Japan International Cooperation Agency (JICA)

Ministry of Agriculture and Industry
Government of Mongolia

THE STUDY
ON
STRENGTHENING OF AGRICULTURAL COOPERATIVES
IN
MONGOLIA

VOLUME-II

APPENDIXES

NOVEMBER 1997

Nippon Koei Co., Ltd.
System Science Consultants Inc.

MINISTRY OF AGRICULTURE AND INDUSTRY
GOVERNMENT OF MONGOLIA
THE STUDY ON STRENGTHENING OF AGRICULTURAL COOPERATIVES IN MONGOLIA
VOLUME-II
APPENDIXES
NOVEMBER 1997

Japan International Cooperation Agency (JICA)

Ministry of Agriculture and Industry
Government of Mongolia

THE STUDY
ON
STRENGTHENING OF AGRICULTURAL COOPERATIVES
IN
MONGOLIA

VOLUME-II

APPENDIXES

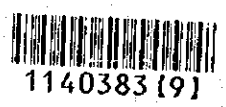
NOVEMBER 1997

Nippon Koei Co., Ltd.
System Science Consultants Inc.

List of Appendixes

CURRENCY EQUIVALENTS

US$1 = Mongolian Tugrug 800 (Tg) = Japanese Yen 120 (¥)
as of August 1997



Appendix-I

Natural Condition

APPENDIX I

NATURAL CONDITION

Table of Contents

List of Tables

List of Figures

APPENDIX I

NATURAL CONDITION

1. LAND RESOURCES

The Mongolian Academy of Sciences classified soils into 17 types in Mongolia. The principal soil type is chestnut soil, which covers some 40% of the territory of the Mongolia. Chestnut soils, which are typically around 30 cm deep with an organic matter content of 3 to 4 % and pH value of 6 to 7, are arable soils except for deficiencies in nitrogen and phosphorus content. The distribution of the soil types are shown below:

Soil Type	% of total area of the country (%)	Composition (%)		
		In mountains	On foothills ouvalabald mountain territory	On low lands and inter mountain depressions
1. Mountain tundra soils	1.6	1.6	-	-
2. Mountain meadow soils	3.0	3.0	-	-
3. Mountain meadow steppe soils	0.9	0.9	-	-
4. Alpine steppe soils	2.0	2.0	-	-
5. Mountain frozen taiga soils	2.1	2.1	-	-
6. Mountain sod taiga soils	5.0	5.0	-	-
7. Dark colored mountain forest soils	1.8	1.6	0.1	0.1
8. Chernozem	5.9	4.4	0.9	0.6
9. Chestnut soils	39.9	11.2	11.4	17.3
Dark chestnut	17.1	6.8	4.9	5.4
Chestnut	11.9	2.7	3.6	5.6
Light chestnut	10.9	1.7	2.9	6.3
10. Meadow chestnut soils	0.5	-	-	0.5
11. Brown desert steppe soils	17.1	1.4	2.8	12.9
12. Gray brown desert soils	9.3	0.4	2.0	6.9
13. Extra arid desert soils	2.1	-	-	2.1
14. Saline soils	1.7	-	-	1.7
15. Meadow and meadow swamp soils	2.3	-	-	2.3
16. Alluvial soils	2.0	-	-	2.0
17. Sand soils	1.8	-	-	1.8

Source: Mongolia, the Comprehensive Reference Source of MPR (Academy of Sciences)

The distribution of arable soil by Aimags is shown in the following table. More than 50 % of arable soils are distributed in the central region such as Aimags of Töv, Selenge and Khentiy, and 31 % is distributed in the east region such Aimags of Dornod and Sükhbaatar. These five Aimags account for 80 % of the total arable soils.

Aimag	Distribution (%)	Aimag	Distribution (%)	Aimag	Distribution (%)
Dornod	22.0	Bulgan	4.3	Gobi-Altay	1.0
Töv	19.0	Zavkhan	3.4	Khovd	0.7
Selenge	16.2	Övörkhangai	3.3	Dundgobi	0.6
Sükhbaatar	9.5	Khövsgul	2.9	Ömnögobi	0.4
Khenty	6.5	Arkhangai	2.3	Bayan Ölgiy	0.2
Uvs	6.5	Bayankhongor	1.1	Dornogobi	0.1

Data source: Agricultural sector background paper UNDP

2. CLIMATE

The Mongolia climate by regions are shown on Fig. I-2.1. Climate types are desert climate, steppe climate and subarctic climate from south to north. Due to the extreme continental climate, the range of temperature is wide and average temperature is very different by regions. The average annual temperature is around 4 °C in Gobi, zero °C in the central region, below zero °C in north and west north regions as shown in Fig. I-2.2.

The growing period for crops is from May to September in the central region which is the main crop production area in Mongolia. The average temperature is between 8.5 °C to 14.3 °C and the total heat units above zero °C rarely exceed 2,000. The sunshine is enough for growing, the days of effective sunshine is 260 and monthly average of sunshine hours is 1,339 hours.

Annual mean precipitation is 218.5 mm and rainfall is concentrated in the summer period. Annual mean precipitation is between 200 mm to 280 mm in north, central and east region, and below 100 mm in the Altay region and southern Gobi region as shown in Fig. I-2.3. Relative mean humidity is 50 % and generally the weather is dry all year. Annual mean evapotranspiration of crop, which is estimated about 600 mm, exceeds the precipitation.

The wind velocity varies from region to region. In the mountainous northern parts of the country, the wind velocity is 2 to 3 m/s. In other parts it is slower while in Gobi is 3 to 4 m/s or even more. The most windy season is April and May which coincides with the cultivating season and this strong wind can cause significant erosion. According to the Ministry of Nature and Environment, 50 % of the cultivated are suffers from erosion due to strong wind and regional rainfall.

3. WATER RESOURCES

There are many rivers in Mongolia of which total length is about 70,000 km. The largest river is the Selenge with an river basin of 25% of the total territory and 50% of the total runoff of Mongolia. In addition, there are the major rivers such as the Herlen, the Onon, the Khovd and the Zavkhan. According to the report of "Irrigation Rehabilitation Project" prepared by FAO, it is estimated that the total surface water resources of Mongolia is 32,730 million m^3/year as shown in Table I-2.1. All Mongolia rivers freeze up, most of them for 140 to 180 days. The rivers become ice-free in April in the plains and from mid-May in the mountain area. Snow melting generally starts in the second half of April and continues till mid-May. Generally river discharges from July to September are about 50 to 70% of the total annual discharge. The river discharge of the main rivers are shown below:

(unit: million m^3)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Tuul/Ulaanbaatar	0.26	0.09	0.86	4.29	76.3	97.8	267	187	153	60.9	14.6	1.37
Orhon/Shhbaatar	21.4	24.1	32.2	346	1,166	772	1,850	973	973	1,448	362	72.4
Herlen/Ondorhan	1.28	1.28	15.4	126	195	213	372	629	585	339	87.3	2.57
Herlen/Choibalsan	1.61	0.64	19.6	196	264	290	611	881	431	415	103	3.86

Basin area of the station: Ulaanbaatar (6,300 km^2), Suhbaatar(132,000 km^2), Ondorhan (39,4000 km^2) and Choibalsan (71,5000 km^2)

According to the report of "Irrigation Rehabilitation Project" prepared by FAO, the total groundwater resources of Mongolia was estimated to be 6,070 million m^3/year. Total recharge is 12,050 million m^3/year, discharge to river is 5,980 million m^3/year. Details are shown in Table I-3.1.

Tables

Table I-2.1 Monthly Temperature by Aimag (Average of 30 years; 1961-1990)

(Celsius)

Aimag	Station	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	average
Arhangay	Tsetserleg	-14.9	-13.6	-6.9	1.1	8.7	13.1	14.3	12.8	7.6	0.3	-7.6	-12.9	0.2
Bayan-Olgiy	Olgiy	-17.2	-14.8	-6.7	1.7	9.4	14.6	16.3	14.5	8.6	0.1	-8.6	-15.1	0.2
Bayanhongor	Bayanhongor	-18.3	-16.2	-8.2	0.9	9.6	14.9	16.2	14.5	8.3	-0.3	-10.8	-16.8	-0.5
Bulgan	Erdenet-ovoo	-16.8	-14.8	-7.7	1.1	9.0	13.8	15.5	13.9	8.3	0.8	-8.7	-14.6	0.0
Gobi-Altay	Altay	-18.0	-16.6	-9.3	-0.5	7.2	12.5	13.7	12.3	6.4	-1.4	-10.5	-15.9	-1.7
Dornogovi	Sainshand	-17.8	-13.8	-4.3	6.0	14.5	20.4	22.8	20.8	13.6	4.4	-7.1	-15.6	3.7
Dornod	Choibalsan	-20.5	-17.8	-7.9	2.6	11.3	17.7	19.9	17.8	10.7	1.6	-9.9	-17.7	0.6
Dundgobi	Mandlgovi	-17.5	-14.8	-6.6	2.7	11.2	16.8	18.7	16.9	10.3	1.7	-8.8	-15.9	1.2
Zavhan	Uliastai	-22.6	-20.0	10.3	0.6	8.5	14.0	15.0	13.3	7.1	-0.9	-13.3	-20.4	-2.4
Ovorhangay	Khujirt	-14.7	-13.2	-6.6	1.5	9.2	14.1	15.3	13.8	8.4	1.4	-7.2	-12.8	0.8
Omnogovi	Dalanzadgad	-14.9	-11.4	-3.1	6.2	14.3	19.4	21.1	19.4	13.2	4.9	-5.2	-12.7	4.3
Suhbaatar	Baruun-urt	-21.5	-18.1	-8.2	3.0	11.4	17.5	19.9	17.9	10.7	1.8	-10.2	-18.7	0.5
Selenge	Orhon(Erdenet)	-23.2	-19.2	-7.6	3.1	11.0	17.0	19.1	16.7	9.9	1.3	-10.5	-19.1	-0.1
Tov	Zuunmad	-20.4	-18.0	-9.8	-0.2	8.3	13.7	15.6	13.7	7.4	-0.6	-11.2	-18.2	-1.7
Uvs	Ulaangom	-32.2	-30.1	-18.7	0.1	11.5	17.6	19.0	16.8	10.0	0.5	-10.8	-25.8	1.9
Hovd	Hovd	-24.4	-20.4	-7.5	4.0	12.0	17.2	18.5	16.7	10.6	1.4	-9.8	-20.1	-0.2
Hovsgol	Moron	-22.6	-18.4	-8.1	1.5	9.7	15.2	16.2	14.4	7.9	-0.9	-11.5	-19.8	-1.4
Hentiy	Ondorhaan	-23.4	-20.3	-9.4	2.4	10.6	16.0	18.7	16.2	9.3	0.3	-12.7	-21.2	-1.1
U.B.	UB-Takhilt	-21.8	-18.1	-8.8	0.8	9.4	14.9	16.9	14.8	8.3	0.1	-11.4	-19.5	-1.2
Govi-Sumber(Choir)	Govi-Sumber(Choir)	-20.5	-17.3	-7.9	2.4	11.0	16.7	18.6	16.8	10.0	1.3	-10.4	-18.3	0.2

source: Hydrometeorological Research Institute

Table I-2.2 Monthly Temperature by Aimag (1981-1992) (1/4)

(Celsius)

Arhangay (Tsetserleg)

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	-17.8	-13.7	-4.0	4.3	9.0	14.0	16.2	11.6	8.0	-3.0	-10.3	-11.6
1982	-13.8	-12.7	-6.2	4.3	8.5	12.3	13.7	12.5	8.1	3.0	-7.3	-12.1
1983	-13.5	-14.1	-5.5	-1.0	9.8	10.3	13.5	13.5	7.2	2.5	-4.7	-13.0
1984	-17.2	-16.8	-7.3	1.1	10.5	13.5	13.3	11.0	7.6	0.8	-8.3	-17.5
1985	-13.3	-15.6	-11.3	1.8	8.6	12.5	13.1	12.3	5.8	1.6	-8.0	-14.7
1986	-13.0	-14.0	-6.2	-0.2	11.2	12.5	14.6	12.8	9.6	0	-11.0	-13.0
1987	-11.5	-10.0	-9.7	3.5	8.5	12.3	14.5	13.0	8.6	-1.7	-9.7	-9.7
1988	-15.6	-16.1	-8.7	1.8	7.5	14.1	14.6	14.0	9.0	1.8	-4.0	-11.6
1989	-13.8	-13.8	-5.1	3.8	9.9	12.4	15.3	13.2	7.1	2.5	-9.9	-8.8
1990	-16.0	-11.2	-4.3	-0.9	9.1	11.0	14.7	11.7	8.7	5.0	-5.7	-10.9

Bayan-Olgiy (Olgiy)

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	-22.3	-15.0	-4.0	4.3	11.0	16.6	16.6	13.6	9.0	-2.2	-12.0	-16.5
1982	-13.1	-14.2	-6.3	4.1	10.6	15.5	16.2	14.5	9.5	4.1	-8.0	-14.5
1983	-17.3	-13.0	-5.8	0	8.3	12.0	15.8	14.5	7.8	0.5	-5.0	-15.1
1984	-20.7	-21.1	-5.7	0	9.2	14.0	14.3	13.6	8.8	1.0	-8.5	-20.2
1985	-15.7	-13.2	-10.8	3.5	8.5	12.8	16.2	14.7	7.8	1.0	-9.3	-15.6
1986	-15.0	-15.3	-6.6	0.5	11.7	13.3	17.0	14.5	10.5	-0.6	-13.8	-14.5
1987	-13.0	-9.8	-8.2	2.7	8.0	13.2	17.0	14.8	9.1	-2.6	-10.0	-11.5
1988	-18.0	-17.3	-8.6	2.0	7.5	14.6	15.5	15.2	11.0	-0.6	-6.5	-11.7
1989	-16.6	-15.1	-4.8	-2.0	10.7	13.6	16.5	15.7	10.1	1.9	-10.7	-9.1
1990	-16.7	-11.8	-5.0	0.6	10.9	15.6	17.1	13.7	9.5	4.1	-7.2	-11.7

Bayanhongor (Bayanhongor)

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	-19.0	-17.5	-5.7	4.5	9.9	15.3	17.9	13.6	8.8	-3.0	-14.5	-16.1
1982	-15.9	-13.8	-6.7	3.7	10.0	14.2	16.5	13.8	8.8	2.4	-12.7	-17.9
1983	-18.0	-16.5	-6.8	-0.7	10.4	13.1	16.3	15.0	8.4	0.7	-8.7	-17.6
1984	-22.1	-21.1	-10.1	0.6	10.6	14.7	15.6	13.4	8.2	-0.3	-13.0	-22.8
1985	-18.6	-17.7	-13.3	2.3	9.2	15.1	15.1	14.4	7.2	1.0	-10.8	-17.0
1986	-16.4	-13.7	-6.3	-0.5	12.7	16.6	16.8	14.6	9.2	-0.6	-12.2	-16.6
1987	-15.6	-11.3	-10.0	3.0	8.9	13.3	16.1	14.9	9.8	-3.7	-14.2	-16.7
1988	-20.7	-19.2	-12.9	0.8	8.4	16.2	17.7	15.9	10.0	0	-8.9	-15.5
1989	-16.7	-15.9	-7.4	3.6	10.5	14.7	16.7	15.3	7.9	1.8	-10.4	-11.3
1990	-18.0	-14.1	-4.6	-0.3	9.7	13.0	15.6	13.6	8.5	4.0	-7.6	-12.9

Bulgan (Bulgan)

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	-22.7	-18.5	-6.0	4.1	9.1	14.5	17.2	12.2	7.6	-5.1	-16.0	-17.3
1982	-22.0	-20.2	-9.5	3.5	8.3	14.0	15.1	13.6	7.5	0.8	-10.0	-17.1
1983	-20.0	-19.0	-7.0	-1.0	9.7	11.0	14.8	14.1	6.5	0.8	-10.0	-18.2
1984	-21.6	-21.3	-11.5	0.1	10.2	15.0	14.5	12.5	7.3	0.1	-11.6	-19.2
1985	-18.5	-18.7	-11.8	1.2	8.1	13.0	14.7	12.7	5.5	-0.2	-9.8	-18.7
1986	-18.3	-18.6	-8.5	0	10.1	14.5	15.7	14.0	8.5	-1.7	-13.0	-18.6
1987	-19.0	-17.3	-10.6	2.7	8.6	12.5	15.2	14.5	7.8	-1.8	-12.5	-14.0
1988	-25.0	-22.2	-11.5	2.6	9.6	15.7	18.2	17.5	10.5	2.0	-6.7	-17.8
1989	-19.0	-16.7	-5.7	2.9	9.7	12.9	16.3	13.3	6.0	0.9	-12.4	-14.1
1990	-22.5	-15.0	-4.4	-0.1	10.6	12.0	16.3	13.2	6.5	2.4	-9.7	-14.2

Govi-Altay (Altay)

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	-20.3	-16.6	-6.7	2.2	7.3	14.1	15.7	11.0	7.1	-6.3	-16.0	-18.1
1982	-15.6	-16.0	-8.7	1.5	7.7	12.3	13.7	12.1	6.7	1.5	-10.5	-15.6
1983	-16.2	-14.8	-7.7	-3.3	7.3	10.0	14.0	12.3	6.2	-0.1	-9.3	-17.5
1984	-23.2	-22.6	-11.6	-2.2	7.5	11.7	12.0	10.0	6.0	-0.8	-8.7	-21.5
1985	-17.2	-16.6	-14.2	1.0	6.5	12.2	13.3	12.1	4.2	0.2	-11.2	-16.7
1986	-19.2	-16.0	-8.5	-2.5	10.0	12.5	14.3	12.0	7.5	-2.0	-14.0	-14.3
1987	-14.0	-11.3	-10.7	1.3	6.6	10.1	13.8	11.0	7.5	-4.0	-10.7	-12.1
1988	-18.1	-19.1	-12.2	1.0	5.5	12.3	14.1	13.7	8.2	-1.5	-7.1	-14.0
1989	-17.7	-16.1	-8.6	1.4	8.4	11.9	12.4	12.7	6.9	0.8	-11.7	-10.7
1990	-17.5	-14.0	-6.6	-2.9	7.6	11.2	13.6	11.6	7.1	3.3	-8.3	-12.6

(continued)

Table I-2.2 Monthly Temperature by Aimag (1981-1992) (2/4)

(Celsius)

Dornogobi (Sainshand)

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	-19.1	-13.6	-1.5	9.2	13.8	21.0	25.6	19.0	14.2	1.3	-12.0	-15.1
1982	-17.5	-11.5	-3.0	8.1	13.8	20.3	22.8	21.1	14.1	7.2	-7.0	-15.0
1983	-16.5	-14.5	-2.5	5.0	15.8	19.0	22.1	21.0	13.6	5.5	-4.0	-12.5
1984	-18.3	-14.7	-6.1	5.6	15.6	20.0	23.1	20.3	13.5	5.0	-6.6	-17.0
1985	-17.5	-15.8	-7.6	5.5	15.3	20.5	21.2	20.7	12.5	6.1	-9.5	-17.8
1986	-16.8	-13.6	-2.7	5.0	16.7	21.8	21.0	21.1	13.3	3.3	-10.3	-18.8
1987	-20.0	-16.3	-8.1	8.6	14.0	19.1	22.3	20.1	14.5	3.0	-7.8	-13.5
1988	-18.5	-16.7	-7.1	5.2	12.6	20.5	24.0	21.2	14.5	6.1	-4.0	-14.5
1989	-15.2	-10.4	-2.6	9.0	15.9	19.6	22.7	22.2	12.6	5.5	-7.3	-16.7
1990	-22.0	-11.1	0.3	4.9	14.5	18.7	22.3	19.8	14.0	8.3	-5.3	-14.2

Dornod (Choibalsan)

