologies used in the research:

1. **Sample survey** using a structured questionnaire with herders, soum and bag officials
2. **Discussion, roundtables and seminars:** Vulnerability and Risk assessment, planning for management at Dundgobi, Khentii and Zavhan aimags.
3. **Desk study:** Policy and other related literature and documents were surveyed. Soum annual livestock logbooks and aimag and state statistical materials were surveyed for primary and secondary socio-economic data gathering.
4. **Meteorological and climatic study:** Climatic norms and hazardous events' characteristics were identified for each of the surveyed soums and aimags on a monthly and annual basis. Indices for pasturing conditions of animals were calculated, and relationships between weather conditions and the animal losses were investigated. Meteorological, climatic, agro-meteorological, and mathematic statistical methods were integrated with expert's logic and opinion..

5. **Pasture vegetation and soil survey:** Geobotanic and soil survey methodologies with field sampling and laboratory analysis were used.
6. **Assessment:** impacts of climate hazard on livelihoods of herders, and vulnerability and risk at household, bag and soum levels were assessed quantitatively and qualitatively on the basis of indicators, indices and methodologies used in the natural environmental, social and economic studies.
7. **Pilots:** "Liquid gas is to protect pasture", "Bayantsagaan ram-lamb for Erdenedalai herders", "Camel wool carpet", "Methodology for Vulnerability and Risk Assessment and Planning for winter and spring".
8. **Integrated Information Processing** was performed with advanced technology such as GIS, remote sensing, an Internet and database management system for processing of climatic, socio-economic data and information.

1.2. Outputs

TOR for Report

The most significant output specified by the TOR is a final report analyzing possible inputs and policies, which both prevent rural herder families from falling into poverty and secure them from the vulnerabilities inherent to the sector. The report was also required to provide an evaluation of the effectiveness of previous and current programme implemented. It is intended a database will be compiled on the effects of the environment upon herder households. The final report is to be distributed by the PRG to the relevant National and International Organizations (in Mongolian and English). The report was required to adopt the standard PRG format.

Report Structure

In line with this, the final report with descriptions of research activities, gathered data and information, the methdodlogies developed and the outputs prepared in Mongolain and English and were submitted to the PRG.

The State, central and local government, and other stakeholders, international organizations and donors who are concerned about households' livelihood and poverty, reduction of risk of livestock sector and preparedness winter and spring can use outputs of the study.

Report structure is as follows:

1. *Introduction:* Terms of Reference and their Implementation
2. *Outputs of the study:* Summary of findings, recommendations and description of piloting
3. *Description of studies:* Impact of current climate hazards on the livestock sector and the livelihoods of herders' households, and findings of policy research.

Main output of the study - 40 recommendations classified in 3 groups are described in Chapter 2.

1. For poverty reduction
   - Recommendations of Surveyed Local Governors and Offcials

- To improve social services in hazardous situation
- Implementation of poverty alleviation policy
- Advises for restocking

2. For economic strengthening of herders' community
   - Economic strengthening
   - Reduce market risk
3. To manage risk of animal husbandry under changing climate and environment
   - Recommendation of surveyed herders
   - Hydrometeorological services for soums, bags and herders
   - Short-term risk management
   - Mid-term risk management
   - Protect pasture and improve its management

Discussion of the Findings

A structure questionnaire for the socio-economic survey of herders, bag and soum governors was developed by the experts from different sectors and disciplines and then it was discussed at the 3 workshops organized with the participation of researchers and representatives from the local communities. This was improved with their advice and recommendations.

Research findings, assessment methodologies and recommendations were discussed as the following:

1. Methodology for assessment of risk and potential losses, and planning for preparedness and risk reduction at the workshops for soum governors and administrators:
   - O'ndorkhaan, 2003-May-16-17
   - Khovd, 2003-June-24-26
   - Uliastai, 2003-October-2-3
2. Research findings and recommendations were discussed at the roundtable organized by the PRG with experts from different organizations, 2003-September-5
3. Regional and national seminars organized by the PRG and UNDP to discuss the findings of all poverty related studies:
   - Central region: Mandalgobi, 2003-September-17-18
   - Western region: O'lgii, 2003-September-29-30
   - Khangai region: Arvaikheer, 2003-October-4-5
   - Eastern region: Baruun-Urt, 2003-October-27-28
   - National seminar: Ulaanbaatar, 2003-November-17
4. Workshop on "Planning for winter preparedness" at the Zavhan aimag:
   - Uliastai, 2003-October-2-3
   - Ider soum, 2003-October-5-6

Critical comments, requests, advise and recommendations from the participants of above workshops and seminars were considered in research and reflected in the final results of the survey.

2.0 OUTPUTS OF THE STUDY

The chapter provides a summary of the research findings, conclusions, recommendations proposed and results of piloting carried out. These are listed below:

Findings & Conclusions:

1. The weather and environmental changes, variability and hazards
2. Impact of climate hazards on pasture animal husbandry
3. Impact of climate hazards on livelihood and poverty of herder households
4. Towards to manage climate risks to improve herders' livelihoods

Recommendations:

1. Poverty Reduction
2. Economic strengthening of herders' communities
3. Manage risk of animal husbandry under changing climate and environment

Piloting:

1. Methodology to assess the risks and threats to animal husbandry
2. Use of liquid gas in rural area is to protect pasture from desertification
3. Restocking with incubation and reproduction
4. Rearing of camels to substitute for cattle losses

The major contribution of this study is the integration and synthesis of; the sample survey findings, gained from 508 herders' households and 60 local officials from 14 soums located in 5 aimags selected; with expert opinions based on study in the field, laboratory analysis and logic; and the results of pilot testing of practical measures and the application of impact, vulnerability and risk assessment methodologies. This approach has been undertaken with intensive use of science, participatory approaches and appropriate information technology.

Samples were drawn wholly from herders' households living in rural areas. The respondents were either herders themselves or representatives from their families, (in all 82% of those questioned were herders). All ages and education classes of people were involved. Overall women questioned out-numbered men two to one.

2.1. Findings and Conclusions

1. Weather and Environmental Changes, Variability and Hazards

The frequency of extreme and non-linear weather events has risen in recent years due to global climate warming. Details of this study are going to be published on the web: www.agronet.mn.

Severity of weather during 1999 to 2002

Key characteristics were:

1. *Dry and warn weather:* Annual average air temperature was warmer by 0.3-2.7^{o}C and precipitation was less by 5-60 mm compared to climatic norms.

2. *Drought:* June-September air temperature was warmer by 1.1-3.2^{o}C, and precipitation was less by 8-50 mm than climatic norms. Continuous hot days with a heat wave caused severe drought. Livestock fattening and fodder gathering became highly problematic.
3. *Harsh winter and spring:* The condition of livestock over the winter and the spring became difficult due to frequent extreme cold, heavy snowfall and hazardous windstorms.

Drought, which has covered over 75% of the country's territory, generally has occurred once every 11-12 years; however, it is occurred on an on-going basis between 1999 and 2002 and 60-80% of the entire country was affected..

Climate warning, extreme hot and cold, drought and dzud disasters, hazardous windstorms may well occur more frequently in future. In addition, the number of rodents steppe mice, worm, and grasshopper has also increased. Moreover what was once permafrost has nowadays been melting with increasing regularity. The contingent climatic hazards such as dzud, drought, and snow and dust storm that occurred between 1999 and 2002 were the root causes of dramatic livestock losses.

Combating desertification through preventing and protecting pasture from overgrazing, degradation and sand movement has become one of the most pressing issues for the development of Mongolia.

Weather in surveyed 5 aimags between 1999 and 2002

Findings of questionnaire survey of 508 herders' households are summarized below:

- Most herders have access to weather forecasting and hazard warning via radio (85% of respondents), from local officials (81%), TV (23%), visitors (4%), and newspaper (4%). But 12% of surveyed households have no access to weather information whatsoever.
- Preparedness for meteorological hazards are: Maintenance of sheds for livestock (85% of respondents), prepare fodder (81%), reserve foods (42%), prepare firewood for fuel (69%), maintain gers (27%), give attention to animal breeding (69)%.
- Soum, bag governors and officials, and herders consider the occurrence of frequent hydro-meteorological extreme events and reduction of pasture resources as a serious change in their living environment. They named the following changes:

  Hydro-Meteorological phenomena:
  - Frequent heavy snowfall
  - Drying up of rivers and springs, and fewer drinking water resources
  - Consequent occurrence of Dzud disaster
  - Consequent severe drought
  - Increased occurrence of flood
  -

  Pasture degradation:
  - Reduction of feeding values of pasture plants
  - Low yields of grasses for hay and a lean harvest.
  - Reduced pasture area
  - Overgrazing and degradation

- Increased risk for pasture desertification
-

In the surveyed 5 aimags the years 1999 to 2002, represented a period of hardship in animal husbandry and dramatic socio-economic losses caused by droughts, dzud, hazardous snow and dust storms. The following provides an aimag by aimag, summary of the most significant weather events, which affect animal husbandry and herders' livelihoods..

Bulgan aimag

- There was drought in the whole area of aimag in the summer of 2002.
- In the summer of 1999 and 2000 sultry heat was lasted for 5-19 days.
- April of 2001 and 2000, and December of 2002 saw hazardous windstorms with speed of 20-40 m/sec.
- Extreme cold at -40^{0}C at the end of January 2000.

Dundgobi aimag

- For the recent 3 years, drought occurred in 70-85% of the aimag territory.
- Annual average air temperature is getting warmer by 1.0-1.6^{0}C over the last 4 years compared to the climatic norm.
- Precipitation during 1999, 2000, 2002 years was lower by 6.8-51.7 mm or 30% less than the climatic norm.

Zavhan aimag

- There was drought and dry climatic conditions for 4 consecutive years.
- Since 2000 white dzud has occurred in entire aimag area.
- Between 1999 and 2002 annual average air temperature has warmed by 0.7 - 2.5^{0}C.
- In 1999-2002 the amount of precipitation was 38-62 mm or 21.9-39.7% less than the climatic norm.

To'v aimag

- There was drought during the summer of 2000 and 2001.
- Hazardous windstorms with speeds of 16-28 m/sec occurred in April 2001, March and April 2002.
- In January 2001 absolute minimum air temperature dropped below -35 to -40^{0}C.

Khentii aimag

- Between 199-2002 year air temperature warmed by 0.6-1.8^{0}C.
- The amount of precipitation fell by 5.9-95.2 mm or 5.9-36.7% less than climatic norms.

2. Impact of Climate hazards on Pasture-based Animal Husbandry[2]

Nomadic pastoralism the base of Mongolia's economy and a large swathe of the population's livelihood, suffers severe environmental and climate hazards. The ongoing dzud, drought and hazardous windstorms that have occurred since 1999 were the force majeures, which caused the great number of livestock losses. Nearly one third of total head of livestock and amongst them half of the cattle stock, were lost.

[2] Details of this study are described in Chapter 3: Impacts of climate hazards on the livestock sector.

Studies into livestock were conducted at the soum level with a detailed consideration of the seasonal variations in animal husbandry practice. Mongolia has a traditional 24-month calendar with a length of 13-15 days, and this was found to be more appropriate to the natural system dynamics as well as to traditions of animal husbandry. We began by first, scoring the year-around activities of animal husbandry according to intensity of production; secondly, temperature, snow and rainfall anomaly, and snow and dust storm according to positive and negative impacts, these were then cross-tabulated with the 24 seasons. We then experimented to assess for each year of unfavorable conditions, by cross tabulating with animal losses in order to define the most appropriate assessment indices and indicators.

Losses caused by drought and dzud of 1999-2002 (at National level)[3]

- **Loss and damage:** During the favorable climatic period between 1993 and 1999, the total head of livestock sharply increased to 33.6 million head by 1999. This represented the greatest number of livestock recorded since 1940. Millions of animals have been lost due to natural disasters such as sultry heat, drought, dzud, hazardous snow and dust windstorms, which have frequently occurred since 1998. The number of animals had fallen to 23.9 million at the end of 2002. And currently Mongolia has fewer livestock than it had 15 years ago.

  In all, 8.6 million of cattle were lost during the 1999-2002 drought and dzud, and this is estimated to have cost 375 billion tugrik. By 2002, 29% of camels, 37% of horses, 51% of cattle, 30% sheep, 17% goat perished compared to 1999 (see table below).

	N_{1999} mill. head	N_{2002}, mill. head	N_{2002}-N_{1999}, mill. head	(N_{2002}-N_{1999})/N_{1999}, %
Total	33.6	23.9	- 9.7	- 28.9
Camel	0.355	0.253	- 0.102	- 28.8
Horse	3.163	1.988	- 1.175	-37.1
Cattle	3.825	1.884	- 1.941	-50.7
Sheep	15.191	10.637	- 4. 554	-30.0
Goat	11.034	9.135	-1.899	-17.2

- **Gross Domestic Products:** The GDP share occupied by agriculture was 40.3% in 1999 during the favorable weather condition period. But had fallen to 20.1% at the end of 2002. GDP in livestock fell by 1.7 times in 2002 compared to 1999 (at 1995 tugrik prices).
- **Agricultural products** fell by 25.3% in 2002 compared to 1999. Meat production by 29% (Slaugter weight) and milk production by 42% also fell..

Conditions in the 5 aimags we surveyed, between 1999 and 2002

In Dundgobi aimag throughout 1999-2000, and Zavhan and To'v aimags during the winter and spring of 1999 -2001 dramatic livestock losses were recorded. The loss of animals in Khentii and Bulgan aimag was somewhat less than the above 3 aimags, but they still lost a considerable number of cattle during wither and spring of 2000-2001.

[3] Information from State annual statistical bulletin, 1999-2002

The 3 years followed after 2000 dzud, the number of livestock, has been rising in Dundgobi aimag, while it has been continuously decreasing in Zavhan, To'v and Bulgan aimags.

The overall number of heads of cattle has gone down in Dundgobi, Zavhan and To'v since 1999, and also in Bulgan and Khentii aimags since 2000.

The following provides a summary of the conditions:

1. *Bulgan:* Dry and hot summers with daily average air temperatures of 34-40^{o}C, drought, winter with 20-29 cm snow coverage, and spring with 24-40-m/sec windstorm. All livestock types have seen losses except goats. Total head of livestock increased by 10.3% between 1998 and 1999, but from 2000 to 2002 all animals except goats fell back. Amongst them; cattle from 11,8-29,1%, horses from 8,2-10,2%, and camels from 10-22,2%.
2. *Dundgobi:* Between 1998 and 1999 all types of animals were already in decline by 4.9%. Moreover, the Dundgobi was the epicenter of dzud of 1999-2000 and the aimag lost 39% of its total livestock, 47.8% of horses and 65.8% of the cattle held. Climatic hazards included: Drought in summer of 1999, 20-40 cm snow coverage in winter, and 28-40 m/sec windstorms during 1999-2001.
3. *Zavhan:* This is perhaps the most affected aimag during the overall period; abnormal animal losses have been suffered every year since 1999. In terms of all animals reductions of 20,2-23,4% have been experienced, horses have fallen by 26,7-27,7% and cattle especially dramatically by 41,8-43,8% during the winter and spring of 2000 and 2001. The total animal count in 2002 was 41% lower when compared to 1999. Conditions have included severe drought in summer for 3 consecutive years, dzud disaster over 2 years, 30-38^{o}C extreme temperatures in July of 1999 and 2000, versus -41- -51^{o}C extreme cold temperatures in January 2001, and 28-40 m/sec windstorms in April 2000 – all causing massive livestock losses.
4. *To'v:* This aimag has suffered cattle losses since winter of 1998. Mass losses occurred in the consecutive winter and springs of 2000 and 2001. Every summer since 1999 were plagued by drought. Snow coverage reached 49 and 38 cm in January of 2001 and 2003 respectively. But interestingly there has been no overall loss in the number of goats.
5. *Khentii:* This is perhaps the least affected aimag. Between 1998 and 1999 total head of livestock has increased by 5.3%. Whereas 2001 saw a reduction of all animals except goats; horses by 9.5% and cattle by 31.2%. Mass animal losses were experienced, mostly of cattle during the winter of 2000-2001. Extreme cold with temperatures of minus 49 -51^{o}C, snowy and dusty windstorms with 28-40 m/sec caused these animal losses. As for To'v there was no reduction in the overall number of goats, whose numbers have increased by 17% since 1999.

When the dynamics of the increases and decreases is studied in the surveyed 5 aimags the following observations are pertinent:

- Loss of animals occurs within a dynamic cycle of commencement, development and decline spanning a 3-4 year period.
- Small losses usually preceded and warned of substantial loss in future years. Such a dynamic might be helpful to forecast and provide an early warning a year in advance. But this should be studied in further detail.

- In the surveyed aimags both camels and goats have been less affected during periods of dzud and drought.
- Underlying this is perhaps the fact that drought does not substantially affect forage for camels. The grasses that feed camel are drought resistant. The main reason for decline of camels was increase in consumption of its meat, because the main meat sources - horse, cattle and sheep had suffered dramatic reductions. Rearing camels with well-developed policies and activities can serve as an adaptation measure to the risks of climate change[4].
- During the past 4 years goats have increased in Bulgan and Khentii aimags by 17-19% (see table below). The severely affected To'v aimag has suffered no goat losses. The goats are more tenacious in finding their forage, and can feed on non-grass foods (vegetable, bread, cloth, etc); and moreover, the herders are generally concerned for their welfare as cashmere represents a valuable income source.

Aimag name	$(N_{2002}-N_{1999})/N_{1999}$, %					
	Camels	Horses	Cattle	Sheep	Goats	Total
Bulgan	-30%	-25%	-47%	-14%	19%	-14%
Dundgobi	-31%	-48%	-74%	-29%	-19%	-30%
Zavkhan	-35%	-51%	-69%	-43%	-21%	-41%
To'v	-36%	-39%	-55%	-31%	0%	-28%
Khentii	-15%	-13%	-37%	-5%	17%	-6%

A detailed impact assessment survey was done for Erdenedalai soum of Dundgobi aimag. Before the dzud 2000, Erdenedalai had the highest total head of livestock among the soums of Mongolia. During the dzud 110 thousands animals were lost, cattle reduced 4 times Andover, and horses losses approaching 3 times. The estimated cost for lost animals was determined as US$4 million, while with consideration of lost products this reached US$6 million. The value lost in the dzud of 2000 has been assessed as being US$ 5.9 million and the total for 1999-2002 as US$6.3 million. The average wealth generated by animals per household was around US$6,500 in 1998 and at the end of 2000, had fallen to US$2,500.

Impact on Pasture[5]

Herders and local governors describe the decline in pasture resources in the last few years in terms of the reduction of the feeding values of pasture plants, low yields of grasses for hay making, reduced pasture area, overgrazing and degradation, and increasing desertification.

Findings of our study in the dry steppe of Dundgobi aimag included a Geobotanic analysis of the 9 types of pasture that are represented in steppe and desert steppe regions. Although we found no considerable change in vegetation species composition, (there are in average 12-30 species in dry steppe and 12-20 species in desert steppe), consecutive droughts have affected vegetation growth. For instance, in dry steppe, the vegetation biomass is 2 times lower than that indicated in fodder resource map of 1981.

[4] A description of ongoing activities for camels is given in Piloting section of this chapter.
[5] Detailed description of the study is going to be published on web: www.agronet.mn.

The decrease in the percentage of valuable forage vegetation (for animal grazing[NU3]) and increase of unfavorable vegetation in total biomass has reached 36-68%[NU4] of total biomass; Animal favorable species are much lower in degraded pastures (less than 20%); thus although vegetation species has not been changed dramatically, saltwort, tumbleweed, wild leek have became dominant. Lean pasture harvests have also been observed in these aimags due to weather factors particularly heat-waves and low levels of precipitation; Tumbleweed and wild weed are taking the place of other species in the degraded pastures - and this is negatively influencing nutritious pasture plants, as weed pasture is main reserve for spring and winter.

Local people are increasingly using scrub in Gobi and steppe area because of there is a scarcity of cowpats caused by cattle losses due to drought and dzud during 1999 and 2002. This destroys pasture and further increases the risk of desertification. Thus use of liquid gas in Steppe and Gobi regions can offer some protection to pasture from desertification[6].

Poor herders have no opportunity to move to another pasture (through 'Otor', the traditional Mongolian form of transhumance) causing pasture degradation.

A limiting factor for growth and development of plants in Mongolia is soil moisture, which is strongly dependant on the amount of precipitation. Continued climate warming will cause a negative balance of moisture capacity, because this factor will increase the evaporation of the water from the soil, while the amount of precipitation remains the same or will decrease. Consequently, such changes in climate will have significant impacts on vegetation cover, particularly on developmental rhythm of the plants.

Developmental rhythm is one the best parameters to study, which is not only a product of change in climate, but also in soil fertility, and moisture capacity of the soil. Therefore, an assessment of the developmental rhythm of the plants is very important to reveal the impact of climate on vegetation more precisely. Using this parameter we would be able to determine to an extent, the impacts of the weather for studied year.

Policy and management[7]

Mongolia has considerable legal, strategic and policy documents, and national programs concerning development of different sectors, but suffers a shortage of resources, knowledge and experience, and methodologies to implement such policies in to practices to obtain real benefits and pass the gains to ordinary people.

Cooperation and relationships between professional organizations is not so good. For this reason professional services fail to assist herders in soums and bags and local administrations.[NU5] The activity of Emergency commissions in soums is limited by the severity of hazardous conditions of natural disasters, although it is the function of different professional organizations to serve rural communities and herders.

What is needed is the establishment of an advanced system for planning and implementation of preventative measures for assessing and managing the risks of climate hazards along with reducing vulnerability and increasing the capacity of agriculture. Risk management should be based on the hazard, vulnerability and risk assessment. Information and communication technology is an important tool for hazard warning and preparedness to assist the sparse distributed population represented by Mongolia's herders. It is important

[6] Study and results of test on use of liquid gas by herders and rural restaurants are described in section of Pilot 2 of this chapter.

[7] Some details is given in Chapter 5: Findings of policy research.

to implement expert-based systems with use of GIS and remote sensing technology that would provide decision options with cost-benefit analysis, integrating different information on weather, pasture, forage, livestock condition and herders' livelihoods.

There is a lack of the data and information necessary for optimal and efficient management of animal husbandry. Statistical information on the head of livestock and losses are doubtful value. There is no information at all on the monthly and seasonal dynamics of livestock, production levels - whilst natural hazards might affect thousands of animals over night or in a few days. Lack of information limits the study of impacts by particular weather events or by different type of hazards.

The current livestock census, which is conducted only once a year, is inadequate because the number of livestock changes daily, monthly and quarterly through natural processes, consumption and losses. In addition existing tax policy is negatively affecting the census as herders usually reduce the number of animals in order to avoid taxes.

This lack of information makes it difficult to learn lessons from the past, to properly analyze and understand the present, and to project future trends. The livestock sector faces many issues today and yet has no appropriate solution, methods and development supporting mechanisms.

Extensive versus Intensive Animal breeding

Herders do not agree with assertions that Mongolian cattle are not of good quality. Mongolian cattle have a high potential accumulated over thousands of years of breeding within severe continental climatic conditions, with frequent drought and dzud. The term "to qualify" means that gene of Mongolian native livestock should be kept and improved forever on the way improving animal breeding technology restoring the tradition with appropriate adaptation to recent climate risks with frequent extremes.

The arguments put for rearing highly productive animals is associated with intensified sedentary livestock farming. This and the related goals of achieving international quality standards to obtain high productivity for milk, wool and meat production cannot be implemented without very substantial and unaffordable levels of investment. This would be required for the provision of sufficient water and forage resources, which will require setting up not only of the new livestock farms but also sustainable arable agriculture, irrigated to grow forage even in drought conditions, using highly fertile crops, technical facilities, and high-level human resources. Establishment of such a system will take decades and this does not offer any help to the 176,000 Mongolia herders' households who have to survive today with their very limited resources, herding their animals, migrating with them seeking, better pasture under changing and difficult, climatic and environment conditions. Poor herders simply don't have any opportunity to develop and own the intensive livestock farms.

The improvement of the management of pastoral animal husbandry and risk reduction through implementing good practices based on traditional technologies and well-planned actions, concrete and practical measures in order to meet the interests of rural people offers a far more realistic policy objective. Such a goal can be achieved with the increased participation and leadership of the rural community, through the collaboration of stakeholders, encouraging professional services to reach soums, bags and herders, and implementing appropriate policies, financial support and coordination from the government.

In the above context the objectives "to quality-mark the livestock" or "to intensify animal husbandry" might start from the simple message that, the first of all, we have to rear breeding animals that are adaptive to climate hazards and more productive for wool, meat and milk; second, to protect their off-spring; and third, replace breeding males in a herd every 2 years to preventing blood approach and genetic failures.

Herders have commented that experiments with rearing yeanling rams which have more lumber vertebrate by 30 herders' family in Erdenedalai from Bayantsagaan[8] soum should be expanded with supervision for each head of animal including the selected breeding animal. They are interested to improve the quality of their herds by acquiring; faster horses, goats with high-quality cashmere potential from Tsagaandelger soum of Sukhbaatar aimag, and to raise camels if cost of wool increases in the marketplace.

Indeed, the traditional selective breeding practices of Mongol herders offer a basis for the improvement of herd quality, and its implementation requires comprehensive knowledge of the bio- and adaptive-capacity of livestock, breeding specifics, quality and quantity of its products, and awareness of the geo- and bio-environment including climate and pasture. For instance, during 1960s there was a feeble attempt in Dundgobi aimag (steppe area) to improve the breading of local cows with Kazakh white head cattle (from mountain and forest steppe). By learning lessons from this experiment, native Mongol cattle can be raised and protected.

The assessment for the Bayantsagaan yeanling rams project conducted in Erdenedalai shows us that if the selective breeding is organized properly, the head of animals with high productivity will sharply increase..

3. Impact of Climate Hazards on Livelihood of Herders' Households[9]

Since 1999 due to severe drought, dzud disaster and epidemic disease thousands of households lost all their livestock or were left with few animals. Living standards for rural people rapidly plummeted contributing to an increase in unemployment and poverty. The numbers of the poor and low-income households increased dramatically. Herders started to migrate to the urban areas in large numbers. Equally, the number of people with infectious diseases increased sharply in affected aimags with dzud and drought. The following provides summary information derived from the available statistics:

- **Number of livestock for per person:** This number fell to 9.7 at the end of 2002, this is the lowest number recorded since 1940.
- **Meat and milk for per person:** Meat fell by 32% and milk by 43% in 2002 compared to 1999.
- **Poverty of herders:** In total 12,100 households completely lost their livestock. In 2002, the number of households with livestock reduced by 26.7 thousand (11%), and the number of households herding more than 200 animals declined by 12 thousand (40%) compared to 1999, - and by 2002 46% of all herder households were subsisting with fewer than 50 animals.
- **Migration from Rural to Urban:** In 1998, the rural population constituted 51.4% of the total, but in 2002 as the result of extensive migration it fell to 42.6%. In 2003

[8] The experiment is described in section of Pilot 3 of this chapter.
[9] Details of this study are described in Chapter 4: Impacts of climate hazards on livelihoods of herders' households.

alone, around 12.6 thousand households or 29 thousand people migrated from rural areas to Ulaanbaatar.

- **Disease:** Dundgobi, O'vorkhangai and Gobi-Altai aimags have registered 3 times more of people with infectious diseases than 2000. The number of people with infectious disease dramatically increased in Zavkhan, Uvs, Kho'vsgol, Bayankhongor and Ulaanbaatar during 2000-2001 compared to 1999.

