Czech University of Life Sciences Prague

Institute of Tropics and Subtropics

Feasibility study of livestock identification system introduction in livelihoods of small holder livestock producers in Central region of Mongolia

Master Thesis

Student: Bc. Jan Šlocar

Supervisor: Ing. Jiří Hejkrlík, Ph.D.

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Declaration

I declare that I worked on my Master Thesis Feasibility study of livestock identification system introduction in livelihoods of small holder livestock producers in Central region of Mongolia by myself and that I used only literature resources listed in references.

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Bc. Jan Šlocar

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Abstract

Mongolia is country which more than one fifth of GDP come from agriculture activities, generally livestock production, where around 40% of inhabitants are involved in. Number of Mongolian population is slightly increasing and number of livestock compare to it is rapidly increasing to maintain required quality of small holder livestock producers' livelihood. Country faces problem of nature sources overutilization and pastureland deterioration due to weak pastureland management which is more or less chaotic since beginning of 1990's and cause increasing vulnerability of small holder livestock producers to several problems as unexpected climate event *dzud*. The National Mongolian Livestock Program together with developing cooperatives tries to improve current stage by national livestock identification system introduction. This study examined current stage of small holder livestock producers' livelihood and determined factors influencing livestock identification contribution willingness on example of Töv *aimag* in Central region of Mongolia and tried to outline feasibility and obstacles connected to national livestock identification system introduction.

Key words: livestock identification system, livelihood, Mongolia, small holder livestock producer

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Abbreviations:

A.D.	Anno Domini
ADB	Asian Development Bank
B.C.	Before Christ
°C	Celsius degree
CHF	Swiss Franc
CIDA	Canadian Development Agency
CULS	Czech University of Life Sciences in Prague
CzDA	Czech Development Agency
CZK	Czech Crown
EN	Encyclopedia of the Nations
EU	European Union
EU-AHLMP	European Union – Mongolian Animal Health and Livestock Marketing Project
FAO	Food and Agricultural Organisation
FIFTA	Foreign Investment and Foreign Trade Agency of Mongolia
IFAD	International Fund for Agricultural Development
GASFP	The Global Agriculture and Food Security Program
GDP	Gross domestic product
ha	hectare
HDI	Human development index
IACR	Identification of Animals in Central Region (Mongolia)
ILO	International Labour Organisation
IMSNY	Indo-Mongolian Society of New York
JICA	Japan International Cooperation Agency
kg	kilogram
km	kilometres
KOIKA	Korean International Cooperation Agency
LIS	livestock identification system
m.a.s.l.	meters above sea level
MDG	Millennium Development Goals

MFATM	Ministry of Foreign Affairs and Trade of Mongolia
mm	millimetre
MNT	Mongolian Tögrög
MOFALI	Ministry of Food, Agriculture and Light Industry of Mongolia
MPO	Ministry of Industry and Trade of the Czech Republic
MPSV	Ministry of Labour and Social Affairs of the Czech Republic
MPRP	Mongolian Peoples' Revolutionary Party
$m \cdot s^{-1}$	meters per second
MSUA	Mongolian State University of Agriculture in Ulaan Baatar
MV	Ministry of the Interior of the Czech Republic
MZE	Ministry of Agriculture of the Czech Republic
MZP	Ministry of the Environment of the Czech Republic
MZV	Ministry of Foreign Affairs of the Czech Republic
NMLP	National Mongolian Livestock Program
No.	number
NP	National Park
NSO	National Statistical Office of Mongolia
PDAIFSP	Programme of the Development of Agriculture and Improved Food Supply of the Population
PIN	People in Need
RPP	Rural Poverty Portal
SDC	Swiss Agency for Development and Cooperation
sp.	Species
t	ton
UN	United Nations
UNDP	United Nations Development Fund
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
UNU-EHS	United Nations University – Institute for Environment and Human Security

USD	United States Dollar
USDS	United States Department of State
USSR	Union of Soviet Socialist Republics
WCED	World Commission on Environment and Development
WB	World Bank

1. Introduction

Mongolia is on the break point in case of pastureland management nowadays. Agriculture brings around a fifth of country GDP, employ around 40% of population (WB, 2012) and is strongly dependent on pasturelands owing to Mongolian traditional nomadic way of life which is inherently connected to extensive livestock production. According to considerable political changes which Mongolian society faced during 20th century has been pastureland management significantly changed. Those changes cause extreme pastureland deterioration, decrease pasturelands' carrying capacity and leads to increasing vulnerability of herders (small holder livestock producers) livelihood to cope with unexpected and even expected events. Due to that increase number of Mongolians under poverty line. Approximately 46.6% of rural population lived under poverty line in 2010 (RPP, 2012).

Mongolian government apply new strategies and cooperate with international organisations, countries and other developing partners to improve current state. One of those strategies is to establish obligatory national livestock identification system (LIS) to improve "chaotic" pastureland management which should be one of the improvements of current state.

Czech project "Livestock Identification System"[1] involved in LIS establishment should play one of the main roles in national LIS introduction procedures together with other developing projects[2].

This study was implied as a part of Czech "Livestock Identification System" developing project since the end of May 2011 till the end of August 2011 in three selected *sums* in Töv *aimag* in Central region of Mongolia.

First part of this study introduces to Mongolian overall ambience and tries to explain basic relations between local small-scale livestock production and environment from several points of view.

Aims of this study are defined in following chapter. Determination of factors influencing LIS contribution willingness and estimation of LIS introduction feasibility in livelihoods of small holder livestock producers in Central region of Mongolia are one of the main objectives of this study.

[1] For further information read chapter 2.12.1.1
[2] For further information read chapters 2.11 and 2.12.1.1

Methodological part describes current environment in selected *sums* Bayanchandmani, Bornuur and Zuunmod as a representatives of Töv aimag. Used research methods are enumerated there and explanation of method selection with methods' specifications are there as well described.

Result chapter lucidly shows all results acquired during elaboration of this study and shows real environment among small-scale livestock production in selected *sums* of Central region.

Results are compared to the already ascertained facts which were discovered in field of LIS and livelihood of small holder livestock producers in Mongolia and final conclusion to this topic is written there.

2. Background

2.1 General information

Population of Mongolia is 2,756,001 people (WB, 2012). It is country with the lowest average population density in the world with 1.76 people per km^2. Mongolia was rated on 130^{th} place in the world with GDP $2,207 per capita in year 2010 and GDP of country was $6,083,047,865. Contribution of agriculture sector on GDP was 21.2%, industrial sector was 29.5% and services were 49.3% in year 2010 (NSO, 2012a).

Ethnic compound of Mongolia, despite population number, is cosmopolitan. Almost 90% are Mongols (*Khalkha, Uriankhai* and *Buryats*), 5.3% Kazakhs, 2% Chinese, 2% Russians and the rest of 1.5% are Tuvins, Uzbeks and Uighurs.

Linguistically is country unified by Khalkha Mongol which is official language spoken by 90% of residents. Minor languages are mainly Turkic, Chinese, Russian and Kazakh on the west. Official alphabet is Mongolian Cyrillic and native old Mongolian Script, although used exceptionally.

Mongolian society was influenced by three main world religions as Buddhism, Islam and Christianity and of course by Shamanism. Buddhism is predominant with 53% followed by Islam (3%), Shamanism (2.9%), Christianity (2.1%) and other minor religious (0.4%) nowadays (USDS, 2012). Owing to almost 70 years under communist rule are 38.6% of population atheists.

Education system is above expectations well developed in Mongolia and total adult illiteracy rate is 97% (UNICEF, 2012). Literacy level and higher education is generally reached by females. Primary and secondary education was extended from total ten to twelve years. Education level positively influence HDI and with 0.651 (UNDP, 2012) it rates Mongolia on 110th place in the world based on HDI.

2.2 Geography

Mongolia is typical landlocked country located in Central Asia. Its' the shortest distance to a sea is approximately 700 km. Mongolia is the 18th biggest country in the world with total area of 1,564,116 km². The territory stretches 1,259 km from north to south and 2,392 km from east to west. The most northern point of Mongolia is Mongol Sharyn Davaa (52'09" latitude, 98'57" longitude). The most southern point is Orvog Gashuuny Bor Tolgoi (41'35" latitude, 105'00" longitude). The most eastern point is Mount Maant (48'53" latitude, 87'44' longitude), and most western point is Modtoi Hamar (46'43' latitude, 119'56' longitude). Mongolia share borders just with two countries in spite of its vast area. Mongolia adjoins Russian Federation in the north and People's Republic of China in the south.

Surface of Mongolia is generally described as highland with average approximate altitude 1,580 m.a.s.l.. The western part of the country is significantly mountainous. The Altai mountain range, the largest in country, with the highest point Munh Hairhany Orgil with 4,653 m.a.s.l., stretches 1,500 km from Russian borders in the west along Chinese border to the Gobi Desert area in the south. Gobi Desert area occupies 41.3% of country area (Badarch *et al.*, 2009) and is generally flat. Vast plains called steppes are mainly located in the central and eastern part of the country.

2.3 Climate

Mongolian climate is highly influenced by location of the country. Considering to distance from the sea is climate typically extreme continental with high variation in temperatures, not only during seasons, but also even during days and according to area. Average annual temperature does not exceed –2.9°C (in Ulaan Baatar) it rates Mongolia as one of the coldest countries in the world. Temperatures can decrease to almost -50°C

during the coldest months of winter (January and February) and can reach almost 40°C during the warmest months of summer (July and August), in Gobi Desert it can even highly exceed 40°C. High differences in day and night temperatures are highly influenced by low average annual precipitation and low relative air humidity.

Continental climate is typical with low average annual precipitations and from that fact resulting low average annual relative air humidity which is approximately 54% in Mongolia. Average annual precipitation of Mongolia is around 220 mm and varies between areas. The lowest precipitation values are as can be expected in Gobi Desert area where do not exceed 100 mm per annum and the highest on the north and in mountain areas. Precipitations in Mongolia are seasonal. The most of precipitations occur during summer period in June, July and first half of August. Heavy rains (40-65 mm may fall in a single hour (Batima *et al.*, 2005)) frequently cause local floods which are significant factor of erosion which highly degrade land in some areas and hamper transportation in country.

Mongolia is known as a country of blue sky which is sacred for Mongolians and no wonder, because there are around 230 or 260 sunny days in year which means 2,600-3,300 hours of sunshine (Batbayar, 2009).

Owing to flatness of Mongolian steppes and changing temperatures is Mongolia very windy. Average annual wind speed varies from 1-2 $m \cdot s^{-1}$ in mountains regions to 4-6 $m \cdot s^{-1}$ in steppe and desert-steppe zones (Batbayar, 2009).

2.4 Environment

Mongolia can be divided into six ecological zones that generally follow the north to south elevational gradient. These include a) the alpine, b) mountain taiga (forest), c) forest steppe, d) steppe, e) desert steppe and f) desert zones. The forest steppe, steppe, desert steppe, and portions of the desert zone can be classified as pasturelands which are so typical and important for Mongolian agricultural sector. The forest steppe and steppe ecological zones occupy around 50% of total and its relative forage productivity range from 600 to 1,800 kg per ha. The desert steppe and desert zones occupy approximately 37% of the land area with productivity that ranges from 30 to 400 kg per ha (Angerer *et al*, 2008), but Suttie (2000) and Erdenetuya and Khudulmur (2000) differ from that numbers considerably (see Table 1).

Ten national parks and sixteen natural reserves were established in Mongolia till nowadays. One of them is Bogd Khan National Park. It was recorded in UNESCO World Heritage Tentative List in 1996. According to UNESCO (2012) is Bogd Khan National Park the worlds' oldest official protected area established in 1778 and protected by tradition, common law and royal decree. In addition to that fact are in Mongolia numerous preserved small areas and especially mountains which are sacred sloping under traditional and religious protection since ages.

Table 1 – Land type distribution (Suttie, 2000)

Land type	Percentage [%]	Area [km^2]
Grasslands and arid grazing	80.7	1,210,000
Forest	6.9	104,000
Saxaul forest[3]	3.1	46,000
Arable	0.5	7,000
National parks	3.5	52,000
Hay land	1.3	20,000
Other	4.0	61,000
Total		1,500,000

2.4.1 Flora

At first sight Mongolian flora seems to be poor and homogeneous, but despite hard climatic conditions and short vegetation period (100 days) is Mongolian flora very rich and miscellaneous. More over 140 species of trees, shrubs and woody plants are presented in Mongolian forest ranges. Ultimate components are the larch (*Larix sp*.), pine (*Pinus sp*.) and the saxaul (*Haloxylon ammodendron*). Saxaul for example is typical plant of arid areas of Central Asia, especially of Mongolian Gobi Desert where form large forests (see Table 1.). It is highly drought-resistant and is frequently plant out as an important remedy for decreasing desertification. More than 2823 species of vascular plants, 445 species of moss, 930 species of lichen, 900 species of fungi and 1236 species of algae have been recorded there (Ganbold and Haliun, 2000) and due to extremely difficult accessibility of few areas many other species remain to be classified. Mongolian traditional medicine uses around 845 species of plants. 1000 plant species are used for fodder preparation. 173 plant species

[3] Gobi Desert

are used for human nutrition, but their consumption decrease together with folk knowledge and 64 plant species are used for industrial purposes. There are 128 species of plants (75 medicinal, 11 human nutrition and 16 industrial species) listed as threatened in the Mongolian Red Book. At least 150 endemic plants and nearly 100 relic species are recorded in flora of Mongolia and over 100 plant species are listed in the Mongolian Red Book as rare or endangered.

Despite all measures diversity and quality of plant species alarmingly decreased during period from 1961 to 2006. The number of plant species decreased by 23.6% in the desert steppe and desert and by 50% in the forest steppe. Palatable grass species have been replaced by poorly palatable weeds and shrubs, resulting in a decline of the pasturelands' productivity and vegetation cover and pastureland productivity decreased by 28.6% in the desert area and 52.2% in the steppe in the same period (SDC, 2010).

Massive deterioration of pasturelands and forests is from mentioned data obvious. Those adulterated changes are mainly caused by increasing illegal deforestation due to increasing timber and fuel demand. Governmental restrictions are disrespected in case of deforestation reduction. Deforestation is closely linked with pasturelands degradation in some areas, because erosion process is accelerated then. Overgrazing is as well great problem in case of pasturelands degradation and is also increasing due to lack of proper pastureland management.

2.4.2 Fauna

Fauna of Mongolia seems to be as its fauna rich and various. The proof is 136 species of mammals, 436 birds, 8 amphibians, 22 reptiles, 75 fish and numerous invertebrates (Ganbold and Haliun, 2000). Numerous Mongolian Voles (*Microtus mongolicus*), Mongolian Gerbils (*Meriones unguiculatus*), Gobi Jerboas (*Allactaga bullata*), Kozlov's Pygmy Jerboas (*Salpingotus kozlovi*), Mongolian Jerboas (*Stylodipus sungorus*) and the Mongolian Hamsters (*Allocricetulus curtatus*) are mammal species endemic in Mongolia. Lofty Snow leopards (*Panthera uncia*) only around 1200 heads in wild, Argali (*Ovis ammon*), Ibex (*Capra ibex*), Gobi bears (*Ursus arctos gobiensis*), Saiga antelopes (*Saiga* tatarica) and Mooses (*Alces alces*) are very rare and endangered mammal

species sought-after for illegal and legal[4] trophy hunting. Grey wolfs' (*Canis lupus*) population is decreasing due to popular hunting, but still is significant problem causes heavy livestock losses especially during hard winters when weak livestock became easy quarry. Livestock losses caused by predators also occur during periods of natural quarry lack and occasionally during whole year in areas with higher livestock density.

Wild mammals as Bactrian camel (*Camelus bactrianus),* Mongolian Wild Ass (*Equus hemionus hemionus*), Black-tailed gazelle (*Gazella subgutturosa*), Mongolian gazelle (*Procapra gutturosa*), Tarbagan marmots (*Marmota sibirica*) or Brown bear (*Ursus arctos*) is possible to see almost in whole country. Finally, especially nowadays are in focus reintroduction programs and activities connected with Przevalski horses (*Equus ferus przewalskii*). One of the participants in reintroduction activities is Prague ZOO which breeds Przevalski horses in Czech Republic since 1921 and several times transported mares to their Mongolian homeland. Last transport was realized in the middle of June 2011. Four of them were transported and reintroduced into the wild in Khomin Tal natural reserve in the western part of country.

Mongolia is also interesting from the ornithological point of view. In steppes we can easily see Saxaul sparrows (*Passer ammodendri*), typical scavenger Cinereous vultures (*Aegypius monachus*), Demoiselle cranes (*Anthropoides virgo*), Golden eagles (*Aquila chrysaetos*) and Steppe eagles (Aquila nipalensis) prevalently used for hunting for centuries, critically endangered White-naped cranes (*Grus vipio*), of which only 4500 remain in the wild or in the western Altai mountain range are native Altai snowcocks (*Tetraogallus altaicus*).

Mongolia is extremely fertile for fish, because fishery is not common there except of lake areas as Khövsgöl and Uvs lakes, but due to growing tourist interest is fishery on the rise and open up new job opportunities for Mongolians. The most famous fish representatives are the endemic Altai osman (*Oreoleuciscus potanini*) and the enormous Taimens (*Hucho taimen*).

Mongolian environment is in many places almost untouched by humans thanks to extremely low population density and is one of the greatest natural treasures in the world without a doubt, but it is heavily ravaging by the fast developing mining industry and small scale unqualified and illegal mining.