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	-22.8	-19.3	-6.2	7.0	10.2	17.7	23.0	17.5	12.1	-0.7	-11.8	-14.1
1982	-18.2	-12.6	-7.3	5.7	9.8	20.0	20.3	18.7	10.6	2.7	-11.7	-17.5
1983	-18.7	-20.1	-0.1	1.3	12.0	15.7	10.8	18.2	10.3	2.1	-7.8	-16.0
1984	-23.2	-20.8	-12.7	1.0	13.1	17.0	19.3	16.6	11.0	1.3	-10.0	-18.0
1985	-22.5	-19.1	-9.0	2.7	12.0	16.8	19.8	16.6	9.5	3.0	-10.6	-19.0
1986	-19.0	-15.0	-4.6	1.5	12.0	20.6	19.5	18.5	11.5	1.2	-10.3	-17.7
1987	-23.7	-18.0	-9.7	3.6	10.3	16.2	19.2	17.0	11.5	0.7	-13.3	-14.6
1988	-19.5	-19.0	-9.3	3.0	10.6	17.6	20.6	19.1	11.6	3.6	-6.0	-15.6
1989	-16.3	-12.2	-4.5	6.2	12.1	15.4	18.6	18.8	10.2	3.3	-9.4	-17.6
1990	-22.8	-15.1	-0.8	2.5	11.9	16.0	19.4	17.4	9.9	5.6	-8.0	-14.7

Dundgobi (Mandalgovi)

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	-18.0	-14.3	-4.0	5.5	10.6	17.5	21.0	15.6	11.0	-1.7	-13.5	-15.1
1982	-16.5	-12.6	-5.2	5.6	10.8	16.3	19.1	16.2	10.7	5.0	-7.5	-15.3
1983	-16.3	-15.3	-4.5	1.2	13.0	15.0	18.5	16.8	10.3	3.3	-5.5	-13.5
1984	-18.5	-17.6	-8.1	2.2	13.0	16.8	18.7	16.0	10.5	2.5	-9.2	-18.8
1985	-17.3	-16.0	-11.0	3.0	11.7	17.3	17.3	16.3	9.5	3.2	-9.5	-17.6
1986	-15.2	-14.6	-5.5	1.5	13.7	19.0	18.1	17.3	10.7	0.2	-11.7	-17.5
1987	-17.3	-14.5	-10.2	5.3	11.2	15.2	18.6	17.0	11.2	-2.8	-13.3	-15.5
1988	-21.0	-19.1	-10.7	1.5	9.2	17.0	19.8	18.5	11.2	2.8	-5.0	-13.6
1989	-14.4	-12.6	-4.7	6.0	12.4	16.2	19.1	18.1	9.6	3.4	-8.4	-13.4
1990	-20.2	-11.8	-1.9	1.3	11.7	14.9	18.5	16.0	10.5	6.1	-7.4	-15.4

Zavhan (Uliastai)

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	-25.1	-21.7	-8.1	3.8	9.3	15.7	15.8	11.6	7.0	6.6	-19.3	-22.5
1982	-20.6	-19.0	-10.0	3.0	9.0	13.7	14.8	13.6	8.1	1.5	-13.8	-21.2
1983	-21.7	-20.0	-9.5	2.5	8.2	11.2	14.5	13.5	6.7	1.1	-9.5	-21.0
1984	-25.8	-25.1	-12.5	-0.7	9.3	13.0	13.5	11.1	7.2	-1.0	-11.3	-23.8
1985	-22.5	-20.3	-16.0	2.0	7.6	13.0	14.8	13.2	5.7	-2.0	-14.0	-21.1
1986	-21.0	-19.1	-9.5	-1.1	11.5	14.3	14.8	13.2	5.7	-2.0	-19.8	-22.5
1987	-19.5	-16.1	-12.5	2.5	8.2	12.0	14.2	12.5	8.0	-3.0	-15.0	-18.3
1988	-23.7	-22.3	-14.1	-0.5	7.5	13.1	14.7	15.5	9.3	-0.8	-10.7	-17.6
1989	-20.2	-18.2	-9.1	2.6	9.9	13.2	14.8	13.9	7.2	1.1	-14.3	-14.2
1990	-21.7	-16.1	-6.4	-1.1	9.3	12.4	14.9	12.4	7.0	3.3	-10.0	-16.4

Ovorhangay (Arvaiheer)

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	-16.1	-13.5	-3.5	4.7	8.6	14.5	17.7	12.5	9.0	-2.3	-10.3	-11.5
1982	-13.5	-11.0	-5.5	4.3	9.5	13.1	15.7	13.5	8.8	4.5	-6.5	-12.2
1983	-13.0	-13.5	-4.7	-0.3	11.2	11.8	15.3	13.8	8.2	2.6	-5.0	-12.5
1984	-17.5	-17.2	-8.1	1.0	10.7	14.5	15.0	12.3	8.5	2.2	-7.8	-17.0
1985	-14.0	-15.1	-11.2	2.2	9.5	14.3	14.0	13.5	7.0	3.0	-7.5	-15.3
1986	-11.6	-13.1	-5.5	0	12.1	16.3	16.0	14.2	9.5	-0.5	-9.5	-12.7
1987	-11.0	-9.7	-9.2	4.1	9.0	12.5	14.6	14.0	9.6	-0.5	-9.5	-10.5
1988	-16.3	-16.8	-9.5	1.1	7.5	14.7	16.5	15.3	9.8	2.0	-6.0	-11.7
1989	-12.9	-12.3	-5.2	4.3	10.0	13.5	16.0	14.7	7.5	3.4	-8.0	-8.2
1990	-16.2	-10.6	-3.7	-0.4	9.6	11.7	15.4	12.9	8.7	5.6	-4.4	-10.6

(continued) **Table I-2.2 Monthly Temperature by Aimag (1981-1992) (3/4)** (Celsius)

Omnogovi (Dalanzadgad)

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	-17.1	-10.7	-0.3	8.7	13.3	20.1	23.4	18.0	14.5	0.6	-8.9	-12.2
1982	-12.1	-9.0	-0.8	7.6	14.2	18.4	21.8	18.9	13.9	8.2	-4.5	-12.4
1983	-13.8	-13.0	-2.4	4.1	16.0	18.6	20.9	18.6	13.5	5.8	-3.1	-11.5
1984	-17.1	-15.2	-4.3	5.7	15.6	18.9	21.0	18.4	13.4	5.8	-5.4	-16.9
1985	-13.6	-11.4	-6.8	6.7	14.3	20.4	19.4	19.9	12.1	6.6	-6.9	-13.9
1986	-13.1	-12.0	-2.4	4.5	16.7	20.8	20.9	19.7	12.4	3.4	-8.6	-12.1
1987	-11.6	-6.7	-5.2	9.3	14.2	18.6	21.3	19.2	15.0	2.0	-4.4	-9.8
1988	-14.6	-12.3	-6.0	5.4	13.2	20.6	23.4	20.4	13.2	5.4	-2.4	-10.5
1989	-12.0	-9.4	-2.3	8.3	14.8	19.3	21.3	20.3	12.8	6.7	-6.2	-7.8
1990	-14.8	-8.4	-0.2	4.2	14.2	17.5	21.2	19.6	14.1	8.4	-2.2	-10.0

Suhbaatar (Baruun-urt)

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	-22.1	-17.9	-9.4	6.6	10.9	17.8	22.7	16.4	11.4	1.1	-13.8	-16.8
1982	-19.2	-13.0	-5.1	5.9	9.9	19.0	20.1	19.1	11.1	4.0	-9.0	-17.7
1983	-19.7	-18.6	-5.8	1.8	12.8	16.3	19.4	18.2	10.6	2.5	-7.8	-15.5
1984	-23.5	-20.2	-11.4	2.3	13.1	16.6	18.9	17.0	10.8	1.9	-9.3	-20.2
1985	-22.6	-19.4	-10.6	2.5	12.8	17.4	19.5	17.1	9.9	3.5	-11.4	-21.7
1986	-21.4	-18.1	-5.8	1.9	12.7	20.4	18.9	18.1	11.2	0.8	-12.3	-19.4
1987	-22.8	-20.0	-12.9	4.9	10.5	16.2	19.4	17.3	11.5	0.3	-11.5	-15.6
1988	-21.7	-19.4	-10.2	2.8	10.4	19.2	21.4	19.0	11.6	3.7	-5.6	-15.2
1989	-16.5	-12.2	-4.4	6.3	12.5	15.6	18.5	19.2	10.2	3.6	-10.8	-17.2
1990	-24.7	-14.4	-1.5	2.6	11.5	16.1	18.5	16.6	9.9	5.8	-7.6	-16.6

Uvs (Ulaangom)

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	-34.4	-29.9	-17.2	2.7	12.2	20.0	19.2	16.3	11.0	-2.2	-14.4	-31.1
1982	-31.2	-32.1	-20.0	2.6	12.6	-	18.3	16.6	10.9	3.8	-9.3	-25.5
1983	-32.1	-28.4	-20.9	-4.7	10.8	15.0	17.6	16.8	8.8	2.8	-5.5	-21.2
1984	-33.6	-35.2	-18.5	-2.1	11.3	17.6	16.9	15.6	10.6	1.9	-11.7	-29.4
1985	-31.5	-29.8	-23.6	1.8	9.8	15.2	17.6	16.1	9.4	1.5	-12.0	-28.6
1986	-31.5	-29.5	-17.8	1.4	13.9	16.4	18.8	16.5	10.2	-0.7	-15.4	-29.3
1987	-31.0	-26.2	-20.6	1.0	11.8	15.0	19.1	17.5	9.8	-0.9	-13.6	-26.0
1988	-31.0	-30.5	-19.8	0.7	10.9	16.3	17.8	17.8	12.0	0.9	-7.5	-20.2
1989	-30.1	-31.2	-14.0	1.7	12.5	16.5	18.6	17.5	9.8	2.9	-11.0	-18.6
1990	-32.3	-25.6	-14.7	0.6	12.8	17.2	20.2	15.6	10.3	3.5	-10.5	-22.9

Hovd (Hovd)

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	-28.5	-23.3	-4.8	6.6	13.0	19.3	20.2	16.5	12.5	-2.6	-13.8	-26.2
1982	-23.2	-21.2	-6.3	5.7	12.8	17.5	18.3	17.0	11.7	5.3	-10.5	-21.1
1983	-26.8	-22.5	-9.7	9.0	12.0	14.0	18.0	17.1	10.6	2.2	-8.5	-23.0
1984	-29.5	-30.0	-11.7	2.6	12.1	17.0	16.7	15.1	10.8	2.7	-8.6	-22.6
1985	-25.0	-20.5	-11.6	5.5	10.7	16.0	18.0	16.8	9.3	2.6	-9.5	-19.6
1986	-21.7	-19.3	-6.0	3.0	14.8	16.3	18.8	17.0	12.0	-1.0	-19.8	-22.5
1987	-22.6	-16.8	-12.0	5.2	11.6	15.1	18.5	17.0	11.8	-2.0	-9.6	-14.6
1988	-20.5	-20.8	-9.3	4.1	11.0	17.3	18.3	18.1	12.6	0.8	-7.8	-17.7
1989	-25.5	-22.2	-7.1	5.3	13.4	16.0	18.8	17.5	11.3	4.0	-10.9	-13.7
1990	-22.5	-15.9	-5.1	1.8	13.6	17.5	19.6	16.3	11.2	6.6	-7.2	-15.1

Hovsgol (Moron)

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	-28.5	-19.5	-5.6	5.1	11.6	16.5	18.2	13.1	8.2	-5.7	-15.0	-19.5
1982	-20.0	-19.3	-7.8	4.6	9.6	14.5	15.7	14.2	9.0	1.8	-12.5	-18.8
1983	-22.2	-19.7	-8.0	-1.0	9.8	12.0	15.1	15.0	7.3	1.1	-9.0	-19.5
1984	-22.1	-19.8	-7.0	0	11.2	15.1	14.6	12.6	8.0	1.5	-13.5	-23.3
1985	-18.7	-17.5	-15.2	2.5	9.0	13.8	16.0	14.0	7.0	-1.0	-11.8	-21.3
1986	-19.2	-19.7	-7.2	-0.3	11.5	14.7	16.2	14.2	10.2	-1.0	-14.3	-21.8
1987	-19.0	-13.8	-9.2	3.3	10.0	14.1	16.0	15.6	8.6	-1.6	-13.5	-17.2
1988	-20.5	-19.0	-9.6	2.5	9.5	15.0	7.2	16.1	9.6	-0.2	-7.7	-17.8
1989	-26.2	-21.9	-5.0	4.2	11.1	14.2	16.8	14.5	6.7	1.8	-14.4	-17.0
1990	-23.8	-13.1	-4.5	1.0	10.7	13.1	17.1	13.9	7.9	3.6	-9.1	-15.8

(continued) **Table I-2.2 Monthly Temperature by Aimag (1981-1992) (4/4)** (Celsius)

Hentiy (Ondorhaan)

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	-20.7	-16.5	-4.2	6.2	10.0	16.8	20.8	15.1	10.1	-1.8	-12.3	-17.0
1982	-22.0	-15.5	-7.0	5.2	9.1	17.5	19.0	16.7	9.6	2.0	-15.0	-21.3
1983	-22.3	-22.0	-8.5	0.6	12.0	14.8	18.2	17.0	9.3	1.2	-11.5	-20.3
1984	-27.8	-24.3	-13.8	8.0	12.0	16.0	17.5	14.8	9.5	0.3	-11.0	-20.8
1985	-22.8	-19.7	-11.1	0.6	12.0	15.2	17.6	15.1	7.8	1.2	-12.0	-21.1
1986	-20.5	-17.7	-6.7	0.6	11.8	18.5	17.0	16.3	9.5	-1.3	-16.3	-25.0
1987	-25.5	-23.2	-16.0	3.0	10.2	15.0	17.6	16.0	10.5	2.2	-15.7	-18.8
1988	-24.6	-23.0	-12.5	1.5	9.5	16.0	21.8	17.5	10.3	1.5	-7.5	-16.6
1989	-19.4	-15.7	-5.5	5.1	11.4	15.2	18.1	17.7	8.0	2.1	-11.0	-18.4
1990	-27.6	-18.6	-3.9	1.2	11.2	14.5	18.0	15.4	9.5	4.3	-12.1	-21.2

Ulaanbaatar

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	-23.0	-18.2	-6.1	4.2	9.2	15.2	19.6	13.5	9.2	-3.9	-13.7	-18.3
1982	-20.5	-15.4	-8.0	4.4	8.3	14.8	16.6	15.0	8.4	2.1	-11.5	-18.9
1983	-19.6	-17.9	-6.3	-1.4	11.5	11.9	15.8	15.4	8.1	1.8	-7.7	-16.6
1984	-22.4	-20.6	-10.5	-0.4	11.5	15.1	16.5	13.6	8.7	0.2	-11.3	-21.5
1985	-21.7	-19.3	-12.8	0.7	9.8	14.2	16.3	14.1	6.9	0.9	-11.8	-21.4
1986	-20.3	-17.6	-7.5	-0.5	11.2	16.9	16.3	15.3	9.7	-0.2	-14.8	-19.1
1987	-20.2	-17.6	-12.1	3.1	9.3	13.1	16.4	15.2	9.5	-2.1	-13.7	-17.6
1988	-22.8	-20.2	-11.3	0.5	7.7	14.5	16.8	15.7	9.5	1.2	-7.3	-16.3
1989	-18.3	-15.8	-6.0	4.2	10.4	14.3	17.3	15.7	7.0	1.7	-11.6	-15.7
1990	-23.1	-14.1	-3.1	0.3	10.5	12.9	16.7	13.5	8.1	5.0	-10.4	-17.8

Govi-Sumber (Choir)

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	-21.0	-16.6	-4.1	6.2	10.3	17.1	21.1	15.1	10.3	-2.0	-13.1	-16.8
1982	-19.6	-14.0	-6.5	5.5	10.1	16.5	19.1	16.7	10.5	4.3	-10.1	-17.5
1983	-18.7	-18.1	-5.3	0.8	12.7	14.6	18.3	17.0	10.0	4.3	-8.0	-16.0
1984	-22.8	-19.5	-10.1	1.5	12.6	16.5	18.2	15.6	9.8	0.5	-9.3	-19.0
1985	-19.6	-17.7	-11.5	2.1	11.6	16.5	17.7	16.2	8.8	3.0	-11.3	-19.8
1986	-18.3	0	-6.3	1.1	13.2	18.5	17.2	16.7	10.6	0	-14.1	-20.3
1987	-20.1	-18.5	-12.7	4.5	10.7	15.3	18.3	16.6	11.6	-3.0	-15.5	-17.7
1988	-23.2	-20.7	-12.6	1.2	9.5	16.8	20.0	18.2	11.2	3.5	-6.2	-16.7
1989	-17.4	-14.7	-6.0	6.2	12.2	15.9	18.6	18.4	9.0	3.0	-9.4	-15.8
1990	-22.8	-14.5	-2.4	1.6	11.8	15.1	18.4	15.5	9.9	6.0	-10.0	-17.7

source: Hydrometeorological Research Institute

Table I-2.3 Late Spring Frost and Early Frost by Aimag (1981-1995) (1/3)

(date)

	Arkhangay (Tsetserleg)				Bayan-Olgiy (Olgii)				Bayanhongor (Bayanhongor)			
	late spring frost		early frost		late spring frost		early frost		late spring frost		early frost	
	month	date	month	date	month	date	month	date	month	date	month	date
1981	May.	31	Aug.	29	May.	29	Sep.	1	Jun.	29	Sep.	9
1982	Jun.	24	Aug.	31	Jun.	19	Sep.	2	Jun.	20	Sep.	20
1983	Jun.	19	Sep.	4	Jun.	16	Sep.	3	Jun.	17	Sep.	8
1984	Jun.	8	Aug.	29	Jun.	5	Aug.	27	Jun.	6	Jul.	14
1985	Jun.	10	Aug.	19	Jun.	4	Sep.	6	Jun.	6	Sep.	7
1986	Jun.	21	Aug.	29	Jun.	18	Sep.	3	Jun.	12	Sep.	10
1987	Jun.	29	Sep.	4	Jun.	5	Sep.	4	Jun.	6	Aug.	27
1988	Jun.	10	Jul.	2	Jun.	9	Sep.	1	May.	30	Sep.	2
1989	Jun.	14	Aug.	15	Jun.	9	Aug.	4	Jun.	1	Sep.	14
1990	Jun.	8	Aug.	26	Jun.	5	Aug.	25	Jun.	6	Aug.	26
1991	Jun.	6	Sep.	4	Jun.	4	Sep.	15	Jun.	2	Sep.	15
1992	May.	17	Sep.	5	Jun.	21	Sep.	3	Jun.	6	Sep.	6
1993	Jun.	6	Sep.	6	May.	27	Sep.	4	Jun.	6	Sep.	16
1994	Jun.	2	Aug.	22	Jun.	5	Sep.	8	Jun.	2	Sep.	8
1995	Jun.	28	Aug.	6	Jun.	7	Sep.	8	Jun.	24	Sep.	9

	Bulgan (Bulgan)				Gobi Altay (Altai)				Dornogobi (Sainshand)			
	late spring frost		early frost		late spring frost		early frost		late spring frost		early frost	
	month	date	month	date	month	date	month	date	month	date	month	date
1981	Jun.	22	Sep.	5	Jun.	26	Aug.	6	May.	11	Sep.	21
1982	Jun.	21	Aug.	26	Jun.	21	Jul.	10	May.	15	Sep.	26
1983	Jun.	19	Jul.	18	Jun.	16	Jul.	6	May.	13	Sep.	24
1984	Jun.	8	Aug.	13	Jun.	19	Jul.	19	Jun.	5	Sep.	23
1985	Jun.	23	Aug.	19	Jun.	30	Jul.	10	May.	25	Sep.	8
1986	Jun.	13	Aug.	24	Jun.	26	Jul.	15	May.	13	Sep.	26
1987	Jun.	29	Sep.	4	Jul.	1	Aug.	1	May.	19	Sep.	26
1988	Jun.	14	Sep.	7	Jun.	15	Jul.	2	May.	12	Sep.	28
1989	Jun.	14	Aug.	6	Jun.	25	Jul.	10	May.	19	Sep.	7
1990	Jun.	8	Aug.	27	Jul.	5	Aug.	25	May.	21	Sep.	17
1991	Jun.	4	Sep.	3	Jul.	7	Aug.	12	May.	10	Sep.	26
1992	Jun.	6	Aug.	29	Jun.	26	Aug.	4	May.	15	Sep.	24
1993	Jun.	6	Sep.	6	Jul.	11	Aug.	5	May.	8	Sep.	17
1994	Jun.	3	Sep.	4	Jul.	14	Sep.	2	May.	26	Sep.	23
1995	May.	29	Sep.	9	Jun.	28	Aug.	29	May.	26	Sep.	13