The 5 aimags surveyed

Relevant findings of survey questionnaire were:

- 54% of out of the 508 respondents considered that the herders' livelihood has worsened since 1998; 92% considered that environmental and climatic hazards caused a worsening of their livelihoods.
- Between 77-92% of people surveyed in each aimag[NU6] considered the frequent dzud disasters, continued droughts, heavy snowfall and reductions in hay grasses are the key features of the climatic changes occurring in their living environment.
- 92% of the surveyed households had lost animals in the last 5 years due to hazardous meteorological phenomenon; 53% of them had lost more than the half of their animals; and 17% had lost all of their stock due to drought and dzud disasters.
- 35% of surveyed herders were able to estimate the value of their losses, the estimated annual animal losses ranged from 90 to 3,600 US dollars.
- Stress and frustration, exposure to disease, debts, hunger, alcoholism, and out of school children, are listed among the negative impacts on herders' households.
- 58% of surveyed households have no animals or less than 100; 21% have between 101 and 250; 10% have 251 to 400; and only 6% have more than 401 head of livestock.
- Herders' incomes are not evenly distributed throughout year and depend on seasonal variations of products of animal origin. Many households don't have a regular monetary income except those who have old or sick family members with pension or benefit payments. Monthly income is not stable. 33% of surveyed households are living with monthly income of less than US$30 - and 37% with annual income less than US$500.
- Herders who have pensions are those who worked for cooperatives before the 1990s with sufficient years to qualify for a pension. But now the labor of many herders, particularly the young ones, is not registered with the social security authorities, they don't get involved in social care insurance as they don't want to pay any tax for it. Thus the system to involve herders in getting a pension in older age in non-operational.

Impact on herder's assets and income

Almost all livestock in Mongolia is privately owned. By the end of 2002, 243.2 thousand families owned livestock, 72.3% of which (175.9 thousands households) are dependent solely on income generated from their livestock.

The main assets of herders' households consist of livestock, gger with very modest furniture, shelters for animals, vehicles, carts and a few facilities used for animal breeding, hay making, and preparation of dairy products.

Herders derive *incomes* from livestock, pensions, social care benefits and allowances, some job, services, trade and others. Livestock alone generates 60-100% of the income of herders' households.

A generalized calculation shows that the majority of the rural population has incomes below the poverty line. Herding family income is dependent on many factors including type and quality of animals, weather conditions, season, internal and external market prices and distance to the market place. As the statistical survey showed, in 2001 the total income of herders was generated 52.8% from cashmere, 28.6% from live animals, 6.4% from skin and hides, 5.4% from meat, 4.3% from wool and 1.2% from milk and dairy products.

As the livestock sector is highly sensitive to extreme weather events and the natural resource represented by pastureland, rural households are the much more vulnerable to the negative impacts of climate hazards than households settled in aimag, soum centers and the capital city. Soum household's income is also sensitive to changes in the livestock sector but half as less than herders.

The climate hazards such as drought, dzud, hazardous windstorms and flood directly affect livestock, and indirectly affect products of animal origin; the main assets and income sources of herders households.

Frequent snow and dust storms, flood and forest fire have damaged other assets too, including; houses, fences, vehicles, equipment and other items. These can be considered as direct and indirect impacts.

Impacts on Poverty

One of the indicators, which can be used to evaluate herder households' wealth, is the number of animals a household owns. At the state level, the number of herding households, having less than 100 animals accounted for 58.5% among the total households with animals in 1999, but this figure had increased to 69.1% at the end of 2002; and 19% have between 101 and 200 animals. Families having less than 200 animals are generally considered to be poor.

During livestock privatization, many hundred of herdsman received livestock, however, many of them lost this source of living due to the deficiency of their herding skills and unpreparedness for the climatic hazards of 1999-2002.

Between 1990 and 1999 with favorable weather conditions, the number of households with few animals decreased and the number of households with more animals increased greatly. But, after the dzud disaster of 2000, the position reversed, with the number of households with larger herds decreasing and those with smaller holdings increasing sharply. Poverty in rural areas also increased dramatically. For instance, an average heads of animal per household (in sheep units) in the surveyed aimags declined between 16 and 46%. Zavhan is the most affected aimag and has the fewest animals per household (see table below).

	N_{1999}, sheep unit	N_{2002}, sheep unit	N_{2002}-N_{1999}, sheep unit	$(N_{2002}-N_{1999})/N_{1999}$, %
Bulgan	256	184	-72	-28%
Dundgobi	334	200	-133	-40%
Zavkhan	229	124	-106	-46%

To'v	208	133	-75	-36%
Khentii	205	172	-33	-16%

Before dzud disaster Erdenedalai soum of Dundgobi aimag had 3 households without any animal and 7 households below poverty line (0.4% of total households). Yet during the year of the dzud (2000) 100 households were registered as very poor (5.7% of total households) and in the next year this number was increased to 173 (9.8% of total households). Those without any livestock accounted for 139 households in 2001.

The survey has indicated some variations between areas, for instance; 66% of herders from 3 soums in Zavhan aimag have less than 100 animals, while 27% of herders from the 3 soums in Dundgobi aimag have less than 100. But, head of animals is not an only indicator of household's wealth, some other indicators such as type animals, herd structure, access to market, knowledge, skill and health of the herders, family size and education level should be considered. The herders from Dadal soum of Khentii aimag and Teshig soum of Bulgan aimag have less affected by dzud disasters demonstrating their best practices and capacity.

The soum and bag governors surveyed named as possible activities to alleviate poverty, restocking, intensification of livestock sector, efficiency improvements, employment, low interest rates and long-term loans, SME development at soums, more reliable power supplies and integration of livestock with arable agriculture.

Notably the total numbers of herders decreased by 30 thousand people in 2002 compared to 1999, and now stand at 390 thousand. The composition of herders continues to change. The number of the young (16-35 age) and the elderly (older than pension age) herders has been decreasing since 2000.

In the surveyed aimags and soums (except To'v aimag) the herders have not significantly joined cooperatives share labor and equipment. They are sparsely located in distant areas, far from education, cultural and health services and markets. The difficulties caused by natural disaster hazards and weak social services are creating a tendency towards migration from rural to urban areas. This tendency has lead to some wells, shelters and pastures in distant locations being abandoned while many central pastoral lands are being overgrazed.

Impact on herders health and school children

Relevant findings of questionnaire survey are summarized below:

- Above mentioned natural hazards have affected human health, some herders have become ill, getting frostbite and others have sustined serious injuiries and even become handicapped. Some herders have lost their lives.
- Certain negative consequences such as mental stress (66%), worsened general health (26%), disability (1.3%), running up huge debts (18%), school dropouts (17%), shortage of food (10%), alcoholism, family break-up, turning to crime, and even cases of suidcide have followed the climate hazards of year 1999-2000.
- 89% of herders can get health service when they are sick. The most of those who cannot get health service explained the reason as the high cost of medical treatment and incapable to pay for medicine.
- Children from 18% of the surveyed households were out of school during the last 5 years. The main reason, they gave, was the lack of labor for animal breeding and

their inability to provide their children with necessities for school, clothes and shoes, etc.

Impact on mass migration

Migration of people is an important integral indicator of macro level impacts of socio-economic and environmental factors on the livelihoods of people, particularly for a country with a mobile and adaptive population of nomadic origin as in Mongolia.

Mass migration of population between urban and rural area has severely affected Mongolia. In the last decade, there have been two very different migration movements: urban-to-rural migration between 1990 and 1998; and rural-to-urban migration since 1999. It is considered that the initial urban-to-rural migration caused by the economic transition and substantial structural change, whereas the latter rural-to-urban migration was caused by the climate hazards of 1999-2002 and has intensified after implementation of new Land law, that allowed citizens to privately own land in urban areas. In 2003, the first year of Land law implementation about 29 thousand citizens migrated to Ulaanbaatar.

In the last few years migration has caused an increase in unemployment and poverty in urban areas, pasture overgrazing, land degradation, environmental pollution, pressure on resources and social services. For instance, on average, time primary and secondary schools in Ulaanbaatar are heavily oversubscribed with 40 to 50 pupils in each class. The number of classes required has exceeded the available space; some schools have had to move to providing lessons in three shifts with short classes and break times. With such a high rate of increase in pupils in Ulaanbaatar, it is estimated the 5-6 new schools need to be built annually. Yet the government does not have the financial sources for this.

Mass migration affects mostly the capital city - Ulaanbaatar and Central region. In Ulaanbaatar, total migration for the 5 years between 1995 and 2000 was 95.4 thousand, while in 1999 it was 39.5 thousand. According to the statistics for 2002; 57.4% of the population live in urban areas, and 34.2% of population live in Ulaanbaatar. With such a trend, the projection is that in 2025, 42% of population will live in Ulaanbaatar unless the government implements policies for territorially balanced development.

Relevant findings of questionnaire survey can be summarized as follows:

- 65% of those surveyed want to stay in their home at heir present location, breeding their animals even in the changing and increasingly challenging climate and environment, 15% want to move to settled area, 4% to move to a place with better weather conditions. The remainder did not have a clear answer to this question.
- Migration at soum level can be seen with the example of Erdenedalai soum: Since 1998, the annual migration rate has been 2-5% and for the last 5 years in total, 328 households (19% of total soum households) have migrated from the soum.

Livestock Restocking

From 1990 to 1999 with favorable weather conditions, the number of households with few animals decreased and the number of households with larger herds animals increased greatly. But, after dzud disaster of 2000 the position reversed dramatically.

As we mentioned above, the questionnaire survey showed that 65% of herders prefer to stay at their homeland to look after their livestock, providing food and some monetary support for their children and relatives studying or living in the cities. This is in spite of the

fact that climatic hazards occur frequently and their incomes have sharply dropped. Therefore good quality animals are needed for these strong herders. But, many of these households remained outside of the restocking campaign implemented since 2001, by the government and the donors.

It is vital that a well developed and comprehensive policy with consideration for the natural environment for restocking with livestock and a detailed methodology for its implementation is put in place. The existing regulations for restocking and for paying back loans are not affordable to herders and fail to achieve the desired goals for enabling recovery from dzud losses and to poverty reduction.

Herders' Food

Relevant findings of the questionnaire survey were:

- 10% of surveyed herders suffered food shortages in their family and feel hungry.
- 58% of herders households monthly spend on food is less than US$50.
- Herders' food intake has a seasonal pattern and consists mostly of beef, mutton, horse and goat meat, milk, dairy products such as yogurt, cream and butter, dried curds from sour milk, wheat flower, rice, salt, sugar and vegetable oil. Vegetables are used in only small amounts.
- Herders are the main food producers in Mongolia and a "free of charge" supplier to their parents, children, and relatives living in urban area and mass visits to them during summer – the pleasant time of the year.

As far as food supply to the population is concerned, local meat production meets domestic demand and some meat products are exported. Meat consumption per person has gradually increased to 120 kg per year. Local dairy production has not been able to meet the population's needs fully.

In 2001 meat production increased, whilst milk production decreased. Meat and milk production is plays the major role in the food sector and has good prospects for intensive development of food production. During recent years the export of meat has noticeably increased. The Government has approved and is implementing its "Meat project". There is an ongoing need to take measures that can meet the requirements of the international market that will improve processing, grading and packaging of meat and meat products.

Supply of domestic milk and diary products in urban areas is not sufficient. Indigenous technology of rural households is still in use in milk and diary production sectors. The amount of milk processed in milk factories, has decreased. While in 1990, 61.5 thousand tons of milk was processed on average, in the last 2 years only 1.3 thousand of tons has been processed in milk factories. This situation has come about as a result of the collapse of dairy farms and mechanized milk farms, which were located near to the cities and the collapse of the milk procurement system.

A single member of a poor household, on average, consumes only 58-68%[NU7] of the minimum required daily calories. People in dzud affected are particularly short of food.

It is intended that the "National Program on Food Security, Food Safety and Nutrition" approved and being implemented since 2001, will play an important role in the development of the food sector in general, and meat and milk production in particular.

4. Towards to Manage Climate Risks To Improve Herders' Livelihoods

A system to monitor households' vulnerability and manage risks caused by climate and environmental hazards[10]

Mongolia is in need of a system that could regularly monitor, provide early warnings and assess impacts of climate and natural environment hazards, the vulnerability of herder households and properly manage risks.

The issue of herders' livelihoods has environmental, social and economic aspects. The activities of central and local government, professional and business organizations and herders themselves are in effect, a chain with the components highly interrelated to each other. However, these tasks and roles should be better formulated in the light of the above-mentioned issues and activities, and should be well coordinated.

Our study finds that environmental and socio-economic data - and information gathered from different sources, is rarely brought together. Connections over time and space are not made. This shows a lack of common achievable goals and objectives, and poor coordination amongst those in the public service and regulatory agencies.[NU8]

It is important to have a system to make a proper assessment of vulnerability and risk, and then to manage it appropriately at all levels,; state, aimag, soum, bag and households. Information technology can be a powerful tool for implementation and investment plans should reflect this.

Meteorological services at soum level

5 soums out of surveyed 14 soums have no meteorological station with a full programme of weather observation. Therefore, there is no information on air temperature averaged daily, monthly or annually. Soums where meteorological observation started operating after mid of 1960s have no climatic norms, as climatic norms were calculated internationally for period between 1961 and 1990. Thus for these two kinds of soums we could not assess the last year's climate variability in comparison with the climatic norms.

Yet herders very much need to know the weather forecast on a daily basis for their livelihoods. But work to improve weather forecasting has become rare in recent years. Nowadays few researches have work in this field. There are no methods available that can process data and recording from meteorological stations on the basis of thematic maps that are used in the study of socio-economic practices of agriculture. For instance, meteorological information has not been linked on a regular basis with information on land use, flora and fauna, pasture degradation, forage resource, ecosystem deterioration caused by rodents and insects, and environmental pollution, aside from some occasional case studies which have been conducted.

There is no methodology currently available for the interpolation and extrapolation of point data gathered at meteorological stations located in soum centers for the whole territory of soums where animal husbandry is affected by the effects of geomorphology and, which also possess a heterogeneous distribution of geo processes and bio resources.

Geobotanic observations on vegetation have not been conducted for many of the species used as forage for animals. No chronological records even exist on plants growing within

[10] Some results of testing of methodology for vulnerability and risk assessment are described in the section of Pilot 1 of this chapter.

the fenced areas of meteorological stations. Therefore, there is no possible way of investigating and identifying for sure; the trends and rates of changes in pasture plants due to global warming.

Study on Climate Change and Pastureland

Since the middle of 1980s a study on climate change was carried out with internationally used methodologies, this developed future climate scenarios at 20, 40, 70, and 100 years ahead.

Similarly, a study on plant and vegetation including biomass and forage resources, and their fluctuation has been conducted for several years, with the participation of numerous research and development institutions.

However, there are few studies that have integrated the above-mentioned areas of enquiry. There is no well-researched information on climate and vegetation interaction in the basic literature in Mongolia. Indeed, the lack of secondary sources might indicate a lack of appropriate study itself. Many characteristics such as the pasture ecology of dominant plants that can adapt during periods of climatic variability, biological capacity, duration of seeds and breeding in boggy conditions of hibernation, plant rehabilitation capacity, K.S.R strategy, plant phynological stages, and fluctuation and succession times/ areas, and trends has not been studied well until now. Listing the key parameters are vital in defining climate and vegetation interactions and the development and adaptation of policy to climatic and natural environment changes. Unfortunately such kind of studies were abandoned in Mongolia following 1990, though as some of these enquires are beginning to re-emerge now, with advent of the global concerns regarding the threats to humanity posed by intensified climate warming and the passing of the warmest decade of the last millennium.

In Mongolia there are no particular standards for the study and assessment of pasture vegetation. The research and research institutions lack collaboration in this field and they have their own methodologies that give conflict results. The end-users of those studies – local governors, rural communities and herders have no access to information on research findings that would provide an appropriate theoretical base in which to ground their every day governing or managing of herding practices.

In deed, the rural population of Mongolia, which every day interacts with nature, is unable to benefit from modern highly developed societies.

Yet recently a new land law has been introduced, and at the same time the whole of Mongolia from government to ordinary people, is learning-by-doing by way of trial and error, incurring both losses and benefits. Many regulatory and methodological issues are still under development. Systems for monitoring of pastureland quality have not yet been established even though the new agency for land management has been operating and government is spending monetary and human resources. Pastureland mapping at soum level has no standardized methodology. The experts, who surveyed soil and vegetation at the selected soums, found large differences between the existing pasture map and the reality in the field. There is a serious need to develop a comprehensive methodology for land mapping in order to implement the new land law and protect pasture as a basic source of living in Mongolia.

It is very doubtful that the researchers from urban areas who conducted short-term and summertime seasonal field surveys can provide a complete study that would serve pastoral animal husbandry as a whole. Equally, from the other side, herders and local governments are not active and rarely enthusiastic about improving their pasture management. They are

busy with their daily life and have little concern about the mid- or long-term use of pastureland. That means they have no active duties and take responsibility for these matters. There is a strong need for good professional services to improve pasture management at bag and soum levels to reach overall sustainability in pasture land use.

In recent year numerous research conferences and meetings regarding climatic changes have organized and discussed whether the plant sprouting and blossoming period of plants has been postponed and/ or shortened. But the study of the Mongolian flora has not carried-out properly. Moreover, talks on changes in the boundaries of Mongolia's natural zones, which suggest that the Gobi region is expanding to the north and the area of the forest steppe is reducing, have not been verified and confirmed with proper geobotanic studies. Furthermore, studies of important indicators of global change such as desertification, wind and water erosion of land have also not been linked with the geobotany either.

There is some fluctuation in pasture vegetation caused by drought, but no clear answer as to how the bio system can be adapted to and/or rehabilitated from the short-term hazards and long-term changes which have occurred in nature and been intensified with human activities.

Study on Climate change and Socio-economy

Climate changes scenarios and projections have been calculated for 20, 40, 70 and 100 years ahead, but socio-economic development objectives and programmes are generally developed over 5-10 years and implemented in annual stages. Thus, the combination and integration of the two with different time scales, is very complex and no study has yet achieved this properly.

It is impossible to implement a strategy for pro-poor economic growth in agriculture or define appropriate policy to reduce poverty within the livestock sector or secure development in rural Mongolia without a clear understanding of trends and intensity of change in the rural environment including both natural and socio-economic systems, and the risks caused by the changes to the peoples' livelihoods.

Use of remote sensing and GIS Technology[11]

Although the hydro-meteorological organization receives satellite information several times a day and calculates a vegetation index for every 10 days there is no interpretation of these calculations in connection with the climatic hazards, agriculture and poverty risks and monitoring of pasture condition, and managing of fodder resource for animal husbandry, etc.

The vegetation index calculated for each square kilometers of Mongolia at the Information and Computer Center is not used at all by its neighboring agency, the Institute of Meteorology and Hydrology, which has produces on a regular 10 day cycle, maps of drought conditions using field gathered data from the meteorological stations located at a distance of several hundreds kilometers. Satellite information would serve as valuable resource for interpolation of point data over large areas. There is a lack of attention from the Government and its agencies to encourage the use of high level information technology such as remote sensing and GIS for monitoring of dynamic natural resources, management of risks, and in the use of knowledge based decision-making. This is particularly disappointing in the case of agriculture as it is a highly dynamic sector.

[11] Some examples are shown in section on Piloting of this chapter.

2.2. Advises and Recommendations

1. For Poverty Reduction

Recommendations of Surveyed Local Governors and Officials

1. Local governors and official of surveyed soums and bags recommended the followings to alleviate poverty
   - Restocking
   - Intensification of livestock sector
   - Integrate livestock with agriculture
   - Save and efficient use of time at all levels
   - Proper consuming
   - Employment
   - Low interest rate and long-term loan
   - SME development
   - Reliable power supply
   -

To improve social services in hazardous situation

2. The local governors and official to communicate frequently and be care of those households who mostly affected. Psychological support is very important for herders;
3. To organize free and operative health service to those who affected by dzud disaster;
4. To implement a policy for low interest rate of bank loan service for area under drought and dzud condition;
5. To provide financial support to those households who affected by natural disasters and lost their animals to get the stationary, textbooks, notebooks, shoes and clothes for their school children;

Implementation of poverty alleviation policy

6. Policy to alleviate poverty for the poor herders who lost their animals during natural disaster should be implemented with consideration of their interest and family capacity. Different measures can be taken. For instance[12]:
   - *The herders who worked hardly trying to overcome the hardship by themselves but lacked of the learned experience:* If they have desire to look after animals, they can be involved in restocking with comprehensive measures like "infant bored prematurely in incubator". The possible methodology can be utilized in restocking is described in the following bulleted paragraph. In the case the herders don't want to stay as herder furthermore, they can be retrained and provided with some other job opportunities that can feed their families.
   - *The herders lacked with man power and financial resource to combat with dzud disaster and lost their animals:* Sustainable animal husbandry requires sufficient

[12] Mr. Bayarbat, the herder of Erdenedalai soum of Dundgobi aimag proposed this recommendation.

man power, therefore it might be better for them to be in a herders' cooperatives to share labor or to be retrained to obtain profession for other job.

- *The lazy helpless herders:* They should be involved in forced employment and educated on "God helps those who help themselves". While "the lazy parents" were involved in the training and no income generation, the government has to care of their children providing public service and school.

7. To approach to poverty issues as an integral of environmental and socio-economic factors, use open and networked structure to involve government and non-government sectors, and introduce the best practices of science, technology and traditional knowledge to clearly define root causes to be poor and mitigate them.
8. To encourage establishment of open and dynamic Web and Meta database on poverty and make it available for public access on the Internet.

Advises for restocking

9. The three phased methodology as "Incubation, Multiplication & Restocking" can be recommended for restocking:

- Erdenedalai practice, as "Bayantsagaan 30 yeanling rat" can be expanded, improved deeply at herd structure level and tested for other soums and bags (it is described in the section of Pilot 3 of this chapter).
- Restocking process is a similar to "incubation", it requires certain time (2-3 years) while the herds will grow to produce sufficient food herder's family and generate income. Therefore international practices as "incubation for new business" can be considered in restocking programme. In Mongolia "incubation of software companies at the National IT Park" has been started recently in September. Having lessons from it we put the followings for "Incubation of poor herders for restocking":

10. Involve the herders in restocking project whose have the desire to look after animals although they lost their animals in dzud, adjust the types of animals and herd structure based of herders' family interest and herding capacity;
11. Select the households for restocking project through the open tendering with participation of local residents in development of selection criteria, tender process and evaluation.
12. The selected households for the project would work on contractual base signed by 3 parties: herder household, local government and herder-supervisor (neighbor, experienced herder who can certify, consult and support the poor). The contract would be evaluated quarterly and in case of unsuccessful results the contract can be canceled with returning back of invested stocks.
13. The amount, types, sex and schedule for returning back of animals have to be appropriate to household capacity and indicated in terms of the contract. Identify the duration of incubation concerning the enough time for sustainability.
14. The selected households for restocking programme have to return back the animals after "incubation" and help to building up "Iron herd" in local areas for restocking of other poor herders.

15. The supports that can be provided to herder's households when they are in the incubation listed below:
    - Supply with the minimum of food items such as flour, rice, salt, sugar and vegetable oil, and some sanitary items as soup, teeth paste and brush for each member of the households once a quarter.
    - Carry out the training under the experienced herder supervision in accordance with the topics: The traditional technology for animal husbandry, pasture vegetation, preparation of forage and fodder, running home business and cooperatives, combat with natural disaster and the ways to earn extra money and financial support, etc.
    - Provide with support for improvement of quality and breed of animals;
    - Coordinate the pasture, movement and otor, fencing;
    - The animals for restocking project get insured and provide with 50% discount for insurance tax;
    - Tax free during incubation period and for 3 years after incubation.

2. For economic strengthening of herders' community

Economic strengthening:

At state and local levels to focus on increase of income and assets of herders' households:

16. The development strategy, national programs and policy documents should be evaluated on regular base with feedback from the society. Main evaluation criteria of those should be the contribution to the increase of people's income and households' assets, and improvement of quality of social services and rural people access to market and social services;
17. Support and encourage herders cooperatives;
18. Investment for development of Small and Medium enterprises to produce the animal origin products at soums with involvement of herders communities
19. At soum center re-establish regularly operating "School for Young Herders" to train and empower the herders with knowledge on management, business and herding technology including mitigation and protection of animals from extreme meteorological events;
20. Develop and implement dynamic (flexible) economic and tax policy on livestock that would encourage to keep cattle and camel, consider factor of remoteness and climate severity, and use "1 sheep unit" in calculation of tax for calf, foal and camel calf of the first and second year as they did not produce any income (in the present tax law the young and adult cattle considered as "5 sheep unit" without consideration of age);
21. To focus the research projects on practical implementation of economic development strategy and policy documents, and on the methodological issues of cross-sector and interdisciplinary tasks.

Reduce market risk

22. To establish a system and mechanism to protect herders from external market risk:

- To provide financial support for creation of soum trade centers for food and animal origin products
- To develop policy and establish a system and mechanism to protect both herders and national enterprises from market risk, particularly fluctuation of market price of products of animal origin as cashmere, wool, skin etc. which affects much livelihoods of herders.

3. To manage risk of animal husbandry under changing climate and environment

Recommendation of surveyed herders

23. Herders noted the following measures to reduce risk of animal husbandry under changing climate and environment
    - Irrigate and protect pasture
    - Improve shelters for animals
    - Encourage creation of soum risk fund
    - Intensify animal husbandry
    - Improve winter preparedness
    - Find appropriate pasture and migrate to better pasture
    - Develop herders cooperation
    - Efficient use of pleasant weather condition
24. What the Herders can do to overcome climate hazards?
    - Hay making
    - Animal quality
    - Find and migrate to better pasture
    - Improve shelters for animals
    - Improve animal healthcare
    - Improve the breed of livestock and
    - Improve income and livelihood
25. What the Local Government can do to reduce losses from climate hazards?
    - Create fodder fund
    - Encourage creation and support herders cooperatives
    - Reserve pasture
    - Fund and organize Restocking project
    - Organize to collect seeds for forage planting
    - Encourage and coordinate different projects to improve income and livelihoods of herders
    - Regularly communicate with herders, survey their desire, success and faults.
26. What the State and the Government should consider in adaptation policy to climate and environmental change?
    - Intensification of livestock sector
    - Intensive agriculture for fodder production
    - Fodder fund
    - Restocking
    - Support crop growing

- Reserve pasture
- Support Herders cooperatives
- Establish loan and investment system to herders' cooperatives and livestock farms
- Encourage development of agricultural farms that can be as model in different natural zones.
- Transit from nomadic animal husbandry to settled farm

Hydro-meteorological services for soums, bags and herders

27. To improve professional services that would meet actual requirements of soum, bag and herders:

    - To define daily, monthly and annual average of meteorological parameters and calculate climate norms for each of soums, develop and implement on regular basis a methodology to interpolate and extrapolate point data gathered at the meteorological station throughout the soum and bag territory, relate meteorological and climatic data with information on herders' livelihoods, social services, pasture vegetation, soil, animal breeding, land use, and livestock sector management.
    - To improve content, quality and forms of meteorological medium and long-term forecasting
    - To enable market based professional services that would meet needs of local administration, herders and rural communities.

Short-Term risk management

28. Organize a network for monitoring and early warning within a bag based on "Aravt" (an unit of 10 households). This traditional system can be utilized for emergency warning, hazard preparedness and mitigation, and improvement of collaboration of people living in a distance.
29. At soum and bag level to implement seasonal and semi-annual registration of changes in herd in order to monitor animal dynamics and relate it with climate and environmental changes and variability. On this base to establish a system for regular assessment of vulnerability of herders' households and natural hazard risk management of soum. In this regard the findings of this study can be utilized as follows:

    - To encourage R&D for creation of "Risk Manager" expert system for vulnerability and risk assessment of livestock sector
    - To encourage implementation of a system to warn early and reduce risk at bag and soum levels supporting initiatives of "Risk study" working group and JEMR Consulting by the way of approving the methodology developed since 2000 and piloted at O'mnodelger soum of Khentii aimag and 10 soums of Zavkhan aimag (test results is shown in section Pilot 1 of this Chapter), expanding the pilots to other soums and training of local officials and rural communities.
    - To expand test of "Household index" for different socio-economic studies and assessment of vulnerability in other soums (example is shown in section Pilot 1 of this Chapter).
    - Risk assessment results can be used for funding and insurance.