[4] Mongolian government annually issues limited number of hunting permits

2.5 History

Territory of contemporary Mongolia show long history of human settlement. Occurrence of *Homo erectus* inhabitancy date from approximately 800 thousand years ago. Modern humans' occurrence is dating from forty thousand years ago and is proved by several animal paintings and engravings in caves or on stones in steppe. Agricultural settlement occurred during Neolithic times from 5,500 or 3,500 years B.C. (IMSNY, 2004). That period was crucial for future forming of Mongolian culture. Horse domestication begun in that region and strongly affected way of nomadic life. Horse riding was recorded and wheel vehicles were found firstly in the central part of Mongolia where Afanasevo culture was located. More nomadic cultures occurred till the interface of a new era when first nomadic empire of Xiongnu rose. Xiongnu Empire was conglomerated from nomadic tribes of unknown ethnicity. Construction of Great Wall of China due to greatly treating than Chinese dynasties by Xiongnus is handed down. Time of small empires and chaotic skirmishes between nomadic tribes begun after Xiongnu Empire disintegration and chaos continued till the end of 12th century A.D.

Temujin better known as Genghis Khan in 1190 united small Mongol confederation from till that time non-unified Mongol tribes and other small nomadic tribes in northern region of country (Khenti region nowadays) and in 1206 was after famous battle with Jamuha elected by *Great Hural*[5] or and became the leader (Great Khan) and unifier of tribes in contemporary Mongolia. The Mongolian Empire based on nomadic tribes as Merkits, Keraits, Mongols, Tatars and numerous other tribes under the rule of Genghis Khan and than his descendants consequently expanded to the far west area of Near and Middle East, far to the Europe to contemporary border between Republic of Poland and Federal Republic of Germany, to the southwest to contemporary India and finally to China which was long time under the rule of Mongols as for example the most famous one there Kubla Khan. Rule of Ligden Khan who was overthrow in early 17th century by Chinese Manchus is considered as the fall of the Mongolian Empire (Weatherford, 2006).

Mongols were more than 400 years ruling the biggest empire in human history which brought paper money, horseback-riding messenger net, "modern" warfare tactic

[5] Also called *Khuruldai*, was "political" gathering of each tribe representatives. It is still used in Mongolia as parliament.

widely used by Germans (*Blitzkrieg*) or Russians during The Second World War and many other important matters.

Mongolian feudal Lamaist system controlling area of contemporary Mongolia was under the rule of Chinese dynasties for almost 300 years after the fall of the Mongolian Empire.

The modern history of Mongolia begun by year 1911 when independence from Chinese dynasties and short Mongolian autonomy was achieved and after the death of king Bogd Khan in 1924 a socialist Mongolian People's Republic was founded and Mongolia became second Marxist-Leninist oriented country in the world. “Agricultural” production was entirely focused on livestock production with trace indication of crop production centered on fixed settlements which were predominantly Buddhist monasteries till foundation of new republic.

2.5.1 History of agriculture and breeding

Change occurred by 1925 with collectivisation (known as “Left deviation”) of pastoral production and central planed economy under Mongolian Peoples’ Revolutionary Party (MPRP) control which was embedded in Party Program. The Seventh Party Congress in 1928 emphasized the importance of organising various kinds of labour associations as for example: 1.) cooperative encampments for pastoral production, in which a number of households jointly managed aspects of their private livestock production and 2.) specialised associations, based on particular types of productive labour such as caravan workers cooperating as a team and dividing their income (Rosenberg, 1981). Mass collectivisation begun among herders in countryside in the end of 1920’s by confiscation of livestock in personal property and its’ redistribution to *arads* (poor herder families) and increasing levying tax on animal per head (Bold, 1996). Due to poor management, high number of slaughtered animals (defence against levying tax on animals) and harsh weather conditions cattle and horses declined by 18% each, sheep by 37% and goats by 24% and overall loss was between six and seven million heads of livestock from a national total of about 23 millions (Rosenberg, 1981). Considering primary failure more herders discontinued to participate in collectives.

MPRP had begun to increase herders’ motivation by new tax law initiation. A*rads* who were collected in *suurs* (collective working groups from one to three families of *arad*

herders organised in *khesegs* and *brigades*) who were gradually replacing *Khot Ails* (traditional herder groups) were exempted from tax payment and provided relief from 10% to 25% for middle and upper strata households in case of their degree of contribution in hay making and winter shelters preparation. Land utilisation law favouritizing collective members on quality pastures became practised in mid 1940's also enforced more *arad* herders (after who were collectives named) to participate in *suurs.* There were ten state farms (focused on crop production) and ninety one *suurs* (focused on livestock production), 61% of nation income came from agriculture where approximately 90% of population was employed during 1940's (EN, 2012). Number of *suurs* was continuously slightly increasing owing to MPRP restriction against livestock private property and benefits to *suurs'* members as collective winter fodder preparation by hay making machine stations from USSR, winter shelters preparation, small loans by *suurs* etc.

The most influential policy by MPRP was forced after The Second World War in the beginning of 1950's. It was definite breakpoint in collectivisation. New system purchase obligation for private herders to pay for any difference in case of planed number of livestock in cash or products. In case household had 95 adult milk cows and number planed by state for next year was 110 heads of adult milk cows, household had to increase number of cows until they reach planed number of heads and was expected to sell animal products at the state purchased prise based on the production of 110 cows. If the household had only 105 cows instead of 130, it had to pay the price differential for the products from the missing 5 cows (Rosenberg, 1981). Owing to new policy against private herders, lack of manpower (most of poor which were before hired by better herders became members of *suurs*) and strong collectivisation propaganda significantly increased number of *suur* participants and weakened rows of private herders.

Livestock economic collectives called *negdels* replaced *suurs* communities in mid 1950's (Bold, 1996; EN, 2012; Mearns, 1993; Neupert, 1996; Rosenberg, 1981; Templer *et al*, 1993), but exact year varies by authors. Participants of *negdels* were paid for each working day by: 3 tugrik (approximately 1 USD), 34g or red *aaruul*[6], 3g of white *aaruul* and 34g of *ayrag*[7] or milk vodka for example, were allowed to have up to

[6] Mongolian kind of dried curd (generally very hard, sometimes softer and sweet)
[7] Fermented mares' milk (kumis in Kazakh and Russian)

40 *bodo*[8] of livestock and animal husbandry manager was allowed to have over 100 *bodo* (Rosenberg, 1981)of livestock (limited number of livestock was given by state quotas), but according to Potkanski (1993) only 2 *bodo* were allowed in private property, feed supplements were provided for free and risk of livestock looses was partially straighten by livestock insurance.

The 1960's were period of other significant changes. Mongolia became participant of SEV[9] in 1962 and began receiving large-scale agricultural assistance from the USSR and other East European Socialistic countries. Number of state farms increased, state fodder supply farms were established, the number of *negdels* decreased through consolidation and inter-agricultural cooperative associations were organized to facilitate *negdel* specialization and cooperation (EN, 2012), because *negdel* structure (in its´ basic concept) did not work effectively.

The beginning of 1970's was in sign of law and rules improvement. The State Emergency Fodder Fund was formally established in 1971 as a response to the consistently bad winters of the 1960's (Templer *et al*, 1993). It forced *negdels* to produce more forage stocks for winter and winter shelters for livestock as well and was enforced establishment of fodder supply farms and watering wells. Law concerning usage of land, which specified usage of land for private crop production, was received also in 1971 (Wädekin, 1990). Statistical data became to be collected and more supervision on *negdels* and smaller *arads* was enforced.

Several programmes as Programme of the development of agriculture and improved food supply of the population (PDAIFSP) which started in 1986 were introduced during 1980's. PDAIFSP concept was developed owing to soviet cooperation and was based on analogous USSR Food Programme from year 1982. Exactly 52 state farms, producing approximately 75% (Wädekin, 1990; EN, 2012) of whole agricultural production and employing almost two thirds of workers engaged in agricultural sector, 17 fodder supply farms, and 255 *negdels* (EN, 2012) were presented in Mongolia in mid 1980's. Average

[8] Mongolian animal unit. Transfer vary among authors:
a) Potkanski (1993): Cow, yak or horse = 1 *bod* (*pl*. *bodo*); camel = 1.5 *bodo*; sheep = 0.14 *bod*; goat = 0.1 *bod*
b) Rosenberg (1981): 1 *bod* = cattle or horse; 1 *bod* = 0,5 camel; 1 *bod* = 7 sheep; 1 *bod* = 14 goats
c) Bold (1996): 1 *bod* = horse, cow or yak; camel = 1.5 *bod*; sheep = 0.7 *bod* and goat = 0.9 *bod*
1 *bog* - (*Mongolian small animal unit*) = sheep; goat = 0,7 *bog*; horse, cow or yak = 7 bog; camel = 15 *bog*
[9] Council for Mutual Economic Assistance (*Sovet ekonomicheskoy vsaymopomoshchi* in Russian)

negdel had 61,500 head of livestock, 438,500 ha of land, of which 1,200 ha was plowable land, 43 tractors, 2 grain harvesters and 18 motor vehicles and it harvested 500 t of grain. Average state farm employed 500 workers, owned 26,200 head of livestock, 178,600 ha of land of which 15,400 ha was plowable land, 265 tractors, 36 grain harvesters and 40 motor vehicles and it harvested 12,100 t of grain (EN, 2012) in contrast of *negdels* focused on livestock production. Governmental organisation changed a bit in the second half of 1980's. Several ministries were abolished and new ones were established to improve their efficiency as for example three ministries: 1.) the Ministry of Agriculture, 2.) the Ministry of Forestry and Woodworking and 3.) the Ministry of Food and Light Industries were abolished and their competency was devolved on to two new ministries as: 1.) the Ministry of Agriculture and Food Industry and 2.) the Ministry of Environmental Protection which were established. In late 1980's was increased allowed number of privately held livestock and area for private crop production with the highest increase in rural areas and the lowest in urban areas.

The turning point of 1980's and 1990's brought the biggest change in Mongolia since independence on Manchus rule in 1911. Mongolia joined USSR and countries of Eastern Europe in leaving socialistic political system after democratic revolutions. Transition from socialistic system to democratic system caused process of massive decollectivisation, privatisation of collective *negdels*, state farms, plants, shops, houses, etc and the collapse of the industrial sector caused by interrupted cooperation with ex-socialist countries and USSR primarily. Privatisation of livestock was conducted quite mechanically, according to a simple arithmetic formula based on family size plus a coefficient related to the time of employment of adults in the *negdel* (Potkanski, 1993). Approximately 30% of livestock and *negdels* facilities were distributed through all country and remaining 70% was transferred to newly established companies (Neupert, 1996). Privatisation of companies took similar progress as in Czech Republic during same period. Companies were mostly closed or somehow sold after privatisation which has been seeing as huge rout. Owing to previous mentioned facts Mongolian economic crisis had arisen followed by increasing unemployment (see Figure 1).

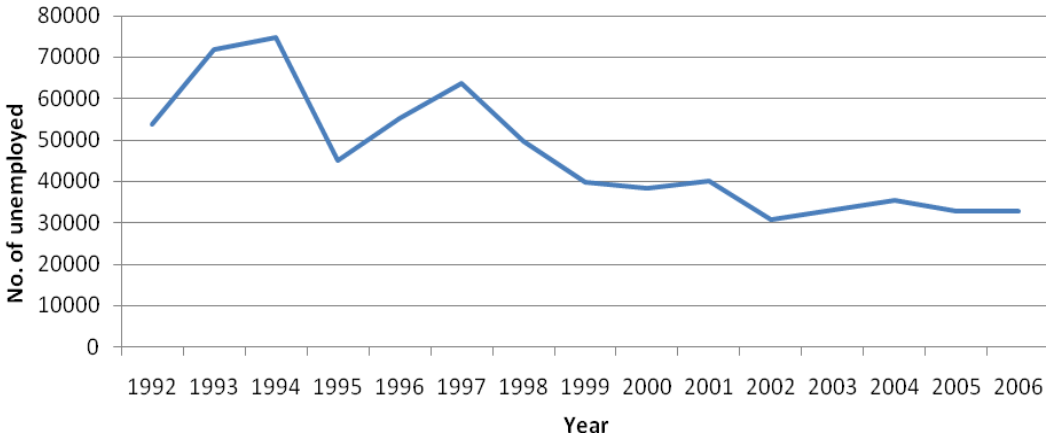

Figure 1 – Unemployment (1992-2006) – (Source of data: NSO (2007))

Lack of goods, food shortage progressed and level of unemployment rapidly increased hand by hand with inflation. Introduction of new pastoral cooperatives called *khorshoo* formed by members pooling their shares to gain joint ownership of some section of the old *negdel* (Kotkin and Elleman, 1999) and reintroduction of traditional *Khot Ail* system had begun (Sneath, 1993) together with rural-ward migration (Griffin, 2012) as answer to economical crisis and people started to slowly shift from industrial and urban areas to rural areas, however veterinary, schooling and health services quality and quantity rapidly decreased. Infrastructure developed by collectives of *negdels* decayed and number of winter shelters decreased due to no repairing of new owners, watering wells lapsed, winter forage production decreased due to lack of functional haymaking machinery. Number of livestock increased as answer to lack of food supply caused by interruption of crop production caused by dissolution of state farms. Owing to absence of pastoral management, which was managed by *negdels* and state farms before decollectivisation, occurred problem of overgrazing and depreciation of pastures due to accumulation of herders and livestock in areas with good conditions for livestock and preferably with good infrastructure as asphalt roads or close to big cities or *sum* centres.

Nowadays is problem of overgrazing and deterioration of pastures coming more and more actual because herders and livestock density in mentioned areas is still increasing, although trend of substantial city-ward migration (Neupert, 1996) after withering *dzuds* from 1999 to 2002 is increasing (see Figure 2).

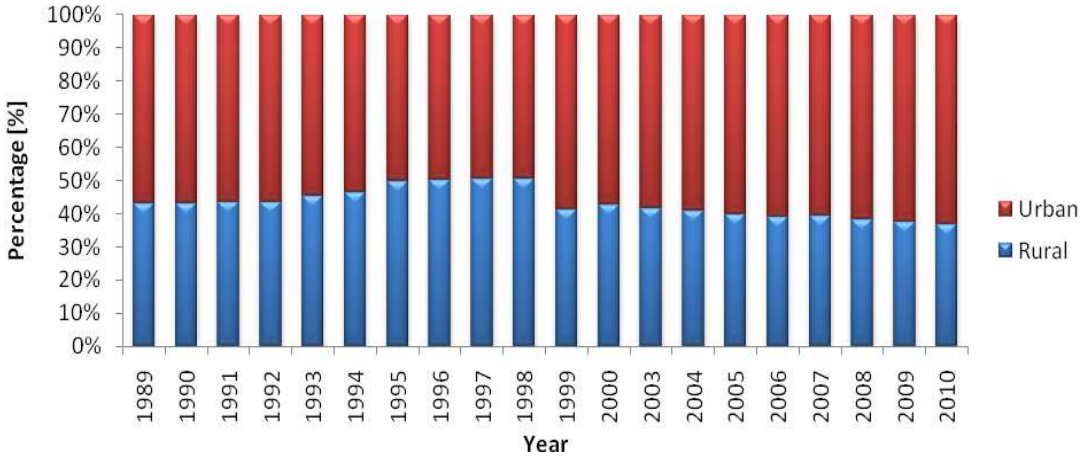

Figure 2 – Progress in rural-urban population rate (1989-2010) (Source of data: Griffin (2002) and NSO (2011))

2.5.2 History of livestock identification systems in the world and Mongolia

Livestock identification has been used since the domestication of first livestock approximately 9,000 BC. It was logical step in recognition process of livestock ownership firstly and during time were advantages of livestock identification applied for other purposes connected to livestock breeding. Several kinds of identification types and systems were invented and are used all around the world.

Types of LIS used are more or less sophisticated and depend on livestock type, type of breeding, number of livestock, climatic conditions, culture, traditions, finance conditions and other factors. Widely used types of livestock identification are colouring of livestock, branding (by red-hot or breeze branding iron), tattooing, nose printing, neck collars or chains, ear notching, ear tags, ringing[10] and others. Two main systems are used as a) numbering[11] systems (ear tags, collars, brandings, tattoos, ringing, etc.) and b) electronic systems (electronic ear tags, microchips and electronic collars) (Neary and Yager, 2002).

Purposes of LIS usage can be a) recognition of ownership, b) recording of quantity and quality of production, c) livestock movement, d) health condition surveillance, e) retrogressive control of livestock products and others.

[10] Poultry
[11] Combination of numbers and letters determining all needed information of identified livestock

Many countries[12] have compulsory LIS which are unified and are strictly controlled by law. Uruguay for instance has registered branding livestock system since 18th century (Allflex, 2012). There are many countries which do not have national or official LIS and Mongolia is one of them.

Mongolian herders were using their private "LISs" since time immemorial. Most used were ear notching for small livestock as goats or sheep and branding for larger livestock as camels and horses. Cattle were recognized generally by special signs or was combined branding and ear notching (collars were used minimally). Official LIS usage was introduced by USSR agricultural co-operators since period of collectivization. Cattle, goats and sheep were identified by metal ear tags imported from USSR (IACR, 2012). Ear tags were imprinted by letter and number system and livestock data were registered in *negdels* filing cabinets on paper cards. LIS was not proper managed and paper cards with livestock data were not properly stored. Herders left LIS immediately after communist regime collapsed. The most of livestock data were irrecoverably lost due to facts mentioned above and low interest of herders in continuing in LIS. Usage of LIS became private decision based after change of regime and most of herders returned to traditional systems as ear notching and official national LIS was interrupted. Most of *negdels* ex-members had experience with soviet metal ear tags, but due to livestock health complications from them refused to use them almost at all.