	Dornod (Choibalsan)				Dundgobi (Mandalgovi)				Zavhan (Uliastai)			
	late spring frost		early frost		late spring frost		early frost		late spring frost		early frost	
	month	date	month	date	month	date	month	date	month	date	month	date
1981	Jun.	19	Aug.	29	May.	30	Sep.	11	Jun.	25	Sep.	2
1982	Jun.	1	Sep.	8	Jun.	2	Sep.	7	Jun.	25	Jul.	12
1983	Jun.	6	Sep.	19	Jun.	17	Sep.	13	Jun.	18	Jul.	6
1984	May.	23	Sep.	24	Jun.	11	Sep.	10	Jun.	8	Aug.	25
1985	May.	27	Sep.	8	Jun.	1	Sep.	8	Jun.	26	Aug.	18
1986	May.	24	Sep.	16	Jun.	13	Sep.	15	Jun.	22	Aug.	23
1987	Jun.	5	Sep.	15	Jun.	28	Sep.	6	Jun.	29	Sep.	1
1988	May.	24	Sep.	28	May.	30	Sep.	17	Jun.	14	Jul.	2
1989	May.	24	Sep.	14	Jun.	9	Sep.	14	Jun.	13	Aug.	15
1990	May.	22	Sep.	17	Jun.	4	Sep.	14	Jun.	8	Sep.	7
1991	May.	22	Sep.	23	May.	28	Sep.	26	Jul.	1	Sep.	2
1992	Jun.	7	Sep.	6	Jun.	5	Sep.	15	Jun.	11	Aug.	20
1993	May.	22	Sep.	8	Jun.	1	Sep.	17	Jun.	6	Sep.	5
1994	May.	21	Sep.	20	May.	26	Sep.	10	Jun.	2	Aug.	12
1995	May.	28	Sep.	9	May.	29	Sep.	9	Jun.	28	Jul.	23

(continued) **Table I-2.3 Late Spring Frost and Early Frost by Aimag (1981-1995) (2/3)** (date)

	Ovorhangay (Arvanheer)				Omnogovi (Dalanzadgad)				Sukhbaatar (Baruun-urt)			
	late spring frost		early frost		late spring frost		early frost		late spring frost		early frost	
	month	date	month	date	month	date	month	date	month	date	month	date
1981	Jun.	22	Aug.	29	Jun.	1	Sep.	11	May.	18	Sep.	11
1982	Jun.	19	Sep.	4	May.	14	Sep.	21	May.	23	Sep.	6
1983	Jun.	16	Sep.	4	Jun.	5	Sep.	13	Jun.	5	Sep.	14
1984	Jun.	9	Aug.	27	Jun.	5	Sep.	17	Jun.	8	Sep.	7
1985	Jun.	10	Aug.	18	Jun.	1	Sep.	11	May.	25	Sep.	8
1986	Jun.	13	Sep.	11	May.	13	Sep.	11	May.	24	Sep.	13
1987	Jun.	29	Sep.	5	May.	25	Sep.	20	Jun.	30	Jun.	9
1988	Jun.	10	Jul.	2	May.	30	Sep.	2	May.	24	Sep.	4
1989	Jun.	10	Aug.	15	May.	19	Sep.	14	Jun.	2	Sep.	7
1990	Jun.	21	Aug.	29	May.	30	Sep.	14	May.	23	Sep.	14
1991	Jun.	6	Sep.	3	May.	27	Sep.	19	May.	27	Sep.	18
1992	Jun.	5	Sep.	5	May.	16	Sep.	8	Jun.	7	Sep.	7
1993	Jun.	5	Sep.	6	Jun.	1	Sep.	19	May.	22	Sep.	13
1994	Jun.	2	Sep.	5	May.	25	Sep.	10	May.	26	Sep.	8
1995	Jul.	1	Sep.	9	May.	25	Sep.	10	May.	30	Sep.	9

	Selenge (Suhbaatar)				Tov (Zuunmod)				Uvs (Ulaangom)			
	late spring frost		early frost		late spring frost		early frost		late spring frost		early frost	
	month	date	month	date	month	date	month	date	month	date	month	date
1981	Jun.	18	Aug.	25	Jun.	22	Aug.	10	May.	28	Sep.	21
1982	Jun.	1	Aug.	26	Jun.	27	Aug.	19	May.	21	Sep.	24
1983	Jun.	11	Aug.	16	Jun.	19	Aug.	16	Jun.	4	Sep.	11
1984	Jun.	10	Aug.	31	Jun.	10	Aug.	13	Jun.	12	Sep.	22
1985	-	-	-	-	Jun.	10	Aug.	19	Jun.	4	Sep.	6
1986	Jun.	2	Sep.	10	Jun.	13	Aug.	15	Jun.	1	Sep.	14
1987	Jun.	28	-	-	Jun.	29	Sep.	5	Jun.	5	Sep.	2
1988	-	-	Jul.	3	Jun.	23	Jul.	2	May.	30	Sep.	1
1989	Jun.	15	Sep.	5	Jun.	29	Aug.	18	Jun.	8	Sep.	13
1990	Jun.	8	Sep.	8	Jul.	2	Aug.	24	May.	26	Sep.	7
1991	May.	30	Sep.	26	Jul.	2	Aug.	31	May.	29	Sep.	14
1992	Jun.	6	Sep.	15	Jun.	12	Aug.	29	Jun.	10	Sep.	5
1993	Jun.	1	Sep.	17	Jun.	23	Sep.	7	May.	21	Sep.	6
1994	May.	28	Sep.	12	May.	29	Aug.	23	Jun.	5	Sep.	14
1995	May.	28	Sep.	9	Jun.	23	Sep.	5	Jun.	7	Sep.	8

	Hovd (Hovd)				Hovsgol (Moron)				Hentiy (Ondorhaan)			
	late spring frost		early frost		late spring frost		early frost		late spring frost		early frost	
	month	date	month	date	month	date	month	date	month	date	month	date
1981	May.	29	Sep.	2	May.	29	Sep.	5	May.	28	Aug.	29
1982	May.	15	Sep.	24	Jun.	20	Aug.	30	Jun.	1	Aug.	26
1983	Jun.	10	Sep.	11	Jun.	7	Sep.	4	Jun.	5	Sep.	5
1984	Jun.	7	Sep.	22	Jun.	7	Sep.	7	Jun.	5	Sep.	8
1985	May.	31	Sep.	27	Jun.	8	Aug.	28	Jun.	8	Aug.	29
1986	May.	17	Sep.	15	May.	18	Aug.	15	May.	27	Sep.	11
1987	Jun.	5	Sep.	2	Jun.	26	Sep.	3	Jun.	10	Sep.	6
1988	May.	30	Sep.	17	Jun.	14	Sep.	16	Jun.	16	Jul.	4
1989	Jun.	8	Sep.	13	Jun.	8	Sep.	13	Jun.	10	Sep.	5
1990	May.	29	Sep.	7	May.	26	Sep.	8	Jun.	9	Sep.	17
1991	May.	29	Sep.	14	May.	31	Sep.	9	Jun.	5	Sep.	9
1992	May.	17	Sep.	4	Jun.	10	Sep.	5	Jun.	12	Sep.	5
1993	May.	19	Sep.	6	May.	29	Sep.	6	May.	23	Sep.	7
1994	May.	25	Sep.	8	May.	2	Sep.	9	May.	29	Sep.	11
1995	May.	27	Sep.	22	May.	30	Sep.	7	May.	30	Sep.	9

(continued) **Table I-2.3 Late Spring Frost and Early Frost by Aimag (1981-1995) (3/3)** (date)

	Darhan				Govi-Sumber (Choir)			
	late spring frost		early frost		late spring frost		early frost	
	month	date	month	date	month	date	month	date
1981	May.	26	Aug.	31	May.	30	Aug.	29
1982	May.	31	Sep.	7	May.	21	Sep.	5
1983	Jun.	5	Sep.	13	Jun.	7	Sep.	13
1984	Jun.	5	Sep.	24	Jun.	6	Sep.	8
1985	May.	18	Sep.	8	Jun.	10	Aug.	29
1986	May.	19	Aug.	26	May.	26	Sep.	15
1987	Jun.	10	Sep.	5	-	-	Sep.	20
1988	May.	26	Jul.	2	May.	30	Sep.	17
1989	Jun.	15	Sep.	5	Jun.	15	Sep.	5
1990	Jun.	4	Sep.	19	Jun.	4	Sep.	14
1991	Jun.	15	Sep.	9	May.	27	Sep.	9
1992	Jun.	7	Sep.	8	Jun.	4	Sep.	5
1993	Jun.	1	Sep.	17	Jun.	1	Sep.	7
1994	May.	29	Sep.	5	May.	26	Sep.	17
1995	May.	30	Sep.	9	May.	29	Sep.	9

Source: Hydrometeorological Research Institute

Table I-2.4 Montly Sunshine by Aimag (Average of 30 years;1961-1990)

(hours)

Aimag	Station	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	total
Arhangay	Tsetserleg	185.7	197.2	250.2	245.6	279.6	275.4	265.2	260.5	254.0	232.5	186.6	172.6	2,805
Bayan-Olgiy	Olgii	164.4	187.7	255.1	267.3	321.5	302.6	319.6	302.6	262.3	221.9	172.6	147.7	2,925
Bayanhongor	Bayanhongor	260.5	223.7	271.5	275.1	320.1	309.6	308.8	293.2	280.8	261.7	220.6	205.4	3,231
Bulgan	Erdenet-ovoo	182.9	196.9	245.3	250.9	290.2	276.9	257.6	255.4	234.8	209.6	172.6	162.8	2,736
Gobi-Altay	Altai	201.1	208.3	252.2	260.6	308.9	298.5	293.2	290.2	272.4	246.1	199.6	184.8	3,016
Dornogobi	Sainshand	217.8	219.0	274.8	277.2	308.7	308.9	311.0	286.7	282.9	263.9	219.0	203.2	3,173
Dornod	Choibalsan	198.5	212.0	266.1	264.0	294.9	307.3	297.9	287.1	258.2	239.2	199.5	177.6	3,002
Dundgobi	Mandlgobi	210.5	232.4	273.4	263.7	300.7	294.6	292.5	285.9	279.7	258.0	216.9	201.8	3,110
Zavhan	Uliastai	186.6	204.8	260.7	266.3	311.4	302.1	291.3	288.9	266.3	223.6	174.0	166.2	2,942
Ovorhangay	Khujirt	196.4	210.7	261.5	252.9	283.0	272.8	260.2	250.0	250.3	238.5	196.0	176.3	2,849
Omnogovi	Dalanzadgad	227.0	220.1	257.1	259.2	314.1	313.9	302.8	297.4	285.4	271.2	229.1	217.1	3,194
Suhbactor	Baruun-urt	203.3	216.4	263.5	274.6	304.5	303.0	298.9	290.4	280.0	245.2	208.2	183.2	3,071
Selenge	Orkhon	164.4	195.5	257.3	256.8	281.8	268.6	259.2	257.8	228.1	215.0	160.4	143.8	2,689
Tov	Zuunmad	203.1	204.8	267.1	269.4	309.6	295.0	277.7	268.6	256.4	235.7	197.1	175.2	2,960
Uvs	Ulaangom	135.0	158.4	233.9	260.4	313.4	318.9	307.4	297.2	250.4	195.9	100.5	103.6	2,675
Hovd	Hovd	171.6	196.3	255.2	266.8	300.4	300.1	302.1	298.0	269.7	230.9	180.3	151.0	2,922
Hovsgol	Moron	168.4	199.0	252.6	250.0	294.5	291.5	274.3	274.1	249.0	224.9	168.1	154.5	2,801
Hentiy	Ondorhaan	193.7	211.5	267.3	268.4	292.6	273.0	255.2	251.4	241.6	228.5	186.4	165.9	2,836
U.B.	UB-Takhilt	176.1	204.8	265.2	262.5	299.3	269.0	249.3	258.3	245.7	227.5	177.4	156.4	2,792

source: Hydrometeorological Research Institute

Table I-2.5 Monthly Sunshine by Aimag (1981-1990) (1/4)

(hours)

Arhangay (Tsetserleg)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	190	192	269	257	262	267	323	230	250	220	-	200
1982	187	218	250	231	283	230	266	230	263	239	177	168
1983	188	177	281	267	303	238	308	266	260	276	186	181
1984	184	211	263	268	248	293	261	207	258	224	211	153
1985	170	184	247	238	314	275	230	313	250	264	198	187
1986	192	207	279	274	300	293	282	266	258	208	199	179
1987	184	207	239	230	300	303	254	264	239	171	180	173
1988	196	184	304	295	244	346	321	266	274	260	221	168
1989	189	182	257	255	290	300	304	251	241	248	208	178
1990	197	202	245	278	284	302	251	267	285	269	188	178

Bayan Olgiy (Olgiy)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	132	191	272	287	339	297	330	268	268	224	195	174
1982	166	172	244	269	319	312	338	280	302	208	154	132
1983	147	190	248	236	302	278	316	294	241	202	171	136
1984	169	184	259	282	331	297	273	328	259	235	138	136
1985	172	193	261	250	319	314	333	327	302	224	165	165
1986	164	217	239	293	315	290	352	317	300	240	191	154
1987	174	188	279	246	278	291	322	314	222	219	157	164
1988	164	223	318	305	282	308	294	325	281	237	197	149
1989	152	191	280	251	312	314	330	322	239	222	190	134
1990	157	163	240	296	342	332	320	278	308	243	174	141

Bayanhongor (Bayanhongor)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	216	231	264	273	292	284	332	262	293	247	232	219
1982	238	232	291	260	321	304	324	241	297	273	212	182
1983	212	223	278	277	335	320	354	286	279	260	212	208
1984	220	225	302	311	335	293	349	349	250	269	229	186
1985	221	200	282	263	329	344	382	322	253	289	229	219
1986	229	217	274	305	342	325	286	278	276	262	222	204
1987	220	242	251	257	319	306	304	315	251	214	217	209
1988	222	221	327	324	281	378	359	263	307	272	240	210
1989	250	207	292	297	326	297	322	260	232	270	237	209
1990	202	224	206	283	320	352	239	291	315	285	205	194

Bulgan (Bulgan)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	-	-	-	-	-	-	-	-	-	-	-	-
1982	-	-	-	-	-	-	-	-	-	-	-	-
1983	-	-	-	-	-	-	-	-	-	-	-	-
1984	-	-	-	-	-	-	-	-	-	-	-	-
1985	-	-	-	-	-	-	-	-	-	-	-	-
1986	-	-	-	-	-	-	-	-	-	-	-	-
1987	-	-	-	-	-	-	-	-	-	-	-	-
1988	-	-	-	-	-	-	-	-	-	-	-	-
1989	-	-	-	-	-	-	-	-	-	-	-	-
1990	-	-	-	-	-	-	-	-	-	-	-	-

Gobi-Altay (Altay)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	209	202	253	243	272	266	319	256	286	227	220	192
1982	203	203	261	224	297	309	317	248	267	233	191	190
1983	193	219	262	245	281	312	341	242	283	246	206	185
1984	216	213	276	252	295	272	286	263	232	251	175	164
1985	204	172	257	269	324	355	317	317	265	256	210	202
1986	212	292	243	296	295	321	-	283	272	262	209	181
1987	211	230	271	242	331	268	345	311	292	191	170	189
1988	200	204	301	309	278	341	353	309	295	264	220	184
1989	230	198	294	313	331	317	338	272	255	236	209	152
1990	160	188	200	283	335	304	311	299	318	270	158	175

(continued)

Table I-2.5 Monthly Sunshine by Aimag (1981-1990) (2/4)

(hours)

Dornogobi (Sainshand)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	230	223	272	291	329	324	312	256	295	251	224	204
1982	204	235	281	280	313	298	218	306	325	276	204	187
1983	215	210	286	285	320	294	326	288	271	283	250	219
1984	233	234	280	311	347	318	372	330	314	269	232	205
1985	233	216	311	301	323	357	321	342	313	294	211	214
1986	244	246	283	326	364	311	332	322	278	256	240	205
1987	229	234	288	298	346	364	342	276	278	247	211	210
1988	221	144	332	328	324	339	353	294	329	292	244	194
1989	207	237	299	316	346	362	332	327	270	292	236	176
1990	225	208	252	289	333	317	291	306	297	286	195	213

Dornod (Choibalsan)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	215	190	228	257	279	333	289	258	273	197	217	181
1982	198	228	256	304	272	325	302	282	267	251	184	159
1983	174	191	269	242	313	260	292	272	234	276	207	180
1984	157	212	260	285	338	279	294	253	243	212	208	178
1985	162	208	279	224	337	315	293	289	278	250	188	186
1986	211	235	261	274	339	349	305	321	296	232	213	198
1987	199	212	272	263	305	315	303	286	262	205	193	188
1988	219	212	306	281	303	336	361	304	277	264	213	172
1989	194	236	263	292	326	292	300	317	257	246	196	186
1990	228	201	285	303	271	270	232	272	220	281	189	183

Dundgobi (Mandalgovi)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	203	234	264	99.999	306	278	320	257	276	250	204	216
1982	210	247	302	270	308	293	308	261	315	266	201	178
1983	186	212	276	270	314	298	319	277	279	267	218	220
1984	195	219	248	254	278	268	309	272	268	262	226	192
1985	209	195	292	245	298	338	224	305	302	288	285	189
1986	227	230	280	310	296	293	292	274	288	236	232	184
1987	189	240	260	248	308	303	292	276	266	174	203	206
1988	231	235	316	306	268	322	323	286	285	268	250	198
1989	207	223	301	299	296	328	303	287	257	279	229	202
1990	212	224	246	287	301	300	265	290	301	273	193	201

Zavhan (Uliastai)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	208	206	266	262	285	275	300	240	263	188	189	184
1982	189	240	266	249	323	294	293	289	267	214	174	153
1983	186	197	292	267	290	305	344	283	226	235	186	168
1984	190	205	272	267	337	273	273	265	232	214	162	146
1985	188	191	268	243	328	331	342	320	243	240	185	172
1986	184	220	269	307	318	297	271	280	284	216	204	150
1987	190	208	262	265	322	301	286	288	264	170	147	168
1988	184	194	310	315	282	346	336	315	281	245	195	150
1989	215	218	270	278	309	306	327	281	232	223	181	158
1990	172	193	199	268	327	320	286	289	306	249	177	171

Ovorhangay (Hujirt)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	193	209	240	247	258	245	282	198	240	218	204	189
1982	200	229	261	246	280	228	248	221	249	241	186	162
1983	175	189	272	271	309	256	291	237	238	247	180	-
1984	177	224	273	276	280	287	273	199	241	232	206	152
1985	167	188	278	243	295	276	209	288	238	268	178	171
1986	179	205	275	270	291	276	268	239	245	207	200	176
1987	185	233	249	244	296	301	359	254	230	186	183	166
1988	195	198	311	290	247	317	309	242	265	240	223	168
1989	210	186	269	259	268	282	285	239	219	246	174	176
1990	188	196	214	267	286	272	259	247	264	265	195	184

(continued) **Table I-2.5 Monthly Sunshine by Aimag (1981-1990) (3/4)** (hours)

Omnogovi (Dalanzadgad)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	218	225	272	281	293	307	304	271	278	256	218	218
1982	226	217	258	248	290	297	306	251	267	280	219	205
1983	212	211	259	257	278	281	297	278	292	276	239	224
1984	234	229	282	274	321	291	304	303	281	300	231	209
1985	238	207	296	301	296	325	291	320	295	298	218	227
1986	246	248	292	296	328	332	335	290	300	286	240	206
1987	249	248	241	267	346	345	358	302	306	230	230	221
1988	233	222	285	277	319	326	364	337	304	278	262	222
1989	222	226	271	300	334	332	335	310	276	296	246	219
1990	215	213	244	270	331	352	320	333	319	272	219	217

Suhbaatar (Baruun-urt)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	223	205	241	285	314	307	308	256	269	217	231	195
1982	217	245	277	304	289	301	289	290	278	260	198	172
1983	180	208	270	284	331	264	296	249	258	277	218	195
1984	197	230	286	289	322	312	327	290	275	223	225	188
1985	200	202	303	268	353	309	279	301	291	280	190	200
1986	228	246	273	311	327	315	301	340	282	238	226	185
1987	196	213	268	313	314	366	311	265	266	217	198	184
1988	226	216	298	279	301	355	346	293	297	254	227	156
1989	198	239	254	319	351	334	305	322	259	271	231	195
1990	224	208	249	302	309	301	260	296	263	288	214	199

