The Data collection and confirmation survey for Dzud countermeasures (climate change adaptation measures) and resilience building in Mongolia

Completion Report

March 2023

Japan International Cooperation Agency (JICA)

ORIENTAL CONSULTANTS GLOBAL CO., LTD.

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Abbreviations

ADB	Asian Development Bank
ADMEM	Aimag (District) Department for Meteorology and Environment Monitoring
ADPC	Asian Disaster Preparedness Center
AEMD	Aimag (District) Emergency Management Department
CP	Counter part
DB	Database
EMDC	Emergency Management Department of the Capital City
ERI	Economic Research Institute
FAO	Food and Agriculture Organization of the United Nations
FB	Facebook
GAVS	General Authority for Veterinary Services
GCF	Green Climate Fund
GDP	Gross Domestic Product
GIS	Geographic Information System
ITU	International Telecommunication Union
IFC	International Finance Corporation
IFRC	International Federation of Red Cross and Red Crescent Societies
IRIMHE	Information and Research Institute of Meteorology, Hydrology and Environment
JICA	Japan International Cooperation Agency
MAS	Mongolian Academy of Sciences
MCUD	Ministry of Construction and Urban Development
MET	Ministry of Environment and Tourism
MNT	Mongolian tögrög
MOFALI	Ministry of Food and Agriculture Light Industry
MOU	Memorandum of Understanding
MRCS	Mongolian Red Cross Society
MULS	Mongolian State University of Life Sciences
MUST	Mongolian University of Science and Technology
NAMEM	National Agency for Meteorology and Environment Monitoring
NEMA	National Emergency Management Agency
NGO	Non-Governmental Organization
NUM	National University of Mongolia
SDGs	Sustainable Development Goals
SMS	Short Message Service
UB	Ulaanbaatar
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
USD	United States Dollar
WB	World Bank
WG	Working Group

WHO	World Health Organization
WV	World Vision

Chapter 1   Outline of the Survey

1.1   Survey Background and Objectives

In Mongolia, the cold weather disaster known as "Dzud" has had a tremendous impact on the livelihood of herders. Dzud is defined as "a natural disaster that causes mass deaths of livestock as a result of weight loss due to lack of grass and water during the winter and spring seasons," and livestock deaths lead to a significant decline in herders' income. In particular, in recent years, the trend of decreasing precipitation due to climate change has led to summer droughts, which are believed to lead to outbreaks of Dzud when harsh winters arrive. In addition, the phenomenon of herders unavoidably relocating to cities when they lose a significant amount of livestock to Dzud has continued for many years, and as a result of the increasing concentration of the population in the capital city of Ulaanbaatar, urban problems such as air pollution and lack of basic infrastructure have become apparent, making the minimization of Dzud damage an urgent issue for Mongolia.

JICA has implemented the "The Project for capacity development to establish a national GHG inventory cycle of continuous improvement (from November 2017)" and the "The Project for Restoration of Pastureland by Effective Usage of Wild Forage Plants based on Traditional Knowledge of Herderic Mongolians (2021-2025)" as climate change mitigation measures. In addition, from the viewpoint of promoting the agriculture and pastoral industry, the project is implementing human resource development for veterinarians and livestock technicians through the "Project for Strengthening the Capacity for Human Resource Development in the Field of Veterinary and Animal Husbandry (2014-2020)" and the "Project for Strengthening the Practical Capacity of Public and Private Veterinarian (2020-2025)", as well as the "Project for formulation of Master Plan on the Agricultural Value Chain (starting in FY2020)" which develops a master plan for the development of value-added chain mechanisms in production, processing, distribution, and marketing. In addition, Japan's Ministry of the Environment has also been conducting support projects related to climate change adaptation in Mongolia, and in the past conducted the "Support services for the development of a climate change adaptation plan in Mongolia (FY 2019)".

Based on the background, JICA has been considering the possibility of JICA's cooperation projects and the use of external funds (assuming the Green Climate Fund (GCF)) for climate change adaptation measures in order to boost the prevention, avoidance, and reduction of Dzud damage among herding people. Before the commencement of the project, two preceding surveys have been conducted and four activities have been envisaged: (1) improving the accuracy of Dzud outbreak forecasts and strengthening operational capacity, (2) effectively utilizing the results of Dzud outbreak forecasts, (3) introducing a meat freezing and storage system utilizing photovoltaic (PV) power generation (hereinafter referred to as "PV system"), and (4) improving production and distribution of livestock products with high food safety. The project is continuing to consider the project plan for the future procedures by submitting a Concept Note (CN) to the GCF for the four envisaged activities.

The objective of the survey is to analyze the current situation and issues related to Dzud damage in Mongolia and examine the contents of projects to strengthen the adaptive capacity of herders in response to Dzud forecasts. In particular, the objective is to consider the possibility of a Khorshoo project by JICA to strengthen implementation capacity and the use of external funding (assuming the Green Climate Fund (GCF)) for climate change measures.

1.2   Survey Process and Methodology

The survey collected information on issues related to the four activities outlined in the current plan: (1) improving the accuracy of Dzud outbreak forecasts and strengthening operational capacity, (2) effectively utilizing the results of zodiac outbreak forecasts, (3) introducing a photovoltaic-powered meat freezing and storage system (PV system), and (4) improving production and distribution of livestock products with high food safety.

Figure 1.1 illustrates the activities envisioned in the CN and the survey content in this work. The survey content was designed to address the activities envisioned in the CN: "Gathering information on herders' knowledge and practices to strengthen their capacity to adapt to Dzud ", "Agenda setting for sending and receiving information on Dzud forecasting," "Review the issues, effectiveness and sustainability of PV systems " and "Reinvestigation of the interventions to solve the issues of meat production of herders". In addition to the review of relevant reports and literature, this survey included interviews with relevant Mongolian agencies, officials of the target Aimags, and herders in the Soum as field research.
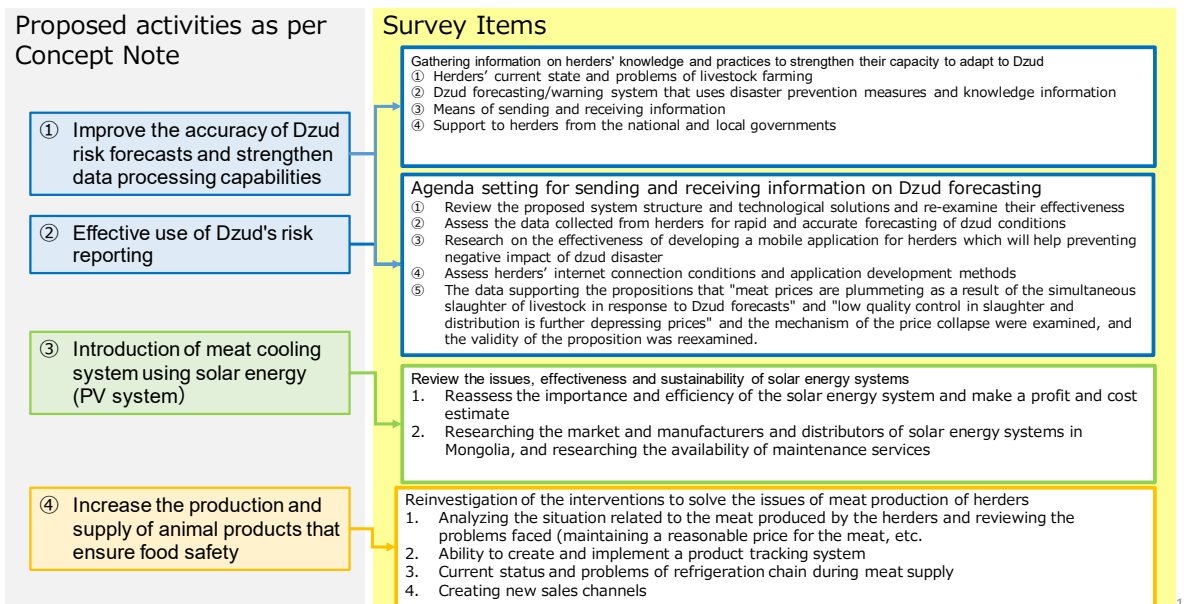
Source: JST

Figure 1.1   Activities Envisioned in the Current Plan and the Content of the Survey Items

1.3 Survey Period

The first field survey was from October 10th to November 9th, 2022 for 31 days, and the second survey was from December 14th to December 28th, 2022 for 15 days. The field survey period of each member is shown in Table 1.3.

Table 1.1   First field Survey Schedule

	Destination
10/10	Narita→ Ulaanbaatar
10/11	JICA Mongolia Office, MOFALI (Policy and Planning Department, Light Industry Department, Food Industry Policy Implementation Coordination Department)
10/12	MET (International Bureau for Climate Change)
10/13	IRIMHE (Agricultural and Meteorological Research Division)
10/14	National University of Mongolia, University of Science and Technology (TANA Lab), Ministry of Digital Development and Communications
10/15	Organize materials
10/16	Organize materials
10/17	GCF Focal Point, NEMA
10/18	Dundgovi District Agriculture Department, Dundgovi District Emergency Management Department
10/19	Survey of herders in Dundgovi Aimag
10/20	Workshop (UB)
10/21	[Dundgovi Aimag] UB →Mandalgovi [UB] World Vision
10/22	[Dundgovi Aimag] Herderic Household Survey (Gurvansaikhan Soum)
10/23	[Dundgovi Aimag] Herder workshop preparation
10/24	[Dundgovi Aimag] Herder Workshop (Gurvansaikhan Soum) [UB] ADPC
10/25	[Dundgovi Aimag] Herder Workshop (Adaatsag Soum) [UB] IT Park
10/26	[Dundgovi Aimag] Meat supplier survey, Dundgovi Aimag Statistics Bureau, Dundgovi Aimag Meteorological Office, media company,
10/27	[Dundgovi Aimag] Dundgovi Aimag Agriculture and Livestock Bureau, Dundgovi Aimag Emergency Situations Bureau, Meat Company (slaughterhouse), Herder Survey (Mandalgovi) [UB] University of Science and Technology
10/28	[Dundgovi Aimag] Mandalgovi → UB [UB] CCRCC (Mr. Batjargal), FARMDO
10/29	Organize materials
10/30	Organize materials
10/31	Monholus company,
11/1	GCF Region office, G mobile, Spotter, UNITEL,
11/2	Information communication research / Meat distribution research
11/3	Summary of survey results
11/4	Khuchit Shonkhor Market, Precom
11/5	Organize materials
11/6	Organize materials
11/7	Summary of survey results
11/8	MOFALI (Food Industry Policy and Implementation Coordinating Agency), Veterinary Agency, Mongolian Meat Association
11/9	UB → Narita

Table 1.2   Second Field Survey Schedule

	Destination
12/14	Narita → UB
12/15	Collection of related laws
12/16	G-mobile
12/17	Organize materials
12/18	Organize materials
12/19	JICA Mongolia Office, Special Envoy for Climate Change, Veterinary Agency
12/20	IRIMHE, MET, MOFALI
12/21	Workshop preparation
12/22	Workshop (UB), Special Envoy for Climate Change, Veterinary Agency
12/23	NEMA [Govi-Altai Aimag] UB → Altai
12/24	[Govi-Altai Aimag] Provincial Department of Agriculture and Livestock
12/25	[Govi-Altai Aimag] Altai ⇔ Biger Soum Chief of Soum, etc.
12/26	[Govi-Altai Aimag] Altai → Arvaikheer (Burkhangai Aimag)
12/27	[Gobi-Altai] Arvaikheer → UB
12/28	UB → Narita

1.4   Composition of Team Members

Table 1.3   Composition of Survey Members and Duration of the Survey

Position	Name	Field Survey Period
Team Leader/Social Survey ①	Kiyotaka Owada	October 10, 2022 to October 21, 2022 December 19, 2022 to December 28, 2022
Social survey ②	Hiroshi Komiyama	October 17, 2022 to October 28, 2022
Telecommunications	Isao Takatori	October 24, 2022 to November 4, 2022 December 14, 2022 to December 26, 2022
Market research ①	Aritsune Uehara	October 10, 2022 to November 9, 2022 December 14, 2022 to December 28, 2022
Market research ②	Yoko Ota	October 10, 2022 to November 4, 2022

1.5   Target Aimag and Soum

1.5.1   Basic Information on the Target Areas

In Mongolia, most of the five livestock species (horses, cows, camels, sheep, and goats) are still raised in the traditional herding way, and the total number of livestock was generally in the range of 20 to 26 million from the 1920s to 1990. While the number of livestock reached 33.57 million at the end of 1999, the country was hit by record-breaking Dzud in three consecutive winter/spring seasons (1999/2000, 2000/2001, and 2001/2002), with 11.17 million adult animals dying in the three years[1]. This brought the total livestock population down to 23.9 million head at the end of 2002.

Against the backdrop of the damage caused by Dzud during these three years, the number of pastoralists continued to decline until 2005, but the total number of livestock began to recover from 2003, reaching a record (at that time) high of 44.02 million at the end of 2009. Against this backdrop, the winter of 2009/2010 was marked by severe cold and snowfall, resulting in the first major Dzud in about 10 years, with 10.32 million adult livestock dying in 2010; although no major Dzud have occurred since 2010, Dzud and storms have occurred every year since 2016, and in 2018 2.64 million head (4.0% of the number of head at the end of the previous year), 2.06 million head (2.9%) in 2020, and 3.01 million head (4.5%) in 2021 were recorded as adult livestock die-offs[2].

The number of livestock has continued to increase since 2011, reaching an all-time high in 2019 (70.97 million head). However, as of 2021, the number of livestock kept in Mongolia will be close to 120 million sheep equivalent[3], and the country is in a state of considerable overgrazing, so it would not be surprising if a large-scale Dzud outbreak were to occur at any time.
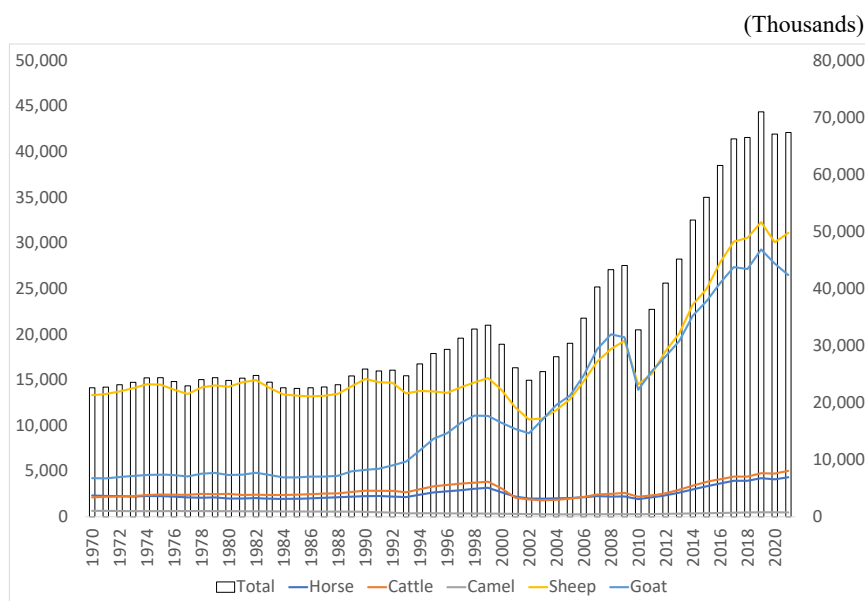
Source: NSO

Figure 1.2   Transition of Livestock by Kinds of Animals and Total Amount of Livestock

The following is a description of the current status of the agro-pastoral industry in the Soum, the target Aimag of the survey[4].

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[1]   These deaths include those due to disease and accidental deaths.
[2]   In years with little weather damage, etc., the death rate of adult livestock is about 1-2%.
[3]   Horses are converted to 7 sheep, cattle to 6 sheep, camels to 5 sheep, and goats to 0.9 sheep
[4]   Referring to the description in the MONGOLIA GUIDE.

1.5.2 Overview of the Target Aimags

The target Aimags for the survey were selected from those with high Dzud-affected areas. Table 1.4 shows the top four Aimags with the most livestock lost to Dzud in 2009/2010. The Aimag with the highest number of livestock lost was Uvurkhangai, followed by Zavkhan, Govi-Altai, and Dundgovi. Considering that one of the adaptive behaviors of the Dzud countermeasures is to reduce the number of livestock, targeting herders with large numbers of animals in captivity provides insight into the effects of behavior change. Of the four Aimags mentioned above, the Aimags with the highest number of livestock kept per household were Dundgovi, Govi-Altai, Zavkhan, and Uvurkhangai (Table 1.4). Based on these data, we selected Dundgovi and Govi-Altai Aimag as the surveyed Aimags.

Table 1.4 Number of Livestock Heads that Died in Dzud in 2009/2010, Number of Pastoralist Households (2022), Number of Livestock Heads per Household (2022)

	Aimag	Dead livestock (2010-2008)		Herder households (thousand houses)	Livestock per household (Head)
		Number (thousand)	Percentage (%)		
1	Uvurkhangai	1,439.19	42%	19.81	203
2	Zavkhan	1,418.27	45%	13.87	271
3	Govi-Altai	1,190.39	48%	10.97	273
4	Dundgovi	929.08	46%	8.94	355

Source: JST

Note: The number of dead livestock is calculated from the difference between the number of livestock in 2010 and 2008. The number of herder households and the number of livestock per household are for the year 2022.

Source: JST

Figure 1.3   Target Aimags

The distance from UB is approximately 300 km to Dundgovi and 1,000 km to Govi-Altai, and the conditions for meat distribution differ significantly between the two Aimags.

1.5.3 Selection of Target Soum

Two Soums (four Soums in total) were selected for the study, each from Dundgovi and Govi Altai Aimags. As shown in Table 1 .5, specific selection conditions were set for the selection criteria, and the above selection conditions were presented to the livestock production staff of the Food and Agriculture and Pasture Department of the Aimag to select the candidate Soums based on their experience with Dzud damage among the Soums that have a regional base and are active in the herders people's cooperatives (Khorshoo). The target Soums were selected after discussing the conditions with the person in charge of each Aimag.

Table 1.5   Selection Criteria of Target Soums

Selection Criteria	Detailed Selection Criteria of Target Soum
A) Prone to natural disaster	Areas with high risk of weather disasters, such as areas that have suffered severe damage from Dzud in the past
B) Status of means of communication with herders, commitment of herders	Herder Khorshoos are active and herders are grouped together.
C) Status of slaughterhouses	Slaughterhouses are not a priority in the selection criteria, as there are few slaughterhouses at the Soum level in the surveyed Aimag.
D) Commitment of the Aimag Government, and securing the system and budget for maintenance and management	For the commitment of the Aimag Government, a recommendation from the person in charge of livestock production in the Food, Agriculture and Pasture Bureau of the Prefectural Government was received

Source: JST

Table 1.6 summarizes the Khorshoo activities in the surveyed Soums. Tables 1.7 and 1.8 also summarize the percentage of livestock decline and the number of registered Khorshoo and enterprises in each Aimag. According to this, the Soums in the Aimags with the highest percentage of livestock decline in 2020/2021 were Gurvansaikhan Soum in Dundgovi Aimag and Tsogt Soum in Govi-Altai Aimag. Tsogt Soum had the highest number of registered Khorshoos in Govi-Altai Aimag. Adaatsag Soum in Dundgovi Aimag had the lowest number of livestock declines of any Soum in the Aimag, and the number of registered Khorshoos and enterprises was not high. However, as shown in Table 1.6, it has been active, receiving a national award for its Khorshoo activities in 2014. Biger Soum in Govi- Altai Aimag does not have a high percentage of livestock decline, but the number of enterprises is the third largest in the Soum, and as shown in Table 1.6, meat production, fruit cultivation, and wine production are active in the area.

Based on these factors, the Survey Team selected "Adaatsag Soum" and "Gurvansaikhan Soum" in Dundgovi Aimag, and "Biger Soum" and "Tsogt Soum" in Govi-Altai Aimag.

Table 1.6   Characteristics of Target Soums and activities of Khorshoo

Target Soum	Contents
Adaatsag	• Awarded by the national government as an example of excellent Khorshoos in 2014 due to activities such as preparation of grass cutting and collection and sale of hides and hair from livestock products[5]
Gurvansaikhan	• Khorshoos collect livestock from pastoralists and sell them under contract to a meat company in Ulaanbaatar (UB). • In the 2021 dust storm, livestock losses were highest in Soum in the Aimag, and the risk of weather disasters, including Dzud, is extremely high.
Biger	• Biger Soum has high meat production and is also active in fruit growing agriculture and wine production. • Pasture degradation is a problem due to mining development.
Tsogt	• Tsogt Soum has the highest number of registered Khorshoos in the Aimag. • The number of goats is especially large.

Source: JST

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[5] https://news.mn/r/688082/

Table 1.7   Condition of reducing number of livestock, Khorshoo and firms in Dundgovi Aimag

	Ratio of reduce of livestock	Number of register	
	2020/2021	Khorshoo	Firms
Delgertsogt	81%	1	29
Deren	82%	5	25
Govi-Ugtaal	79%	7	31
Tsagaandelger	85%	2	26
Bayanjargalan	77%	2	50
Undurshil	88%	9	48
Gurvansaikhan	76%	3	47
Ulziit	87%	6	49
Khuld	92%	6	54
Luus	90%	2	40
Delgerkhangai	80%	6	34
Saikhan-Ovoo	86%	10	46
Erdenedalai	87%	6	56
Adaatsag	92%	3	44
Saintsagaan	84%	33	721

Source: JST based on NSO and field interview

Table 1.8   Condition of reducing number of livestock, Khorshoo and firms in Govi-Altai Aimag

	Ratio of reduce of livestock	Number of register	
	2020/2021	Khorshoo	Firms
Altai	67%	3	41
Bayan-Uul	103%	2	41
Biger	87%	3	55
Bugat	82%	5	41
Dariv	103%	3	31
Delger	94%	6	69
Jargalan	94%	7	35
Taishir	87%	2	28
Tonkhil	100%	2	37
Tugrug	91%	5	31
Khaliun	89%	7	36
Khukhmorit	105%	2	32
Tsogt	77%	12	69
Tseel	91%	4	42
Chandmani	86%	8	53
Sharga	93%	4	44
Erdene	83%	4	30
Yesunbulag	95%	11	796

Source: JST based on NSO and field interview

Adaatsag Soum	Biger Soum
Dundgovi Aimag	Govi-Altai Aimag
Gurvansaikhan Soum	Tsogt Soum

Source: JST
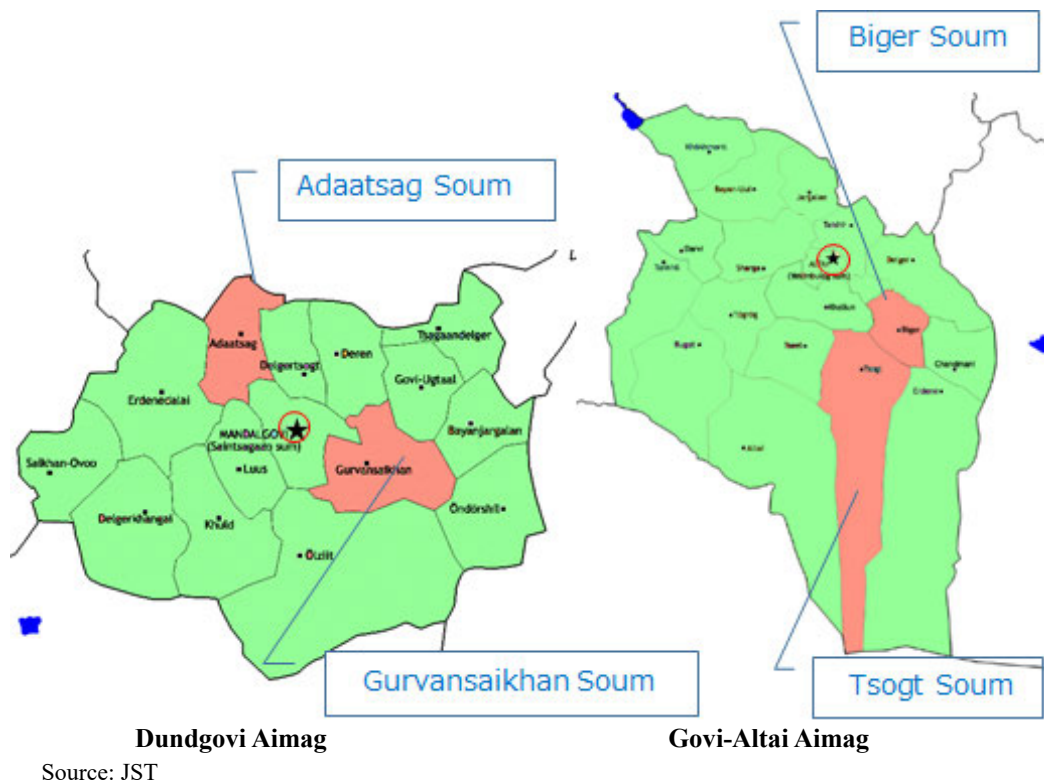
Figure 1.4   Survey Target Soum

1.5.4   Overview of Target Soum

(1)   Dundgovi Aimag

Dundgovi Aimag is located at the entrance to the Gobi Desert, with dry steppe in the northern part of the Aimag and the Gobi in the southern part. It covers an area of 74,690 square kilometers and has a population of 47,542. Mandal Gobi, the provincial center, is about 260 km from Ulaanbaatar, and its elevation is 1,393 meters above sea level. The number of livestock is 3.17 million (2021), and the area under crops is 471.0 ha (including 195.8ha of feed-related product, 35.0 ha of grains and 142.6 ha of potatoes) (2020). Dundgovi is rich in mineral resources such as coal, copper ore, iron ore, and fluorite, but its main industry is cattle raising.

1)   Adaatsag Soum

Soum Center is located 104 km north-northwest of the provincial center and 221 km from Ulaanbaatar. It is located in the arid steppe region. It covers an area of 3309 square kilometers and has a population of 2,794. The total number of households is 804, of which 550 are pastoralist households. The number of livestock is 254,000 head (14,000 horses, 6,600 head of cattle, 0.8 thousand camels, 120 thousand sheep, and 110 thousand goats) (2021). The crop acreage planted (cultivated) is 2.5 ha (of which 1.8 ha is feed-related, 0.0 ha is grain, and 0.3 ha is potatoes), and 1.1 ha is forage crops (2020)..

2)   Gurvansaikhan Soum

The Soum Center is located 71 km east-southeast of the provincial center and 322 km from Ulaanbaatar. It is located mainly in the arid steppe region. It covers an area of 5,416 square kilometers and has a population of 2,149. The total number of households is 687, of which 510 are pastoralist households. The number of livestock is 228,000 (8.7 thousand horses, 4.5 thousand cattle, 2.3 thousand camels, 123 thousand sheep, and 89 thousand goats)(2021). The area of crops planted (cultivated) is 2.6 ha (of which 1.3 ha is feed-related, 0.0 ha is grain, and 0.6 ha is potatoes).

(2)   Govi-Altai Aimag

Govi-Altai Aimag is located in the western part of Mongolia, bordering China to the southwest. The distance from the provincial center to Ulaanbaatar is 1,001 km. The Altai Mountains, which rise to 3,000 meters, run through the center of the Aimag. The average elevation of the Aimag is 1,940 meters. It is the second largest Aimag in Mongolia, named after the Gobi Desert and the Altai Mountains. Most of the population lives in the northeastern part of the Aimag, where there are lakes and rivers. The landscape is beautiful, but its geographical conditions make it one of the most difficult areas in Mongolia for cattle raising. The area is 141,448 square kilometers and the population is 58,735. The number of livestock is 2.99 million (2021), and the area planted with crops is 1,040.7 ha (of which 117.1 ha is feed-related, 410.0 ha is grain and 88.4 ha is potatoes) (2020).

1)   Biger Soum

The Soum Center is located 108 km southeast of the provincial center and 960 km from Ulaanbaatar. The Altai Mountains are located in the southern part of the Soum, and a mountain range is also located in the northern part. The area is 3,826 square kilometers and the population is 2,265. The total number of households is 655, of which 450 are pastoralist households. The number of livestock is 116,000 head (4.4 thousand horses, 4.6 thousand cattle, 2 thousand camels, 24 thousand sheep, and 81 thousand goats) (2021). The area under crop cultivation is 1.5 ha (of which 0.8 ha is feed-related, 0.2 ha is grain and 0.3 ha is potatoes).

2)   Tsogt Soum

The Soum Center is located 188 km south-southeast of the provincial center and 1,050 km from Ulaanbaatar. The northern part of the Soum is in the Altai Mountains. The Soum is long and narrow to the south, extending to the Chinese border. It covers an area of 16,618 square kilometers and has a population of 3,568. The total number of households is 1,044, of which 720 are pastoralist households. The number of livestock is 222,000 head (45,000 horses, 46,000 cattle, 37,000 camels, 45,000 sheep, and 164,000 goats) (2021).   The crop acreage planted (cultivated) is 378.4 ha (of which 17 related to feed, 174.0 ha to grains, 174.0 ha for cereals, and 7.1 ha for potatoes) in addition to this, 12.9 ha for feed crops and 613.7 ha for fruit trees (2020).

Chapter 2   Current Condition and Countermeasures on Climate Change in Mongolia

2.1   Role and policy of the related ministries and local government agencies

2.1.1   Ministry of Food and Agriculture Light Industry (MOFALI)

MOFALI's mission is to increase income and productivity through the definition and implementation of industrial policies, appropriate use of resources, substitution of imports, production of products for export, and development of value chains. The highly relevant departments in the Survey is the Policy and Planning Bureau, the Livestock Policy Implementation and Coordination Bureau, and the Food Industry Policy Implementation and Coordination Bureau. In particular, the Food Industry Policy Implementation Coordination Bureau is responsible for the meat supply chain. Figure 2.1 illustrates the organizational chart of MOFALI.
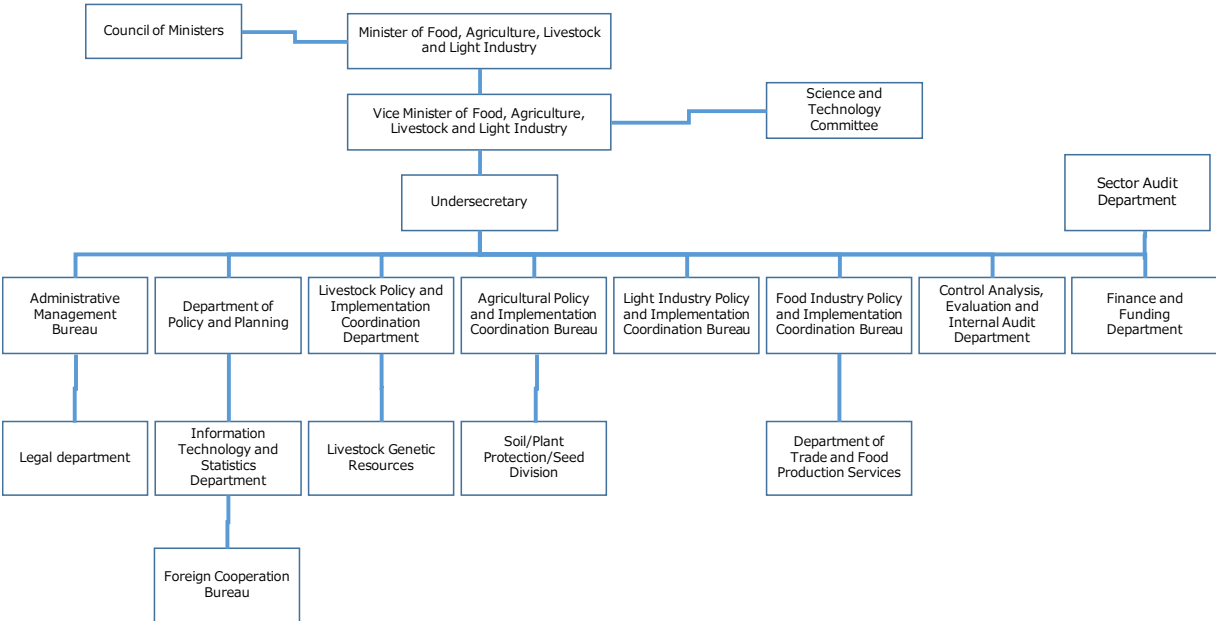
Source: Website of MOFALI[6]

Figure 2.1   MOFALI's Organization Chart

2.1.2   Ministry of Environment and Tourism (MET)

The mission of the MET is to maintain environmental stability through economic growth and social development that does not jeopardize the ecological balance, ensuring appropriate use of natural resources, and creating opportunities for natural regeneration. The highly relevant department in the Survey will be the Climate Change Department, which is the department in charge of the GCF. Figure 2.2 illustrates the organizational chart of the MET.