Plastic ear tags together with accessory were reintroduced during last decade owing to international developing projects[13]. Private companies[14] or individuals import plastic ear tags from China, Taiwan or other countries, than distribute to market and expand. Break point came in 2010 with National Mongolian Livestock Program (NMLP) application when became LIS compulsory since 2012 (MOFALI, 2009). The NMLPs' objective no. 4.2.4 focuses on "Creation of an animal registration database and network" (see Annex 1). "Ordinance on livestock identification system and livestock central database establishment" define exact duties of each LIS chain contributor, livestock evidence tools

[12] Australia, Brazil, USA, Canada, EU countries, etc.
[13] "Animal Health and Livestock Marketing Project", "Identification of animals in the Central Region of Mongolia", "Livestock Identification System" and "Special Programme for Food Security project: Increasing the supply of dairy products to urban centres in Mongolia by reducing post-harvest losses and re-stocking" more in chapter 2.11 and 2.12.1
[14] Allflex USA, Inc.; etc.

and accessory characteristics, LIS function and structure characteristics and LIS law directives (MOFALI, 2011).

2.6 Nomadism as a Mongolian way of life

Nomadism can be simply described as a roving lifestyle which supposedly emerged during Neolith period when domestication of animals begun. Nomads, members of nomadic society, are usually formatted into groups and tribes of different size and migrate together from place to place search better pasture or conditions in general for their livestock. Bindings in nomadic groups are usually based on family which is core of nomadic household.

Nomads are generally divided into two types. Pure nomads who entirely depend on their animals for livelihood and who, as a result of this dependence, move periodically around in search of water and pasture, thereby having no permanent residence or semi-nomads whose are similar to pure nomads except that they also engage in agriculture during part of the year when crops can be grown (Kalsbeek, 1986). Semi-nomads often leave agricultural activities when needed, especially during periods unfavourable for their animals (drought, pastureland depletion by overgrazing, etc.). Nomadic hunter-gatherer groups ware predominantly transformed or replaced by nomadic pastoralism or transhumance. Only few ethnic groups are still following this way of life, when group follow game and shift to areas with better fruits access. The most known were certain North American Indians or nowadays are African Bushmen, Pygmies or Indian Adivasies.

Migration is strongly bound to current environmental conditions, seasonality and is also strongly influenced by ancestors' heritage. Migration from point of regularity can be considered to be a) irregular when is migration forced by need of fresh pastures for grazing livestock which is known as a nomadic pastoralism or b) regular when is migration forced by tradition acquired from ancestors where pastures are seasonally fixed and generally represent rotational system is known as transhumance. Migration may be furthermore a) horizontal which is typical for vast open areas as steppes and pampas (Mongolia, Kazakhstan, Argentina, etc.) b) vertical which is typical for mountain areas (European Alps, Caucasus, Altai, Himalayas, etc.), c) long distances when generally move all households with whole families or d) short distances as well when generally migrate only men part of group or household with livestock to seasonal pasture. Mentioned migration

"types" are usually mingling between each other and combined to ensure the best conditions to livestock on which households are dependent.

Mongolia can be perceived as country of nomads with a little exaggeration. Tsaatan ethnic group[15] in Khövsgöl *aimag* can be consider as intermediate step between hunter-gatherers and nomadic pastoralists. Nomadism became the most effective way of life in contemporary Mongolian area, due to environmental and climatic conditions and still is in case of agriculture. Thus that fact is Mongolian society ground on nomadic roots. Even Great Mongolian Empire led by Genghis Khan (between 12th and 13th century A.D.) was based on several "types" of nomadism and owing to nomadic life strategy which Genghis Khan capitalized in warfare was so successful. Mongolian army structure was imitating structure of Mongolian society and was strongly bonded to animals especially horses and intimately linked by family ties. Animal husbandry has not been changed much since Genghis Khans' times. One of the proofs of this is very high popularity and common usage of regular living (even in Ulaan Baatar) of mobile dwelling called *ger*[16] (see Annex 3).

Pure nomadism slightly transformed into semi-nomadism especially during collectivization era and under the influence of western culture. Transhumance is mainly practicing nomadic "type", but in areas with lower pastureland carrying capacity pastoralism predominates. Broad variation between ecological zones of Mongolia in territorial behaviour among pastoralists was surveyed (Mearns, 1993) and linkage between pasture quality and territorial behaviour was proofed. Namely in Altai area on the west and mountain area on the north of country predominate transhumance with more vertical than horizontal migration on shorter distances. In contrast pastoralism predominate in the east and south part of the country where is prevalent horizontal migration than vertical migration, on longer distances due to carrying capacity of pasturelands (Bold, 1996; Schmidt, 2006). Finally central area of the country shows combination of transhumance and nomadic pastoral strategies which are more or less penetrating each other. Mongolian nomadic way of life was strongly affected by collectivization era and was reflected in decreasing distances necessary for migration and its frequency (see Table 2).

[15] Also known as „reindeer people". Population estimated between 200 and 400 (Toirkens, 2011).
[16] Traditional Mongolian rounded dwelling (*yurt* in Russian) – kind of tent with wooden construction and felt cover. Well adapted type of dwelling for Mongolian climate conditions and nomadic way of life (both construction and deconstruction take one or less day according to size) and cheap (price from 100,000 MNT)

Mongolian nourishment is typical for nomadic way of living there. Mongolians predominantly depend on five animals as cattle[17], horse, goat, sheep and camel which are pillar of Mongolian nomadic living. Milk and milk products as *aaruul*, *eezgii*[18], *ayrag*, *tarag*[19], *cay*[20] and many others are consumed predominantly during summer period when milk production is high and during winter period is nourishment composed of meat of all five animals mentioned above (the most preferred is horse meat). Cereals, vegetable and fruit are consumed minimally (cities are exceptions). The unwritten Mongolian law is to entertain traveller with *cay* and other homemade products. Similar nourishment composition can be seen in Kazakhstan, Tajikistan, Tibet, Inner Mongolia[21], Kyrgyzstan or among few ethnic communities in Iran, Afghanistan, Somalia and other places with nomadic cultures.

Table 2 – Frequency and distances migrated through different regions in 1930's – 1950's (Bold, 1996)

Period	Mountain regions		Steppe regions		Gobi Desert regions	
	Distance [km]	Frequency	Distance [km]	Frequency	Distance [km]	Frequency
1930's	10-12	7-8	150-200	10		
1940's	15	4-10	200	10		
1950's	15-20	6-8	30-40	7-8	50-100	15

2.7 Administrative division of Mongolia

Niyslel is capital city (province) Ulaan Baatar. Capital city is primary level administrative unit of State equal to *aimag*, but much smaller by area. *Niyslel* is divided into nine *Düüregs* (districts). Than each *Düüreg* is divided into several *Khoroos* (sub-districts) and whole Ulaan Baatar composed of 121 *Khoroos*. State government with president of country and subordinate ministries' bureaus are positioned there.

Aimag (province) is primary level administrative unit of State. There are 21 *aimags* plus 1 *niyslel* (capital city province) in Mongolia. Aimags are divided into several *sums*.

[17] Including yaks
[18] Kind of dried cheese
[19] Yoghurt
[20] Everyday drink - tea with milk, salt and sometimes some fat, meat, rice or whatever
[21] Autonomous region of the People's Republic of China

Province governors and state representative secretariat are positioned in *aimags'* centre cities.

Sum or *soum* (district) is secondary subdivision level administrative unit of State. There are 331 *sums* in Mongolia. *Sums* are divided into several *bags*. District governors and small governance offices are positioned in *sum* centre cities.

Bag (sub-district) is subordinated unit of *sum*. *Bags* are the lowest level administrative unit of the State. Bags are composed by individual households more or less informal associated.

2.8 Local level pastoral organisation

Bag as was mentioned above, is the lowest level administrative unit of the State. It usually composes from 50 to 250 households (Mearns, 1993). Membership of *bag* is usually stable in principle and formalised by administration responsible which is together with *sum* superordinated to households, informal associated into pastoral communities, neighbourhoods and camps. *Sums'* and *bags'* governors and governance offices are responsible for proper monitoring and statistical data collection from pastoral communities, neighbourhoods and camps. *Bag* may have economic function in some areas as arable cropping for example.

Neg Nutgiinkhan or *Neg Jalgynkhan* (community) is ordinarily composed from 20 to 80 households. They are residence based community of herders or aggregation of neighbourhoods in fact known as "people of one place". Economical function is not necessary in case of *Neg Nutgiinkhan* or *Neg Jalgynkhan,* but may occur kind of cooperation, for example in marketing activities. Weak kinship relations are typical there, except within individual neighbourhoods close each other.

Neg Usnykhan or *Neg Khamrynkhan* (neighbourhood) is ordinarily composed from 5 to 20 households. They are residence based groups. Economical functions may have occur in limited scale as pooled usage of vehicle, looking for lost animals or collective haymaking for example. Kinship relations between members may be extensive in this case. Those "neighbourhoods often take name from landscape features as *Kholboo Tolgoi* (united knoll), etc.

Khot Ail (camp) is traditional unit of pastoral nomads. It has long history of development and was known under different names and with different structure during

time. *Khürees* were groups consisted of several hundreds patrilaterally related members during 12th and 17th century and composed of *Ails* (same as *Khot Ail* nowadays) (Bold, 1996). It is ordinarily composed from 2 to 12 households. Economic and social function is obvious and proves in pooling of labour resources in herding tasks, livestock product processing, etc. Kinship relations between households' members are very strong in case of *Khot Ails* according to Mearns (1993). Adaptation to severe conditions is occurrence (not rarely) of sequestered single households in areas with low carrying capacity of pasturelands as Gobi regions for example.

2.9 Livelihood analysis as a base of research design

The term livelihood is more and more frequently used and mentioned nowadays, no doubt due to rapid growth of human population. Pressure on life conditions and life itself results from rapid population growth, increase demand of food, drinkable water, sufficient space for living and other factors influencing human welfare.

The term itself is well recognized as humans inherently develop and implement strategies to ensure their survival (UNDP, 2010?). It is undisputed that term livelihood represent for each other something different owing to their different strategies to ensure survival. Herders' livelihood are obviously his animals for instance and of course other factors, because his existence intimately depend mainly on animals that he take care about, but also on other factors which will be mentioned below.

Increased demand in almost all sectors important for human life calls for increased attention to the approach to livelihood. Shouldn't been forgotten that livelihood should be managed as congruously as possible to be sustainable to be maintained for long time period.

The term livelihood and even sustainable livelihood seems to be clear at first sight, but each person can comprehend it in different way as was mentioned above. Even scientists' and specialists' definitions and explanations differ from each other, although frequently differ in a slight details. Great discussion about livelihood and its' sustainability arisen in 1980s in the report of an Advisory Panel of the World Commission on Environment and Development where was sustainable livelihood defined as adequate stock and flows of food and cash to meet basic needs and sustainable refers to the maintenance or enhancement of resources productivity on a long-term basis (WCED, 1987). According

to Chambers and Conway (1991) a livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living and a livelihood is sustainable which can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long term. Chambers and Conways' definition was few years later adjusted by Scoones (1998) a livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living and a livelihood is sustainable when it can cope with and recover from stresses and shocks maintain or enhance its capabilities and assets, while not undermining the natural resource base. New definition which can be shortly comprehended as combination of Scoones' and Chamber and Conways' definitions was formulated by Krantz (2001) as follows: A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base. Krantz (2001) alert and added that definition for livelihoods to be considered as sustainable should also contribute net benefits to other livelihoods. Definitions and comprehension of livelihood differ as was mentioned above and due to better knowledge gained in sustainable livelihood research field were changed during time.

2.9.1 Factors influencing livelihood

It is unexceptionable that concrete factors influencing livelihood obviously depend on the type of livelihood and differ case by case, but generally can be factors influencing livelihood divided according to Chamber and Conway (1991) into three categories: a) social; b) economical and c) ecological or environmental. Ellis (1999) usher analogous categories as: a) social factors (social relations, institutions, organisations); b) exogenous trends (e.g. economic trends) and c) shocks (drought, disease, floods and pests). Ashley and Carney (1999) mentioned slightly different components and factors as: a) the priorities that people identify; b) the different strategies they adopt in pursuit of their priorities; c) the institutions, policies and organisations that determine their access to assets/opportunities and the returns they can achieve; d) their access to social, human,

physical, financial and natural capital and their ability to put these to productive use; and e) the context in which they live, including external trends (economic, technological, demographic, etc.), shocks (natural or man-made) and seasonality. Carney (2002) point out three main categories: a) risks; b) institutions and c) access to other assets (such as health or technology). Sustainability of economic, social, environmental and institutional factors according to SDC (2010) are the most significant factors influencing sustainability of Mongolian herders' livelihood.

2.9.2 Factors influencing livelihood of small holder livestock producers in central region of Mongolia

Classifications of factors influencing livelihood are not unified as was mentioned before. The simplest, well-arranged and the most used seem to be categorization schema: a) social factors; b) economical factors and c) environmental factors more or less used by Chamber and Conway (1991), Ellis (1999) and SDC (2010). Short description, list of factors influencing livelihood of herders in central region of Mongolia by category and list is visible below.

2.9.2.1 Social factors

Age – Mongolians usually study eight or ten years and then participate in duty cycle. Retirement age is 60 years for men and 55 years for women who are not subject to any special early retirement rules (UNESCAP, 2007)[22]. Work efficiency of children and retirees is generally lower than efficiency of full duty cycle participants.

Education – The structure of the education system in Mongolia includes pre-school education and general secondary schools (primary, lower and upper secondary, but generally do not exist separately). Schools in countryside have four grades, the most of schools has eight grades and few schools in larger cities have up to ten grades. First four or eight years are obligatory (depend on accessibility of school) (Rosario *et al*., 2005). Total

[22] The lowest age limit for retirement claim for both men and women is 50 years influenced by number of children, years in services in hazardous conditions *etc*. For further information read:*"Country report for Seminar on the Social, Health and Economic Consequences of Population Ageing in the Context of Changing Families (UNESCAP, 2007)"*

adult illiteracy rate 97% (UNICEF, 2012) is quite high owing to obligatory school attendance.

Ethnicity – Some kind of ethnic discrimination exist in Mongolia appointed especially against Kazakhs and Chinese, but there are no registered events among pastoral communities. Kind of rancour and discrimination against ethnics mentioned above occur in cities generally.

Gender – Social position of men and women in Mongolia seems to be more or less equal owing to Buddhist tradition based society and long time under communist MPRP influence, but women work longer hours than men do as families rely more on subsistence production and casual employment to meet household needs (Thomas *et al*., 2010). Women and children are less able to take up alternative economic opportunities and their health and education are compromised due to that fact.

Number of household members – Size of household is one of key factors. Different number of household members requires different size or number of dwellings, also food requirement increase with household members number, but on the other hand members can share household expenses, participate in household and other activities which may lead to income increase and expenses per household member decrease.

Policies – Several policies influence livelihood of Mongolian herders. The most important seem to be Pasture law, accepted in 2009[23] provides for a transition from non-regulated pastureland use to regulated economically-oriented and ecologically sustainable use of pastureland. New pasture law regulate: a) securing possession of pastureland for herders and legal entities; b) procedure to classify pastureland on an ecological basis and provide for the agricultural and economic needs of traditional herding communities and the emerging intensive livestock husbandry industry; c) managing pressures on the ecological

[23] First pasture law was drawn up in 1933 influenced by introduction of collective production, than in 1971 law specified classification of land according to its use and the responsibilities, the obligations, rights of economic organisations and the administration. In 1997 individual and group ownership of natural pasture and areas for winter and spring camps, rules for use of grazing in emergencies, stock-raising in settled areas, rules for contracting grazing to right-holders, setting up of inter-*aimag* and inter-*sum* areas, granting of haymaking rights to individuals and groups of herders was incorporated (Suttie, 2000).

environment (desertification and natural disasters as *dzud*); d) distinguishing the functions, duties, responsibilities and rights between the different levels of administration and e) pastureland planning and management system (UNU-EHS, 2010).

All herder families belong to Tax low. They are registered in one of the country's *sums* (or village), and they only pay taxes if they have permanent winter and spring shelters. If they leave their *sum*, they have to pay a tax (per animal per day) to the governor of the other *sum*. But these regulations do not apply during the *dzud*s, when this tax is not valid, and herders are free to move to other *sums* in order to survive the winter with their animals (Tumendemberel and Goodijk, 2011). Due to tax per animal is prevalence of reporting lower livestock number by herders than in reality (RFLC, 2005). Government enforces to establish livestock evidence system to eliminate this problem[24].

Livestock insurance also can influence livelihood in case of livestock looses compensation, but only two livestock insurances were provided in 2002 by Mongol Daatgat Company and by state owned company (Skees and Enkh-Amgalan, 2002). Herders participation in livestock insurance is quite low, even to wide spread Daatgat Comp. with at least one branch in all *aimags*[25] (Skees and Enkh-Amgalan, 2002). Livestock insurance was compulsory for *negdels* since 1964, but validity of insurance rules expired with regime changes in 1990 (RFLC, 2005). Mahul and Skees (2007) alert to need of kind of Disaster Response Product which cover catastrophic losses, occurring approximately once every 25 years or more. Livestock insurance system also face same problem as Tax law and require adequate livestock identification system for proper function.