- 24-season calendar can be utilized for integration of environmental and socio-economic information and complex system analysis (example is shown in section Pilot 1 of this Chapter).

30. To encourage ICT application in rural area (soum and bag) to warn early and reduce risk and introduce the advanced technology for data gathering, transmission and integrated processing of information and knowledge based decision-making at aimag and soum levels.

Mid-term risk management

31. To develop and implement policy to get more benefits from camel wool and milk rather than its meat and skin in order to rise camel if the mass losses of cattle be continued (some description in regard with the camel is given in section of Pilot 4 of this Chapter);
32. Intensify and qualify animal husbandry on the way selecting the native best breading male animal for high productive of wool, meat and milk production, protecting the spring of the selective breading animals and replace the breading male animals in a herd every 2 years in order to prevent from the blood approach.
33. To develop climate change scenario for 5-10 years;
34. To establish a system and implement mechanism to use climate change scenario in socio-economic development strategy, policy and management;
35. To establish a system for regular assessment of impacts of climate hazards on socio-economic system particularly on agriculture and livelihoods of households every 3-5 years, planning and implementation of mid- term adaptation measures.

Note: There are internationally implemented practices and a system operating to assess impact on environment from human activities with a well-developed legislation, regulation, procedures and the methodologies. But there is no regularly operating system to asses impacts of natural hazards and disasters on the livelihoods of households. Also there is no well-developed practices that assess impacts from and evaluate the government macro socio-economic policy that affect peoples livelihoods.

Protect pasture and improve its management

36. Review the concept and principles of further development of pastoral animal husbandry in globally changing climate is becoming an actual task. For this purposes, it is required to conduct comprehensive study on pasture vegetation bio-capacity, related physical processes in order to identify scientifically the trends for mid- and long-term change and other serious issues as degradation, overgrazing and desertification more clearly;
37. To implement policy encouraging use of liquid gas in Steppe and Gobi region in order to prevent pasture desertification (primary results of the study and piloting is described in section Pilot 2 of this Chapter);
38. To develop and implement standard methodology for scientific research on geobotany and soil, coordinate R&D activities to get the outputs with more emphasis on policy development, land cover/use mapping at soum level and use them in practical management of pasture in both short and midterm.

39. To encourage collaboration of scientific institutions and soum administration for geobotany and soil survey and monitoring of change in order to improve pasture land and livestock sector management on seasonal and semi-annual basis;
40. Finding out mechanism and system that are more suitable for monitoring of pasture resources as water supply and forage reserve, and serving the herders, local communities and stakeholders.

2.3. Piloting

1. Risk assessment and planning the preparedness

Inquiries:

The system for protecting the agriculture from any natural hazards has to be established…

Source: The state policy on food and agriculture, 2003

The Master plan on animal winter and spring over passing should be worked out, approved by the Soum Khural (Local parliament) and be implemented in soums …

Source: National programme on assisting of prevention the livestock from drought and dzud, 2001.

Lesson 1. Dzud risk mitigation

Approach to dzud risk mitigation should be based on the state development policy correlated with issues of infrastructure development, social services, economic provision, and nature and environment conditions.

Lesson 2: Dzud assessment

Develop a methodology for objective assessment of dzud risk, its possible loss and use it for making decision at all levels.

Lesson 3: Dzud disaster mitigation

In case of possible occurrence of dzud disaster proved by relevant professional agencies it requires to make timely decision and efficient implementation taking into account the priority importance of animal husbandry in the society.

Root causes of agricultural risks in general, the pastoral animal husbandry in particular, should be reformulated and the risk mitigation methodology should be implemented effectively adjusting to the new economic and social conditions of the country.

Change the existing Disaster Management and Information Management system that is too weak to respond adequately in emergency situation and create an effective and advanced system of Management.

Improve herders' knowledge and skill for combating with disaster

Lessons Learnt from the Dzud{tc "Lessons learnt from the dzud"} 1999-2000{tc " 1999-2000"}

Exercise

Risk assessment and planning the preparedness with integrated scientific and participatory approach were tested by listed members[13] of "Risk study" working group on the example of dzud disaster, drought, hazardous windstorm, extreme cold, forest and steppe fire and epidemic diseases in 12 soums of Khentii, Zavhan and Dundgobi aimags.

The aimag, soum and bag governors and the local officials participated in the piloting agreed on that the assessment of risk and planning the preparedness for droughty summer or severe winter and spring is very helpful to set clear objectives, define appropriate measures, calculate budget for their implementation and the most importantly to allow coordinated activities among the stakeholders that would improve efficiency saving time and resources at the grassroots of Mongolia – soum, bag and households. The methodology with an integrated approach, which has been developed since 2000 by the experts of JEMR Consulting and "Risk study" working group for comprehensive management of risk, can be used for introduction of new practices in governance of rural area and management of agriculture, particularly pasture animal husbandry.

Below is described some test results, namely:

- Risk study of O'mnodelger soum of Khentii aimag
- Risk study of 9 soums of Zavhan aimag in Gobi and Steppe area
- Risk study of Manuustai bag, Ider soum of Zavhan aimag
- Test of Household Index
- Test of Tabular calendar with 24 seasons

1. **O'mnodelger soum of Khentii aimag[14]:** An expert-assessment of risk and planning of disaster management at soum level was conducted through a participatory approach with 16 local government officials of Khentii aimag on the example of O'mnodelger soum for drought, dzud, hazardous windstorm, and epidemic diseases. Results of the this survey are the followings:
    a. Primary data collection with questionnaire from soum officials, initial analysis and draft report
    b. Impacts and lessons learnt from past natural hazardous events
    c. Assessment and forecasting of risk, based on local socio-economy and summer weather forecasting
    d. Mapping of risky areas for each of 5 type of hazardous events, and location of soum population and livestock
    e. Risk management plan with cost estimation and possible financing mechanisms
    f. Draft recommendation

[13] R.Oyun, H.Togtokh, G.Jamsranjav, Sonintamir, Sh.Mo'khtseren, Sh.Boldbaatar, O.Namkhai, G.Bizya, N.Manibazar, J.Tsogt and others

[14] Exercise designed and facilitated by R.Oyun, J.Tsogt, Sh.Boldbaatar, with participation of O.Namkhai, Myagmarsuren, Lkhamsuren, Delgermaa, Uuganbayar, S.Bayasgalan and others, May 2003.

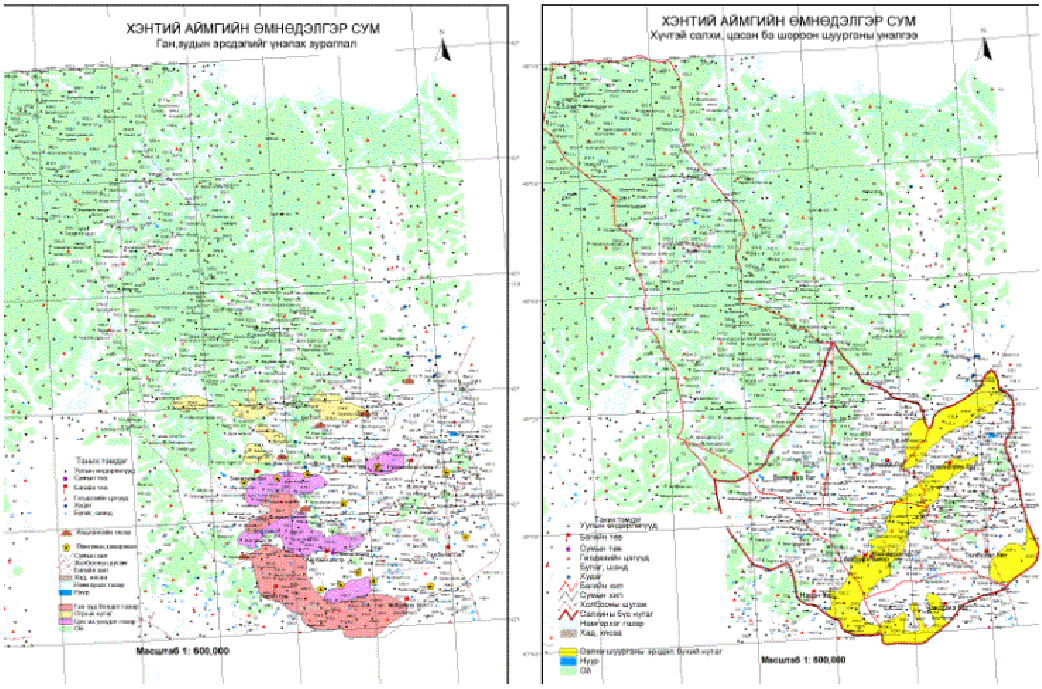


Figure 2.1 O'mnodelger soum of Khentii aimag, Mapping of risk under drought, dzud and hazardous windstorm

2. **9 soums of Zavhan aimag in Gobi and Steppe area[15]:** During the experiment the hazardous events frequently occurred in the area were listed and categorized by it's intensity and frequency, and the borders for soum, natural zone and vulnerable area per event were defined and marked on a map. The vulnerability of livestock, pasture and herder household and contingent impact from each hazard was assessed individually. In addition the learned lessons from the previous dzud disasters are written. Finally, risk mitigation plan with calculated budget for winter and spring 2003-2004 was worked out. Below is shown some outputs of this exercise.

Table 2.4. Threats of hazardous events occur in Gobi and Steppe soums of Zavkhan aimag

	Soum name	Windstorm	Black Dzud	Heavy snowfall	Extreme cold	Sum of scores	Ranking of soums by threats
1	Aldarkhaan	2	2	3	3	10	3
2	Do'rvoljin	3	3	1	3	10	3
3	Zavkhanmandal	3	3	1	2	9	4
4	Santmargats	2	3	1	2	8	5
5	Urgamal	3	3	1	2	9	4
6	Tsagaankhairkhan	2	1	2	3	8	5
7	Tsagaanchuluut	3	3	3	3	12	1

[15] Exercise designed and facilitated by R.Oyun, J.Tsogt and Sh.Boldbaatar, October 2003

8	Shiluustei	3	2	3	2	10	3
9	Erdenekhairkhan	3	3	3	2	11	2
	Sum of scores	24	23	18	22	87	
	Ranking of hazardous events by threats	1	2	4	3		

Legend: More threat 3 Intermediate 2 Less threat 1

Findings: From the threat assessment one can set the priority for preparedness. For instance on the above example it can be found the more threaten events are hazardous windstorm and black dzud, and the more threatened soums are Tsagaanchuluut and Erdenesaikhan.

Table 2.5. Vulnerability of pasture in Gobi and Steppe soums of Zavkhan aimag

	Soum name	Sandy soil & sparse vegetation, %	Affected by white mice, %	Lean Harvest	Decrease of vegetation species	Average, %	Ranking of soums by pasture weakness
1	Aldarkhaan	15	0	0	70	21%	8
2	Do'rvoljin	40	10	10	50	28%	6
3	Zavkhanmandal	30	20	10	60	30%	4
4	Santmargats	15	0	0	60	19%	9
5	Urgamal	40	10	5	60	29%	5
6	Tsagaankhairkhan	25	5	0	70	25%	7
7	Tsagaanchuluut	30	15	10	70	31%	3
8	Shiluustei	40	0	60	100	50%	1
9	Erdenekhairkhan	60	0	30	70	40%	2
	Average, %	33%	7%	14%	68%		
	Ranking by pasture weakness indicator	2	4	3	1		

Findings: Shiluustei and Erdenekhairkhan soums are more vulnerable with their pasture condition.

Table 2.6. Vulnerability of animal in Gobi and Steppe soums of Zavkhan aimag

	Soum name	Below the average fatness	Not involved in veterinary service	Lack with shelter and manure	Unprepared hay making	Unprepared salt marsh	Unprepared hand making forage	Not supplied with water	Lack of dry manure	Average, %	Ranking of soums by animal weakness
1	Aldarkhaan	0	0	10	0	0	0	0	25	4%	7
2	Do'rvoljin	5	0	40	10	0	0	40	60	19%	3
3	Zavkhanmandal	3	0	50	0	0	0	40	60	19%	3

4	Santmargats	4	0	30	10	0	30	20	40	17%	5
5	Urgamal	10	0	30	0	0	0	40	60	18%	4
6	Tsagaankhairkhan	0	0	65	0	0	0	30	50	18%	4
7	Tsagaanchuluut	5	10	0	14	47	30	30	70	26%	1
8	Shiluustei	5	0	10	0	0	0	25	70	14%	6
9	Erdenekhairkhan	0	0	40	20	0	30	30	40	20%	2
	Average, %	4%	1%	31%	6%	5%	10%	28%	53%		
	Ranking by animal weakness indicator	7	8	2	5	6	4	3	1		

Findings: Shiluustei and Erdenekhairkhan soums are more vulnerable with their animals, and lack of well-prepared dry manure and shelters are the most issue to concern for winter and spring of 2003-2004.

Table 2.7. Vulnerability of households in Gobi and Steppe soums of Zavkhan aimag

	Soum name	Herders households	Lack with firewood	Lack with warm clothes	Insufficient food	Lack of labor	Average, %	Ranking of soums by households weakness
1	Aldarkhaan	340	15	0	0	25	10%	4
2	Do'rvoljin	320	16	6	0	22	11%	3
3	Zavkhanmandal	240	30	0	0	15	11%	3
4	Santmargats	330	10	0	0	20	8%	5
5	Urgamal	395	29	3	0	30	16%	1
6	Tsagaankhairkhan	358	0	50	0	15	16%	1
7	Tsagaanchuluut	330	0	20	10	20	13%	2
8	Shiluustei	482	10	0	0	20	8%	5
9	Erdenekhairkhan	350	20	0	0	30	13%	2
	Average, %		14%	9%	1%	22%		
	Ranking by households weakness indicator		2	3	4	1		

Findings: Urgamal, Tsagaankhairkhan soums are more vulnerable with their herders' households, and labor and firewood is the issues to concern more for preparedness to winter and spring of 2003-2004.

In table below is shown ranking of soums by risk level calculated as an integration of above results of hazard and vulnerability assessments.

Table 2.8. Risk of animal husbandry for winter and spring of 2003-2004 in Gobi and Steppe soums of Zavkhan aimag

	Soum name	Rank by threats of hazardous events	Rank by vulnerability	Rank by risk
1	Aldarkhaan	3	4	4
2	Do'rvoljin	3	3	3
3	Zavkhanmandal	4	2	3
4	Santmargats	5	4	6
5	Urgamal	4	2	3
6	Tsagaankhairkhan	5	3	5
7	Tsagaanchuluut	1	1	1
8	Shiluustei	3	3	3
9	Erdenekhairkhan	2	1	2

Findings: In coming winter and spring of 2003-2004 the Tsagaanchuluut and Erdenekhairkhan soums have facing high risk compare to other soums of Steppe and Gobi area of Zavhan aimag and implementation of well-planned measures to reduce risk with proper management is more desirable to prevent animal losses.

3. **Manuustai bag, Ider soum of Zavhan aimag[16]:** Risk assessment and mitigation plan for winter and spring of 2003-2004 was conducted with participation of bag governor, soum officer responsible for animal husbandry and schoolteacher on geography.

   Manuustai bag has 172 households, 686 population, and 153 hundreds of livestock. Heavy snowfall, the extreme cold and hazardous windstorms are usually occurred in.

   During the experiment map of heavy snowfall, extreme cold and windstorm area was draw up. The vulnerability of pasture, livestock and herders' households was assessed, too. On based of the assessment draft plan for winter and spring over passing was prepared with consideration of per hazardous events.

   Below is shown a part of risk management plan drafted for heavy snowfall occurs in Yamaat and Jargalant winter stand as an example. Theses areas located in 67 km away from soum center and 53 km from bag center. 9 households with 1250 head of animals will stand there for wintering. 2 of them are the most vulnerable and have high risk as they couldn't prepare sufficient firewood, forage, lack of dry manure, 1 person is sick and inquire regular medical service.

Table 2.9. The draft plan to reduce risk of heavy snowfall in Jargalant and Yamaat, Manuustai bag of Ider soum

The activity	The frame of time	The responsible	The needed funding	Funding source
Introduce winter weather forecast, support to 2 households in Jargalant to	Oct.10 - 20	Bag governor and herders' group leader	US$80	Herders, relatives, and soum risk fund

[16] Exercise designed and facilitated by R.Oyun, J.Tsogt and Sh.Boldbaatar, October 2003

prepare the firewood, dry manure and forage.				
Organize animal slaughter for winter in Jargalant and Yamaat	Oct.20 - Nov.10	Bag governor and herders' group leader	-	Herder
Sort out livestock for additional feeding and prepare sufficient forage	Nov.1 - Mar.1	herders	For 20 sheeps US$100	Herder
Prepare 130 pieces of wrap-cloth for protection of sheep and goat foots in snowy pasture	Nov.1 - Mar.1	herders	US$10	Herder
Provide households with medical preventive inspection and drugstore	Oct.1 and Jan.10	Soum and bag doctors	US$20	Soum budget
Locate the alder, pregnant women, infant and sick persons in the center of soum.	Oct.1 and Jan.10	Soum and bag doctors	US$30 ?	Herders
Total			US$240	

Findings: Total estimated cost to reduce risk of heavy snowfall for 9 households is around US$240. Soum can provide medical service for US$20 and rest US$220 is to be covered by the herders. For 2 vulnerable households it is required at least US$40 for each for winter preparedness. Both soum and herders are shortage of monetary income, therefore the bag governor together with the community group leader will look for some support with firewood, forage from relatives and neighbors of these 2 households and soum risk fund, which has very limited reserve.

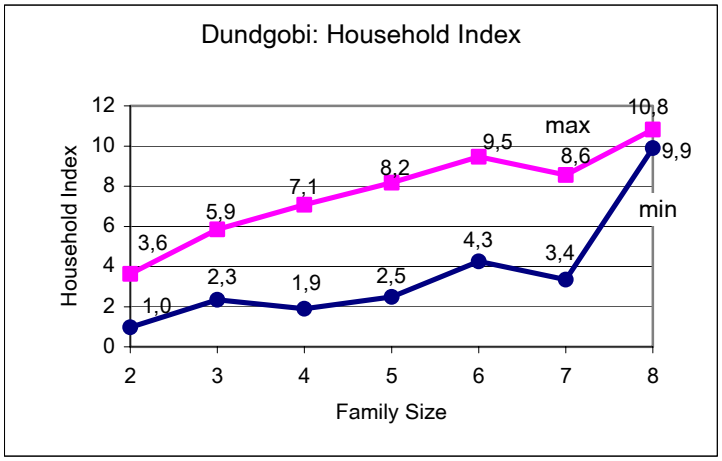
For above named 3 hazardous events, livestock and all households' total cost for preparedness were estimated as US$1200-1500. But both soum and herders are not capable to finance all preparedness measures except the items related to medical service.

Simplified cost-benefit analysis has showed that the market value of all 22800 animals of Manuustai bag is around US$600 000 (US$500 000 asset and US$100 000 annual income generation). The minimum planned forage preparation for all households in total is estimated around US$18 000, soum risk fund US$6 000 and aimag risk fund US$6 000. So, planned forage for winter preparedness would cost about 5% of total market value of livestock. Furthermore the total cost for preparedness including social issue will not exceed 10% of total value. Therefore, it is important to create and strengthen soum risk fund sufficient for winter preparedness and make it accessible to the herders in between June-October.

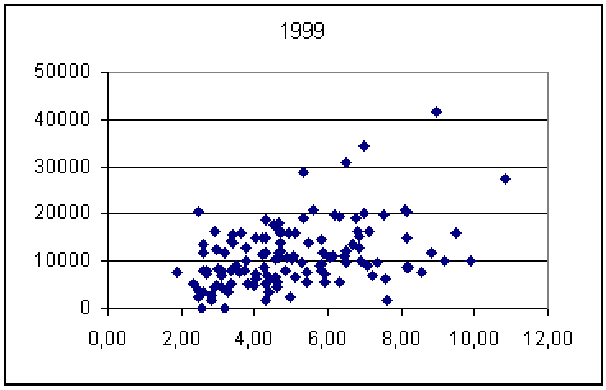
4. **Household Index[17].** In order to assess risk and vulnerability of households number of household members, age, sex, education, health state, talent, employment year are summarized as a household index. This experiment was conducted in totally 135 households from 3-surveyed soum of Dundgobi aimag. These indices were different depending on education, working experience, and health state of household members. For instance, index for a family with 5 members can range between 2.5 and 8.2, and their capacities to own

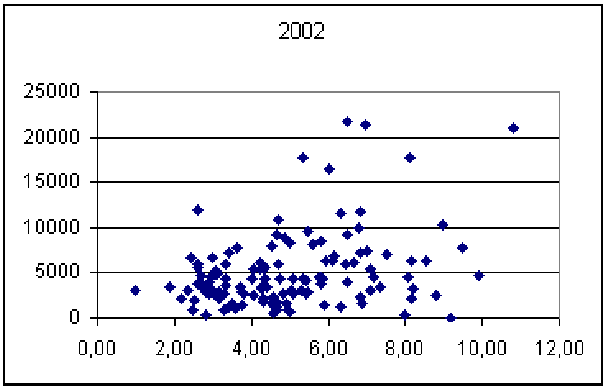
[17] Methodology developed and information processed by R.Oyun, 2003

livestock and generate income differ significantly. Households with lower index are more vulnerable.



Below graphics show scatter plot of per household market value of owned assets-livestock per month and household index before and after dzud of 2000.





Findings: The index can be used in quantitative assessment of household capacity and its productivity. But there is a need to continue the test to finalize the methodology and computer software for calculation of the index and its use for different purposes.

5. **Tabular calendar with 24 seasons (quarter)[18].** As we found livelihoods of herders is an integral of environmental, social and economic factors and information from different sources differs by spatial and temporal scales, which causes difficulty for their integrated processing. Therefore, we've tested to use a tabular calendar with 24 season and animal breeding items scored by level of significance for interrelation of information and data, and study of dynamics regarding to climate, pasture, livestock and income generation of herder households (Figure 2.3).

[18] 24-season identified by G.Jamsranjav, tabular calendar designed and prepared by R.Oyun, G.Bizya, 2003.

Some examples on the use of this calendar are shown below. Sum of scores for each of 24 seasons shows annual dynamic of herder's labor while sum of scores by animal breeding shows duration and importance of the particular items.

Findings: 24-season tabular calendar can be used for integration of environmental, social and economic data, furthermore for coordination of activities of different stakeholders. Also, it can be used in risk management of animal husbandry.

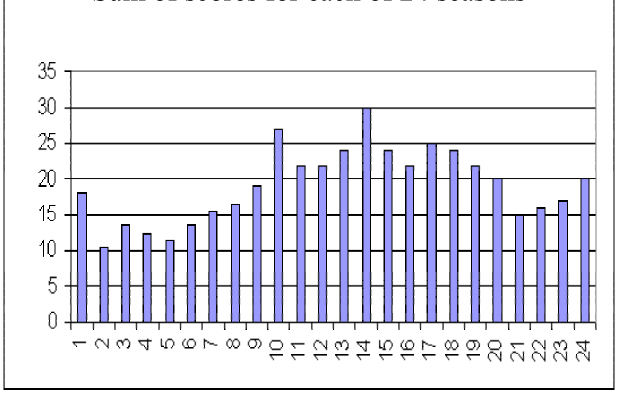
Figure 2.3. 24-season tabular calendar

24 seasons

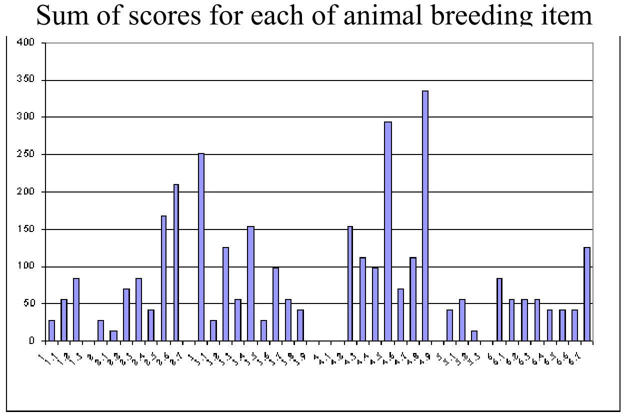
Animal breeding

Улирлын нэр	Хавар эхлэх	Хур усны	Ичигсэд хөдлөх	Хаврын хугас	Ханш нээх	Тариалангийн хур орох	Зуны уур орох	Өчүүхэн дүүрэн	Буудай боловсрох	Зуны туйл	Өчүүхэн халуун	Их халуун	Намрын уур орох	Сэрүүн орох	Цагаан хяруу унах	Намрын хугас	Хүйтэн шүүдэр унах	Хяруу унах	Өвлийн уур орох	Өчүүхэн цас орох	Их цас орох	Өвлийн туйл (нар наашл	Өчүүхэн хүйтэн	Их хүйтэн
сар	2		3		4		5		6		7		8		9		10		11		12		1	
улирал эхлэх өдөр	4	19	5	20	5	20	5	21	5	21	7	23	8	23	8	23	9	24	8	23	7	22	6	21
Малын хариулга, маллагаа																								
Мал хаваржилт	5	5	5	5	4	4																		
Мал зусалт							3	3	3	3	3	3												
Мал намаржилт													4	4	4	4	4	4						
Мал өвөлжилт																			5	5	5	5	5	5
Малын тарга хүч																								
Мал тэнхрүүлэх, ногоонд цатгах							1	1																
Усан тарга авахуулах									2	2	2	2												
Махан тарга, чамбайруулалт													3	3	3	3	3	2						
Мал үржил:																								
хуц, ухна тавих																	1	1						
хуц, ухна ялгах																			1					
тэмээний үржлийн үе	1	1																				1	1	1
бод малын хээлтүүлэг										1	1	1	1	1	1									
төл хүлээн авах бэлтгэл	1	1	1																					
бог мал төллөлт			4	4	4																			
бод мал төллөлт						3	3	3	3	3														
Малын түүхий эд																								
арьс борлуулалт									0,5	0,5	1	1	2	2	2	2	2	2	4	4	3	3	2	2
ямааны ноолуур самнах				1	1																			
ямааны ноолуур борлуулах						1	1	1	1	1				1	1	1	1							
тэмээний ноос авах				1	1	1	1																	
тэмээний ноос борлуулах								1	1	1							1	1	1	1	1	1	1	1
хонины ноос авах									1	1														
хонины ноос борлуулах										1	1	1			1	1	1	1						
бод дэллэлт, хөөвөрлөлт					1	1	1	1																
бодын хөөвөр, хялгас борлуулах, боловсруулах								1	1	1														
Малын бүтээгдэхүүн																								
богийн сүүний ууpаг				1																				
сүү сааль авах						1	1	1	1	1	1	1	1	1	1	1	1	1	0.5	0.5	0.3	0.3	0.1	0.1
тараг бүрэх						1	1	1	1	1	1	1	1	1	1	1								
ааруул ээзгий, зөөхий, тос бэлтгэх								1	1	1	1	1	1	1	1									
нэрмэл архи										1	1	1	1	1	1	1								
цагаан идээ борлуулах	3					1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	3
айраг бэлтгэх										1	2	2	3	2										
айраг борлуулах	1									1	2	2	3	3	1	1	1							1
идэшний мал, мах борлуулах	4	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	1	1	1	1	1	1	1	1	2	3	3	3	4	4
Малын арчилгаа																								
малын угаалга, туулга										1	1			1										
урьдчилан сэргийлэх тарилга								1	1	1				1										
гуурын боловсруулалт									1															
Өвөлжилт, хаваржилтын бэлтгэл																								
зун, намрын отор										3	3	3		3	3	2								
хадлан тэжээл бэлтгэх												1	2	2	1									
бэлтгэсэн хадлан тэжээлээ өвөлжөө, хаваржаанд татах																	2	2	2	2				
хашаа засах, шинээр барих							2									3	3	3						
худаг ус засах, шинээр гаргах																	2	2	2					
хужир давс бэлтгэх																		1	1	1				
өвлийн отор																		1	1	1				
тэжээл худалдан авах	3	3	3														1	1	2	2	2	2	3	3

Figure 2.4. Example on the use of 24-season calendar



Sum of scores for each of 24 seasons



Sum of scores for each of animal breeding item

2. The liquid gas fuel is to protect the pasture from desertification

Inquiries:

Desertification will be the most threatening issue in future.