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[6]   https://mofa.gov.mn/home   (2023/2/11)
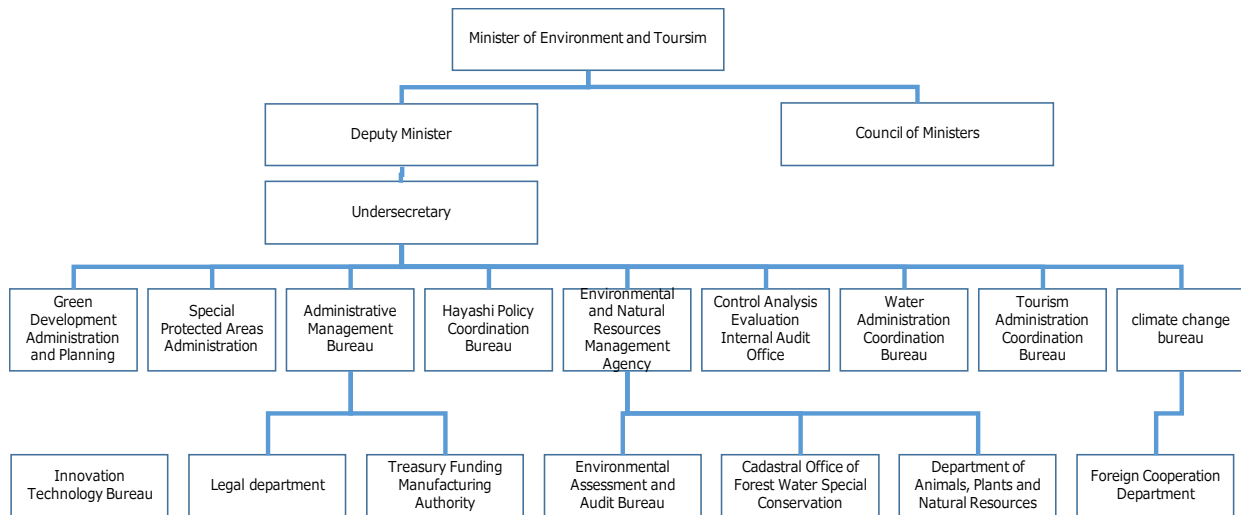
Source: Website of MET[7]

Figure 2.2　MET's Organizational Chart

2.1.3　Information and Research Institute of Meteorology, Hydrology and Environment (IRIMHE）

IRIMHE is an auxiliary agency of National Agency for Meteorology and Environment Monitoring and its mission is to provide water, weather, climate, and environmental research and forecasting information based on science and research. The department most relevant to this survey is the agro-meteorological department, which provides meteorological information. Figure 2.3 illustrates the organizational chart of IRIMHE.
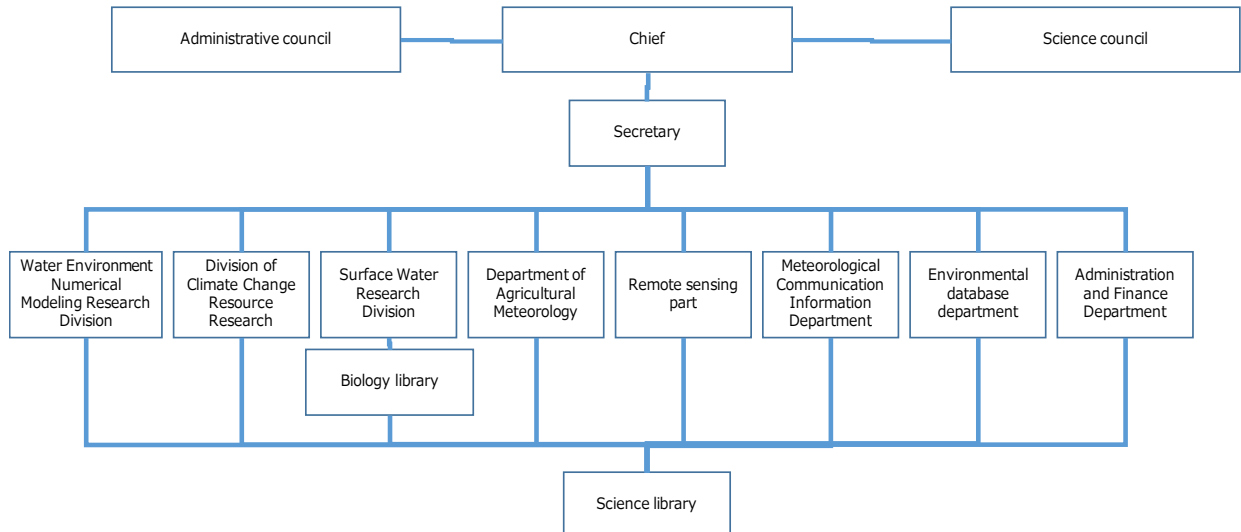
Source: Website of IRIMHE[8]

Figure 2.3　IRIMHE's Organizational Chart

7　https://met.gov.mn/　(2023/2/11)
8　https://irimhe.namem.gov.mn/index.php　(2023/2/11)

2.1.4　National Emergency Management Agency (NEMA)

NEMA's mission is to implement disaster protection laws, regulations, and state policies, and to organize and manage disaster protection activities at the national and local levels. The Office of Risk Management has the responsibility of collecting disaster risk information and for disseminating the information, which is relevant to the survey in terms of Dzud risk information. Figure 2.4 illustrates the organizational chart of NEMA.
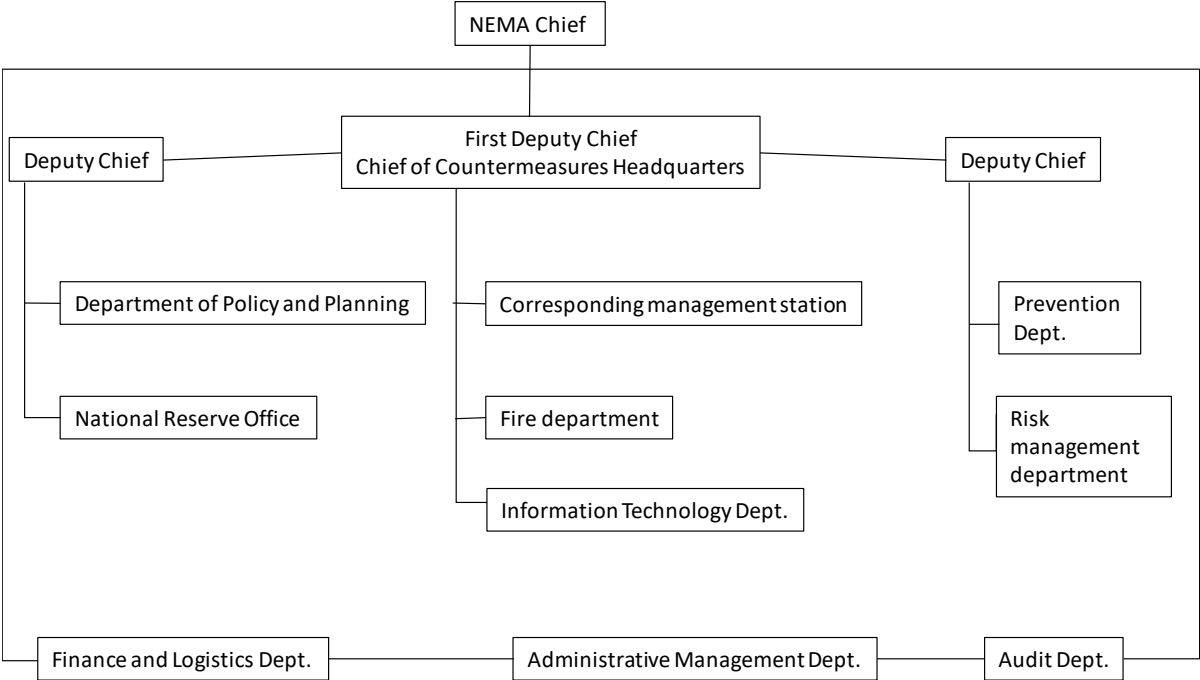
Source: NEMA

Figure 2.4　Organizational Chart of NEMA

2.2　Current condition of Dzud forecast and its accuracy, and information dissemination and institutional arrangement

2.2.1　Current condition on the EWS in Mongolia

NEMA, the legally designated authority for early warning dissemination in Mongolia, disseminates prevention and warnings for each of the 24 disaster types including Dzud in accordance with the procedures for the early warning system stipulated in the NEMA Chief Decree A/682019 (March 13, 2019). The National Agency for Meteorology and Environment Monitoring (NAMEM) also has an Early Warning Division, which produces information on other weather-related warnings such as fires, landslides, drought forecasts, and storms. Information is issued by NAMEM and disseminated through ministries, NEMA, regional meteorological offices, and mass media to reach the herders. The Institute of Astronomy and Geophysics (IAG) of the Mongolian Academy of Sciences is also responsible for earthquake observation, and when it detects seismic motion, the information is sent to NEMA and other government agencies on a real time basis.

Mongolia's current early warning system was developed between 2012 and 2014. The system receives earthquake information from the IAG and blast sirens in UB city, as well as transmits the information to the general public via TV, radio, and mobile phone dispatch services for mobile network operators. Early warning systems for Dzud are being piloted in selected areas, and the system developed by the Livestock Early Warning System (LTS-2) project implemented by Mercy Corps Mongolia uses remote sensing of pasture biomass and other data to develop a five-level index of Dzud risk. As of December 2022, some functions, including the Dzud risk map, are inaccessible due to broken links in the database.

Other weather and disaster information is disseminated to the herders by local mass media using a variety of media, including web sites, national radio and television stations, and telephone. The Emergency Broadcasting System (EBS) sends information from warning centers to the Mongolian National Broadcasting (MNB), UBS TV, and CBS; CBS (Cell Broadcasting System) can send messages to the public's mobile phones.

As for early warning infrastructure, as of July 2020, there are 256 signal sirens in 21 Aimags, 44% of which are more than 30 years old. The sirens were produced in Russia, China, Korea, and Japan; these sirens are not compatible with each other, and the systems are not integrated. These sirens transmit only the siren sound and not detailed warnings. In addition, trucks are used as mobile control centers in case the early warning system does not work and cannot transmit information.

2.2.2 Medium- and long-term forecast

IRIMHE publishes medium- and long-term forecasts of Dzud risk information every year in October. This information is distributed via the IRIMHE website[9], Facebook, SMS, etc., as the Dzud risk map. This information is also disseminated via TV and radio, and is widely known among the herding population. The Dzud risk map is based on a 5-point scale (1.Very high, 2.High, 3.Medium, 4.Low, 5.Very low) based on the following 8 factors.

(1) Summer precipitation
(2) Amount of pasture cover
(3) Amount of grass in pasture
(4) Average precipitation
(5) Average snowfall
(6) Snow cover forecast
(7) Temperature as of November and expected winter temperature
(8) Amount of precipitation as of November and expected precipitation

Of these pieces of information, herders put more importance on summer pasture conditions (1) and (3), as well as temperature (7) and snow cover forecast (6).

In the Dzud risk map published by IRIMHE, the four target Soums indicated by red circles are all classified as Very High (dark brown) as of January 2021 (Figure 2.5 Top). In December 2022, on the other hand, the northern part of Tsogt Soum in Govi-Altai Aimag is classified as "Very High," Biger Soum as "Medium (yellow)," and the two Soums in Dundgovi Aimag as "Very Low (gray)" (Figure 2.5, bottom). The Dzud risk map is updated with information according to situation changes.

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[9] http://tsag-agaar.gov.mn/eng
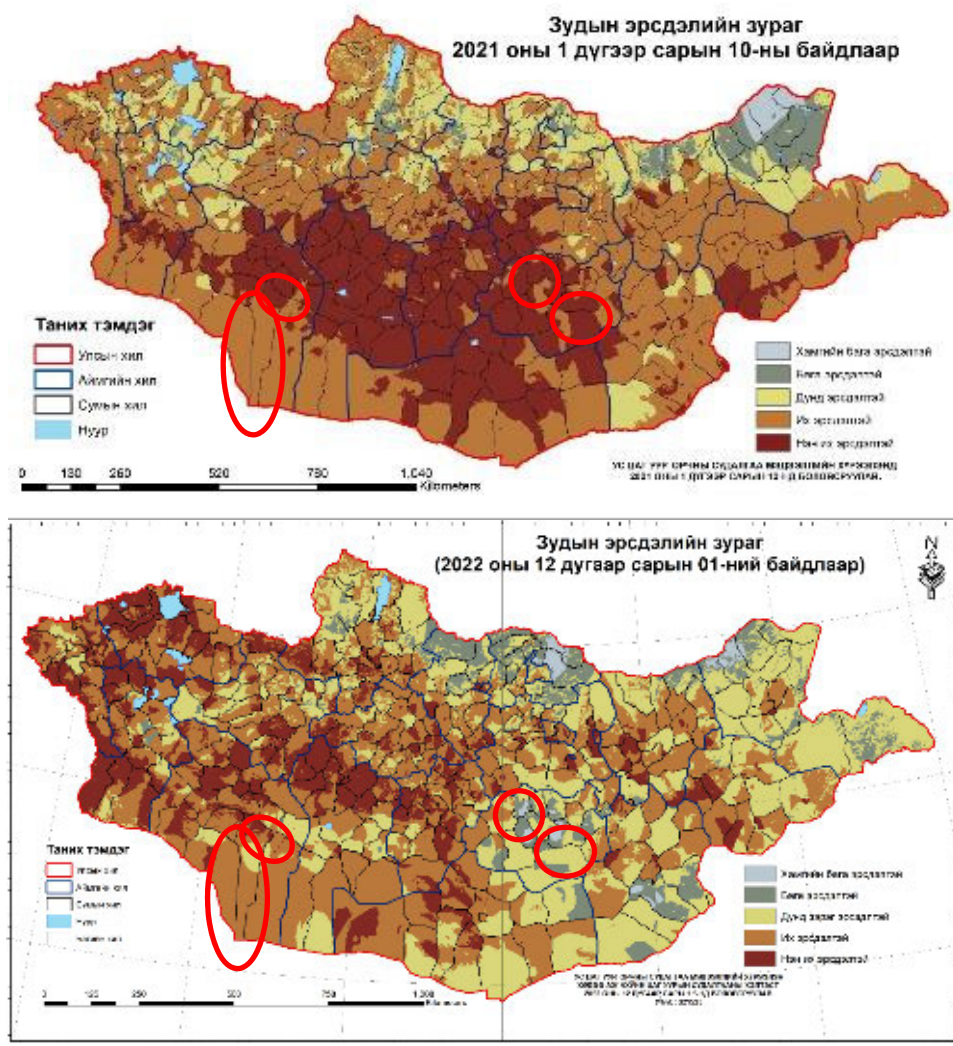
Top: 2021.1／Bottom: 2022.12

Figure 2.5   Dzud Risk Map Prepared by IRIMHE

2.2.3   Short term forecast

IRIMHE's Dzud risk map is released annually in November and then updated according to winter conditions. These updated information maps are communicated as short-term forecasts. Short-term forecasts are disseminated through Figure 2.6
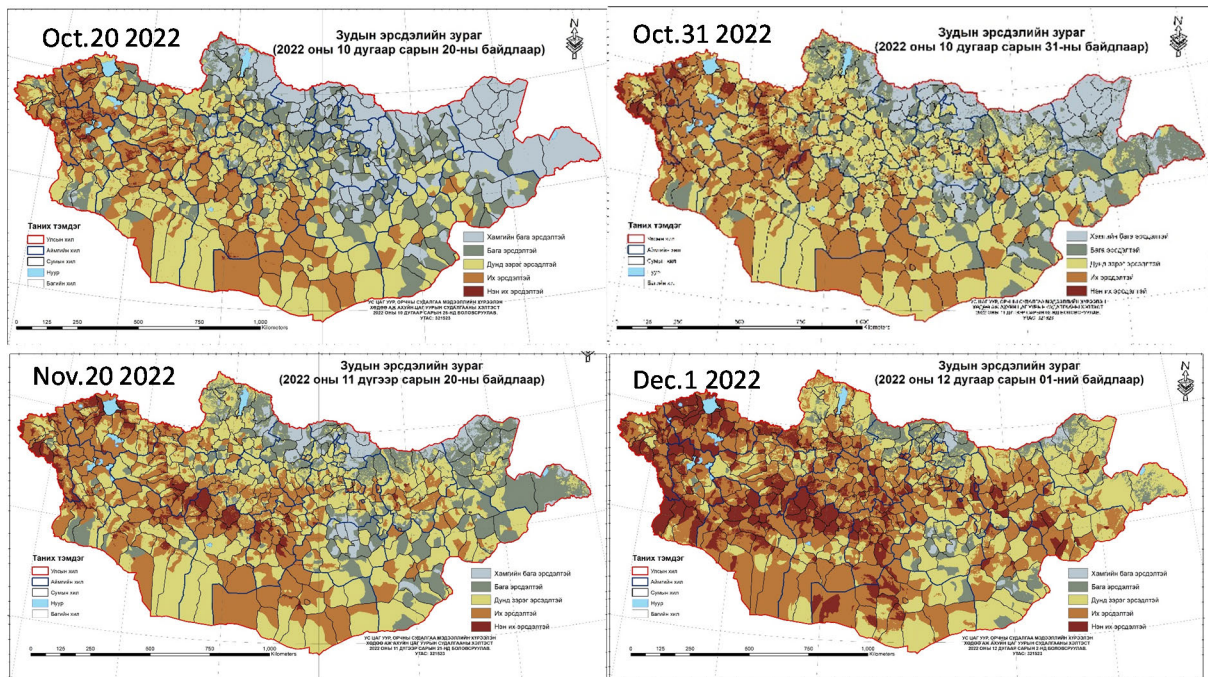
Source: IRIMHE

Figure 2.6   Condition of Updating Dzud Risk Map

2.2.4   Emergency Forecast

Sudden weather changes are communicated as emergency information. Emergency information is often communicated by phone or SMS, especially through Facebook groups.   The information is transmitted such as ADEM→AEMD→Head of Soum→Head of Bug→Headers.

2.3   Other forecasting system

2.3.1   PRISM

PRISM is open software developed by WFP and operated in more than 80 countries around the world, with particular active use in Indonesia, Sri Lanka, Cambodia, and Mongolia. In the agricultural sector, the system provides an intuitive map-based representation of long-term risks related to disasters, including Dzud and droughts (Figure 2.7).

Unfortunately, some links including the Dzud risk map are not available at this time. One of the reasons for this is that some of the functions of PRISM are not working properly and need to be modified, but this cannot be modified due to the lack of personnel who understand Perl in Mongolia, a programming language used for PRISM. Incidentally, according to the interview with the officials in IT Park, the most common programming language used by Mongolian programmers is "JAVA".

The final result shows the actual level of dzud risk based on the actual indicators connected to the system
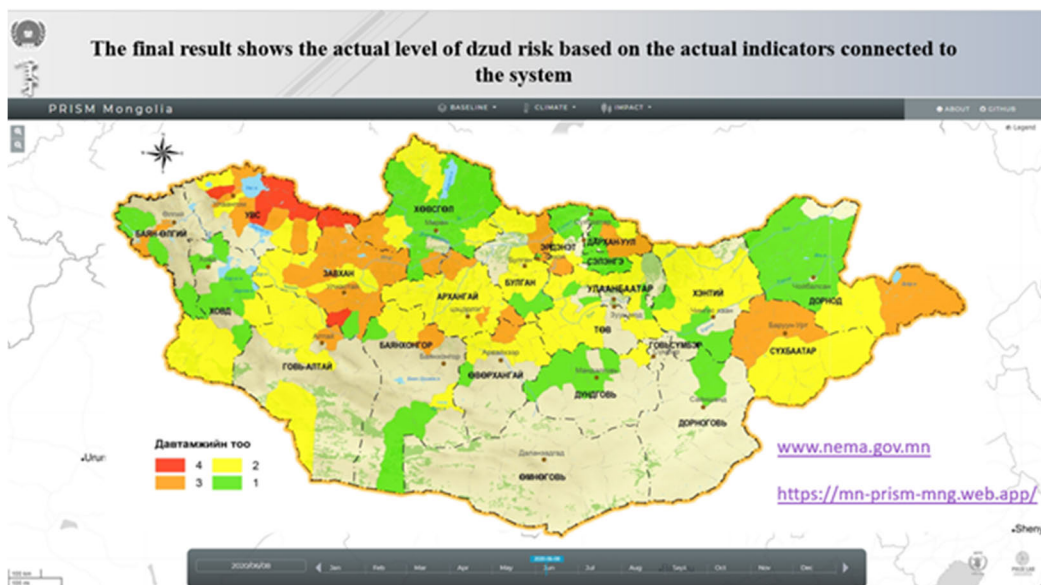
Source: Presentation by NEMA

Figure 2.7   Screenshot of the PRISM

2.4   Current condition on ICT infrastructure in Mongolia

2.4.1   Conditions on communication infrastructure

In the ITU (International Telecommunication Union) statistical information for 2021, the ICT-related penetration rate in Mongolia is reported as follows.

Table 2.1   ICT Related Penetration Rate in Mongolia

ICT	Penetration
Mobile network population coverage	100%
4G network coverage	99%
Mobile phone penetration rate	80%
Internet access rate from home	80%
Same as above (local area)	25%
Home PC ownership rate	33%
Per capita mobile phone ownership rate	140%
High-speed mobile phone subscription rate per capita	116%
Internet user rate (2021)	84%
SNS user rate	86%
Mobile network average download speed	16.53MBPS
SNS user rate (ages 13 and over)	117.7%
Bank account ownership rate	93%
Credit card ownership	3.2%

Source: Study Team obtained from ITU report

There are four telecom carriers in Mongolia, of which Mobicom and Unitel have a high share (Table 2.2). The largest company, Mobicom (in which the Japanese company KDDI has invested), is strong in urban areas and has a high market share nationwide.

LTE (4G) services started in 2016, and new base stations compatible with LTE are being introduced gradually. According to the Ministry of Digital Development and Communications, as of the end of 2022, 3G or 4G services are provided in all Soum and bug centers and each telecom carrier provides 3G or 4G services in most of Soum and bug centers.

Table 2.2   Changes in the share of Number of Subscribers by Telecom Carrier in Mongolia

	Subscribers (Thousands)	Mobicom	Unitel	Skytel	gmobile
June 2018	4,085	37.32%	34.03%	16.51%	11.98%
June 2019	4,360	38.95%	34.57%	15.44%	11.04%
June 2020	4,423	37.59%	32.94%	17.67%	11.80%
June 2021	4,509	37.82%	33.49%	17.81%	10.87%
June 2022	4,750	38.66%	33.84%	17.04%	10.10%

Source: Mongolian Telecommunications Regulatory Authority

As mentioned above, the population coverage rate of mobile networks is 100%, of which the coverage rate of 4G networks is 99%. This percentage is the data for urban areas including UB and the center of Soum, and areas where herders live are often covered by 2G if they are covered. In particular winter camps area for herders are often left uncovered.

In general, 3G and 4G base stations have a reach of about 5 km to 20 km, while 2G has a reach of about 30 km to 50 km.

Considering the relationship between base stations and coverage area, if 100 base stations are erected for reach distances of 10 km and 60 km, the area that can be covered is approximately 25,000 km^2 and 860,000 km^2, assuming the condition that the antennas can reach without leakage (the entire Mongolian land area is 1.56 million km^2.) UNITEL plans to construct 200 new antennas for 4G in 2023 and 2024, but the area of coverage that can be expanded is minimal. Other carriers are working to expand the area available for at least 2G by installing 2G base stations in addition to 3G or 4G.

The government of Mongolia does not plan to suspend 2G services at this time, and carriers have no plans or plans to suspend 2G services at this time. Even at this time, the government and carriers are considering expanding the 2G network as the top priority, in order to increase coverage area even in areas with few users per area, such as herding areas , and to achieve 100% not only population coverage but also area coverage. (From the interview with Ministry of Digital Development and Communications).

In the case of 2G, even if calls and SMS can be used without problems, data communication on the smartphone app (program downloaded from the Play store or Apple store) and the web is difficult.

2.4.2   Current condition on usage of IT equipment

The number of information receiving (IT) devices among herders is highest for televisions, followed by mobile phones and smartphones (Table 2.3).

Table 2.3   Herders' Ownership Rate of IT Devices (n=212)

No	Item	Rate	Main usage
1	TV set	85%	Watch weather forecast
2	Radio	27%	Watch weather forecast
3	Stationary phone	21 %	Install in the ger and receive a call from head of Bug
4	Mobile phones (other than smartphones)	79%	Contact with family and friends and carry while herding
5	Smartphone	47%	Watch Facebook and weather application while visiting at Aimag center and Soum center

Source: JST

Although about half of the herders own smartphones, ordinary mobile phones are still the mainstream. This is mainly because radio waves are relatively easy to reach even outdoors, and the battery life is long.

Herders also commented that it is difficult for smartphone owners to use their phones in outdoor grazing areas, especially during the winter months. This is due to the lack of signal in grazing areas although they are connected in residential areas, due to rapid shortage of the lithium-ion battery caused by the cold temperature in winter, and the poor operability of the touch panel. Radio receivers used to be used mainly outdoors, yet in recent years they have been replaced by mobile phones, and the number of users has declined to about one fourth of the population.

For these reasons, an increasing number of herders own smartphones, although general cell phones are preferred. During the field survey, it was noted that although herders usually use ordinary cell phones, they take their smartphones with them when they go to the Aimag center or Soum Center to browse Facebook and weather forecast applications. Data on when and for how long herders use their smartphones to gather information was not available because it depends on the behavior of each herder, but it is expected that smartphones will become more widespread, especially among the younger generation.

About 20% of herders have installed stationary gmobile terminals (said terminals use the CDMA450 standard and are classified as 2G in Mongolia). The gmobile 2G terminals can reach more than 60 km from the base station by installing a special standard terminal antenna. In the herders' ger where the study team interviewed, there was no cell phone signal, but the head of the bug called us on stationary gmobile terminals　phone.

The chief of the bug collects the phone numbers of herders registered in the bug and reports them to the Aimag meteorological office and the Aimag Emergency Management Authority. The herders' contact information is updated monthly and used to send out SMS. With SMS and Facebook, it is not possible to know whether or not the herder who received the message has confirmed it. At this time, telephone is the only measure that the receiver confirmed the message.

2.4.3　Means of communication

When transmitting Dzud forecast information, it is necessary to decide on the transmission method, since it requires a mechanism on the sender's server as well as on the terminal used by the user (cell phone, smartphone).

In this section, the Study Team assumes the introduction of an application to convey information to herders over the web by utilizing existing applications. The following is a summary of the characteristics of applications for herders' mobile terminals.

The applications are compared for smartphone applications by development, web applications by development, general-purpose smartphone applications such as Facebook, and SMS. All of these are available as information transmission platforms using the cell phone network.

Table 2.4   Comparison of Mobile Phone Applications

	SMS	General purpose App (e.g. Facebook)	Smart phone application	Web application
Send Data	△; Text only. Limited number of characters (It is possible to link to web screens, images, etc. by attaching a URL. However, it is often not possible to link with a low-speed line.)	○; Text, image, video, audio	○; Text, image, video, audio	○; Text, image, video, audio
Push Notification	○	○	○; Development required	△ ;Only when logged in
Read Confirmation	○; Possible by development	○; Possible by development (for Facebook)	○; Possible by development	○; Possible by development
Network Environment	○; Operates on all mobile networks.	△; Some functions can be used even with 2G.	△; A level that is practically unusable with 2G.	×; Almost unusable with 2G.
(Interactive) Data Input from Terminal	○; Possible (simple data such as numbers. Development required)	Possible (using comments, etc. Data conversion is difficult)	○; Possible (development required)	○; Possible (development required)
Terminal	○; All mobile devices. (In Mongolia, including gmobile's CDMA450 fixed telephone)	○; All mobile devices (If you have a web function. In Mongolia, gmobile's CDMA450 fixed phone is excluded. Depending on the radio wave condition, it cannot be used on the web)	△; Smartphone (There may be restrictions)	○; All mobile devices and PCs (If you have a web function. Except gmobile's CDMA450 fixed phone)
Terminal Installation	○; Not required	△; Necessary. (may be pre-installed)	×; Basically necessary	Yes; not required (assuming a browser is installed)
Terminal Application Development Load	○; None	○; None	×; Large (requires support for each model type and OS)	△; Medium (requires support for each browser)
Maintainability	○; Little maintenance required.	○; Depends on the version upgrade of the general-purpose application.	×; Confirmation and correction are required when adding a model, OS, or upgrading the OS version.	△; Requires confirmation and correction when upgrading the browser version. "

Source: JST

At this time, it is difficult to expect a network environment of 3G or higher in the Herding residential areas and grazing areas, and the number of devices owned by the herders is more common than smartphones, so the use of SMS is realistic. Most probably, in the future, the network environment will improve and the number of herders owning smartphones will increase, but even in that case, the system used for SMS can still be used.

A two-way application is proposed in the 2020 "The survey for Dzud Countermeasures (Climate Change Adaptation Measures) and Resilience Building in Mongolia (Disaster Prevention/Climate Change Adaptation Measures) (Livestock Value Chain/Climate Change Adaptation Measures)". However, considering the usage of the devices and telecommunication network environment, it is assumed that more than half of the herders cannot use the system.

2.5 Meteorological disasters other than Dzud

A large sandstorm occurred on March 14, 2022. The sandstorm caused widespread damage in Khovd, Govi-Altai, Bayankhongor, Arkhangai, Uvurkhangai, Umnogovi, Dornogovi, and Dundgovi Aimags. In Dundgovi Aimag nine herders died and more than 300,000 livestock were lost. The total number of livestock in the Dundgovi Aimag was 3.17 million in 2021, which means that approximately 10% of the livestock were lost in a single day due to this dust storm. Although sandstorms occur every year, disasters of this scale are extremely rare in recent years.

The 2021 sandstorm killed nine herders, although the Dundgovi Aimag Emergency Management Authority received 400 SOS messages from the victims. Information transmission in an emergency relies heavily on the head of bug's daily information collection and emergency information transmission. The head of bug Gurvansaikhan Soum who was interviewed had called the herders directly to convey emergency information. During the 2021 sandstorm, the head of bug called 70 of the 250 herders directly, and the herders who received the call contacted the remaining 180.

A disaster situation survey by a team from NEMA, MOFALI and the Aimag Construction Department found that 90% of the herders monitored had received information about sandstorms in advance via television or SMS from the Aimag Emergency Management Authority. Although the information itself was received four days before the outbreak, many herders were unable to adapt to the sudden change in weather, and many of the herders who went out to graze suffered damage.

2.6 Issues for future project formulation

Medium- and long-term forecasts such as Dzud forecasts are transmitted through various routes, and it is recognized that the sender is providing the necessary information. Recipients, such as herders, use the provided information through empirical judgment. In recent years, the accuracy of weather forecasts provided by smartphone apps has improved, and the quality of information judged by herders has improved. The herders pointed out that the issue is not the provision of highly accurate information, but rather the ability of the herders themselves to take measures (according to the herder survey). For this reason, rather than improving the accuracy of medium- to long-term forecasts such as Dzud, it is desirable to increase the options for countermeasures by the herders themselves or by the government, and to improve countermeasure capabilities.

On the other hand, as seen in the aforementioned sandstorm damage, short-term/emergency information has the following issues.

(1) Although there are various routes for communication in an emergency, the provision of information to the herders, which is the last mile, depends on the individual, such as the head of bug, and it is desirable to establish a standardized communication mechanism.

(2) The telephone is a time-consuming means of communication, and there are many problems with it as a means of communicating emergency information. Furthermore, even if information can be communicated to herders, it may not be possible to evacuate immediately if their livestock are grazing away from their Gers, and many other problems have been pointed out regarding the reception of information.

(3) Telephone calls and face-to-face communication are the only way for herders to confirm who received and who could not receive the information. However, especially in winter, many herders are in the areas of out of mobile phone service areas.

(4) Head of bug only could make phone calls to approximately 100 households although the head of bug are responsible for 200 households. For those heads of bug who cannot directly communicate should depend on the communication among herders and this causes delay such as herders could not receive the warning before the occurrence of the damage of disaster.

(5) With one-way information transmission such as SMS, it is not possible to specify the location of the damage situation, making it difficult to take countermeasures.

Chapter 3 Herders Countermeasures against Dzud

A herder survey was conducted to understand the adaptation behavior of herders to the Dzud forecast.

The survey consisted of interviews using questionnaires and group discussions based on themes for each survey target Soum. Participants in the survey were selected by the Soum administration, officials of the Soum office, residents of the Soum center, and households more than 10 kilometers away from the Soum center.

The participants of the survey are the officials of the Soum office, the residents of the Soum center and the households more than 10 kilometers away from the Soum center, those who were selected by the Soum officer. The number of participants was set at approximately 10% of the number of herder households. Tsogt Soum has a large number of herder households, and the number of participants was 6.4% of the total number of herder households, but the terrain is long from north to south, and the participants were mainly herders from the northern part where the Soum Center is located. Among the participants, some of the residents of the Soum Center transferred their livestock to their children. This caused variation in the number of respondents   (n-number) in the following survey results.

Table 3.1 shows the outline of the survey, and Figure 3.1 shows the photo of the survey.

Table 3.1   Outline of Herders Survey

Aimag	Soum	Number of herders Household	Participants (person)	Implementation date
Dundgovi	Adaatsag	658	47	2022/10/25
	Gurvansaikhan	558	56	2022/10/24
Govi-Altai	Biger	584	51	2022/11/3
	Tsogt	909	58	2022/11/4

Survey in Adaatsag Soum   **Survey in Gurvansaikhan Soum**

Survey in Biger Soum   **Survey in Tsogt Soum**

Figure 3.1   View of the Survey in Soum

3.1 Livelihood Situation and Adaptation to Disaster Prevention of Herders

3.1.1 Livelihood and Behavioral Style of Pastoralism of Herder

(1) Number of times of herder migration and migration distance per year

There were differences in the number of annual movements of herders between Soums (Figure 3.2).