Accessibility of loans is extremely low for Mongolian herders. According to RFLC (2005) are only 5% of herder households able to borrow from the banking system and only two banks are offering lower interest rates and/or longer loan terms for herders purchasing the Base Insurance Product[26] . Reason for low access to loans is significantly influenced by high risk of herding activities which are threatened by high livestock looses during *dzuds* and herders cannot guarantee to bank owing to their only belongings is livestock.

[24] CULS project "Livestock Identification System" work on solution of this problem within National Mongolian Livestock Program (goal no.4)
[25] There are 27 branches for 21 *aimags*
[26] Product covering the mezzanine layer of risk. Herders pay premiums priced at commercial rates, i.e., including the risk load premium and the operating costs.

No doubt that in Mongolia missing policy on livestock number regulation[27]. Herders are enforced to sustain their livelihood through livestock increase, but do not see possibility of movement to areas with lower livestock density which are suitable for them.

Religion – Mongolians are mainly affected by Buddhism (53% Buddhists) and are in case of religious subjects superstitious and it may affect decision-making. Activities are a bit muffled during religious holidays and festivals.

Migration – Mongolian livestock production is strongly linked with migration owing to its nomadic society history and life of herders is strongly affected by it of course. For further information read chapter: “Nomadism”.

Infrastructure – Mongolian infrastructure is a bit complicated. Railway starch from the north from Russian Ulan Ude through Ulaan Baatar and continue to Chine just by one rail. Mongolian roads or better say trials has only 1,674 km paved roads. The rest are just earthen trials which highly complicate transportation during heavy rains or snowing. Schools and governmental offices are generally in *sum* or *aimag* centres far away from each other.

2.9.2.2 Economical factors

Prices of livestock and products – Fluctuation of live animals, animal products as meat, milk, leather, fur, wool, cashmere, and fruits and vegetable is seasonal. Prices of milk and milk products and fruits and vegetables are lowest during summer when is production highest. Prices of meat, leather, fur, wool and cashmere are lowest in the winter when production is highest owing to high slaughter activity. The lowest price of live animal is during spring, when their weight is the lowest after harsh winter. Meat-packing plants use that fact to gain higher profit, largely buy livestock and transport it to plants by foot till the autumn (livestock gain its original weight on the way).

[27] Even Pasture law should regulate it, but supervision is weak.

Prices of fuel – Fuels are scarce goods in Mongolia especially in some areas. Prices of coal are high, wood is hardly accessible and dried dunk (widely used in rural area) may not be enough for heating and cooking for whole winter season. Prices of fuel are fluctuating and increase from day to day even by 400% owing to high dependency on petroleum and petrol on Russia which use that fact for business.

Livestock number – Livestock number is very important factor influencing quality of herders' livelihood. It is extremely difficult to determine the exact number of livestock necessary for sustainable livelihood of herders and it differs among various authors. The nomadic herders rely entirely on their animals for their survival and it is estimated that a family needs approximately 150 mixed livestock and horses to sustain it (Centre for Tropical Veterinary Medicine, 2005) likewise 100 to 150 heads is considered to be threshold herd size for a reasonable living and 50 is the poverty line (Scoones, 1998 and Suttie, 2000), Chuluundorj (2006) and Skees and Enkh-Amgalan (2002) and RFLC (2005) claim that the number of livestock for a reasonable living for an average family of 4 or 5 people would range from 200 to 300 animals, but according to Bold (1996) is limit much lower (see Table 3). Potkanski (1993) indicate 100 *bodo* as the lowest level of economically and ecologically viable production unit in Mongolia and Khazanov (1980) mentioned that in the beginning of the 20th century a Mongol family required 14 horses, 3 camels, 13 cattle and 90 small stocks for subsisting. Minimum required livestock number for sustainable living since the beginning of 20th century till nowadays changes a lot according to time period and author, but reflex socio-economical situation (see Figure 3).

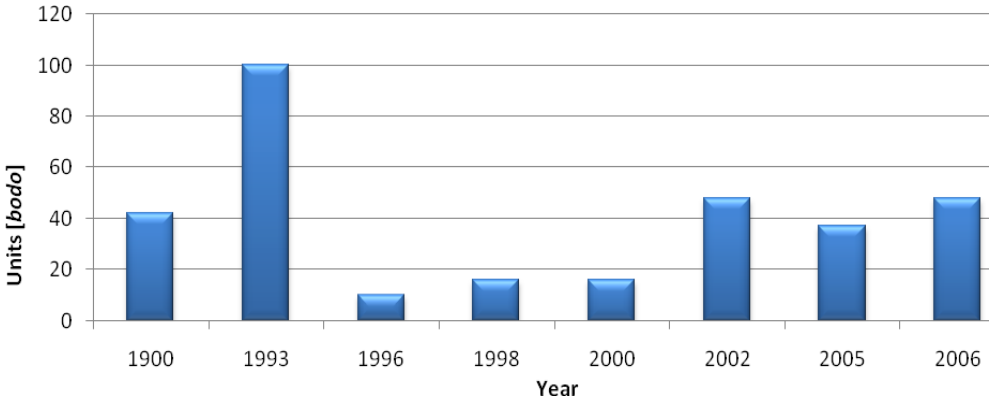

Figure 3 - Progress of minimum *bodo* level for living during time (1900-2006) (Source of data: Bold (1996), Chuluundorj (2006), CTVM (2005), Khazanov (1980), Potkanski (1993), Scoones (1998), Skees and Enkh-Amgalan (2002) and Suttie (2000))

Table 3 – Percentage distribution of households by livestock number during time (Source of data: Bold (1996), Suttie* (2000) RFLC* (2005) and NSO** (2012c))**

Year	No. of households keeping livestock	Number of livestock									
		0-10	***11-20***	***21-30***	***31-50***	***51-100***	***101-200***	***201-300***	***301-500***	***501-1000***	***1000+***
1927	155,600	15,4%	17,8%		14,2%	21,5%	18,9%	11,0%		1,1%	0,1%
1952	216,400	46,0%				48,7%			5,3%		
1995-1996	283,900	63,7%		34,2%				2,1%			
		Households without surplus production			Households with surplus production						
***1995	u.n.	40% (poverty line)				45%		15%			
2005	**253,300	80% (Households without surplus production)*						20% (Households with surplus production)*			

2.9.2.3 Environmental factors

Carrying capacity and livestock density – According to Neupert (1996) is the most important limitation that imposed by the carrying capacity of the pasture. Carrying capacity is defined as population of a given species that can be supported indefinitely in a

given habitat without permanently damaging the ecosystem upon which it depends (Rees, 1992) and also maintain the condition of the vegetation and soil in such away as to be able to fulfill the needs and aspirations of future land users (Bothma *et al*., 2004). Carrying capacity together with livestock density significantly influence quantity of pasturelands and forage available per animal. Herders deliberately migrate to areas with better quality of pastures and infrastructures in vision of livelihood improve by better market access. Density of herders and livestock cause increasing overgrazing (their number exceeds carrying capacity of pasture) mainly around main trails and cities of central region. The number of animals has been found to exceed the carrying capacity of pastureland by 32.5% at the national level and 651% in Ulaan Baatar district (SDC, 2010). Degradation of pastures due to herders' accumulation and livestock number increase (see Figure 4) is increasing, cause erosions, desertification and pasture degradation there.

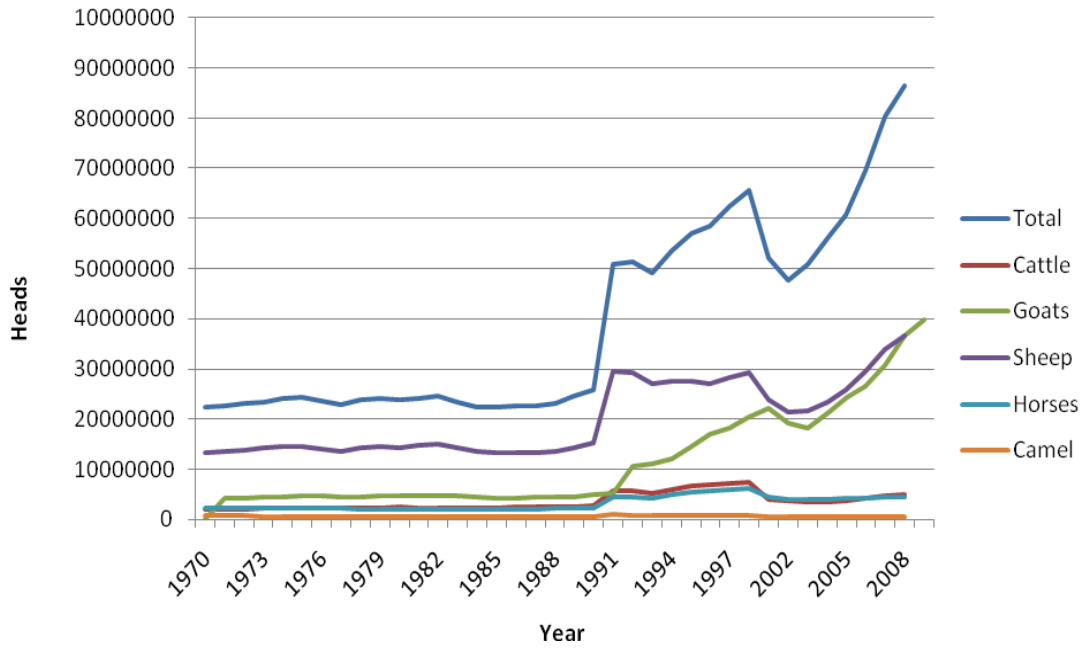

Figure 4 – Progress in livestock population by type (1970-2008) (Source of data: NSO (2008))

Diseases – Several kinds of diseases occur in Mongolia. Systematic vaccination aimed at preventing epidemics may prevent economical losses, but management of vaccination system in vast Mongolian conditions face problem in regular distribution in some areas. Several imperilling diseases are for example anthrax, contagious pustular dermatitis, contagious agalactia, enterotoxaemia, equine infectious anaemia, foot-and-mouth disease,

listeriosis, pasteurellosis, rabies, salmonellosis, tuberculosis, etc. Since the early 1960‘s intensive control programs of brucellosis have been executed and with foot-and-mouth disease continues to cause substantial economic losses in Mongolia (Odontsetseg *et al*., 2005).

Dzud - *Dzud* is one of the most significant factors influencing livelihood of herders in Mongolia and Kazakhstan. Its occurrence is known since time immemorial. Although occurrence is not periodically repeating, it always had strong impact on herders' livestock. The harshest *dzuds* occurred in past 70 years were in 1944[28], 1960's[29], 1977, 1983, 1993, 2000-2002 and 2010 (see Table 4 and Figure 5). *Dzud* is defined as a generic term denoting a natural disaster during which livestock is not able to graze (SDC, 2010). Three main categories of *dzud* are known and may occur separately in different seasons or also can appear in the same one. First category is "white *dzud*" which means a heavy snowfall denying the animal's access to the grass. Second one is known as "iron *dzud*", which is when the spring or autumn snows thaw and then re-freeze covering the grazing in a sheet of ice and the last category is "black *dzud*", which is a lack of rain, reducing the growth of grass (Centre for Tropical Veterinary Medicine, 2005) or "hoof *dzud*" occurs when there are too many hoofs in one area as herders from a problem area have moved their animals in an attempt to find forage which result overgrazing (Skees and Enkh-Amgalan, 2002).

Dzud phenomenon cause high looses in livestock. *Dzud* cause in case of livelihood of Mongolian herders: a) lack of access to health care, b) widespread food insecurity, c) loss of livelihoods, d) risk of a mass exodus of people from rural areas to the cities in search of alternative employment and e) psychological trauma for affected herders and their families (UN Mongolia Country Team, 2010). Factors mentioned above significantly decrease live standard of Mongolian herders, deepen their poverty and cause urban-ward migration.

[28] 37% losses of total livestock (9 millions heads) (Templer, 1993)
[29] In first half of 60's were losses each year around 6% or 7% and 1967 were 12% (Templer, 1993)

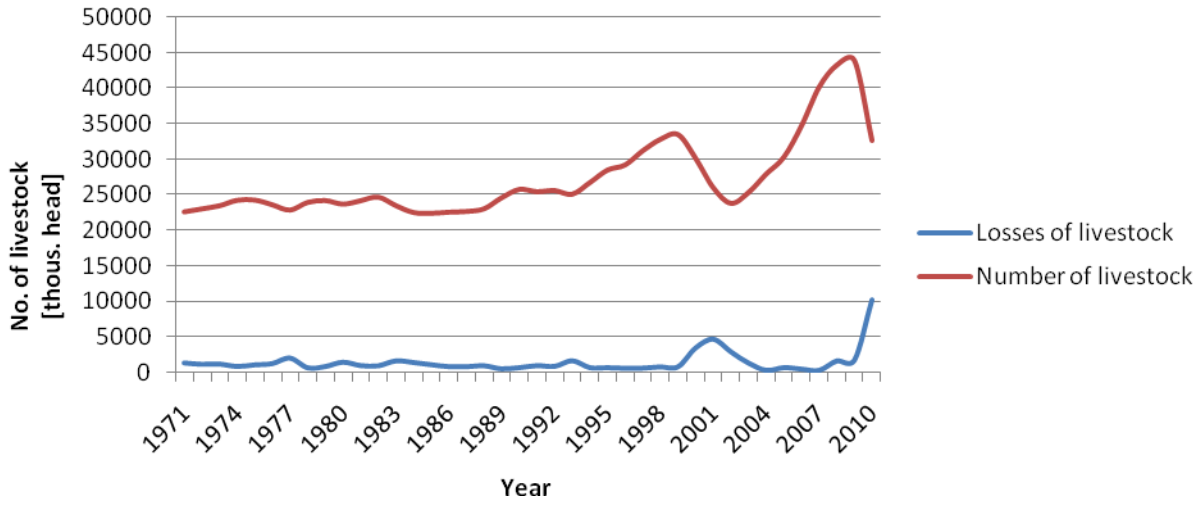

Figure 5 – Comparison of livestock number to *dzud* livestock losses (1971-2010) (Source of data: NSO (2011))

Table 4 – Livestock losses (1971-2010) (Source of data: NSO (2011))

Year	**1971**	**1972**	**1973**	**1974**	**1975**	**1976**	**1977**	**1978**	**1979**	**1980**
Losses [%]	5,9	5,0	5,0	3,5	4,4	5,3	8,9	2,7	3,5	6,1
Year	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**
Losses [%]	4,0	3,8	6,9	6,2	4,9	3,7	3,5	4,1	2,1	2,6
Year	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
Losses [%]	3,8	3,4	6,5	2,5	2,3	2,0	1,9	2,4	2,4	11,5
Year	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Losses [%]	18,1	12,2	5,2	1,0	2,2	1,4	0,7	3,8	3,9	31,5

Predators – Mongolia is homeland of two types of wolf (grey and blue). Those animals are generally shy and keep away from human settlements, but during unfavourable seasons cause livestock losses, especially for herders with low number of livestock.

Storms – Mongolian climate is harsh and weather can change unexpectedly fast. Snow storms which bring several centimetres of snow and may harm young animals may occur even in summer. Rainy storms also occur since June till August and cause local floods with destructive effect on infrastructure. Dust storms also make herders' life unpleasant and can cause animal losses as well.

Water sources – Watering wells and animal water stations constructed during *negdels* period were heavily damaged or lapsed and their number is alarmingly low and cause water shortage in arid areas and during dry seasons all around the country.

2.10 Mongolian strategy for animal production development

Ministry of Food, Agriculture and Light Industry of Mongolia (MOFALI) presented new strategy for food and agricultural sector, which tried to be able to compete in the external and domestic markets and overcome the natural and economical obstacles, during 2006.

MOFALI introduced the NMLP, the most important program in last twenty years, which suppose to help to improve situation of agricultural sector, in December 2009. The NMLP suppose to be implemented from 2010 to 2021 in 2 phases[30]. Several official documents should maintain the NMLPs' functionality as State Policy on Food and Agriculture; National Development Strategy based on MDG; State policy on Herders (Great Khural of Mongolia, 2009a); Main direction of reforming legal framework until 2012 and Government Action Plan 2008 - 2012. Great Khural of Mongolia (2009b)[31] agreed with five goals of the NMLP (2009) defined as (MOFALI, 2009):

1. Drawing special attention from the State to the livestock sector as the main traditional economic activity of the country, to assist in the formulation of a favourable legal, economic and institutional environment for sustainable development, and to develop of good governance in the livestock sector;

2. Improving animal breeding services based on social need/demand, increasing the productivity and production of high quality livestock products and raw materials and increasing market competitiveness;

3. Raising the veterinary service standard to international levels and protecting public health through securing Mongolian livestock health;

[30] First phase 2010-2015 and second phase 2016-2021
[31] For further information read "Resolution based on Law of Great Khural of Mongolia, Article 43 and clause 43.1: Mongolian Livestock National program translation".

4. Developing livestock production that is adaptable to climatic and ecological changes with strengthened risk management capacity;

5. Developing targeted markets for livestock and livestock products; establishing proper processing and marketing structures and increasing economic turnover.

Interventions are still in progress nowadays and its success will be visible in future.