Mongolian National Action Programme on Climate Change, 2000

The shrub plants such as saxaul are highly adaptable for many species of plant in gobi-steppe and protect the environment from degradation and erosion, while became the nutrutious food for animals. Local residents make a fire with schrub plants due to lack of cowpat because of great number herd of cattle were lost during 1999-2002 drought and dzud. It puts in a danger for pasture degradation and intensify the desertification.

Herders said that the most needed items such as flour, rice, lull, and firewood, warm clothing are required during the dzud extreme condition.

Exercise

This exersize was initiated and conducted by leadership and particpitaion of Dr. Togtokh N, head of Risk study working group. The 62 customers of 8 soums in Dundgobi had installed light device and cooker with 30L of bottled liquid gas in July, 2003. During the experiment the followings were studied and found:

1. *The demand of fuel and firewood, cowpat availability and cost:* One trailer cowpat of Russian truck cost 50.000 in the surveyed soums. 100-sacked cowpat is in one frailer. 15 kg of manure cowpat, 13 kg cowpat from fencing and 11 kg of gathered cowpat is contained respectively in each sack. As an estimation 1 sack of cowpat 500 tugrik 1 kg of manure cowpat 33.3 tugrik, fencing cowpat 38.5 tugrik, gathered cowpat 45.5 tugrik cost respectively. Herders are in short of finance for preparation fuel and firewood reserve and lack of cowpat caused by dzud in these soums.
2. *Safety and operation mode of liquid gas device:* People in rural are as have not experience using the liquid gas, so they don't have knowledge on safety and operational mode. Al thought the gas suppliers have the instruction on safety; there is no survey for operational mode. As we studied and found gas devices have the opportunity working at the different level of operation but selection of levels is more complicable problem. At each level gas expenditure and time are different. On based of operational data from costumers 2.16 g/min, 4.11 g/min are more suitable mode for them.

The above two modes are similar with gas expenditure but speed for boiling water is different. 5 litre of water boils for 26 min at 2.16 g/min it was similiar with cooker in a apartment. But 5 litre of water boils for 13 min at 4.11 g/min like in a ger.

Table 2.7 Comparision of liquid gas and cowpat

No:	Boiled water	Indicator	Cowpat	Liquid gas	
				2.16 g/min	4.11 g/min
1	7 litre	Gas use, g	2235 - 2780	73.4	74.0
		Time, min	23 - 35	34	18
2	5 litre	Gas use, g	1830 - 2300	56.2	53.4
		Time, min	18 - 27	26	13
3	3 litre	Gas use, g	1110 - 1765	43.2	37.9
		Time, min	10 - 18	20	9.0

Comparative cost study: Cost for use of liquid gas was studied in comparison with cost of cowpat and electricity. In our experiment cost for liquid gas for boiling 5 litre water was 55-58 tug, which is by 15-31% cheaper if herder will pay for cowpat. In comparison with electricity, liquid gas is similar to that has unit cost 54 tug/per kWt. It is cheaper by 60% the most costly electricity.

Table 2.8 Comparision of costs of electricity, cowpat and liquefied gas

No:	Boiled water	Cowpat	Electricity	Liquid gas	
				2.16 g/min	4.11 g/min
1	7 litre	76.0 - 92.7	47 - 138	76.0	76.6
2	5 litre	61.0 - 76.7	42 - 92	58.2	55.3
3	3 litre	37.8 - 60.0	33 - 64	44.7	38.2

Sustainability of gas supply-use chain. The participants in the experiment were happy with the gas. But when gas is completed, there is not opportunity recharge it in rural area. Thus 2 costumers from 8 people who have already completed their gas arrived to recharge their bottle of gas in Ulaanbaatar. 12.5 kg for 30 liter bottle recharging cost 12937 tugrik and cost for transportation of the empty bottles one by one will increase gas recharge cost by 2.5 times. So it is needed to organize the bulk transportation. Seeing from the examples taken in 5 soums in Dundgobi. Carriage of 40 bottled gas per 20 days from Ulaanbaatar to Erdenedalai soum and in return 40 empty bottles for recharging can be organized. From our study a gas supply and use chain can be profitable for customers not less than 120. There is a need to continue the experiment to finalize it with some calculations and recommendations for sustainability.

3. Multiplication and incubation for restocking with livestock

Inquiries:

The most of herders learned lessons from climate hazards want to stay and look after the animals in their homelands. For these herders need the livestock for revealing from poverty situation. From our study the almost the all survyed herders were remained outside of the limited restocking activity. The restocking project with loan payback in monetary form has been criticed from the herders, local authorities as not well developed and approporiate to herders' need and capacity.

They local governor officials and herders are thought that in order to ovecome the natural disaster with low rates of damages, improvement of animal breeding and it's productivity and quality that can adapt the extreme climate variabilities.

Exercise

This exersize has been initiated H.Bayarbat, herder in Tengeleg bags of Erdenedalai soum, supported leaded by H.Togtokh and B.Narantsetseg, and implemented by the Erdenedalai soum officials and herders' communities.

Exersize is that the 30 yeanling ram with more lumber vertebral from Bayantsagaan soum of To'v aimag were given to 30 households in Erdenedalai soum on contractual basis. Households with sifficient livestock and human capacity, and willing to improve their animal quality were selected. Particular terms of the contract is that the herder who got a yeanling should be responsible to raise this yeanling ram, the next year to use for breeding and on the second year to return the 3 yeanling ram from its newborns and give to 3 poor households by one each. Poor households who get 1 yeanling ram will be responsible to give 1 from its newborn to another household. Number of households taken the yeanling ram with the scheme planned in this exersice is shown in table below.

Table 2.9 Number of households taken the yeanling ram

Year	Shift taken the ram			Number of households
	I	II	III	
2003	30 lamb			30
2004	30 year-old lamb			
2005		90 lamb		90
2006		90 year-old lamb		
2007			90 lamb	90
2008			90 year-old lamb	
	30	90	90	210

Findings: All households in Erdenedalai soum will have the opportunity to get yeanling sheep with more lumber vertebral born after 2004 for improving the animal breeding, and by 2010 total herds of sheep in the soum will be improved by breeding and productivity.

Methodology to combine restocking with breed improvement: Multiply limited resources in rich and/or middle households and then restock poor households with hard stock principle, improvement the breed of livestock by local elite males.

4: Raise camel to substitute cattle losses

Inquiries:

The boundary of high mountain zone shifts up, the forest area would decrease, the steppe would move forward the forest steppe and desert steppe and desert would extend to the north (Table 2.10).

Table 2.10 Natural zone change projection in 2040 and 2070

Natural zone	Current area	Projected change in 2040		Projected change in 2070	
	Mln.ha	%	Mln.ha	%	Mln.ha
High mountain	5,66	-2,5%	5,52	-8,5%	5,05
Forest steppe	28,71	-3,2%	27,89	-7,1%	25,91
Steppe	35,12	-0,5%	35,06	-2,9%	34,03
Desert Steppe	35,33	-7,2%	33,16	0,3%	33,25
Desert	20,36	13,3%	23,09	18,1%	27,28

Mongolian National Action Programme on Climate Change, 2000

Climate change study projected pasture area decrease for cattle and increase for camel. Climate hazards occurred since 1999 caused dramatic losses of cattle and negatively affect meat and milk production. At the same time, dzud and drought has less affect on camel, and reduction of its number caused mainly by meat consumption.

It is important to have policy that would encourage raise of camel basing on increase of market value of wool and milk. From other side there is a need to implement a policy to recover cattle losses.

Risk study working group

Test

During the climate change impact study we put a question "If large amount cattle loss will occurred the camel can substitute?" and did survey comparing camel with cattle. As well as some test on carpet knitting using "male" wool of camel was carried out at the Ulaanbaatar carpet factory. But result of it has not yet completed.

Today camel's benefit is limited with transportation, meat production and "female" wool. Camel milk is used for food and treatment, and its droppings for fuel. The "male" wool that covers over 30% of camel wool is used rarely.

Findings: The technology to process "male" wool and produce carpet was developed and tested. Primary results showed that the "male" wool could be used for production of chemical-free natural carpet. Compare to sheep-wool the camel wool carpet is light, 4% cheaper and twice stronger. If this new product will be introduced to market successfully then herders who camel will benefit from the wool of alive camel rather than meat of died camel and as the result camel will raise.

3.0 Impact of Climate Hazards on Pasture and Animal Husbandry[NU9]

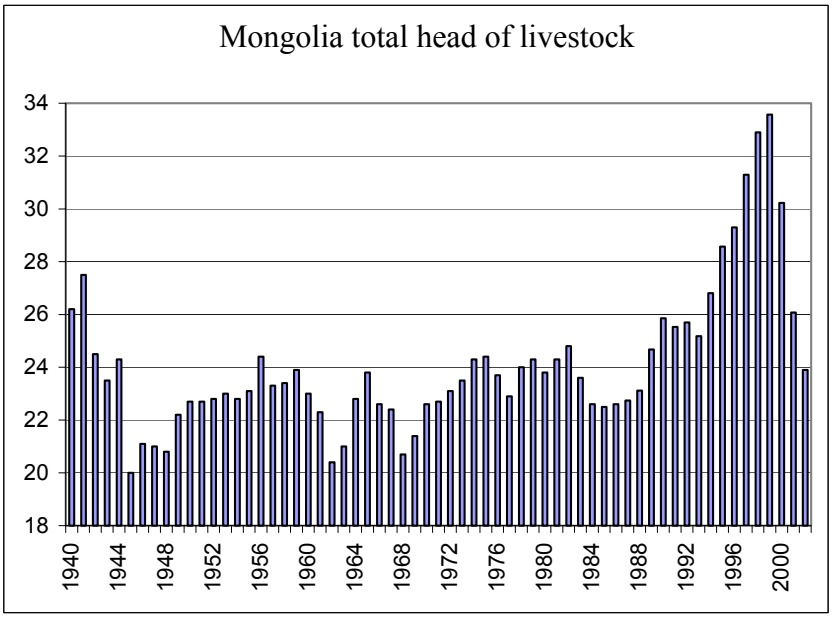
The impact of climate and environmental changes and annual variability was studied and assessed for the whole of Mongolia on the basis of 5 aimags and 14 soums surveyed, focusing on the impact of dzud and drought that occurred between 1999 and 2002 using information from professional organizations, national, aimag and soum statistics, and data gathered from soum and bag governors and officials via with a survey questionnaire . The outputs of this study are described below.

3.1. Mongolia

Figure 3.1. Head of Livestock

Pasture animal husbandry, the basis of many Mongolian's livelihoods and way of life, is under direct affect of changes in the climate and natural environment. Livestock numbers increased sharply in years 1993 - 1999 with favorable weather conditions, and reached 33.6 million, which is the maximum level reached since 1940.

But after 1998 under heat waves, dzud disaster, drought and hazardous windstorms 9 million of animals have been lost and in 2002 total heads fell to 26.9 million, which is less than it was 15 years ago.



The number of animals per person fell to 9.7 in 2002 which is the minimum recorded in the period from 1940 (See Figure 3.2) The minimum numbers for the twentieth century were recorded in 1988 and 1993 as 11.3, 11.2 respectively.

Figure 3.2. Head of livestock per person[NU10]

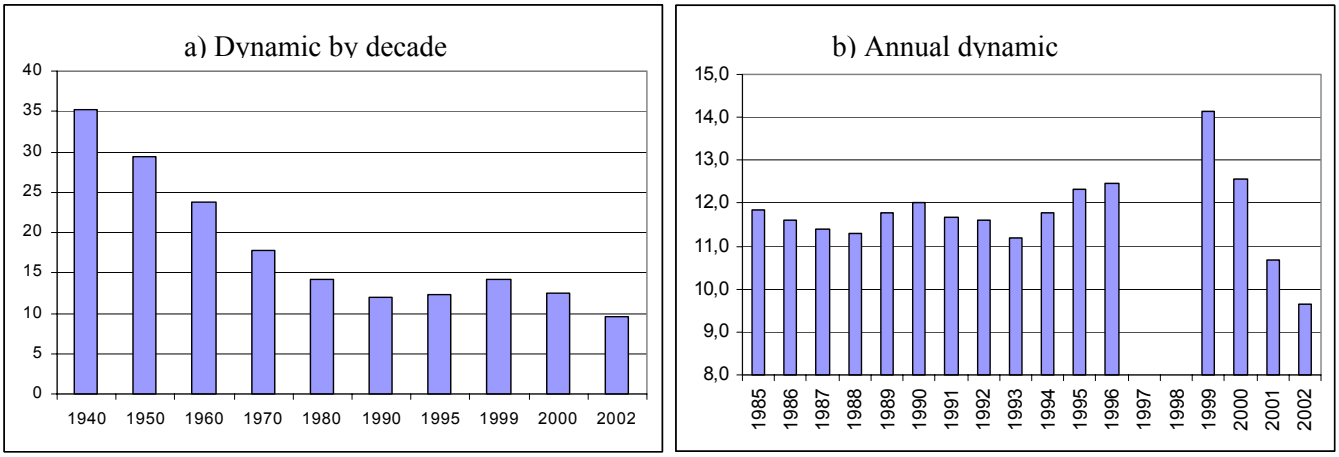
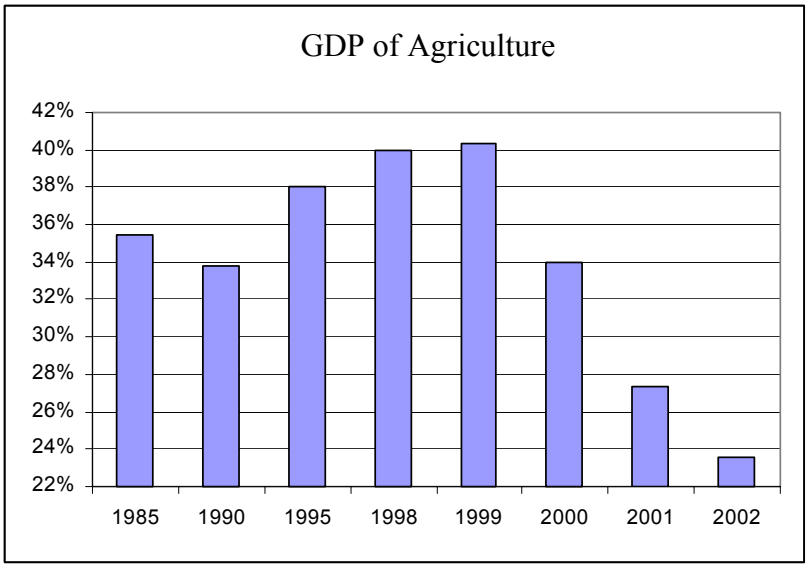


Figure 3.3

The contribution to GDP from agriculture was 40.3% in 1999, and it fell to 23.6% in 2002, decreasing by 16.8%.

Value of GDP at 1995 prices, was 252.4 billion tugrik in 1999, and has fallen 1.6 times over, to 152.6 billion, in 2002.



Drought, which covers over 75% of the country's territory, generally occurs once every 11-12 years; however, it has consistently occurred between 1999-2002, and 60-80% of the entire country was affected by drought (Table 3.1). 'Iron' or 'white' dzud, extreme cold, and human and animal epidemics followed on, after the drought and caused mass losses of animals.

Table 3.1. Area affected by dzud and drought 1999-2002

Date	Drought Affected		Droughty and under drought area, %	Date	White dzud Affected	
	Aimags	Soums			Aimags	Soums
1999 summer	8	45	Around 60	1999-2000 winter	14	58
2000 summer	12	44	Around 60	2000-2001 winter	17	98
2001 summer	9	54	More than 70	2001-2002 winter	8	114
2002 summer	13	77	Around 70	2002-2003 winter	7	60

The direct impact of climate hazards between 1999 and 2002 is estimated as 8.6 million head of livestock with a market value of 333 billion Tugrik (Table 3.2).

The impact of particular meteorological hazards that affect animal husbandry has been studied in detail in for 2002-2003 (see below).

Table 3.2. Head of animals lost in dzud 1999-2003

Year	Aimag and soums with dzud[19]		Affected households thousand	Animals in area with dzud disaster, million head	Lost animals, thousand head	Households that lost all animals	Estimated direct loss, billion tugrik
	By IMH	By MFA					
1999-2000	13 aimags, 158 soums	15 aimags, 157 soums	80.9	7	2399.2	2369	91.7
2000-2001	20 aimag, 192 soums	17 aimags, 98 soums	118.3	19,5	3491.3	4995	133.4
2001-2002	7 aimags, 65 soums	8 aimags, 114 soums,	32.2	4.4	2689.0	4736	108
2002-2003		11 aimags, more than 60 soums	Not yet known		More than 400	Not yet Known [NU11]	

2002-2003

The summer of 2002 was extraordinarily hot and dry. Low precipitation in July and August, continued for days with daily average temperature of more than 30oC. This affected pasture characterized by decreasing phytomass. Animals that had survived the severe winter and spring of 2001-2002 could not be fattened.

Experts from IHM calculated the number of days that it was unfavouranle for pasturing of animals averaging data from 114 meteorological stations20. By this estimation, 65 days in Tes soum of Uvs aimag, 40-41 days in Hutag soum of Bulgan, Saihan soum of O'mnogobi and Renchinlhumbe soum of Kho'bsgol aimags were unfavorable for animal breeding. July and August was the most difficult months for animals (Table 3.3).

Table 3.3. Number of unfavourable days for animal pasturing, averaged for 114 meteorological stations

Season, month	Summer 2002				Winter 2002-2003					Total winter & summer
	6	7	8	Sub-total	11	12	1	2	Sub-total	
Number of days	2.1	6.1	5.6	14	0.4	2.9	1.9	1.1	6.29	20.2

At the end of August the IMH forecast and warned of early heavy snowfall in autumn. The central and local governments, and herders took measures to prepare. The hot summer had ended by 20th August.

September was warm and with less precipitation than normal. Around 10th of September there was rain, and pasture in Dundgobi, Dornogobi and O'mnogobi aimags were replenished with grass. Due to climatic warming, cold conditions arrived later, providing pleasant conditions for winter preparations.

[19] We provide information from both the Institute of Meteorology (IMH) and the Ministry of Food and Agriculture (MFA), as there were differences.

[20] They use criteria developed by T.Tuvaansuren and B.Danzannyam that consider air temperature and wind speed.

October and November were snowy and with hazardous windstorms in the areas which has suffered the summer drought. Snow coverage had arrived 20-30 days earlier than usual. In the first 10 days of October Bulgan, Selenge, To'v, Khentii, Dornod, Zavhan, Kho'vsgol and Arkhangai aimags were warm and in some cases daily air temperature reached up to 13^{o}C above zero, which caused melting of the snow and an increase in snow density, and consequently created pre-conditions for iron-dzud.

In November snowfall was around the climatic norms or more, and 60% of Mongolia had snow coverage. Northern aimags had more unfavorable conditions for livestock as the snow was dense and thick ; mountain passes were blocked by snow, opportunities for pasturing of sheep and goats became limited and feeding them with additional fodder had to be started earlier.

In December 80-95% of entire country had snow coverage. Uvs, Kho'vsgol, Bulgan, Selenge, To'v, Khentii, Dornod, Gobi-Altai, Bayankhongor, Dundgobi and O'mnogobi aimags had 10-34 cm of snow. By the middle and end of month, it was extremely cold, night temperatures reached 41-51^{o}C below zero. In some areas the cold snap continued for 2-4 days, with daily average temperatures colder than minus 30^{o}C. This greatly negatively affected the pasturing of animals.

The beginning of January 2003 was windy, snowy and more than 90% of country had thick snow coverage of 10-40 cm. Daily air temperatures were highly variable, ranging from 15 to 27 in Uvs, Zavkhan, Kho'vsgol, Selenge, Darkhan-Uul and Khentii aimags, and in other areas below 30oC. In this period some aimags and soums exhausted their forage reserves, and IMH reported losses of more than 400 thousands head of livestock. The State Special Standing Commission (SSSC) and the State Board of Civil Defense (SBCD) undertook dzud relief measures, but transportation of forage to dzud-affected areas became more difficult due to thick snow coverage.

On January 5, the Government, SSSC and MFA made a decision to provide aid to Bulgan, Kho'vsgol, O'mnogobi, O'vorkhangai, Bayankhongor, Dundgobi, Khentii, Selenge, To'v, Orkhon and Darkhan-Uul aimags, as a result of the dzud disaster in 60 soums of the listed 11 aimags. Relief measures as reported by the Unen newspaper, are listed in Table 3.4.

Extreme cold with temperatures of 30-44^{o}C below zero occurred at the beginning of February. On average the month was warmer and with more snowfall than normal, with snow covering 60% of country areas. Warm weather caused the snow to melt during the day, refreeze at night and therefore, the snow became dense and hard, which affected the pasturing of animals very negatively. All of the above listed aimags remained under dzud conditions. In areas with less snow, there was also a lack of forage for animals. Hazardous windstorms occurred on February 7-8, costing one human life and a considerable number of animal losses.

Table 3.4. Relief measures taken in January 2003 for aimags with dzud[21]

Aimag, soum	Weather hazards	Relief measures
Bulgan: Bayan-Agt, Mogod, Saikhan, Burenkhangai, Khishig-O'ndor, Teshig, Khutag-O'ndor, Selenge, Rashaant	Summer drought, Early snowfall, Feeding animals with additional fodder started in November, Dense, hard and 20-30 cm thick snow coverage,	Gov. Res. No.268: Herb - 1500 tonnes, fodder - 3,5 tonne, consumer goods for 15,8 million tugrik, Aimag disaster unit: Cleaning of mountain passes, transportation of fodder
Kho'bsgol: Tsagaan-Uul, Tarialan, Ikh-Uul, Rashaant	Dense 20-30 cm snow coverage, Shortage of reserve fodder, Road and mountain passes blocked by snow	Gov. Res. No.268: 600 tonne herb, consumer goods for 15,8 million tugrik Aimag disaster unit: cleaning of mountain passes, transportation of fodder Aimag governor: Visited dzud area and made operative decision on relief
Darkhan-Uul: Orkhon, Khongor, Sharyn gol, Darkhan	Dense 20-30 cm snow coverage No pasture and shortage of fodder	Gov. Res. No.268: 200 tonne[NU12] herb, 100 tonne fodder, consumer goods for 4.6 million tugrik
O'mnogobi: Mandal-Ovoo, Tsogt-Ovoo, Tsogt-Tsetsii, Manlai, Bayan-Ovoo, Khanbogd, Bulgan	Dzud disaster in the north west soums of aimag No pasture and shortage of fodder Shortage of and no reserve for firewood, fuel Damage to aimag heat powerstation Loss of 3000 head of livestock	From State Reserve: 300 tonnes of herb, 35 tonnes of fodder, Decision to sell herb from aimag reserve to herders at a discount price Rehabilitation of power station with support from the experts from the Ministry of Infrastructure
O'vorkhangai: Baruun Bayan-Ulaan, Bogd, Bayangol, To'grog, Guchi-Us	Summer drought 70% of aimag area with dense, 20-25 cm thick snow coverage Shortage of forage and pasture	Collection of voluntary aid for herders from local residents, 292.6 tonne herb fodder from aimag reserve Forage sale from private sources at a discounted price
Dundgobi: Adaatsag, Erdenedalai, Delgerkhangai	Shortage of forage	From SSSC: consumer goods and medicine for 770 thousands tugriks to each of Adaatsag and Erdenedalai soum
Khentii: Binder, Dadal, Norovlin, Bayan-Adarga, Bayan-Ovoo	Dense 15-20 cm thick snowcoverage, Roads and mountain passes blocked with snow	Relief with internal sources
Selenge: Jargalant, Shaamar, Orkhon, Yo'roo, Tsagaannuur, Khushaat, Bayangol	Dense 20-30 cm snow coverage, roads and mountain passes blocked with snow Shortage of fodder	Gov. Res. No.268: 1000 tonnes herb, 100 tonnes fodder, consumer goods for 15.8 million tugriks, Aimag disaster unit: cleaning of mountain passes, transportation of fodder Aimag governor: Radio conference with all soums, concerned with readiness of bag communication and emergency warning
To'v: Tseel, Zaamar, Jargalant, Ugtaal, Lun, O'ndorshireet, Erdenesant, Bornuur, Altanbulag, Batsumber	Dense 15-20 cm snow coverage, The most disastrous conditions in Tseel, Zaamar, Jargalant, Ugtaal Additional feeding of animals	Gov. Res. No.268: 2000 tonnes herb, 200 tonnes fodder, food and consumer goods for 15.8 million tugriks, Aimag Governor: Contract with otor pasture in Khentii aimag, monthly visits to herders and provide relief in emergency
Orkhon: Jargalant, Bayan-O'ndor	Dence 20-30 cm snow coverage, No pasture and shortage of forage	Gov. Res. No.268: 400 tonnes herb, 100 tonnes fodder, food and consumer goods for 4.6 million tugriks, Aimag Governor: Organized relief group and trips to herders to assist every 2 weeks until April

[21] Unen newspaper, 2003-1-06

3.2. Experiences of the surveyed aimags and soums

Dundgobi aimag in 1999-2000, and Zavhan and To'v aimags in the winter and spring of 1999-2001 recorded dramatic livestock losses. The loss of animals in Khentii and Bulgan aimags was less , but they also lost a considerable number of cattle during winter and spring of 2000-2001.

After the 2000 dzud, the number of livestock rose in Dundgobi aimag for 3 years while it continuously decreased in Zavhan, To'v and Bulgan aimags.

The number of heads of cattle has gone down in Dundgobi, Zavhan and To'v since 1999, and in Bulgan and Khentii aimags since 2000, respectively.

When increase and decrease dynamics are studied in the surveyed 5 aimags the following can be noticed:

- Animal losses have occured with a dynamic of commencement, development and decline, spanning the last 3-4 years.
- Small losses a previous year, has usually warned of a greater loss in the next year. Such a dynamic might be helpful to forecast and provide an early warning a year in advance. But this should be studied in detail further.
- In the surveyed aimags, camels and goats have been less affected in dzud and drought.
- Drought does not materially affect forage for camels. Grasses that camels feed on are drought resistant. The main reason for decline in camel was an increase in consumption of its meat, because the staple meat sources - horses, cattle and sheep had suffered dramatic losses. Rearing camels with well-developed policy and activities can be as an adaptation response to climate change[22].
- In the last 4 years goat number increased in Bulgan and Khentii aimags by 17-19% (see table below). And the severely affected To'v aimag had no goat losses. The goats are more tenacious in finding their forage, can feed on non-grass foods (paper, cloth, etc), and also the herders are generally more concerned for their welfare as cashmere is a very valuable income source.

Table 3.5 Increase and decrease of head of animals in surveyed aimags, (as a % compared with the previous year)

	Total	Camels	Horses	Cattle	Sheep	Goats
Bulgan aimag						
1999	10,30	0,00	7,80	6,66	12,33	10,18
2000	-5,37	0,00	-9,43	-14,60	-4,22	1,76
2001	-4,28	-10,00	-8,25	-29,14	-2,47	10,31
2002	-4,80	-22,22	-10,20	-11,81	-7,67	6,37
Dundgobi						
1999	-4,86	-3,40	-0,55	-7,86	-0,51	-10,46
2000	-39,07	-25,70	-47,79	-65,80	-31,32	-42,44
2001	8,93	-8,06	-1,06	-30,48	3,18	24,81

[22] Some discussion on activities for camel rearing is given in section Pilot 4 of chapter 2.