In Adaatsag Soum, 17 households (44%) moved more than five times a year, the highest number, and some herders said they moved up to 20 times. In Gurvansaikhan Soum, the number of trips twice a year was the highest. In Biger Soum, most of them moved three times a year, and in Tsogt Soum, four times a year was the most common.
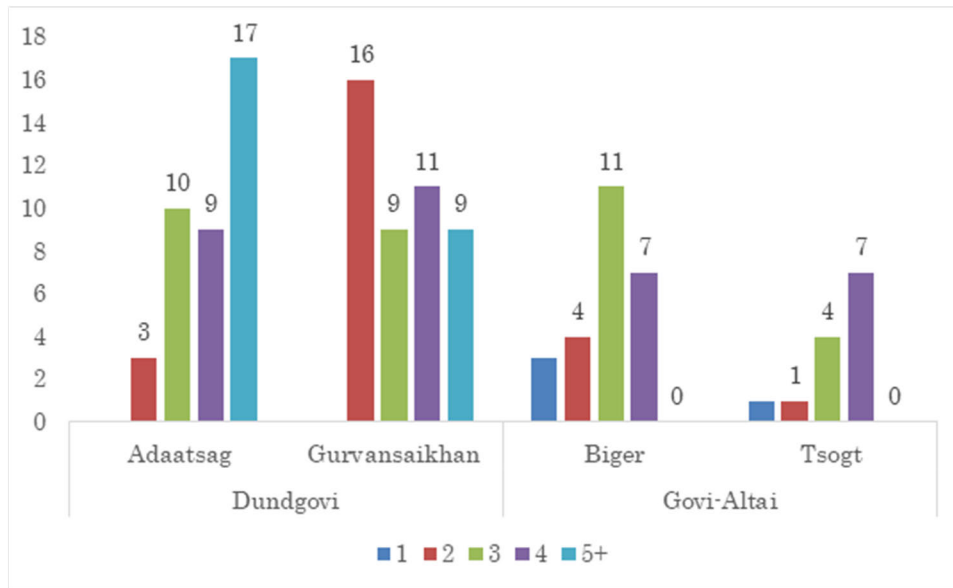
Source: JST

Figure 3.2   Number of Herder Migrations per Year

Pasture migration distances were mostly less than 100 km in Adaatsag Soum, Gurvansaikhan Soum and Biger Soum. On the other hand, there were herders traveling more than 1,000 km in Gurvansaikhan Soum and Tsogt Soum. The maximum distance traveled (km) was 500, 1,500, 280, and 1,000 for Adaatsag Soum, Gurvansaikhan Soum, Biger Soum and Tsogt Soum, respectively.
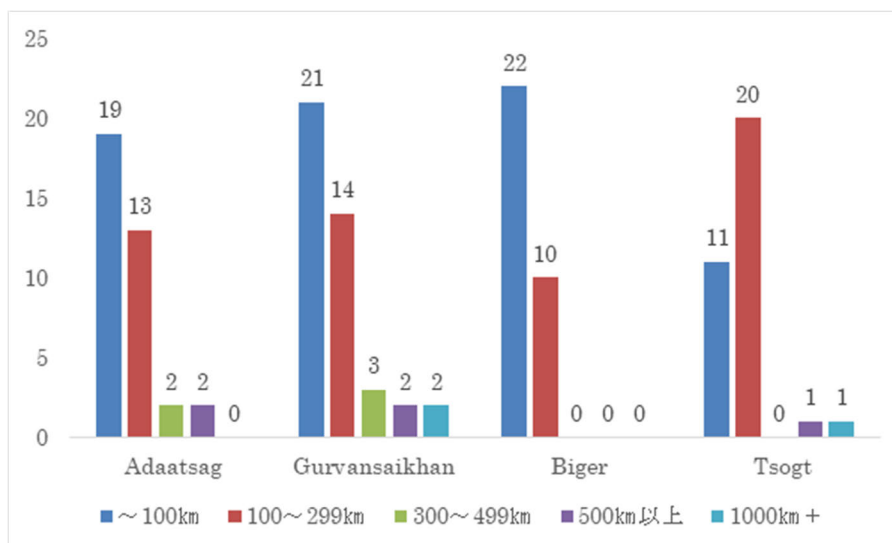
Source: JST

Figure 3.3   Grazing Distance of Herders

(2) Ownership of Livestock Barn

Most herders own barns in Adaatsag Soum, Gurvansaikhan Soum and Biger Soum. On the other hand, 39% (13 out of 33) of the respondents in Tsogt Soum answered they did not own a barn. Tsogt Soum has a long north-south shape of territory, which is influenced by the long distances traveled.

Table 3.2   Status of Ownership of Livestock Barns

Soum (Respondents)	Number of herders	
	Own a barn	Don't own a barn
Adaatsag (n=32)	32	0
Gurvansaikhan (n=43)	43	0
Biger (n=43)	41	2
Tsogt (n=33)	20	13

Source: JST

(3) Livestock Feed Storage

In Biger Soum all herders have their own livestock feed storage. On the other hand, in Adaatsag Soum and Tsogt Soum, about half of the herders own livestock feed storage, and in Gurvansaikhan, only 35% of the herders own a livestock feed storage.

Table 3.3   Status of Ownership of Livestock Feed Storage

Soum (Respondents)	Number of herders	
	Own a storage	Don't own a storage
Adaatsag (n=32)	18	14
Gurvansaikhan (n=43)	15	28
Biger (n=43)	43	0
Tsogt (n=33)	15	18

Source: JST

3.1.2   Behavior of herders after receiving Dzud warning information

Among the behaviors of herders who received Dzud prediction information, the most frequently answered were "preparing feed," "slaughtering and selling livestock," "warming barns in winter," and "move/Otor" (Figure 3.4). In particular, more than 70% of herders in all target Soums responded that "preparing feed" was a necessary action for Dzud countermeasures.
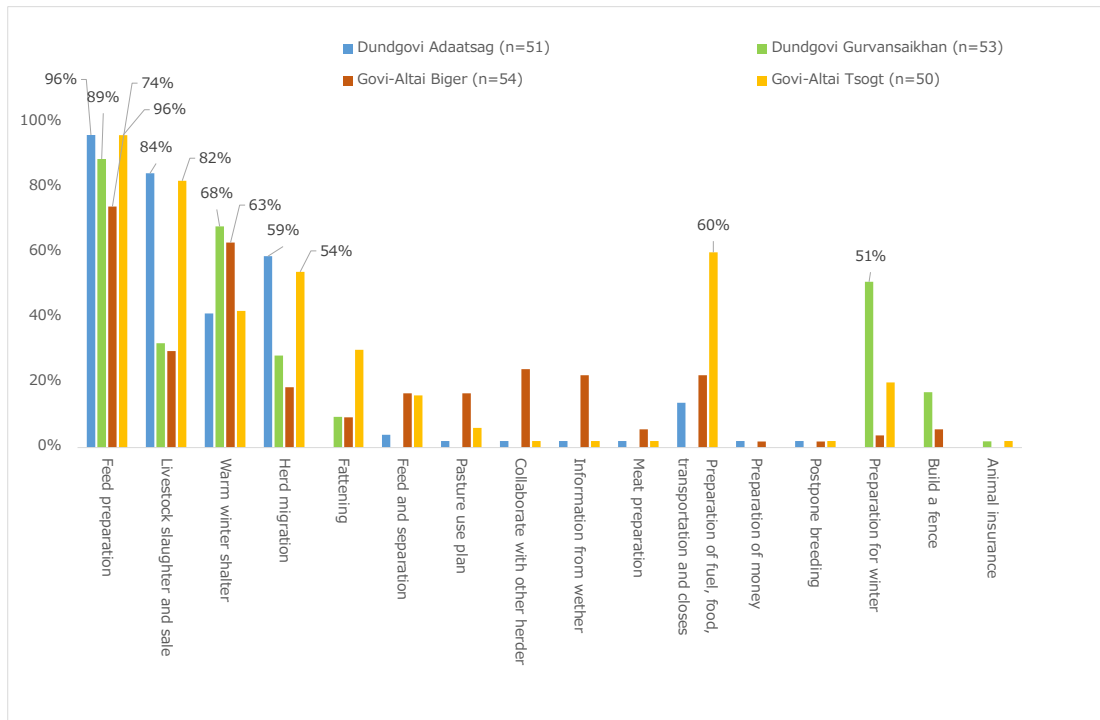
Source: JST

Figure 3.4   Behavior after Receiving Dzud Warning (Multiple Answers)

The adaptation behavior of herders to the Dzud forecast varies by Aimag, (Figure 3.5), but in all Soums, "feed preparation" ranked first, and "animal feed preparation" was found to be the most important behavior.

Looking at other trends, in Adaatsag Soum and Tsogt Soum, the next largest number, "slaughter and sale of livestock", accounts for more than half. Gurvansaikhan Soum and Biger Soum   answered more to the third "warm the winter barns" than "livestock slaughter and sell". If "Migration/Otor[10]" is added, it accounts for more than 90% of the total for Adaatsag Soum, and more than 50% for other Soums.

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[10]   Otor refers to the movement of livestock outside of their normal use grazing areas.
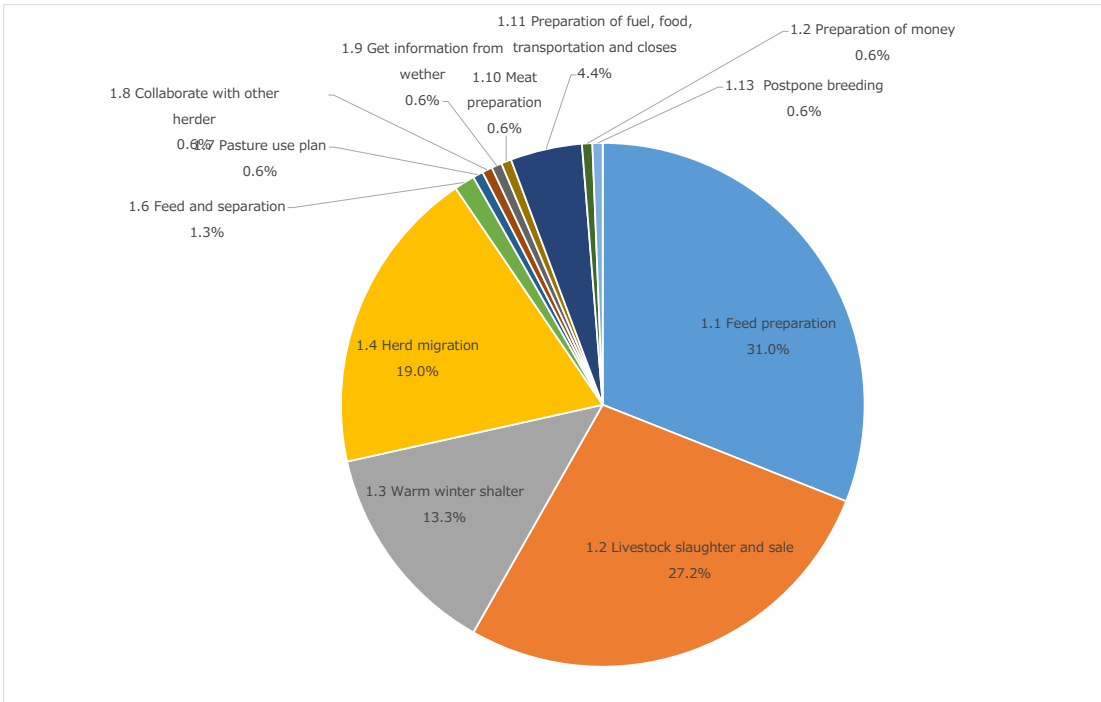
(1) Adaatsag Soum, Dundgovi Aimag
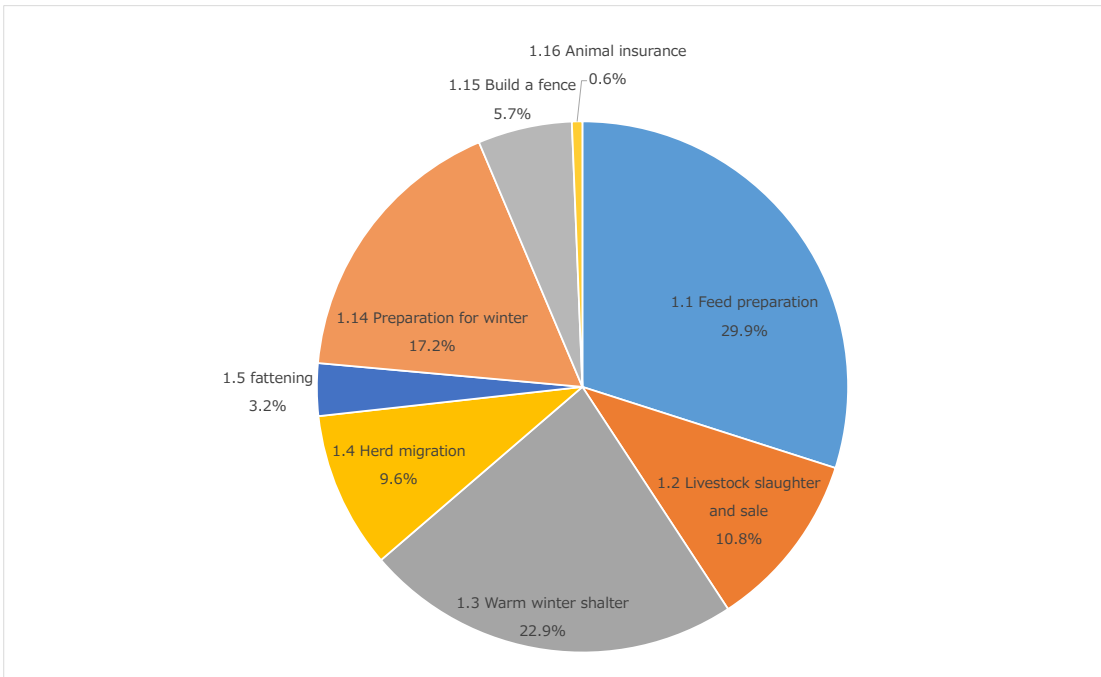
(2) Gulvansaikhan Soum, Dundgovi Aimag
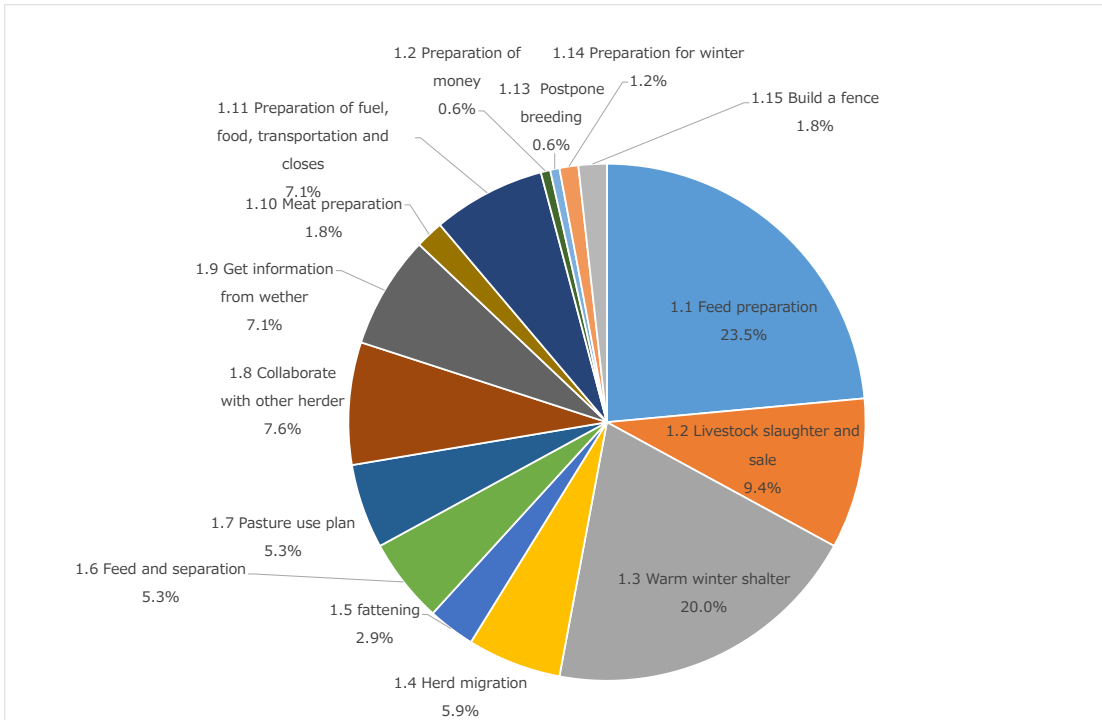
(3)   Biger Soum, Govi-Altai Aimag
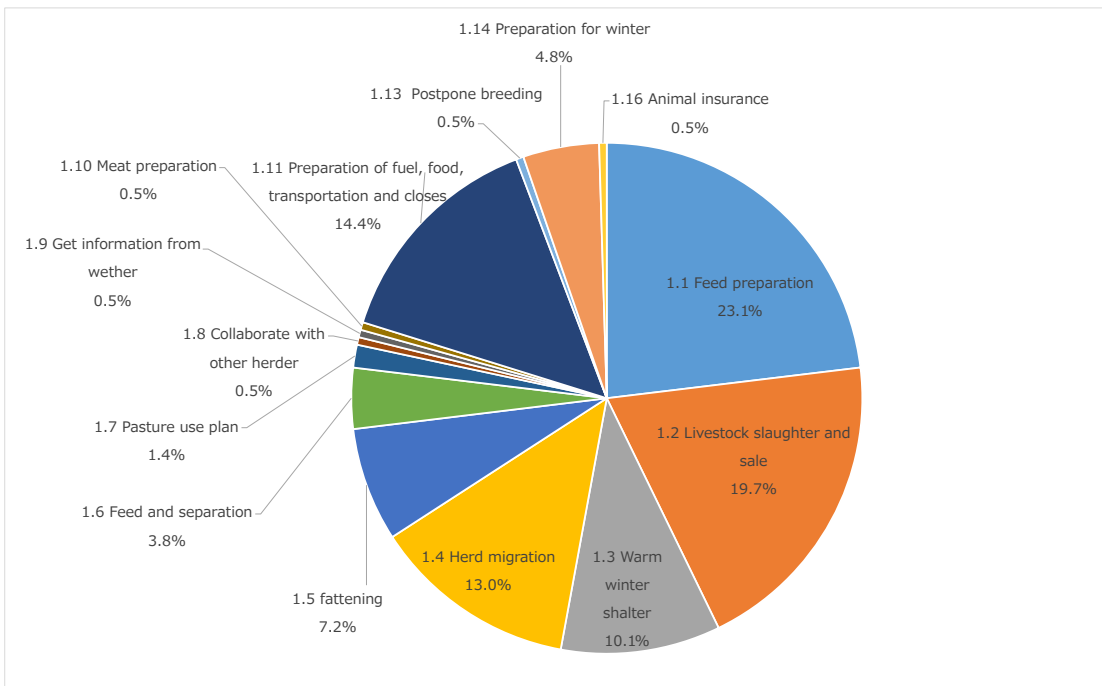
(4)   Tsogt Soum, Govi -Altai Aimag

Source:JST

Figure 3.5   Behavior after Receiving Dzud Warning by Soum

3.1.3 Dzud Prediction Information Prioritized by Herders

Table 3.4 shows the priority of the factors that herders pay attention to and their selection ratio among the factors that determine the Dzud forecast.

The factor of Dzud forecast that herders attach importance to be "summer conditions in pastures" followed by "precipitation" at 27.1% and 26.4%, respectively. In addition, the 2nd response rate was 32.3% for "grazing ability", which is also given considerable importance. The response rate for both "grazing ability" and "amount of pasture grass" exceeds 10%.

Based on these facts, it seems that herders place importance on the condition of pasturelands in summer, refer to the grazing capacity and precipitation, and predict the winter conditions of the year empirically.

On the other hand, herders have expressed the opinion that "rather than improving the accuracy of forecast information, we would like more countermeasures to be implemented" (according to a hearing conducted by the survey). Dzud risk information can be useful information for herders to make decisions, but in order to promote behavioral changes that contribute to herder's measures against Dzud, it is necessary to provide measures that can be expected to be effective, such as preparing various feeds and securing livestock barns.

Table 3.4   Prioritization by Herders of Factors Determining Dzud Predictions (n=208[11])

	Summer conditions in pastures	Grazing ability	Condition of livestock	Amount of pasture grass	Precipita-tion	Temper-ature	Draught forecast	Amount of snow	Temperature prediction	Snow prediction	Others
1st	27.1%	11.4%	1.4%	15.7%	26.4%	0.7%	2.1%	4.3%	5.7%	5.0%	0.0%
2nd	11.3%	32.3%	4.8%	22.6%	16.1%	0.0%	1.6%	3.2%	4.0%	4.0%	0.0%
3rd	15.6%	11.5%	15.6%	21.3%	12.3%	5.7%	8.2%	4.9%	4.9%	0.0%	0.0%
4th	18.2%	10.7%	12.4%	12.4%	16.5%	7.4%	9.9%	6.6%	3.3%	2.5%	0.0%
5th	5.4%	9.8%	16.3%	9.8%	8.7%	12.0%	17.4%	8.7%	6.5%	5.4%	0.0%
6th	6.8%	13.7%	6.8%	2.7%	2.7%	15.1%	16.4%	20.5%	11.0%	4.1%	0.0%

Source: JST

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[11] The total number of respondents was based on the total number of the four Soums where the herder survey was conducted. Because some participants did not have livestock, there is a difference between the number of differences covered by the herder survey (n=212) and the number of respondents (n=208).

3.2 Means of information Communication of Herders

3.2.1 Communication of Weather and Disaster Information

Weather and disaster information for herders is divided into three types according to the time until occurrence, Medium- to Long-Term Forecast Information, Short-Term Forecast Information, and Emergency Forecast Information in line with the forecast types shown in 2.2 (Table 3.5). .

Table 3.5　　Means of Transmitting Weather Forecast Information to Herders

	Medium- to Long-Term Information	Short Term Information	Emergency Forecast Information
Time for forecasting	3 month	1 month	Within a week
Type	Dzud Risk Map	Updating of Dzud Risk Map	Forecast of Sudden Weather Change
Medium	TV, Radio Receiver	TV, Radio Receiver Website Smartphone App Facebook (NAMEM)	SMS Telephone Facebook (Aimag DMEM, Aimag EMD)
Means of information	Watching the herder channel on TV The weather forecast on radio (3pm daily) Newsletter distribution by Bag Chief	Access to smartphone apps (Windy, etc.) Check the Aimag AMEM and Facebook of the herder group Receiving information by SMS	Aimag AMEM, Aimag EMD sent SMS to Soum Chief and Bug Chief by SMS. The Bug Chief contacts each herder by phone. The herder who received the information spread the information to other herders by messenger or telephone

Source: JST

Alert: An alert to be aware of an abstention phenomenon in the weather forecast. 7 October 2022 Afternoon blizzard in most areas at night in northern areas of Dundgovi Aimag. Winds are blowing from the north up to 13-15m/s, so special warning for herders, transporters and residents. Dundgovi EMD

A message from the Aimag EMD received by the chief of Adaatsag Soum

An app on the smartphone of a herder of Adaatsag Soum

Source: JST

Figure 3.6　　Examples of Information Reception of a Herder

3.2.2 Means of receiving information by herders

Herders obtain weather and disaster information as follows. In addition, herders communicate with each other mainly by telephone. If the phone service is not available, they access Facebook, etc. when they go to the Soum Center for shopping, etc., or get information from people they know who have been to the Soum Center stopped by.

Table 3.6 Means of Receiving Information by Herders

No	Medium	Long-Medium	Emergency	Means of Receiving
1	TV, Radio Receiver	○	○	Listen to scheduled weather information, herder's channels
2	Document (Paper)	○		Hand-delivered on paper from Bug Chief
3	Telephone		○	Transferred from Bug Chief to each herder, and from herder to herder. Receiving terminals are Ger.'s fixed terminals, herder's mobile phones and smartphones.
3	SMS	○	○	Receiving from Aimag DMEM, Aimag EMD and Bug Chief. Terminals are Ger.'s fixed terminal, herder's mobile phone and smartphone
5	Facebook	○	○	Sent from Aimag DMEM, Aimag EMD

Source: JST

3.2.3 Ownership of information and communication equipment

More than 50% of the herders surveyed had mobile phones (Figure 3.7). In particular, 83% of herders in Gurvansaikhan Soum, Dundgovi Aimag, had mobile phones. Smartphone ownership ranged from 36% to 57%. Landline phone ownership is lower than mobile phones and smartphones, with only 3% in Tsogt Soum, Govi-Altai Aimag. The landline ownership rate is around 20%, but Tsogt Soum, Govi-Altai Aimag, it is quite low at 3%.
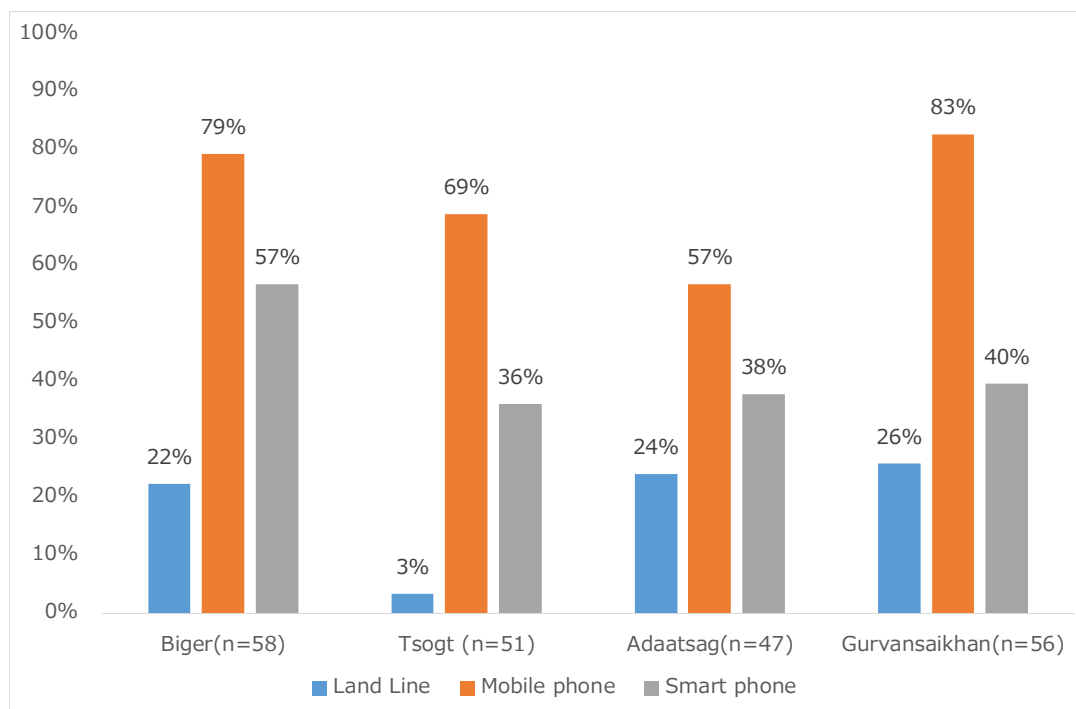
Source: JST

Figure 3.7 Ownership of Communication Equipment of Herders (As of November 2022)

3.3 Income of herders

3.3.1 Income and expenses

(1) Business Conditions

The percentage of gross income (sales total) per household by item tends to be highest for "Livestock/Meat", followed by "Cashmere". However, in Biger Soum in Govi-Altai Aimag, the sales of cashmere exceeds that of livestock and meat (Table 3.7). The ratio of "Milk and Dairy Products" to the total sales amount was 8% or less for all Soums.

Expenditures (operating costs) tends to be the highest for "Gasoline", followed by "Hay/Fodder Purchase" and "Borrowing Interest", but it was reversed in Biger Soum (Table 3.8).

The annual income, which is the gross income minus the expenditure, is 10.7 million to 13.2 million MNT, or 890,000 to 1.10 million MNT per month (Table 3.9). In terms of household income, it is high compared to the average monthly salary of local civil servants, which is about 500,000 to 600,000 MNT.

The income of herders depends on livestock and livestock products, and it can be said that their productivity is not stable due to the sudden decline in production and increase in expenditure due to the risk of natural disasters.

Table 3.7   Gross Income (Sales) of Herder's Households by Soum

Soum (Respondents)	Gross Income (Sales) Upper: Thousands MNT, Lower: Ratio (%)				
	Total	Livestock・Meat	Milk・Dairy Products	Cashmere	Others
Adaatsag (n=44)	18,358 100%	9,544 52.0%	985 5.4%	7,257 39.5%	571 3.1%
Gurvansaikhan (n=52)	17,325 100%	9,363 54.0%	1,200 6.9%	5,935 34.3%	827 4.8%
Biger (n=44)	15,647 100%	7,734 49.4%	1,120 7.2%	6,625 42.3%	169 1.1%
Tsogt (n=43)	15,193 100%	6,278 41.3%	968 6.4%	7,654 50.4%	293 1.9%

Source: JST

Table 3.8   Expenditures (Operating Costs) of Herder's Households by Soum

Soum (Respondents)	Expenditures (Operating Cost) Upper: Thousands MNT, Lower: Ratio (%)						
	Total	Hay・Fodder	Veterinary・Medicine	Gasoline	Heating・Cooking Fuel	Livestock Insurance/ Tax	Borrowing Interest
Adaatsag (n=44)	5,154 100%	1,340 26.0%	316 6.1%	1,555 30.2%	754 14.6%	272 5.3%	916 17.8%
Gurvansaikhan (n=52)	6,308 100%	1,866 29.6%	202 3.2%	2,558 40.6%	376 6.0%	263 4.2%	1,044 16.5%
Biger (n=44)	4,951 100%	1,204 24.3%	403 8.1%	1,078 21.8%	863 17.4%	261 5.3%	1,142 23.1%
Tsogt (n=43)	4,036 100%	1,023 25.3%	113 2.8%	1,050 26.0%	685 17.0%	283 7.0%	883 21.9%

Source: JST

Notice: Borrowing interest was set at 18% (annual interest) of the borrowing amount.

Table 3.9   Annual Income of Herders by Soum

(Unit: Thousands MNT)

Soum (Respondents)	Annual Income (Gross Income-Expenditures)
Adaatsag (n=44)	13,203
Gurvansaikhan (n=52)	11,017
Biger (n=44)	10,696
Tsogt (n=43)	11,157

Source: JST

(2)   Borrowings

The average amount borrowings per herder's household is about 5-6 million MNT (200,000-240,000 yen), most of which are borrowed from banks (Table 3.10). The borrowing period is generally one to three years, with two years accounting for 54% of the total (according to a herder's survey). Borrowing interest rates range from 18% to 24% per annum. The purpose of borrowing is most for living expenses, followed by fodder costs. In Biger Soum, the ratio of tuition costs was higher than that of feed costs.

Table 3.10   Details of Borrowings per Herders Household

(Unit: Thousand MNT, %,%)

Soum (Respondents)	Average Borrowing Amount (thousand MNT)	Lenders			Borrowing Purpose				
		Bank	Individual	Others	Tuition Fees	Living Expenses	Feed Expenses	Vehicles/Machine /Facilities	Others
Adaatsag (n=44)	5,091	100%	0%	0%	11%	44%	35%	9%	2%
Gurvansaikhan (n=52)	5,798	100%	0%	0%	12%	44%	30%	11%	2%
Biger (n=44)	6,345	90%	8%	3%	26%	37%	22%	11%	4%
Tsogt (n=43)	4,906	100%	0%	0%	16%	49%	21%	9%	5%

Source: JST

3.3.2   Situation of Livestock Sales

(1)   Number of Livestock

In terms of the number of livestock per household by surveyed Soum, sheep and goats account for around 90% of the total in each Soum (Table 3.11).   In Adaatsag Soum and Gurvansaikhan Soum, the numbers of sheep are slightly more than goats. In Biger Soum and Tsogt Soum, the number of goats was almost double that of sheep. This is probably because Biger Soum and Tsogt Soum are located in the Altai Mountains, and the number of goats that are good at grazing in the mountains has increased. Also, in Govi-Altai Aimag, the difference in transportation conditions has an effect, such as the fact that meat cannot be transported unless it is frozen.

Adaatsag Soum had more horses than other Soums. This reflects the fact that Adaatsag Soum is more northerly located than other Soums, and its vegetation is closer to forest grasslands, making it more suitable for horse production.

Table 3.11   Number of Livestock Owned per Household of Herders by Soum and Ratio of Livestock Type

(Unit: heads, %)

Soum (Respondents)	Total	Horse	Cow	Camel	Sheep	Goat
Adaatsag (n=44)	417.6	35.1	14.1	1.4	194.2	172.8
	100.0%	8.4%	3.4%	0.3%	46.5%	41.4%
Gurvansaikhan (n=52)	380.4	9.1	10.1	0.8	200.9	159.4
	100.0%	2.4%	2.6%	0.2%	52.8%	41.9%
Biger (n=44)	284.6	12.2	15.9	4.1	77.1	192.2
	100.0%	4.3%	5.6%	1.5%	27.1%	67.5%
Tsogt (n=43)	357.2	6.2	10.4	3.7	126.0	214.2
	100.0%	1.7%	2.9%	1.0%	35.3%	60.0%

Source: JST

(2)   Consumption, Donation and Sales of Livestock

The number of domestic livestock consumed per household was 8-10 sheep, 8-9 goats in Adaatsag Soum and Gurvansaikhan Soum, and 12-14 in Biger Soum and Tsogt Soum (Table 3.12).

About three sheep and three to six goats were donated.

In terms of the number of head of sale, 33-42 sheep and 19-23 goats were the most sold in Adaatsag Soum and Gurvansaikhan Soum. Biger Soum sells less sheep than other Soums, about 5 sheep, while Tsogt Soum sells 14 sheep. In Biger Soum and Tsogt Soum, the number of goats sold was high, ranging from 26 to 38 (Table 3.12).