2.11 International cooperation in agricultural development in Mongolia

Mongolian government, namely MOFALI frequently cooperate with several international organisations, various countries' governments and agencies on agricultural development in different branches. Several development projects were and are implemented there together with scientific cooperation which is mainly focused on examination of environment condition and try to resolve main problems endangering environmental and Mongolian pastoral society which is reliant on it. The most important cooperation is between MOFALI and CIDA (The Canadian Development Agency), CzDA (The Czech Development Agency), EU (European Union), FAO, IFAD (The International Fund for Agricultural Development), JICA (Japan International Cooperation Agency), KOIKA (Korean International Cooperation Agency), SDC (The Swiss Agency for Development and Cooperation), WB (The World Bank). Most of organisations and agencies are involved in development of agriculture through NMLP. Some of agricultural development project and programmes implemented in last ten years are mentioned below.

"***Agriculture Sector Development Program/Project***"[32] was in 2002 – 2007 implemented by ADB (The Asian Development Bank). Program comprised integrated package of policy and institutional reforms, sector investments, and advisory technical assistance to develop a more market-oriented, efficient and sustainable agriculture sector and reduce poverty by increasing income opportunities (ADB, 2009).

[32] Project no.: 32285 and budget: u.n.

*"**Animal Health and Livestock Marketing Project**"*[33] has been implemented by EU since 2008 and supposes to terminate in 2012. Project main objective is to support the Government of Mongolia in its efforts to reform its services in the agricultural sector to the rural population thereby alleviating rural poverty. Project includes technical support to establish LIS there (EU-AHLMP, 2011).

"***The Development of Agricultural Services***" was in 2003 – 2006 implemented by EU-TASIS and was focused on improvement of overall agricultural services in Mongolia (FIFTA, 2006).

"***Green Gold" - pasture ecosystem management***"[34] has been implemented by SDC since 2004 and supposes to terminate in 2012. Main objectives were a) test and introduce technologies for pasture improvement and forage production to be adopted by herders; b) introduce co-management schemes for managing pastures involving herders, local government and other relevant stakeholders and c) test and demonstrate an enabling legal environment for pasture improvement and co-management (SDC, 2009).

"***Rural Development Training***"[35] was in 2004 – 2011 implemented by CIDA. CIDAs' project focused on promotion sustainable rural development in Mongolia by strengthening their related roles in agriculture research (i.e. knowledge production), training and extension services and improve local capacity to conduct relevant research, carry out appropriate technology adaptations and to develop demand-driven extension programs (CIDA, 2011).

"***Rural Poverty Reduction Programme***"[36] was in 2003 – 2011 implemented by IFAD. Project was focused on introducing an innovative restocking scheme that helps herders rebuild their herds with credit in kind. Credit is also provided for vegetable production and activities that generate income for non-herder families (IFAD, 2012).

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[33] Project no.: ASIE/2007/146-568 and budget: 9,300,000 EUR
[34] Project budget: 6,200,000 CHF
[35] Project no.: S062532-001 and budget: 2,800,000 USD
[36] Project budget: 11,000,000 USD and implemented another two projects: a) Arhangai and Huvsgul Rural Poverty Alleviation Project (3,500,000 USD budget) and b) Market and Pasture Management Development Project (28,000,000 USD budget)

"***Special Programme for Food Security project: Increasing the supply of dairy products to urban centres in Mongolia by reducing post-harvest losses and re-stocking***"[37] was in 2004 - 2006 implemented by Japanese government and FAO. Aim was to improve food security by providing a sustainable supply of safe milk and dairy products to urban centres in Mongolia. Project also includes technical support to establish LIS there (FAO, 2006).

"***Sustainable Livelihood***"[38] was in 2002 – 2007 implemented by WB. Main aim of this project was to target groups and individuals adopt improved strategies that build and maintain human, social, financial, physical and natural capital while reducing vulnerability to shocks (WB, 2008).

2.12 Czech Mongolian cooperation

Czech - Mongolian cooperation is dating back to 1956[39] when was sighed "Agreement on scientific and technical cooperation" which both countries have committed to joint cooperation for the first time. Since that time became Czech - Mongolian cooperation very frequent. Other important agreements were "Agreement on friendship and culture (1957)" and "Agreement on economic cooperation (1960)". Official cooperation was interrupted after fall of the Iron Curtain in 1989 and was restored in 1996. The most important and in 2011 valid documents were, "Agreement on avoidance of double taxation and prevention of fiscal evasion with respect to taxes on income and assets (1997)", "Agreement on the promotion and protection of investments (1998)" and "Agreement on economic cooperation (2005)" (MZV, 2012).

Development cooperation was restored in 1996 together with other official cooperation activities. Within development cooperation since 1996 were realized 47 projects in several branches as agriculture, health services, environment, water sources, light and heavy industry etc. with total budget 742,146,269 CZK. 11 projects are still under implementation phase with total budget 180,463,000 CZK (See Annex 2). Czech Development Agency was established in the beginning of 2008 as an implementing body of the Czech Development Cooperation primarily focused on design and execution of

[37] Project budget: 1,920,000 USD
[38] Project no.: P067770 and budget: 22,120,000 USD
[39] Czechoslovakian Socialistic Republic and Mongolian People's Republic that time

bilateral development projects under the Ministry of Foreign Affairs. Between main implementers are rated Czech University of Life Sciences in Prague (CULS), DEKONTA, a.s., People in Need (PIN), CHARITA, Vodní zdroje, a.s. and others.

2.12.1 Czech development projects in agricultural and animal sector

Czech development activities in agriculture focused on establishment of livestock identification system and improvement of animal and crop production generally. CULS is the most important implementer of that kind of projects in Mongolia and widely cooperate with MOFALI and the Mongolian State University of Agriculture in Ulaan Baatar (MSUA).

2.12.1.1 Livestock identification system projects

"***Identification of animals in the Central Region of Mongolia***"[40] was since 2007 till 2009 implemented by CULS. The main aim was recreation of livestock identification and information announcing system release at the central region of Mongolia by plastic ear tags with serial numbers and card index system (IACR, 2012). More over 30,000 ear tags were distributed in Töv *aimag* during project implementation, but Mongolian response was low, but herders community was acquaint to that king of livestock identification possibility.

"***Livestock Identification System***"[41] has been implemented since 2011 by CULS in central region, namely Töv *aimag*. The project follows the work and experience of previous project "Identification of animals in the Central Region of Mongolia". The project intends to contribute to higher efficiency of livestock management, animal breeding and animal products marketing by establishment of proper livestock evidence system based on ear tags with barcodes (see Annex 5), barcode readers and data trajection chain system. It should ensure correct transfer of livestock data from herder to *bag*, than to *sum*, to *aimag* and finally to central database in MOFALI in Ulaan Baatar. Data refers to livestock genealogy, ownership, redeployment and may be used to livestock yield controls and actual livestock number in different areas and help to manage proper and sustainable pasture management

[40] Project no.: 17/MZe/B/07-09
[41] Project no.: CzDA-MN-2010-1-31195 and budget: 14,200,000 CZK

to fulfill NMLP goals and help to solve taxation of herders and improve livestock insurance management. System should be extend to whole country if is successful.

2.12.1.2 Livestock production projects

"***Support for processing of livestock products - Meat and skin processing plant***" since 2006 till 2011 was built slaughterhouse near Zuunmod city in Zuunmod *sum* (see Figure 9). Slaughter house was built to improve quality processing of meat and skin production in Töv *aimag*. Slaughterhouse should be connected with LIS which is under implementation phase under CULS and should in the beginning of system preferentially slaughter registered livestock and then entirely slaughter registered livestock.

2.12.1.3 Crop production projects

"***Alternative solutions to the development of plant production in arid regions of Mongolia***" (CzDA-MN-2010-2-31161/1) was implemented in 2010 by CULS in Dornogobi province create solutions for the development of alternative plant production in arid areas, to obtain the necessary data and establish cooperation with relevant institutions in the recipient country (CzDA, 2011a).

"***Support for improving the quality of crop production in Dornogobi***" is under implementation since 2011 by PIN. It builds on CULS project "Alternative solutions to the development of plant production in arid regions of Mongolia" and is generally focused on the development of consulting services and distribution of agriculture inputs (CzDA, 2011b)

3. Aim of the thesis

The main aim of this thesis was to determine which factors influence LIS contribution willingness, to analyze livelihood environment of herders, to determine possible interactions between LIS contribution willingness and livelihood environment of herders and estimate feasibility of introduction of livestock identification system in livelihoods of small holder livestock producers in Central region of Mongolia.

Particular aims were defined as:

1.) Analyze current livelihood environment of small holder livestock producers.

2.) Determine key factors influencing LIS contribution willingness of small holder livestock producers.

3.) Analyze correlation of LIS contribution willingness and current livelihood environment of small holder livestock producers.

4.) Estimate eventual LIS introduction feasibility in national scale level.

4. Methodology

4.1 Studied area

Research took place in Töv *aimag* which belongs to Central Mongolian region (see Figure 6). It is one of the 21 *aimags* in Mongolia. It is divided into 27 *sums*. The centre of Töv *aimag* is Zuunmod city, which is also centre of Zuunmod *sum*. Its total area is 74,042.37 km^2 which is approximately same as area of Czech Republic and population in year 2010 was 90,200 people (NSO, 2011). Population density in 2010 was very low (1.22 people/km^2) and residents are generally aggregated in *sum* centres or close to them and main roads.

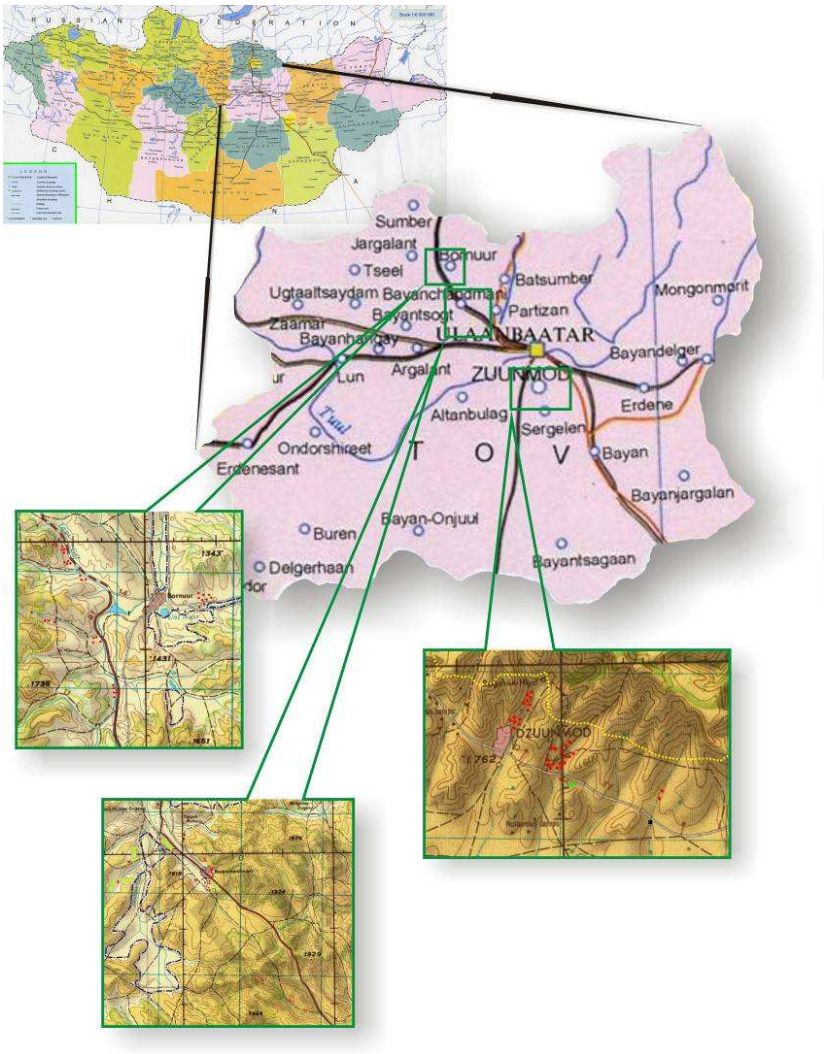

Figure 6 - Location of Töv *aimag* and *sums* where study was carried out in

4.1.1 Bayanchandmani *sum*

Bayanchandmani *sum* is located in the northern part of Töv *aimag*. It belongs to hilly steppe and mountain forest ecological zone. Total area of Bayanchandmani *sum* was estimated as 810km^2. Bayanchandmani is the second smallest *sum* where collecting of data was implemented and belongs to four smallest in whole Töv *aimag*. It is surrounded by five another *sums*, Bornuur on the north, Batsümber on the northeast, Ulaan Baatar district on the southeast, Bayantsogt on the south and Jargalant on the northwest. Formal and administrative centre of Bayanchandmani *sum* is Bayanchandmani city located in the centre of the *sum*. Bayanchandmani city is build on asphalt road (sole in whole *sum*) which connect capital city Ulaan Baatar (70km) with Darchan Uul (160km) and then lead to the Mongolian-Russian border crossing Altanbulag-Kjachta (280km). Area of Bayanchandmani *sum* is almost two times smaller compared to Bornuur *sum*.

Population of whole Bayanchandmani *sum* in year 2010 was 3,730 people of which 2,859 lived in central city Bayanchandmani and the rest of 871 lived in countryside (NSO, 2012a). More than 70% of households lived or were registered in *sums'* central city and less than 30% belonged to the rest of the *sums'* area – countryside (see Table 5). Most of Bayanchandmani city residents live in wooden and brick houses or *gers* segregated by fences and generally has full access to electricity network. The rest of the *sum* population lives mainly in *gers* scattered in pastures on foots of hills, around main asphalt road, main trails and water sources or valleys. Most of Bayanchandmani *sum* population is agricultural, specifically livestock oriented.

Total number of livestock is 36,888 heads (10 heads *per capita*) (NSO, 2012b). Proportion of sheep is approximately 48%, goat 33.5%, cattle 13.5% and horses 7% of all livestock in whole *sum* (see Table 6).

Few small livestock oriented farms with cattle herds till 50 heads are presented in Bayanchandmani city and in surrounding as well. The most modern, well-equipped and also the newest farm[42] with herd of 33 high-utility dairy cows[43] and few ha of feed crops is 6.5 km by the asphalt road to the northwest from the centre. Two the biggest farms (remains of state farms from collectivisation era) with herds of 220 and 250 heads of cattle

[42] Established in 2010
[43] Capacity of cowshed is at least fourfold

and few ha of feed crops as maize, alfalfa, oats and potatoes are approximately 15km on the west from the city. Majority of farms is focused on milk production. Poultry farm is also presented in Bayanchandmani city and give job opportunity to residents.

Owing to hilly terrains which surround city and overtop it approximately by 700m are few valleys well-protected from harsh winds utilized for crop production of potatoes, wheat and feed crops. Most of them are situated 15km on the southwest and 7km on the north (on the trail to Tsagun Muhur settlement) from Bayanchandmani city (see Figure 7). Small plastic greenhouses are used for vegetable growing as cucumbers, tomatoes etc., although very rarely.

Elementary school and agricultural vocational educational training centre are also presented in *sums'* central city and gives educational opportunity for local and non-resident children. Along the main asphalt route are some small groceries, other kinds of small shops of daily used goods and few *Cayni Gazars* (local small restaurants).

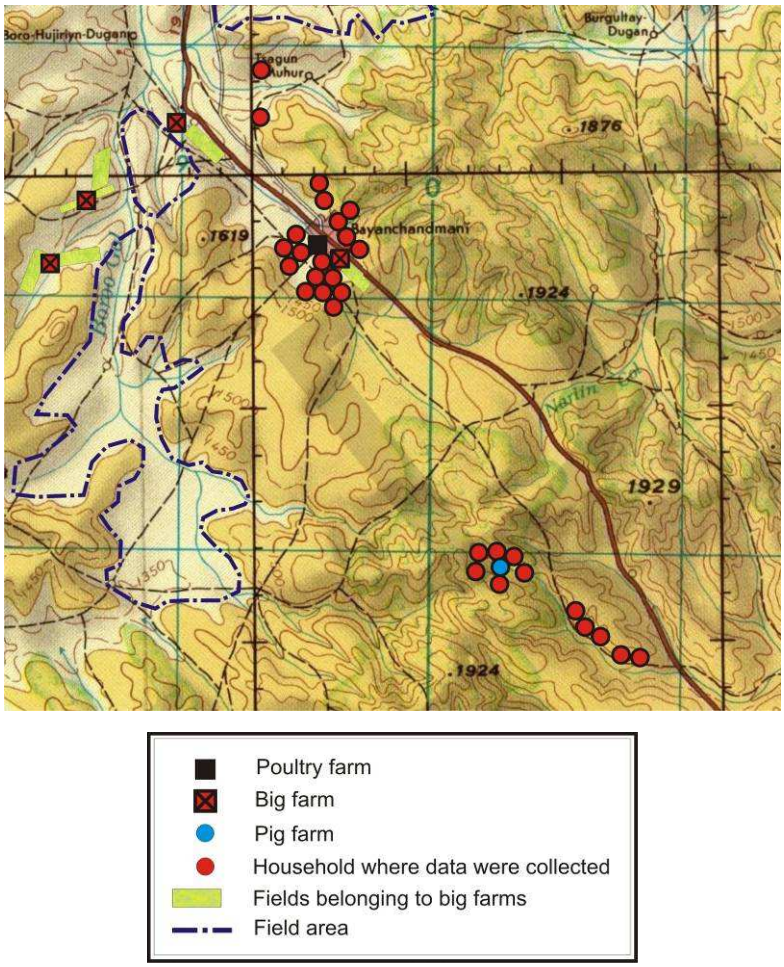

Figure 7 – Map of respondents' distribution in Bayanchandmani *sum*

4.1.2 Bornuur *sum*

Bornuur *sum* is located on the north border of Töv *aimag* with Selenge *aimag*. It as well as Bayanchandmani *sum* belongs to hilly steppe and mountain forest ecological zones, but area is hillier and afforestation level is higher. It is surrounded by another four *sums*, Batsümber on the east, Bayanchandmani on the south, Bayantsogt on the southwest and Jargalant on the west. Total area of Bornuur *sum* was estimated as 1,550km^2. Formal and administrative centre of Bornuur *sum* is Bornuur city located in the centre of the *sum* approximately 4km to the east from the main asphalt road (sole in whole sum) which connect capital city Ulaan Baatar (100km) with Darchan Uul (130km) and lead to the Mongolian-Russian border crossing Altanbulag-Kjachta (250km).