2002	5,55	0,00	10,18	8,31	0,09	13,20
Zavkhan aimag						
1999	-6,59	-2,70	-6,24	-3,72	-6,63	-7,75
2000	-20,18	-19,44	-27,68	-41,78	-16,88	-15,66
2001	-23,42	-9,20	-26,69	-43,80	-27,85	-9,35
2002	-2,93	-11,39	-8,34	-6,42	-5,66	2,70
To'v aimag						
1996	5,75	-2,33	5,78	9,84	1,60	16,95
1997	9,66	-2,38	7,15	5,69	7,29	21,37
1998	9,28	0,00	7,99	5,87	7,12	17,92
1999	-0,91	2,44	0,30	-8,46	0,21	-0,32
2000	-8,84	-14,29	-17,82	-23,63	-6,29	-2,11
2001	-17,51	-19,44	-22,77	-34,80	-18,76	-5,31
2002	-4,20	-6,90	-3,58	-8,99	-9,81	7,97
Khentii aimag						
1999	5,30	0,00	6,06	5,62	8,10	-0,20
2000	0,62	0,00	-0,77	-4,85	1,61	3,11
2001	-7,80	-12,33	-9,49	-31,15	-5,90	3,56
2002	1,61	-3,13	-2,69	-4,06	-0,60	9,72

Cells are shaded according to different % of animal losses

- < 10%
- 11%-20%
- 21%-40%
- 41% <

[NU13]

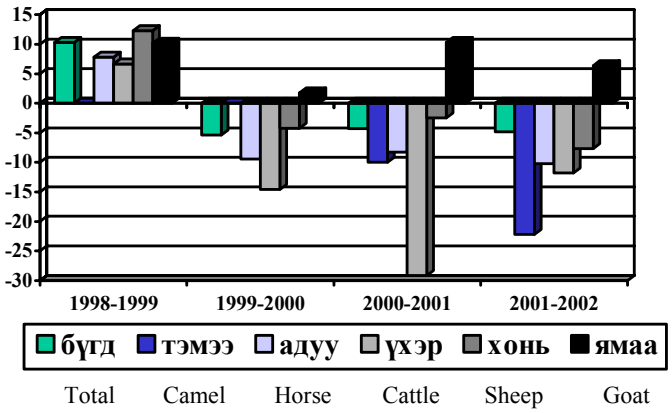
Described below are the dynamics of animals losses and climatic hazards for each of survyed aimags.

Bulgan aimag

The total head of livestock increased by 10.3% in 1998-1999, but in 2000-2002 all animals except goats suffered losses; among them cattle by 11.8-29.1%, horses by 8.2-10.2%, and camels by 10-22.2%.

Different animal types suffered during different periods, 1999-2000 was unfavorable for horses, 2000-2001 for cattle, and 2001-2002 for camels and sheep.

Figure 3.5. Change in head of livestock in Bulgan aimag



The weather conditions during the last few years can be characterized; in summer, as dry and hot summer with an daily average air temperature 34-40°C, with drought; and winter with 20-29 cm snow coverage; and in spring, windstorms with speeds of 24-40 m/sec . The worst year for cattle losses, 2001, was extremely cold in January with air temperatures of 35-40°C below zero (Table 3.6).

Table 3.6. Livestock and weather events, Bulgan aimag

Year	Animal type	Increase & Decrease		Weather events
		1000 head	%	
1998-1999	Total	150,3	10,3	1998-1999 favorable winter with less snow 1999 good summer in all soums except Gurvanbulag, Mogod, Buregkhangai and Khishig-O'ndor. 1999 July with 5-10 hot days with average temperatures of more than 30oC, and some days it reached 38oC.
	Camels	0,0	0,0	
	Horses	15,2	7,8	
	Cattle	16,5	6,7	
	Sheep	87,6	12,3	
	Goats	31,0	10,2	
1999-2000	Total	-86,4	-5,4	1999-2000 winter with 5-20 cm snow cover in Khangal, Bugat, Orkhon soums, in others 0-5 cm of snow. 2000 April, hazardous dust storms with wind speeds of **28-40 m/s.** 2000, June 6 to July 19 hot days, with average air temperatures 30-34oC 2000 good summer except Mogod, Buregkhangai and Gurvanbulag.
	Camels	0,0	0,0	
	Horses	-19,8	-9,4	
	Cattle	-38,6	-14,6	
	Sheep	-33,7	-4,2	
	Goats	5,9	1,8	
2000-2001	Total	-65,2	-4,3	2000-2001 winter with **10-20 cm** snow in Bayan-Agt, Khangal and Selenge soums, 0-10 cm snow in rest of soums. 2001 end of January extreme cold with absolute minimum temperature **35-40C below zero**. Hazardous windstroms in April 5-9 with speed of 16-24 m/s, and **28-40 m/s in Rashaant** 2001 drough in summer except Teshig, Selenge, Khangal, Bugat and Khutag-O'ndor soums.
	Camels	-0,1	-10,0	
	Horses	-15,7	-8,2	
	Cattle	-65,8	-29,4	
	Sheep	-18,9	-2,5	
	Goats	35,2	10,3	
2001-2002	Total	-69,2	-4,8	2001-2002 winter with **10-29** cm snow in Khutag-O'ndor, Selenge, Bayan-Agt, Bugat and Khangal, 5-10 snow in Teshig and Saikhan, and rest of soums with 0-5 cm snow. 2002 summer drought in Saikhan, Mogod, Bugerkhangai, Dashinchilen and Gurvanbulag, rest of soums drought affected 2002 December 2-4, hazardous windstorms with speeds of 16-20 m/s, maximum **20-24** m/s.
	Camels	-0,2	-22,2	
	Horses	-17,8	-10,2	
	Cattle	-18,9	-11,8	
	Sheep	-57,2	-7,7	
	Goats	24,0	6,4	

2002-2003

Summer was heavily drought affected. Winter dzud affected Bayan-Agt, Mogod, Saikhan, Burenkhangai, Khishig-O'ndor, Teshig, Khutag-O'ndor, Selenge and Rashaant soums.

Early snow in the autumn forced animals to be fed for a longer period. Dense and hard snow coverage with 20-30 cm depth blocked the roads and mountain passes. A shortage of forage, no pasture to migrate to, signaled the very unfavorable conditions for pasturing of affect animals, particularly cattle, sheep and goats, that had emerged.

The number of days of unpleasant conditions reached more than 20 during July and August in Gurvanbulag, Khutag and Mogod soums, and 15-20 days in December, January in Ingettolgoi, Khutag, Teshig soums. Combining winter and summer, the greatest number of most unfavorable days was recorded by Khutag and Teshig soums.

Table 3.7. Number of unfavouarble days for animal grazing, Bulgan aimag

Season, month / Soum name	2002 summer					2002-2003 winter						Winter, summer	
	6	7	8	Total	Δ/δ	11	12	1	2	Total	Δ/δ	Total	Δ/δ
Gurvanbulag	5	11	9	25	1,55	0	0	0	1	1	-0,80	26	0,62
Bulgan	0	4	2	6	-1,10	0	0	0	0	0	-0,96	6	-1,52
Ingettolgoi	2	6	6	14	0,02	0	9	4	2	15	1,32	29	0,94
Mogod	4	10	6	20	0,86	1	1	1	1	4	-0,35	24	0,41
Khutag	4	12	9	25	1,55	0	13	2	0	15	1,32	40	2,12
Teshig	2	6	9	17	0,44	0	16	4	0	20	2,08	37	1,80

Dundgobi aimag

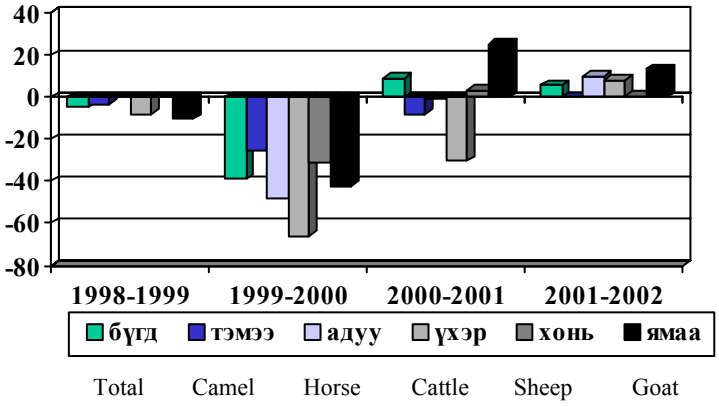


Figure 3.6. *Change in head of livestock in Dundgobi aimag*

In 1998-1999, total animals decreased by 4,9%.

Epicenter of the 1999-2000 dzud was within Dundgobi aimag, losing 39% of its total livestock, 47.8% of horses and 65.8% of cattle.

Relevant climate hazards are drought in the summer of 1999, 20-40 cm snow coverage in winter, and 28-40 m/sec windstorms in 1999-2001.
All 5 types of animals had raised in 2001-2002.

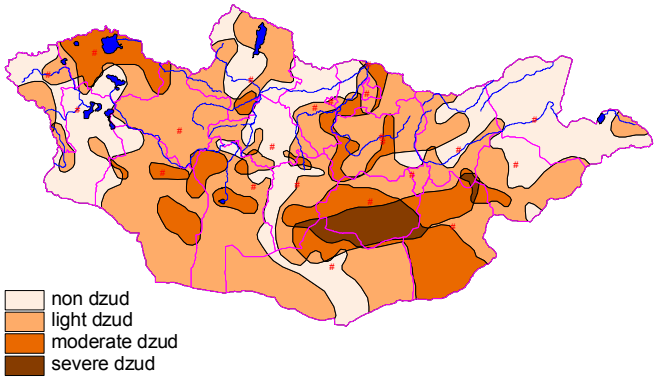
Table 3.8. Livestock and weather events, Dundgobi aimag

Year	Animal type	Increase & Decrease		Weather events
		1000 head	%	
1998-1999	Total	-107,6	-4,6	1999 July 13-25 extreme heat with maximum air temperature 36-44°C. 1999 drought in Adaatsag, Erdenedalai, Delgertsogt, Deren, Tsgaandelger, Gobi-Ugtaal, Bayanjargalan, Gurvansaikhan, and rest of soums were affected by severe drought.
	Camels	-1,0	-3,4	
	Horses	-1,2	-0,6	
	Cattle	-10,8	-7,9	
	Sheep	-5,0	-0,5	
	Goats	-89,6	-10,5	
1999-2000	Total	- 822,4	-39,7	1999-2000 winter: Delgerkhangai, Khuld, Luus and Gobi-Ugtaal with 20-40 cm and rest of soums with 5-20 cm snow coverage 2000 April: hazardous dust storms twice at the begining and at the end of the month with wind speed of 28-40 m/s. 2000 June, July: Extreme heat with maximum air temperatures of 35-42C, and in June 28-30 hot days with average temperature more than 30C. 2000 summer: Droughty in Saikhan-Ovoo, Delgerkhangai, Erdenedalai, Adaatsag, Delgertsogt, Bayantsagaan, and rest of soums under severe drought. 2000 November 2-7: Hazardous storm with wind speeds of 16-28 m/s, in Bayanjargalan 28-40 m/s.
	Camels	-7,3	-25,7	
	Horses	-103,6	-47,8	
	Cattle	- 83,3	-65,8	
	Sheep	-302,7	-31,3	
	Goats	-325,5	-42,4	
2000	Total	114,6	8,9	2000-2001 winter: no snow in Saikhan-Ovoo, Delgerkhangai, Khuld and Ölziit soums, rest of soums with 0-10 cm snow coverage

	Camels	-1,7	-8,1	
	Horses	-1,2	-1,1	
	Cattle	-13,2	-30,5	
	Sheep	21,1	3,2	
	Goats	109,5	24,8	
2001-2002	Total	77,6	5,6	2001-2002 winter: Adaatsag, Delgertsogt, Deren soums with 10-20 cm of snow, central and sothern part of aimag with 5-10 cm snow, and rest of soums with 0-5 cm snow coverage. 2002 March 18-19: Hazardous windstorms with wind speeds of 28-40 m/s in Gurvansaikhan and Khuld soums. 2002 April 4-8: Hazardous windstorms with 28-38 m/s wind speeds in Adaatsag, Bayanjargalan and Bayantsagaan soums. 2002 June: Extreme heat with maximum temperatures of 33-37C. 2002 July: Drought in Delgertsogt, Deren, Gurvansaikhan, Saikhan-Ovoo and Delgerkhangai, and rest of soums were drought affected. 2002 December 2-4: windstroms with 20-24 m/s speed in Mandalgovi, Gurvansaikhan, Delgerkhangai and Khuld soums.
	Camels	0,0	0,0	
	Horses	11,4	10,2	
	Cattle	2,6	8,3	
	Sheep	0,6	0,1	
	Goats	72,7	13,2	

During the study of the Dzud in 2000, the agro-meteorologist S.Sangidansranjav developed a methodology for dzud assessment and tested it using the example of the white dzud of 200023. The methodology is for relational assessment and ranking of interrelated factors and processes with qualitative scores. It was developed on the bases of Leopold matrix, screening and scoping checklists, which is commonly used in practices of environmental impact assessment. As the result of such an assessment, Dundgobi aimag was judged to be the epicenter of the dzud disaster in 2000 (see Figure 3.7) and it lost 39% of its total livestock.

Figure 3.7. Assessment of Dzud Disaster 1999-2000

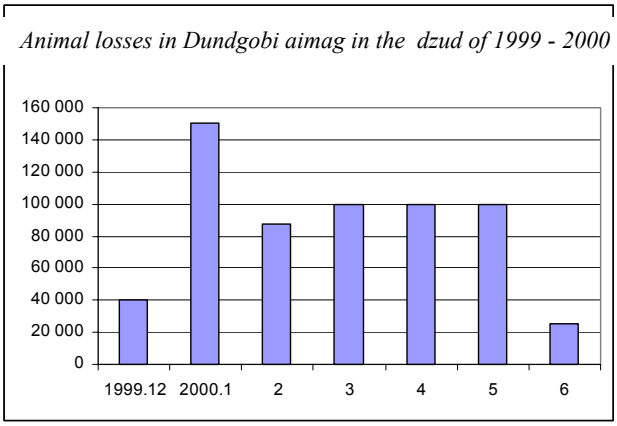


[23] S.Sangudansranjav, Dzud assessment, "Lessons Learnt From the Dzud 2000", JEMR, 2000

Figure 3.8. Animal losses in Dundgobi aimag in the dzud of 1999 - 2000

In total 602.5 thousand head of livestockwere lost inthe dzud disaster of 1999-2000.

Extreme cold weather occured at the beginning of January 2000 and caused 150 thousands animal losses alone.



Source for Figures 3.7 and 3.8: Lessons Learnt from the Dzud (2000)

Figure 3.9. Head of Livestock in Dundgobi aimag

The Dzud of 1999- 2000 resulted in a decrease in livestock numbers of 39% (822 thousand) compared tothe end of 1999

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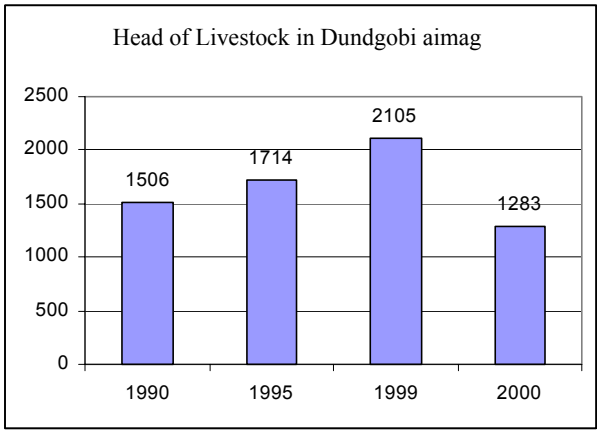


Figure 3.10. Head of livestock per aimag resident, Dundgobi aimag

Dzud caused a decrease in livestock equivalent to 6 animals per person

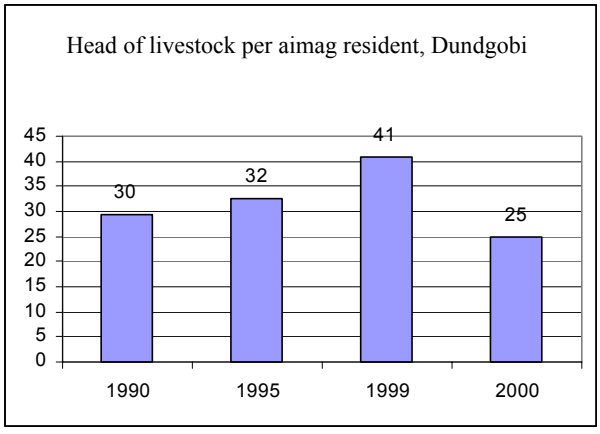
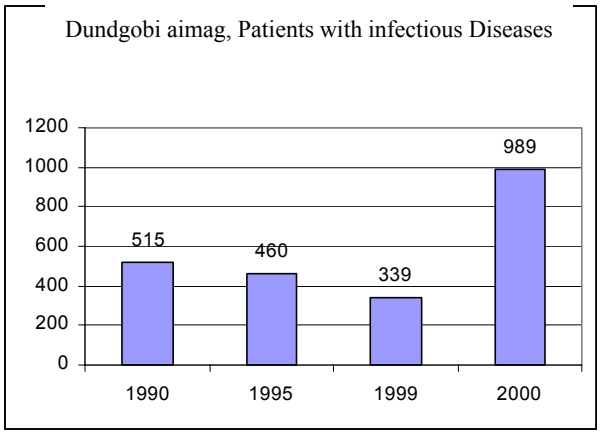


Figure 3.11. Dundgobi aimag, Patients with infectious Diseases

In the dzud-affected years, 989 patients presented with infectious diseases, this is 3 times more than the pervious year. Similarly,in other dzud affected aimags, such as O'vorkhangai 3 times as many patients presented in 2000 compared to 1999.



Source: Graphics made from the State Statistical Bulletin, 2000

2002-2003

Adaatsag, Erdenedalai and Delgerkhangai soums were badly affected by dzud in this period. The winter weather hardship and shortage of fodder was brought to the attention of and considered by the SSSC, and as a result Adaatsag and Erdenedalai soums received aid in the form of consumer goods and medicine with a value of 770 million tugrik each.

For soums where a meteorological station operates, 20-22 days of severly unfavouarble weather was recorded. This is close to the national average.

Table 3.9. Dundgobi aimag, Number of days with unfavourable weather

Season, month	2002 summer					2002-2003 winter						Winter, summer	
Soum name	6	7	8	total	Δ/δ	11	12	1	2	total	Δ/δ	total	Δ/δ
Gurvansaikhan	5	6	5	16	0,30	2	0	4	0	6	-0,04	22	0,20
Mandalgobi	1	5	1	7	-0,96	1	3	6	5	15	1,32	22	0,20
Saikhan-Ovoo	2	5	11	18	0,58	0	0	3	1	4	-0,35	22	0,20
Erdenedalai	1	7	6	14	0,02	0	0	5	1	6	-0,04	20	-0,02

An example of animal losses in soum is shown in below tables for Erdenedalai soum. Before the dzud, Erdenedalai soum had the highest number of animals in the whoel of Mongolia. During the dzud it lost 110 thousand animals with a value of 4 billion tugrik. Considering income generation potentail, these losses can be assessed as being worth 6 million tugrik. Head of cattle decreased 4 times over and horses by nearly 3 times.

Table 3.10. Livestock in Erdenedalai soum

Year	Livestock census (by type of animals)						Animal losses (by type of animals)					
	Horses	Cattle	Camels	Sheep	Goats	Total	Horses	Cattle	Camels	Sheep	Goats	Total
1998	36 564	26 906	2 784	165 446	115 277	346 977						
1999	32 499	22 054	2 445	150 930	93 201	301 129	209	84	2	218	84	597
2000	11 255	5 646	1 328	92 105	49 769	160 103	13 698	15 450	397	46 702	34 313	110 560
2001	14 375	6 175	1 186	102 672	67 219	191 627	282	101	8	3 372	2 103	5 475
2002	12 229	6 972	1 181	98 865	72 502	191 749	495	370	1	775	549	2 190
Total							14 684	16 005	408	51 067	37 049	118 822
Year	Livestock census (by herd structure)						Animal losses (by herd structure)					
	Sire	Female animals	Young animals	Large*	Small**	Barren	Sire	Female animals	Young animals	Large	Small [NU14]	Barren
1998	3 619	142 765	94 429	66 254	280 723	106 164						
1999	2 584	121 619	101 080	56 998	244 131	75 836	4	339	254	295	302	
2000	3 322	81 881	21 967	18 229	141 874	52 933	896	65 828	22 310	29 545	81 015	21 526
2001	2 435	77 902	69 659	21 736	169 891	41 631	34	3 284	2 940	391	6 072	205
2002	2 180	79 634	58 894	20 382	171 367	51 041	8	2 089	93	666	1 324	

** Large (Bod) - cattle, horse and camel; ** Small (Bog) – sheep and goat*

Table 3.11. Livestock value assessment, Erdenedalai soum

Year	Livestock, million tug.						Losses, million tug.						With consideration of lost income generation
	Horses	Cattle	Camels	Sheep	Goats	Total	Horses	Cattle	Camels	Sheep	Goats	Total	
1998	2 120,7	2 959,7	306,2	3 722, 5	2 190,3	11 299,4							
1999	1 884,9	2 425,9	268,9	3 395,9	1 770,8	9 746,5	12, 1	9,2	0,2	4,9	1,6	28,1	39,3
2000	652,8	621,1	146,1	2 072,4	945,6	4 437,9	794,5	1699,5	43,7	1050,8	651,9	4240,4	5936,6
2001	833,8	679,2	130,5	2 310,1	1 277,2	5 230,7	16,4	11,1	0,9	75,9	40,0	144,2	201,8
2002	709,3	766,9	129,9	2 224,5	1 377,5	5 208,1	28,7	40,7	0,1	17,4	10,4	97,4	136,3
Total							852,6	1760,5	44,9	1149,0	703,9	4510,1	6314,1

Zavkhan aimag

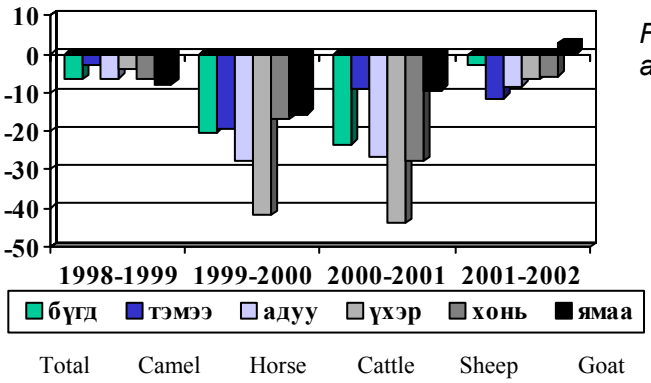


Figure 3.12. Change in head of livestock in Zakhan aimag

This was the most affected aimag by abnormal animal losses since 1999. During teh winter and spring of 2000 and 2001, total head of all animals fell by 20.2-23.4%, horses by 26.7-27.7% and cattle dramatically by 41.8-438%.

Total animals counted in 2002 had fallen by 41% compared to 1999.

Table 3.12. Livestock and weather events, Zavkhan aimag

Year	Animal type	Increase & Decrease		Weather events
		1000 head	%	
1999-2000	Total	-490.7	-20.2	1999-2000 Winter: No snow in Zavkhanmandal, 0-5 cm snow in Urgamal, Santmargats and Tes, 20-40 cm snow in Bayantes, and rest of soums, 5-20 cm snow. 2000 April: Hazardous snow storms with 28-40 m/s wind speeds. 2000 June-July: Extreme heat with temperatures of 30-34C.
	Camels	-2.1	-19.4	
	Horses	-53.2	-27.7	
	Cattle	-113.4	-41.8	
	Sheep	-213.4	-16.9	
	Goats	-108,.6	-15.7	
2000-2001	Total	-454.6	-23.4	2000-2001 Winter: Zavkhanmandal 0-10 cm, Urgamal, Santmargats and Do'rvoljin 10-20 cm, rest of soums with 20-40 cm snow coverage. 2001 July: Ider soum affected with severe drought and rest of soums were drought affected.
	Camels	-0.8	-9.2	
	Horses	-37.1	-26.7	
	Cattle	-69.2	-43.8	
	Sheep	-292.6	-27.8	
	Goats	-54.7	-9.4	

2002-2003

Summer of 2002 was relatively normal, but 25-30 days of unfavoutable weather were recorded for Bayantes, Do'rvoljin and Tosontsengel soums.

Table 3.13. Zavkhan aimag, Number of days with unpleasant weather

Season, month / Soum name	2002 summer					2002-2003 winter						Winter, summer	
	6	7	8	Total	Δ/δ	11	12	1	2	Total	Δ/δ	Total	Δ/δ
Bayantes	1	5	5	11	-0,40	0	11	0	3	14	1,17	25	0,52
Do'rvoljin	1	10	8	19	0,72	0	5	3	1	9	0,41	28	0,84
Otgon	0	4	1	5	-1,24	0	6	2	2	10	0,56	15	-0,55
No'mrog	0	4	2	6	-1,10	0	9	1	1	11	0,72	17	-0,34
Uliastai	0	4	5	9	-0,68	0	0	0	0	0	-0,96	9	-1,19
Tosontsengel	0	5	5	10	-0,54	0	14	5	1	20	2,08	30	1,05
Tsetsen-Uul	0	4	6	10	-0,54	0	2	1	1	4	-0,35	14	-0,66

To'v aimag

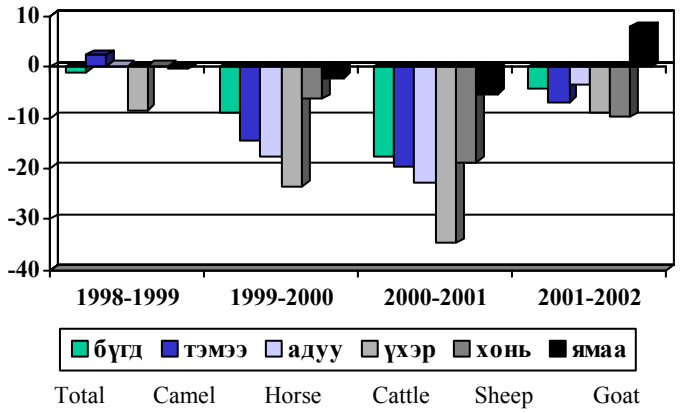


Figure 3.13. Change in head of livestock in To'v aimag

This aimag has experienced cattle losses since the winter of 1998. Mass losses except for goats occurred in the 2 consecutive winter and springs of 2000 and 2001.

Table 3.14. Livestock and weather events, To'v aimag

Year	Animal type	Increases & Decreases		Weather events
		1000 head	%	
1999-2000	Total	-8.8	-8.8	1999-2000 Winter: Mo'ngonmorit, Bayan, Bayanjargalan, Bayantsagaan, Sergelen, Altanbulag soums had less snow at 0-5 cm depth, rest of soums with 5-20 cm snow coverage. 2000 April: Hazardous dust dstorms with wind speeds of 28-40 m/s. 2000 June-July: Continous extreme heat with air temperatures of 30-34C, in June, in total 10-19 days with daily average temperatures of more than 30C. All soums except Tseel, Zaamar, Ugtaal and Jargalant were affected by drought.
	Camels	-14.3	-14.3	
	Horses	-17.8	-17.8	
	Cattle	-23.6	-23.6	
	Sheep	-6.29	-6.3	
	Goat	-9.1	-2.1	
2000-2001	Total	-17.5	-17.5	2000-2001 Winter: Zaamar, Erdenesant, Lun, O'ndorshireet, Buren, Delgerkhaan, Bayan'O'njuul, Bayantsagaan, Bayan with 0-10 cm snow, rest of soums with 10-20 cm snow coverage. 2000-2001 New year: Hazardous windstorm with 16-28 m/s speed 2001 January: Extreme cold with minimum temperatures of 35-40C below zero. 2001 April 5-9: Hazardous windstorm with 16-24 m/s, in Lun, Tseel, Bayanjargalan, Bayantsagaan soums dust wind speeds reached to 28-40 m/s. 2001 July: Zaamar, Ugtaaltsaidam, Altanbulag and Sergelen soums were normal, rest of soums were affected by drought.
	Camels	-19.4	-19.4	
	Horses	-22.8	-22.8	
	Cattle	-34.8	-34.8	
	Sheep	-18.8	-18.7	
	Goats	-5.3	-5.3	

2002-2003

Tseel, Jargalant, Ugtaal, Lun, O'ndorshireet, Erdenesant, Bornuur, Altanbulag and Batsumber soums were all affected by dzud. Animals received additional forage, from Government relief, they obtained 2000 tonnes of herb, 200 tonnes fodders, and food and consumer goods with a value of 15,8 million tugrik.