Table 3.12   Number of Consumption, Donation and Sales of Livestock per Household of Herder by Soum

(Unit: head)

Soum (Respondents)	Total			Horse			Cow			Camel			Sheep		
	Consumption	Donations	Sales	Consumption	Donations	Sales	Consumption	Donations	Sales	Consumption	Donations	Sales	Consumption	Donations	Sales
Adaatsag (n=44)	0.9	0.3	2.2	0.8	0.1	1.5	0.0	0.0	0.0	9.6	3.0	33.0	8.1	2.4	18.8
Gurvansaikhan (n=52)	0.5	0.3	0.8	0.4	0.5	1.2	0.0	0.0	0.1	9.5	5.4	41.8	8.7	3.7	22.5
Biger (n=44)	0.7	0.9	1.3	1.0	0.6	2.5	0.1	0.0	0.4	7.6	3.9	4.5	12.7	5.5	26.4
Tsogt (n=43)	0.2	0.1	0.6	0.7	0.2	0.7	0.1	0.1	0.2	9.9	2.2	13.6	13.9	5.8	37.3

Source: JST

(3)   Sales Price of Livestock

The selling price per livestock is 794,000 to 910,000 MNT for horses, 917,000 to 1,270,000 MNT for cattle, 950,000 to 1,166,000 MNT for camels, 112,000 to 126,000 MNT for sheep, and 87,000 to 102,000 MNT for goats. (Table 3.13). The UB City market price converted from the carcass unit price is 200,000 to 250,000 MNT/livestock for sheep (according to herder interviews), and the selling price of local herders is about half of the UB City market price.

Table 3.13   Sales Price of Livestock per Livestock

(Unit: thousand MNT)

Soum (Respondents)	Horse	Cow	Camel	Sheep	Goat
Adaatsag (n=44)	910.0	1,039.3	-	125.2	98.5
Gurvansaikhan (n=52)	861.4	1,270.5	1,000.0	118.2	93.8
Biger (n=44)	905.6	1,154.5	1,166.7	112.5	102.2
Tsogt (n=43)	793.8	916.7	950.0	126.1	87.3

Source: JST

Note: No response from camel owner of Adaatsag

As for the ratio of livestock to the total sales per household calculated from the sales price and the number of livestock, sheep accounted for about half of the total in Adaatsag Soum and Gurvansaikhan Soum (Table 3.14). In Biger Soum, cattle and goats accounted for more than 70% of the total, with more cattle being sold than goats. In Tsogt Soum, goat sales accounted for about half of the total.

Table 3.14   Sales Price of Livestock and Ratio of Sales by Type of Livestock per Herderic Household by Soum

(Unit: thousand MNT, %)

Soum (Respondents)	Total	Horse	Cow	Camel	Sheep	Goat
Adaatsag (n=44)	9,544.4	2,002.0	1,559.0	0.0	4,131.1	1,852.2
	100.0%	21.0%	16.3%	0.0%	43.3%	19.4%
Gurvansaikhan (n=52)	9,363.1	689.1	1,524.5	100.0	4,939.1	2,110.3
	100.0%	7.4%	16.3%	1.1%	52.8%	22.5%
Biger (n=44)	7,734.3	1,177.2	2,886.4	466.7	506.3	2,697.8
	100.0%	15.2%	37.3%	6.0%	6.5%	34.9%
Tsogt (n=43)	6,277.9	476.3	641.7	190.0	1,715.1	3,254.9
	100.0%	7.6%	10.2%	3.0%	27.3%	51.8%

Source: JST

(4)   Sales Destinations and Sales Forms by Livestock Species

Table 3.15 shows sales destinations and sales forms by livestock Species. Figure 3.8 shows where sheep and goats are sold.

In Dundgovi Aimag, Adaatsag Soum had the most sales to UB City, while Gurvansaikhan Soum had the most sales to the Aimag center. In Govi-Altai Aimag, sales to Soum centers were the highest in both Biger Soum and Tsogt Soum. Slaughter sales account for nearly 90% of all sales in both Adaatsag Soum and Gurvansaikhan Soum, but in Biger Soum and Tsogt Soum, live sheep and slaughter are about the same, and goats in Biger Soum account for 80%, slightly more live than slaughtered at Tsogt Soum (Figure 3.9).

Table 3.15   Sales Destinations and Sales Forms by Livestock Type

Livestock Species	Soum (Respondents)	Sales Destinations				Forms	
		UB City	Aimag Center	Soum Center	Others	Living	Slaughter
Horse	Adaatsag (n=22)	40%	20%	20%	20%	43%	57%
	Gurvansaikhan (n=13)	0%	62%	31%	8%	17%	83%
	Biger (n=13)	10%	0%	50%	40%	75%	25%
	Tsogt (n=5)	25%	0%	75%	0%	50%	50%
Cow	Adaatsag (n=14)	46%	23%	7%	23%	29%	71%
	Gurvansaikhan (n=10)	9%	45%	18%	27%	10%	90%
	Biger (n=9)	0%	0%	78%	22%	75%	25%
	Tsogt (n=3)	0%	0%	0%	100%	100%	0%
Camel	Adaatsag (n=5)	20%	0%	0%	80%	100%	0%
	Gurvansaikhan (n=1)	0%	100%	0%	0%	0%	100%
	Biger (n=6)	0%	0%	83%	17%	67%	33%
	Tsogt (n=1)	-	-	-	-	100%	0%
Sheep	Adaatsag (n=28)	65%	23%	4%	8%	23%	77%
	Gurvansaikhan (n=32)	3%	63%	22%	12%	10%	90%
	Biger (n=7)	0%	14%	57%	29%	50%	50%
	Tsogt (n=16)	10%	20%	60%	10%	50%	50%
Goat	Adaatsag (n=23)	57%	24%	9%	9%	26%	74%
	Gurvansaikhan (n=29)	5%	55%	34%	7%	14%	86%
	Biger (n=15)	0%	13%	53%	33%	79%	21%
	Tsogt (n=21)	7%	13%	73%	7%	57%	43%

Source: JST

Note: No response of those who own camel in Tsogt
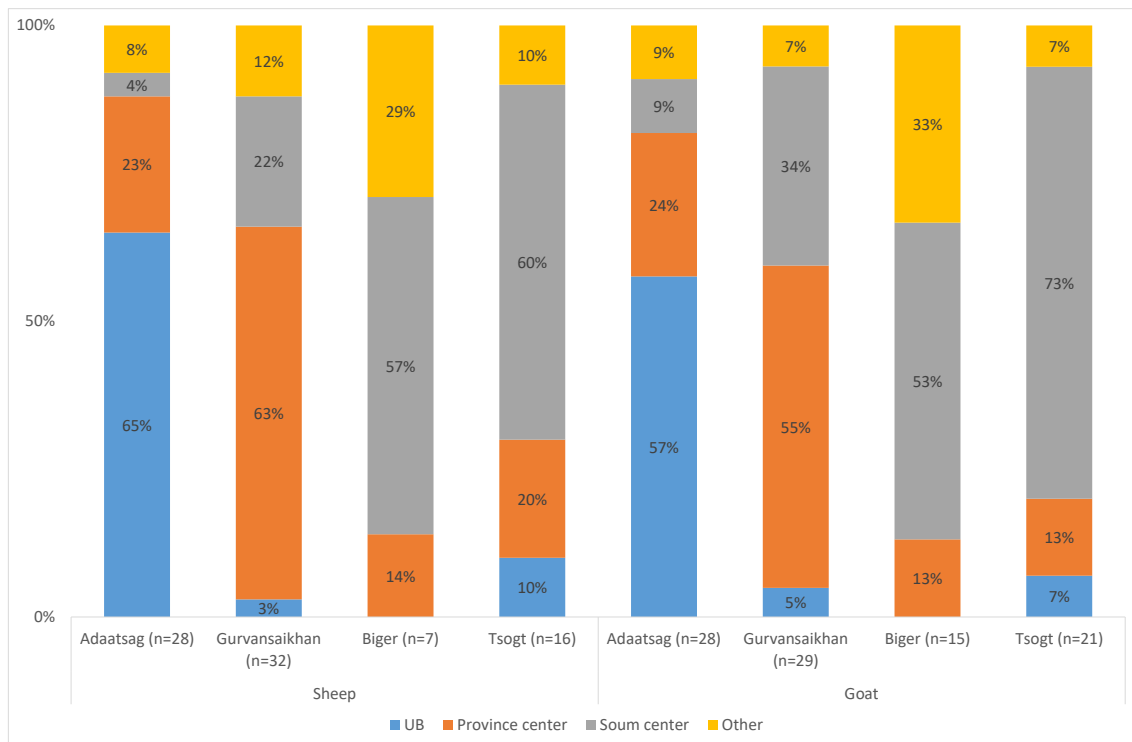
Source: JST

Figure 3.8   Sales Destination of Sheep and Goat
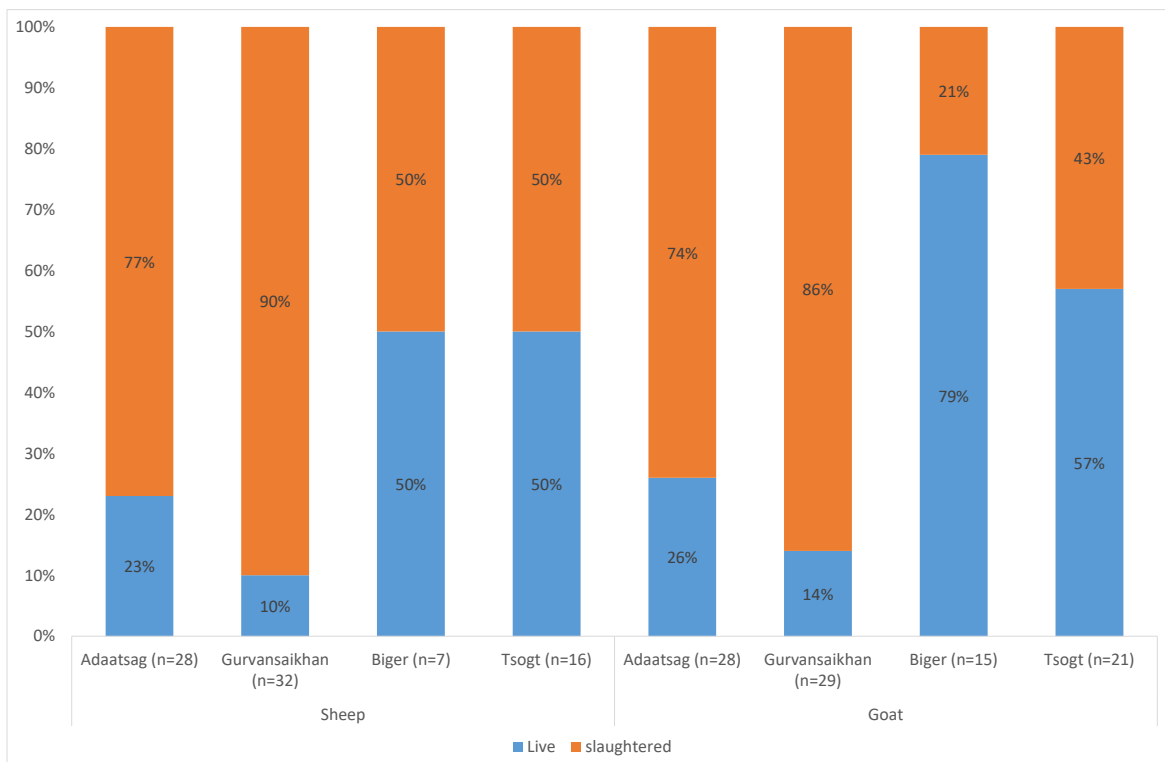
Source: JST

Figure 3.9   Sales Forms of Sheep and Goat

(5)   Sales Seasons and Sales Purpose

Table 3.16 shows the sales seasons and purpose of sale by livestock species, and Figure 3.10 shows the sales period of sheep and goats. As for the sales season, autumn and winter account for about 70% of the total sales, except for Biger Soum sheep (Figure 3.10). As shown in Figure3.9Biger Soum is sold mostly in the summer (Table 3.16) because it is often sold live. Gurvansaikhan Soum and Tsogt Soum are sold throughout the year.

Debt repayment and living expenses accounted for more than 60% of all sales. In particular, most of the livestock sold in the spring are used to pay off debts and living expenses. In Biger Soum, 100% of sheep sales are debt repayment. In Adaatsag Soum, the 11-13% is for the purchase of feed, which may be related to the preparation of feed by Khorshoos.

Table 3.16   Sales Seasons and Sales Purpose by Livestock Species

Livestock Species	Soum (Respondents)	Sales Timing					Sales Purpose					
		Spring	Summer	Autumn	Winter	All Year	Tuition Fees	Debt Repayment	Living Expenses	Feed Preparation	Purchase of Machinery	Others
Horse	Adaatsag (n=22)	0%	0%	71%	24%	50%	27%	41%	23%	5%	0%	5%
	Gurvansaikhan (n=13)	10%	0%	80%	0%	10%	22%	44%	22%	0%	0%	11%
	Biger (n=13)	0%	0%	44%	44%	22%	31%	38%	31%	0%	0%	0%
	Tsogt (n=5)	0%	0%	40%	40%	20%	20%	40%	40%	0%	0%	0%
Cow	Adaatsag (n=14)	0%	0%	64%	29%	7%	23%	31%	15%	23%	0%	7%
	Gurvansaikhan (n=10)	0%	0%	50%	50%	0%	30%	60%	10%	0%	0%	0%
	Biger (n=9)	13%	0%	37%	50%	0%	33%	44%	22%	0%	0%	0%
	Tsogt (n=3)	0%	0%	0%	100%	0%	67%	0%	33%	0%	0%	0%
Camel	Adaatsag (n=5)	0%	0%	50%	50%	0%	0%	50%	50%	0%	0%	0%
	Gurvansaikhan (n=1)	0%	0%	0%	0%	100%	0%	100%	0%	0%	0%	0%
	Biger (n=6)	25%	0%	75%	0%	0%	20%	20%	60%	0%	0%	0%
	Tsogt (n=1)	-	-	-	-	-	-	-	-	-	-	-
Sheep	Adaatsag (n=28)	4%	14%	54%	29%	0%	15%	33%	33%	11%	0%	7%
	Gurvansaikhan (n=32)	10%	7%	63%	10%	10%	14%	52%	28%	0%	3%	3%
	Biger (n=7)	0%	50%	25%	25%	0%	0%	100%	0%	0%	0%	0%
	Tsogt (n=16)	0%	6%	38%	38%	19%	21%	28%	43%	0%	0%	0%
Goat	Adaatsag (n=23)	5%	18%	50%	27%	0%	4%	22%	43%	13%	9%	9%
	Gurvansaikhan (n=29)	0%	19%	52%	15%	14%	8%	50%	38%	0%	4%	0%
	Biger (n=15)	0%	10%	20%	70%	0%	25%	75%	0%	0%	0%	0%
	Tsogt (n=21)	0%	10%	43%	38%	10%	13%	47%	40%	0%	0%	0%

Source: JST

Note: No response of those who own camel in Tsogt
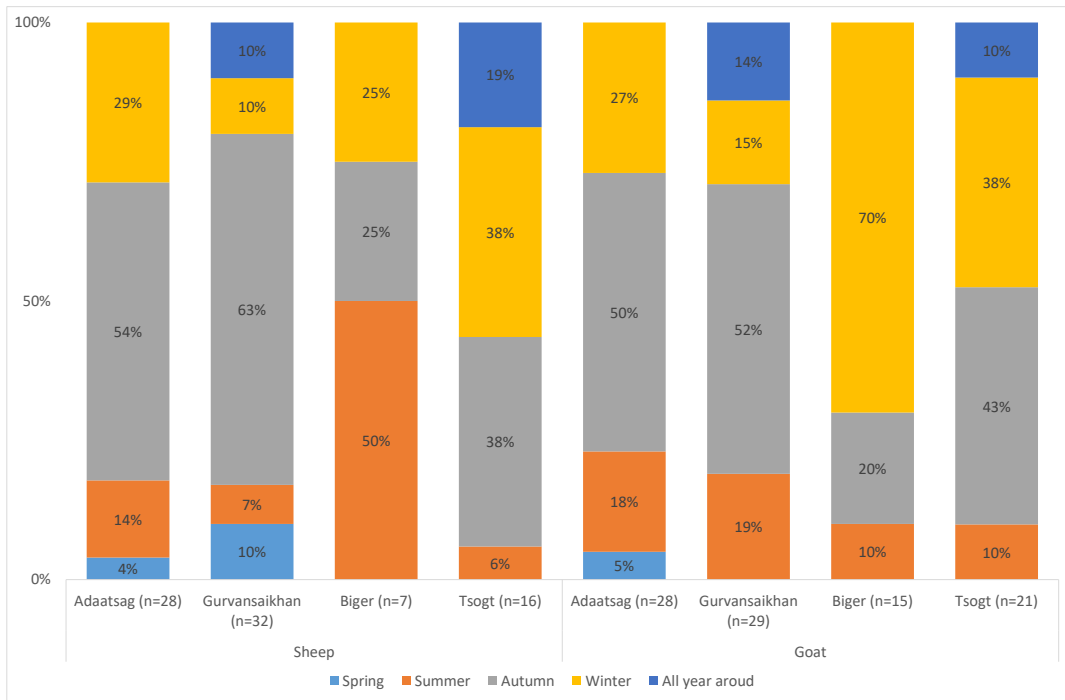
Source: JST

Figure 3.10   Sales Seasons of Sheep and Goat
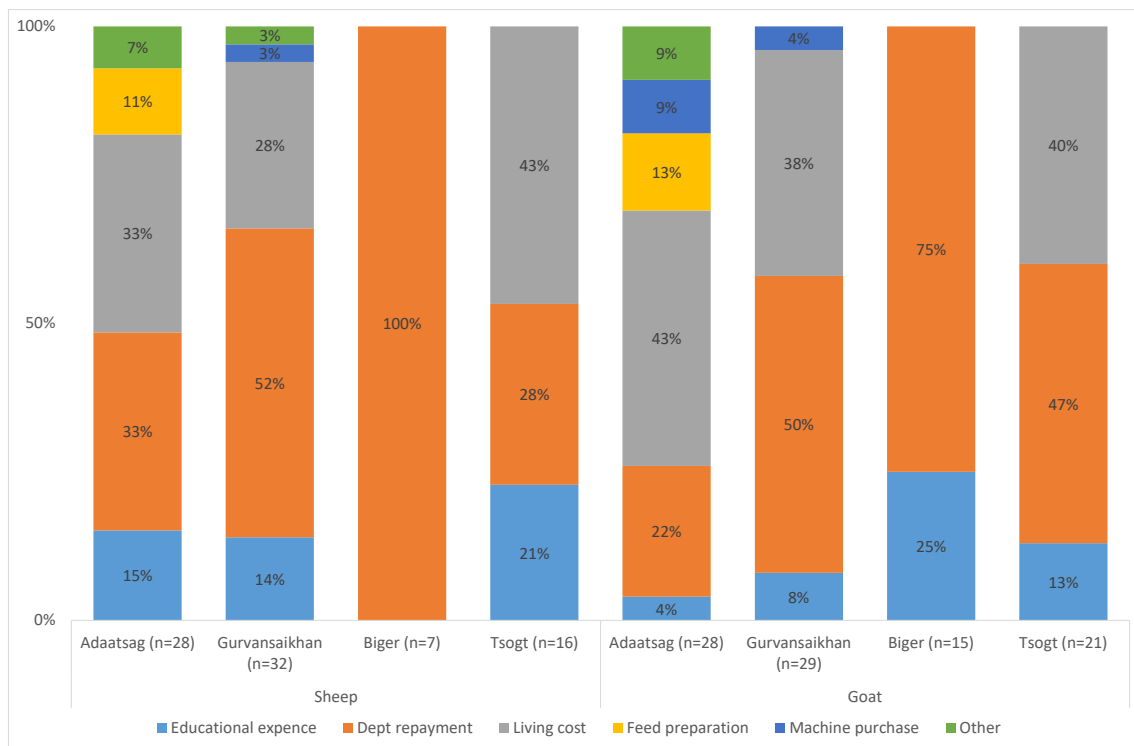
Source: JST

Figure 3.11   Sales Purpose of Sheep and Goat

(6) Milk and Dairy Product

The largest amount of self-consumption and sales of milk and dairy products is horse milk wine in Adaatsag Soum, goat milk in Gurvansaikhan Soum, cow milk in Biger Soum, and goat milk in Tsogt Soum (Table 3.17). In Biger Soum, cow milk and goat's milk are about the same. In Tsogt Soum, horse milk wine is mostly self-consumed, and the sales volume is small, but cow milk is mostly sold and not self-consumed. Sheep milk is not used for sale in Gurvansaikhan Soum and Biger Soum.

Table 3.17　Consumption and Sales Volume of Milk and Dairy Products per Household of Herder

(Upper: Self-Consumption, Lower: Sales) (Unit:Liter)

Soum (Respondents)	Horse Milk Wine	Cow Milk	Camel Milk	Sheep Milk	Goat Milk
Adaatsag (n=44)	300.7 130.0	34.3 21.7	20.2 12.7	5.6 5.7	76.1 65.9
Gurvansaikhan (n=52)	87.9 71.9	6.2 2.3	12.5 6.2	1.2 0.0	265.5 183.3
Biger (n=44)	2.2 0.0	301.5 68.2	57.5 40.9	0.0 0.0	227.8 61.1
Tsogt (n=43)	10.6 0.9	1.3 23.3	0.1 2.8	2.2 11.6	108.3 125.8

Source: JST

As for the selling price of milk and dairy products, horse milk is the most expensive in Adaatsag Soum and Gurvansaikhan Soum, and camel milk is the most expensive in Biger Soum and Tsogt Soum.

Table 3.18　Sales Price of Milk and Dairy Product

(Thousand MNT) (Unit: MNT／Liter)

Soum (Respondents)	Horse Milk Wine	Cow Milk	Camel Milk	Sheep Milk	Goat Milk
Adaatsag (n=44)	4,643	3,137	4,000	3,000	3,727
Gurvansaikhan (n=52)	4,571	4,000	3,000	－	4,357
Biger (n=44)	2,000	2,700	7,667	－	3,125
Tsogt (n=43)	2,450	2,700	4,500	3,500	3,374

Source: JST

(7) Other Livestock Products

As for other livestock products, wool is the most sold in Adaatsag Soum and Gurvansaikhan Soum, followed by cashmere. Cashmere is the most common in Biger Soum, followed by wool and camel hair. Cashmere has the highest sales unit price, and each Soum is priced at around 100,000 MNT per kg. Dundgovi Aimag is promoting the branding of camels, and the price of camel hair is almost double that of Govi-Altai Aimag. Horse hides, cow hides, and goat hides are relatively expensive and provide a good source of income for herders.

On the other hand, since the price of sheep skin is about the same as that of sheep and goat intestines and higher than that of wool, it is expected to expand its commercialization as a new source of income for herders. The difference between the volume of livestock hides sold and the number of livestock sold shown in Table 3.19 is due to the difference in livestock sales by animal body.

Table 3.19   Sales Volume and Unit Price of other Livestock Products per Household of Herder

(Unit: Upper: Sales Value, Lower: MNT)

Soum (Respondents）	Cashmere (kg)	Wool (kg)	Camel Hair (kg)	Horse Hides (Piece)	Cow Hides (Piece)	Camel Hides (Piece)	Sheep Hides (Piece)	Sheep Hides (Piece)	Sheep and Goat Intestines (roll)
Adaatsag (n=44)	69.2	120.7	1.3	1.0	0.6	0.0	7.4	15.3	14.3
	104,875	1,597	7,500	9,471	6,233	-	2,300	19,987	2,245
Gurvansaikhan (n=52)	58.9	158.2	3.8	0.3	0.8	0.1	29.7	20.6	39.1
	100,766	1,395	10,000	10,875	12,250	8,000	3,069	16,952	2,911
Biger (n=44)	72.2	39.4	18.0	0.1	0.1	0.1	1.0	2.3	1.5
	91,758	1,213	4,357	12,200	15,000	4,822	2,847	14,438	2,000
Tsogt (n=43)	83.3	82.8	18.5	0.1	0.2	0.0	4.9	5.6	5.8
	91,886	1,147	5,556	8,100	10,500	-	1,328	14,270	1,058

Source: JST

(8)   Feed

Self-supplied fodder (hay) is highest in Biger Soum and very low in other Soums. Adaatsag Soum relies entirely on purchased feed. Hay is the most purchased feed, followed by wheat bran and green grass clipping feed. The price of clipped green grass feed and wheat threshing waste is high, but there is no big price difference with wheat bran and solid feed (holgorgin). Regarding purchased feed, the amount of green fodder, wheat threshing waste, and solid fodder purchased is about one-tenth that of the two Soums in Govi-Altai Aimag compared to the two Soums in Dundgovi Aimag. This is due to the small area of wheat cultivation in Dundgovi Aimag.   On the other hand, although wheat cultivation is not practiced in Dundgovi Aimag, the neighboring Tuv Aimag has 66,008 ha of wheat cultivation, and the difference in purchased feed between Govi-Altai Aimag and Dundgovi Aimag's Dund Belt can be attributed to differences in means of obtaining the feed.

Table 3.20   Amount of Self-supplied Feed (Hay) and Amount and Price of Purchased Feed per Household of Herder

(Upper row: quantity (kg), lower row: price (thousand MNT/ton))

Soum (Respondents）	Self-Supplied Fodder (Hay)	Purchased Feed				
		Hay	Wheat Bran	Clipped Green Grass	Wheat Threshing Waste	Solid Feed
Adaatsag (n=44)	0	1,059	402	230	57	104
	-	593	840	1,050	840	823
Gurvansaikhan (n=52)	67	1,334	582	327	104	107
	-	671	730	966	1,253	934
Biger (n=44)	464	996	455	21	11	14
	-	779	843	888	1,200	938
Tsogt (n=43)	75	781	410	17	10	21
	-	803	854	1,009	1,064	828

Source: JSTNote: he purchase price was calculated from 20 kg/bundle of hay, 25 kg/bag of wheat bran, 20 kg/bag of green grass feed, 25 kg/bag of wheat threshing waste, and 40 kg/bag of solid feed (holgorgin).

3.3.3 Appropriateness of Setting the Issues of "Meat Prices Plummeted as a result of Simultaneous Slaughter in Response to the Dzud forecast" and "Poor Quality Control in Slaughter and Distribution Further Reduces Prices"

As a precondition for the "introduction of a meat freezer storage system (PV system) that utilizes photovoltaic power generation", which is an activity shown in the GCF Concept Note, there is a view that "as a result of mass slaughter in response to the Dzud forecast, meat prices, price will plummet" and that "poor quality control in slaughter and distribution is further lowering prices", it was verified from the adaptive behavior of herders and the market price of meat in the UB City.

The ratio of the number of animals slaughtered by herders in normal times is 20-25% of the herd, and the slaughter ratio increases to 30-35% of the herd when there is a Dzud forecast (according to a herder survey). This amount is not an amount that can be called a mass slaughter, and it is not a number that can be called a mass slaughter. Also, most of the livestock that are slaughtered for Dzud countermeasures are lean and weakened individuals that have difficulty in surviving the winter. The purchase price of meat for lean livestock is low (according to local interviews).

Meat market prices fluctuate seasonally, being higher in the summer and lower in the autumn. In 2021, the impact of Dzud was seen, and the number of adult cattle deaths was 3.01 million, which was higher than 1.12 million in 2019 and 2.06 million in 2020 (from Mongolian Statistics). On the other hand, the market price of meat in 2021 tends to be higher than in 2020, and it was not confirmed that the sales of livestock in the Dzud forecast led to a crash in prices (Figure 3.12).

As shown in Figure 3.13, there is a correlation between carcass weight and purchasing unit price. Livestock with a light carcass weight (lean) are cheaper to purchase than livestock with a heavy carcass weight (fat). In 2022, according to the Dzud forecast, lean livestock from the western region were purchased at a lower price at the UB City meat market, while fat livestock from the eastern region were purchased at a higher price than normal at the same time (according to UB brokers). Based on these facts, it became clear that the purchase price of meat is determined by the condition (mainly weight) of livestock to be slaughtered and the place of production.

The current Mongolian meat market price is greatly influenced by export volume. Meat destined for China is said to prefer lean livestock with little fat, and as the amount of slaughter destined for China increases, the price tends to drop as cheaper meat is sold in the market. From 2020 to 2022, market prices tend to be high due to restrictions on exports to China due to the impact of the coronavirus.
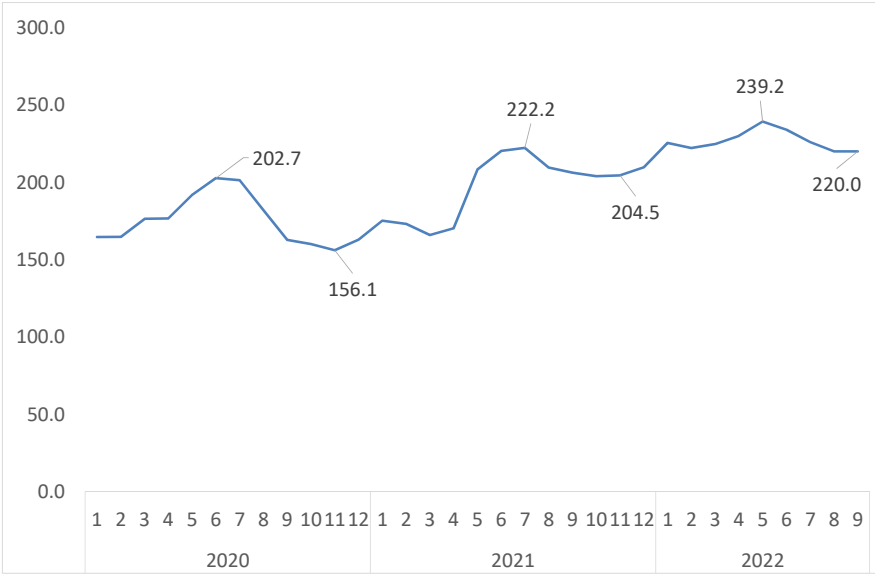
Source: NSO

Figure 3.12　Seasonal Fluctuations in Meat Market Prices
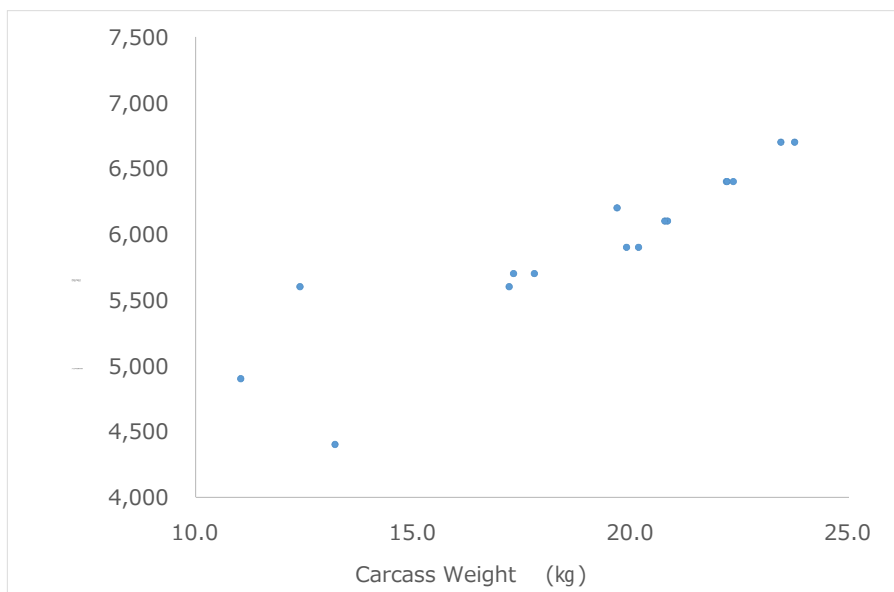
Source: Broker at Khuchit Shonkhor Market

Figure 3.13 Relationship between Carcass Weight (kg) and Purchase Price (MNT/kg)