Population of whole Bornuur *sum* in year 2010 was 4,817 people of which 2,608 lived in central city Bornuur and the rest of 2,209 lived in countryside (NSO, 2012b). Population was more or less equally distributed into central city and the rest of *sum* area-countryside, where 48% of all households lived registered in Bornuur *sum* (see Table 5). Most of Bornuur city population lives in wooden, brick houses or *gers* segregated by fences and generally has full access to electricity network as well as population of Bayanchandmani city. The rest of *sum* population lives mainly in *gers* and exceptions in wooden houses scattered in pastures on foots of hills, around main asphalt road and main trails and water sources or valleys. Although Bornuur *sum* area is almost twice then Bayanchandmani *sum* and also population exceed Bayanchandmanis' by almost 1200 people, the *sum* centre is smaller, less populated and less developed due to its location further from main road which influence job opportunities and so population is more involved in agricultural activities than in Bayanchandmani, where traffic between Ulaan Baatar and Russia offer more jobs in service sphere.

According to total livestock number 96,713 heads (20 heads *per capita*) (NSO, 2012b) is livestock population almost three times higher than in Bayanchandmani and Zuunmod *sums*. Livestock production predominates as well as in most parts of Mongolia. Proportion of sheep is approximately 46%, goat 36%, cattle 11%, horses 6.9% and camels 0.1% of all livestock in whole *sum* (see Table 6).

Crop production on fields is focused in valleys well watered by springs. Potatoes and cereals are grown there on few ha. Remains of collectivisation era are well visible on

the northeast side of the central city where ruins of greenhouses belonged to state crop farm are.

Elementary school is presented in Bornuur city as well as few small groceries and *Cayni Gazars* (local small restaurant).

Small local natural-religion reserve was established 7km to the southwest from Bornuur city (see Figure 8) by lama Purevbat and new Buddhist monastery is under construction in the centre of it. Establishment of reserve has religious influence on local herders, but restriction of entry in it do not influence herding activities due to high inaccessibility of reserve area for livestock. It also positively affects locals by job opportunities for construction workers and one household is engaged as reserve keepers. Probable is higher positive economic influence on local households due to interest in reserve area of pilgrims in future.

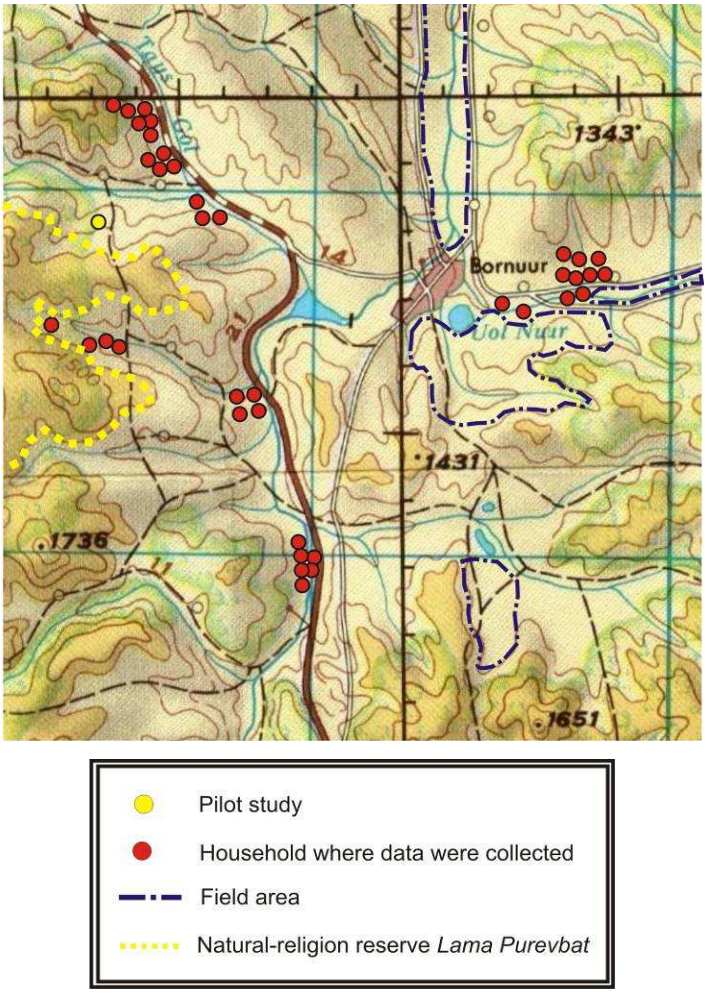

Figure 8 - Map of respondents' distribution in Bornuur *sum*

4.1.3 Zuunmod *sum*

Zuunmod *sum* is located in the central part of Töv *aimag*. It belongs to steppe and hilly steppe ecological zones. It is the smallest but the most populated *sum* where collecting of data was implemented. Total area of Zuunmod *sum* is 19.18km^2. It is surrounded by Sergelen *sum*. Formal and administrative centre of Zuunmod *sum* is Zuunmod city, which is also central city of Töv *aimag* and is located in the north part of the *sum*. City is located on the asphalt road leading to the south from Ulaan Baatar (45km), ends in Zuunmod and then continues dusty steppe trail to Mandalgovi (240km) and Dalanzadgad (590km) in Gobi desert.

Population of whole Zuunmod *sum* in year 2010 was 15,295 people, but distribution in central city and countryside wasn't counted (NSO, 2012b). According to NSO (2007) in the year 2007 lived 99.8% of *sum* population in Zuunmod city (see Table 5). Most of Zuunmod city population lives in wooden and brick houses or *gers* segregated by fences, but prefabs are presented and occupied as well. Zuunmod city is hometown of few local companies. Population generally works in small companies in Zuunmod city, but majority work in Ulaan Baatar and minority is involved in agriculture (livestock production).

Total number of livestock is 31,971 heads (2 heads *per capita*) (NSO, 2012b), but they are also on pastures of Sergelen *sum*. Proportion of sheep is approximately 45.5%, goat 35.5%, cattle 8.5% and horses 10.5% of all livestock in whole *sum* (see Table 6).

The Bogd Khan National Park is located 2km on the north of city. It is the oldest NP in Mongolia and in whole world (established in 1778) and is in UNESCO World Heritage Tentative List. It has important influence on herding activities in Zuunmod, because area of Bogd Khan NP is fenced and occupies pasture for livestock whose density is extremely high there. It is not exception when incidents between herders and NP management occur if livestock penetrate into NP area or even herders due to easy availability of quality pasture and wood used as construction or heating material.

Infrastructure is the most developed compare to Bayanchandmani and Bornuur. The city and its surrounding profits from close presence of Mongolian military base where numerous inhabitants are employed.

Zuunmod is place where few international developing projects focused on agriculture environment improvement were implemented. One of them is Czech

developing project "Support for processing of livestock products - Meat and skin processing plant (SPLP-CZ)"[44] (see Figure 9). Although new slaughterhouse will offer new job opportunities and improve quality and quantity of meatpacking and leather products, some of local herders appointed that they will refuse their services due to ethical point of view[45].

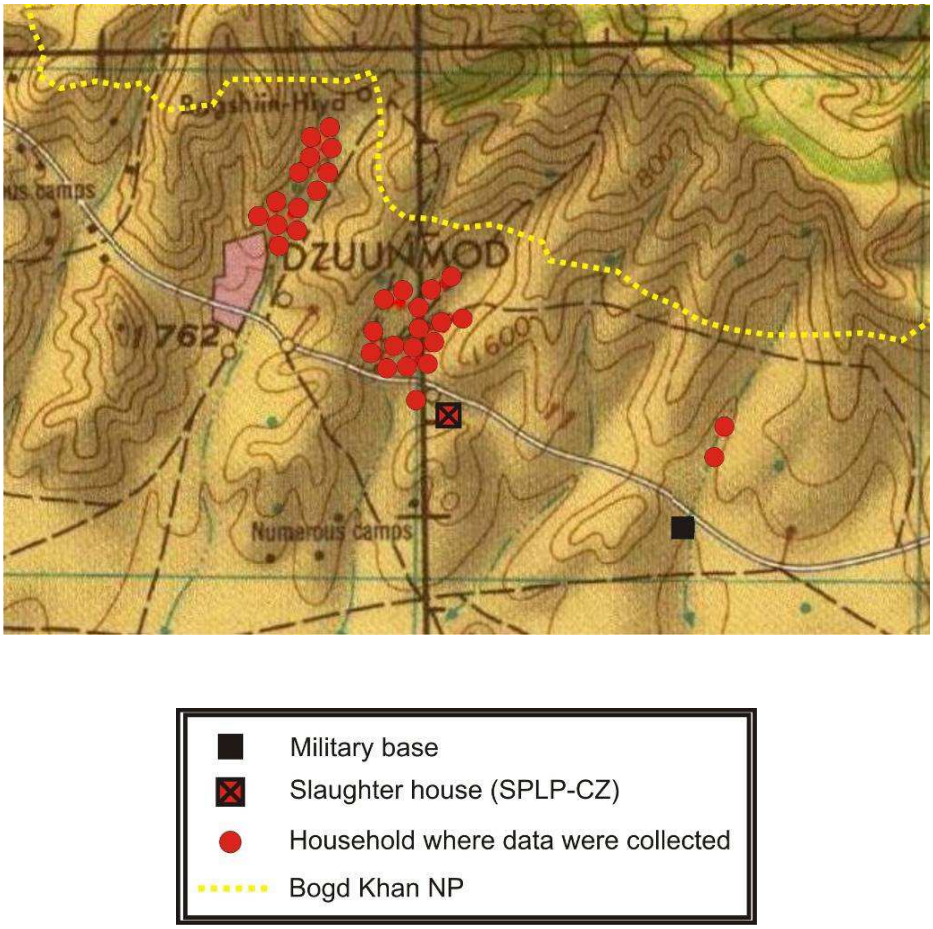

Figure 9 - Map of respondents' distribution in Zuunmod *sum*

[44] For further information read Chapter 2.12.1.2 – subhead: "Support for processing of livestock products - Meat and skin processing plant"
[45] Mongolian traditional slaughter methods differ from industrial methods and herders tries to avoid livestock tribulation.

Table 5 – Number of residents and households among Bornuur, Bayanchandmani and Zuunmod *sums* (Source of data: NSO (2012b))

	Bornuur	Bayanchandmani	Zuunmod	Total
Number of residents	**4,817**	**3,730**	**15,295**	**23,842**
In *sum* centre	2,608	2,859	15,295	20,762
In countryside	2,209	871	0	3,080
Number of households	**1,416**	**1,143**	**4,511**	**7,070**
In *sum* centre	741	822	4,511	6,074
In countryside	675	321	0	996

Table 6 – Number of livestock by type among **Bornuur, Bayanchandmani and Zuunmod *sums* (Source of data: NSO (2012b))**

	Bornuur	Bayanchandmani	Zuunmod	Total
Number of livestock	**96,713**	**36,888**	**31,971**	**165,572**
Camels	78	0	0	78
Horses	6,642	2,614	3,340	12,596
Cattle	10,626	4,992	2,693	18,311
Sheep	44,526	16,915	14,606	76,047
Goats	34,841	12,367	11,332	58,540

4.2 Timeframe

Total time earmarked for preparation and data collection in Mongolia was three months since 25th May till 31st August 2011. Theoretical preparation for data collection started in the beginning of year 2011. Questionnaire structure and composition was delineated in the same time. Final preparation started in the end of May 2011 in Mongolia, when realization of project "Livestock Identification System" has been started. Selection of the most suitable area for data collection was done during June 2011. Visit of most of selected areas took place during June and July 2011 and general observation was done during same time as well. Finalization of questionnaires was done after pilot testing in Bornuur in the middle of July 2011 and then collecting of data by structured questionnaires was implemented in the first half of August 2011.

4.3 Research design

According to the project[46] activities was possible to operate only in three of twenty seven *sums* of Töv *aimag*. Selection of three *sums* was as was mentioned above dependent mainly on project operational range given by MOFALI priorities and preferences to prior operation of project realization team in those areas. Selection of three *sums* was also influenced positively or negatively by other significant factors as a) vastness of Töv *aimag* which is approximately as large as Czech Republic, b) high concentration of herder households gathering around the main road tractions in *sums* during summer period, c) accessibility of *sums'* centres which all of those three are easily accessible by the asphalt roads which are not so common in Mongolia, d) good knowledge of area and e) opportunity of utilisation of local translators. Promised cooperation of *sums* representatives to collecting data team as well contributed in selection of Bayanchandmani, Bornuur and Zuunmod *sums* as representative sample for data collection based on consideration of all factors listed before.

4.4 Sample size

The sample size considered the coverage of appropriate and available respondents, respondent cooperation willingness, time availability, infrastructure and environmental and climatic conditions in this study. The total sample size of 105 randomly selected respondents (households) using two stage cluster technique was determined as representative sample of 22,100 households[47]of Töv *aimag* with confidence level equal to 95% and confidence interval equal to 9.52. Respondents' gender distribution was almost equal, concretely 51% of respondents were females and the rest of 49% were males (see Table 7). Number of randomly selected respondents was approximately same in each *sum*.

Sum livestock specialists were taken out by method of key informants. The total sample size needed was determined as 25 questionnaires as representative sample of 27 *sum* livestock specialists of all 27 *sums* of Töv *aimag* with confidence level equal to 95% and confidence interval equal to 5. Owing to operational range of project team was

[46] More information in chapter: Czech development projects in agricultural and animal sector - "Livestock Identification System" project
[47] Estimation based on NSO (2012c)

possible to visit only three *sums* and only three *sum* livestock specialists were available there. According to that number increased confidence interval from 5 to 54.36. Gained data has informational function about three mentioned *sums*, but cannot be analysed to gain proper statistical data applied to whole *aimag*.

Table 7 – Distribution of respondents among Bornuur, Bayanchandmani and Zuunmod *sums* (Source of data: authors' questionnaires, (2011))

Name of *sum*	Male	Female	Total	Percentage [%]
Bornuur	20	19	39	37.14
Bayanchandmani	21	13	34	32.38
Zuunmod	10	22	32	30.48
Total	51	54	105	100.00

4.5 Data and data sources

Two types of data were collected and used in case of elaboration of this study as primary data and secondary data. Primary data and information were collected personally continuously June, July and August 2011 from random respondents in countryside, local agricultural representatives of all three *sums*, livestock specialist from Bornuur *sum* Mr. Enkhbayar and livestock specialist from Bayanchandmani *sum*, NSO (The National Statistical Office of Mongolia) personal visit in Ulaan Baatar, visit of EU project[48] realization team, namely Mr. Ian Leach, Mr. Nigel Brown, Mr. Tsetsenbaatar and Mr. Enkhtur Byakharjav and MOFALI GB (Gene Bank) director Mr. Jantsankhorol Deleg and Mr. Gantugs. Secondary data and information sources were as well used to precisely sketch current situation and to bring as accurate results as possible by careful reviewing of several articles, documents, reviews and statistical and other databases.

4.6 Data collection methods

Several methods were used for data collection in case of this study due to accuracy improvement of data collection. Structured questionnaires, interviews, observations and transect walks were used and combined to gain more accurate information.

[48] "Animal Health and Livestock Marketing Project"

4.7 Pilot testing

Questionnaire was discussed with Bornuur livestock specialist Mr. Enkhbayar and then filled with local herder (see Annex 4) firstly in the middle of July 2011[49] to find out weaknesses of questionnaire for subsequent change of questionnaire composition to make it as appropriate as possible for local conditions before collecting data itself.

4.8 Structured questionnaire

Structured questionnaires were chosen as a main data collection tool as the easiest and the most appropriate method to gather detailed information, which is wide used and recommended by Carney (2002), Kirsopp-Reed (1994), Roth *et al.* (2003), Schmidt (2006), Scoones (1998), Xia *et al.* (2011) and others which were focused in their studies in livelihood analyses or topics closely related to it.

Two structured questionnaires were created. One was created for livestock owners and herders and second one for livestock specialists of each sum, where collection of data was implemented. Questionnaires were prepared in English, but due to language barrier, better understanding and specification of questions and answers were translated to respondents personally by Czech and English speaking native Mongolians. Personal approach in case of questionnaire completing showed advantage in better respondent response, in willingness of cooperation, possibility of enlightenment in case of LIS as well.

4.8.1 Small holder livestock producers

Questionnaire for livestock owners and herders consisted from 56 questions. Closed format questions were used as well as opened and semi-closed format questions to gain qualitative and quantitative primary data. Questionnaire was divided into four parts. Questions in first part were related to personal data of livestock owners and herders. Questions in second part were related to their household and data related to them. Third part was focused on their livestock and LISs and fourth on livestock owners and herders life conditions.