Uvs (Ulaangom)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	136	152	231	284	343	321	319	259	246	195	89	130
1982	156	172	233	267	315	344	328	296	282	203	105	70
1983	106	149	231	252	320	336	287	299	231	176	110	36
1984	149	135	236	288	327	326	296	303	246	204	75	119
1985	155	178	249	252	302	303	304	322	287	198	101	130
1986	150	201	233	287	304	290	330	314	268	219	102	102
1987	160	151	248	243	317	337	313	298	229	173	142	128
1988	132	173	268	305	332	364	339	324	267	197	97	75
1989	88	162	210	218	321	305	307	309	246	218	98	198
1990	121	153	213	318	357	312	306	274	275	214	89	94

Hovd (Hovd)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	145	202	275	264	347	301	333	263	281	229	198	192
1982	165	284	243	254	287	316	332	280	270	208	178	141
1983	152	186	252	273	229	266	350	286	278	221	190	109
1984	156	184	284	295	303	305	279	318	238	240	165	157
1985	166	185	269	281	286	309	308	311	280	227	181	185
1986	178	233	270	303	284	263	312	231	263	217	202	142
1987	192	192	276	264	317	279	217	305	249	149	184	157
1988	171	191	313	297	298	312	309	322	286	222	169	131
1989	152	194	286	296	305	308	327	288	250	221	199	114
1990	156	175	234	278	343	316	308	287	301	254	170	152

Hovsgol (Moron)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	162	179	225	262	286	296	313	201	232	216	196	153
1982	182	225	251	258	267	264	241	242	262	219	150	142
1983	143	185	287	215	276	224	283	321	253	244	178	168
1984	180	220	246	283	340	289	219	192	226	198	171	122
1985	164	202	266	244	333	307	264	321	267	247	177	165
1986	170	220	282	271	304	267	292	307	286	203	200	165
1987	189	199	166	255	316	329	275	233	256	209	164	132
1988	178	172	284	306	284	322	342	299	231	225	214	192
1989	164	196	233	255	282	283	313	274	214	236	191	165
1990	169	200	258	251	328	292	263	247	275	269	204	152

(continued) **Table I-2.5 Monthly Sunshine by Aimag (1981-1990) (4/4)** (hours)

Hentiy (Dadal)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	216	200	246	252	292	304	286	256	242	190	199	173
1982	209	227	265	296	283	263	260	223	244	243	197	150
1983	176	200	283	260	347	207	236	252	193	256	221	148
1984	184	227	279	254	304	263	256	173	201	200	179	178
1985	193	217	267	229	319	244	244	220	248	240	190	194
1986	200	222	256	287	317	281	232	278	298	230	198	185
1987	180	208	268	291	318	268	260	230	233	194	167	157
1988	196	172	271	285	255	288	276	258	285	248	213	165
1989	199	240	266	259	281	279	216	266	218	249	295	160
1990	181	211	300	288	293	252	197	286	198	257	190	169

Ulaanbaatar

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	177	194	244	261	291	295	285	253	229	211	189	161
1982	189	224	244	285	259	254	260	252	272	224	158	133
1983	156	188	283	247	314	215	205	265	211	253	189	160
1984	171	218	249	289	302	262	267	232	234	205	183	149
1985	162	174	285	238	338	265	207	275	275	242	187	126
1986	170	210	284	281	318	281	260	274	291	215	182	149
1987	164	204	268	279	326	285	268	225	227	167	153	136
1988	166	179	296	317	233	294	306	227	260	252	227	164
1989	177	217	278	289	303	319	238	234	244	228	206	165
1990	188	196	238	281	327	294	-	210	249	242	176	132

Govi-Sumber (Choir)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	-	-	-	-	-	-	-	-	-	-	-	-
1982	-	-	-	-	-	-	-	-	-	-	-	-
1983	-	-	-	-	-	-	-	-	-	-	-	-
1984	-	-	-	-	-	-	-	-	-	-	-	-
1985	-	-	-	-	-	-	-	-	-	-	-	-
1986	-	-	-	-	-	-	-	-	-	-	-	-
1987	-	-	-	-	-	-	-	-	-	-	-	-
1988	-	-	-	-	-	-	-	-	-	-	-	-
1989	-	-	-	-	-	-	-	-	-	-	-	-
1990	-	-	-	-	-	-	-	-	-	-	-	-

note: (-) data is not available

source: Hydrometeorological Research Institute

Table I-2.6 Monthly Precipitation by Aimag (Average of 30 years;1961-1990)

(mm)

Aimag	Station	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	total
Arhangay	Tsetserleg	2.1	2.8	6.0	16.5	32.7	69.0	90.2	82.1	26.9	13.5	6.0	2.7	350.5
Bayan-Olgiy	Olgiy	0.8	0.7	1.4	4.6	10.7	25.1	34.2	20.1	12.7	3.2	0.8	1.1	115.5
Bayanhongor	Bayanhongor	2.0	2.8	4.1	8.6	14.4	33.3	56.2	48.2	18.3	6.9	2.7	1.8	199.4
Bulgan	Erdenet-ovoo	2.0	1.7	5.0	13.8	23.7	70.7	100.5	81.3	41.2	13.0	7.6	3.3	363.8
Govi-Altay	Altai	1.1	1.9	6.0	10.2	12.3	27.8	45.0	40.9	16.2	7.7	3.1	1.6	173.8
Dornogobi	Sainshand	0.6	1.3	1.7	3.2	8.3	16.3	34.7	31.0	11.1	4.8	2.2	1.5	116.7
Dornod	Choibalsan	1.8	2.0	3.0	6.5	14.6	39.1	76.3	63.0	27.3	7.9	3.4	2.8	247.7
Dundgobi	Mandlgobi	0.6	1.5	1.9	3.4	10.7	24.7	40.0	48.8	15.9	5.0	2.2	1.2	156.0
Zavhan	Uliastai	2.2	1.9	4.9	9.4	15.0	34.2	62.4	48.3	21.9	9.5	4.8	3.3	217.7
Ovorhangay	Khujirt	0.9	1.4	4.5	7.8	14.7	34.7	85.1	64.7	20.0	6.8	3.0	1.6	245.2
Omnogovi	Dalanzadgad	1.4	0.9	3.4	5.4	11.9	18.2	33.9	31.2	13.1	4.5	2.1	1.2	127.1
Suhbaator	Baruun-urt	1.7	1.5	2.2	6.6	13.1	34.3	61.8	51.2	19.3	5.4	2.8	1.8	201.8
Selenge	Orkhon	3.3	2.3	3.2	10.5	15.3	50.5	81.5	68.8	35.2	11.4	5.4	2.5	289.7
Tov	Zuunmad	1.9	2.0	3.6	8.6	14.9	51.2	76.7	71.9	27.4	7.2	4.6	2.5	272.5
Uvs	Ulaangom	1.9	1.8	3.6	4.2	6.5	29.7	37.7	22.9	14.0	4.7	7.1	4.2	138.4
Hovd	Khovd	1.5	1.1	2.5	6.1	9.7	26.6	37.9	22.8	10.8	4.8	1.9	1.8	127.4
Hovsgol	Moron	1.5	1.2	1.0	7.1	15.5	47.3	72.0	64.6	17.6	5.5	2.1	1.6	236.9
Hentiy	Ondorhaan	1.3	2.7	2.6	8.0	15.1	48.6	73.2	69.9	23.6	8.4	3.5	2.6	259.4
U.B.	UB-Takhilt	2.2	1.6	3.7	7.3	14.7	54.6	57.9	75.9	23.4	9.7	4.2	3.2	258.5
Govi-Sumber(Choir)	Govi-Sumber(Choir)	0.7	1.7	1.7	4.6	10.4	32.6	60.4	53.3	19.3	5.8	4.1	2.0	196.5

source: Hydrometeorological Research Institute

Table I-2.7 Monthly Precipitation by Aimag (1981-1992) (1/4)

(mm)

Arhangay (Tsetserleg)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	2.6	0.9	9.7	5.8	29.8	40.8	76.6	149.4	25.1	17.4	4.3	0.3
1982	2.2	0.1	2.8	0.2	24.6	98.6	116.7	69.8	35.8	9.6	12.1	6.1
1983	0.6	6.0	4.2	11.7	13.1	95.7	129.6	96.8	22.4	0.7	4.9	0.1
1984	0.1	1.3	2.4	3.1	14.8	117.6	94.3	126.9	29.3	38.3	0.7	2.2
1985	1.1	1.9	0.7	15.1	21.7	72.9	105.3	73.3	53.8	4.6	1.9	1.3
1986	5.1	1.2	7.2	11.6	22.9	44.6	93.8	97.7	20.9	28.6	9.8	1.2
1987	4.8	2.5	16.1	22.6	37.2	20.6	166.8	86.8	36.4	26.4	7.8	7.4
1988	0.9	7.0	2.6	4.6	58.1	77.3	57.1	70.8	43.9	10.6	1.1	1.1
1989	3.9	5.1	6.5	7.0	38.4	68.0	60.8	69.4	26.5	22.2	8.4	0.4
1990	0.3	3.2	9.3	34.2	41.4	90.5	83.2	58.9	14.3	2.0	8.9	2.1

Bayan-Olgiy (Olgiy)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	1.8	0.1	0.1	4.8	1.6	41.6	23.3	85.1	4.6	0.2	1.6	0.1
1982	0.1	0.1	3.1	1.7	12.1	14.6	32.3	22.2	4.3	0.3	0.2	1.1
1983	0.2	0.9	0.1	3.9	19.9	34.3	37.2	38.6	8.7	2.2	1.6	1.3
1984	1.2	3.0	0.1	2.1	7.1	31.8	38.6	16.2	42.4	0.9	0.3	0.1
1985	0.1	1.1	0.1	0.3	5.2	16.7	20.8	6.7	1.6	1.9	0.1	0.1
1986	0.1	0.1	3.2	6.2	0.3	71.1	8.6	26.4	2.4	0.6	2.1	4.2
1987	0.1	0.1	0.9	2.6	25.6	29.6	42.3	33.2	3.6	13.1	0.1	0.4
1988	5.3	0.8	0.3	9.7	18.6	16.6	41.1	13.6	8.4	3.2	0.3	2.1
1989	2.1	1.4	0.1	0.7	2.6	31.4	37.6	7.6	18.3	2.4	0.1	0.9
1990	0.1	1.2	6.1	12.1	0.3	19.7	36.8	43.6	3.6	0.1	1.3	1.0

Bayanhongor (Bayanhongor)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	8.5	0.6	11.4	3.6	1.8	97.2	24.8	74.2	32.3	0.0	4.7	0.0
1982	0.7	0.4	0.5	0.1	5.9	39.6	49.6	70.7	38.7	10.3	5.2	0.9
1983	0.0	0.0	0.0	0.6	12.3	32.9	37.3	37.2	7.6	11.2	3.1	1.1
1984	0.5	6.8	1.3	0.7	21.8	25.1	27.0	41.8	27.6	18.0	0.0	5.5
1985	0.0	2.3	0.9	8.5	9.2	29.5	53.5	18.9	8.1	3.7	1.8	16.9
1986	3.7	0.0	0.0	3.2	16.0	26.7	37.8	39.3	38.6	3.8	7.2	0.5
1987	0.0	0.2	2.6	24.1	13.4	22.1	43.2	26.2	11.6	23.4	5.4	3.4
1988	3.8	9.6	2.6	3.7	23.2	2.6	7.2	51.8	2.5	6.2	8.6	0.0
1989	1.2	4.8	1.1	3.0	3.3	33.3	24.7	41.5	42.8	2.3	0.3	0.7
1990	4.0	2.0	8.1	9.1	35.4	33.8	97.0	16.9	5.5	0.0	0.7	0.5

Bulgan (Bulgan)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	2.3	1.1	3.1	16.8	11.1	22.6	68.2	104.9	22.9	14.1	7.6	0.1
1982	3.7	0.1	2.9	7.6	18.3	109.1	110.9	75.9	28.8	5.4	3.1	2.6
1983	0.8	0.1	0.2	10.1	10.8	119.7	66.7	48.1	38.1	4.1	5.6	0.2
1984	2.7	0.5	11.2	2.3	21.1	52.4	137.3	149.6	46.4	20.4	4.1	0.4
1985	1.2	1.3	1.6	12.6	27.8	89.7	169.6	105.8	33.8	9.6	1.6	0.1
1986	3.1	1.2	5.6	19.4	21.9	72.6	65.7	48.4	29.1	30.1	1.1	2.6
1987	5.6	1.5	2.4	4.6	8.9	48.6	86.4	150.1	17.4	12.3	3.2	0.6
1988	4.3	6.8	0.9	11.4	69.6	37.6	65.1	86.6	62.9	5.1	1.1	4.1
1989	1.3	0.4	2.9	5.0	54.7	50.2	93.1	72.6	54.1	8.8	4.6	1.6
1990	0.6	2.7	5.5	11.3	2.6	77.4	194.4	107.4	12.7	3.3	6.5	1.8

Gobi-Altay (Altay)

	Jan	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	1.1	1.1	13.6	15.4	0.1	6.2	19.9	35.6	4.6	8.1	2.9	2.2
1982	0.1	0.4	4.1	7.1	31.9	33.1	27.6	23.9	13.6	9.2	1.6	0.1
1983	0.7	0.5	0.6	0.1	7.3	51.6	4.3	68.9	12.4	9.2	6.8	0.1
1984	0.9	7.9	1.7	14.3	1.9	26.6	80.3	40.7	26.7	7.6	2.3	2.6
1985	0.6	1.9	1.3	6.3	18.6	7.3	51.1	18.2	21.1	4.8	0.1	2.8
1986	0.1	0.9	1.9	11.8	0.3	20.6	48.6	63.4	29.8	2.2	2.1	4.3
1987	1.1	0.7	2.7	13.6	2.4	47.6	51.2	46.3	18.2	22.1	1.7	0.9
1988	1.8	7.5	0.3	5.6	15.6	7.3	28.2	28.6	3.6	7.9	1.7	3.1
1989	0.1	0.6	3.5	0.5	11.4	21.3	25.8	35.1	47.5	7.8	0.7	1.3
1990	2.2	3.8	2.7	22.7	12.1	71.4	58.7	31.6	3.4	1.1	6.7	0.1

Table I-2.7 Monthly Precipitation by Aimag (1981-1992) (2/4)

(mm)

Dornogobi (Sainshand)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	0.1	0.2	8.7	1.1	3.6	7.2	11.3	23.3	13.3	6.8	0.7	0.1
1982	0.6	0.1	0.1	0.1	1.6	20.2	12.1	27.4	5.8	2.3	2.2	0.3
1983	0.2	0.7	0.2	0.1	14.6	21.7	33.9	8.1	22.3	7.2	0.1	0.1
1984	0.1	0.9	0.2	0.1	0.8	17.7	24.9	67.1	12.6	7.2	0.1	0.6
1985	0.1	5.9	0.1	4.9	0.4	5.3	49.2	10.4	16.6	2.6	6.6	0.7
1986	0.1	0.1	5.2	0.1	0.1	48.6	55.1	6.1	28.7	18.1	7.6	6.6
1987	5.6	0.4	2.4	0.1	4.1	22.8	56.2	88.4	29.4	10.1	1.3	4.1
1988	3.1	1.2	0.1	1.7	29.9	13.3	23.7	60.1	4.1	11.9	0.1	3.1
1989	0.1	1.2	0.5	4.4	2.2	5.8	17.5	2.7	6.3	1.0	5.1	10.4
1990	1.1	1.5	4.5	0.1	2.0	2.6	44.2	54.3	4.2	6.4	1.5	0.4

Dornod (Choibalsan)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	1.1	4.0	5.9	8.4	7.4	14.9	41.1	36.6	13.7	7.2	0.9	0.7
1982	0.9	1.2	1.1	0.4	18.8	16.8	65.1	62.1	25.4	10.2	0.4	2.2
1983	2.7	1.8	0.2	4.6	2.1	55.4	101.8	29.6	45.3	7.8	7.1	0.6
1984	2.7	4.1	6.4	3.8	7.6	57.7	29.3	145.1	23.4	9.1	5.9	0.1
1985	3.4	0.5	0.1	8.1	1.6	51.4	42.2	185.3	14.1	6.2	1.2	2.2
1986	0.1	0.1	3.1	9.9	0.4	16.1	47.2	28.8	5.2	7.6	1.4	2.8
1987	1.9	1.8	0.7	3.1	5.3	41.9	98.4	83.1	45.7	14.1	6.4	0.1
1988	1.6	2.4	1.3	5.9	22.1	19.8	45.1	100.6	61.1	17.3	0.1	1.1
1989	2.1	0.1	0.7	7.0	23.6	68.9	82.2	30.9	17.8	5.2	4.8	3.1
1990	2.9	3.2	0.5	1.3	62.9	83.3	125.4	88.8	54.0	4.6	0.3	0.7

Dondgobi (Mandalgovi)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	1.6	0.1	7.3	5.1	3.2	2.4	28.4	38.4	22.9	3.1	6.6	0.1
1982	0.1	0.1	0.1	0.1	5.1	39.9	61.6	62.6	32.1	0.3	0.7	0.8
1983	0.1	0.1	0.1	0.1	23.7	33.6	35.2	26.9	22.6	2.9	2.7	0.1
1984	0.3	4.4	0.8	0.1	2.2	12.8	37.7	50.8	21.8	6.1	0.1	3.1
1985	0.1	4.9	0.2	5.4	0.1	8.1	69.6	12.1	7.6	0.2	1.1	0.3
1986	0.4	0.1	0.1	0.1	6.4	15.6	39.7	22.1	18.4	1.3	4.6	5.8
1987	1.7	0.9	3.6	1.1	10.2	12.9	26.1	66.3	25.6	22.6	5.1	3.9
1988	2.7	2.6	0.1	1.6	31.9	7.4	15.2	43.4	4.8	8.8	0.1	0.1
1989	0.1	3.2	0.6	5.6	1.2	22.4	37.5	32.1	5.7	0.1	0.6	3.3
1990	0.4	2.2	1.9	2.1	19.0	15.0	52.6	58.0	6.5	5.3	4.9	1.2

Zavhan (Uliastai)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	2.1	1.4	3.4	6.7	9.3	15.1	55.2	87.2	11.9	7.8	6.8	1.6
1982	0.8	0.1	0.9	2.3	9.9	18.1	31.6	20.2	11.9	7.6	7.1	4.2
1983	1.2	1.4	0.3	4.4	31.3	43.3	33.1	70.7	14.1	2.1	6.4	0.6
1984	1.3	4.6	1.3	5.7	5.8	40.1	70.4	70.9	28.4	8.4	0.6	0.6
1985	4.2	2.6	0.9	3.4	26.8	8.2	45.1	37.3	21.7	10.1	4.6	1.7
1986	1.6	0.1	5.4	14.3	12.6	28.8	59.7	67.6	21.7	3.4	3.6	7.8
1987	1.8	1.9	5.1	6.6	8.8	59.6	65.6	70.2	26.2	15.1	10.2	12.3
1988	3.8	3.1	3.1	6.1	45.6	42.3	54.1	6.1	3.4	28.6	3.7	2.1
1989	1.9	3.8	1.6	2.1	10.2	43.7	39.1	53.7	78.4	15.1	5.9	4.4
1990	2.5	7.3	16.8	21.6	9.4	64.7	95.7	82.7	25.6	2.8	8.9	3.7

Ovorhangay (Arvaiheer)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	2.8	1.7	2.8	5.6	5.3	20.6	52.9	79.7	22.3	6.4	9.3	0.6
1982	0.2	0.3	0.2	5.1	1.8	40.7	35.9	83.8	14.6	5.8	2.3	0.6
1983	0.1	0.3	0.1	0.8	12.6	17.2	28.1	119.9	28.9	10.2	3.4	0.1
1984	0.1	0.6	9.2	3.7	3.6	40.2	101.3	56.6	25.3	7.8	0.1	2.3
1985	0.2	4.0	0.4	1.1	13.7	22.2	129.3	58.1	21.2	0.1	0.6	3.7
1986	0.6	0.1	2.2	1.1	14.1	9.6	37.1	52.1	27.1	11.4	10.1	3.6
1987	3.9	0.1	6.9	3.7	9.1	55.4	87.9	75.1	22.1	19.3	10.1	0.7
1988	2.9	5.3	0.2	0.4	41.6	23.1	39.3	45.9	3.7	2.4	3.4	0.1
1989	0.1	7.4	4.3	8.1	17.2	51.1	70.5	61.8	60.1	0.3	0.1	0.1
1990	1.4	4.1	5.3	3.0	45.3	48.0	92.1	53.6	9.8	0.5	0.1	0.1