In the summer of 2002 Buren, Erdenesant soums had 22-25 unfavorable days. The winter was comparatively normal, in total, for winter and summer Erdenesant had 29 unfavorable days and Jargalant 22.

Table 3.15. To'v aimag, Number of days with unpleasant weather

Season, month / Soum name	2002 summer					2002-2003 winter						Winter, summer	
	6	7	8	Total	Δ/δ	11	12	1	2	Total	Δ/δ	Total	Δ/δ
Buren	2	8	12	22	1,14	0	0	0	1	1	-0,80	23	0,30
Bayanchandmani	3	7	5	15	0,16	1	0	0	1	2	-0,65	17	-0,34
Bayan-O'njuul	1	8	5	14	0,02	0	1	1	1	3	-0,50	17	-0,34
Jargalant	2	8	8	18	0,58	1	1	1	1	4	-0,35	22	0,20
Altanbulag	1	8	8	17	0,44	0	0	1	0	1	-0,80	18	-0,23
Zuunmod	0	7	3	10	-0,54	1	0	4	1	6	-0,04	16	-0,45
Lun	1	7	3	11	-0,40	0	7	1	0	8	0,26	19	-0,13
Maanit	0	3	3	6	-1,10	1	1	2	2	6	-0,04	12	-0,87
Mo'ngonmorit	0	6	1	7	-0,96	0	0	1	1	2	-0,65	9	-1,19
Ugtaal	4	8	5	17	0,44	0	0	0	1	1	-0,80	18	-0,23
Erdenesant	7	10	8	25	1,55	1	0	3	0	4	-0,35	29	0,94

Khentii aimag

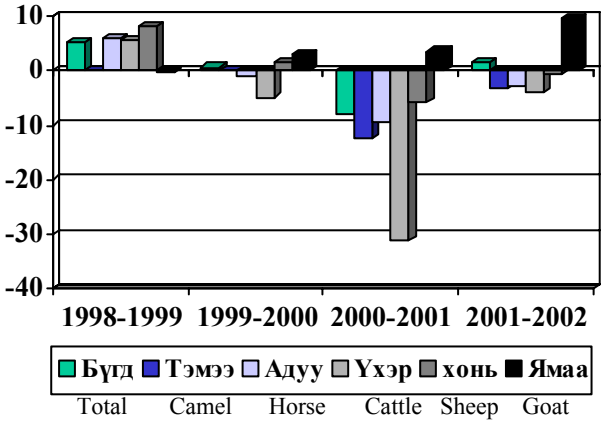


Figure 3. 14. Change in head of livestock in Khentii aimag

Between 1998 and 1999, total head of livestock increased by 5.3%. In 2001, all animals types suffred losses except goats; horses by 9,5% and cattle by 31,2%. Mass animal losses affected cattle during the w inter of 2000-2001. There were no goat losses, indeed goats have increased by 17% since 1999.

Table 3.16. Livestock and Weather events, Khentii aimag

Year	Animal type	Increases & Decrease		Weather events
		1000 head	%	
2000-2001	Total	-114,7	-7,8	2000-2001 Winter: Dadal, Binder, Batshireet soums with 20-40 cm of snow, Darkhan, Galshar, Bayankhutag 0-10 cm, rest of soums with 10-20 cm snow coverage. 2000-2001 New year: Windstorms with 16-28 m/s speeds 2001 January: Extreme cold with minimum temperatures 41-48oC below zero, in Batshireet 49-51oC below zero. 2001 March: Hazardous snow and dust storm with 16-34 m/s 2001 April: Hazardous storm with 16-24 m/s wind speed, in Kherlenbayan-Ulaan (area of state reserve pasture) 28-40 m/s.
	Camels	-0,9	-12,3	
	Horses	-18,3	-9,5	
	Cattle	-67,9	-31,2	

	Sheep	-40,6	-5,9	2001 Summer: End of July, Darkhan, Bayaynmonkh, Delgerkhaan, Tsenkhermandal, Galshar, Bayankhutag and Bayan-Ovoo soums were drought affected, the rest of the soums were normal.
	Goats	13,0	3,6	

2002-2003

Dzud badly affected Binder, Dadal, Norovlin, Bayan-Adarga and Bayan-Ovoo soums. Dense, 15-20 cm snow coverage ensured local roads and mountain passes were blocked. Aimag and soum administrations offered some relief measures from their own internal sources.

The summer of 2002 was relatively normal. Bayan-Ovoo had 27 days of unfavorable conditions and Orgil 19 days for winter and summer periods.

Table 3.17. Kentii aimag, Number of days with unfavourable weather

Season, month / Soum name	2002 summer					2002-2003 winter						Winter, summer	
	6	7	8	Total	Δ/δ	11	12	1	2	Total	Δ/δ	Total	Δ/δ
Dadal	0	6	3	9	-0,68	0	4	0	1	5	-0,20	14	-0,66
Galshir	2	6	1	9	-0,68	1	0	2	2	5	-0,20	14	-0,66
Bayan-Ovoo	0	3	6	9	-0,68	1	11	3	3	18	1,78	27	0,73
Binder	0	6	8	14	0,02	0	0	0	1	1	-0,80	15	-0,55
O'ndorkhaan	1	4	4	9	-0,68	0	0	1	3	4	-0,35	13	-0,77
Orgil	1	7	6	14	0,02	1	0	3	1	5	-0,20	19	-0,13

4.0 Impact of Current Climate Hazards on the Livelihoods of Herders' Households

Impact of climate and environmental changes and variability on the herders' livelihoods studied and assessed on the example of dzud and drought that occurred in 1999-2002 at two scales, as entire Mongolia and surveyed 14 soums of 5 aimags.

Information from professional organizations, national, aimag and soum statistics, and data gathered from the herders with questionnaire survey have been used. The questionnaire aims to gather data for the last 5 years, as during this period the Mongolia livestock sector has been affected by natural disasters (consequent drought and dzud phenomenon), and lost more than 10 million animals – one third of year 1999 total.

Outputs of the herders' livelihoods study and assessment are described below.

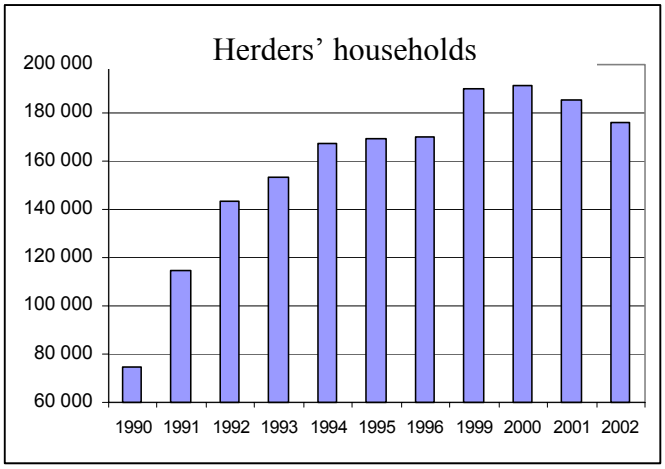
For reference purpose, survey questionnaire structure, the methodology used for impact and vulnerability assessment is shortly described at the end of this chapter.

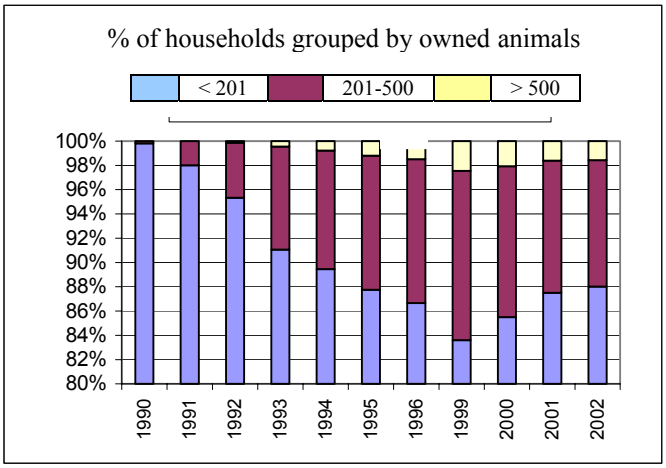
4.1. Livelihoods of Herders' Households in Mongolia

During livestock privatization, many hundred of herdsman received livestock. Some 97,2% of the total livestock is private owned. By the end of 2002, 243,2 thousand families owned livestock, 72.3% of which (175,9 thousands households) are dependent solely on income generated from their livestock.

Climate hazards consequently occurred since 1999 have affected livelihoods of herders' households dramatically. However, many of them lost this source of living as a result livestock losses due to deficiency of herding skills and un-preparedness to natural disasters, hazardous weather events. There is a tendency to decrease of number of herding households (Figure 4.1).

Figure 4.1. Number of Herders' Households





The composition of herders continues to change. Notably the total number of herders decreased by 28 thousand people in 2002 compared to 1999 and now stands at 389765. Some 54.1% of herders are between the ages 16-34, 32.9% from 35 to the retirement age. There is a tendency to decrease number of young herders since 2000.

One of the indicators of evaluation of rural household wealth is the number of animals it owns[24]. Table 4.1 shows dynamic of changes in herders' livelihood since 1990. Each column represents change in number of households from previous year and each row represents levels of households according to the head of owning animals. From 1990 to 1999 with favorable weather condition number of households with less animals decreased and number of households with more animals increased intensively. But, after dzud disaster of 2000 number of households with more animals decreased and with fewer animals increased dramatically.

Table 4.1. Herders' Livelihood Dynamic, 1990-2000

	1991-1990	1992-1991	1993-1992	1994-1993	1995-1994	1996-1995	1997-1996	1998-1997	1999-1998	2000-1999	2001-2000	2002-2001
<10	-11,4	-6,1	-10,5	-1,6	-3,1	-3,9	-4,2	-3,9	-3,0	2,7	2,4	-0,6
11-30	-16,4	-2,4	-12,2	-3,2	-3,2	-3,5	-6,1	-4,2	-0,9	4,5	2,6	-0,3
31-50	8,2	-0,7	-6,5	-1,7	-1,8	-2,7	-2,7	-1,1	-1,8	3,2	1,0	0,1
51-100	21,3	2,4	-2,9	-0,4	-1,9	0,4	2,3	-0,8	-1,6	1,7	-2,9	-4,3
101-200	21,2	10,9	8,6	1,8	0,4	1,8	9,9	2,2	0,4	-8,0	-8,4	-5,3
201-500	5,2	8,0	10,9	3,7	3,1	1,6	1,6	1,7	1,4	-4,2	-5,5	-2,6
501-999	0,00	0,38	0,89	0,85	0,97	0,58	0,46	0,98	0,33	-0,85	-1,19	-0,25
1000-1499	0,00	0,01	0,04	0,09	0,14	0,17	0,09	0,33	0,20	-0,17	-0,25	-0,04
1500-2000	0,00	0,00	0,00	0,00	0,01	0,02	0,02	0,01	0,01	-0,03	-0,01	0,00
2001<	0,00	0,00	0,00	0,00	0,01	0,00	0,00	0,02	0,01	0,00	-0,01	-0,01

The number of herding households, having less than 100 animals accounted for 58.5% among the total households with animals in 1999, but this figure had increased to 69.1% at the end of 2002. 18.9% have between 101 and 200 animals (see Table 4.2). During 1999-2002 total 12100 households lost their all animals, number of households own the animals decreased by 267 hundreds, number of household with more than 200 head of animals were declined by 151 hundreds, while the household with more than 500 animals by 28 hundreds. By end of 2002, the 12% of households own more than 200 animals, while this number was 16.4% in 1999.

For instance, in 1999-2000, about 190 thousand households with 33.5 million heads of livestock were spending the winter in the country. 80.9 households with 452.0 thousand people and 7 million heads of livestock were affected by Dzud disaster throughout the winter and spring. The disaster affected 13 aimags and 157 soums of Dundgobi, Zavhan, Khovd, Uvurkhangai and To'v aimags. As of 1 June 2000, about 2399.2 thousand heads of livestock were lost an equivalent of 91.7 billion tugrik according to local market prices[25].

[24] In reality, family capacity to generate income depends not only from the number of animals but, also the herd structure, type and breeding of animals and market condition. But official statistics don't give such information.

[25] Lessons learnt from the Dzud 2000, UNDP and Government of Mongolia, JEMR Consulting, 2000

Table 4.2. Number of Households with Animals

Number of animals owns a family	Number of households				
	1999	2000	2001	2002	2002-1999
<10	28 669	31 361	33 797	33 183	4 514
11-30	35 970	40 436	43 082	42 796	6 826
31-50	31 874	35 041	36 030	36 165	4 291
51-100	61 347	63 096	60 195	55 905	-5 442
101-200	67 840	59 821	51 383	46 051	-21 789
Sub total < 200	*225 700*	*229 755*	*224487*	*214100*	
201-500	37 635	33 408	27 949	25313	-12 322
501-999	5 438	4 591	3 406	3160	-2 278
1000-1499	1 061	893	639	601	-460
1500-2000	75	48	38	36	-39
2001+	41	37	31	24	-17
Sub total > 200	*44 250*	*38 927*	*32 777*	*29134*	
Total	269950	268 732	256 550	243 234	
Per cent of households with <100 animals	58%	63%	67%	69%	

Source: State Statistical Department

On top of 2369 households, which have lost the entire livestock due to the Dzud, over 10 thousand households were left with less than 100 heads of livestock. Living standard of rural people rapidly plummeted contributing to increase of unemployment and poverty in rural areas.

5.7-28.6% of total livestock of affected aimags such as Dundgobi, Zavhan, Uvs, Bayankhongor, To'v aimags were lost and the loss of these aimags makes 84.4%, among it the loss of Dundgobi, Uvurkhangai and Zavhan aimags makes 61.7% of total loss throughout the nation.

There is a lack of regular statistical information on poverty in general, on herders households particularly. UNDP, World Bank has funded some study on poverty and their findings have circulated among the stakeholders as official information on poverty. Below is given some findings of those studies regarding to herders' livelihoods that we use in our study as a background.

The majority of the rural population earns income lower than the vulnerable level for poverty assessment. Herding family income is dependent on many factors including type and quality of animals, weather condition, season, internal and external market price and distance to the market place. In 2001 the total income of herders was generated 52.8% from cashmere, 28.6% from live animals, 6.4% from skin and hides, 5.4% from meat, 4.3% from wool and 1.2% from milk and dairy products.

Living standards assessment with participatory approach (World Bank, 2000) found the causes of difficulties facing Mongolian herders today as the following[26]:

1. Insufficiency of water resources;

[26] A Strategy Paper for Poverty Reduction in Mongolia, Report of a UNDP mission led by Keith Griffin, July 2001.

2. Insufficiency of winter shelters;
3. Lack of access to veterinary services;
4. Difficulty in accessing basic services; especially education and health care;
5. Difficulty in getting access to markets and the means of transportation to reach these markets
6. Inability to get access to credit

In year 2002 National Statistical Department has been conducting households' livelihood survey throughout Mongolia and its results will be available to public next year. Meanwhile there is some statistics by June of 2002 for household income and expenses (Table 4.3). The most rural households are herder's family. Centers of aimags and soums are small towns that belong to rural area. But their households composed from people working in different sectors. As statistical survey is showing the households living in rural are more efficient than the households settled in Ulaanbaatar. From the efficiency point of view the rural households - herders have the highest status. Negative balance of income and expenses of Ulaanbaatar city households is notifying poverty increase that Mongolia facing today in reality.

Table 4.3. Monthly Monetary Income & Expenses, June 2002

	Income	Expenses	Balance	Efficiency %
State average	120 884,4	98 940,9	21 943,5	18
Capital city	144 659,5	153 370,7	-8 711,2	-6
Center of aimag	104 967,8	98 008,1	6 959,7	7
Center of soum	106 369,1	85 192,4	21 176,7	20
Rural	112 266,9	70 256,2	42 010,7	37

Source: State Statistical Department

Another interesting result of this survey is a significant difference in monetary income distribution of urban and rural households (Table 4.4). 60-65% of income of aimag center and Ulaanbaatar city is composed from salary and trade, while 70% of income of rural households generated by livestock alone. As livestock sector is highly sensitive to weather extreme events and natural resource of pastureland, rural households are the most vulnerable one to negative impacts of climate hazards than households settled in aimag, soum centers and capital city. Soum household's income is also sensitive to change in livestock sector but twice less than the herders.

Though the climate hazards of 1999-2002 were a consequence of a natural "force major", the factors of human activity influenced the severity of its consequences and mitigation efforts in social and economic terms. On the other hand, Dzud disaster is not an issue of a given one or two winter and summer seasons. It is closely related to the several previous years weather conditions and present level of the country's development, it also has a direct bearing on situation in coming 5-15 years.

Table 4.4 Monthly Monetary Income Distribution

	State average	Capital city	Center of aimag	Center of soum	Rural
Salary, fee	0,29	0,46	0,39	0,29	0,03
Subsidy, pension	0,08	0,095	0,089	0,08	0,07
Social care	0,00	0,00	0,01	0,00	0,00
Income from livestock	0,30	0,01	0,07	0,31	0,70

Income from agriculture	0,005	0,001	0,007	0,009	0,007
Income from non-agricultural job, services	0,07	0,07	0,10	0,07	0,04
Income from trade	0,15	0,19	0,21	0,17	0,07
Income from fixed assets	0,02	0,03	0,01	0,01	0,01
Monetary aid and gifts	0,03	0,07	0,03	0,01	0,01
Loan	0,03	0,02	0,03	0,04	0,03
Other income	0,04	0,06	0,05	0,03	0,02

Source: State Statistical Department

Mass movement of herders, who had lost their livestock and left without livelihood because of the dzud, to aimag center and major cities increased drastically and it, in turn, caused serious problems in designated capacity and allocated budget for schools, kindergartens and hospitals.

Herders have not significantly joined in cooperatives to share labors. They are sparsely located in distant areas, far from education, cultural and health services and markets. The difficulties caused by natural disasters and social services are creating a tendency towards migration from rural to urban areas. This tendency leads to some wells, shelters and pastures in distant locations being abandoned while many central pastoral lands are overgrazed.

4.2. Livelihoods of Herders' Households in Surveyed 5 Aimags

Surveyed Households and Their Representatives

The following 12 soums of 5 aimags were selected for detailed survey (Table 4.5). Planned sample size is 6% of soum households, but 0.7-1.8% of aimag total households. Sample 508 households is 1.1% of 5 aimags total of 44786 households, and 0.26% of the country total

Table 4.5. Surveyed Households in each of soums

Aimag name	Soum name	Number of herders' households	Herder population	Households with animals	Number of surveyed households
Zavkhan	Tosontsengel	873	3662	1273	52
	Do'rvoljin	494	2094	596	30
	Aldarkhaan	676	2795	932	41
	Aimag total	11081	46283	15369	123
Percent of aimag total (%)		18.4	18.5	18.2	1.1
Tuv	Altanbulag	567	2323	682	34
	Bayan-O'njuul	566	2355	584	34
	Aimag total	9804	39504	15755	68
Percent of aimag's total (%)		11.6	11.8	8.0	0.7
Dundgobi	Erdenedalai	1341	5543	1576	80
	Ulziit	591	2425	676	35
	Gurvansaikhan	482	1995	592	29
	Aimag total	8077	363163	9587	145

Percent of aimag's total (%)		29.9	2.7	29.7	1.8
Hentii	Bayan - Ovoo	248	1030	339	15
	Dadal	421	1614	480	25
	O'mnodelger	923	3733	1235	55
	Aimag total	8016	31697	10271	96
Percent of aimag's total (%)		19.9	20.1	20.0	1.2
Bulgan	Bulgan	328	1274	844	20
	Bugat	385	1319	467	23
	Teshig	577	2308	755	35
	Aimag total	7808	29681	11760	77
Percent of aimag's total (%)		16.5	16.5	17.6	1.0
Total		44786	510328	99894	508

Samples 100% represent herders' households living in rural area. But questioned people are herders themselves or their representatives from their families. 82% of questioned people are herders. All age and education classes of people were involved. Questioned women are twice less than the questioned man (Table 4.6).

71% of surveyed people are with 31-60 age and they can be considered as experienced in animal breeding and represent the herders communities (Table 4.7).

People with different education involved in survey. People with primary and secondary education are dominant composing 66.6% of total (Table 4.8).

2.4% of surveyed people are living alone, 22.4% in a family with 2-3 members, 41.3% in a family with 4-5 members and 35% are living in a family with size of more than 6 members. 70.1% of households are whole family with parents and children (Table 4.9).

Table 4.6. Job and sex of surveyd people

	Summary	Bulgan	Dundgobi	Zavhan	To'v	Khentii
Surveyed households	508	77	145	123	68	96
Living in rural area, %	81,5	95,2	91,8	60,5	70	83,2
Sex:						
Male, %	66,6	56,6	84,3	64	47,1	71
Female, %	33,4	43,4	15,7	36	52,9	29
Job:						
Herders, %	82,0	86,7	94	64	77,2	84,1
Others, %	3,7	3,7	3,7	7,9	10,0	
Retired, %	2,9	4,8		4,4	5,7	
Unemployed, %	3,5	4,8		7,9		

Table 4.7. Age of surveyed people

Age class	Summary	Bulgan	Dundgobi	Zavhan	To'v	Khentii
Younger 20, %	2,4		1,5	7,9		1,9
21-30, %	13,4	10,8	11,9	11,4	17,1	17,8
31-40, %	26,1	28,9	28,4	23,7	30	19,6
41-50, %	26,6	13,2	26,9	27,2	41,4	30,8
51-60, %	18,5	28,9	16,4	19,3	5,7	16,8
Elder 61, %	14,3	18,1	14,9	15,8	5,7	13,1

Table 4.8. Education of surveyd people

Education category	Summary	Bulgan	Dundgobi	Zavhan	To'v	Khentii
High, %	2,8	3,6	1,5	3,5		4,7
Special, %	11,7	13,2	4,5	11,4	21,4	13,1
High school, %	14,7	16,9	14,2	8,8	20	15,9
Secondary, %	38,0	45,8	41	35,1	31,4	32,7
Primary, %	28,8	16,9	36,6	36,8	22,9	28
Non certified education, %	2,2	2,4	0,7	3,5		3,7

Table 4.9. Size of Surveyd Households

Family size	Summary	Bulgan	Dundgobi	Zavhan	To'v	Khentii
Living alone, %	2,4	1		4,4		5,6
2-3 members, %	22,4	22,9	28,4	19,3	15,7	22,4
4-5 members, %	41,3	44,6	39,5	36,8	52,9	38,3
6-7 members, %	26,0	26,5	24,6	30,7	24,3	23,4
8-9 members, %	7,1	3,6	8,2	7,9	5,7	8,5
More than 10 members, %	2,0	1	0,7	3,5	1,4	2,8

39.6% of households have children with kindergarten age, 61.6% school age and 14.4% have students in college, institute and universities. Also, 30.9% of households have retired and 36% have unemployed family members. More families with unemployed people are in To'v aimag (Table 4.10).

Table 4.10. Employement and children

	Summary	Bulgan	Dundgobi	Zavhan	To'v	Khentii
Employment:						
Labor age, employed, %	74,7	84,3	88,8	59,6	58,6	72,9
Labor age, unemployed, %	36,3	41	12,7	49,1	60	31,8
Retired, %	31,9	44,6	30,6	31,6	21,4	26,2
Children:						
Kindergarten, %	39,1	33,7	43,3	34,2	45,7	41,1
School age (1-10th grade), %	61,7	61,4	61,2	65,8	65,7	55,1
College, University age, %	14,5	15,7	9,7	13,2	17,1	18,7

Herders' Household Livelihoods

97% of surveyed local officials is considering that climate hazards are the root causes for mass losses of livestock and dramatic increase of poverty in rural area.

In average 54% of surveyed herders considered that the herders' livelihood was worsened since 1998 (Table 4.11). Among the surveyed aimags the herders' livelihoods have worsened more in Zavhan (78%) and less in Khentii (21.5%).

As we investigated, there are two reasons for such a difference. Zavhan had more frequent and severe drought than the Khentii, and animal breeding in Khentii is a mix of settled livestock farm and nomadic pastoral animal husbandry. By severity of winter there is no big difference of these two aimags, snow falls even more in Khentii, but here herders have more resources and good tradition for sufficient haymaking, and less head of animals in what cattle of better breed is dominant. Herders in Khentii are less dependent from the weather and climate than the herders of Zavhan.

Comparing Zavhan with Dundgobi we found that Zavhan had more frequent climate hazards than Dundgobi. Severe dzud affected Dundgobi in 2000, but Zavhan in both 2000 and 2001. Investigating root causes of worsening of herders' livelihoods we've conducted detailed study on weather and climate hazards for each of aimags and the outputs are described in Chapter 5.

Table 4.11 Herders' livelihoods in the last 5 years

Livelihoods since 1998	Summary	Bulgan	Dundgobi	Zavhan	To'v	Khentii
Improved, %	7,9	4,8	0,7	3,5	5,7	14
No change, %	35,4	37,3	40,3	14	25,7	64,5
Worsened, %	54,3	56,6	59	78,1	65,7	21,5

Livelihoods of herders' households are in direct dependence of livestock and incomes generated from it on the natural resources and weather. 92% of those livelihoods had worsened considered that environmental and climatic change caused worsening of their livelihood.

58.5% of surveyed households were with less than 100 head of animals, 5% of which are without any animals (Table 4.12). 30.9% of households with 101-400 animals, while only 6% has more than 400 animals. It shows from one side we surveyed poor, middle and rich households, and from other side we can find that the poor households were became

dominant in the sample. Households with less than 100 animals are more in Zavhan (67%), while it is less in Dundgobi (36%).

Table 4.12. Per cent of surveyed households grouped by owning animals

Groups by owning animals	Summary	Bulgan	Dundgobi	Zavhan	To'v	Khentii
Without livestock, %	5,2		1,5	8,8		5
With 1-50 head, %	35,7	51,8	13,4	47,4	24,3	30,8
With 51-100 heads, %	17,5	19,3	20,9	10,5	24,3	20,6
Sub total	58,4	71,1	35,8	66,7	48,6	56,4
With 101-150 heads, %	9,3	8,4	16,4	9,6	7,1	10,3
With 151-250 heads, %	11,3	9,6	14,2	6,1	25,7	7,5
With 251-300 heads, %	5,5	3,6	14,2	5,3	7,1	4,7
With 301-400 heads, %	4,8	3,6	7,5		8,6	7,5
With more than 401 heads, %	6,2		10,4	5,2	2,9	9,3

UN Millennium Declaration resolved to halve, by the year 2015, the proportion of the world's people whose income is less than one dollar a day[27]. In our understanding, implementation of this goal should go along with the study and assessment of people's income, particularly the most vulnerable and poor ones. At meantime in Mongolia there is no system, no information to serve to this purpose except the very rough, general and irregular statistics.

We did some attempt to gather information on income of herders' households' with questionnaire. As we found, by monthly income the 33% of surveyed households have income less than 1000 tug (US$0.85), and 23% 1001-2000 tug (US$0.86-1.71) per day (Table 4.13). Income generation is less in To'v and Zavhan aimags. We recognized that the herders don't like to give information on their income and head of livestock. However, data is not complete and it can be used only for general consideration. Data on head of animals per households were completed from the soum logbooks of annual livestock census.