[49] Questionnaire pilot testing was applied within LIS pilot testing of "Livestock Identification System" project

4.8.2 *Sum* livestock specialists

Questionnaire for *sum* livestock specialists consisted from 24 questions. They as well as first questionnaire composed from closed and semi-closed format questions mainly and few opened format questions to gain qualitative and quantitative primary data. Questions were focused on statistical data related to numbers, types and registration of livestock and their owners and herders in *sum* and additional questions related to available services and LISs in *sum*. *Sum* livestock specialists were taken out by method of key informants. It was planned to fill out at least 27[50] questionnaires personally, but owing to operational range of project team was possible to visit only three *sums* and only three *sum* livestock specialists were available there.

4.9 Data analysis

All gained data from 105 filled livestock owners and herders' questionnaires were transcribed into Microsoft Office Excel, then categorised, coded and prepared for further processing and analysing. Prepared data were transferred into SPSS – PASW Statistic 18, selected data were more closely categorised and new categories were coded for proper analyse and then were prepared data analyzed by contingency table method.

5. Results and discussion

5.1 Descriptive part

Age

Average age of respondents was calculated as 50.6 years. That fact is reflected in percentage age distribution among respondents in Bornuur, Bayanchandmani and Zuunmod *sums* where majority of them, 39% belong to middle-aged group from 41 to 60 years. Reproductive active group from 21 to 40 years represent 30% and is followed by retiree group over 60 years with 28%. The lowest contribution has youth group with 3% (see Figure 10). Low contribution of youth group is caused by set up home and gaining of

[50] Each *sum* has one main livestock specialist who should be easily accessible in *sum* centre.

own households after marriage, generally after age of 21 years for both gender (Barcelona *et al*., 2002).

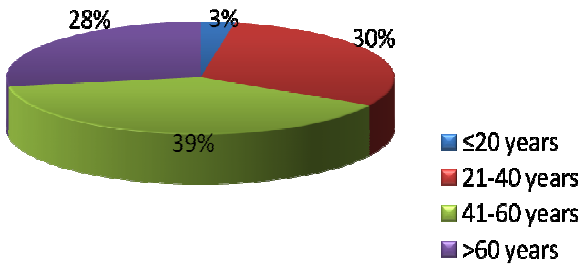

Figure 10 – Respondents' age distribution

Sex

Respondents were almost balanced with 51% contribution of female and 49% contribution of male (see Figure 11). Gender discrimination does not occur even male and female has their interchangeable roles in household management.

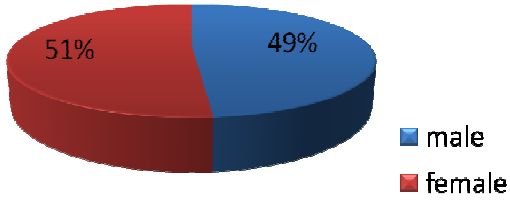

Figure 11 – Respondents' sex distribution

Years of school attendance

Secondary school attended the 71% of respondents. Absolvents of primary school were 15% and the lowest amount of respondents, 14% attended postgraduate or university studies (see Figure 12). Most of respondents with school attendance till 4 years were retirees with average age 69 years and only 12.5% of them were below retirement age.

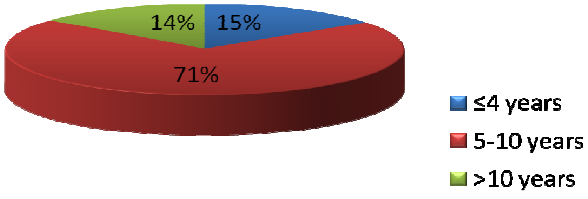

Figure 12 – Respondents' school attendance in years

Number of members in household

Households differed in members' number between one as minimum and nine as maximum. Households with only one member were 10%, generally middle-aged males and retirees. Two-person households were 30%, generally young or retiree couples. Majority of households had between 3 and 5 members and other 20% belong to households with more than 5 members (see Figure 13). Average number of members per household was 3.9. Prevalently are families composed from more than 3 members and form kind of small group which can more efficiently and flexibly manage livestock and household crucial activities to maintain reasonable living. The most economically effective seems to be families or groups with between 3 and 5 household members generally composed of parents, their children and grandparents.

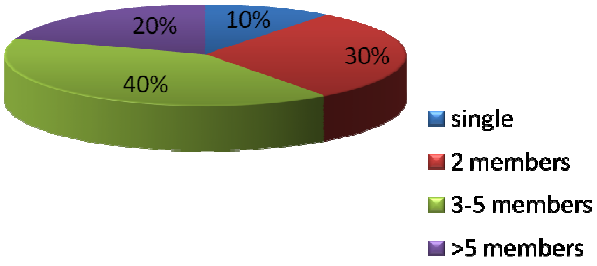

Figure 13 – Number of members in households

Livestock ownership

Total 82% of respondents were owners of livestock which they were keeping. Pure breeders with any livestock were 9% and 9% of respondents were grazing their livestock and livestock of another owner at the same time (see Figure 14). Number of pure breeders without livestock points to high losses of livelihood for thousands of households during winter *dzud* 2009-2010 mentioned by GAFSP (2010). Another monitoring has to be done to see progress in number of households without livestock in future to determine poverty level there.

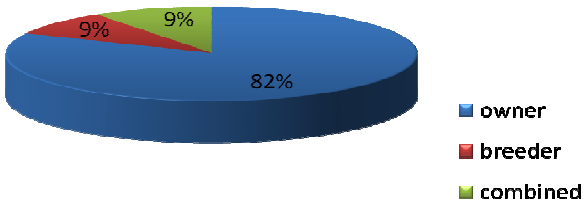

Figure 14 – Livestock ownership distribution

Livestock number by type

Total number of livestock of all respondents was 9,262 heads with approximately 88 heads per household and almost 23 heads per household member. Households with 50 and less livestock were 60%, households with herd between 51 and 150 were 21% and only 19% had more than 150 livestock (see Figure 15). Sheep and goats contribution was 61%, cattle were 27% and horses 12%. Contribution of pigs was insignificant (see Figure 16). According to Scoones (1998) and Suttie (2000) defined minimum herd size for reasonable living as 50 livestock heads, suppose 60% of small holder livestock producers in Töv *aimag* live under poverty line if does not have extra income. Average number of livestock per household for reasonable living calculated from data presented in Figure 3 is 150 heads and according to that 81% of small holder livestock producers in Töv *aimag* live under poverty line if does not have extra income which usually do not have access to.

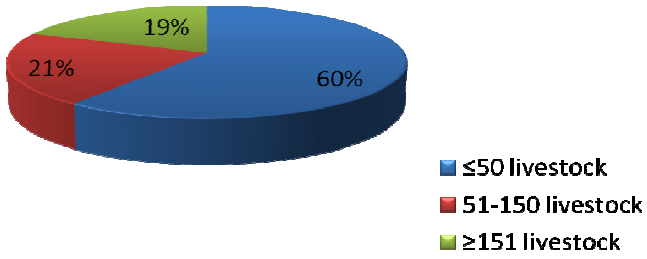

Figure 15 – Percentage contribution of household by herd size

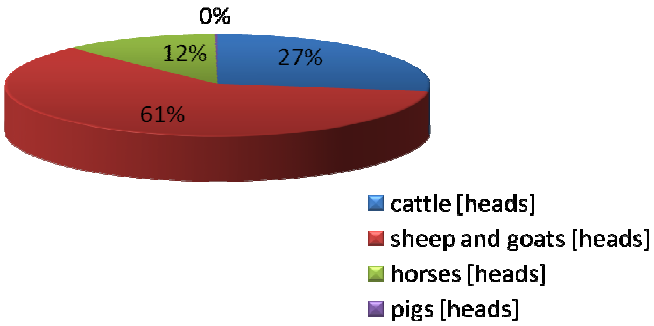

Figure 16 – Number of livestock by type

Habitation type during summer and winter

The most preferable habitation was *ger* no matter summer or winter period. Almost 67% in summer lived in *ger*, 19% in wooden houses and 14% in brick houses. Contribution of living in prefab was insignificant during winter and summer period. Preference of living in wooden and brick houses increased by approximately 6% each, while ger decreased by almost 12% for winter period (see Figure 17). Usage of *gers* is influenced by migration necessity, traditions and in large part by *ger* purchase price pointed by 46% *ger* usage of no migrating households.

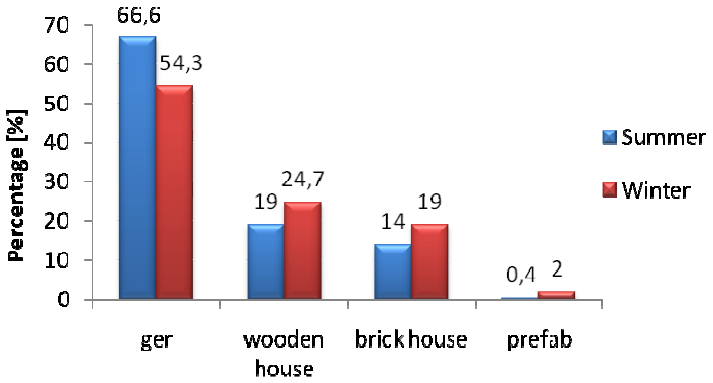

Figure 17 – Distribution of different habitation types during summer and winter period

LIS type

The most widely used LIS was ear notching system (40%) of LIS in case of cattle and small ruminants followed by ear tags (19%) mainly those incorporated in some

agricultural developing project[51]. Almost 21% of respondents in Bornuur used ear tags from EU project, 15% of respondents used ear tags from old CULS project and 3% from FAO project in Bayanchandmani. Branding was used generally in case of horses and camels, exceptionally on cattle. Colouring system was in 6% used among gestating sheep. Almost 26% did not use any kind of animal marking and orientate just based on animal specific sights (see Figure 18). Respondents had experience with ear tag LIS from collectivisation period, but all respondents involved in *negdels* answered that usage was official, but was used parallel system of colouring and ear notching and ear tags usage was just ostensible. Overall experience was negative due to bad influence of metal ear tags on livestock health and still has influence on LIS contribution willingness. Contributors in old CULS project announced ear tag looses and denied ear tag usage in future.

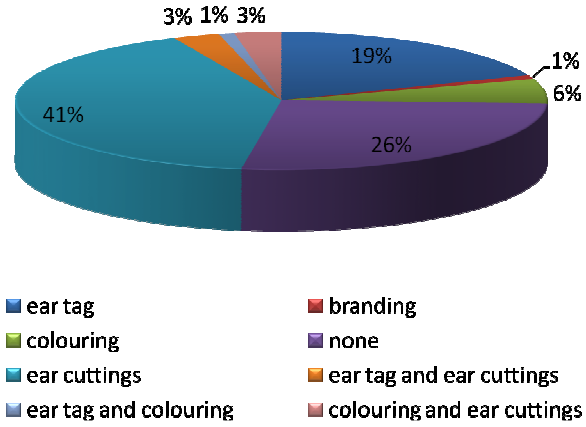

Figure 18 – Type of LIS used by small holder livestock producers

Attitude to obligatory LIS

Most of the respondents (66%) agreed with obligatory livestock evidence of MOFALI, although around 60% had never heard about it and 22% did not agree with based on previous experience mentioned above. More than one tenth did not care about it (see Figure 19). Over 33% of respondents see main potentiality of LIS in proper ownership evidence and 18% believe in livestock looses decrease. Over 20% does not see any reason to use national LIS while is used traditional private LIS which is for small holder livestock

[51] More in chapter: "International cooperation in agricultural development in Mongolia"

producers for centuries suitable solution in case of livestock recognition which they mainly require.

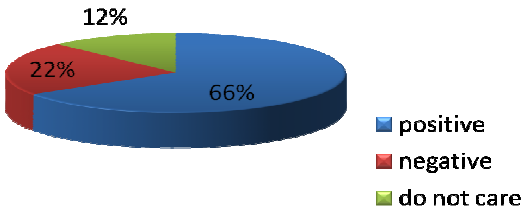

Figure 19 – Small holder livestock producers' attitude to obligatory LIS

Winter fodder preparation

Insignificant volume of respondents (less than 1%) did not prepare winter fodder owing to yak keeping. The rest generally make fodder stocks themselves (22%) and replenish it by fodder from market (52%) and 25% just banked on fodder from market. Most used fodders are hay (more than 99%), feed mixtures[52] (90%) and silage (11%). Those fodders are generally mixed based on conditions of livestock (see Figure 20).

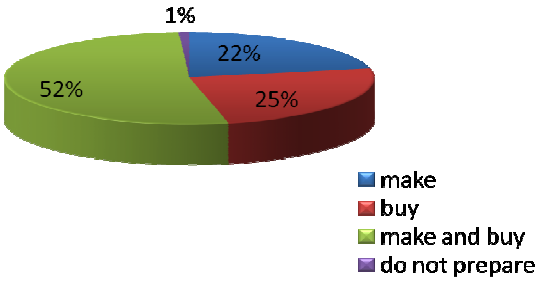

Figure 20 – Winter fodder preparation

Mineral supplements usage

Commonly mineral (mainly salty) blocks used 92% of respondents as livestock nutrition supplement[53]. The rest of 8% has mineral source near place of residence and let livestock consume it from nature and does not specially support them by it (see Figure 21).

[52] Grain mixtures (wheat, corn, oat, barley generally)
[53] Mainly for winter periods

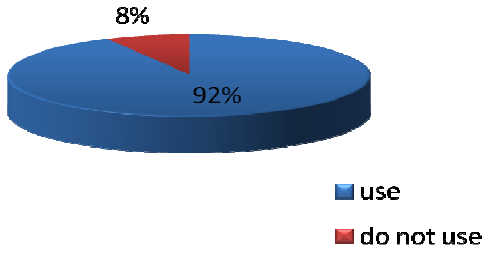

Figure 21 – Mineral supplements usage

Small holder livestock producers' migration

Majority (62%) of respondents had stable place of residence, but graze livestock in different place. The rest of 38% migrate with whole family and household approximately three times a year (mainly in spring, summer and autumn) (see Figure 22). Migration number varies from 2 to 5 times per year. At least 57% of migrating respondents migrate 2 times a year[54], 18% 3 times a year, 20% 4 times a year and only 5% 5 times a year. Number of migrations increase with kept increasing livestock number due to adequate pasture need.

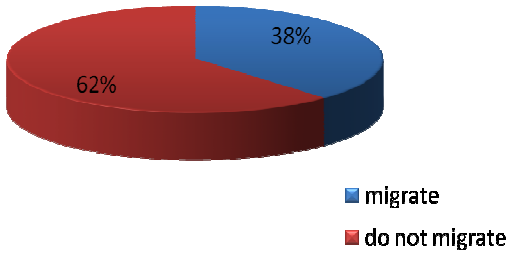

Figure 22 – Migration of small holder livestock producers

Veterinary service

Majority of respondents (97%) had access to veterinary service, but approximately 19% of them does not use veterinary preparations and 4% does not let to vaccinate their livestock. Those who vaccinate livestock use vaccines against: anthrax in 44%; FMD[55] 39%, brucellosis 37%, blue tong 17% and TBC[56] 11.5%. Almost 27% did not have idea

[54] Spring and autumn
[55] Foot and mouth disease
[56] Tuberculosis – vaccination used only for horses

against which diseases was his livestock vaccinated. Payment was provided by government in 74%, 17% were somehow participating on vaccination payments and 7% paid all vaccination expenditures themselves (see Figure 23). According to local livestock specialists is vaccination of nationally wide menace diseases paid by government and livestock owners pay only extra vaccination and vaccination application. Situation seems to be more chaotic compared to small holder livestock producers' responses.

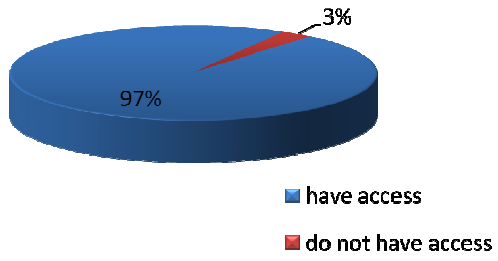

Figure 23 – Veterinary service accessibility

Consultation service access

Around 50% of respondents had access to agricultural or another kind of consultation service, but 46% had any. Despite that fact 54% were interested in consultation opportunity, but almost 40% did not interest in it and rest of 6% does not care. Approximately 62% of accessible consultation services to respondents were private, 21% governmental and 9% of both. Almost 8% did not know who provide consultation in their area (see Figure 24).

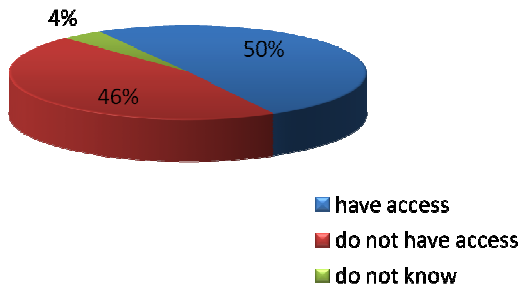

Figure 24 – Consultation service accessibility

Main problems among small holder livestock producers

Lack of pasture 37% was considered as main problem for herders in studied areas. Climate changes, namely *dzuds* were mentioned by over 16% of respondents as the second rough problem. Lack of winter fodder considered 12.5% of respondents and lack of water and finance both mentioned by 11.5% of respondents. Astonishingly 30.5% replied they did not face problems at all (see Figure 25). Fact that approximately 30% of respondents does not face any problems may relate to the result that 81% of small holder livestock producers in Töv *aimag* live under poverty line if does not have extra income. Rural poverty level reached almost 50% in 2010 (RPP, 2012) and owing to harsh *dzuds* from last 2 years and gained results can be estimated that number of rural poor increased by almost 30%. This result can be misrepresented by city ward migration of stricken households which could not respond to questionnaire. Rural poverty incessantly increases in Mongolia without doubt.