(continued) **Table I-2.7 Monthly Precipitation by Aimag (1981-1992) (3/4)** (mm)

Omnogovi (Dalanzadgad)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	2.2	0.2	7.4	0.0	9.0	14.6	29.3	39.9	5.3	10.1	2.6	1.3
1982	0.2	0.0	0.1	2.5	2.2	6.4	20.6	28.2	8.3	1.1	1.9	5.1
1983	3.4	0.6	3.8	5.2	3.3	19.6	54.6	50.2	31.0	39.1	1.5	0.2
1984	0.0	1.8	0.4	3.6	11.6	6.4	18.6	12.5	12.7	0.1	3.6	3.0
1985	0.2	0.7	1.9	10.8	1.0	6.3	36.7	8.5	19.0	0.0	3.1	0.3
1986	1.9	2.5	5.2	1.2	0.8	9.1	46.1	14.9	37.0	6.2	3.3	4.1
1987	4.0	0.0	4.1	2.4	16.8	16.8	24.0	10.9	13.7	20.7	0.9	0.6
1988	1.2	0.9	1.3	0.1	12.1	1.5	20.8	31.2	6.1	5.3	0.0	0.2
1989	0.5	0.0	3.3	6.7	3.1	3.4	29.1	14.3	6.9	3.2	1.1	0.8
1990	2.7	0.1	13.1	4.6	21.5	6.4	47.7	23.7	1.4	2.9	0.0	0.4

Sukhbaatar (Baruun-urt)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	0.0	1.7	2.8	14.2	5.8	15.7	30.4	70.8	12.1	11.6	0.5	0.1
1982	0.1	0.2	0.2	0.1	22.0	14.0	71.0	52.1	18.0	2.6	1.5	2.5
1983	0.0	0.4	0.5	0.4	5.0	18.1	81.7	59.5	38.9	0.0	5.3	0.1
1984	0.9	1.1	0.2	0.7	7.5	181.6	49.8	50.0	25.9	2.9	0.2	2.1
1985	0.8	0.9	0.6	7.0	7.3	29.5	107.2	40.2	9.5	2.1	1.1	1.1
1986	1.8	0.0	0.9	0.4	4.5	8.6	69.6	43.3	19.0	5.4	3.1	5.4
1987	2.3	1.1	5.5	0.0	12.8	7.4	52.9	49.0	36.3	12.6	5.8	2.3
1988	0.5	3.5	2.4	6.2	34.7	19.7	26.3	149.1	10.3	11.7	0.4	0.8
1989	3.2	0.9	0.1	13.8	7.0	61.5	79.5	50.2	6.1	1.5	5.0	1.9
1990	2.6	1.0	0.1	3.0	24.7	52.9	160.6	108.4	23.1	0.6	2.4	2.6

Uvs (Ulaangom)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	1.6	1.7	0.9	14.6	0.9	1.0	13.5	29.7	24.5	5.8	11.4	1.3
1982	2.0	0.8	8.9	1.4	7.0	54.4	88.1	34.4	4.0	1.6	9.4	10.0
1983	2.8	0.9	0.4	10.3	1.6	58.4	26.2	21.9	18.8	6.6	2.7	7.9
1984	4.9	0.4	1.1	4.0	5.4	20.6	80.6	26.0	29.5	12.8	7.5	0.9
1985	0.9	3.5	0.0	0.9	25.0	37.0	39.0	46.3	2.5	3.8	10.6	5.6
1986	0.9	1.0	0.2	0.0	0.5	177.0	41.5	19.4	6.8	11.5	8.2	9.8
1987	0.0	5.5	2.1	9.0	7.9	7.7	24.2	33.1	31.4	6.4	7.2	2.2
1988	0.2	2.6	1.2	1.2	5.5	31.0	22.0	1.8	2.4	12.8	6.9	7.7
1989	6.1	0.8	2.4	0.5	0.5	34.1	31.1	9.6	16.8	0.0	15.6	10.3
1990	4.7	0.9	6.4	1.3	3.6	22.0	56.6	56.6	1.0	0.0	5.4	5.4

Hovd (Hovd)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	2.6	0.3	1.2	3.4	1.7	50.3	19.4	30.6	4.7	3.2	6.2	0.1
1982	0.2	0.1	0.3	4.1	11.3	17.4	37.3	6.4	15.1	5.2	1.6	2.8
1983	1.1	1.8	0.1	11.7	2.1	66.2	25.3	29.2	18.6	23.1	3.1	4.7
1984	6.6	2.5	2.6	2.1	4.8	70.4	56.6	36.6	26.7	3.6	0.1	1.1
1985	0.6	0.1	0.4	0.2	1.1	19.6	38.3	9.6	11.3	0.1	0.1	0.1
1986	3.6	0.2	9.2	3.1	7.6	88.8	23.1	17.6	15.1	21.6	10.1	2.6
1987	0.3	0.1	5.4	9.4	16.7	66.1	36.2	9.4	8.4	25.7	2.1	0.1
1988	0.1	4.5	0.2	2.9	2.9	5.8	24.9	16.1	15.1	12.2	1.1	4.1
1989	3.5	1.3	4.8	0.1	8.2	24.9	44.6	30.0	30.7	8.2	1.4	3.1
1990	0.7	4.8	12.4	20.2	1.0	24.9	38.1	29.1	0.1	0.1	0.1	1.4

Hovsgol (Moron)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	2.8	0.8	1.9	6.6	12.3	20.1	24.8	120.7	5.4	3.2	2.4	0.1
1982	0.2	0.1	0.1	0.1	4.8	49.2	71.9	56.4	20.1	1.1	5.1	2.7
1983	0.4	1.9	0.2	3.6	3.8	67.4	87.3	42.6	10.6	0.1	2.6	0.1
1984	0.2	0.7	0.1	0.1	2.2	60.4	102.1	68.8	19.4	1.2	4.2	1.1
1985	0.1	0.8	1.1	8.6	44.6	27.7	34.7	69.8	6.6	4.1	0.1	1.9
1986	1.6	0.9	1.6	25.4	11.8	179.2	120.6	22.7	14.8	11.9	3.4	4.9
1987	0.2	0.6	0.4	5.3	7.9	24.6	64.2	96.3	11.1	11.8	3.1	0.7
1988	0.1	6.4	0.1	3.1	30.3	19.8	16.3	71.6	17.1	7.6	0.1	0.1
1989	4.1	0.3	0.1	4.5	53.6	53.4	45.4	60.5	36.6	0.6	5.5	1.0
1990	0.3	0.3	1.0	18.1	21.5	73.4	109.8	42.1	13.0	2.3	1.3	1.3

(continued) **Table I-2.7 Monthly Precipitation by Aimag (1981-1992) (4/4)** (mm)

Hentiy (Ondorhaan)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	0.3	3.3	7.2	14.1	24.3	9.9	55.9	96.2	30.9	3.1	0.4	2.9
1982	0.6	0.2	0.7	6.1	15.4	30.9	64.1	83.1	6.7	6.9	0.8	2.9
1983	0.1	1.0	2.3	1.1	6.2	29.1	105.6	106.9	36.7	2.1	10.1	0.4
1984	1.2	2.5	3.4	0.2	0.3	60.3	87.9	180.1	29.1	9.8	2.4	4.9
1985	1.9	0.3	0.1	22.1	0.4	30.4	98.7	62.8	4.9	2.9	1.1	1.1
1986	0.8	0.7	3.4	1.6	13.4	36.4	79.6	41.2	4.8	8.8	5.9	7.1
1987	5.2	1.4	6.8	1.9	18.1	35.7	95.4	41.2	32.8	15.1	7.6	1.3
1988	0.2	7.1	0.6	1.2	20.9	55.1	44.2	69.2	25.7	22.3	0.1	1.1
1989	4.0	1.2	1.7	9.0	4.7	44.7	72.8	28.7	24.1	3.9	1.3	4.7
1990	3.7	4.1	1.2	3.2	26.5	65.0	17.0	62.3	21.2	4.5	13.5	1.6

Ulaanbaatar

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	0.6	0.3	15.3	3.7	13.8	25.1	35.4	59.9	29.8	2.9	2.1	0.6
1982	1.9	0.0	0.0	0.0	21.1	64.9	38.9	114.4	6.8	4.7	1.5	2.8
1983	0.1	0.6	0.8	2.6	5.7	113.7	104.3	62.1	26.0	2.6	1.3	0.9
1984	2.1	2.9	0.6	2.5	4.2	25.4	98.2	133.5	47.4	25.8	3.1	1.4
1985	3.2	2.4	1.3	19.5	6.7	71.5	56.5	31.0	9.5	9.6	2.3	0.6
1986	2.1	0.6	6.9	14.1	8.3	95.1	87.7	112.8	2.8	18.0	6.0	6.8
1987	3.3	1.4	5.6	1.2	12.5	28.5	58.5	78.6	29.1	13.4	7.7	2.0
1988	1.0	6.0	1.4	2.8	38.5	75.9	51.0	135.4	40.7	10.6	1.0	1.5
1989	3.7	2.2	3.1	8.4	7.6	25.8	40.4	52.3	17.6	12.7	0.5	3.6
1990	1.8	1.7	5.9	2.6	6.1	52.7	82.5	84.6	44.4	5.3	12.0	10.0

Govi-Sumber (Choir)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1981	1.7	0.1	1.6	0.1	3.7	21.1	53.4	54.7	22.8	2.6	1.6	0.4
1982	0.2	0.3	0.2	1.8	1.1	13.8	59.1	35.3	0.8	13.3	5.2	1.1
1983	0.4	3.1	0.1	0.6	4.1	85.6	72.1	66.2	25.1	1.1	7.3	3.1
1984	0.2	1.7	1.1	4.9	6.3	27.6	49.4	83.9	20.1	6.8	0.1	1.3
1985	1.7	4.2	0.1	17.8	1.9	21.1	44.9	36.8	10.1	1.2	1.1	0.1
1986	0.4	1.5	4.3	7.4	5.6	62.3	78.8	18.6	41.1	3.6	5.4	4.8
1987	1.8	2.4	3.6	0.1	19.8	17.4	66.8	34.7	43.1	24.6	9.9	3.6
1988	0.6	2.2	0.1	1.2	18.6	21.3	17.2	90.1	11.2	6.6	0.1	1.1
1989	1.2	3.4	2.6	9.7	5.5	25.4	60.2	22.2	21.0	1.4	0.7	7.2
1990	1.8	4.4	4.2	6.9	17.6	12.4	122.0	62.3	18.4	10.3	31.9	0.7

source:Hydrometeorological Research Institute

Table I-2.8 Monthly Wind Velocity by Aimag (Average of 30 years;1961-1990)

(m/sec)

Aimag	Station	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	average
Arhangay	Tsetserleg	2.1	2.4	2.9	3.6	3.2	2.4	2.0	1.9	2.2	2.4	2.5	2.3	2.5
Bayan-Olgiy	Olgii	2.2	2.4	2.7	3.6	3.8	2.9	2.4	2.5	2.5	2.9	3.1	2.1	2.8
Bayanhongor	Bayanhongor	2.6	2.7	2.9	3.7	3.6	3.1	2.7	2.5	2.6	2.6	2.8	2.7	2.9
Bulgan	Erdenet-ovoo	1.8	1.9	2.2	2.9	2.7	2.0	1.5	1.6	1.8	2.1	2.2	2.0	2.1
Gobi-Altay	Altai	2.5	2.8	3.3	4.6	4.5	3.7	3.2	3.2	3.3	3.6	3.6	2.7	3.4
Dornogobi	Sainshand	3.7	3.9	4.8	5.8	5.6	4.9	4.1	3.8	3.7	3.8	4.0	4.0	4.3
Dornod	Choibalsan	3.9	3.6	4.3	5.3	5.0	3.9	3.1	3.0	3.6	3.8	3.8	4.0	3.9
Dundgobi	Mandlgobi	3.8	4.1	4.8	5.9	5.9	5.1	4.3	3.8	3.9	3.7	3.9	3.8	4.4
Zavhan	Uliastai	0.7	0.9	1.4	2.2	2.2	1.9	1.5	1.4	1.3	1.2	0.8	0.7	1.4
Ovorhangay	Khujirt	2.9	3.4	4.2	5.2	5.2	4.3	3.6	3.4	3.7	3.8	3.6	3.1	3.9
Omnogovi	Dalanzadgad	2.4	2.9	3.9	5.2	5.1	4.1	3.6	3.3	3.2	3.1	3.1	2.5	3.5
Suhbaator	Baruun-urt	3.0	3.1	3.7	4.9	4.8	4.0	3.4	3.0	3.4	3.4	3.3	3.2	3.6
Selenge	Orkhon	1.5	1.6	2.3	3.2	3.1	2.6	2.1	2.1	2.2	2.1	2.0	1.7	2.2
Tov	Zuunmad	1.7	2.0	2.7	3.9	3.7	3.0	2.5	2.2	2.6	2.3	2.1	1.8	2.5
Uvs	Ulaangom	0.7	0.8	1.0	1.8	2.2	1.9	1.5	1.5	1.5	1.4	1.2	0.8	1.4
Hovd	Khovd	0.7	1.0	1.5	2.3	2.4	2.0	1.4	1.4	1.6	1.6	1.3	0.7	1.5
Hovsgol	Moron	1.1	1.6	2.6	3.4	3.3	2.5	1.9	1.7	1.9	1.9	2.0	1.4	2.1
Hentiy	Ondorhaan	3.4	3.2	3.9	4.9	4.4	4.0	3.2	2.8	3.3	3.3	3.4	3.7	3.6
U.B.	UB-Takhilt	1.6	2.1	2.9	3.9	4.4	3.5	3.1	2.8	2.9	2.6	2.0	1.6	2.8
Govi-Sumber(Choir)	Govi-Sumber(Choir)	2.7	2.8	3.3	4.3	4.1	3.5	2.9	2.7	3.0	2.9	2.7	2.6	3.1

source: Hydrometeorological Research Institute

Table I-2.9 Monthly Wind Velocity by Aimag (1981-1990) (1/4)

(0.1m/sec)

Arhangay (Tsetserleg)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	14	26	29	32	27	24	21	19	20	26	19	21
1982	15	14	28	31	30	23	18	14	17	20	18	26
1983	15	21	28	47	38	32	25	24	31	20	24	22
1984	22	29	34	47	36	27	21	22	26	31	27	25
1985	31	19	33	37	28	26	22	19	21	23	27	23
1986	21	23	30	41	29	31	28	22	23	30	23	21
1987	36	29	31	39	38	35	23	25	30	30	31	34
1988	25	24	35	50	33	32	25	18	23	27	29	22
1989	21	18	41	37	34	23	26	23	24	25	18	19
1990	23	19	24	39	34	25	17	16	24	21	23	22

Bayan-Olgiy (Olgiy)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	7	15	24	28	26	18	24	12	22	24	18	11
1982	15	16	30	21	27	19	15	16	22	28	20	15
1983	13	15	17	35	34	16	18	13	31	12	18	11
1984	5	12	23	43	35	25	19	15	18	23	30	24
1985	18	17	26	34	37	27	20	18	22	40	43	22
1986	21	24	31	39	42	35	26	23	22	27	10	26
1987	30	23	20	41	33	27	24	27	41	34	50	33
1988	28	27	20	32	44	44	33	25	23	41	42	20
1989	29	30	30	48	37	29	31	31	34	31	27	29
1990	31	29	27	37	40	33	26	27	31	30	45	30

Bayanhongor (Bayanhongor)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	20	29	27	25	38	28	25	20	27	28	15	30
1982	22	24	32	34	40	37	32	17	23	20	27	25
1983	27	31	32	43	36	35	28	22	29	20	27	24
1984	20	24	27	42	30	35	26	26	24	25	32	37
1985	35	28	27	27	24	27	18	22	17	16	14	17
1986	26	31	32	45	42	33	27	24	18	24	25	32
1987	35	28	24	25	35	31	29	20	25	19	23	24
1988	23	22	23	39	33	37	35	19	22	19	25	22
1989	24	25	30	38	38	35	27	27	20	18	25	21
1990	23	22	23	38	32	37	27	27	30	27	28	29

Bulgan (Bulgan)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	15	23	34	34	32	22	14	15	22	23	14	26
1982	12	16	21	24	35	25	18	14	16	14	8	12
1983	8	13	15	28	22	14	14	8	13	10	11	11
1984	16	21	23	29	25	17	14	14	12	16	9	15
1985	10	10	20	27	20	16	10	11	10	10	12	12
1986	10	14	21	35	23	20	11	15	14	17	16	13
1987	15	12	21	25	26	24	21	13	16	16	17	17
1988	20	16	21	35	22	19	16	14	16	16	16	8
1989	11	14	26	28	27	20	21	19	13	21	16	14
1990	12	13	16	28	33	25	17	13	16	12	13	14

Gobi-Altay (Altay)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	20	28	34	41	40	31	36	45	43	42	25	20
1982	21	20	41	35	46	32	27	31	32	32	28	24
1983	23	25	30	60	60	32	32	26	37	31	27	16
1984	12	26	28	59	50	36	43	36	38	40	50	28
1985	26	28	35	45	50	44	27	25	27	38	34	17
1986	26	19	24	41	40	41	29	33	35	37	24	31
1987	33	26	39	45	45	41	29	36	41	35	56	30
1988	27	28	17	46	45	45	38	22	25	37	23	17
1989	21	24	31	49	35	33	32	31	33	33	29	23
1990	23	35	31	47	41	29	28	32	33	38	46	23

(continued)

Table I-2.9 Monthly Wind Velocity by Aimag (1981-1990) (2/4)

(0.1m/sec)

Dornogobi (Sainshand)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	28	34	47	59	50	50	43	44	44	57	64	45
1982	42	43	53	50	68	51	47	38	55	35	36	43
1983	35	50	45	77	59	64	44	44	43	36	39	36
1984	41	48	51	60	50	58	45	49	45	53	46	49
1985	41	47	63	60	54	56	49	39	43	40	47	45
1986	47	42	52	69	49	44	41	43	38	40	48	37
1987	43	44	52	50	60	57	47	45	44	51	49	48
1988	61	57	59	73	68	59	48	40	37	46	43	37
1989	31	41	60	55	67	59	49	53	45	50	38	30
1990	37	37	49	69	64	59	56	41	49	29	38	39

Dornod (Choibalsan)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	31	26	28	48	50	32	28	32	31	50	32	42
1982	39	23	43	52	54	30	30	23	40	38	41	43
1983	47	38	30	64	53	38	30	32	35	33	42	37
1984	40	44	40	53	46	50	37	32	43	34	35	43
1985	30	23	53	57	40	32	32	33	40	37	40	38
1986	38	42	36	63	46	44	38	34	36	42	56	38
1987	42	42	43	46	44	48	30	23	34	45	39	47
1988	47	37	45	59	54	38	35	29	29	35	44	34
1989	30	30	54	48	47	44	27	30	31	39	31	26
1990	33	24	33	57	50	39	29	26	30	19	34	35

Dundgobi (Mandalgovi)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	47	46	53	62	65	53	49	42	38	42	39	44
1982	38	27	48	56	72	51	44	42	46	40	34	42
1983	35	47	44	72	59	60	39	42	47	33	40	28
1984	51	40	42	53	48	52	39	41	33	34	29	46
1985	39	37	51	55	52	57	38	38	39	36	50	43
1986	45	49	49	65	52	52	45	44	40	46	49	38
1987	31	34	47	51	52	56	47	38	42	35	41	43
1988	42	44	51	66	58	44	46	35	29	41	40	40
1989	25	35	66	52	62	56	51	42	48	52	41	24
1990	28	36	52	75	61	67	55	39	47	30	40	31

Zavhan (Uliastai)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	10	13	14	24	24	17	12	8	15	16	12	8
1982	8	11	17	17	22	14	13	11	9	10	6	6
1983	4	6	8	27	25	21	17	12	16	8	6	5
1984	6	8	15	22	29	18	15	10	10	10	10	6
1985	4	10	12	17	12	18	14	10	7	9	8	4
1986	7	9	9	20	17	17	17	11	9	15	10	9
1987	9	10	20	23	26	24	14	9	17	14	9	7
1988	9	9	11	18	14	12	13	15	12	11	5	3
1989	3	3	9	19	19	19	16	15	13	11	10	6
1990	11	7	13	23	20	15	11	13	13	11	10	7