3.4 Challenges of the Livestock Sales of Herders

The challenges of herders' livestock sales, from the many responses of the survey, were: 1) low and unstable prices, 2) lack of direct buyers, 3) difficulty in storage, and 4) difficulty in transportation due to distance from markets. (5) Lack of knowledge and information. Figure 3.14 (1) to (4) show the responses for each survey target Soum.
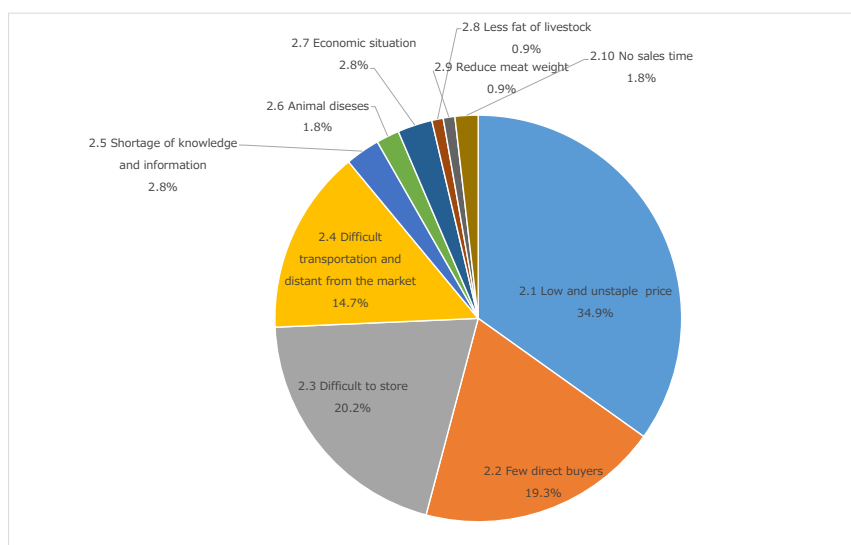
(1)   Adaatsag Soum
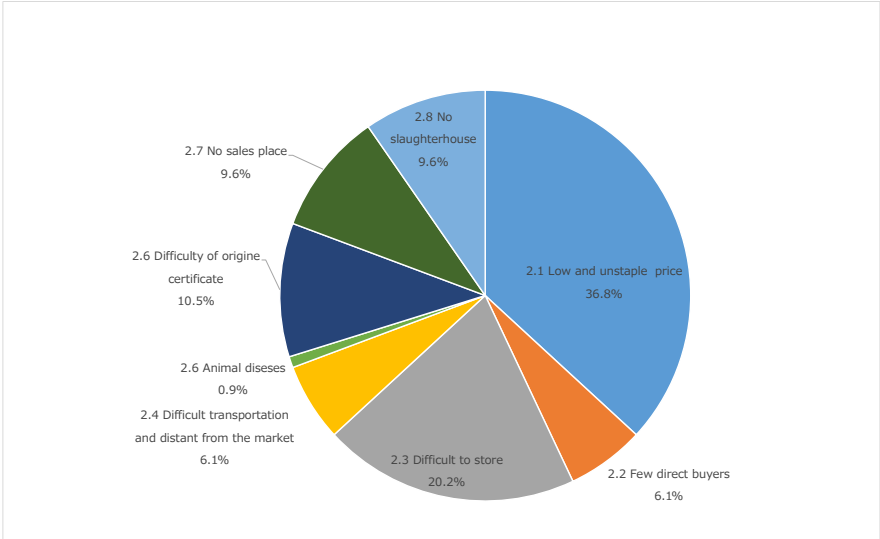
(2) Gulvansaikhan Soum
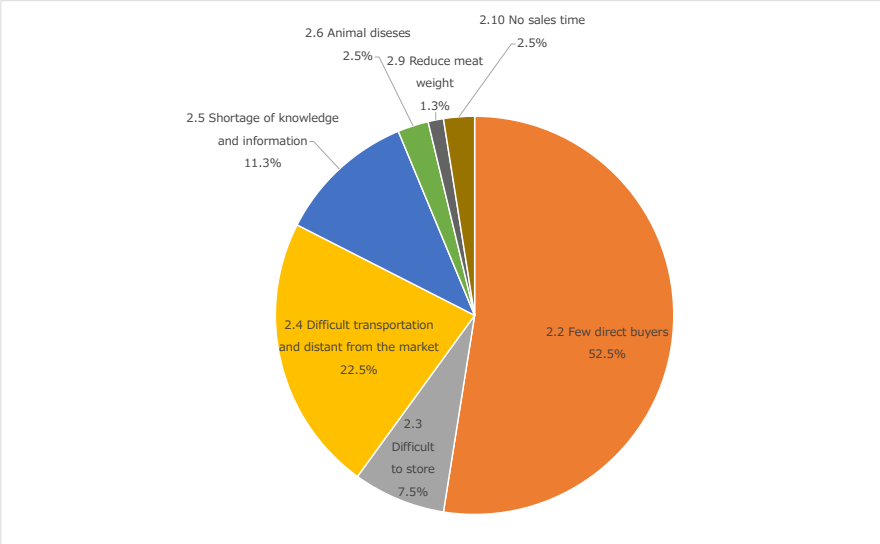
(3) Biger Soum
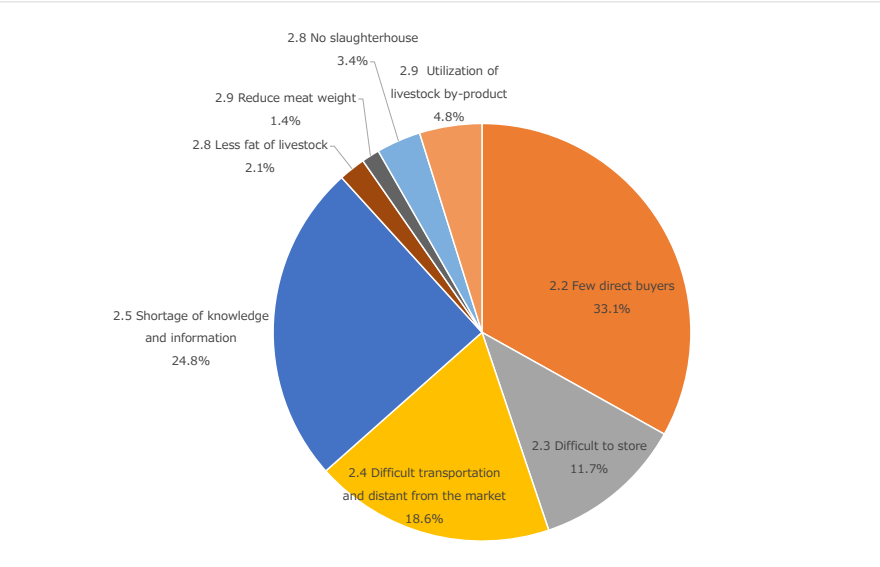
(4) Tsogt Soum

Source: JST

Figure 3.14 Challenges of the Livestock Sales

In the two Soums in Dundgovi Aimag, the most common answer was "cheap and unstable".

The frequently answered by the respondents follows, in Adaatsag Soum, "cannot find a direct buyer" and "difficult to store", in Gurvansaikhan Soum, "difficult to store" was raised. Adaatsag Soum is located 120 km from the provincial center, and there is a narrow mountain pass on the way, so there are few opportunities to sell directly to change and consumers, which is considered to be the reason for the need for market development and storage.

Gurvansaikhan Soum is located 75 km from the Aimag Center, and it is relatively easy to get around because the road is flat and grassy on the way. Gurvansaikhan Soum had little need for market development, as the Soum Center's Khorshoo was engaged in activities such as collecting livestock and contracting with a UB City meat company (Makhimpex). Since Khorshoo collects livestock, there was a high response to the need for storage.

In Govi-Altai Aimag, the most common answer for both Soums was 'cannot find a direct buyer'. In particular, Biger Soum accounted for more than half of all responses. On the other hand, there were no respondents for "low and unstable prices," which was the most common response in Dundgovi Aimag. The reason that there were no problems with the price. Govi-Altai Aimag is located 1,000 km from UB City, and it is thought that changes play a major role in the sale of livestock to large cities due to transport problems. In other words, whether the product could be sold was considered more important than the price. It can be said that the fact that there were many responses to "lack of knowledge and information" in Tsogt Soum is due to problems in the means of communicating information with the market.

3.5 Situation and Issues of Administrative Support for Disaster Prevention and Adaptation Measures for Herders

Livestock feed is prepared by the herders themselves by purchasing the necessary amount for winter and spring, but in the event of a disaster such as a Dzud, there is a system to supply it from the National, Aimag and Soum feed reserves.

When the stock of Soum runs out, it is appropriated from the stock of the Aimag, and when the stock of the Aimag runs out, the reserve of the National is to be used. In Dundgovi Aimag, there are two reserved feed warehouses in the Aimag, and the total amount of stock in the Aimag is about 10,000 bundles of hay every year. The National reserve of feed is classified as a National Secret.

**Feed Reserves Warehouse of Soum
(Gurvansaikhan Soum)**

**Feed Reserves Warehouse of Aimag
(Dundgovi Aimag)**

Feed Reserves Warehouse of National (Mandalgovi)

Source: JST

Figure 3.15   Feed Reserves Warehouses

Chapter 4   Supply Chains of Livestock Products

4.1   Policy of Meat Production and Marketing

4.1.1   Policy of Mongolian Government

In its National Livestock Program, the Mongolian government aims to develop pastoralism that can adapt to climate change and social development, strengthen competitiveness in the market economy, and provide a safe and healthy food supply for the people. In particular, the program aims to provide sustainable pastoralism, high-quality livestock products, and international-level veterinary services; to develop livestock production systems that can adapt to climatic, environmental, and ecological changes; and to develop markets for livestock products.

The Mongolian Government has strengthened regulations on Food Security and enacted "Technical Regulation of Production and Trade of Meat and Meat Products" (Government Resolution No. 224, 2022) based on the policy regarding "Implementation of technical regulatory requirements in animal husbandry, agriculture, food industry, storage, transportation, trade, food production, and services" and "Establishment of unified registration system for storage of food raw materials and products in designated warehouses and storehouses that meet standards" that were stipulated in "On Certain Measures to be Taken to Ensure Food Supply and Safety" (Cabinet Resolution No. 36, 2022).

The regulation stipulates that meat and meat products intended for sale must be processed in a certified slaughterhouse and must be issued with an inspection certificate (Table 4.1 below). This new regulation will be applied from January 1, 2023, and will be fully implemented after a trial period of three years.

Table 4.1   Key Provisions of the "Technical Guideline for Refrigerating and Freezing Facilities for the Production and Trading of Meat and Meat Products"

1.1.1	This technical regulation determines the requirements for slaughter, meat production, processing, transportation, marketing, export and import, and aims to protect the health and environment of humans and livestock and public interests
1.1.2	Meat traders, etc., must comply with this technical regulation in the slaughter, production, transportation, storage, sale, export and import of meat products for public consumption.
1.3.4	"Slaughterhouse" means a legal entity facility engaged in slaughter for food consumption, registered and approved by the governing body.
2.4.3	Veterinarians must maintain a health register for each livestock.
3.4.1	The location, design, construction, commissioning, expansion and change of use of facilities shall be subject to the issuance of a certificate as specified in Article 5.3 of the Sanitation Act.
3.7.1	(Freezers) shall be equipment that meets the technical requirements for cooling, freezing and storing meat.
4.10.3	Carcasses and internal organs that are accepted for human consumption must have an internal temperature of 0-4°C and a pH of 5.4-6.0 within 24-48 hours.
4.10.3	The freezer temperature should be -25°C or -35°C.
5.2.1.	Meat processing plant, food production, service and trade department shall use meat prepared in the factory, cooled or frozen, with a veterinary certificate and, if necessary, with a laboratory exam
5.2.5	For meat other than industrially slaughtered meat, without a veterinary certificate, without a laboratory test certificate issued in accordance with Article 27.5 of the Law on Animal and Animal Health, and for imported meat without a laboratory test result or import certificate, not to supply it for public consumption.
7.3	Slaughterhouses and meat processing plants must be staffed by veterinarians, food technicians and refrigeration technicians. Veterinarians must be professionally trained and certified. Food technicians and refrigeration technicians must have a bachelor's degree or above.

4.1.2 Legislation related to Food and Livestock Products

Major laws and regulations related to food and livestock products in Mongolia are as follows.

(1) Food Law

Under Article eleven (11) of this law, activities to ensure a stable and smooth food supply and food safety at the national level shall be carried out by MOFALI as the national administrative central agency in charge of food, and by the branch of national agencies in Aimags, capital city and districts of the capital, in case of Soum and bug, will be implemented by a food officer.

It positions livestock meat, milk, cereals, wheat, flour, and drinking water that are essential to the physiological needs of Mongolians as "strategic foods". The Government provides for the development of seasonal stockpiles of strategic food.

The provisions were drafted by the MOFALI in 2012 and posted on the official website, but has not yet been approved.

In this draft provision, Aimag and capital city surveys the supply and demand of strategic food along with the population increase in the area, determines the items and quantities of food to be stockpiled for each season in the following year, and submits the draft to the MOFALI by May 1st of each fiscal year, and the ministry integrates these proposals to formulate an integrated plan that summarizes the food items and quantities of the national-level strategic food reserves, sends it to the Cabinet, and decides at the Cabinet meeting. It is expected to issue a decision within the second quarter to include the necessary funds in the current year's regional budget.

After the decision is issued, Aimag and capital city will establish a working group responsible for overseeing the bidding of companies to develop the stockpile, the quality and safety of the food stockpile, its storage, distribution and replenishment. The above regulations set out the main food items, the companies responsible for supplying and storing, and the requirements for selling and distributing food reserves.

(2) Livestock Health Law

This law, which was promulgated in 2017, stipulates the health of animals and livestock, the compliance of livestock products and raw materials with sanitary requirements, the maintenance of social hygiene, and the support of free trade. It also stipulates the prevention of infectious diseases for livestock and humans, the system of veterinary institutions, and funding.

(3) Livestock Genetic Law

This law, which was promulgated in 2017, regulates activities related to the registration, definition, storage, protection, stable use, research and development of livestock genes.

(4) Livestock Tax Law

This law, which was promulgated in 2020 and enforced in January 2021, stipulates the tax payment according to the number of livestock and the mechanism for reporting the income of this tax. Herders who own livestock and those who own livestock are regarded as taxpayers. It was decided that the number of livestock subject to taxation would be set based on the previous year's livestock statistics. The amount of tax payable per livestock ranges from 0 to 2,000 MNT, and the specific amount of tax payable is set by the Resident Representative Council of the Soum or districts of the capital to which the household belongs, depending on the type of livestock. For the purpose of protecting livelihoods of herders, it can be made tax-free.

(5) Livestock Theft Prevention Law

This law, promulgated in 2004, stipulates the implementation and coordination of efforts to prevent livestock theft, and defines the responsibilities of the state, residents, businesses and organizations, and administrative staff. This law stipulates the establishment of livestock slaughter facilities necessary for food market operators, meat producers and service providers, and the implementation of verification of the origin of livestock and meat.

In addition, residents, companies and organizations that are engaged in meat manufacturing, sales, and other related service businesses must be able to make a contract with a supplier of livestock and meat to conduct business, a sales contract and its appendix, must keep health certificates for six months, must perform primary processing of slaughtered livestock such as heads and skins, must keep them for three days after slaughter, and to present them to relevant officials.

(6) Cross-Border Quarantine Control Law for Animal and Plant Based Products

The Law covers animal raw materials and products such as meat, milk, by-products, fat, eggs, hides, bones, hair, cashmere, intestines, horns, hooves, feathers, feet, testicles, gall, glands, etc., are subject to quarantine management. Regulations on issuance of export and import permits for animals and plants, their raw materials and products shall be formulated by MOFALI or local government agencies.

This law stipulates that animal and plant raw materials and products must comply with the quarantine conditions agreed with the importing country at the time of export, international treaties regarding quarantine to which Mongolia is a party, standards and specifications issued by international organizations. It stipulates compliance with the guidelines and also stipulates that relevant agency certificates have been issued attesting to compliance with export requirements.

(7) Genetic Resources Law

The law regulates genetic resources, traditional knowledge about genetic resources, registration in information databases, etc. This law stipulates that the Customs shall establish a safe and appropriate environment for the transportation of animals, plants, raw materials, etc., at the time of cross-border, cleaning and disinfection by relevant technology before transportation, requirements for transportation, disinfection and cleaning of means of transportation is defined.

(8) Law of Disaster Protection

This law stipulates the speedy and effective implementation of disaster prevention activities, emergency agencies and disaster management systems. This law was significantly revised in 2017 to expand the precautionary measures. The content of the revision includes disaster risk assessment, disaster prevention planning, disaster risk reduction, ensuring disaster preparedness, conducting disaster prevention audits, conducting disaster prevention education and awareness raising, providing information, and disaster database activities.

A "disaster" is defined in this law as a critical phenomenon, an accident resulting in the loss of a large number of lives and health, and the mass death of livestock and animals.

On the other hand, emergency response in the occurrence of a disaster includes activities such as implementation and coordination of communications and early warning, identification of disaster occurrence areas, mobilization of search and rescue personnel, materials and equipment, evacuation of victims, and removal of damage. This law details command and control in times of disaster, especially central and regional command and control, and the powers of the emergency council.

(9) Law of State Reserves

This law stipulates the procurement, storage, transportation, replenishment, distribution and financing of state reserves. It also stipulates that reserving products and goods can be procured for the purpose of balancing the supply and demand of goods for the purpose of ensuring economic stability.

Procurement of reserves is regulated in detail by the tender law.

It also stipulates that corporations that have storage facilities that meet storage standards and technical requirements for some reserved products and supplies can sign storage consignment contracts, and the list of reserved products and supplies to be stored will be provided by the minister in charge of emergency situations. The storage consignment contract describes the quality of stockpiled products and materials, storage period, storage fee, product names and items, quantities, prices, responsibilities of both parties, and reporting obligations.

(10) Union Law

The law, which was revised in 2021, stipulates the establishment of unions, union members, executives, management structure, funds, audits, and termination of activities. To establish a union, nine or more residents are to be required, and union members and corporations can jointly establish a union.

Union members are required to account for 51% of the members of the cooperative. The article of the union should specify the name, address, purpose of the union, activity policy, conditions for joining and leaving the union, rules, and the powers and responsibilities of union members, and the assets to be invested by the members, and approved at a meeting of all members.

(11) Act on Agricultural Products Raw Materials Exchange

This law, promulgated in 2011, stipulates the establishment of agricultural and livestock products and raw materials exchanges, the organizational structure, the establishment of legal bases for activities, the manufacture, procurement, storage, transportation of agricultural and livestock products and raw materials, and transactions through exchanges.

The law stipulates that MOFALI shall establish the regulations regarding the list of commodities, raw materials traded on the exchange and the coding of commodities and raw materials.

Relatedly, Decree of the Minister of MOFALI No. A/35 of 2013 approved the above list, which includes goat cashmere, wool, livestock (horse, camel, cattle, sheep, and goat), beef and mutton, goat meat, horse meat, heat-treated meat, hides and other livestock products.

4.2 Current Situation and Needs of Meat Production by Herders

4.2.1 Situation of Meat Product of Soum Level

The average annual meat production (total of all livestock) in Dundgovi and Govi-Altai Aimags from 2017 to 2021 is 20,135 tons and 20,417 tons, respectively (according to Mongolian statistics).

The average number of sheep sold per herders household is 50-60 in Dundgovi Aimag and 10-30 in Govi-Altai Aimag (according to a herder survey).

The selling price per sheep is around 120,000 MNT, which is about half of the price per head in UB city of 250,000 MNT.

As shown in 3.2.2 Situation of Livestock Sales, in Dundgovi Aimag, sheep and goats account for about 90% of the total sales, and the number of each is almost the same. In Govi-Altai Aimag, sheep and goats also account for about 90% of the total, but the composition ratio of sheep and goats is 4:6, with goats being the majority. The reason for the large number of goats is that Govi-Altai Aimag is located far from the consuming area and mainly produces and sells cashmere, which is easy to store and easy to distribute. However, while cashmere can only be sold once a year, sheep for meat can be sold all year round as needed, so it is expected that the number of sheep for meat will increase if the supply chain is improved. (From herder hearing.)

Few places have cold storage warehouses at the Soum level, and slaughter of livestock for the purpose of sale will be carried out from October onwards, when the temperature drops and it is possible to store outdoors.

The number of livestock that each herder slaughters is up to each herder, and the administration such as Soum does not give instructions.

The problem faced by herders is that, in most cases, they live far away from Aimag centers and Soum centers and they are far from markets so that they cannot sell directly to general consumers then the sales volume and price are unstable. (From herders' interviews.)

4.2.2   Logistic Flow of Meat

From point of view of herders, the flow is as follows (Figure below). There are five ways for herders to put into this flow.

(1)   Bring live or slaughtered livestock directly to the prefectural meat market/meat company
(2)   Selling to agents of large-scale meat companies
(3)   Bring directly to the slaughterhouse in UB
(4)   Khorshoo of Soum collects livestock and sells them to slaughterhouses or meat company agents
(5)   Selling to middlemen (change)

The method of selling livestock is selected according to the situation of each herder.

Livestock slaughtered in rural areas are transported in different ways depending on the distance from UB city: fresh meat (chilled or refrigerated) is the main transport method within 300 km from UB city, and frozen meat is used when the distance exceeds 300 km (MOFALI). Dundgovi is within 300 km of UB and can be transported in chilled and refrigerated form. On the other hand, private meat traders in Mandalgovi (provincial center) handle much of the meat for export to China, and meat for export is transported frozen. Govi-Altai Aimag is more than 1,000 km away from UB City, and most of the meat is transported by live animals, and slaughtered meat is transported by refrigerated vehicles.

Only a few herders own tracks that can transport livestock directly to slaughterhouses or processing factory. In some Khorshoos, herders' livestock are collected and taken to slaughterhouses or contracted meat company agents. Khorshoo of Gurvansaikhan Soum of Dundgovi Aimag has a contract with Makhimpex Ltd to ship livestock. Khorshoo of Adaatsag Soum also collects livestock from herders, but does not sell under contract with a meat company.

The figure below shows the flow of the logistics of meat in Mongolia.
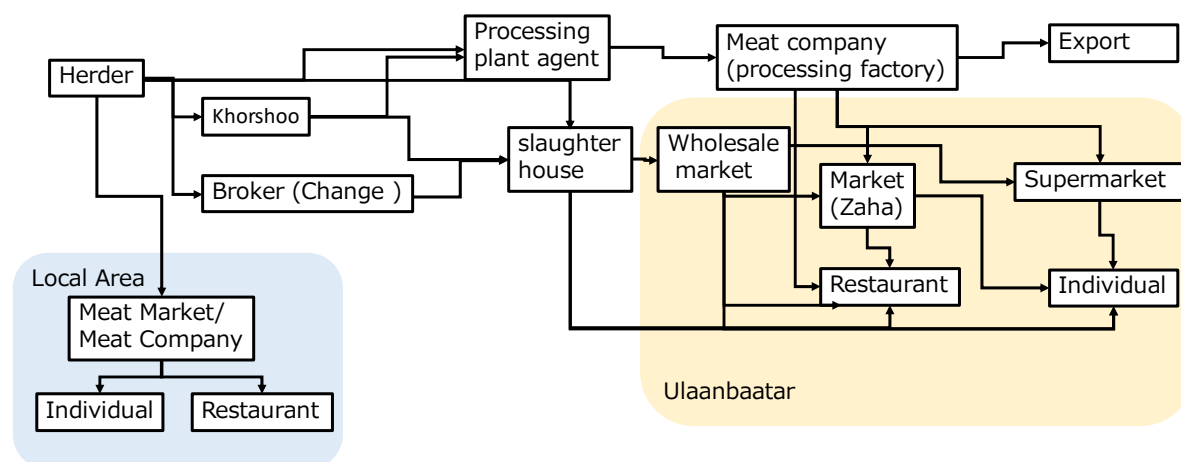
Source: UNCTD、Fostering Integration of the Mongolia Downstream Value Chain of Meat into Regional Value Chains[12]

Figure 4.1   The Flow of the Logistics of Meat

In Mandalgovi (Aimag Center) in Dundgovi Aimag, there are 3 private slaughterhouses and 6 meat traders.

About 20 changers come to the Aimag center to stock up before winter. Meat dealers in district centers generally have cold storage warehouses.

The largest retailer has a slaughterhouse, one 40 ft. refrigerated container and three 20 ft. containers (without refrigeration), and can store more than 2,000 sheep. This retailer also handles meat destined for China and has refrigerated trucks.

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[12] https://unctad.org/meeting/fostering-integration-mongolia-downstream-value-chain-meat-regional-value-chains

Another example of a relatively small-scale distributor in the Aimag center is that it owns a cold storage warehouse and utilizes the prefecture's facility for slaughter. The annual sales number of livestock is around 5,500, mainly to the residents of the Aimag center. There is no price difference between frozen meat and fresh meat, but many people prefer raw meat. The capacity of the freezer is 1 t, and the construction cost when it was built five years ago was about 40 million MNT. The electricity fee for the freezer is about 1 million MNT per month.

As for Govi-Altai Aimag, there are three meat traders in the Aimag center. One of these firms has a slaughterhouse and sells about 50 tons of meat annually to the UB city market and exports it overseas. This firm owns a cold storage warehouse with a capacity of 100 tons. Herders bring live animals to this firm, and 300 sheep and 100 cows can be stored frozen in the refrigerated container they own. Herders also bring in slaughtered meat.

Private slaughterhouse in Aimag center of Dundgovi Aimag

Same as left

Over-the-counter sales by small distributors

Inside of a small distributor's freezer

Source: JST

Figure 4.2   Meat Trader of Mandalgovi, Dundgovi Aimag

4.3   Current Situation and Needs of Meet Supply Chain

4.3.1   Deployment of Traceability System

The Veterinary Agency has been operating a traceability system based on MAHIS (Mongolia Animal Health Information System) since 2019. The main functions of MAHIS are the inspection of livestock by veterinarians at each Soum and the traceability associated with regional movement.

The flow of the system is shown below.

(1)   Herder brings livestock to be inspected to Soum veterinarians (private sector).

(2) The veterinarian inspects the health condition of all livestock brought in and fills in the inspection form for each animal with the inspection results as a health certificate. An inspection ID and a QR code are attached to the inspection slip.

(3) The result of inspection are sent to the Veterinary Service auditor for approval.

(4) When transporting livestock to other areas, a police officer will read the QR code on the inspection card at the gate to confirm whether the livestock has been properly inspected.

Stolen or uninspected livestock cannot pass through the gate. After introducing this system, it is reported that theft has decreased by 40% compared to before the introduction.

The Veterinary Agency compiles information on periodic health checkups and vaccinations into data. This information is passed on to Soum's veterinarian.

Once inspected animals are slaughtered, their information is updated and the QR code is changed at this point. About 600 slaughterhouses and factories nationwide are registered with MAHIS, including small-scale slaughterhouses and large-scale processing plants.

MAHIS is yet to be put into full-scale operation, as new regulations require pre-slaughter inspections.

At retail stores, a QR code is affixed to each package, and consumers can read the QR code to check information such as the place of origin, herderic people, inspection information, and the date of slaughter.

The retail chain "e-Mart" is testing a service that allows users to view the health certificates of products sold at stores by reading the QR code displayed on the storefront using their own smartphone app.(Figure below).

This service is limited to meat from Tuv Aimag contracted by e-Mart, and as of December 2022, the link of the health certificate is broken, and it has not been fully operational.

| **The right : Download the app with the QR code** **The left : View of the hygiene certificate with the QR code** | **Beef corner from Tuv Aimag (e-Mart)** |
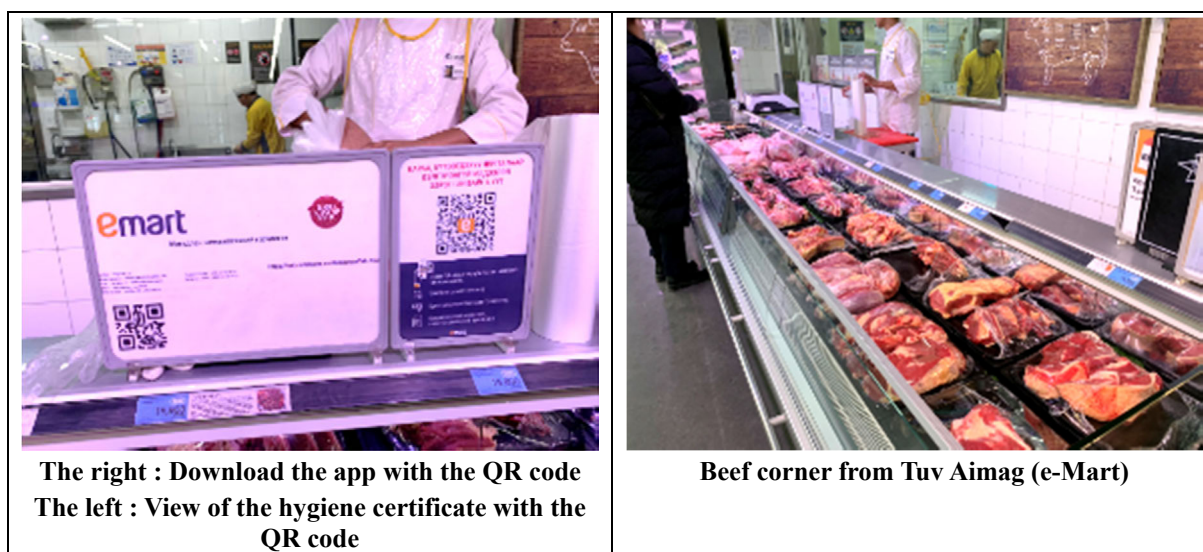
Source: JST

Figure 4.3   An Example of the Traceability System Using the QR Code

4.3.2   Status of low-temperature distribution system after shipment

There are six meat firms in Mandalgovi (Aimag Center) in Dundgovi Aimag and three firms in Altai (Aimag center) in Govi-Altai Aimag, each of which owns a cold storage warehouse. In addition, many of the changes own their own cold storage warehouses. Some of the meat firms in Dundgovi have refrigerated trucks.

In UB City, a private frozen storage facility is installed in the meat market (Khuchit Shonkhor Market), and meat is stored frozen at -35°C or -17°C. This meat firm owns a refrigerated truck.

Photos of companies and facilities related to meat logistics are shown below.

Situation of Khuchit Shonkhor Market	**Cold Storage Facility of Private Company in Khuchit Shonkhor Market**
Container slaughterhouse of a private meat company (Precom Ltd)	**Referigerated truck of Precom Ltd**

Source: JST

Figure 4.4   UB City Meat Market and Private Meat Trader

(1)   Needs of refrigeration facility

From the results of the herders' survey, it was found that there was a high need for the installation of freezer storage at the Soum level because "difficulty in storage" was cited as an issue of livestock sales for effective use of the results of Dzud outbreak predictions.

There is a high need for frozen storage facilities at the Aimag level as well. Meanwhile, private meatpackers and brokers are independently installing their own freezing facilities. In particular, a major private meat supplier at the Aimag center handles meat exports to China and has well-equipped freezers and refrigerated vehicles. The meat distribution at the Soum level needs to establish a strategy to cooperate with such Aimag-level meat distribution or to aim for a different market.

When freezers are introduced, it is assumed that there will be various uses such as "storage of meat", "storage of dairy products", and "storage of leather" (see figure below). Meat storage is mainly from autumn slaughter to spring sale, and freezer utilization is low during the summer. Since facility management during non-operational periods is a heavy burden, the use of freezers throughout the year is essential.
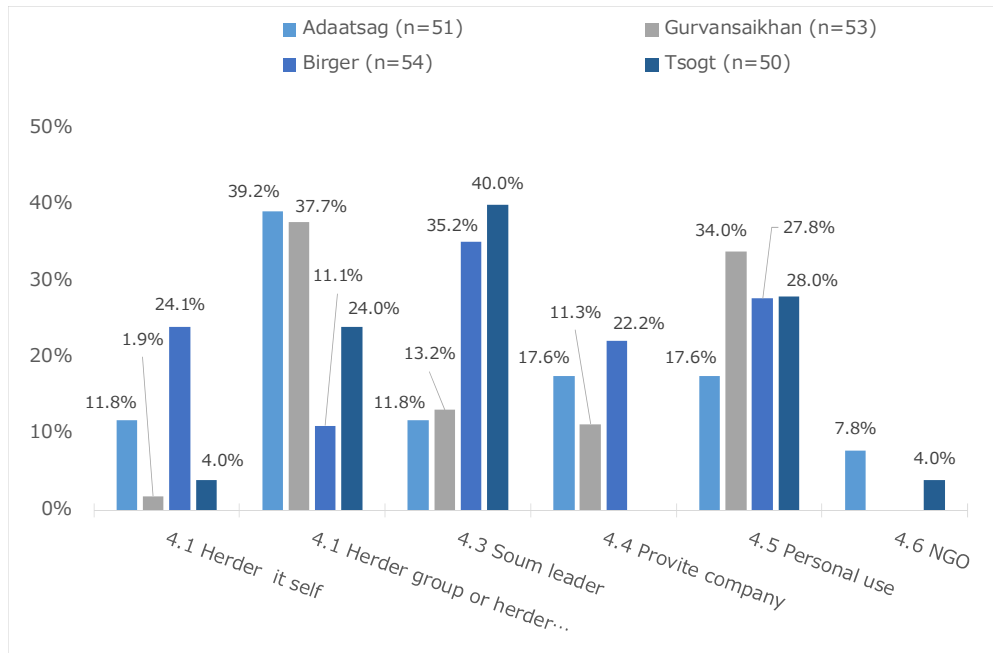
Source: JST

Figure 4.5   Intention to Use the Refrigerator

As for the management body of the freezer, in Dundgovi Aimag, 'Herders Group Khorshoo' was considered to be appropriate, and in Govi-Altai Aimag, 'Administrative executives such as Soum Chief' were listed (figure below). On the other hand, many of the government officials interviewed expressed the opinion that it would be desirable for the facilities to be managed by a herders group, Khorshoo, or a private organization. As for the reason, it was pointed out that "governmental organizations tend to change the person in charge due to a regime change, making it difficult to take over."
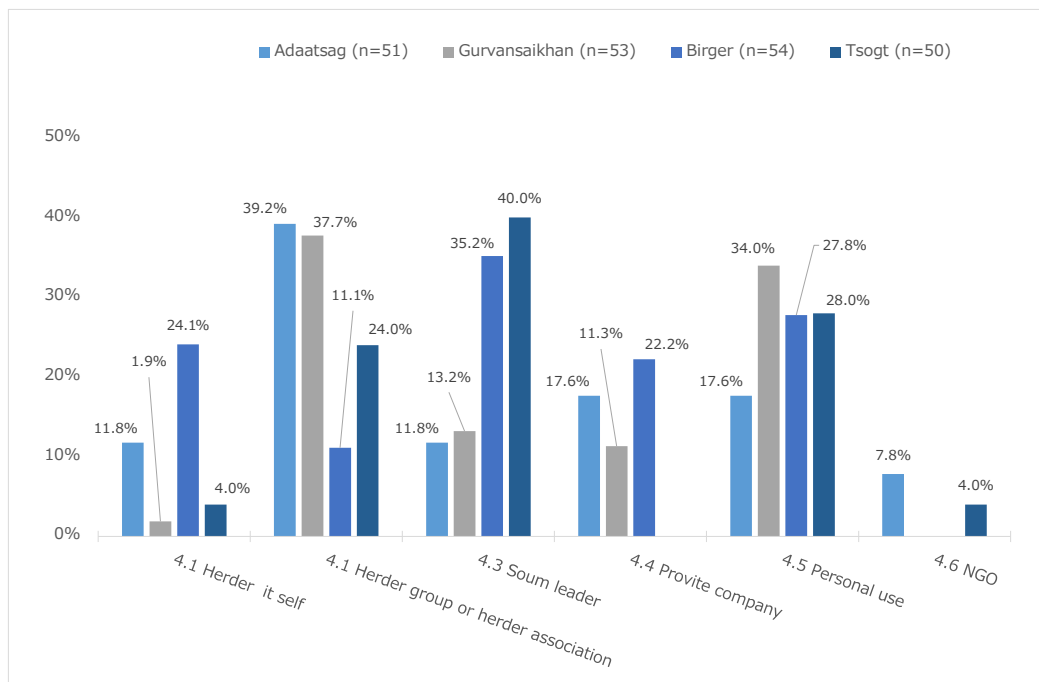
Source: JST

Figure 4.6   Management body of the freezer

4.3.3 Meat Export

(1) Export Market

Beef (frozen) exports were over 10,000 tons in the early 2000's, but due to foot-and-mouth disease, exports were 0 tons in 2013. Exports resumed in 2014, with the main export destination being Russia. Exports increased to 1,055 tons in 2018, but since 2019, the upward trend in exports has stopped.