Annual income of herders does not distributed evenly throughout a year. It has monthly and seasonal dynamic as the products of animal origin differ by month and season. For instance, production and sale of meat mostly occur in autumn and early winter, milk and diary products in summer and autumn, wool, cashmere in spring and summer, etc. The 24-season calendar that we designed and described in the section 3 of Chapter 2 clearly shows this dynamic.

By annual income the 37% of households have less than 500 thousands tug (US$427) while 12.7% have 900 thousand tug (US$769) income (Table 4.14). There is no significant deference among the aimags. Household with more income are in Dundgobi, while with less income are in Zavkhan and To'v aimags.

[27] United Nations Millennium Declaration, Resolution adopted by the General Assembly

Table 4.13. Per cent of surveyed households grouped by monthly income

Groups by monthly income	Summary	Bulgan	Dundgobi	Zavkhan	To'v	Khentii
Up to 15000 tug., %	17,2		4	18,8	17,1	15,9
With 15001-25000 tug, %	9,6		13,4	12,3	7,1	8,4
With 25001-30000 tug, %	6,5	11,1	10,4	6,1	7,1	6,5
Sub total	33,3	11,1	27,8	37,2	31,3	30,8
With 30001-40000 tug, %	8,2	7,4	9	5,3	15,7	6,5
With 40001-50000 tug, %	9,3	25,9	8,2	7,9	11,4	9,3
With 50001-60000 tug, %	5,2		3,7	3,5	4,3	7,5
Sub total	22,7	33,3	20,9	16,7	31,4	23,3
With more than 60001 tug., %	10,7	7,4	27,7	11,4	5,7	13,1

Table 4.14. Per cent of surveyed households grouped by annual income

Group by annual income	Summary	Bulgan	Dundgobi	Zavkhan	To'v	Khentii
Up to 200000 tug., %	13,7	16,9	6	8,8	15,7	17,8
200001-300000 tug, %	11,0	13,2	13,4	9,6	12,9	11,2
300001-400000 tug, %	6,5		6	7,9	4,3	6,5
400001-500000 tug, %	5,8	4,8	6,7	3,5	15,7	1,9
Sub total	37	4,8	32,1	29,8	48,6	37,4
500001-700000 tug, %	11,3	14,5	11,2	14	10	9,3
700001-900000 tug, %	4,8	4,8	10,4	4,4	2,9	6,5
More than 900001 tug, %	12,7	8,4	23,9	14,1	7,1	15
Sub total	28,8	27,7	45,5	32,5	20	30,8

UN Millennium Declaration also resolved to halve, by the year 2015, the proportion of people who suffer from hunger. In our study we found that the 10% of surveyed herders noted their feeling of hungry. We gathered detailed data on food of herders' households. Within the given time of this study project we could not complete data processing. Integrated information processing and detailed analysis is required further to get more useful outputs.

Meanwhile we can note that the monthly expenses of herders' households for food are very modest. 59% of households spend less than US$1.7 per day for food (Table 4.15). More households in To'v, Zavhan and Dundgobi aimags spend fewer expenses for food. Herders in Dadal soum of Khentii aimag, Teshig soum of Bulgan aimag are well known with home made cream, butter and bread.

As the livestock is the main source for food the herders' households, food supply depends from weather and climate very much. They regular menu is consisted from meat, milk and diary products, wheat floor, rice, salt and sugar. For cooking they use a few vegetables and vegetable oil. Fish, chicken, pig, fruits and cakes are almost not used. 6% of the surveyed herders grow some vegetables.

Table 4.15. Food expenses for surveyed households

Monthly expenses for food	Summary	Bulgan	Dundgobi	Zavhan	To'v	Khentii
Up to 20000 tug., %	21,6	12	24,6	19,3	32,8	16,8
20001-30000 tug., %	17,5	19,3	17,9	22,8	20	10,3
Sub total	39,1	31,3	42,5	42,1	52,8	27,1
30001-40000 tug., %	11,0	15,7	11,9	13,2	10	9,3
40001-50000 tug., %	6,2	8,4	6	5,3	4,3	8,4
50001-60000 tug., %	3,1	2,4	4,5	4,4		3,7
Sub total	20,3	26,5	22,4	22,9	14,3	21,4
More than 60001, %	4,5	2,4	9	2,6		9,3

Households' food consumption has some seasonal dynamic. Meat is used more in winter, milk and diary products, wheat flower, rice and sugar consumption is increased in summer as rural households usually have "summer guest" and visitors from the cities: their school children, students, relatives and their children etc, those who want to spend their summer vacation in rural area. In general the herders from their "extensive and underdeveloped" herds supply themselves by fresh food and their children and relatives living in the settled area by free meat, milk and diary products. For winter their prepare beef, horse meat and mutton, cream, butter and curds from sour milk, and for spring and summer 10-50 kg dry meat for their own and several other households living in the Ulaanbaatar, aimag and soum centers.

Impact of climate hazards on assets and incomes of herders' households

Natural disaster and extreme meteorological events affect both assets and incomes of herders. Therefore impact assessment is to consider both assets and income.

In our study impact assessment is made for livestock and other assets of herders' households such as the gger (or house), the shelters for animals, the vehicles and the home facilitates used for animal breeding and production, and the others.

For selection of income categories we based on the outcomes of the households' livelihood survey conducted by the National Statistical Board in year 2002. 11 income categories and their distribution were found in this survey. But the survey showed that herders earn nothing from social care, and very little incomes (less than 3%) from fixed assets, monetary aid and gift, loan and others. 70% of herders' income constitutes from income gathered from the sale and direct use of animals and its products. Therefore, in our study we focused on the 5 categories that constitute 91% of herders' incomes, namely:

1. Income from livestock
2. Salary
3. Subsidy, pension
4. Income from non-livestock job, services
5. Income from trade (perhaps, non-livestock, its product)

92.4% of surveyed households lost their animals in the last 5 years due to hazardous meteorological phenomenon. 53% of surveyed households lost the most or all animals due

to drought and dzud disasters. High number of dramatically affected households is in Zavhan and less affected households in Bulgan and Khentii.

Table 4.16. Households lost their animals in the last 5 years

	Summary	Bulgan	Dundgobi	Zavhan	To'v	Khentii
Lost few animals, %	40,2	42,2	14,9	16,7	34,3	69,2
Lost half of animals, %	10,0	20,8	35,8	10,5	14,3	6,5
Lost more than half animals, %	26,5	24,1	43,3	35,1	34,3	12,1
Lost all animals, %	16,8	2,4	3	35,1	8,6	3

In per cent of total surveyed households

The herders in forest steppe area, for instance Bulgan and Khentii had better condition for winter preparedness with haymaking. With sufficient fodder resources they feed their animals keeping in shelters when occur extreme situation on pasture as heavy snowfall and hazardous windstorm, etc. Herders in Zavhan, To'v aimags also makes hay, but consequent droughts caused reduction of phytomass of pasture grasses, hay resources and preparation of other fodders.

In the steppe and Gobi area there is no grasses for haymaking. For instance, in Dundgobi herders usually prepare the hand made supplements from wild leek and onion, etc. Livestock overpass winter and spring with their own resource accumulated in summer and autumn - fatness. But due to drought in summer of 1999 the animals couldn't get sufficient fatness, which caused mass loss of 2000.

Households with less human capacity and monetary sources couldn't go far away to better pasture with their animals, make hay from distant hay-field or buy fodder from the market or government reserve fund even with reduced price. These households were the most vulnerable in climate hazards and have severely affected.

35% of surveyed herders estimated their losses. However, estimated annual animal losses range from 90 to 3600 US dollar.

For quantitative impact assessment we've used household initial examination checklists and composed a two-dimensional impact matrix with 0-3 scores as serious impact 3, moderate impact 2, low impact 1 and no impact 0.

Below is shown an example of impact matrix that evaluated by the experts for households assets in general (Table 4.17). However such assessment should be conducted for the particular area, for given period of time and for real occurring events. We gathered data from the herders' households for such assessment, but there was lack of ready-made computer software to process this big amount tabular data.

On this evaluation example the most affected asset is livetsock and the most directly affecting events for assets are flood and fire.

Table 4.17. Example of Impact Matrix

No	Assets / Hazardous events:	Livestock	Gger, house	Shelter	Transport, equipment	Others (pasture)	Total
1	Dzud	3	3	1	2	1	11
	a) White dzud	3	2	1	2	1	10
	b) Iron dzud	3	2	1	3	1	11
	c) Black dzud	3	1	1	1	1	7

	d) Hoof dzud	3	1	1	3	1	9
	e) Hunger dzud	3	1	1	1	3	9
2	Drought	3	1	0	1	1	7
3	Desertification	3	1	0	1	1	7
4	Heavy rain	3	1	2	1	0	8
5	Thunder	3	3	2	3	0	12
6	Continues extreme hot	3	1	1	1	3	9
7	Hail	3	1	2	2	0	9
8	Flood	3	3	3	3	3	15
9	Fire	3	3	3	3	3	15
10	Snow storm	3	3	2	1	1	11
11	Continuous extreme cold	3	1	0	1	1	7
12	Dust storm	3	3	2	3	0	12
13	Earthquake	3	1	3	0	0	7
	Total scores	54	32	26	33	21	

Climate hazards followed with mass animal losses affect negatively the herders and their family members. To have stress and frustration (66%), disease and disable (27.3%), incur debts (18%), become hungry (10%) or an alcoholic and out-school children (17%) are listed among the negative impacts to herders' households. 89% of herders who got disease or disabled they could get medical service. Rest of herders couldn't get health service, and named the reasons for it such as high cost for treatment and lack of money to buy medicine (65%) and far distance from the soum center.

Education of herders' children is an important for further improvements of their livelihoods. UN Millenium Declaration resolved to ensure that, by the year 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling and that girls and boys will have equal access to all levels of education. But 17% of suervyed households have withdrawal of children from school. Need of children labor for animal breeding, lack of monetary sources to dress and boot them, and to provide training materials and facilities are named among the main reasons which caused children to left the schools. There is awareness on increase of illiterate youth in rural area.

Erdenedalai soum of Dundgobi aimag

More detailed impact and vulnerability study has been conducted for Erdenedalai soum of Dundgobi aimag. Below is showing some outputs regarding to the herders livelihoods.

Five groups have been identified in the Poverty Reduction Strategy Paper (PRSP) as being particularly vulnerable: single parent households with many children; households with less than 100 head of livestock; unemployed persons; uneducated persons as well as the elderly, disabled, street children and orphans[28]. In our survey we've tried to get some data on and analyze vulnerable households.

Erdenedalai soum has 1700 households with total of more than 7000 inhabitants. Female is 2% more than the male. Children compose 36%, people of pension age 9%, and disabled people are 4%. In 2002 population decreased by 200 people compare to 1998 (Table 4.18).

10% out of 1700 households are women headed. By end of 2002, 87% of soum households had livestock, 73% of households are herders, 88% of population lives in households with the livestock and 74% of population lives in the herders' households.

[28] Mongolia Millennium Development Goals Report, February 2003

Erdenedalai soum has dramatically affected by the dzud disaster 2000. All surveyed herders had loss in dzud of 2000. Lost all animals 6%, lost more than half- 55%, lost half of herd – 22%, lost a few animals 17%.

After dzud of 2000 number of poor households increased dramatically. In 1998 there were registered 3 households as without livestock and 7 households as very poor. But in 2001 number of households without livestock reached to 139, and very poor households to 173 (Table 4.19).

In year of dzud (2000) 100 very poor households were registered, but it increased to 173 in the next year. In 2002 number of very poor households were reduced, but number of households without the livestock has remained to increase.

Annual migration of households from soum to other location is ranging 2-5% since 1998. Total 328 households have migrated in the last 5 years.

Table 4.18. Population of Erdenedalai soum, 1998-2002

Year	Population						Per cent in total, %				
	Total	Male	Female	Children	Elder age	Disabled	Male	Female	Children	Elder age	Disabled
1998	7218	3528	3690	2773	684	230	49%	51%	38%	9%	3%
1999	7340	3650	3690	2317	672	284	50%	50%	32%	9%	4%
2000	7362	3564	3798	2688	674	344	48%	52%	37%	9%	5%
2001	7185	3541	3644	2509	672	358	49%	51%	35%	9%	5%
2002	7007	3468	3539	2566	669	213	49%	51%	37%	10%	3%
Average	7222	3550	3672	2571	674	286	49%	51%	36%	9%	4%

Table 4.19. Herders' households of Erdenedalai soum, 1998-2002

Year	Number of households					Per cent in total, %			
	Total	Woman headed	Very poor	Lost all animals	Moved to other	Woman headed	Very poor	Lost all animals	Moved to other
1998	1724	150	7	3	41	9%	0,4%	0,2%	2%
1999	1673	162	16	89	48	10%	1,0%	5,3%	3%
2000	1759	184	100	126	77	10%	5,7%	7,2%	4%
2001	1767	169	173	139	81	10%	9,8%	7,9%	5%
2002	1723	196	142	172	81	11%	8,2%	10,0%	5%
Average	1729	172	88	106		10%	5%	6%	4%

Source: Local government office, 2003

Dzud affected income of herders. In Table 4.20 is showing comparison of before (1999) and after dzud (2002) monthly income of the herders' households. In 1999, 36% of households had income below 30 thousand tug., and in 2002 this number had increased to 81%. In 1999, 18% of herders were with income more than 60 thousand tug., but in 2002, only 4% of households have this amount of income.

Similar comparison is made for O'lziit and Gurvansaikhan soums of Dundgobi aimags. The percent of households of two soums grouped by the monthly income is showing in Table 4.21 and 4.22.

Table 4.20 Comparision of monthly income of herders, Erdenedalai soum

Year	Monthly income of herders households, thousand tug.							
	<10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 <
1999	0%	11%	15%	26%	17%	13%	7%	11%
2002	24%	35%	22%	11%	3%	2%	2%	2%

Table 4.21 Comparision of monthly income of herders, O'lziit soum

Year	Monthly income of herders households, thousand tug.							
	<10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 <
1999	0%	3%	15%	6%	12%	18%	18%	29%
2002	6%	21%	29%	26%	9%	6%	0%	3%

Table 4.22 Comparision of monthly income of herders, Gurvansaikhan soum

Year	Monthly income of herders households, thousand tug.							
	<10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 <
1999	0%	3%	13%	10%	17%	7%	7%	43%
2002	13%	26%	23%	19%	6%	3%	0%	10%

Natural Environment and Climate Change and Variability

Questioned all local officials and 97.6% of the herders is considering that climatic and environmental changes are reality in their living area. They named the changes listed in Table 4.23.

The herders of Bulgan and Khentii aimags named the heavy snowfall, reduction of drinking water, of Bulgan and Zavhan aimags consequent drought, of To'v, Zavhan and Bulgan occurrence of frequent dzud is considered as the sign of climate change.

The herders of Bulgan, Zavhan and Khentii aimags named drying up rivers and springs and reduction of hay making land yield, the herders of Bulgan, Dundgobi and Khentii aimags decrease of pasture land feeding value, the herders of Dundgobi, Zavhan and To'v aimags sand movement and intensification of desertification as the most significant change in natural environment.

The herders also noted decreasing of a number of the forage plant species, animal fatness and consequently its products such as meat, milk and negative impact on the process to form wool, cashmere and molt hair.

In order to adopt a sound theoretical basis for change and variability observed and named by the herders the professionals of "Risk study" working group have conducted detailed study of weather, climate, pasture soil and vegetation. Findings of these studies are in 2003 annual report of climate change study conducted by Risk study working group and JEMR Consulting since 2002[29].

[29] Potential impacts of climate change and v&a assessment for grassland ecosystem and livestock sector in Mongolia, Annual report edited by R.Oyun, Risk study working group and JEMR Consulting, 2003

Table 4.23. Environment and climate changes named by the herders

Weather and climate	Summary	Bulgan	Dundgobi	Zavkhan	To'v	Khentii
Heavy snow fall, %	69,8	97,6	64,9	75,4	45,7	79,4
Frequent dzud %	67,4	94	59,7	84,2	77,1	43
Consequent drought, %	59,1	91,6	68,7	86,8	61,4	28
Reduction of drinking water, %	27,1	48,2	24,6	21	17,1	40,2
Pasture						
Reduced hay making land yield, %	67,7	87,9	27,6	73,7	50	73
Drying up rivers and springs, %	55,7	87,9	9	52,6	24,3	79,4
Decreased pasture land feeding values, %	51,9	79,5	74,6	50,9	30	67,3
Reduced pasture area, %	40,5	75,9	37,3	37,7	40	43,9
Pasture degradation, %	39,5	33,7	48,5	25,4	47,1	49,5
Sand movement, %	17,2		13,4	35,1	14,3	
Desertification	10,7	16,9	30,6		44,3	

There is a seasonal specific of impacts on animal breeding and herders' livelihoods. Winter and spring is high risky season with most animal losses. 80% of herders considered spring as a season with more hazardous phenomenon, while 73% is considered winter with hazards. 90% of herders named spring as the worst season with mass animal losses while 62% named winter as the worst. Herders named spring as the hardest for all type of animals.

The herders named the worst hazardous season of the last 5 years as the following:

40% - winter and spring of 2000;
28.5% - winter and spring of 2000-2001;
23% - winter and spring of 1999;
21.5% - winter and spring of 2002; and
15.3% - winter and spring of 2003.

Meteorological data were collected for years and months, when herders considered as the harshest weather was occurred and hazardous events, which could cause animal losses, sorted and described briefly in full report on the web www.agronet.mn. Unfortunately there is a lack of information on livestock losses after each of hazardous events. Therefore assessment of quantitative correlation between meteorological events and animal losses is not possible. There is need to develop methodology for integrated assessment of impacts, herders households vulnerability and risk for animal losses which is main asset and source of income of herders households.

Access to weather forecasting, hazard warning information and activities for preparedness

The most herders have access to weather forecasting and hazard warning via radio – 92.9%, from local officials – 31.4%, TV – 10%, visitors – 7%, and newspaper – 5.7%. But 7% of surveyed households have no access to weather information.

31.4% of the herders received hazard warning information one day, 13% in 2 days, 11% in 3 days and 23% few days in advance.

The herders' activities for preparedness for meteorological hazards are: To maintain sheds for livestock – 46%, prepare fodder – 49%, reserve foods – 14%, prepare firewood, fuel – 26%, maintain ggers – 27%, attention to animal breeding – 60%.

Remoteness of herders from market

Market economy newly introduced to Mongolia in the last decade also affects the herders' livelihoods. Mongolia has been exercising central market – Ulaanbaatar oriented transition while the herders - one third of population is living sparsely distributed over vast territory. Here infrastructure plays main role. Low developed infrastructure (road, communication, electricity, etc.) increases cost for social services and access to market while increased needs caused by the climatic hazards to migrate with the animals far away from the settled area seeking better pasture, is tent to increase of herders' remoteness.

One-centered market, remoteness of rural population with low developed infrastructure along with frequent climatic hazards is a serious complex development issue that increases urban and rural difference, and rich and poor divide, and threat sustainability of entire country.

Expert –economist Tseveen studied relationship between heads of livestock per household, distance to the central market and family size. He found some optimal herd structure depending from the distance to the central market (Table 4.24), which is proposed for further consideration and detailed study in connection with the natural zones and resources.

Table 4.24. Head of animals per herder's household sufficient to provide livilihood standards[30]

Family size	Recommended heads of animals per households living away from the central market (Ulaanbaatar)																	
	500 km away						1000 km away						1500 km away					
	Camel	Horse	Cattle	Sheep	Goat	Total	Camel	Horse	Cattle	Sheep	Goat	Total	Camel	Horse	Cattle	Sheep	Goat	Total
1 person	5	8	9	79	28	129	5	8	10	82	36	141	5	8	11	85	44	153
2 person	7	12	13	93	44	169	7	12	14	96	52	181	7	12	15	99	60	193
3 person	9	18	18	188	56	289	9	18	19	191	64	301	9	18	20	194	72	313
4 person	9	24	21	193	72	319	9	24	22	196	80	331	9	24	23	199	88	343
5 person	9	30	28	233	88	388	9	30	29	236	96	400	9	30	30	239	104	412
6 person	9	36	36	273	118	472	9	36	37	276	126	484	9	36	38	279	134	496
7 person	9	42	42	289	118	500	9	42	43	292	126	512	9	42	44	295	134	524
8 person	9	48	49	299	148	553	9	48	50	302	156	565	9	48	51	305	164	577
9 person	9	55	59	309	161	593	9	55	60	312	171	607	9	55	61	315	179	619
10 person	9	58	66	313	198	644	9	58	67	316	206	656	9	58	68	319	214	668

[30] By economist PhD. Tseveen, June-September 2003

Support and Aid to the Herders

Disaster relief and aid of government, international organizations, donors and communities has played a significant role to overcome consequent climate hazards of the last years, and recover its' losses measured in many hundred millions of dollars.

The herders appreciated the value of relief and aid measures. 33% of the herders have valued Red Cross aids, 24% support from the Local government, and 16% aid from the Central government, 11% aid from the International and Non-governmental organizations. But 33% of surveyed herders complained that they didn't get any support and aids. Only 2 households out of the surveyed 508 households were involved in some aid projects.

The most of herders is considering the improvement of their own internal capacity with increase of assets and incomes, which the most cases is related to improve livestock quality and raise animals' quantity. Therefore, aid and support is mostly required for these two main objectives. Experienced herders are willing to raise father animals that are adaptive in the climate hazards and more productive for wool, meat and milk, to protect their offspring, and to replace breeding males in a herd per 2 years. Improving the livestock quality and restocking with the livestock is crucial to reduce vulnerability of those herders who have desire to breed animals as a source for their livelihoods.

The local officials, in order to identify the poor households to be involved in aid programme, use criteria as few animals, low income generation, lack of labor force, etc. They are considering getting support for the followings that might be effective measures to alleviate poverty:

- Restocking
- Intensification of livestock sector
- Save time
- Proper consuming
- Employment
- Low interest rate and long-term loan
- The SME development
- Reliable power supply
- Integrate livestock with agriculture
-

5.0 Findings of the Policy Research

Mongolians today are experiencing a profound transformation in virtually all facets of life. Managing this change in ways, which promote equitable and sustainable growth is the core development challenge facing the nation today[31].

The herders' livelihoods stand at the cross-section of four policy directions, namely, socio-economic development (particularly rural and livestock sector development), poverty reduction, disaster mitigation and emergency management and adaptation to climate change. In the study the several strategic and policy documents have been surveyed and commented. Brief description of policy research is given below.

Local government efforts to reduce unemployment, poverty, to improve breed of livestock, household capacity and some achievements are shown on the example of To'v aimag.

According to the TOR the task was for the outputs of the study to contribute to government policies on poverty reduction, rural development and risk management of the livestock sector. But, while the research was being conducted, a series of key policy documents such as "The State Policy for Food and Agriculture Development", "Programme for Regional Development - 2010" were approved by the Mongolia Parliament (June 2003). Also, Mongolia's Pro-poor Economic Growth Strategy has been developed by the Government and approved by the World Bank and International Monetary Fund (September 2003). Therefore, in our study we more concerned about the methodological issues for implementing approved strategies and policies rather than policy development.

5.1. Government Strategy for Development

Economic Development

Mongolia Government overall policy objectives and measures in 2001 were directed[32] at the deepening of economic reforms, supporting domestic industry and exports, accelerating real sector growth, securing sustainable human development and promoting regional development in the country. As result of actions taken to implement the policy agenda, macroeconomic stabilization was enhanced, budget arrears were reduced, private sector credit increased substantially, manufacturing production grew sharply, and pensions were increased.

The main objectives of economic policy for 2002 was to accelerate economic growth, enhance social security services and to deepen rural development through improvement to economic and financial conditions, promotion of domestic industry with focus on export production, while providing for sustainable recovery in the agricultural and cropping industries. To achieve the objectives the Mongolian Government plans to undertake a series measures to deepen restructuring, support domestic industry and promote private sector development. Medium term key targets are shown in Table 5.1.

[31] Mongolia Millennium Development Goals Report, February 2003
[32] Economic Development Report for 2001, Ministry of Finance and Economy of Mongolia, 2002

Table 5.1. Mongolia key targets for 2002-2005

	2002	2003	2004	2005
GDP growth, %	4.0	5.0	6.0	6.5
Inflation rate, %	6.0	5.0	5.0	5.0
Overall Budget Deficit to GDP, %	-7.1	-6.6	-6.0	-5.5
Population average, thousand persons	2 443.8	2 479.9	2 515.2	2 549.3
Unemployment rate, %	4.7	4.7	4.6	4.6

Source: Ministry of Finance and Economy

The government successfully achieved the key targets of year 2002 and 2003 (preliminary) as it is shown in table below.

Table 5.2. Achievent of key targets in 2002 and 2003

	2002	2003*
GDP growth, %	4.0	5.3
Inflation rate, %	1.6	5.0
Overall Budget Deficit to GDP, %	-5.9	-5.6
Population average, thousand persons	2459.4	
Unemployment rate, %	3.4	

** - Preliminary information*

Government Programme

The Government basic objectives for 2000-2004:

- To continue and deepening of economic renovation and provide higher growth
- To follow the export orientated economic policy in order to provide sustainable high growth
- Respecting education and culture to develop people - the pillar of development
- To decrease livelihoods divide by the way of improving social wealth and income distribution, and creating an optimal system for social care
- To establish high capacity, responsible and good governance capable to develop and implement state policy for economic and social development with consideration of Mongolia specifics

Below is given some comments (with italic) on the implementation of the government programme.

Social policy

- To halve number of households with income below the living standards compare to 1999:

  Comment: In surveyed soums the number of poor and low-income households has been increased dramatically since 1999.

- To increase three times the least of salary compare to 2000:

Comment: This is not applicable to the herders as their labor for private herds is not valued and not for salary. In surveyed soums herders' income has decreased sharply since 1999.

- To improve social care of herders and private sector involving them in insurance:
  Comment: Herders are living under direct risk of weather and climate. But they are who have less benefit from the existing social care system except a few elder herders who could got pension from their work at the cooperatives during the socialist time. The most of herders, particularly the younger herders don't pay tax for social insurance, health care and they will not get pension at elder age.

- In connection with implementation of the new Law on Labor the standards for labor safety and hygiene will be renovated.
  There is no approporiate statements in the law regarding to the herders' labor and no any standards for their safety and hygiene.

- To encourage the initiatives for creation of new job places and broadly implement support with small credits
  Comment: No increase of employement at the soum level compare to 1999. The herders who lost thier animals in dzud disaster migrated to soum, aimag centers and cities causing increase of unemployement and poverty in urban areas. No any remarcable initiatives for creation of new job places in rural areas if will not consider some seasonal work with mining, auto road construction and agriculture. Small loans not accessable to the herders.

- Training and re-training of unemployed and vulnerable groups.
  Comment: Herders lost their animals in dzud disaster not secured by unemployement insurance and the most of them not involved in training and re-training programme.

- To improve training programme and operation of professional training centers.
  Comment: There is no professional training and re-training centers for the herders.

- To create fund to encourage development of SME in rural area, planting crop, vegetable and fruits, and chicken and bee farms, etc.
  Comment: No soums were found among the surveyed soums, which has created such a fund and well developed SMEs, or established other than the livestock farms. Herders are still don't have access to the credit.

- To develop and implement policy on in-migration of population in connection with regional development.
  Policy and programme to 2010 on regional development has been developed and approved by the Parliament. But there is no study and assessment of human and financial resources, no consideration of wishes and real potentials of grass roots of the particular area, no well-developed structure, and no managed and coordinated activities for thier implementation.
  No challenging and suppotive mechanizm to involve private sector and rural community in regional development. The most people in soums have no information and well understanding of this programme.
  Also, no well- developed policy for coordination of rural-to-urban mass migration.