Ovorhangay (Arvaiheer)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	34	43	46	50	46	38	32	33	40	49	29	39
1982	21	20	37	46	55	47	40	32	32	35	34	35
1983	30	37	43	59	45	42	34	30	34	29	26	26
1984	29	28	38	50	42	40	34	38	32	39	39	26
1985	30	26	40	54	52	45	38	32	33	43	46	29
1986	29	39	41	57	44	41	46	34	33	45	32	29
1987	35	29	46	45	49	49	33	34	37	26	40	27
1988	25	36	40	56	52	38	34	29	33	37	28	27
1989	26	30	54	50	51	38	32	29	36	42	29	22
1990	18	26	33	53	46	37	27	22	28	25	33	20

(continued) **Table I-2.9 Monthly Wind Velocity by Aimag (1981-1990) (3/4)** (0.1m/sec)

Omnogovi (Dalanzadgad)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	25	33	47	44	54	36	35	34	37	43	30	28
1982	19	18	45	46	62	42	40	34	38	999	999	999
1983	24	27	35	71	53	49	40	31	38	28	24	22
1984	22	26	42	55	42	38	33	39	35	35	33	29
1985	31	27	44	60	51	46	42	34	29	28	33	21
1986	22	24	35	55	44	42	35	36	28	45	29	23
1987	25	33	42	44	50	47	43	34	40	36	45	28
1988	34	34	38	61	56	48	41	34	27	30	29	24
1989	22	23	44	51	44	39	38	34	32	33	24	21
1990	24	35	34	59	55	47	42	32	32	29	33	25

Sukhbaatar (Baruun-urt)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	34	33	40	50	46	42	38	30	34	39	35	38
1982	30	26	51	44	49	41	34	30	38	39	37	39
1983	33	30	32	62	54	52	38	33	31	37	34	28
1984	29	26	34	54	36	42	25	36	35	28	36	30
1985	23	26	42	45	43	36	29	25	36	32	24	16
1986	23	27	33	52	35	39	31	25	33	35	33	28
1987	35	30	28	33	39	36	31	24	32	36	35	35
1988	35	32	38	51	52	45	41	27	30	33	38	29
1989	32	36	47	50	48	42	30	31	30	42	29	25
1990	32	29	29	48	47	42	41	27	35	26	36	35

Uvs (Ulaangom)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	4	8	10	17	18	13	16	10	12	12	7	5
1982	4	8	10	24	23	20	17	12	18	8	12	2
1983	5	6	12	20	26	22	20	20	18	15	20	8
1984	2	4	5	20	21	18	14	12	15	12	9	6
1985	4	4	9	20	23	15	11	12	13	15	9	3
1986	5	7	6	14	19	18	13	13	17	19	7	6
1987	7	7	11	16	24	19	20	15	12	14	17	10
1988	6	10	11	21	25	18	16	17	21	18	17	10
1989	10	12	14	19	25	21	20	22	18	19	17	8
1990	10	11	12	26	27	27	25	19	19	19	16	9

Hovd (Hovd)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	4	6	17	24	22	16	14	8	17	13	5	2
1982	1	3	11	13	16	11	8	9	9	9	4	2
1983	1	3	9	25	32	8	9	9	19	5	3	1
1984	0	4	12	25	21	17	8	8	12	10	9	5
1985	0	2	6	19	16	18	10	10	7	16	14	0
1986	3	5	8	17	21	15	9	12	14	15	7	8
1987	6	2	5	19	18	9	6	9	12	10	15	8
1988	4	2	5	16	20	15	10	6	8	13	6	3
1989	1	3	10	22	14	10	9	7	13	11	2	6
1990	4	6	7	11	16	14	10	7	8	7	11	1

Hovsgol (Moron)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	0	12	20	24	29	22	22	16	16	18	7	11
1982	8	5	24	26	35	19	19	14	22	20	11	15
1983	4	8	17	47	35	26	16	19	24	18	15	12
1984	16	25	31	48	29	25	23	18	16	27	17	16
1985	21	14	30	36	26	21	22	18	22	16	16	12
1986	15	11	28	39	31	20	15	18	16	19	24	13
1987	16	19	31	33	39	30	19	17	27	23	21	16
1988	13	20	30	44	35	33	33	22	18	20	20	12
1989	5	5	34	34	34	24	22	17	21	22	12	6
1990	6	18	17	32	29	20	17	14	18	15	15	16

(continued) **Table I-2.9 Monthly Wind Velocity by Aimag (1981-1990) (4/4)** (0.1m/sec)

Hentiy (Ondorhaan)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	30	32	38	50	48	40	29	26	28	35	31	39
1982	32	30	38	40	48	36	27	25	29	29	27	37
1983	35	28	29	55	47	48	35	36	28	32	32	35
1984	33	29	30	49	49	48	34	32	33	30	34	33
1985	26	22	42	51	41	36	29	24	38	33	32	35
1986	31	34	39	56	42	39	28	28	33	32	41	38
1987	36	39	45	39	36	45	29	28	42	38	36	46
1988	45	39	48	50	46	39	32	22	26	34	37	33
1989	34	38	48	46	40	30	38	32	43	35	32	32
1990	35	33	32	53	48	42	37	28	34	29	35	39

Ulaanbaatar

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	13	24	36	44	45	43	36	25	24	34	20	13
1982	16	19	32	40	42	40	35	29	31	21	17	15
1983	15	20	24	43	46	34	26	26	29	20	17	10
1984	19	15	26	36	88	36	26	30	32	30	23	23
1985	15	26	31	38	42	35	32	32	31	28	26	16
1986	15	21	29	37	36	33	25	26	23	30	18	18
1987	13	18	23	29	28	29	24	20	30	24	20	12
1988	16	19	25	33	32	33	31	28	24	25	17	15
1989	15	18	31	41	45	34	30	30	31	27	19	18
1990	17	23	24	47	37	34	27	21	27	21	19	16

Govi-Sumber (Choir)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Dec.	Nov.
1981	19	23	27	34	36	30	19	22	26	36	22	17
1982	13	14	29	30	43	31	22	19	29	18	17	21
1983	21	24	28	53	42	41	25	24	24	21	20	15
1984	21	19	27	39	40	34	26	25	27	23	21	15
1985	24	22	35	36	32	30	27	22	30	25	27	26
1986	23	28	30	44	28	28	19	22	21	33	21	17
1987	22	25	28	31	36	35	25	24	32	23	24	23
1988	29	26	31	45	50	42	44	24	30	38	37	31
1989	32	28	38	37	41	42	34	36	35	34	27	21
1990	24	22	27	52	37	37	32	24	30	16	23	16
1991	17	24	22	35	44	25	28	32	26	25	28	13

source : Hydrometeorological Research Institute

Table I-3.1 Resources of Surface Water and Ground Water in Mongolia

Name of Aimag	Surface water		Ground water		
	Area	Water resources	Total recharge	Discharge to river	Available resources
	(1,000 km²)	(million m³/year)	(million m³/year)	(million m³/year)	(million m³/year)
Arhangai	55	2,650	1,060	530	530
Bayan Olgii	46	2,900	1,050	520	530
Bayan hongor	116	1,510	620	310	310
Bulgan	49	1,160	690	340	350
Govi Altai	142	810	400	200	200
Dornogovi	111	110	140	70	70
Dornod	124	700	690	340	390
Dundgovi	78	100	120	60	60
Zavhan	82	2,980	940	470	470
Ovorhangai	63	1,060	640	320	320
Omnogovi	165	140	140	70	70
Suhbaatar	82	120	170	80	90
Selenge	43	2,880	770	380	390
Tov	83	3,400	990	500	490
Uvs	69	1,210	230	120	110
Hovd	76	1,630	250	130	120
Hovsgol	101	7,100	1,950	980	970
Hentii	82	2,270	1,200	600	600
Total	1,567	32,730	12,050	5,980	6,070

Data source: Irrigation rehabilitation project, phase 1 preparation report, FAO, 1993

Figures

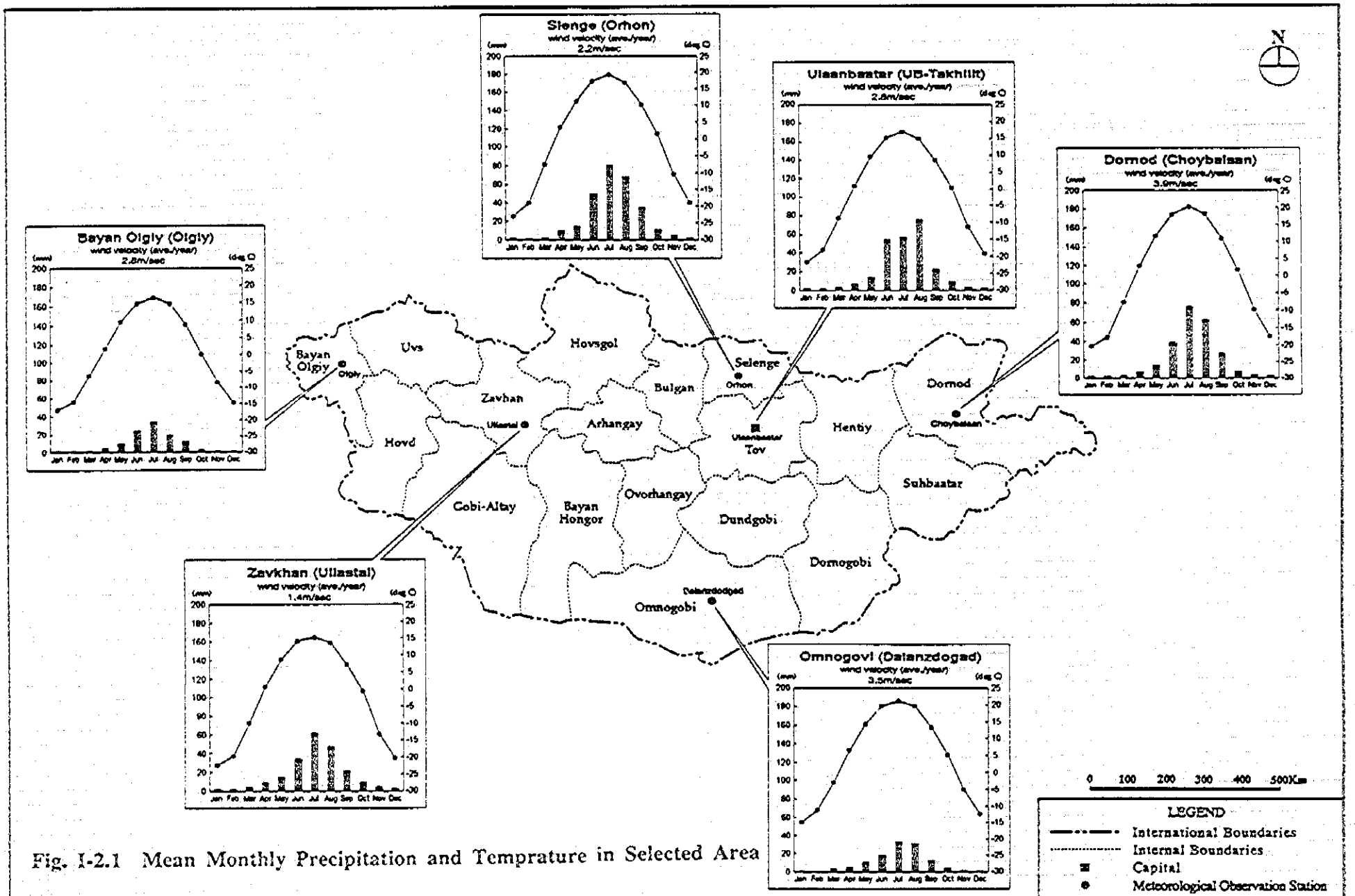


Fig. I-2.1 Mean Monthly Precipitation and Temprature in Selected Area

Source : Hydrometeorological Research Institute

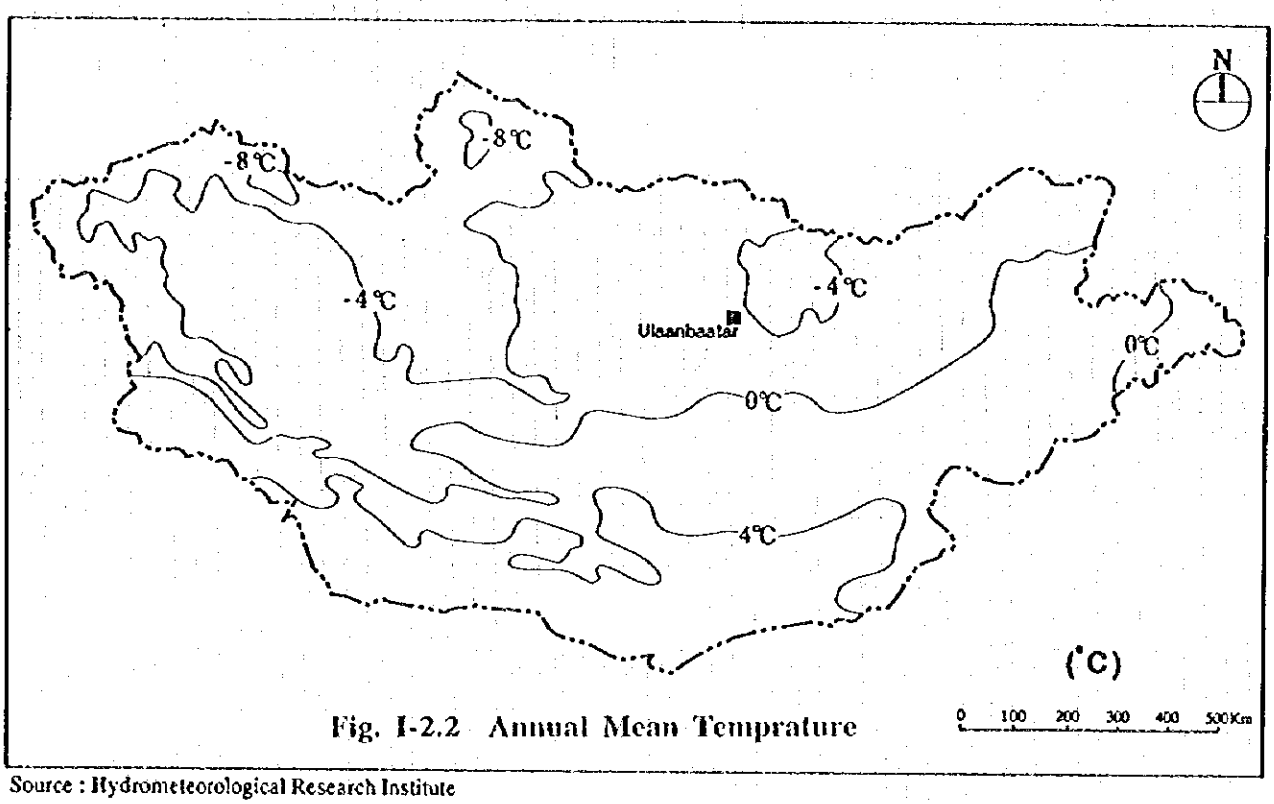


Fig. I-2.2 Annual Mean Temprature

Source : Hydrometeorological Research Institute

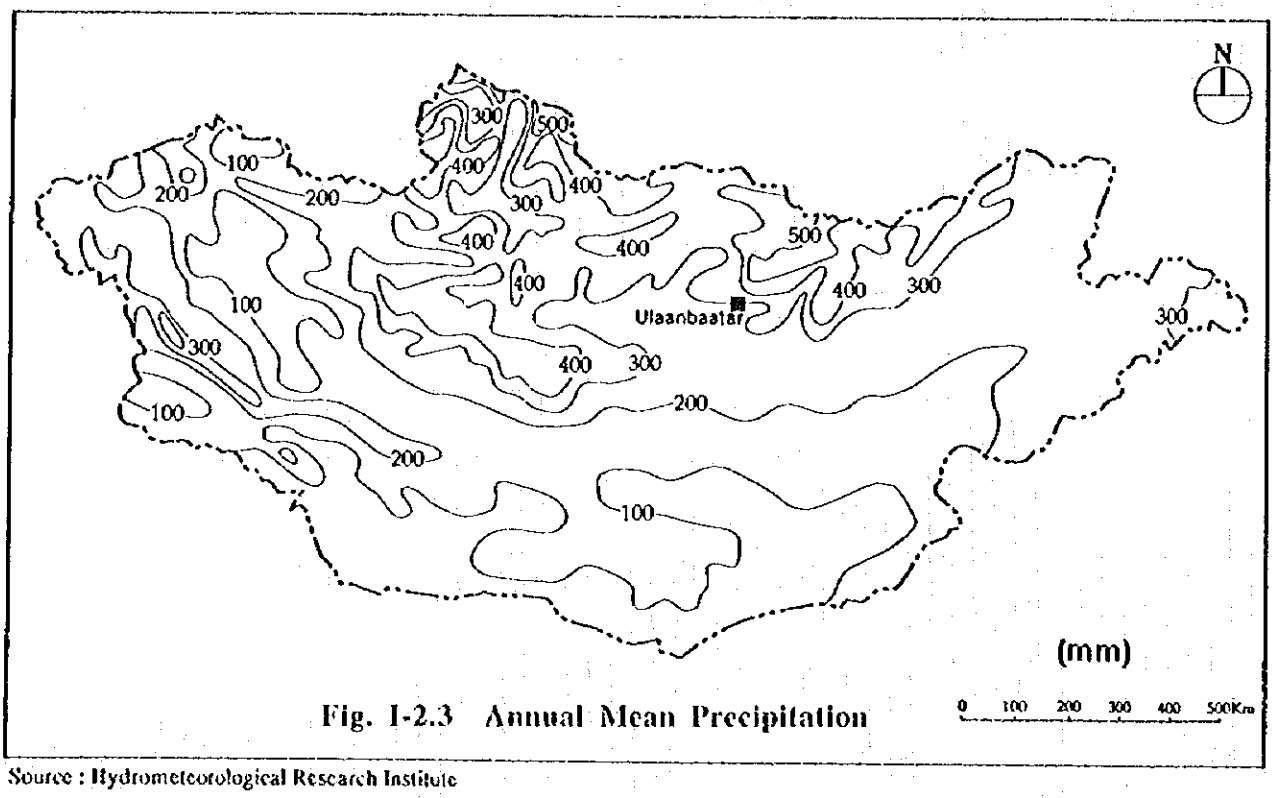


Fig. I-2.3 Annual Mean Precipitation

Source : Hydrometeorological Research Institute

Appendix-II

Agricultural Production

APPENDIX II
AGRICULTURAL CONDITION

Table of Contents

List of Tables

List of Figures

APPENDIX II

AGRICULTURAL CONDITION

1. LAND USE

The current conditions in land use are shown below. Natural grassland comprises 78 % of the total national land area.

Conditions in Land Use (1992)

	Area (1,000ha)	Ratio (%)
Total land area	156,650	100.0
Agricultural land	123,600	78.9
Arable land	1,363	0.9
Natural Pasture	122,227	78.0
Forest	14,400	9.2
Others	18,650	11.9

source: Institute of land policy

The area of agricultural land, including both natural grassland and cultivated land , for the past 35 years from 1960 to 1995 is shown in the table below. As can be seen, 98 % of the total agricultural land area consist of natural grassland and the area of cultivated land is only 1 %. However, the area of natural grassland has been decreasing annually , while the rise in cultivated land area has been prominent in the recent years. The figure for 1995 was approximately five times higher than that of 1960 statistics.

Transition of Agricultural Land Area (unit 1,000 ha)

		1960	1970	1980	1985	1990	1995
1. Arable land	sown area	265	455	704	790	788	373
	fallow and abandoned land	267	289	478	564	583	949
	subtotal	532	744	1,182	1,354	1,371	1,322
2. Natural pasture		140,151	139,939	123,405	123,233	124,285	117,147
total		140,683	140,683	124,587	124,587	125,656	118,469

source: National Economy of the MPR for 70 years.

2. AGRICULTURAL PRODUCTION

2.1 General

Full-scale production of field crops in Mongolia began shortly after World War II when the state farms were built with the assistance of the former Soviet Union. As a result, the ratio of the total production volume in the field husbandry division of the agricultural and livestock sector rose from 0.5% to 15%, and the production volume of wheat in 1960 reached self-sufficiency levels. This was followed by the introduction of large-scale farms which mainly produced wheat and feed crops; and natural grassland was converted to cultivated land with the

technical and financial assistance from the COMECON countries. The volume cereals production in the latter half of the 1980s increased about 3.5 times more than 1960 levels.