Exports of sheep and goat meat were generally in the hundreds of tons, but due to foot-and-mouth disease, became 0 tons in 2014; exports resumed in 2015 and started again in recent years, with the main export destinations being Iran and Vietnam. The export volume for 2019 increased to 7,012 tons, while the export volume for 2021 was 1,692 tons.

Horse meat exports, which have been constant since they are not affected by foot-and-mouth disease, and most of the export destinations in recent years have been in China. In 2018, the export volume increased to 32,201 tons, but in 2021 it was only 6,959 tons.

Exports of conditioned and processed meat (heat-treated meat[13]) were only 0.2 tons in 2013, but increased to 29,222 tons in 2018 and 13,478 tons in 2021. The main export destination is China, with sheep and goat meat accounting for 86% and beef for 14%.

Meat exports have fluctuated, mainly due to the outbreak of foot-and-mouth disease in Mongolia. In addition, exports have stopped declining significantly in 2020-2021, mainly due to logistical restrictions imposed by China due to COVID-19.

The Mongolian National Livestock Program set a target of 50,000 tons for meat exports in 2021, but actual exports in 2021 remained at 8,600 tons.

(2) Halal Meat

Halal meat exports from Mongolia to Iran began in 2017, and 1,320 tons were exported in the first year. Regarding halal meat production, internationally certified methods are used, and inspectors from the importing country visit facilities in Mongolia to conduct inspections. Meat firms with halal meat export certification in Mongolia include Darkhan Meet Food, Makh Market, Eco Food Trading and Zerger International.

4.4 Challenges of Meat Products and Logistics

Mongolia has more livestock than domestic consumption, and strengthening the competitiveness of overseas markets is an urgent issue. Controlling livestock diseases such as foot-and-mouth disease and improving sanitary standards at slaughterhouses are essential to expanding meat exports.

Global demand for meat is expected to increase over the next 10 years, mainly in developing countries, and the expansion of meat exports from Mongolia has great potential.

In developed countries, there is a tendency to view livestock farming negatively from the perspective of the environment and animal welfare.

As a long-term goal, the Mongolian government aims to maintain a herder culture and expand exports of organic and branded livestock products. In the future, it will be necessary to establish a herder pastoral system that sustainably uses grazing land resources and sanitation management at an international level.

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[13] Even in countries where foot-and-mouth disease has occurred, exports are possible if the meat is heat-treated in a facility approved by the destination country.

Chapter 5   Condition of the Cooperation of Development Partners and Policy for Cooperation

5.1   Framework of donors' cooperation related to the project

In Mongolia, government agencies, international organizations, and donors are working together to form clusters within the Humanitarian Country Team (HCT) to provide assistance. In the Food Security and Agriculture cluster, which is relevant to the Survey, MOFALI is the focal point for government agencies, and FAO is the lead agency for the cluster, coordinating and exchanging information with related agencies.

The FAO Mongolia Office is the focal point of the Task Force for Dzud Risk Assessment in accordance with Decree #05 of the Deputy Prime Minister of the Government of Mongolia and the Director General of the National Emergency Committee. The Task Force includes the Director General of the National Emergency Committee and experts from MoFALI, Directorate General of Veterinary Services, Directorate General of Labor and Social Welfare Services, IRIMHE, NEMA, and FAO. The Task Force is reviewing available information to conduct the assessment, and is conducting a fact-finding survey and Dzud-risk assessment in the Aimags of Arkhangai, Bayan Ulgi, Bayan Hongor, Govi- Altai, Zavkhan, Ubulhangai, Uvs and Hovd, which were affected by last summer's drought.

Table 5.1   List of the Clusters in Mongolia and Agencies in Charge

No	Clusters/Sectors	HCT Lead Agency	Key Government Agencies
1	Cluster Coordination	RCO/HC	DPM Office; NEMA
2	Nutrition	UNICEF	Ministry of Health (MoH)
3	Water and Sanitation	UNICEF	National Water Committee (NWC)
4	Education	UNICEF and Save the Children	Ministry of Education and Science (MoES)
5	Health	WHO	Ministry of Health (MoH)
6	Emergency Shelter	MRC (IFRC)	Ulaanbaatar City Governor's Officer
7	Protection (GBV and Child Protection)	UNFPA and UNICEF	Ministry of Labour and Social Protection (MoLSP)
8	Food Security and Agriculture	FAO	Ministry of Food, Agriculture and Light Industries (MOFALI)
9	Logistics	UNICEF	Ministry of Road and Transportation (MoRT), Civil Aviation Authority (CAA), Mongolian General Customs Administration (MGCA)
10	Emergency Telecoms	UNICEF	MDDC
11	Camp Coordination and Camp Management	IOM	Ulaanbaatar City Emergency Management Agency (UB CEMA)

Source: Materials received from NEMA

5.2   Outline of the related projects implemented by development agencies

The following table provides an overview of recent and ongoing projects by donors (bilateral donors, international organizations, and NGOs). According to interviews conducted in the field survey, a loan project is being formulated to strengthen NEMA's capacity and procurement of equipment for disaster information transmission with ADB's support. The Asian Disaster Preparedness Center (ADPC) is planning to formulate technical assistance to the Ministry of Environment to improve the accuracy of forecasts of meteorological disasters (Dzud, droughts, and floods), considering to utilize GCF. NEMA and the MOFALI are also expected to be involved in the ADPC project as relevant agencies.

(1)   GCF and Climate Change Related Projects

	Agency Name	Program/Project Name	Outline of the Project	Relevance/Possible Collaboration
1.	ADB	TA 6859-MON: Improving Climate Change Adaptation Strategic Planning and Community Resilience in the Environment and Natural Resources Sector	**Period:** 2021-2024 **Focal agency:** MET **Implementing agency:** Center for Climate Change Research and Cooperation (CCRCC) **Expected Outcome(s):** Outcome 1: CCRCC's climate change risk management and strategic planning capacity is improved. • Strategic projects and action plans developed to improve the knowledge, operational and technical capacity of the CCRCC. • Support for procurement of office and technical equipment to support CCRCC's daily operations, including information and communication technology hardware, software, and office furniture as needed. • Develop guidelines for climate risk assessment, climate-related financial risk management, monitoring and evaluation to track the effectiveness of adaptation measures, and pathways for NDC reporting. • Based on these guidelines, conduct TOT on climate risk assessment, climate-related financial risk management, gender mainstreaming, and monitoring, reporting, and verification, and guide project officers to effectively conduct NDC reporting and evaluation of climate adaptation projects Outcome 2: Guidance is developed for integrating country-specific (NDC) adaptation targets into policies, strategic plans, and projects. • Identification of appropriate adaptation measures to be prioritized in the three areas of (a) water resources management, (b) biodiversity conservation and ecosystem restoration, and (c) ecotourism, based on ADB's loan portfolio • Conducting pre-feasibility studies leading to a pipeline of projects in selected Aimags, strengthening public policies on climate change adaptation and promoting financial mechanisms • Capacity studies and project development for adaptation measures. • Design capacity building programs for national climate focal points and ministerial representatives (including water, environment, agriculture, and finance) on climate vulnerability assessment and NDC adaptation assessment, gender mainstreaming in adaptation projects, NDC implementation reporting, and preparation of biennial accountability reports in accordance with the monitoring, reporting and verification arrangements of the Paris Agreement Integrate NDC adaptation targets into comprehensive land management and regional adaptation plans in selected Aimags (Arkhangai, Bayankhongor and Selenge)	Since capacity of CCRCCs is strengthened through capacity building, mutual results will be strengthened by ensuring linkages such as reflecting them in relevant policy documents and making them subject to monitoring.

	Agency Name	Program/Project Name	Outline of the Project	Relevance/Possible Collaboration
			• Share lessons learned with other development partners and ADB. Outcome 3: Organize environmental civil society to design and implement adaptation measures • CCRCC and ADB will jointly establish a steering committee to publish and manage calls for proposals and review, select, and award CSO initiatives.	
2.	UNDP	Improving Adaptive Capacity and Risk Management of Rural Communities in Mongolia GCF-funded project	**Period:** 2021-2028 **Focal Agency:** MET **Implementing Agency:** UNDP Mongolia **Expected Outcome:** To strengthen the resilience of herding communities in the four Aimags vulnerable to climate change by a) establishing climate-based land and water use plans at the Aimag level, b) ecosystem-based adaptation measures, and c) building the capacity of herding peoples to make climate resilient livelihoods. The project will. The project is implemented by the MET to reduce the impacts of climate change on natural resources and support necessary changes in the pastoral sector, in close cooperation with MOFALI, in particular the National Mongolian Livestock Program (NMLP), using an integrated approach. Outcome 1: Climate information is integrated into land and water use planning at national and local levels Outcome 2: Climate resilient water and soil management capacity of small herd's herdsmen is expanded and resource management is strengthened to contribute to climate resilient livestock production.	This project focuses on the creation and management of pastures by securing water resources. The project overlaps in terms of securing pastureland, securing methods and securing water resources. No overlap in areas are confirmed.
3.	ADB	FP154: Mongolia: Aimags and Soums Green Regional Development Investment Program (ASDIP) GCF-funded project (Approved in 2021/in the process of parliament approval)	**Period:** 2 years **Focal Agencies:** Ministry of Finance, Ministry of Construction and Urban Development (MCUD), the Development Bank of Mongolia (DBM),the Asset Management Company of Development Bank of Mongolia (AMC-DBM) **Implementing Agencies:** MCUD, MOFALI, AMC-DBM **Activities:** The project aims to address the degradation and overgrazing of Mongolian rangelands and provide sufficient services to attract private sector investment to build climate resilient, low-carbon cities and support local agribusinesses. The project will also take measures to support pastoralist groups to limit the number of grazing animals and sustainably manage rangelands, and strengthen agribusiness value chains. Candidate target areas are Bayan-Ulgii, Khovd, Uvs, Dornod, Sukhbaatar, Govi-Altai, and Zavkhan.	Relevant with respect to pastureland improvement and Infrastructure development, financing, and subsidies to pastoralists, which the proposed project can refer to.

	Agency Name	Program/Project Name	Outline of the Project	Relevance/Possible Collaboration
3.	World Vision Mongolia	Climate Resilient Herders Livelihood project	**Period**: 2021-2023 **Focal Agencies:** MOFALI、NEMA **Expected Outcome:** Key implementing partners: Governor offices of Uvs (Umnugobi, Tarialan, Turgen, Sagil Soums) and Govi-Altai (Bugat, Delger, Taishir, Chandman Soums) Aimags, local agriculture departments, Emergency management agencies and animal breeding units. The project aims to improve resilience, livelihood and nutrition of poor herder households through sustainable livestock development, improved productivity of livestock, home gardening and producer group formation. The project interventions also contribute to the sustained well-being of children and their families by helping vulnerable communities to ensure that children are well provided for, well-nourished and have better access to health services.	Relevant in activities to improve the livelihoods of herders. Refer to the results of this project to raise awareness among herders.
4	World Vision Mongolia	Climate Resilient Communities" (CRC) project	**Period**: 2022-2025 **Focal Agencies:** MOFALI, NEMA **Expected Outcome:** The project is funded by USAID's Bureau of Humanitarian Assistance (BHA) and is located in Ulaanbaatar City (Bayangol, Bayanzurkh, Songinohairkhan, Sukhbaatar, Khan-Uul and Chingeltai districts), Dornod Aimag (Kherlen, Bayantumen, Bulgan, Choibalsan, Bayandun, Khalkhgol Soum), Dundgovi Aimag (Saintsagaan, Erdenedalai, Huld Soum), Dornodgobi Aimag (Sainshand, Khatanbulag, Ikh khet Soum), Gobi-Altai Aimag (Yesunbulag, Biger, Tugrug Soum), and Uvs Aimag (Ulaangom, Ulgii, Davst Soum). It aims to increase community resilience to climate-induced disasters through enhanced disaster risk management, improved livelihoods, and sustainable agriculture. The CRC project aims to provide assistance in disaster risk reduction policy planning and agriculture, a sub-sector of the BHA Emergency Application Guidelines. The project's main activities are to improve institutional disaster management, improve community skills using sector-specific approaches, and mentor pastoralists. It also aims to strengthen private veterinary clinics, introduce community participatory risk assessment, and help finance mitigation activities to improve disaster preparedness.	No direct relevance. Refer to results on strengthening veterinary functions. Consider collaboration with Gobi Altai Aimag since there is overlap in the target areas.
5.	World Bank/FAO	Livestock Commercialization Project	**Period**: 2020-2024 **Focal Agency:** MOFALI **Implementing Agency:** FAO **Expected Outcome:** The objective of the project is to improve livestock health, productivity, and commercialization of the target value chain in the project sites and to be able to respond immediately and effectively in the event of a crisis or emergency situation.	Since the activities are related, information will be collected, and potential collaboration will be investigated.
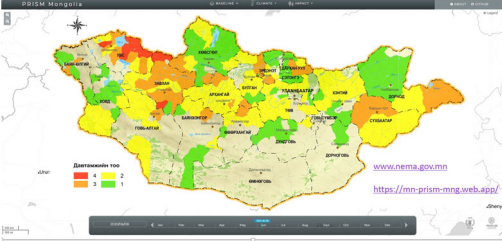
	Agency Name	Program/Project Name	Outline of the Project	Relevance/Possible Collaboration
			• Addressing issues such as animal health management systems, product quality, and promotion of food safety standards • Strengthening the investment climate and financial intermediation by working with SMEs • Supporting strategic investments for the creation of public goods and services and promoting partnerships with the private sector to improve market access for pastoralists and pastoralist groups • Support for a framework for greater private sector involvement by strengthening key public institutions • Improve alignment and coordination of higher level policies and programs between human resource development and livestock sector development • Coordinated investment in animal health, breeding, nutrition, and market linkages • Improve competitiveness of food safety and environmental value chains and promote livestock exports Targeted areas include 12 Aimag and 80 Soums (Bayankhongor, Bayan-Ulgii, Bulgan, Dundgovi, Govi-Altai, Khentii, Khovd, Khuvsgul, Tuv, Usv, Uvurkhangai, Zavkhan, Ulaanbaatar)	

Source: JST

(2) Dzud Early Warning Related Projects

	Agency Name	Program/Project Name	Outline of the Project	Relevance/Possible Collaboration
1.	ADB	TA 6534-MON: Strengthening Integrated Early Warning System in Mongolia Project	**Period**: Pending application by the Ministry of Finance **Implementing agencies**: NEMA,NAMEM, IAG **Activities:** This project will implement the following eight activities for the development of an Integrated Early Warning System (EWS). 1. Development of an integrated warning information system 2. Development of a digital radio communication system 3. Development of a live TV and radio broadcasting system 4. Development of a cell phone warning information transmission system * Development of a system to send information directly to the public's cell phones and the associated hardware and software 5. Capacity building of the public and emergency response services, and the legal environment 6. Development of a siren tower system 7. Development of an internal warning system 8. development of mobile communication systems (vehicles)	The results of the project will be used in the development of a mobile phone information delivery system.

	Agency Name	Program/Project Name	Outline of the Project	Relevance/Possible Collaboration
2.	World Vision Mongolia	Disaster Anticipatory Action in Mongolia (DAAM)	**Duration**: 2022-2023 **Funding Agency:** Aktion Deutschland Hilft Target areas: 3 selected Dzud high-risk Aimags out of 8 Dzud forecasted Aimags. World Vision Mongolia is starting Disaster Anticipatory Action in Mongolia (DAAM) project from October 2022 funded by the Aktion Deutschland Hilft (ADH), a union of German relief organizations. The Relief Coalition provides rapid and effective aid in the case of large catastrophes and emergency situations. Mongolia is one of six countries where World Vision will establish anticipatory action protocols for selected disaster-exposed areas to enhance the level of readiness and pre-disaster action capacity at community level.	
3.	WFP	Enhancing Mobile Data Systems for Livelihood Protection in Mongolia	**Period**: 2019-2020 **Funding Agency**: WFP **Implementing Agencies**: Mercy Corps, NEMA **Related Agencies**: NSO, NAMEM, MOFALI, MRCS In this project the following activities were conducted in support of building mobile-based technology to facilitate the provision of information to the related agencies involved. • Mobile-based surveys using tablets and smartphones • Remote surveys via call center, SMS, or IM • Chatbots and interactive voice response • SMS system created by Mercy Corps under the Leveraging Tradition and Science -2 (LTS2) project to provide all cell phone users in Mongolia with 14 types of weather, market prices of grass, hay and wheat bran, etc. Information will be distributed (after the project completion, the maintenance and management entity was transferred to NEMA). • SMS messages for early warning (e.g., warnings about winter storms and flash floods) The Mongolian government and the above agencies have established an SMS-based system to monitor Dzud risk nationwide using satellite data; WFP, in partnership with USAID and Mercy Corps, has expanded the mobile phone-based monitoring system to include a real-time Dzud impact and situation Platform for Monitoring (PRISM). PRISM is designed to mitigate the effects of climate-induced damage by ensuring that decision makers have up-to-date risk and impact analysis to support planning and response. A total of 44 hazard, vulnerability, risk, and capacity indicators linked to the "Space Observation and Information Technology Platform for Real-Time Information and Situation Monitoring" and were developed in collaboration with NSO, NEMA, MOFALI, and NAMEM.	

	Agency Name	Program/Project Name	Outline of the Project	Relevance/Possible Collaboration
			In the case of a long-term spanning disaster, such as a drought, PRISM can provide an overview of the current situation within the historical context and combine this information with data on vulnerable groups to highlight areas at risk. In the event of a serious disaster, PRISM is designed to quickly produce statistics on the number of people potentially at risk, allowing governments and humanitarian partners to immediately assess the scale of the disaster without having to send people to the scene. Information in PRISM can be distributed directly to government agencies, humanitarian aid workers, and the general public. **Figure 5.1 PRISM's Screenshot**	
4.	Red Cross Mongolia	Forecast-based Financing for vulnerable herders in Mongolia	**Period:** 2018 **Funding Agencies :** British Red Cross A Dzud risk map developed by the National Agency for Meteorology and Environmental Monitoring (NAMEM), Information and Research Institute of Meteorology, Hydrology and Environment (IRIMHE) and Nagoya University of Japan, is the basis to trigger Forecast-based Financing (FbF) action for Mongolia. Dzud risk is developed around 14 scientific indicators such as rainfall deviation, risk of drought, regional temperature, etc. By implementing the FbF Programme, early action could be taken to reach the herders well before the loss of their livestock and not after. The best time to support herders is before their animals become weak, giving any action the chance to avert livestock loss and to reduce the impact of Dzud on the livelihoods of vulnerable herders. 240,000 MNT and mineral nutrition packages were provided to 2,000 herding families of vulnerable groups in 40 Soums of 12 Aimags.	

Source: JST

(3)   Donor's Formulating Projects

	Agency Name	Program/Project Name	Outline of the Project	Relevance/Possible Collaboration
1.	ADB	TA 6534-MON: Strengthening Integrated Early Warning System in Mongolia Project	**Period**: Pending application by the Ministry of Finance **Implementing agencies**: NEMA,NAMEM, IAG **Activities:** This project will implement the following eight activities for the development of an Integrated Early Warning System (EWS).	The results of the project will be used in the development of a mobile phone information delivery system.

	Agency Name	Program/Project Name	Outline of the Project	Relevance/Possible Collaboration
			1. Development of an integrated warning information system 2. Development of a digital radio communication system 3. development of a live TV and radio broadcasting system 4. Development of a cell phone warning information transmission system 5. Development of a system to send information directly to the public's cell phones and the associated hardware and software 6. capacity building of the public and emergency response services, and the legal environment 7. Development of a siren tower system 8. Development of an internal warning system 9. Development of mobile communication systems (vehicles)	
2.	ADPC	Technical Assistance on Improving Dzud Forecasting	**Period**: 2024- (FY2023 GCF application considering) **Funding Agency**: GCF/USAID **Implementing Agency:** MET (IRIMHE), **Contents of Proposal**: The project plans to provide technical assistance to IRIMHE to enhance its Dzud forecasting capabilities (improvement of the forecasting model used by IRIMHE), equipment and materials necessary for forecasting (PCs, servers, etc.), and pilot activities to improve the accuracy of Dzud forecasts in the northern part of the country.	Utilization of improved forecasting information

Source: JST

5.3 Information of assistance from the Ministry of Environment in Japan

The Government of Japan has published the "Loss and Damage Assistance Package for Adverse Effects of Climate Change [14] by the Government of Japan". This support package includes (1) comprehensive support from Japan ranging from proactive disaster prevention to disaster relief and disaster risk insurance, (2) knowledge-based knowledge sharing, (3) contributions to the UN and multilateral frameworks, etc., and (4) promotion of overseas deployment of climate-related services and technologies through public-private partnership.

The Ministry of the Environment (MOE) is conducting a project to support desertification control with the aim of contributing to combating desertification from a scientific perspective[15]. In Mongolia, the "Study on Sustainable Pastureland Use in Arid Regions with the Participation of Local Communities (2012-2015)" and "Improving Adaptive Capacity to Desertification and Climate Change: Efforts and Lessons Learned in the Govi Region, Mongolia (2007-2011)" were conducted.

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[14] https://www.env.go.jp/press/press_00826.html
[15] https://www.env.go.jp/nature/shinrin/sabaku/index_1_6.html

Chapter 6　Result of Review of Current Activities Plan

As a climate change adaptation measure, JICA has submitted the CN for a project consisting of four activities to foster prevention, avoidance, and reduction of Dzud damage among herders: (1) improving the accuracy of Dzud outbreak forecasts and strengthening operational capacity, (2) effectively utilizing the results of Dzud outbreak forecasts, (3) introducing a PV system for frozen meat storage using solar power, and (4) producing and distributing livestock products with high food safety, to GEF.　As shown in Table 6.1, the study confirmed the current status and issues related to these current plans, and examined the necessary measures.

Table 6.1　Activities Planned by CN Submitted to GCF and Confirmed Items in this Study

	Activities planned in CN	Confirmation items in this survey
Activity ①	Improving the accuracy of Dzud outbreak forecasts and strengthing operational capacity	Understanding awareness and behavior of herders to improve their ability to adapt to Dzuds, forecasting and distributing Dzuds
Activity ②	Effectively utilizing the results of Dzud outbreak forecasts,	Investigate how to receive and transmit prediction information of Dzud occurrence to herders, verify application development, consider and propose useful prediction information receiving and transmitting methods
Activity ③	Introducing a PV system for frozen meat storage using solar power	Review of task setting, effectiveness, and sustainability of PV system introduction
Activity ④	Producing and distributing livestock products with high food safety	Re-examination of necessary interventions for herderic meat production challenges

Source: JST

6.1　Evaluation of the current plan

6.1.1　Improving the accuracy of Dzud prediction and enhancing capacity of information utilization, and effective utilization of Dzud forecast information

(1)　Evaluation of improvement of Dzud forecasting accuracy

Dzud forecast information is provided appropriately in terms of quantity, quality, and frequency of information provision, and it is recognized that the reduction of Dzud damage is appropriate adaptation behaviors by herders using information than improving the accuracy of predictions. (IRIMHE). In particular, the important in the Dzud forecast information is whether their own location is classified with very high or high risk. The herders decide their adaptive behavior based on their experience by selecting the provided information (herder survey). In recent years, the accuracy of weather forecasts has improved, and weather information such as wind direction and wind speed is provided via free smartphone apps, increasing the variety of weather information that herders can access. Therefore, neither the sender nor the receiver of the forecast information do not require more subdivided segmentation (IRIMHE, herder survey).

In the previous project, Dzud information segmented by region was provided via a charged service, which was developed by Mercy Corps and operated by NEMA, but is currently suspended, including data updates.

At present, less than 50% of herders own smartphones, and it is difficult to improve the accuracy of Dzud forecast by collecting the information from herders because the information devices are not widely used. In this regard, rather than improving the accuracy of Dzud-risk forecast information, it is necessary to establish an information receiving and transmitting system that is linked to countermeasures, such as reliable transmission of Dzud risk and taking countermeasures while understanding responses, since herders can choose various adaptive behaviors in high-risk areas.

(2)   Issues

Currently, information on weather disaster risks, etc., is sent to the Soum chiefs and Bug chiefs by the administration (e.g., the Aimag Meteorological Department and the Aimag Emergency Department) mainly by SMS, and this information is then sent to the herders by SMS or other means. The Soum chiefs and Bug chiefs call their respective herders to confirm that this information has been conveyed. The SMS system can provide information quickly and extensively, while the SMS system can be used by herders to communicate with their neighbors.

On the other hand, SMS does not allow the sender to confirm that the information has been received by the herders. Therefore, it is necessary to establish a mechanism to ensure that herders receive weather disaster information, including Dzud forecast information, so that effective countermeasures can be implemented.

A mechanism is needed to confirm that information is reliably transmitted via SMS. A system is needed to confirm that information is being communicated via SMS.

6.1.2   Introduction of Meat Frozen Storage System (PV System) Utilizing Photovoltaic Power Generation

(1)   Evaluation of PV system

1)   Demonstrating PV system

Figure 6.1 shows the PV system currently being demonstrated in Mongolia. It is connected to the diesel generator and the grid power to ensure power for starting the refrigeration compressor. In addition, since solar power cannot be generated at night, 53% of the power used in the PV system is supplied from solar power generation. In addition, photovoltaic power generation is widely used in Mongolia, and a similar PV system can be installed with existing facilities available in Mongolia (Professor Amarbayar, National University of Mongolia).

PV system-related equipment currently available in Mongolia is mainly made by manufacturers in China, Germany, Switzerland, etc. (Figure 6.2, Table 6.2).

Source: JST

Figure 6.1   Demonstrating PV System in Mongolia
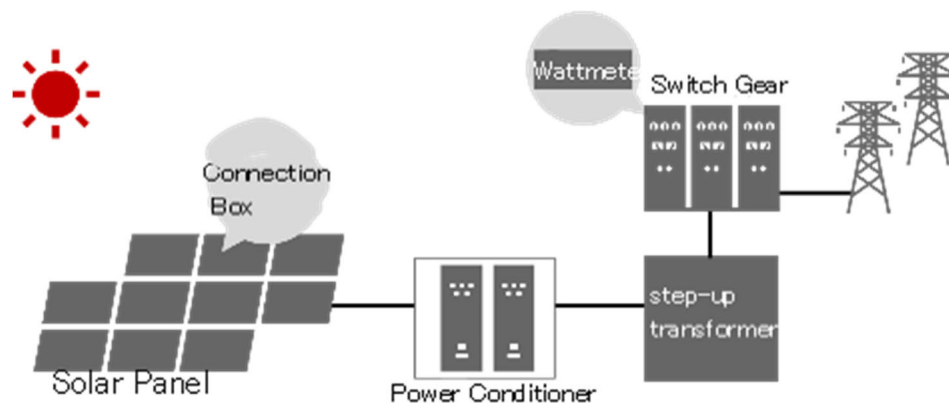
Source: Hitachi Power Solutions Co. Ltd. Web site[16]

Figure 6.2   General Photovoltaic Equipment

Table 6.2   Photovoltaic Equipment Currently available in Mongolia

	Equipment	Manufacturer (country of origin)	Remark
1)	Solar panel	Jinko Solar (China)	27 cents per Mw
2)	Power conditioner	SMA (German)	Equipment that supplies electricity to the grid. 20 million yen per unit. Same cost as panel.
3)	Charge controller	SMA	Connect panel
4)	Monitoring system (power monitor)	ABB (Switzerland)	
5)	Cable	(China)	
6)	Step-up transformer	(China, Philippine)	Required manual maintenance

Source: JST

2)   Confirmation of the PV system needs in Mongolian market, and consideration of necessary measures for dissemination and maintenance

Mongolia's solar power generation business boomed in 2017-2018, but due to the revision of the law in 2019, the initiative for installation changed from the private sector to the government. The Ministry of Energy decided the specifications and the installation location of the equipment. According to the previous survey results, the selling of electricity has been considered as one way to monetize the PV system, but since the price of electricity is low in Mongolia, the price of solar power generated electricity is higher than that of grid electricity, so profitability is difficult (solar power generation facility company).

3)   Issues in introducing PV systems

Under DECISION OF THE GOVERNMENT OF MONGOLIA No. 224 of 2022 "Technical regulation of production and trade of meat and meat products" (new legislation), from 1 January 2023 livestock for sale must be processed in certified slaughterhouses. In order to slaughter herder's livestock before a coming disaster and to earn from the price differences of seasons, it has become necessary to build slaughterhouse. The introduction of a freezer alone does not lead to an improvement in livelihood. In addition, the new law stipulates that the freezing temperature of meat should be -25 to -35°C, but the current PV system of -15°C does not meet the regulations of the new law. In addition, the new law stipulates inspections by veterinarians and the allocation of food technicians and refrigeration technicians. The total operation cost of the system requires a careful examination with maintenance and management costs including technicians.

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[16]   https://www.hitachi-power-solutions.com/energy/wind-solor/solar-power/system/index.html

Figure 6.3 shows assumed equipment component.
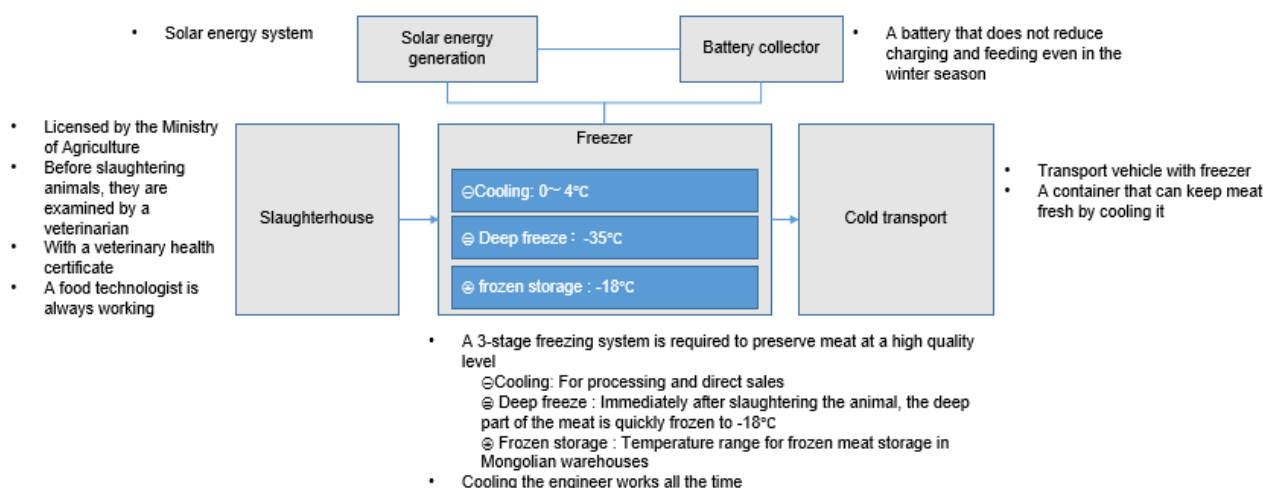
Source: JST

Figure 6.3   Assumed Equipment Component

4)   Management trial calculation of PV system

The price of the PV system, including related equipment, is about 20 million yen per set (according to the quote from the vendor). Assuming that the market price of sheep per head is 250,000 MNT (10,000 yen), 2,000 sheep are required for the initial investment of the PV system alone. This is nearly six times the 350 sheep that can be stored in a PV system (20ft container). Considering that one herder household sells about 300 livestock per year, introducing a PV system would be a heavy burden for herders or herder groups. In addition, PV systems require a lot of maintenance and management costs, such as maintenance and management of solar panels, replacement of power conditioners (6 years by law in Japan), and repair of deteriorated cables. This heavy financial burden causes difficulty of expanding to other areas.