Regional and rural development policy

- To develop strategy and policy documents, legal environment for regional, rural and livestock sector development:

  The following documents have been developed and approved:

  1. MP Resolution, Concept of Regional development of Mongolia, No.57, 2001-Jun-14
  2. MP Resolution, Concept to create economic free zone in Mongolia, No. 87, 1995-Dec-4;
  3. Mongolia Law on Legal right of Altanbulag free zone, 2002-Jun-28
  4. MP Resolution, Creation of Altanbulag trade free zone, No. 38, 2002-Jun-28
  5. MP Resolution, Regional centers, No. 01, 2003-Jan-2
     - Western region: Khovd, Uliastai
     - Khangai region: Kharkhorin, Erdenet
     - Central region: Zuunmod, Darkhan
     - Eastern region: Choibalsan, O'ndorkhaan
  6. Mongolia Law on Regional management and coordination, 2003-May-30
  7. MP Resolution, Measures to implement Law on Regional management and coordination, 2003-May-30
  8. MP Resolution, Approvement of Mid-term strategy for regional development, 2003-Jun-18, Annex: Mid-term strategy to 2010 for regional development of Mongolia
  9. Government policy documents approved in the last 3 years regarding to the livestock sector: Total 36 resolutions of the Government, 39 protocols of cabinet meetings, and 22 orders of the Prime Minister.

- To improve Pasture land management

  Law on Land has been implemented since June of 2002, states possessing of land under winter and spring stands to the households, and use of winter and spring pasture on contractual base to herders' communities. Summer, autumn and reserve pasture is for public use with coordination at bag and among the neighbor herders.

- To involve livestock to insurance

  Animals lost in dzud was not been insured. Insurance companies have not interest to insure livestock in year of dzud and drought.

- To recover losses of 1999-2000 dzud in 2-3 years, and implement restocking with livestock

  Surveyed soums and aimags could not recover the losses of dzud 2000 in 2-3 years as the following years were with drought and dzud. Restocking programme implemented with the limited sources could not benefit many herders who lost all or the most of thier animals.

5.2. Government Strategy for Poverty Reduction

It mean time there are official statistics on human development index and poverty indicators for 1995 and 1998 (see Table 5.3, 5.4). But the most climate hazards that cause mass poverty in both rural and urban areas occurred in 1999-2002. Existing system to monitor households' livelihoods is not appropriate for evaluation of government and

donors' efforts to reduce poverty and implement more operative and effective decision-making and practical measures for poverty reduction.

Table 5.3 Mongolia Human Development Index

Year	Average age for living, years	Adult literacy, %	Enrolled in school, %	GDP per capita, PPP	Index for average life	Education index	GDP index	Human development index
1990	63.7	96.5	60.4	1,640	0.640	0.845	0.467	0.652
1992	62.8	96.5	54.3	1,266	0.630	0.824	0.424	0.626
1995	63.8	96.5	57.0	1.267	0.647	0.833	0.424	0.635
1998	65.1	96.5	62.0	1,356	0.669	0.850	0.435	0.651

Source: State Statistical Department, 1999;
Information on adult literacy is from 1989 population census.

Table 5.4 Poverty indicators, 1995 and 1998

	People below living standards in % of total		Poor people, thousand		Poverty ???..		Severity of Poverty	
	1995	1998	1995	1998	1995	1998	1995	1998
State average	36.3	35.6	820.7	862.9	10.9	11.7	4.8	5.6
Urban area	38.5	39.4	470.5	493.4	12.2	13.9	5.7	7.1
Ulaanbaatar	35.1	34.1	214.1	221.3	10.4	13.0	4.5	7.4
Othe cities	41.9	45.2	256.5	272.1				
Rural area	33.1	32.6	350.1	369.5	8.9	9.8	3.6	4.4

Source: SSD, 1998

Growth Policies for Poverty Reduction

In June 2002 Government of Mongolia prepared for Consultative group meeting Discussion papers on "Medium-term growth policies for poverty reduction"33 in which set up poverty reduction strategy goals as reducing the proportion of people living in extreme poverty by 25% by 2005 and by 50% by 2015, reducing the number of people whose income falls below the minimum living standard by 50% by 2005 and another 25% by 2015.

As set in the strategy the outcome of a comprehensive policy encompassing economy, society, governance and environment is for reducing poverty and ensuring sustainable livelihood of the population. From the discussion paper the followings are related to the rural area and livestock sector.

- Reducing herders' poverty is planned to be implemented mostly through the activities aimed at increasing individuals' incomes and improving pasture and livestock risk management of herders' group or local cooperatives;
- A set of policies for providing the rural areas with services and sound supply of energy, heat, fuel and financial intermediation will be implemented;
- Household and family development is the basis for development.

[33] "Medium-term growth policies for poverty reduction" Discussion papers for Mongolia Consultative meeting, Ulaanbaatar, 2002.

- Organizing a phased work on preparing herders' children to school, providing them with dormitories, improving the learning environment of rural kindergartens and expanding the scope of pre-school education;
- Improving the availability and quality of universal basic health care and services, especially, those provided to the rural population, by ensuring normal operating conditions of soum hospitals over the medium-term period
- Considering climate and low density of population, one important direction in reducing poverty and overcoming social vulnerability will be development of cooperatives, partnerships and household-owned farms engaged in livestock breeding, agriculture, hay-making and fodder production. In this connection, measures to protect and rehabilitate nature and environment as well as production activities and services to use natural resources will be enhanced as well;
- Involve herders and workers in the informal sector in social security, create a legal framework for introducing a sector-specific social security system for workers who work in extraordinary conditions or have a specific work or profession characteristic;
- Construction of number of paved roads and reinforced concrete bridges across the rivers along the road are planned in the eastern part of the country where is vast plains and steppes, suitable for pasture and agriculture development

Comments: However, above-mentioned mid-term strategic items reflect today's reality and the most actual issues. The most valuable and important point in this strategy is that household and family development is considered as the basis for development. To follow the strategy and evaluate its implementation the proper monitoring of impact and management of risk of climatic hazards on sustainability of the households' livelihoods is required.

Adaptation to climate and natural environment change and variability not mentioned among the strategy items. But these would be as starting point of socio-economic scenario and guidance for further development of adaptation policy of livestock sector along with the study of climate hazards' impact on the herders' households.

Strategy Paper for Economic Growth Support and Poverty Reduction

This is the first full government document on poverty reduction strategies. It was elaborated by the Government of Mongolia with collaborations of international organizations and approved by International Development Agency, World Bank and Board of Directors of the IMF in September 2003. The Ministry of Finance and Economy has played the leading role in elaboration of the strategy at national level and has established technical and inter-ministerial governing committees under its leadership.

Specific of this strategy is that poverty reduction is to be supported by pro-poor growth, structural reforms at macro level and ensuring sustainable human development with clear definition of development strategies of main sectors such as education, health, infrastructure, rural development and ICT.

The strategy consists from 6 main chapters, which broadly describes socio-economic situation of the Mongolian transition period, achievements, challenges, present situation and further strategies on poverty reduction and growth facilitation, namely:

- The transition period in Mongolia
- Economic growth support & poverty reduction strategy
  - Government Development Goals and Policy Priorities
  - Extending Participation
  - Sustainable Development and Pro-Poor Growth
  - Acceleration of Economic Growth
- Promotion of economic & financial sustainability
- Improving access to markets
- Ensuring sustainable human development
- Implementing and monitoring the strategy

Priority issues of this strategy are the followings:

- To deepen the reforms for ensuring macroeconomic stability, and to intensify the restructuring process
- To improve the health of the banking and financial sectors
- To recover and develop national industry, to ensure economic growth through supporting export oriented industry
- To speed up the land reforms;
- To support the regional as well as rural development, to intensively develop infrastructure;
- To ensure sustainable development and ecological balance
- To create an equitable environment for ensuring human development, to improve all levels of education, its quality, health service provision and its accessibility
- To create a fair, moral and democratic society that protects concepts of democracy, basic human rights and the freedom of each citizen
- To improve governance and ensure gender equality;
- To reduce unemployment and poverty, to generally improve the living standards of population

The overall implementation and monitoring of the Strategy is to be coordinated by the MFE and its Poverty Research Group (PRG) is to be a main acting body to coordinate implementation, monitoring and reporting for the strategy. A resource for the implementation of the Strategy is estimated as equal to 40-45 percent of GDP per annum.

Comment: It is required to establish a well-managed system with networked structure, mechanism, information sharing and enabling environment to encourage broad participation of civil society organizations and private sector in the implementation, monitoring and evaluation of the Strategy. Also it is required to develop and implement methodology for qualitative and quantitative assessment of efficiency of poverty reduction efforts with appropriate indicators and indices.

5.3. Government Policy to Reduce Risk of Livestock sector

Recently amended or approved laws:

- Protection of Livestock Gene Fund and Health Law
- State Reserve Law
- Cooperatives Law

Approved and implemented Programs related to livestock:

- Improvement of livestock quality and reproduction
- Livestock health
- Social program on Development of Cooperatives
- Green revolution (Alternative source of income for herders)
- White revolution (Milk production)
- Food provision, security and nutrition
- Assisting to protect against drought and dzud disaster
- Elite breeding male sub program

In October 2002 Policy Research Institute published Mongolia Rural Development Strategy[34] in which there were highlighted the following 5 components:

1. Motivate local initiatives
2. Improve risk management capacity
3. Encourage herders' group and cooperation development
4. Create favorable environment for rural social and economic development
5. Agriculture development and food security

Closer look at the strategy paper and a few months development process of such an important policy document arise several discussion points among the experts involved in research of climate hazards' risk. For instance, Mongolia needs to improve its socio-economic capacity in order to improve livelihood of population and to overcome poverty, but it has limited resources and facing frequent natural disasters such as drought and dzud. Donors assisted much in research and development of sustainable development agenda, strategic papers, national action plans, other policy documents covering almost all sectors but there is a lack of financing capacity for implementation of all those. Many brilliant ideas for development, improvement, strengthening have been stayed on paper without realization and becoming useless. Government is under pressure of recent issues. How we should approach to government, other stakeholders to assist them to have more far vision with serious consideration of impact of natural disasters such as drought, dzud, hazardous windstorm, flood, etc? Shall we develop separate adaptation policy document or we should try to put related paragraphs in the existed or under development policy documents? We hope to get clear picture and right answer to above questions from our following studies.

The following project have been implemented for livestock sector development:

- To combat with burtselios deseace of cattle, sheep and goat, 2000-2010
- To combat with cattle parasitic insects, 2002-2004
- To combat with chronic desease of animals, 2003-2007
- To reduce rural poverty
- To strengthen capacity to diagnose epedemic desease of animals

The government and the donors to protect livestock and overcome dzud disaster losses have spent a significant financial resource. The Government during the period from August 2000 to March of 2003 has invested total of 24.3 billion tug. for livestock sector, namely:

[34] Strategy for Rural Development, Policy Research Institute, October 2002

- Protect from drought and dzud: 3..98 billion tug.
- Haymaking and fodder production: 4.7 billion tug.
- Combat with epidemic desease: 4.4 billion
- Increase in livestock: 27.2 million tug.
- Plant protection: 1.7 billion tug.
- Pasture irrigation: 1.4 billion tug.

Donors' aid has been valued as 12 million US dollars:

- The Government of Japan, US$10 million
- The UNDP and the Government of UK, US$652 thous.
- Sweden, US$289 thous.
- The Government of Swetserland, US$218 thous.
- The Government of Greese, US$26.4 thous.
- The Government of US, US$318 thous.
- The Government of Italy, aid valued as US$300 thous.
- The Government of Vietnam, aid valued as US$400 thous.

Comment: We planned to study how much government expended in 1990-2002 for aid and services to herders in emergency and disastrous situation such as dzud, drought, windstorm, etc. Unfortunately we could not find data and information for the study. There is no such a particular item in government budget, therefore any statistical information on it. The most involved and responsible government organization in aid is State Reserve Agency. Information of that agency is not accessible for general use.

The following concepts has been followed by the state for food and agriculture:

- To go along with the regional development vision
- To intensify agriculture, produce safe and ecologically clean food and increase of exports
- To establish a system to protect agriculture from risks caused by nature
- To improve legal environemnt of agriculture sector

The general direction of state policy for food and agriculture:

- Efficient use of natural economic, financial and human resources, intencify agriculture improving production, and improve compatativeness
- Combined development of livestock and agriculture
- Development of pastoral and intencified livestock and agriculture of all types of property, which is well adapted to climate and environmental change and high productive
- Encourage development and introduction of food and agriculture and technology, which produce ecological clean products with low risk and is not harmful to nature.

National Programme to Assist the Protection of Livestock from Drought and Dzud

The Programme notes that "As a result of global climate change, natural disasters and especially droughts and dzud become more frequent, with increasing economic and social losses. The programme, which will determine policies for better use of available personnel and funding, was developed to help provide a system for post-disaster relief. Programme design has been based on an assessment of the efficiency of measures taken by the Government against drought and dzud from 1944-2000 and the immediate lessons and recommendations of the UNDP supported study "Lessons learnt from the 1999-2000 dzud", as well as on ideas from discussion with academics and experienced herding organizations.

The programme has a set of integrated goals:

i. To devise and put into operation all available mechanism to protect livestock from drought and dzud
ii. To improve the system for disaster reduction and relief
iii. To establish relief aid networks and to identify responsibilities and roles of livestock owners, herders and various government agencies in emergencies
iv. To provide strong policy, monitoring and guidance to national natural risk management

Comments: The programme is an example of success stories how research outputs can benefit to the government policy development (see Chapter 4). It has been successfully implemented since 2001 at all levels of government administration with appropriate funding mechanisms. The most activities at state, aimag and soum levels and of the herders to reduce risk of drought and dzud have been conducted along with this programme paragraphs specified by each of responsible organizations and bodies. There is some room for improvements regard to details in Soum Emergency Fodder Fund, estimation of carrying capacity of soum pasture, planning for winter and spring preparedness and livestock insurance, etc.

Priority tasks of Livestock sector of Mongolia

A major conference highlighting the challenges facing rural Mongolia was held on the 27-28 May 2002. The conference brought together representatives of government, private sector and donor community to discuss ways to revive the rural economy and improve living standards for rural Mongolia, and highlighted five key issues as land reform, rural finance, small and medium enterprise development, rural cooperatives and risk management. A major result of the conference was an agreement between government representatives and donor community to work toward developing a more comprehensive and integrated strategy for rural development[35].

Participating above-mentioned conference "Risk study" team put for discussion a framework for risk assessment and management of livestock sector in which climate change impact is considered[36] and got approval from the other participants.

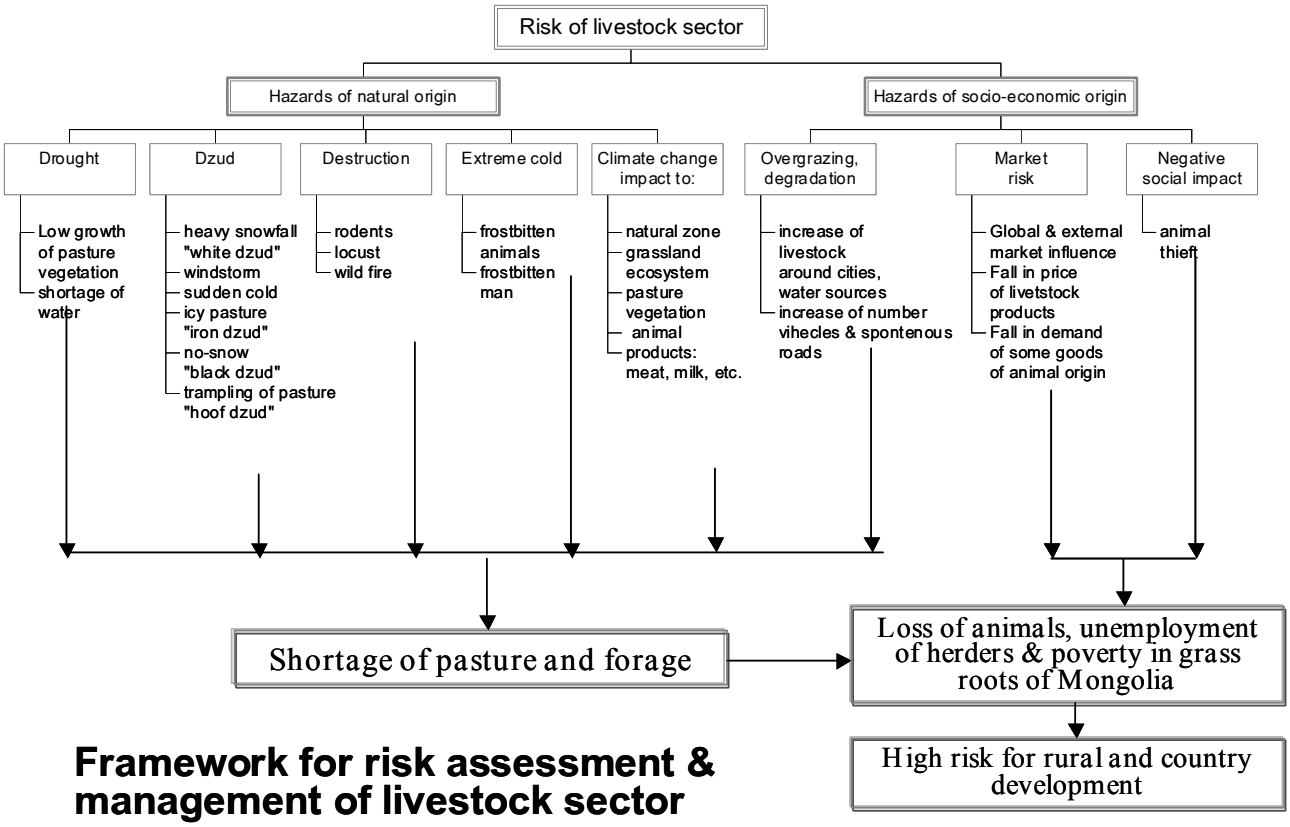
As the conclusion of discussions, the participants of the conference found the highest priority items for inclusion in the "Rural development strategy" as the following:

1. Provide an enabling environment for co-operatives to develop and operate
2. Need for inter-ministry coordination on rural development
3. Need for donor coordination
4. Reform rural public service (health, education, culture)
5. Promote the development of SMEs in rural areas (create employment in rural areas)
6. Include government, civil society organizations, donors, international organizations & others in rural development strategy process through a transparent consultative process
7. Manage pastoral natural risk
8. Encourage and develop rural finance and micro services

[35] Government of Mongolia – Donors "Rural development conference" Conclusion Document, 27-28 May, 2002.

[36] Risk and Development of Livestock sector, "Risk Study" working group, JEMR Co., Ltd., February 2002

Figure 5.1. Framework for risk assessment and management of livestock sector



Source: "Risk Study" working group

9. Create and sustain basic rural infrastructure including rural energy
10. Improve the productivity and sustainability of livestock sector and crops
11. Solve land tenure issues in order to improve land utilization
12. Improve public access to information in rural areas
13. Improve rural marketing structure
14. Create macro-economic enabling, supportive sector policy framework that facilitates and encourages rural development
15. Control livestock number (protect the environment from livestock)
16. The rural development strategy should increase knowledge about rural poverty and address the causes
17. Rural development strategic plan should include regional development, and regions should be evaluated before planning begins
18. Provide adult training to herders and farmers
19. Rehabilitate Steppe areas (pasture land)

As we can see from the above list, risk related to the climate hazards are not directly mentioned among the high priority tasks. But it is considered under paragraph 7 as "Manage pastoral natural risk". Mongolia like other developing countries has limited resources and is concerned with more pressing issues such as economic growth, poverty alleviation and equity, public health, education, energy supply, infrastructure development and other urgent issues. But with partnership development, close co-operation with different stakeholders the climate and natural environment study group can introduce the

study, share the findings, participate in process of rural development strategy and develop adaptation policy to provide context and guidance for specific measures of relevant items of the strategy, particularly for management of natural risks, improvement of productivity and sustainability of livestock sector. With such an approach Risk study working group composes its initiative and research activities.

5.4. Policy documents of Climate Change

The Third Assessment Report of the IPCC

We started our study with closer look at nine key policy-relevant questions of climate change and findings of IPCC TAR37. Its message is clear that intensive climate research and monitoring gives scientists much greater confidence in their understanding of the causes and consequences of global warming. The Assessment presents a compiling snapshot of what the earth will probably look like in the late 21st century, when global warming of 1.4-5.8^{o}C will influence weather patterns, water resources, the cycling of the seasons, ecosystems, extreme climate events, and much more. Even greater changes are expected in the more distant future[38].

National Action Programme on Climate Change[39]

Recent climate change country studies result with the followings regarding to the impacts on natural zone, pasture and livestock:

1. **Natural zone:** The boundary of high mountain zone shifts up, the forest area would decrease, the steppe would move forward the forest steppe and desert steppe and desert would extend to the north (Table 5.5). Desertification will be the most threatening issue in future.

Table 5.5. Projection for natural zone change, 2040 and 2070

Natural zone	Current area	Projected changes			
		2040		2070	
	Mln.ha	%	Mln.ha	%	Mln.ha
High mountain	5.66	-2.5%	5.52	-8.5%	5.05
Forest steppe	28.71	-3.2%	27.89	-7.1%	25.91
Steppe	35.12	-0.5%	35.06	-2.9%	34.03
Desert Steppe	35.33	-7.2%	33.16	0.3%	33.25
Desert	20.36	13.3%	23.09	18.1%	27.28

2. **Grassland:** Climate change will cause significant negative impact on pasture productivity. 10 and 3% decrease of carbon and nitrogen in soil organics, 23.5% reduction of peak standing biomass is projected. The most vulnerable regions in the country are the desert steppe and desert. The negative balance of moisture capacity will definitely limit both the growing season and the pasture productivity.

[37] The Third Assessment Report of Intergovernmental Panel on Climate Change, UNEP, UNFCCC, 2001
[38] Climate Change Information Kit, UNEP and UNFCCC, 2002
[39] Mongolian National Action Programme on Climate Change, NAMHEM, Ulaanbaatar, 2000

3. **Livestock:** The study focused on sheep, ewe weight, daily intake of ewe, grazing discontinuance and some socio-economic impacts have been considered. In general, the impact assessment indicates that temperature increases have a negative impact on ewe weight gain in all geographical regions. Under unchanged management, ewe live-weight gain will be lower. The averaged ewe weight at the end of autumn will be 2.2 kg lower in the high mountains, 1.4 kg in the forest steppe, 0.8 kg in the Gobi region and, 0.2 kg in the steppe. The reduction in ewe weight gain would increase from south to north of country. Lower weight will negatively affect the production of milk, wool, etc.

Geologists studying the lake sediments found a trend of change in climate to be warm and wet in Mongolia[40] in geological period of hundreds and thousands years. If so it will be more favorable condition for livestock in far longer term.

Adaptation measures against negative impacts of climate change that set in the National Action programme on Climate change addressed to government and consist from 12 paragraphs listed below:

1. Increase public awareness and educate herders
2. Develop rangeland and livestock management system
3. Restore natural hay making fields and improve forage production system
4. Improve water supply system
5. Relieve impacts of harsh winters, severe droughts and manage risk of extreme conditions
6. Strengthening of early warning system for extreme climate events
7. Develop insurance system for livestock
8. Improve marketing system
9. Improve income taxation system
10. Alternative revenue sources for rural people in case of unfavorable weather conditions
11. Improve health and veterinary service
12. Combat desertification

Livestock sector development is in agenda of government objectives and seven of above measures are among the priority tasks of rural development and livestock sector. Our objective was to conduct an assessment toward to results with more detailed adaptation measures, addressing government, herders, local communities, NGOs, professional organizations and other stakeholders.

5.5. Efforts to reduce unemployment and alleviate poverty in To'v aimag

The Labor Department of the aimag, the project on "Improvement of households' livelihoods" and its whole time employed secretary at soums, and some the private initiatives have been contributing for reduction of unemployment and poverty (Table 5.6 and 5.7).

[40] Khosbayar P., Ariunbileg S., Lake bottom sediments for climate change projection, Journal "Geology", 2001.

Measures taken by the Labor department in 2000-2002

In January of 2000 there were registered 1248 unemployed people in the aimag. During the 2000-2002 total 2720 people were newly registered and 943 people were canceled from the registration. The Department assisted for 2178 people to find a job and be employed. As the result, unemployment in the aimag has been decreased by 28% compare to 1999. Below in Table 7.4 is showing aimag statistics on unemployment.

Total 3738 people have been employed for some seasonal work as "Millennium road" construction, forest rehabilitation, and crop and vegetable harvest.

Total 1278 people attended the professional training organized by the Labor Department and after what the 60% of them be employed.

The aimag fund to support employment has financed 26.5 million tugrug to 172 inhabitants and 5 economic entities.

Measures taken by the project on "Improvement of households' livelihoods"

The project has a whole time employed secretary at soums. The project has created a fund for pasture risk management that is to supports rural community to implement a project with small grants and loans. The supporting projects are to be for pasture protection, water supply improvement and development and strengthening of herders' cooperatives, etc.

The project activity has been started with the training on climate risk, early warning to the herders, pasture management, rehabilitation and protection, fodder production and herders' cooperatives have been organized at Ugtaal and Bayan-O'njuul soums.

Total 300 million tugrik has been allocated to finance the projects for improvement of pasture risk management. There are some critics on the duration and interest rate of loan. Duration up to 6 months is too short to run a business, get benefit and return back loan. Monthly interest rate 2-4% is too high for rural business where is no market and poor buying capacity of people affected by consequent drought and dzud disasters.

Other point for critics is that by the guidelines developed from the MFE the eligible body to apply with the project proposal is to be only a cooperative, while in the reality there are several other forms of the rural communities such as khot ail, herders' association or group, farm, etc.

At meantime the documents for 7 projects have been prepared and applied to the project head office.

Regional event: "To'v collaboration 2003" exhibition

The Mongolian Chamber of Commerce and local government of To'v aimag organized the event from 11 to 13 of June 2003 in the Zuunmod city, the center of Central region. The total 58 entities from 5 aimags of the region and Ulaanbaatar city were participated. Main outputs of this event are collaboration of business entities of the region, revenue for 7 million tugrik and contracts for 30 million tugrik in total.

Table 5.6 Poverty reduction measures implemented in To'v aimag

	Implementing organization, project	Policy document	Financing	Activities
1	Labor Department of Aimag Government	Aimag Programme to support employment	Aimag fund for support of employment	Registration of unemployed people
				Assistance to unemployed people in finding jobs and be employed
				Registration of newly created job places
				Involvement of unemployed people in public activities
				Thematic days as "Work force and Job"
				Professional training and re-training
2	"Improvement of households' livelihoods" project & its whole time employed secretary at soums	National Programme on Supporting households' livelihood, The project implementation guide	Fund for Livestock sector risk management	Training
				Call for tendering and monitoring of small projects
				Grant projects to improve water sources
				Other projects: with loan for 6 months and 4% monthly interest rate
3	Private sector	National Programme to develop Small and Medium Enterprises	Private	Establishment of Agriculture farms, Breed farms and Sheep farms: Milk producing 26 farms in 8 soums such as Batsumber Otgonbat's farm, Lans Trade LLC, etc. Breed farms such as Khusbaganat goat farm, Bayantsagaan sheep farm, etc.

Table 5.7. To'v aimag statistic on unemployment

	2000	2001	2002
Unemployment, %	3.3	2.8	2.1
Number of unemployed inhabitants	8278		7432

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[NU1]Convention in English is to put ‘Dr’ before name or PhD after name. I think DR is better but feel free to change.
[NU2]You don’t need this – said already and its **your** report not mine.
[NU3]Is this what you mean by valuable?
[NU4]Why is there a range?
[NU5]Please check meaning
[NU6]Is this correct? Is this why there is a range?
[NU7]Why the range?
[NU8]Please check my text!
[NU9]Is this type face different from the rest of the report? If so please make consistent throughout
[NU10]Why has 1997/ 98 got less than 8 per person?
[NU11]Is this right – better to say this than a ‘?’
[NU12]Translation?
[NU13]Wouldn’t this heading be better at the top of page
[NU14]Check my interpretation!