The agricultural sector under the planned economy was managed by the state farms and the Negdels, and in 1985 nearly 80 % of the total cultivated land area in Mongolia was managed by the state farms. The entire production process at the state farms, from ploughing, sowing, to harvesting, was carried out by machinery; and all farm inputs such as machinery, fuel, fertilizer, pesticides, etc. were imported from the former Soviet Union and provided at low prices due to government subsidies.

Transitions in the number of state farms and Negdels are shown in the table below.

Transitions in the Number of State Farms and Negdels

		1940	1960	1970	1980	1985	1990
State farms	total no. of state farms	10	25	42	62	69	73
	general	10	25	32	49	52	53
	fodder production	-	-	10	13	17	20
	sown area (1,000 ha)	-	205.8	342.8	556.9	636.4	n.a.
Negdels	no. of Negdels	91	354	272	255	255	255
	sown area (1,000 ha)	-	59.7	111.8	147.1	153.2	n.a.
Other agricultural organization and enterprises		-	17	17	17	28	26
Total no. of agricultural enterprises		101	396	331	345	352	356

source: Central Statistical Board of the MPR

In conjunction with the transition from a planned economy with 70 year history to a market oriented economy in 1991, the state farms which were the nucleus of agricultural crop production were dissolved and privatized to companies in the private sector. Since 1990, import and use of agricultural inputs such as fertilizer, agrochemical products, have been reduced due to limited access to credit and non-availability of foreign exchange in Mongolia. As a result, currently the majority of the companies face shortage of agricultural supply, and production of field crop has declined sharply since 1991.

2.2 Agricultural Regions

The land area in Mongolia is divided into the five agricultural regions of the Mongolian Altay, Khangai Khövsgol, Selenge Onon, Central and Eastern Steppe, and Gobi Desert as shown in Fig. II-2.1. Agricultural characteristics of the region are shown below.

Agricultural Regions in Mongolia

Region	Location/Area	Natural Conditions	Cultivated Crops
Mongolian Altay	Western Alpine Zone, 11% of the total land area	Altitude: 1,750-4,250 m Annual mean temperature: -1.25 °C Annual mean precipitation: 450 mm Frost free period: 70-130 days Content of organic matter: 0.8-3.0%	Cultivation of irrigated fruit trees in the southern Altay region, watermelons, tomatoes, cucumbers, melon
Khangai Khövsgul	Located in the northwestern region, high altitude forest belt, deep valleys, many lakes, marshes	Altitude: 2,000-3,000 m Annual mean temperature: -6 °C - -1 °C Annual mean precipitation: 200 mm Frost free period: 70-100 days Content of organic matter: 0.8-3.0%	Suited for early ripening grains and fodder crop cultivation
Selenge Onon	Located in the north central region, contains Töv, Selenge Bulgan provinces, encompasses 17% of total national land area; is a flat, sloping valley area, major grain belt	Average altitude: 1800m Annual men temperature: -3.75 °C Annual mean precipitation: 300 mm Frost free period: 90-110 days Content of organic matter: 1.8-2.5%	The nation's largest grain producing valley; cultivation of cereals such as wheat, etc. Cultivation of vegetables such as potatoes, etc. through rainfall
Central and Eastern Steppe	Spacious plateau belt extending from the central to eastern region, encompasses 18% of total national land area	Average altitude: 800-1,450m Annual mean temperature: 1.25 °C Annual mean precipitation: 200 mm Frost free period: 130-225 days Content of organic matter: 4-5 %	Grain and fodder crop cultivation using rainfall in the eastern area.
Gobi Desert	Dry grassland belt running from the southern to western regions, encompasses 38% of total national land area	Average altitude: 850-1,150 m Annual mean temperature: 1.25 °C Annual mean precipitation: less than 100 mm Frost free period: more than 130 days Content of organic matter: 0.5 - 0.8%	Cultivation of vegetables such as celery, melon , etc. through irrigation

2.3 Crop Yield and Production

2.3.1 General

As explained in section I-2 "Climate", the short growing period of crops accrued from the severe low temperature, low precipitation, occurrence of unseasonal frost, strong wind, etc., is the most crucial constraint for agricultural production. Wider selection of crops and crop production are hindered in Mongolia.

The total land area cultivated by crops is equivalent to a mere 1 % of the total national land area of Mongolia. The main crops are (i) wheat, followed by (ii) other cereals such oat, barley and etc., (iii) fodder crops, (iv) potatoes and (v) vegetables such as tomatoes, onions, cabbage and carrots. Most of the crops are under rainfed condition with the exception of vegetables.

After the transition into the market economy from the planned economy, production of these crops have been drastically reduced. The production of crops in the recent years became about less than 30 % of that of the planned economy period. The main causes are reducing of the cultivated area and a decrease of the yield of the crops. The cultivated area in 1995 decreased to 4 to 60 % of that in 1989, the last year of the centrally planned economic period. Also the yield of the crops in 1995 became about 50 to 80 % of that in 1989. It is considered that these drastically reduced crop productions are because after the collapse of the COMECON, most of farm inputs such as fertilizers, chemicals, improved seeds, farm machinery and materials were not imported and effective management of farms was not undertook after privatization of the state farms.

2.3.2 Cropped Area

Transitions in the total cropped area of the major crops for the past ten years (1986-1996) are given in Table II-2.1. Details of the cropped area of wheat, potato, vegetables and fodder crops are shown in Tables II-2.2 to II-2.5. The total cropped area of all the crops has been decreasing since 1989 and it became 373,000 ha in 1995 or about 45 % of that of 1989 or about 28 % of the total arable land (1,322,000 ha).

Cereals occupied 97 % of the total cropped area, followed by potatoes (1.6 %), fodder crops (1.6 %), and vegetables (0.8 %).

2.3.3 Production and Yield

The production and yield of the crops from 1986 to 1996 in Mongolia are shown in Table II-2.1. Details of the production and yield of wheat, potato, vegetables and fodder crops are shown in Tables II-2.2 to II-2.5. The unit yield of the crops from 1961 to 1995 is illustrated in Fig. II-2.2.

The production of wheat and potatoes, the major farm products, kept relatively stable until 1989, but the cropped area for these products has begun to decrease since then. These are shown in Figs. II-2.3 to II-2.6. The production of wheat began to fall from 1990 and it became 213,000 tons in 1996 or one-third of the 1990 production levels. The total production of potatoes reached a peak in 1989 and was 41,000 tons in 1996 or 28 % of the 1989 level. The total production of vegetables often sharply fluctuated. It, however, has decreased since 1990 and was 19,000 tons or 32 % of a peak production level in 1989. With respect to the fodder crop production, the total production in 1995 was only 19,000 tons or 3 % of the production level in 1989.

The unit yield of the crops in 1989, the last year of the centrally planned economic year, was 1.3 tons/ha for wheat, 12.3 tons/ha for potatoes, 14.1 tons/ha for vegetables and 3.7 tons/ha for fodder crop. They all showed a stable increase from 1969. But it dropped sharply since then. The yield of wheat, potatoes, and vegetables and fodder crop was 0.7 tons/ha or 58 % of that in 1989, 8.3 tons or 67 %, 8.4 tons/ha or 67 % and 3.1 tons/ha or 83 %, respectively.

2.4 Cropping Pattern and Farming Practices

Until 1990, import and supply of farm inputs were carried out by the Agricultural Supply Service (ASS) under the control of the Ministry of Food Agriculture. Farm inputs such as fertilizer, chemicals, seeds, machinery equipment were imported from the Federation of Soviet Union based on the planned production targets for each state farm. However, neither fertilizer nor chemicals have been imported since 1991, apart from quantities provided under the foreign financed projects. Also seed production system has largely collapsed since 1990 and most farms now prefer to save their own seed rather than purchase it from seed farms.

2.4.1 Wheat

Sowing is done at the beginning of May in general and harvest is carried out in the middle of September. The varieties of wheat are selected out of the imported varieties and registered by Ministry of Agriculture and Industry. However, most of the seeds used now have not been replaced since 1990 and the quality of seeds was deteriorated.

In general, wheat is cultivated without irrigation. A wheat-fallow rotation system is practiced with either wheat for two years followed by bare fallow in the third year, or wheat and fallow

in the alternate years as shown below: The main purpose of fallow is to conserve soil moisture and maintain soil fertility.

Typical Rotation System in Wheat Farm

a. wheat(1 year)+fallow(1 year) (cultivated area 5,000 ha)

field	area(ha)	1st year	2nd year	3rd year	4th year	5th year	6 th year	7th year
A	2,500	wheat	fallow	wheat	fallow	wheat	fallow	wheat
B	2,500	fallow	wheat	fallow	wheat	fallow	wheat	fallow

b. wheat (2 year)+fallow (1 year) (cultivated area 5,000 ha)

field	area(ha)	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year
A	2,500	wheat	wheat	fallow	wheat	wheat	fallow	wheat
B	2,500	fallow	wheat	wheat	fallow	wheat	wheat	fallow

Before 1990 the scale of the state farms were 5,000 ha on an average, ranging from 20,000 to 30,000 ha. Still now the cropping pattern for wheat is almost same as that applied to the state farm period. However, the present wheat farms face several difficulties such as low productivity due to no supply of fertilizer and chemicals, the loss of production during the harvest and storage period, lack of agricultural equipment and its spare parts, no countermeasure for climatic damage, and so forth.

2.4.2 Potato

The production of potato is second to wheat production and it is an important crop due to high storage quality and processing suitability.

The seed of potato used were two varieties which were registered in the Ministry of Agriculture and Industry. One is the imported variety from Germany and the other is selected in Mongolia. Seed of potato has not been renewed since 1991 and the seed quality was much deteriorated.

Potato is sown from the beginning to the middle of May. Harvest for the early maturing variety is done from the end of August to the beginning of September. The late maturing variety is harvested from the beginning to the middle of September. In general, potato is cultivated on the middle scale farm in rotation system with wheat cultivation and fallow as shown below:

Typical Rotation System in Potato Farm

potato and wheat (cultivated area 300 ha)

field	area(ha)	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year
A	100	potato	wheat	fallow	potato	wheat	fallow	potato
B	100	wheat	fallow	potato	wheat	fallow	potato	wheat
C	100	fallow	potato	wheat	fallow	potato	wheat	fallow

There are problems of a high rate of the seed potato loss during winter due to decrepit storage facility and a large annual fluctuation of sown area and production due to incidence of disease and insect.

2.4.3 Vegetables

Vegetable cultivation is divided into two types consisting of (i) open field cultivation and (ii) green house cultivation. Main vegetables of open cultivation are cabbage, carrot, onion, leek and garlic. Fruit vegetables such as cucumber, tomato, water melon and melon are cultivated in the greenhouse with heating or without heating. In case of open cultivation, planting or sowing

are practiced from the beginning of May to the beginning of June when the risk of frost damage is decreased. In case of the protected cultivation, sowing and nursing start at the end of March.

There are vegetable companies which were privatized from state farms with 50 to 60 ha scale. In addition recently some private small farms with 1 to 3 ha scale are increasing. A rotation system is applied in the private farms as shown in the following table.

Typical Rotation System in Vegetable Farm

a. open field cultivation farm (cultivate area 1 ha)

field	area(ha)	1st year	2nd-year	3rd year	4th year	5th year	6th year	7th year
A	0.2	cabbage	radish	carrot	onion	leek	cabbage	radish
B	0.2	radish	carrot	onion	leek	cabbage	radish	carrot
C	0.2	carrot	onion	leek	cabbage	radish	carrot	onion
D	0.2	onion	leek	cabbage	radish	carrot	onion	leek
E	0.2	leek	cabbage	radish	carrot	onion	leek	cabbage

b. green house cultivation farm (cultivated area 3 ha)

field	area(ha)	1st year	2nd-year	3rd year	4th year	5th year	6th year	7th year
A	1.5	cucumber	tomato	cucumber	tomato	cucumber	tomato	cucumber
B	1.5	tomato	cucumber	tomato	cucumber	tomato	cucumber	tomato

3 LIVESTOCK PRODUCTION

3.1 General

The five major types of livestock animals that are suited to the country's natural conditions, are cattle, horse, camel, sheep, and goat. Their composition, distribution density, etc. varies depending on the agro-ecological characteristics of the five regions as shown in Fig. II-3.1. Generally, livestock are distributed mainly in the central, northern, and western regions and they are fewer in number in the southern dry belt and the eastern regions. In addition, intensive farming of pigs, poultry, and dairy cows is carried out in the surrounding urban or town areas. The characteristics of the five regions are outlined below:

3.1.1 Alpine Tundra

The alpine tundra is found in the four mountainous areas of the Khövsgol region, the Khentiy mountain range, the Khangai mountain range, and the Mongolian Altay mountain range located along the country's western border. It comprises 3 % of the nation's total mountain range. Livestock farming in these areas centers on sheep, goat, and yak and there are very few horses and camels. Yaks and hainaks (a cross between a cattle and yak) are abundant in the Khangai mountain range and reindeer are also raised in some areas in the Khövsgol mountain range.

3.1.2 Forest Steppe and Mountain Taiga

This area encompasses the forest to the steppe area and its natural conditions are suited to livestock grazing. As a result, the number of livestock has been large; and cattle and sheep predominate at 25 % and 30 %, respectively. Improved livestock breeds are numerous. The sheep are a variety that produce semi-fine wool, dairy cows are raised in the surrounding urban areas, and cattle used in the production of both dairy and meat products are found in other areas. Intensive farming of dairy cows, pigs, poultry, etc. is carried out near urban areas. The forest steppe is 25.2 % and the mountain taiga is 4.1 % of the total national land area.

3.1.3 Steppe

The steppe is a grassland area, completely devoid of forests, which stretches from east to west and comprises 26.1 % of the total national land area. Being abundant in pasturage, it is suited for grazing and has a very high number of livestock herds. Livestock farming centers on horses, sheep, and cattle and the distribution ratios are 30 % for horses, 35 % for sheep, and 29 % for cows.

3.1.4 Desert Steppe

The desert steppe is located on the midway between the steppe and desert regions and it comprises 27.1 % of the total national land area. Horses and sheep are raised near the steppe and horses and goats are raised near the desert.

3.1.5 Desert

Nearly 68 % of the camel population is concentrated in this region and there are very few cattle. The livestock density is low and due to the scarcity of grass, migrations to other pasturage is high. It comprises 14.5 % of the total national land area.

3.2 Production

3.2.1 Management Patterns of Livestock Production

The livestock industry is roughly divided into two sectors - extensive production which utilizes the vast natural grasslands and intensive production which is concentrated in and around urban areas. A summary of both types of production is given below.

(1) Extensive Production

Extensive livestock production is centered on five pastoral animals (cattle, horse, camel, sheep, goat). This traditional form of livestock production is effectively utilized in the natural grasslands where is unsuited to agricultural cultivation and comprise much of the nation's land area. Natural pasture grass is the basic livestock feed, but during the period from winter to spring when this grass is very scarce, supplementary feed such as hay, etc. is used. The animals lose 25 to 30 % of their weight, and much of their stamina during this period. If the area is hit by heavy snowfall or the grass grows late, many livestock animals perish. This form of livestock production is at the mercy of natural conditions.

In the former planned economy period, the herders received the government subsidies with respect to management and raising of livestock animals owned by both Negdel and private. Presently, 93 % of all livestock animals are privatized. A herder raises his own private livestock animals and produces meat, dairy products, wool, hides, etc. His livelihood stems from the sale and self-consumption of these products. The five major livestock animals have been apt to increase in number since privatization. In 1995 the total number of livestock reached 28,570,000, the highest number ever recorded as shown in Table II-3.1.

(2) Intensive Production

The large-scale state dairy, hog, and poultry farms were built by the government with the cooperation of the former Soviet Union and the East European bloc in the 1960s. The state farms aimed at providing a stable source of livestock products for its urban population. With

the advent of a market oriented economy, these farms were privatized or dismantled and livestock were distributed to herders. The privatized farms which no longer have access to the government subsidies, are faced with a serious shortage of capital and have been forced to curtail their scope of operations. In addition, this situation has been compounded by shortage of rationed wheat, due to reduced production and rising costs. Meanwhile, the demand for milk, chicken, pork, and eggs for making cakes and sweets has increased in the urban areas, in conjunction with the rise in tourism and changes in food consumption habits among the urban population. Supplying livestock products to this market has become an issue.

The Mongolian government has pursued a policy of fostering small to medium scale private hog, poultry, and apiculture farms in the urban areas and suburbs. Small diary farms (50-100 cows) in and around urban areas and medium-scale dairy farms (200-300 cows) in the suburbs have been encouraged. In actuality, private, low cost, and profitable medium scale hog and poultry farms in the urban areas have evolved to meet the demand for eggs, pork, etc. in urban areas.

3.2.2 Trends in Livestock Population

The five major livestock animals have continued to increase since 1989 and reached the highest in 1995 since 1918 as shown in Table II-3.1 and Fig. II-3.2. The main causes of such increase of the number of livestock are considered as follows:

- Following the distribution of livestock animals privatized in 1991, the restriction on the number of privately owned animals was abolished. As a result, livestock animals has grown as a private asset and the volition to increase privately owned herds among herders has risen.
- Inflation, a high unemployment rate, and general economic instability have spurred herder ambition to increase their livestock.
- The controls which regulated the number of livestock that were slaughtered under the planned economy, were abolished. Presently, the number of animals slaughtered is decided by the individual herder. As a result, their number has been limited to very low levels.
- The market for meat has decreased due to a reduction of state supplied meats to the large Russian population living in Mongolia and a drop in exported meat.
- Since the snow damage of 1993, the mortality rate of livestock animals has dropped, due to stable weather conditions and the absence of epidemics.

The number of sheep peaked in 1990, and thereafter, decreased to 13,700,000 in 1995 or less than 50 % of its original total number. This is due to the increased cash needs of herders who used sheep as a cash product and the high price of wool and sheep hides in the Chinese market. The number of goats has increased sharply in recent years due to the rise in the price of cashmere. Their numbers in 1995 was twice that of 1985 figures. Cattle and horses have gradually increased since 1985 and both livestock species have surpassed past peak numbers. Camels have greatly decreased after privatization in 1991 and 360,000 were recorded in 1994.

In 1995 Aimag having the largest number of livestock animals was Övörhangay, while Aimags having the highest livestock growth rate were Bayan-Ölgiy, Ömnögobi, and Dundgobi. On the contrary, a decreasing trend in livestock was seen in aimags such as Dornod, Khentiy, and Sükhbaatar.

The intensive state farms built near the urban and town areas have encountered economic difficulty in the face of privatization measures and distribution of livestock animals to herders

under the market economy. As a result, the number of dairy cows, poultry, and hogs peaked in 1988 and 1989, but it has greatly decreased since that time as shown in Table II-3.2. However, this drop stabilized for laying hens and hogs in 1995; the number of laying hens has slightly increased recently, in correlation with a rise in the number of farms raising poultry as shown in Figs. II-3.3 and II-3.4. The intensive dairy farms are listed in Table II-3.3.

3.2.3 Changes in Livestock Ownership

Under privatization measures adopted under the market oriented economy, the livestock owned by the state farms and Negdels were distributed to private ownership (individual ownership). In 1995 the total number of privately owned livestock rose to 93 % (refer to Table II-3.4). In conjunction with this, the number of non-herding households and businesses possessing livestock increased. During the period of 1991 to 1994, non-herding households or businesses that possessed more than 200 head of livestock rose from 1.7 to 12 % as shown in Table II-3.5 and on Fig. II-3.5.

In addition, the number of herder households (households whose livelihoods are based on herding) also greatly increased. In 1995, 170,000 households or 2.5 times that of 1989 figures were recorded. The number of herders (16 years or older) also rose to 390,000, approximately triple that of 1989 figures. The underlying cause of this increase is the number of new herders, i.e. unemployed engineers, accountants, and other professional people from Negdels and state farms who acquired livestock through privatized distribution measures. Many of these new herders have no experience or skills at livestock farming. The poor propagation rate of livestock due to their lack of skills and the shortage of barns in urban and town areas have become growing issues.