The price of a general refrigerated container (reefer container) is about 2 million yen, which can be covered by the income of the livestock sold by the herders. This is more realistic plan of introduction of freezing system in Soum level economically. In addition, reefer containers can freeze down to -35°C, therefore it complies with the new laws.

PV systems can be powered by photovoltaic power generation, but only about half of the total power can be used. The price of electricity is low in Mongolia, and the share of electricity charges in maintenance costs is low. Table 6.3 shows the estimated electricity costs for the refrigerated containers. Of this amount, the daytime electricity cost that can be replaced by solar power is 3,950,760 MNT per year, which is about 16 sheep at a sheep sale price of 250,000 MNT, making the cost savings from solar power less effective.

Table 6.3   Trial Calculation of Electricity Cost of Freezer Containers

20 feet

Time zone	Operating time		Unit price (MNT/h)	Power consumption (kwh)	Cost of electricity (MNT)		
					Day	Month	Year
Day	06:00-17:00	11	164	6.00	10,824.00	324,720.00	3,950,760.00
Night	17:00-22:00	5	256	6.00	7,680.00	230,400.00	2,803,200.00
Midnight	22:00-06:00	8	105	6.00	5,040.00	151,200.00	1,839,600.00
				Total	23,544.00	706,320.00	8,593,560.00
				Tax included (10%)	25,898.40	776,952.00	9,452,916.00

Source: JST

40 feet

Time zone	Operating time		Unit price (MNT/h)	Power consumption (kwh)	Cost of electricity (MNT)		
					Day	Month	Year
Day	06:00-17:00	11	164	10.00	18,040.00	541,200.00	6,584,600.00
Night	17:00-22:00	5	256	10.00	12,800.00	384,000.00	4,672,000.00
Midnight	22:00-06:00	8	105	10.00	8,400.00	252,000.00	3,066,000.00
				Total	39,240.00	1,177,200.00	14,322,600.00
				Tax included (10%)	43,164.00	1,294,920.00	15,754,860.00

Source: JST

(2) Issues

The slaughtering of livestock by herders based on Dzud forecast information and the cold storage of these animals at the Soum level is expected to improve the livestock distribution channel in Mongolia and strengthen the value chain. On the other hand, it is difficult for herders themselves to install precision equipment such as PV systems at the Soum level in terms of management and operation (MOFALI, based on field interviews). Adaptive behavior by herders in response to Dzud predictions far outweighs fodder preparation slaughter of livestock (from the herder survey). In order to strengthen the adaptive behavior of herders, it is necessary to consider the proposed activities based on the needs of the Mongolian side.

In Biger Soum, a surveyed Soum in Govi- Altai Province, a plan to extend irrigation water previously used for fruit cultivation to vegetable and fodder cultivation areas has been prepared, and in Tsogt Soum, a plan to secure fodder cultivation areas through irrigation has also been prepared (from field interviews). In Dundgovi Aimag, there is no specific plan for fodder cultivation, but it is recommended that herders themselves install fences on their pastureland to secure livestock feed, and the area of fences is gradually expanding (from field interviews).

On the other hand, pastoralism is based on the movement of grazing land, and the cultivation of fodder in a fixed location is not compatible with the traditional livestock production system. However, in recent years, the ecosystem of Mongolia's grasslands has been collapsing, which not only has a major impact on the weather, but has also led to a decline in the quality of grazing grass, which in turn has led to a decline in the meat industry as a whole, and it is hoped that the Mongolian ecosystem can be changed from traditional pastoralism (from the Meat Association).

In addition, for example, due to education and medical care, some members of families often live in a fixed location, with only the father and eldest son going out to graze, (from field interviews). Along with changes in the social system, pastoralism in Mongolia is also changing, and the establishment of more diverse forms of pastoralism is under consideration. For these purposes, pastureland use plans need to be re-examined and pastureland use plans need to be developed that will enable self-sufficiency in livestock feed. In this way, there is a need transit from solely relying on grazing for livestock feed and to establish a mechanism to restore the grazing land ecosystem. In order to secure fodder resources, it is necessary to protect vegetation on grazing lands. It is necessary to restore the original vegetation, for example, by planting low shrubs. Such vegetation protection requires that herders monitor the status of vegetation recovery and raise their own awareness through objective evaluation of their grazing lands.

In addition, meat prices are highly correlated with livestock weight, and seasonal price differences alone due to shipment adjustments are not effective in improving income. In order to improve income from livestock sales, it is necessary to produce healthy and fat livestock. Securing livestock feed can contribute not only to preventing pastureland degradation, but also to producing value-added livestock, thereby enabling herders to improve their livelihoods.

6.1.3 Production and Distribution Improvement of Food-Safe Livestock Products

(1) Evaluation of Improvements in Distribution of Livestock Products

The Mongolian government aims to establish a new value chain for livestock products through new legislation. Mongolia's livestock production far exceeds its domestic consumption, and it is hoped that the country's international competitiveness for overseas exports will be strengthened. In order to rebuild the value chain of livestock products based on the new decree, it is essential not only to install freezers but also slaughterhouses and processing facilities that can be maintained and managed at the Soum level and approved in accordance with the decree. On the other hand, there are a certain number of consumers who prefer the traditional way, so it is necessary to establish regulations to enable supply to such markets (from the Meat Association).

In order to rebuild the livestock value chain based on the new law, it is essential to develop human resources for facility management. It is necessary to establish a system to enhance specialized university courses so that technical licenses can be obtained, and to provide regular technical guidance to those engaged in the field to renew their licenses.

1) Cost Estimation

As for the slaughterhouses, their establishment is stipulated by the new law, and their construction costs should be allocated from the development funds allocated to the Aimag and other funds. Assuming a scale that can be maintained and managed at the Soum level, the Japanese wildlife processing facility (gibier) can be used as a reference. A very simple facility is estimated to cost around 3 million JPY (75 million MNT), while a facility of a certain standard is estimated to cost around 50 million JPY (1.25 billion MNT).

For freezers, general refrigerated containers (reefer containers) should be introduced, and the price is estimated to be around 50 million MNT. These should be purchased by Soum or herders, as the management entity is expected to be herders or Khorshoo.

It is stipulated that two food technicians and two refrigeration technicians must be assigned to the project. The labor cost for the assignment of these technicians was MNT 2,860,706.25 per month (Table 6.4).

Table 6.4 Trial Calculation of Labor Cost

		Monthly (MNT)	Annual (MNT)
Food engineer	Salary	1,200,000.00	14,400,000.00
	Holiday allowance	71,425.00	857,100.00
Refrigeration engineer	Salary	1,200,000.00	14,400,000.00
	Holiday allowance	71,425.00	857,100.00
Subtotal		2,542,850.00	30,514,200.00
Social security (12.5%)		317,856.25	3,814,275.00
Total		2,860,706.25	34,328,475.00

Source: JST

2) Management trial calculation

Profit was calculated assuming that the sale price of sheep is 250,000 MNT per head and the capacity of carcasses in a container of 20 feet and 40 feet are 350 and 700 head, respectively (Table 6.5). In this calculation, all electricity from grid power, and the initial cost and maintenance expenses are not included.

In a 20 ft. container, management costs appropriately 167 sheep. The gross income per sheep was calculated at 130,420 MNT. In the 40 ft. container, management costs appropriately 193 sheep. And the gross income per sheep was calculated 181,207 MNT.

Labor costs account for a high proportion of operating costs, therefore, to earn appropriate income, 40 ft. containers which can store more sheep should be introduced. As containers become larger, it is expected that stock management, such as loading and unloading, will become more complicated, and equipment maintenance and management will be more costly. Even considering that, the effect of introducing freezer to livestock sales by herder is high.

Table 6.5   Calculation of Profit of Freezing Container (MNT)

Type of container	Items	Detail	Amount (MNT)
20 ft.	Gross income	Sales of sheep	87,500,000
	Management cost	Electricity	9,452,916
		Labor cost	32,400,000
		Total	41,852,916
	Balance		45,647,084
40 ft.	Gross income	Sales of sheep	175,000,000
	Management cost	Electricity	15,754,860
		Labor cost	32,400,000
		Total	48,154,860
	Balance		126,845,140

Source: JST

(2)   Issues

The estimated gross income from sheep will be about 70% of the expected sales price, but it is easy to differentiate the meat from others because it is compliant with laws and regulations. In addition, traceability can be easily established, enabling local branding and expanding sales channels through the supply of high value-added meat.

The establishment of such a meat supply chain at the Soum level will shift the market from a buyer's market to a seller's market, creating opportunities for livestock sales and contributing to improved livelihoods for herderic people. Increased opportunities for livestock sales will also lead to increased opportunities to reduce the number of livestock, and this in turn can be expected to restore grazing lands.

6.2   Results of this study and proposed responses to emerging issues

The review of the current plan revealed several assumptions that need to be revised. Table 6.6 shows the main findings related to the modification of the project and the proposed new activities based on these findings. The new plan shall consist of the following three activities, each of which is described in detail in the next chapter.

➢   Activity-1: Strengthening the operational capacity of Dzud forecast information

➢   Activity-2: Strengthening pastoralism through livestock feed preparation

➢   Activity-3: Establishment of a meat distribution system based on technical regulations

Table 6.6   Findings on the Current Plan and Proposed New Activities

Composition of the Current CN	Contents of the activities in the current plan	Results of this survey	New activity idea
Component 1: Adaptive capacity of herders Activity1-1: ICT development for Dzud countermeasures Activity 1-2: Institutional development support Activity 1-3: Solar powered freezer Activity 1-4: High quality meat production Activity 1-5: Capacity building of veterinarians Activity 1-6: Agricultural value chain	**Activity 1 : Improving the Accuracy of Dzud Forecast and Enhancing Operational Capabilities**	· Information is provided to herders, so prediction accuracy is not an issue · It is difficult for herders to change their adaptive behavior even if the accuracy of prediction information just before a disaster occurs is improved.	**Activity -1:** Strengthening the operational capacity of Dzud forecast information Activity 1-1: Improving communication between the government and herders by upgrading the SMS function that enables two-way confirmation of information transmission between senders and receivers Activity 1-2: Improving the efficiency of information transmission by developing a herders' database
	Activity 2 : Effective utilization of Dzud forecasting results	· Making it possible for the sender to confirm whether the information has been transmitted reliably, and for the sender and receiver to confirm the information interactively will lead to a reduction in the risk of weather disasters.	
Component 2: Adaptive capacity of administration Activity2-1: Dzud prediction accuracy Activity2-2: Dzud measures by the government Activity2-3: Local government measures against Dzud	**Activity 3 : Introduction of meat freezer storage system (PV system) that utilizes photovoltaic power generation**	· Meat sales prices are highly correlated with the weight of livestock, and according to Dzud, an increase in the number of slaughtered animals has not necessarily had an effect. · Producing healthy and fat livestock with a high trading price is effective in improving income.	**Activity -2:** Strengthening pastoralism through livestock feed preparation Activity 2-1: Optimal use of grazing land by formulating Soum-level grazing land utilization plan Activity 2-2: Preparation of diverse and stable livestock feed by securing grazing land and cultivating pasture and fodder crops Activity 2-3: Restoration and monitoring of grazing land through vegetation protection
	Activity 4 : Production and distribution improvement of livestock products with high food safety	· Establishing a production and sales system based on the newly enacted meat distribution technical regulations will lead to an improvement in the income of the herders.	**Activity - 3 :** Establishment of a meat distribution system based on technical regulations Activity 3-1: Establishment of Soum-level livestock slaughterhouses and cold storages in accordance with technical regulations, and construction of a meat supply chain with freshness-preserving technology Activity 3-2: Development of a product of origin information provision system linked to the comprehensive veterinary system Activity 3-3: Development of food technicians

Source: JST

Chapter 7　Proposals for New Activities

Based on the above mentioned results, the following new activities are proposed.

7.1　Project Framework

(1)　Project Objectives

To strengthen the adaptive capacity of herders vulnerable to climate change, to the Dzud and to build pastoral resilience.

(2)　Output

Output 1：Adaptive capacity of the administration and herders to weather hazards is strengthened.

Output 2：Grazing lands are restored and high value-added livestock are produced.

Output 3：Market-competitive livestock products are produced and sold.

(3)　Activities

Activity 1: Strengthen the operational capacity of Dzud forecast information

Activity 1-1：Improvement of communication between administration and herders by upgrading SMS functionality that allows both sender and receiver to confirm information transmission.

Activity 1-2：Improvement of efficiency of information transmission through the development of a herders' database

Activity 2: Strengthening Pastoralism by Preparing Livestock Feeds

Activity 2-1：Optimal use of pastureland through the development of a Soum-level pastureland use plan

Activity 2-2：Securing pastureland and preparing diverse and stable livestock feed by cultivating grass and fodder crops

Activity 2-3：Revegetation and monitoring of pastureland through vegetation protection

Activity 3: Establishment of a meat distribution system based on technical regulations

Activity 3-1：Establishment of a Soum-level livestock processing plant and cold storage according to technical regulations, and construction of a meat supply chain with freshness maintenance technology

Activity 3-2：Development of a system for providing origin information linked to a livestock hygiene information system

Activity 3-3：Training of food technicians

(4)　Target area

Dundgovi Aimag and Govi-Altai Aimag, Mongolia

(5)　Project implementation period

2025-2030 (5 years)

(6)　Implementing agencies in partner countries

MOFALI, MET, IRIMHE, Ministry of Digital Development and Communications, Dundgovi Aimag Government, Govi-Altai Aimag Government

Figure 7 1 shows the overall project framework and Figure 7 2 shows the overall activities.
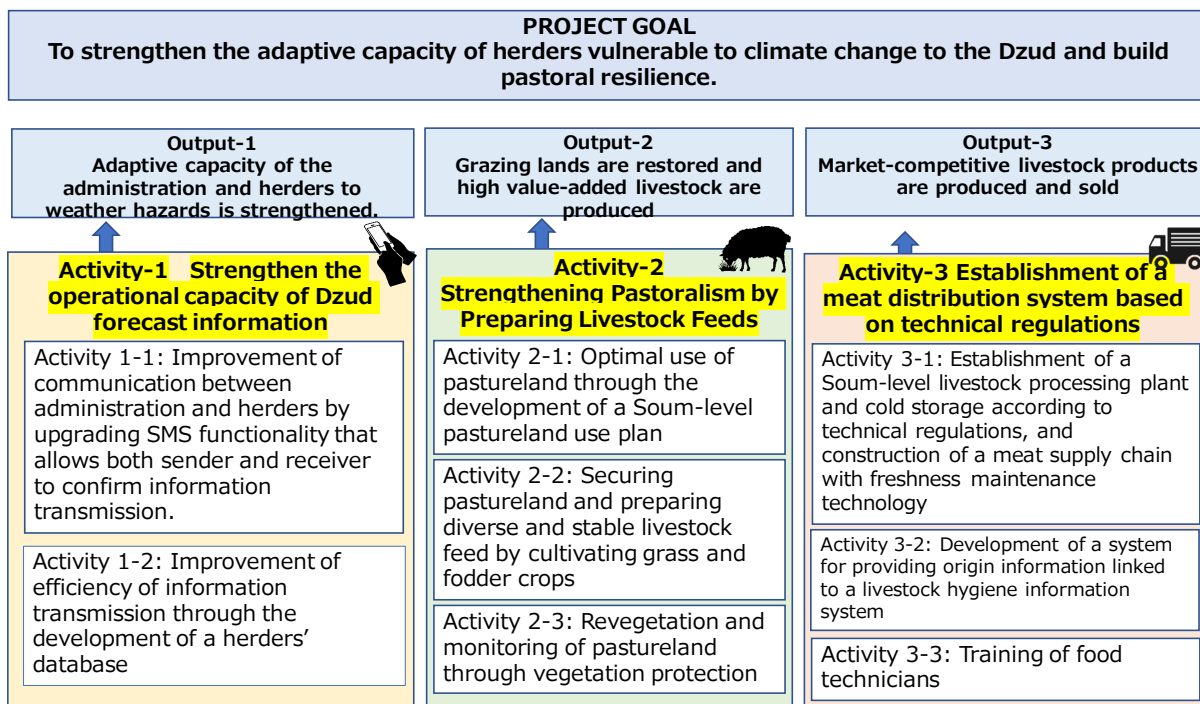
Source: JST

Figure 7.1　Overall Picture of the New Project
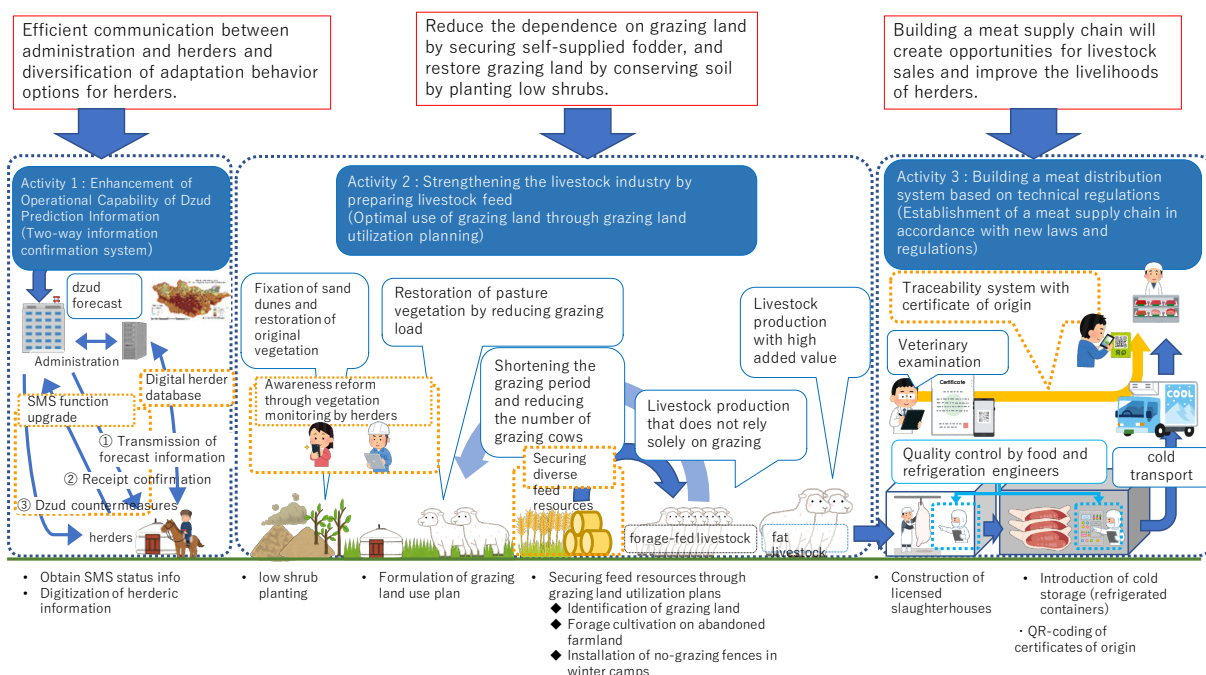
Source: JST

Figure 7.2　Overall Picture of the Activities

7.2　Activity 1: Strengthen the operational capacity of Dzud forecast information

In order to implement effective Dzud countermeasures, it is important to increase the types of adaptive actions that herders can choose from based on Dzud forecast information. In addition to the measures that individual herders can take, improve information transfer and information management mechanisms that will further enhance communication between the government and herders in order to provide herders with measures provided by government agencies such as the national and local governments in a timely manner and without excesses or deficiencies.

7.2.1 Activity 1-1: Improve communication between administration and herders by upgrading SMS functionality that allows both sender and receiver to confirm information transmission.

This activity will upgrade the SMS send/receive functionality and develop an SMS read confirmation system to confirm that messages sent by government agencies have been received by herders.

(1) Overview

Develop and provide a system that feeds back SMS status information (Table 7.1) possessed by telecommunication carriers to the Bug head. Among the status information, a system will be developed to identify herders who have not received messages sent by the administration (herders other than "read" as shown in Table 7.1) and to follow up with them individually. This will ensure that administrative support (e.g., identification of areas to be evacuated, preparation status of stockpiled feed, status of dispatch of emergency disaster relief teams, etc.) is delivered to herders, thereby creating an environment in which they have more options for adaptive behavior.

As an example of information transmission, comparing the case of calling 8,000 herder households in Dundgovi Aimag (60 MNT/minute × 8,000 households = 480,000 MNT) with the case of SMS only (20 MNT/mail × 8,000 households = 160,000 MNT). The cost reduction effect is 320,000 MNT for a single information transmission.

Table 7.1   Types of Status Information

Status	Content
Sent	Recipient notified but not read
Unsent	The notification has not reached the recipient,. power off or out of service area
Error	Incorrect phone number, etc.
Already read	Recipient received information

Source: JST

(2) Activities

① Develop software to read SMS status in collaboration with telecommunication carriers.

② Develop a PC environment for Bug heads.

③ Enable Bug heads to manage status information through IT education and training.

Figure 7 3 shows the overall picture of the activity.

Status information is automatically downloaded to the Bug head's PC and managed in a table (Excel). The assumed Excel table is shown in Table 7.2.
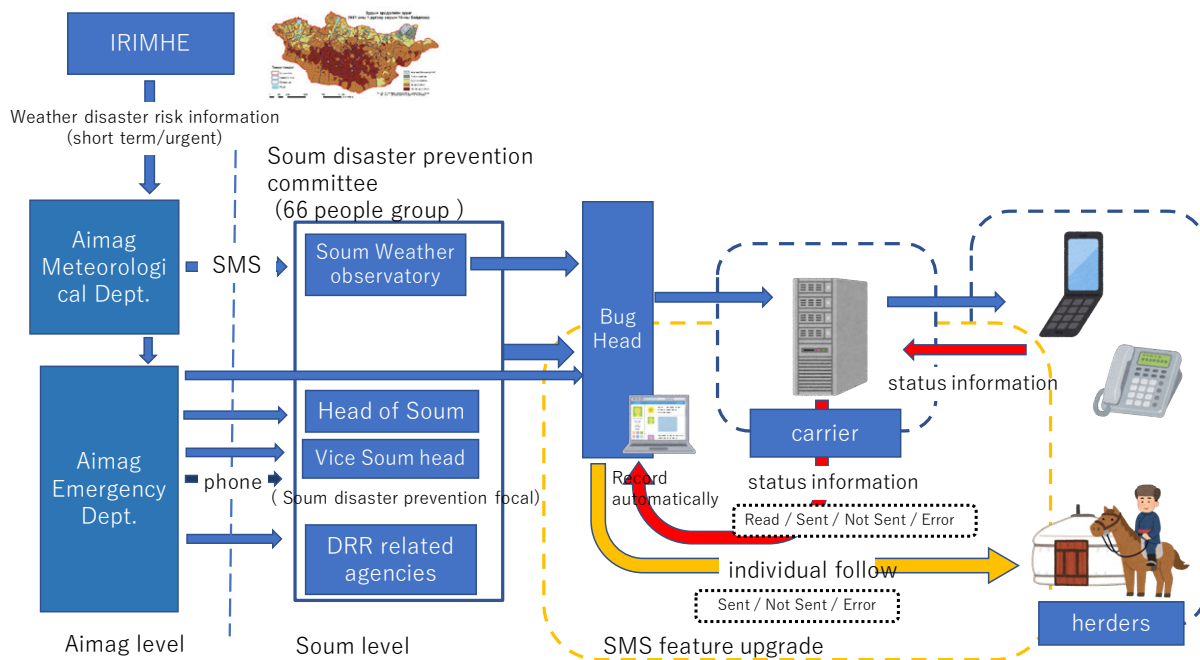
Figure 7.3   Overview of SMS Function Upgrade

Table 7.2   Example of an Excel Table Managed by Head of Bug

Herder Name	Contact Address	Type of Information	Reception Status	Individual Follow-up
		• Medium- to long-term forecast • Short-term forecast • Emergency information	• Sent • Unsent • Error • Already read	• Reconfirm by phone • Visiting • Contact nearby herders • Others

Source: JST

(3)   Input

Table 7.3 illustrates the input costs for upgrading the SMS function .

Table 7.3   Input for SMS Function Upgrade

Expense Item	Content	Unit Price (USD)	Quantity	Subtotal (USD)	Remarks
Software development cost	Software development for creating files for status acquisition and transmission within telecommunications carriers	20,000	1	20,000	
Equipment cost	Bug heads' PC	700	Ten	7,000	5 Bug / 1 Soum 2 Soum / Aimag
Training fee	IT education for Soum staff and Bug heads	1,000	6	6,000	2 Soum /Aimag 3 years continuous
total				33,000	per Aimag

Source: JST

7.2.2 Activity 1-2: Improvement of efficiency of information transmission through the development of a herders' database

In this activity, a database of basic information on herders will be constructed and operated.

(1) Overview

This activity is to develop a herder information system to construct and utilize a database of herderic information in order to strengthen measures taken by the government. In addition to the information submitted to the Bureau of Statistics every year, basic information on herders will be linked to the SMS read confirmation system to link with Dzud countermeasures. In addition, to organize information on the status of livestock breeding and sales, and link this information to the Veterinary Agency's MAHIS system.

(2) Activities

① Determine the input data format for data items and build a database.

② Prepare an operation manual that enables the system to be used in Soum, and create guidelines to promote the widespread use of the database.

③ Conduct hierarchical training (ToT training, Bug manager training) with Soum staff as trainers to train bug managers on PC input.

(3) Input

Table 7.4   Input for IT Education to Head of Bugs

Expense Item	Content	Unit Price (USD)	Quantity	Subtotal (USD)	Remarks
Material Fee	PC operation manuals and information management manuals	5,000	2	10,000	2 Soum /Aimag
Training Fee	IT education for Soum staff and bug chief	1,000	6	6,000	2 Soum /Aimag 3 years continuous
Total				16,000	per Aimag

Source: JST

7.3   Activity 2: Strengthening Pastoralism by Preparing Livestock Feeds

In order to reduce weather-related disasters such as Dzud, there is a need to move away from livestock production dependent on grazing on natural grasslands and to restore the rangeland eco-system.

Therefore, with the aim of changing the mindset of herders to livestock production that does not depend solely on grazing, the project will develop and implement a plan for the preparation of a variety of livestock feeds, and restore the ecosystem through the restoration of vegetation in the grazing lands. Figure 7 4 shows the overall picture of the activities.
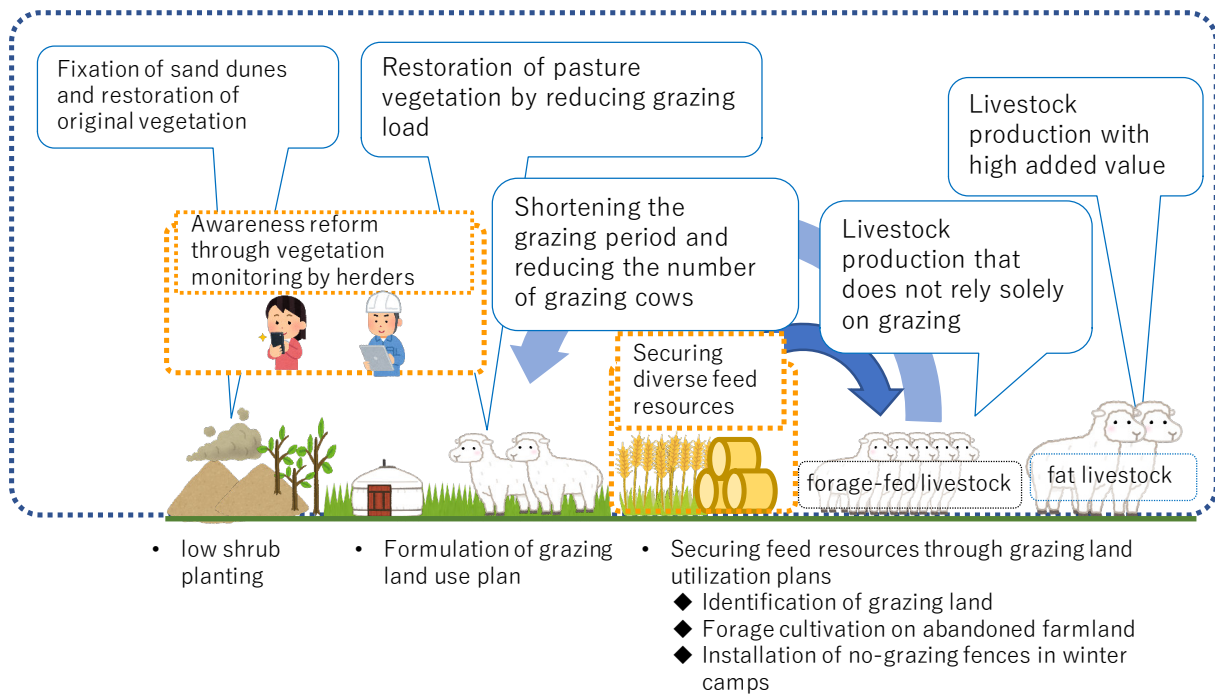
Source: JST

Figure 7.4   Overview of Activity 2

7.3.1   Activity 2-1: Optimal use of pastureland through the development of a Soum-level pastureland use plan

This activity is designed to re-organize pastureland conditions, identify forage areas, identify areas where forage cultivation is possible, identify areas where vegetation restoration is needed, and plan pastureland use.

(1)   Overview

A pastureland use plan will be developed to secure livestock feed. This plan will be developed in a participatory manner with the participation of herders, and through this activity, raise awareness among herders to prepare a variety of livestock feeds that do not depend solely on grazing.

(2)   Activities

①   Workshops will be held with the participation of herders.

②   Reorganize the multifunction of pastureland and formulate a pastureland utilization plan.

③   Classify the pastureland used by herders into pastureland (including otor) grassland, forage cultivation area, and vegetation protection area.

④   Plan interventions as necessary inputs for each area, such as monitoring the production of forage areas, establishing cultivation techniques in areas where forage cultivation is possible, and establishing no-go areas by the herders themselves.

(3)   Input

Table 7.5   Inputs for Formulating Grazing Land Use Plans

Expense Item	Content	Unit Price (USD)	Quantity	Subtotal (USD)	Remarks
Training fee	Workshop holding fee	5,000	2	10,000	2 Soum /Aimag
Total				10,000	per Aimag

Source: JST

7.3.2 Activity 2-2: Securing pastureland and preparing diverse and stable livestock feed by cultivating grass and fodder crops

Diversified livestock feed preparation that does not rely solely on grazing. Herders spend about 1 million MNT per year to purchase feed, which accounts for 25% of their total operation costs. Therefore, the project aims to raise awareness among herders by providing an incentive to reduce costs by securing self-sufficient fodder, and to promote behavioral change among herders toward sustainable activities.

(1) Overview

Based on the pastureland use plan formulated in 7.3.1, the project will install pasture fences, protect forage lands through agreements among herders, cultivate grass and forage crops in abandoned lands and other areas where forage cultivation is possible, and restrict the use of severely degraded pasturelands.

(2) Activities

Based on the pastureland use plan, interventions for pastureland use with emphasis on securing fodder will be implemented. The following activities are currently envisaged.

① Review the pastureland use plan.

② Selection of target Khorshoo by setting selection criteria

③ Establish a no-pasture fence to secure grassland and protect vegetation in the vicinity of the wintering area.

④ Establish model plots in Soum to demonstrate the cultivation of grass and fodder crops by seeding.

⑤ Conduct training programs on subsistence fodder cultivation techniques for surrounding herders.

⑥ Investigate the possibility of establishing an agricultural mechanization service company in Soum to introduce agricultural machinery for the use and cultivation of large areas of forage land.

⑦ Soum, Bug and Khorshoo will monitor the implementation.

(3) Input

Table 7.6   Inputs for Livestock Feed Preparation

Expense item	Content	Unit price (USD)	Quantity	Subtotal (USD)	Remarks
Equipment cost	Installation of no-grazing fences near winter camps	2,000	40	80,000	20 places / Soum 2 Soum / Aimag
Equipment cost	Pasture and fodder crop seeds	2,000	2	4,000	2 Soum / Aimag
Material Fee	Creation of a cultivation technical manual	5,000	2	10,000	2 Soum / Aimag
Training fee	Cultivation technology training	50,000	6	300,000	2 Soums /Aimag for 3 years
Total				394,000	per Aimag

Source: JST

7.3.3 Activity 2-3: Revegetation and monitoring of pastureland through vegetation protection

In the Govi region, human impact from dust storms caused by strong spring winds is severe. Until now, low shrubs had suppressed the flow of sand, but with the degradation of pastureland, these low shrubs are used for livestock feed and fuel, resulting in the loss of vegetation and the inability to suppress the movement of sand, which is one of the causes of sandstorms in the Gobi region. Therefore, through low-shrub plantations, soil conservation in areas with significant vegetation degradation will be promoted.

(1) Overview

Reforestation of low shrubs (zag, hilas, etc.), which are the original vegetation of the Govi region, will be carried out to conserve soil, including sand fixation, and to restore grazing land. In addition, low shrubs will be planted around the grassland and pasture/forage crop cultivation areas to be implemented in Activity 2-2 to control sand movement and secure land use. In order to restore vegetation, it is essential to raise the awareness of the herders themselves, and monitoring of vegetation by the herders themselves will be conducted to raise their awareness.

(2) Activities

① Group herders by setting selection criteria.

② Reforest pastures with severely degraded vegetation according to the pastureland use plan.

③ Low shrubs will be planted in the vicinity to protect forage cultivation areas, and small-scale windbreaks will be established. For low shrubs, the introduction of fruit trees such as hybrids will be considered according to the characteristics of the area.

④ As part of the vegetation management training, the recovery of vegetation after afforestation will be monitored by the herders themselves or by members of the Khorshoo, who will keep a photographic record using smart phones.