3.2.4 Livestock Products

(1) Number of Slaughtered Livestock

In 1991 the number of slaughtered livestock was 8,900,000, much higher than the average figure of 1,400,000 in 1986 to 1990. But the volume of slaughtered livestock has decreased since 1993 and averaged 6,500,000, one million animals less than 1986 to 1990 averages (refer to Table II-3.6). The increased number of livestock which were slaughtered in 1991, despite privatization measures, is due to inexperienced herders, livestock owners unable to earn a living from livestock farming, and unsuitable owners unable to maintain and manage livestock, who sold their animals to the slaughter house. However, livestock ownership stabilized after 1993 and the number livestock animals owned by herders have increased. In addition, the volume of meat exported to Russia has sharply decreased and this has contributed to the low levels of slaughtered livestock. The number of slaughtered livestock has dropped for all five major livestock animals, but the drop in the number of slaughtered goats has been particularly prominent.

(2) Livestock Products

Shipment and sales of livestock products have diversified since the dissolution of Negdels. As a result, there are no accurate statistics on the production volume of livestock products. However, the overall production volume of livestock products declined from 1991 to 1994, when production volume estimates based on the number of livestock animals are studied. But it appears that the number of livestock animals has slightly risen in 1995 as shown in Tables II-3.7 and II-3.8.

The volume of meat production fell continuously for three years from 1992, due to the reduced number of livestock slaughtered; and the per capita consumption volume of meat in 1994 was 93 kg, two thirds the volume of 1990. However, the volume of exported meat also dropped

during the same period. As a result, this consumption volume barely meets the per capita meat consumption standard of 92.5 kg set by the Ministry of Health. However, the distribution routes for meat have changed greatly and it is surmised that there is a large disparity in the actual per capita consumption volume between urban and rural areas.

The production of pork and eggs have dropped drastically to pre-1980 levels, in conjunction with the decrease in livestock animals stemming from privatization and dismantling, etc. of the state farms. Of the 42 state run dairy farms built near urban and town areas, 25 are still in operation at present. Their total milk production volume is 30 % less than 1989 levels and it is estimated at 13,000 to 14,000 liters/day.

3.3 Feed Supply Conditions

3.3.1 Varieties and Utilization of Animal Feed

Livestock fodder in Mongolia can be largely categorized as natural pasture grass and fodder produced from forage crops. The former comprises 99 % of all fodder consumed domestically, while the latter comprises about 1 %. The use of animal feed in extensive and intensive livestock farming is shown below.

Variety and Use of Animal Feed in Mongolia

Variety		Use	
		Extensive Farming	Intensive Farming
Feed using natural pasture grass (99%)	Pasture	Year around use	Grazing from May to September
	Hay	Used when pasture grass is in shortage and when livestock are in weakened condition.	Used from October to April when animals are not let out to pasture.
Feed produced from forage crops	Green forage	Not used	Used together with grazing from mid-June to October
	Silage	Not used	Used from October to April when animals are not let out to pasture.
	Straw	Used from October to March	Used from October to April when animals are not let out to pasture. Used also as bedding
	Formula feed	Used in March during the peak shortage of fodder and when livestock are in weakened condition.	Used throughout the year by dairy, hog, and poultry farms.
Others	Mineral	Used throughout the year	Used throughout the year
	Home made fodder	Given to livestock from winter to spring during the birthing season, given to cows and calves	Not used

Source: Livestock Division, Ministry of Agriculture and Industry

3.3.2 Utilization of Natural Pasture

(1) Grass Resources and Grazing Capacity

According to a survey study on grazing capacity by the Institute of Agricultural Economics and the Research & Teaching Institute of Animal Husbandry, the number of livestock per area unit in the urban areas of Ulaanbaatar, Darkhan, Erdenet and Arhangay, Övörhangay, Bulgan far exceed the number of adapted animals. In contrast, findings show that there is a surplus in the number of adapted animals in Dornod, Khentiy, and Sükhbaatar (refer to Table II-3.9). However, these study findings were calculated from the area of grassland, the stocking rate of pasture grass, and the number of livestock animals. Since they were not based on actual

conditions of grassland usage, it has been pointed out that these findings differ slightly from the reality. However, in other studies on urban areas, (surveys in Terrruji, Naraiha) the proliferation of weeds and soil erosion have been reported; and it has been confirmed that grassland continues to deteriorate in the urban areas.

(2) Hay Harvest and Utilization

The grasslands in Mongolia are also used as meadows for dry feed, in addition to pasturage Under the planned economy, nearly two million hectares of grassland were used for harvesting 1,200,000 tons of hay. However, in the aftermath of privatization, the production of hay declined as its production was left to the volition of the individual herder. In 1996 the production volume of hay leveled off to 620,000 tons. This decline has been especially prominent in the three eastern provinces where the number of livestock is small (refer to Table II-3.10).

3.3.3 Production of Animal Fodder

The types of animal fodder produced in Mongolia are green fodder, straw, silage, formula feed, etc. which is only one % of the total amount of livestock feed used in Mongolia. During the era of the planned economy, this fodder was grown by subsidiary farms of the large-scale government operated dairy farms and the government operated feed cultivation farms. But under the market economy, the cultivation area for feed crops dropped to one-twentieth of the original area. Formula feed is produced from wheat bran and wheat wastes by feed factories adjoining wheat flour mills. Therefore, it is easily affected by trends in wheat production. In recent years, wheat production has fallen and the use of concentrated feed by poultry and hog farms has declined. In conjunction with these trends, the production volume of formula feed has also fallen. The production in 1995 was 13,800 tons or an 8 % decrease from 1989 figures (see Table II-3.11).

3.3.4 State Emergency Feed Fund (SEFF)

A State Emergency Feed Fund (SEFF) was set up during the era of the planned economy and about 200,000 tons of animal feed was reserved annually to supply free livestock fodder in times of emergency due to snow damage. However, this fund was reduced after livestock were distributed to private ownership and herders are now charged for emergency supplies. The original 21 SEFF storage houses scattered throughout the country have been reduced to ten. As of October 1996, the volume of reserved feed at the remaining ten SEFF storage houses was approximately 10,000 tons of hay and 4,600 tons of wheat bran. Although the purchase of an added 10,000 tons of hay and 1,300 tons of wheat bran is planned, it has not been realized due to budget constraints. The SEFF was abolished in November and its function was shifted to the State Reserve Agency under the minister of the Ministry of Agriculture and Industry.

3.3.5 Problems and Constraints in Pasture Utilization and Animal Fodder

The following issues in pasture utilization and animal feed exist.

- An increase in cultivated land, land devastation due to soil erosion, mining development, reduced grassland areas due to growing automobile traffic
- Diminished use of potential grassland areas due to devastation by water supply facilities (wells, water supply tanks) there

- Devastation of grassland surrounding water supply facilities due to a concentration of livestock herds at water supply facilities

- Deterioration of grassland surrounding urban areas: Herders and their livestock tend to concentrate in som and aimag centers and along main roads since they have become responsible for selling and purchasing their own livestock and daily commodities under the market economy. This has destroyed grasslands surrounding urban areas.

- Accurate figures on grazing capacity are not known since detailed studies on grassland use and the allotted volume of pasture grass have not been carried out.

- Decrease in animal feed reserve: Production of hay and reserve supplies have become the responsibility of the individual herder after privatization measures were implemented. As a result, the production of hay has become insufficient and the volume of reserve feed available under the government operated SEFF has been reduced. Presently, many livestock have been left defenseless in the event of an emergency such as heavy snowfall.

- Reduced production of formula feed, in conjunction with diminished production of grains such as wheat, etc.

3.4 Hygiene Conditions of Livestock

3.4.1 Losses and Fertility of Livestock

The mortality rate of livestock which perish due to disease or inadequate management increased from 1991, reaching 6.4 % in 1993. However, due to improved circumstances, it dropped to 2.5 % in 1995, a figure much lower than the average ratio from 1986 to 1990. In contrast, the ratio of abortions and infertility in livestock animals rose to 11 % in 1995, slightly higher than the average ratios of 1986 to 1990. This is due to an increased ratio of infertility and abortions in cattle as shown in Table II-3.12.

3.4.2 Outbreak of Animal Diseases

There are no "A level diseases" as defined by the Office International Des Epizooties (O.I.E.), in Mongolia. Common diseases are bovine brucellosis and enzootic bovine leukosis and an outbreak of hemorrhagic septicemia, rabies, and intestinal toxic poisoning occurs sporadically as shown in Table II-3.13.

3.4.3 Organizations

The State Veterinary Services, now Department of veterinary service under the Agricultural Department of the Ministry of Agriculture and Industry is responsible for matters pertaining to livestock hygiene in Mongolia. The relevant organizations at the central government level are explained in chapter 7 and its organizations are now under re-structuring.

Each aimag has a Veterinary Center comprised of five to six staff members, an administrative office, an examination room, a storage house, etc. The Veterinary Center is responsible for supervising the staff at the sum and bag levels, for overseeing the supply, management, and distribution of medical supplies, to diagnose diseases, etc. There is also a veterinary center at each sum which is equipped with an office, storage house, a simple examination room, and staffed by one veterinarian who has been provided with a jeep to carry out livestock vaccinations, disinfection, etc. Although a veterinarian has been sent to each bag, he has no office and makes his rounds on a motorbike traveling with basic equipment.

3.4.4 Livestock Hygiene Services and Activities

(1) Veterinary services

The government of Mongolia has continued to place priority on policies pertaining to livestock hygiene since the era of the planned economy. The BIOKOMBINAT that its function was now transferred to Estate Profit Committee under the Prime Minister Office has continued to be operated by the government, manufacturing 70 varieties of vaccines and medicine which are distributed throughout the entire country. However, the production volume under the planned economy has been halved, due to national budget cuts. As a result, vaccinations are made available only in areas where there has been an outbreak of disease. The aggregate number of livestock that was inoculated against disease was 84,000,000 during the period of 1986 to 1990, but dropped to 36,000,000 in 1995.

Prevention and treatment measures are included in the national budget for infectious diseases; and vaccines, antiseptics, treatment drugs, etc. are supplied free. However, fees have been established recently for vaccinations, medicated baths, and other services which are paid by the herder.

(2) Quarantine and hygiene control of livestock products

The health conditions of all livestock animals must be inspected and animals must be judged as suitable for human consumption at the time they are shipped and slaughtered in Mongolia. However, the distribution routes for livestock products have diversified under the market economy and in actuality, this inspection system is no longer enforced. As a result, it is estimated that more than 40 % of all meat and dairy products marketed in the country have not been hygienically tested.

3.4.5 Problems and Constraints in Animal Hygiene

Problems and constraints in animal hygiene is summarized below:

- Reduction of function for testing of livestock animals for diseases in rural areas (som level).
- Shortage of veterinary medical supplies (drugs for treatment) due to budget curtailments of regional governments.
- An increased burden on the existing veterinarians due to a shortage of human resources in the livestock hygiene sector.
- Equipment and animal hygiene related facilities such as testing rooms, medicated baths, etc. have depreciated.
- Shortage of capability of border quarantine stations to check quarantine against the imported livestock commodities with their increase.
- A drop in hygiene tests of meats and livestock products due to diversified distribution routes for livestock commodities.

3.5 Varieties and Improvement

3.5.1 Number of Improved Livestock

Improved varieties of livestock have been bred in Mongolia since 1950 at 52 Negdels and the state farms throughout the country which specialized in breeding improved livestock. In 1980 the number of improved livestock animals reached 2 million, but this figure has steadily declined since privatization measures in 1990. There were only 920,000 such livestock reported in 1994 (refer to Table II-3.14). This drop has been attributed to the lack of measures taken to protect improved livestock that were distributed under privatization. In addition to death and slaughter, the whereabouts of such livestock are either not known or the new private owner is unaware that the animals are improved livestock. As a result, they have remained unregistered, contributing to the large decline in the number of improved livestock, statistically (refer to Table II-3.15). In addition, veterinarians in charge of improved livestock in the sum have not been provided with motorbikes or other means of transportation or equipment and materials required to carry out performance tests on livestock. As a result, the inability to grasp livestock conditions within the sum has been another factor contributing to a decrease in the registered number of improved livestock.

3.5.2 Present Situation of Improved Livestock

Under the planned economy, herds of improved livestock were bred by 52 Negdels and state farms specializing in breeding improved livestock and sold to other Negdels to improve their livestock breed. However, the activities carried out under this system of improved breeding by these 52 specialized state farms and Negdels ceased under the market economy. The management and propagation of these improved livestock breeds were taken over by private companies, cooperatives, private individuals, etc. The conditions under which these livestock were privately distributed are shown below and the details are given in Table II-3.16.

Conditions of Private Distribution of Improved Livestock	Number
(1) Distributed to companies, cooperatives, private herders	22
(2) Distributed to herders only	20
(3) A segment managed by the livestock breeding center in the sum and the rest distributed to individual herders	2
(4) A segment owned by the Livestock Research Center and the rest distributed to individual herders	1
(5) Distributed to state industries	1
(6) Unknown	1

In case (1) above, companies or agricultural cooperatives which were given possession of about 10 % of the livestock (several thousand head), are engaged in activities to regenerate, breed, and market improved livestock. In case (2), all the livestock were distributed to numerous herders; and the sum veterinarian in charge of livestock breeding has been unable to ascertain the whereabouts of these livestock. In cases (3) and (4), improved livestock herds are maintained on a large scale by the livestock breeding centers and the Livestock Research Center. The herds have been regenerated, bred, and marketed without decreasing the performance of breeders.

3.5.3 Organization

(1) Central Level

The Livestock Breeding Board under the Agricultural Department of the Ministry of Agriculture and Industry, as a implementing agency, was set up in November 1996 is responsible for

improving livestock breeds in Mongolia. The main functions of this organization are supply breeders, intermediary activities, preserve sperm of improved breeds, artificial insemination,

(2) Regional Level

Each aimag maintains a livestock breeding service center; and a veterinarian in charge of breeding activities who is responsible for supervising, managing, and introducing improved breeds, inspecting the quality of livestock products, etc., is employed in each sum in the aimag. In the aftermath of privatization measures, the national budget allocated to these centers is able to cover only personnel costs. The expenses incurred for the center's activities are supported by the sales generated from their livestock and livestock products. However, the shortage of operating funds at each center has become serious; and in actuality, center activities have become limited to the supervision and management duties of the sum veterinarian in charge of livestock breeding.

One veterinarian in charge of breeding activities has been allocated at the sum level. They are responsible for inspecting and registering improved livestock, and supervising the use of breeders in the sum, in order to improve the performance of all sum livestock. The equipment which has actually been provided are measuring tapes, ear punchers, and weighing scales. The lack of motorbikes, jeeps, and other means of transportation has extremely limited the scope of activities. Therefore, it has been difficult to know all the conditions of the livestock in the sum.

3.5.4 Artificial Insemination

Artificial insemination technology was introduced from the former Soviet Union in the 1950s, with the objective of crossbreeding the existing varieties of Mongolian livestock with improved and highly productive breeds from abroad. With cooperation from the Ukraine, an Artificial Insemination Center was established in the suburbs of Ulaanbaatar in 1985; and artificial insemination techniques using frozen sperm were introduced. This large center is comprised of 17 buildings and possessed 30 to 40 head of livestock prior to 1990. It was responsible for supplying 80,000 doses of frozen sperm annually to modern dairy farms, mainly in Töv Selenge province.

Following the transition to a market economy in 1990, all government funding for the center ended. The center was forced to sell all their breeders due to a shortage of operating funds; and presently, they are engaged in manufacturing frozen sperm. The number of employees at the center has been reduced from 100 to 14 staff members at present. Their activities include periodic production and supplement of liquid nitrogen, and preservation and sales of frozen sperm taken from breeders in the past. The amount of frozen sperm sold in 1995 was 4,800 doses, a mere 6 % of the 80,000 doses sold prior to 1990.

3.5.5 Varieties of Livestock

All improved livestock animals in Mongolia were bred in the past 70 years. During this period livestock products have diversified and products made from Karakul and fine wool producing sheep have evolved. The ratio of improved livestock animals remains low. In 1989 when the ratio of improved livestock among the five major species was the highest, the share of improved cow (including yaks) and sheep species was 9 % and goats 10 %. The varieties of improved livestock animals in Mongolia are given in Table II-3.17.

3.5.6 Problems and Constraints for Livestock Improvement

(1) Issues pertaining to the dispersion of improved livestock

(a) Inadequate management of improved livestock: Improved livestock generally need to be kept in barns and fed fodder during the winter season unlike traditional livestock species. But improved livestock are not appropriately managed due to the lack of knowledge and experience on the part of the herder or herders are unaware that their livestock are improved breeds.

(b) Crossbreeding between existing and improved livestock, stemming from dispersion of improved livestock

(c) Location of improved livestock are unknown.

(2) Issues on administrative services regarding improved livestock species and breeding

(a) The veterinarian in charge of livestock breeding activities in the sum has not been able to carry out activities such as confirming the location of livestock, carrying out performance tests, supervising herders, etc. due to the lack of transportation and equipment.

(b) Due to the inability to carry out performance tests on livestock, scientific evaluations of livestock products can not be made. As a result, information on quality control measures for livestock and livestock products has not been disseminated among the herders.

(c) Lack of herder awareness on livestock and livestock products

3.5.7 Basic National Policy and Measures Pertaining to Improved Livestock Species

Basic policy: The government of Mongolia has placed priority on resolving issues pertaining to dispersed herds of improved livestock, following the dissolution of Negdels and the decline in improved breeding activities. In order to resolve these issues, the government is presently drawing up a "Basic Plan to Improve Livestock Species" which will be carried out from 1997 to 2005. The objective is to promote improved livestock species that will address the issues of a diversified market, and good quality and high grade goods within a market economy. The basic plan is (i) to protect and improve the existing varieties of improved livestock bred during the past 70 years and to breed improved livestock species that meet the demands of a market economy (improve the quality cashmere, maintain the quality of wool while increasing the volume of meat, etc.).

Strategy

(a) Reorganize herds of breeders: Efforts to improve livestock species on an individual basis are limited. Based on a need to carry out such activities on an organized basis, measures to reorganize breeders that were dispersed during privatization will be pursued.

(b) Reform the system of livestock breeding management at the sum : As in the case of the aimags, a group of breeders will be allocated to each sum, which will become the source of improved livestock for that sum. In addition, the number of officer and technician in charge of breeding activities will be increased from one to two.

(c) Use of artificial insemination : The operations of the gene bank (Artificial Insemination Center) will be resumed. The sperm of outstanding livestock

throughout the country will be preserved and used in artificial insemination as needed.

(d) Improve herder awareness: Quality inspection activities will be strengthened for livestock and livestock products; and evaluations on livestock products will be disseminated to herders.

3.6 Facilities

3.6.1 Shed and Fence for Winter and Spring Seasons

Simple shed and fence located in the winter and spring pasture grounds were also distributed to private parties when the Negdels were dissolved. Shed and fence with a relatively large capacity were dismantled and were replaced by smaller barns. As a result, despite the rise in the number of shed and fence, the number of livestock animals housed in these sheds has not increased. In 1995 the ratio of shed and fence accommodating small livestock animals was 111 % and 60.2 % for shed and fence housing large livestock. Both show a decline from 1991 levels of 131 % and 80.8 %, respectively. As a result, the construction of shed and fence has not been able to keep up with the increase in livestock (refer to Tables II-3.18 and II-3.19).

3.6.2 Water Supply Points

Water supply facilities in the grasslands are extremely important in a country where natural grasslands are used as pasturage. During the planned economy, the number of water supply facilities (wells and water tanks) in the grasslands increased steadily and the ratio of grassland area used as pasturage, rose to 70 %. However, the number of water supply facilities has decreased steadily since 1990 and the area of grassland used as pasturage has also declined.

Approximately 1,740 wells were destroyed, damaged, or suffered a loss in water volume from 1992 to 1995, and are no longer in use. In addition, 6,200 wells are in a state of disrepair (refer to Table II-3.20). With the exception of motorized wells, all other types of wells such as animal powered wells, and simple mine wells were distributed to private organization. Motorized wells will be distributed to private organization after a study has been carried out on their current estimated value, use, etc.

The declining number of functioning wells has become a serious issue for the inhabitants in terms of livelihood and the use of grasslands as pasturage. Presently, a nationwide study on the conditions and use of wells is being implemented by the Ministry of Agriculture and Industry.

3.7 Other Data and Information

Other data and information on agricultural condition are shown in Tables II-3.21 to II-3.42 and Figs. II-3.6 to II-3.25.