(3) Input

Table 7.7 Inputs for Monitoring Vegetation Restoration in Seven Pastures

Expense Item	Content	Unit Price (USD)	Quantity	Subtotal (USD)	Remarks
Equipment cost	Provision of low shrub seedlings, reforestation activities (100 ha)	2,000	2	4,000	2 Soum / Aimag
Training fee	Post-planting vegetation management	50,000	6	300,000	2 Soums /Aimag for 3 years
Total				304,000	per Aimag

Source: JST

7.4 Activity 3: Establishment of a meat distribution system based on technical regulations

Although Mongolia has the potential to become a member of the world's food supply countries with its abundant livestock resources, the country is facing difficulties due to low quality that does not meet international standards and low competitiveness in overseas markets.

Therefore, in order to achieve both traditional livestock production and high market competitiveness, the meat supply chain will be reconstructed from the Soum level in accordance with the technical regulations for meat distribution newly established by the Mongolian government, together with strengthening the traceability system and training food-related technicians. Figure 7.5 shows the overall picture of the activities.

The establishment of a meat distribution system based on technical regulations will create opportunities for herders to sell their livestock, and through the sale of livestock independent of the season and the sale of fat livestock with high carcass value, the herders' awareness will be shifted to pastoral management that does not rely on increasing the number of livestock.
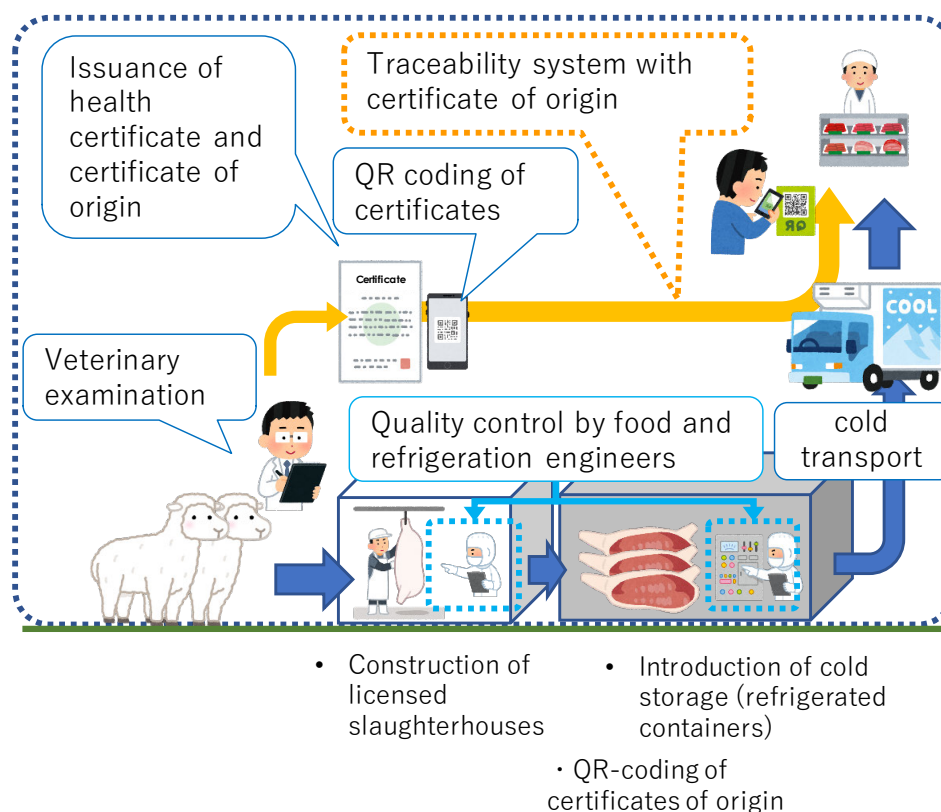
Source: JST

Figure 7.5   Overview of Activity 3

7.4.1   Activity 3-1: Establishment of a Soum-level livestock processing plant and cold storage according to technical regulations, and construction of a meat supply chain with freshness maintenance technology

This activity is designed to reconstruct the supply chain of meat distribution at the Soum level.

(1)   Overview

The activity is designed to install a simple livestock processing plant and cold storage facility at the Soum level to create a model for supplying meat for sale to herders at the Soum level. The specifications of the livestock processing plant and cold storage will follow the new technical regulations based on Presidential Decree No. 36.

(2)   Activities

①   Construct an approved slaughterhouse and freezer in Soums in accordance with the new technical regulations based on Presidential Decree No. 36. The slaughterhouse is a simplified facility based on the wild animal processing facilities (gibier) in Japan. The freezer to be built alongside the slaughterhouse is a reefer container.

②   Select the target Khorshoo to be managed and operated by setting the selection criteria.

③   Cooperate with private meat producers regarding transportation, and support the introduction of refrigerated and frozen vehicles by applying private support measures such as low-interest loans, subsidies, and matching grants.

④ Professionally trained technicians who have received specialized training in Mongolia will be assigned as management technicians for food products and refrigeration facilities. The labor cost will be borne by the project for the first three years, and then shifted to Khorshoo as the profit model is established.

(3) Input

Table 7.8   Inputs for Installation of Soum-level Livestock Slaughterhouses and Cold Storage

Expense Item	Content	Unit Price (USD)	Quantity	Subtotal (USD)	Remarks
Facility construction cost	Simple slaughterhouse	400,000	2	800,000	2 Soum/Aimag
Equipment cost	Reefer container	40,000	2	80,000	2 Soum/Aimag
Equipment cost	Office	50,000	2	100,000	2 Soum/Aimag
Equipment cost	Refrigeration truck	0	0	0	Collaboration with private meat companies
Temporary staffing expenses	Dispatch of supervisory engineers for slaughterhouses and freezers	10,000	12	120,000	2 Soums/Aimag, 2 persons/Soum, 3 years
Total				1,100,000	per Aimag

Source: JST

7.4.2   Activity 3-2: Development of a system for providing origin information linked to a livestock hygiene information system

With assuming exports and retail branding, the system will be linked to the Veterinary Agency's Animal Health Information System (MAHIS) by inputting Soum-level information at the time of slaughter and establishing a system for providing origin information that will ensure consistent traceability from production area to processing.

(1) Overview

When livestock are shipped from a Soum, a certificate of inspection, etc., is issued by the Soum veterinarian, but many of the documents recording vaccinations, etc., are not digitized, which is one of the obstacles to establishing traceability, especially when exporting livestock overseas. Therefore, the vaccination records of livestock at the time of slaughter should be digitized, and by linking the aforementioned herderic database with the comprehensive veterinary system, a traceability system should be constructed that allows information on vaccinations, hygiene certificates, and certificates of origin to be retrieved from the QR codes issued for meat at the time of slaughter.

(2) Activities

① Introduce an information system to recognize each individual (carcass) by issuing a QR code after the completion of post-slaughter inspection. By reading the QR code, various certificates can be viewed on export documents and in retail stores.

② Link the system so that by reading the QR code, information on sanitary certificates and certificates of origin in the Animal Health Information System (MAHIS) by the Veterinary Agency can be viewed.

③ Register paper-based vaccination certificates, etc., which are not currently integrated into MAHIS, by scanning them at the time of post-slaughter inspection, so that they can be accessed via the above QR codes.

(3) Input

Table 7.9   Inputs for the Country of Origin Information Provision System

Expense Item	Content	Unit price (USD)	Quantity	Subtotal (USD)	Remarks
Equipment cost	QR code printer	10,000	2	20,000	2 Soum/Aimag
Equipment cost	PC for data registration , scanner	3,000	2	6,000	2 Soum /Aimag
Training fee	Data registration training	10,000	2	20,000	2 Soum /Aimag
Total				46,000	per Aimag

Source: JST
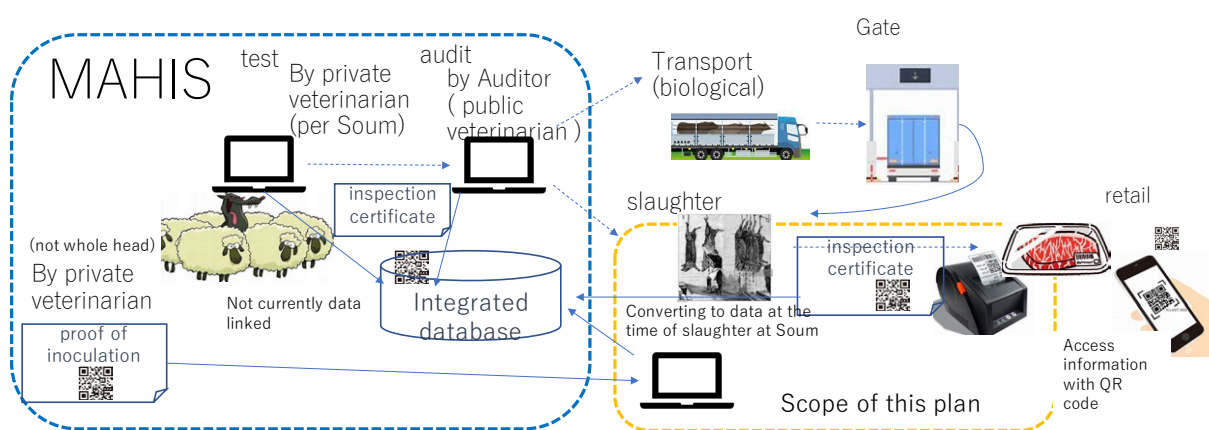
Source: Study Team

Figure 7.6   Schematic Diagram of the Country of Origin Information Provision System

7.4.3   Activity 3-3: Training of food technicians

Support the training of technicians to operate and manage the livestock processing plant to be set up at the Soum level. For human resource development, the project will consider collaborative courses with Japanese universities and private companies.

(1) Overview

The new technical regulations for meat distribution stipulate the assignment of food technicians and refrigeration technicians to livestock slaughterhouses and cold storage facilities, respectively. On the other hand, there is a shortage of human resources of technicians with such knowledge and experience.

In order to develop human resources indispensable for building a meat supply chain based on the new regulations and producing internationally competitive livestock products, the Project will support educational institutions in creating curricula and provide technical training after assignment in order to secure technicians and maintain and improve their technical level.

(2) Activities

① Strengthen and expand the curriculum of specialized courses in food processing and freezing technology at faculties related to food science, such as the Mongolian University of Life Sciences and the University of Science and Technology.

② Develop training programs that enable on-site technicians to update their skills on a regular basis, and conduct training in Aimag and Soum. In conducting the training, the program should comply with policies and laws and regulations in cooperation with MOFALI and the Veterinary Administration.

③ In order to retain technicians in the workplace, year-round operations are necessary, and efforts will be made to commercialize not only meat but also livestock by-products.

(3) Input

Table 7.10   Inputs for Training Food Technicians

Expense item	Content	Unit price (USD)	Quantity	Subtotal (USD)	Remarks
Material Fee	Curriculum creation for specialized courses at universities, creation of teaching materials, and dispatch of lecturers	300,000	3	900,000	
Training fee	Refresher training for on-site engineers	50,000	1	50,000	
Training fee	Livestock byproduct product development training	50,000	1	50,000	
Total				1,000,000	per Aimag

Source: JST

7.5   Project Costs

Table 7.11 illustrates the total project cost per Aimag for each activity. In this table, two Soums per Aimag are used as the target Soum, but some activities are expected to have beneficiaries spanning more than one Soum, even if the activities are per Soum. In addition, consideration must be given to covering all Soums in the Aimag for some of the activities, not just two Soums.

In addition to these direct costs, the project will also need to cover the cost of dispatching experts, personnel expenses such as local staples, and on-site activities such as vehicles.

Table 7.11   Total Project Cost (per Aimag)

Activity	Amount (USD)
1. Strengthen the operational capacity of Dzud forecast information	
1-1. Improvement of communication between administration and herders by upgrading SMS functionality that allows both sender and receiver to confirm information transmission.	33,000
1-2. Improvement of efficiency of information transmission through the development of a herders' database	16,000
Subtotal	49,000
2. Strengthening Pastoralism by Preparing Livestock Feeds	
2-1. Optimal use of pastureland through the development of a Soum-level pastureland use plan	10,000
2-2. Securing pastureland and preparing diverse and stable livestock feed by cultivating grass and fodder crops	394,000
2-3. Revegetation and monitoring of pastureland through vegetation protection	304,000
Subtotal	708,000

Activity	Amount (USD)
3. Establishment of a meat distribution system based on technical regulations	
3-1. Establishment of a Soum-level livestock processing plant and cold storage according to technical regulations, and construction of a meat supply chain with freshness maintenance technology	1,100,000
3-2. Development of a system for providing origin information linked to a livestock hygiene information system	46,000
3-3. Training of food technicians	1,000,000
Subtotal	2,020,000
Total	2,903,000

Source: JST

7.6 Collaboration with related donors

Based on the activities of international donors organized in Chapter 5, the following collaborations can be considered for each component.

7.6.1 Dzud information sharing and transmission.

In terms of Dzud information sharing and transmission, NEMA is currently forming a project to develop an integrated early warning system under ADB funding. As one of the activities of this project, development an information transmission system for mobile phones in cooperation with telecommunications carriers are planned. When implementing the project, it is necessary to ensure the operating environment of the SMS system to be developed in Activity 1 under NEMA system and mobile carriers and coordinate the development of the herder database.

In addition, ADPC is currently formulating project with NAMEM and IRIMHE as counterparts to improve the accuracy and transmission of Dzud forecasts. Information sharing is required in order to utilize the soon to be developed system in Activity 1.

7.6.2 Preparation of livestock feed

Regarding activities related to securing fodder to be implemented in Activity 2, coordination and collaboration can be expected by sharing information with member organizations of the Food Security and Agriculture Cluster, led by FAO and MOFALI, and by dividing roles for the target of livelihood improvement project by World Vision Mongolia. In the preceding GCF project by UNDP and ADB, activities related to securing and improving pasturelands are being implemented.

7.6.3 Supply chain of livestock products

Regarding activities to improve livestock distribution in activity 3, livestock commercialization projects by the World Bank and FAO are implementing quality control of livestock, compliance with food safety standards, improvement of market access for herders, and development of value chains. In addition, since this project is being carried out as pilot areas in Dundgovi and Gobi-Altai Aimags, it is necessary to refer to the project progress and results and consider collaboration when formulating and implementing the project.

Chapter 8 Other Proposed Activities

Chapter 7 describes activities that should be undertaken using the GCF among the issues identified in this study. Chapter 8 describes the remaining issues that should be addressed separately from the GCF, and cooperation proposals that Japan can consider supporting. Table 8.1 summarizes the main issues identified in this study and the measures taken to address them. The measures to address issues other than existing support by other donors and the GCF-supported plan are activities that Japan can consider supporting.

Table 8.1　Main Survey Results, Remaining Issues, and Support Measures from Japan

Assumed activities in the current plan	Review result (Chapter 6)	Issues that need to be addressed (Chapter 2-4)	Activities of other donors related to issues (Chapter 5)	Utilizing GCF Measures to address issues (Chapter 7)	Others, activities requiring assistance by Japan (Chapter 8)
(1) Improving the accuracy of Dzud forecast and strengthening operational capabilities	• Dzud forecast information is provided appropriately in terms of quantity, quality and frequency of information. • At the moment, herders own smartphones less than 50%. Since it is difficult to have a network environment of 3G or higher in the herders' living and grazing areas, the system using SMS will continue for a certain period of time.	Development of long-term forecasting system	ADB TA6534-MON (pending): Development of mobile phone warning information transmission system and hardware maintenance for enhancement of integrated early warning system WFP: Enhancement of mobile data system (2019-'20): Development of information distribution system by SMS. Deployment of the Dzud Impact and Situation Management Platform (PRISM)	—	—
(2) Effective utilization of Dzud forecast results	• Especially for short-term forecasts and emergency information, the information transmission route depends on human intervention such as Soum head and Bug head, and the speed and range of information transmission are limited.	• It is necessary to improve the system to improve efficiency after grasping the current situation, such as information transmission by SMS → confirmation of reception by herders → telephone contact from Soum head and bug head to those who have not received it.	—	• Development of herder database (7.1.2) • Improved system for acknowledging receipt of Dzud information via SMS (7.1.1)	—
	• It is more effective for herders to take appropriate measures using information than to improve the accuracy of forecast.	• There is a need for better government response services and better access to them after receiving information. • Measures to reduce livestock loss in winter are needed	—	• Strengthening regional forage preparation capacity (7.2.1, 7.2.2 Livestock forage preparation, 7.1.3 Vegetation restoration)	• Establishment of feed centers (8.1) • Project for Strengthening Dzud risk Management Capacity (8.4)
			—		• Development of high-performance barns (8.3)

Assumed activities in the current plan	Review result (Chapter 6)	Issues that need to be addressed (Chapter 2-4)	Activities of other donors related to issues (Chapter 5)	Utilizing GCF Measures to address issues (Chapter 7)	Others, activities requiring assistance by Japan (Chapter 8)
(3) Introduction of livestock frozen storage system (PV system) utilizing solar Power generation	• Rather than slaughtering livestock as a countermeasure against Dzuds, herders prefer to prepare fodder. • The freezing temperature of -15°C Introduced in the PV system does not conform to the freezing temperature of -25 to -35°C specified in the 2022 government resolution (new law). • PV systems offer less economic benefits than common refrigerated containers.	• The introduction of freezers at the Soum level is effective for herders to profit from livestock sales if the cost is low. On the other hand, the new Law stipulates processing at certified slaughterhouses, inspection by veterinarians, assignment of refrigeration technicians, etc., and installation and operation of equipment at the Soum level requires a careful examination of maintenance and management costs.	World Bank: Animal Health Management System through Small Business Livestock Commercialization Project	• Establishment of slaughterhouses and supply chains at Soum level (7.3.1) • Introduction of meat freshness-Preserving cold storage for export (7.3.1)	• Introduction of meat freshness-maintaining cold storage for export through a two-step loan (8.2)
(4) Production and distribution improvement of livestock products with high food safety	• The new legislation requires meat and meat products for sale to be processed in certified slaughterhouses and to issue inspection certificates. It was applied from January 2023 and will be trialed for three years. However, these facilities are currently located in Aimag centers, and there are no matching facilities at the Soum level, and the herders are far from the market, so sales volume and prices are unstable. • The Veterinary Agency has developed a traceability system by MAHIS in 2019. Full-scale operation will start after the new law is applied. • Due to the outbreak of foot-and-mouth disease, the export volume fluctuates and the export target has not been reached.	• Rebuilding the livestock product value chain based on the new law requires not only the installation of freezers, but also the installation of slaughterhouses and processing facilities, and the introduction of facilities that can be maintained and managed at the Soum level. • Ensuring traceability is also an issue	World Bank: Strengthen the investment environment through cooperation with small and medium-sized enterprises, promote private-sector partnerships to improve market access for herders, and strengthen major public institutions through livestock commercialization projects.	・Construction of livestock slaughterhouses and supply chains at Soum level (7.3.1)	—
			—	・Training of food technicians (7.3.3)	—
			—	・Development of the origin information provision system linked with the comprehensive veterinary system (7.3.2)	—
		• Mongolian grassland ecosystem is collapsing and needs to change from traditional grazing	Comprehensive land management plan formulation for 3 Aimags at ADB TA6859-MON UNDP: Formulation of land and water use plans in 4 Aimag World Vision: Sustainable Livestock Development in 4 Soums in 2 Aimags with Climate Resilient Herderic Livelihood Project	・Enhancement of local feed preparation capacity (7.2.1, 7.2.2 Livestock feed preparation, 7.1.3 Vegetation restoration)	—

Assumed activities in the current plan	Review result (Chapter 6)	Issues that need to be addressed (Chapter 2-4)	Activities of other donors related to issues (Chapter 5)	Utilizing GCF Measures to address issues (Chapter 7)	Others, activities requiring assistance by Japan (Chapter 8)
		• Reliable implementation of animal hygiene management such as foot-and-mouth disease is still an issue • Need to strengthen wide-area livestock hygiene capacity	World Vision: Strengthening Private Veterinary Clinics with CRC Project World Bank: Animal Health Management System through Livestock Commercialization Project	—	—

Source: JST

Based on the above table, this chapter explains the four support projects proposed below.

Table 8.2   Proposed Support Projects

	Sector	Project Title	Scheme
1	Establishment of feed center	Feed Center Network Formation Project	Grant Aid Project
2	Introduction of meat freshness-preserving refrigerators for export	Two-step Loan Project for Establishment of Value Chain Facilities for Export	ODA Loan Project
3	Introduction of high-performance livestock barns	Livestock Feeding Management Improvement Project to Reduce Loss of Livestock by Dzud	Technical cooperation project
4	Dzud Risk Management Capacity Development Project	Project for Strengthening Dzud Risk Management Capacity in Livestock Administration	Technical Cooperation Project + Grassroots Grant Aid

Source: Study Team

8.1   Establishment of feed center

(1)   Project Name (Scheme)

Feed Center Network Formation Project (Grant Aid Project)

(2)   Background and necessity of the project

When herders receive Dzud forecast information, their first consideration is the supply of fodder. Traditional pastoralism in Mongolia is based on herders' grazing in natural grasslands, but considering the effects of recent climate change and the destruction of grasslands due to overgrazing, it is necessary to consider a pastoral system that uses forage to improve the efficiency of livestock rearing and conserve grassland resources in the future. However, forage cultivation is not yet common in Mongolia, and sufficient forage is not yet available. In addition, it is difficult to expect an increase in forage production through the voluntary activities of herders in Mongolia, where an agrarian culture has not taken root.

Therefore, in line with the land use plan defined in the new project proposed in Chapter 7, a feed center will be constructed to produce and store fodder to improve access to fodder for the local herders.

(3)   Project Objective

The project will improve herders' access to and use of livestock feed by establishing a feed center in a location accessible to several Soums. In addition, the project will provide an emergency shelter by functioning as an evacuation shelter in the event of a Dzud outbreak, thereby reducing the risk of disaster occurrence.

(4)   Beneficiaries of the Project

MOFALI, Aimag Agriculture and Livestock Department, Soum office, Aimag herders, and Soum herders who have access to the feed center (direct beneficiaries)

(5)   Project site/target area name

Aimag where the newly proposed project is implemented and a land use plan is formulated for fodder production, etc. (At present, Dundgovi Aimag and Govi-Altai Aimag are assumed to be the project sites)

(6)   Project framework

 1)   Overall Goal

Restoration of grazing lands by reducing environmental impact.

 2)   Project Purpose

To reduce Dzud damage through sustainable use of the 10 fodder centers that have been established.

 3)   Output

Output 1: Fodder centers are established.

Output 2: A business model for the feed centers is developed and human resource capacity is developed to operate sustainably.

 4)   Activities

- Feed centers are established.
- Necessary agricultural equipment is deployed.
- Business models for feed centers are organized.
- Operational structure of each feed center is established.
- Human resources involved in the operation of the feed centers improve their skills through training.

(7)   Total project cost (Japanese side)

To be investigated

(8)   Project period

2030-2033 (3 years)

(9)   Period of implementation in partner country

MOFALI, Agriculture and Livestock Department of the target Aimag

(10) Inputs

 1)   Japanese side

- Short-term experts (Grant Aid BD, SV)
- Construction of 10 feed centers: USD 150,000 × 10 = USD 1,500,000
- Provision of grass and fodder crop seeds for 10 locations: USD 10,000 × 10 = USD 100,000
- Agricultural machinery for 10 locations: USD 300,000 × 10 = USD 3,000,000

- Emergency shelters for 10 locations: USD 150,000 × 10 =USD 1,500,000

- Soft components (forage cultivation, agricultural machinery operation): USD 200,000

2) Mongolian side

- Arrangement of counterpart

- Site preparation by the government, acquisition of construction permits, etc.

(11) Cooperation and division of roles with other projects and other development partners

The Mongolian University of Science and Technology is currently implementing a project to establish a TMR[17] feed center and an agro-ecological zone through a cross-regional feed supply system in cooperation with China, Russia, Canada, Korea, and Japan, and will consider collaboration regarding feed cultivation.

8.2 Introduction of meat freshness-preserving refrigerators for export

(1) Project name (scheme)

Two Step Loan Project for Establishment of Value Chain Facilities for Export (Yen loan project)

(2) Project Background and Necessity

Mongolia's meat exports in 2021 were 8,000 tons, which is far from the annual target of 50,000 tons set in the National Livestock Program. With a small population of 3.3 million people, Mongolia's domestic demand is limited, and therefore, exports need to be expanded to help herders improve their livelihoods and access better markets where quality and price are in balance.

Mongolia's main export destination is China, but the volume of Mongolian meat exports fluctuates widely from year to year because exports to China are halted when foot-and-mouth disease occurs in Mongolia. Considering the current situation where foot-and-mouth disease infection is spread by herders' pastoralism and wild animals such as impala, it is not easy to completely prevent foot-and-mouth disease. Therefore, in order to expand exports, it is important to export to the Middle East, where outbreaks of foot-and-mouth disease are not a problem.

Frozen meat is not preferred in the Middle Eastern meat market, so live animals are generally imported from neighboring countries and slaughtered. However, since it is not practical to transport live animals from Mongolia to the Middle East, it is necessary to construct a value chain that can provide highly market-competitive meat and promote exports to the Middle East by introducing technologies[18] that enable long-term refrigerated storage without freezing.

(3) Project Objective

This project will promote the formation of a value chain for refrigerated meat exports to the Middle East by providing loans at preferential interest rates to businesses, herders' associations, etc., involved in meat exports throughout Mongolia.

(4) Beneficiaries of the Project

Public financial institutions, meat exporters to the Middle East, herders' organizations, etc.

(5) Project site/area name

Mongolia nationwide

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[17] Abbreviation for Total Mixed Ratio, a method of feeding roughage and concentrated feed at the optimum ratio.
[18] High-voltage refrigerators capable of storing raw meat for 180 days, etc.

(6)　Project framework

1)　Overall Goal

Livelihoods of herders is improved through the expansion of refrigerated fresh meat exports to the Middle East region.

2)　Project Objectives

A value chain for the export of refrigerated meat to the Middle East region is developed.

3)　Output

Output 1: Mongolian public financial institutions have the capacity to develop and implement financial products (two-step loans) that can be used for capital investment for the purpose of exporting fresh meat to the Middle East.

Output 2: Financed companies and organizations develop the necessary facilities for long-term frozen preservation of fresh meat and its transportation.

4)　Activities

- Mongolian public financial institutions will establish applicable interest rates for two-step loan financing and eligible facilities, and develop operational guidelines.

- Capacity building training on the screening of two-step loan financing will be provided to counterpart staff.

- Staff of each branch will be briefed and trained on the operation of two-step loan financing.

- A system for recording and monitoring the operation of two-step loans will be developed and implemented in each branch.

- Briefing sessions on two-step loan financing will be held, and actual financing will be provided through the screening process.

(7)　Total project cost (Japanese side)

To be investigated

(8)　Project implementation period

2025-2030 (5 years)

(9)　Counterpart Implementation Organizations

- Borrower: Mongolia

- Project implementing institution: Public financial institution (State Bank, a state-owned commercial bank, is assumed)

(10)　Inputs

1)　Japanese side

- Two-step loan: Provision of medium- to long-term funds to businesses and herders' organizations related to the food value chain of meat exports. Loan will be provided through a public financial institution (assuming State Bank, a state-owned commercial bank). 5,000 million yen

- Consulting services (business supervision, capacity building of public financial institutions, etc.), 400 million yen

2) Mongolian side

- Arrangement of counterparts

(11) Cooperation and division of roles with other projects and other development partners

JICA is currently implementing the "Project for formulation of Master Plan on the Agricultural Value Chain (2020-)" in Mongolia and is formulating a master plan for the development of a value-added chain mechanism in production, processing, distribution, and marketing, and will consider collaboration regarding slaughter and processing treatment.

8.3 Introduction of high-performance livestock barns

(1) Project name (scheme)

Livestock Feeding Management Improvement Project to Reduce Loss of Livestock by Dzud (Technical Cooperation Project)

(2) Background and necessity of the project

Mongolia has been suffering from large-scale Dzud outbreaks every few years, each time resulting in a significant decrease in the number of livestock. As of 2021, the livestock stocked in the country is in a state of overgrazing approaching 12 million sheep-equivalent head, and Mongolian herding is in a situation where large-scale livestock damage caused by Dzuds could occur at any time.

Some herders do not have barns, and even in case they do, many of them have very simple structures with only roofs and no walls, or are simply covered with sheets. This is one of the reasons for livestock losses during the winter, and improvements are expected.

(3) Project Objective

Through the implementation of this project, livestock losses during the winter season will be decreased by rehabilitating herders' barns in winter camps on a pilot basis. The objective of this project is to reduce the risk of livestock losses and increase the resilience of herders by enabling government officials to instruct herders on appropriate winter livestock management techniques and countermeasures to be taken when Dzud outbreaks are forecasted.

(4) Beneficiaries of the Project

MOFALI, Aimag Agriculture and Livestock Department, herders in the target Aimag

(5) Project site/target area name

Pilot Soums in selected target Aimags (Dundgovi Aimag, Govi-Altai Aimag)

(6) Project framework

1) Overall Goal

To improve the resilience of herders against Dzud in the target Aimag.

2) Project Purpose

To reduce winter livestock losses among herders in pilot Soums in the target Aimag.

3) Output

Output 1: Highly functional livestock barns are established in pilot Soums

Output 2: Appropriate winter livestock management techniques are transferred in the pilot Soums

Output 3: Feed storage technology for winter is transferred in the pilot Soums

4) **Activities**

- Development of high performance livestock barns with heat insulation and heat retention
- Introduction of calf hutches to prevent winter deaths of young stock
- Guidance on feeding management techniques to reduce winter cold stress of livestock
- Guidance on feeding techniques to improve nutritional status of livestock in winter
- Guidance on feed production and stockpiling technology for winter

(7) Total project cost (Japanese side)

To be investigated

(8) Project period

2024 - 2027 (3 years)

(9) Counterpart Implementation Organizations

MOFALI, Agriculture and Livestock Department of the target Aimag

(10) Inputs

1) Japanese side

① Dispatch of Expert

Short-term experts: Experts from universities, livestock research institutes, and consultants, including the project leader

Long-term expert: Project Coordinator

② Provision of equipment

- New construction and renovation of livestock barns (targeting Soum selected as a model)
- Calf hutches: 1 unit per household distributed to 100 households (at 2,000 USD per unit, for a total of 200,000 USD)
- Materials for stockpiling feed (cover sheets, materials for silage preparation, etc.)

2) Mongolian side

① Assignment of counterpart

② Office space for Japanese experts

③ Local consultants and local experts for implementation of project activities

④ Costs for implementation of project activities

⑤ Data and related information necessary for implementation of project activities

(11) Cooperation and role-sharing with other projects and development cooperation organizations

JICA is currently implementing the "Project for Strengthening the Practical Capacity of Civil Servants and Private Veterinarians (2020-2025)" in Mongolia, and is expected to collaborate with the counterpart in this project in providing on-site guidance in the veterinary field.

8.4 Project for Strengthening Capacity for Dzud Risk Management

(1) Project name (scheme)

Project for Strengthening Dzud Risk Management Capacity in Livestock Administration

(Technical Cooperation Project + Grassroots Grant Assistance)

(2) Background and necessity of the project

Mongolia has been suffering from large-scale Dzud outbreaks that occur every few years, resulting in the death of large numbers of livestock. In response to this, while it is necessary for herders themselves to take measures against Dzud, it is also desirable for livestock administrative organizations to develop a system to reduce the risk of Dzud.

(3) Project Objective

The Aimag government and Soum office, as public organizations, develop and operate facilities to reduce Dzud-risk among herders, thereby strengthening their ability to respond as livestock administrative organizations and effectively and efficiently supporting herders, by promoting the pastoral industry at the local level.

(4) Beneficiaries of the Project

MOFALI, Aimag Agriculture and Livestock Department, Soum office, and herders in the target area.

(5) Project site/target area name

Pilot Soums in selected target Aimags (Dundgovi Aimag, Govi-Altai)

(6) Project framework

1) Overall Goal

A pastoral system that is resistant to Dzud control in rural areas will be established.

2) Project Purpose

The capacity of the Aimag government and Soum town halls to deal with Dzuds will be strengthened.

3) Output

Output 1: Local governments have the capacity to implement Dzud control measures

Output 2: Facilities necessary to promote pastoralism at the local level are established.

4) Activities

- Fodder crop production facilities and distribution systems are developed
- Livestock management facilities to receive winter deposit livestock are developed
- Development of slaughtering and meat processing facilities

(7) Total project cost (Japanese side)

To be investigated

(8) Project period

2026 - 2029 (3 years)

(9) Counterpart Implementation Organizations

MOFALI, Agriculture and Livestock Department of the target Aimag

(10) Inputs

1) Japanese side

① Civil works and equipment procurement: Fodder production plots, agricultural equipment and facilities for harvesting and preparation, livestock barns, slaughter and processing facilities (agricultural equipment: 150,000 USD, construction of livestock sheds and fences: 40,000 USD, improvement of slaughter and processing facilities: 400,000 USD)

② Consulting services/software components include: design and construction supervision/guidance on equipment use and management (preparation of guidelines for livestock feed cultivation methods at maintenance facilities: 10,000 USD)

2) Mongolian side

Compliance with the government's site preparation, acquisition of construction permits, electricity hookup and other preparatory work, and other items to be borne by the other party.

(11) Cooperation and role-sharing with other projects and development cooperation organizations

JICA is currently implementing the "Project for formulation of Master Plan on the Agricultural Value Chain (from 2020)" in Mongolia, and is formulating a master plan for the development of a value-added chain system in production, processing, distribution, and sales, and will consider collaboration regarding slaughter and processing treatment.