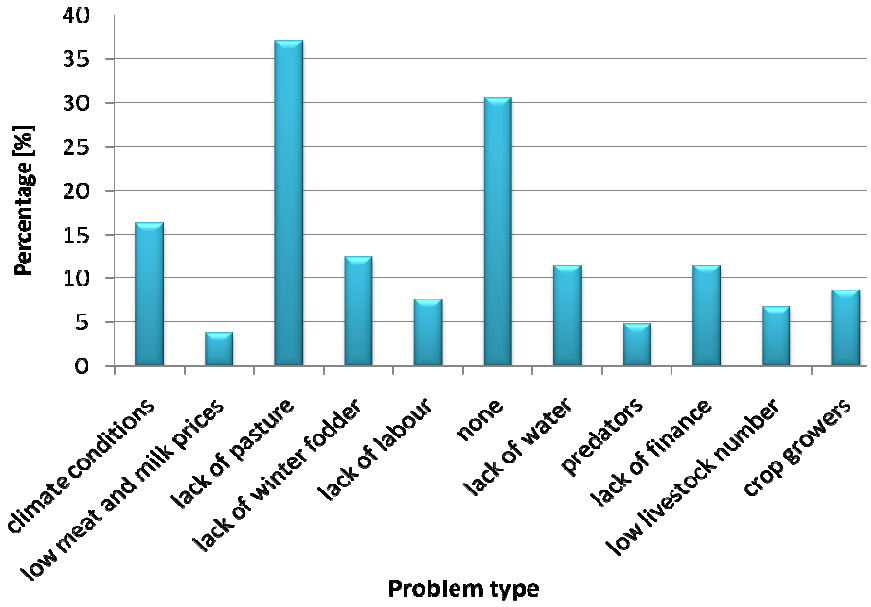

Figure 25 – Distribution of small holder livestock producers' main problems

5.2 Analytical part

Testing of LIS interest dependency on the age of respondents result was $\chi^2 = 0.243$. According to χ^2 value on significance level 10% LIS interest does not depend on the age of respondents.

Testing of LIS interest dependency on the MOFALI ordinance knowledge result was $\chi^2 = 0.680$. According to χ^2 value on significance level 10% LIS interest does not depend on the MOFALI ordinance knowledge.

Testing of LIS interest dependency on the years of school attendance result was $\chi^2 = 0.513$. According to χ^2 value on significance level 10% LIS interest does not depend on the years of school attendance.

Testing of LIS interest dependency on the migration of livestock owners and herders result was $\chi^2 = 0.428$. According to χ^2 value on significance level 10% LIS interest does not depend on whenever livestock owners and herders do or does not migrate with their herds.

Testing of LIS interest dependency on the number of family members result was $\chi^2 = 0.217$. According to χ^2 value on significance level 10% LIS interest does not depend on the number of family members.

Testing of LIS interest dependency on the gender of householder result was $\chi^2 = 0.717$. According to χ^2 value on significance level 10% LIS interest does not depend on the gender of householder.

Testing of LIS interest dependency on the number of livestock result was $\chi^2 = 0.717$. According to χ^2 value on significance level 10% LIS interest does not depend even on the number of livestock.

Testing of LIS interest dependency on the livestock ownership result was $\chi^2 = 0.795$. According to χ^2 value on significance level 10% LIS interest does not depend whenever householder is owner or just herder of livestock which he keep.

Testing of LIS interest dependency on the private LIS used type result was $\chi^2 = 0.275$. According to χ^2 value on significance level 10% LIS interest was not influenced by type of already used private LIS.

Testing of LIS interest dependency on the consultation service accessibility result was $\chi^2 = 0.630$. According to χ^2 value on significance level 10% LIS interest does not depend on accessibility of consultation service.

Testing of livestock number dependency on the age of householders result was $\chi^2 = 0.065$. According to χ^2 value on significance level 10% and $\varphi = -0.180$ is livestock number weakly dependent on the age of householders, shows that livestock number of

householders older than 55 years[57] decrease. It is generally caused by transfer of livestock to their descendents and lower ability of livestock keeping.

Testing of livestock number on the years of school attendance result was $\chi^2 = 0.811$. According to χ^2 value on significance level 10% livestock number does not depend on education level of householder.

Testing of livestock number on the number of family members result was $\chi^2 = 0.869$. According to χ^2 value on significance level 10% livestock number surprisingly does not depend on the number of family members.

Testing of livestock number and the migration dependency result was $\chi^2 = 0.000$. According to χ^2 value on significance level 10% and $\varphi = -0.440$ is migration moderately dependent on livestock number. Livestock owners and herders in Töv *aimag* with increasing livestock number are forced to migrate due to limited pastureland to effectively maintain their herds.

This thesis was written as part of Czech "Livestock Identification System" project implemented by CULS to acquire overall information and data connected to small holder livestock producers to determine key factors influencing LIS contribution willingness of small holder livestock producers, analyse current livelihood environment among them and estimate eventual feasibility of national scale level LIS introduction in central region of Mongolia in Töv *aimag*. Collected data were precisely analyzed and could be used also for further evaluation of Czech "Livestock Identification System" project.

Acquisition of data connected to current livelihood environment among small holder livestock producers in central region of Mongolia had to be done personally through semi-structured questionnaires owing to lack of proper data from secondary sources as NSO and other governmental or nongovernmental organisations. Questionnaires were filled face to face due to better understanding of questions, answers and enlightening activity of project objectives if were respondents interested. Although were data collected personally by author, his colleagues and external translators were collecting complicated and data could be misrepresented by incorrect translation due to language difficulties. Collected data could also be misrepresented by presence of *sum* livestock specialist in Bornuur *sum* during collection of 12 questionnaires who interfered interviews and tried to answer

[57] Usually retiree

instead of respondents. Operating range was reliant on project operation range and was not possible to collect data in other *sums* of Töv *aimag* how was already mentioned. Those facts could negatively influence results of this study.

Key factors influencing livelihood and LIS contribution willingness of small holder livestock producers were theoretically based on works of Chamber and Conway (1991), Ellis (1999) and SDC (2010) and then were adapted to economical, environmental and social conditions in central Mongolian region. Main influencing factors were divided into three main groups as is mentioned in chapter 2.9.2.

Influence of selected factors on LIS contribution willingness of small holder livestock producers was not proved, but gained data point to strong affinity to traditional LIS which is widely used and previous, prevalently bad experiences with LIS from communist era. It is unable to compare obtained results in this study with results from other studies owing to absence of LIS studies in Mongolia.

Obligatory national LIS was introduced and embodied in National Mongolian Livestock Program since 2012 (MOFALI, 2009). This fact significantly influences positive LIS introduction feasibility. National LIS should improve proper supervision on pasture law and should lead to proper livestock tax payment by avoiding lower livestock number reported by herders than in reality (RFLC, 2005). National LIS may also improve livestock insurance service accessibility by accurate livestock number evidence and help to manage regulation or proper livestock keeping. National LIS should also improve livestock epidemics monitoring, keep livestock health, origin and production entries to increase livestock products export. Mentioned facts should improve pastureland utilization, avoid its deterioration and prevent desertification, increase pastureland CC, bring new job and sales opportunities and through that improve small holder livestock producers' vulnerability to unexpected climatic and other events as *dzud* and then increase their livelihood quality.

Function and durability of national LIS will face several obstacles. It entirely depends on human element, way of system usage and LIS occasion understanding. There is possible reduced cooperation of small holder livestock producers with individuals responsible for data collection to avoid taxation of livestock how was already mentioned. Governmental LIS workers' obligations fulfillment will play crucial role in LIS function which will be strongly dependent on their responsibility and is huge question for future. Technical

support and ability to proper LIS management is strongly supported by development cooperation and commercial support accessibility, but entirely depend on Mongolian Government consistency. “Livestock Identification Project” evaluation is recommended to prove LIS function, management and weaknesses in Mongolian conditions, to help prevent national LIS failure. Durability of whole system will be proved during long time period after more data and experiences will be accessible for analysis and fulfillment of expectations of Mongolian Government and small holder livestock producers will be known.

6. Conclusion

This study was focused on livelihood conditions analysis among small holder livestock producers and LIS introduction feasibility in Central region of Mongolia in Töv *aimag*.

It was determined that approximately 81% of small holder livestock producers in Töv *aimag* live under poverty line if does not have extra income.

LIS contribution willingness is independent on the age of respondents, the MOFALI ordinance knowledge, years of respondents school attendance, the migration of livestock owners and herders, the number of family members, the gender of householder, the number of livestock, the livestock ownership and consultation service accessibility, but 66% of respondents agreed with obligatory LIS of MOFALI introduction, although around 60% had never heard about it.

National LIS introduction is feasible owing to obligatory ordinance of MOFALI, but to prove aliveness and durability of it will be possible after long time of LIS operation.

Livelihood of small holder livestock producers is expected to improve, if national LIS will be successfully managed and will fulfilll Mongolian government and LIS experts’ expectations.

Careful monitoring of LIS is strongly recommended to avoid complications and system operation collapse to fulfill governments’ expectations. Evaluation of Czech “Livestock Identification System” project should help to national LIS management improvement and cooperation with other projects involved in LIS introduction in Mongolian conditions is covetable.

7. References

ADB (2009): *Mongolia - Agriculture Sector Development Program and Project*. Asian Development Bank, Completion Report, 2009

Allflex (2012): *The History of Livestock Identification* [online]. [cit.2012-03-15] Available from: <http://www.allflex-group.com/front-offices/anglais/119-the_history_of_livestock_identification.aspx?idparentnode=120>

Angerer, J.; Han, G.; Fujisaki, I. and Havstad, K. (2008): *Ecosystems of Asia with Emphasis on Inner Mongolia and Mongolia*. Society for Range Management, 2008

Ashley, C. and Carney, D. (1999): *Sustainable livelihoods: Lessons from early experience*. Department for International Development. London, 1999. ISBN 0 85003 4191

Badarch, M.; Dorjgotov, B. and Enkhbat, A. (2009): *Fourth National Report on Conservation of Biodiversity of Mongolia*. Ministry of Nature, Environment and Tourism of Mongolia, Ulaan Baatar, 2009

Batbayar, S. (2009): *Geography and Climate* [online]. MFATM, 2011. [cit.2012-02-03] Available from: <http://mfat.gov.mn/index.php?option=com_blog_calendar&year=2009&month=12&day=21&modid=62&lang=en&limitstart=20>

Barcelona, D.; Laski, L. and Gerdts, C. (2002): *Universal Sexuality Education in Mongolia – Educating Today to Protect Tomorrow*. The Population Council Inc., Vol.12, 2002. ISSN: 1097 8194

Batima, P.; Natsagdorj, L.; Gombluudev, P. and Erdenetsetseg, B. (2005): *Observed climate change in Mongolia*. AIACC Working Paper No.12, 2005

Bold, B. (1996): *Socio-economic Segmentation – Khot-Ail in Nomadic Livestock Keeping of Mongolia*. Nomadic Peoples, No. 39, 1996

Bothma, J., du P.; Van Rooyen, N. and Van Rooyen, M., W. (2004): *Using Diet and Plant Resources to Set Wildlife Stocking Densities in African Savannas*. Wildlife society bulletin, 2004. 32(3): 840-851

Carney, D. (2002): *Sustainable Livelihoods Approaches - Progress and Possibilities for Change*. Department for International Development. Canada, 2002. ISBN 1 86192 491 7

Centre for Tropical Veterinary Medicine (2005): *Draught Animal News No. 43*. University of Edinburgh, Scotland, 2005**.** ISSN 1354 6953

Chambers, R. and Conway, G., R. (1991): *Sustainable Rural Livelihoods: Practical Concepts for the 21st century*. Institute of Development Studies, Discussion Paper 296. Brighton, 1991. ISBN 0 903715 58 9

Chuluundorj, O. (2006): *A Multi-level Study of Vulnerability of Mongolian Pastoralists to Natural Hazards and its Consequences on Individual and Household Wellbeing*. Doctor Thesis, University of Colorado at Denver and Health Sciences Center (2006)

CIDA (2011): *Project profile for Training for Rural Development* [online]. [cit.2012-03-10] Available from: <http://www.acdi-cida.gc.ca/CIDAWEB/cpo.nsf/vWebProjByStatusSCEn/A049E2E3FA8CB5CC852573C6003CB7E6>

CzDA (2011a): *Mongolia – Ongoing and Past Projects* [online]. [cit.2012-03-10] Available from: <http://www.czda.cz/czda/en_126/en_166.htm?lang=en>

CzDA (2011b): *Support for Improving the Quality of Plant Production in Dornogobi* [online]. [cit.2012-03-10] Available from: <http://www.czda.cz/czda/en_126/en_166/en_303.htm>

Dorjtseden, L. (1998): *Asia-Pacific Forestry Sector Outlook Study - Working Paper No: APFSOS/WP/42*. FAO, [online] Mongolia: 1998 [cit.2012-01-20]. Available from: <http://www.fao.org/DOCREP/W8302E/w8302e00.htm#Contents>

Ellis, F. (1999): *Rural Livelihood Diversity in Developing Countries: Evidence and Policy Implications*. ODI Natural Resource Perspectives, No. 40, 1999

EN (2012): *Mongolia - A Country Study* [online].[cit.2012-02-08]. Available from: <http://www.country-data.com/frd/cs/mntoc.html#mn0091>

Erdenetuya, M. and Khudulmur, S. (2000): *Land cover change and pasture estimation of Mongolia from space* [online]. Ministry for Nature and Environment of Mongolia. [cit. 2012-01-11]. Available from: <http://www.gisdevelopment.net/application/environment/conservation/envc0002pf.htm>

EU-AHLMP (2011): *Mongolian Animal Health and Livestock Marketing Project* [online]. [cit.2012-03-13] Available from: <http://www.ahlmproject.mn/download/en/AHLM_pres_310_en.pdf>

FAO (2006): *Special Programme for Food Security project - Increasing the supply of dairy products to urban centres in Mongolia by reducing post-harvest losses and re-stocking*. GCSP/MON/001/JPN Working Paper 6, Ulaan Baatar, 2006

FIFTA (2006): *Mongolian Investors Forum 2006* [online]. [cit.2012-03-10] Available from: <http://www.investmongolia.com/forum/projects/tusul39.pdf>

Ganbold, D. and Haliun, D. (2000): *Facts about Mongolia*. Admon Co., 2000. Michigan University. ISBN 9 99295 119 2

GASFP (2010): *Mongolia Proposal for Global Agriculture and Food Security Programme*. Ulaan Baatar, 2010

Great Khural of Mongolia (2009a): *Approval of Government Policy on Herders translation. Annex of Resolution #39 of the State Great Hural*. Ulaan Baatar, 2010

Great Khural of Mongolia (2009b): *Resolution based on Law of Great Khural of Mongolia, Article 43 and clause 43.1: Mongolian Livestock National program translation*. Ulaan Baatar, 2010

Griffin, K. (2002): *Agricultural Involution and Urban-to Rural Migration in Mongolia* [online]. University of California, Riverside, 2002 [cit.2012-02-20] Available from: <http://economics.ucr.edu/papers/papers02/02-02.pdf>

IACR (2012): *Identification of Animals in Central Region (Mongolia)* [online]. [cit.2012-03-09] Available from: <http://www.vetnaadam.org/CZ/cil.php>

IFAD (2012): *IFAD in Mongolia* [online]. [cit.2012-03-10] Available from: <http://operations.ifad.org/web/ifad/operations/country/home/tags/mongolia>

IMSNY (2004): *Mongolian History* [online]. The Indo-Mongolian Society of New York. [cit.2012-02-20]. Available from: <http://www.mongolianculture.com/mhistory.html>

Kalsbeek, W., D. (1986): *An Analytic Study of Alternative Design Strategies* [online]. University of North Carolina. USA, [cit. 2011-12-19]. Available from: <http://www.amstat.org/sections/srms/Proceedings/papers/1986_028.pdf>

Khazanov, A., M. (1980): *The Size of Herd among Pastoral Nomads*. Nomadic Peoples, No. 7, 1980

Kirsopp-Reed, K. (1994): *A review of PRA methods for livestock research and development*. RRA Notes, Issue 20, pp.11–36, IIED London, 1994

Kotkin, S. and Elleman, B., A. (1999): *Mongolia in the Twentieth Century – Landlocked Cosmopolitan*. M.E. Sharpe, New York, 1999. ISBN 0-7656-0536-8

Krantz, L. (2001): *The Sustainable livelihood approach to poverty reduction - An Introduction*. Swedish International Development Cooperation Agency, Stockholm (Sweden), 2001

Mahul, O. and Skees, J., R. (2007): *Managing Agricultural Risk at the Country Level - The Case of Index-Based Livestock Insurance in Mongolia*. World Bank Policy Research Working Paper No. 4325, 2007

Mearns, R. (1993): *Territoriality and land tenure among Mongolian pastoralists - variation, continuity and change*. Nomadic Peoples, No.33, 1993

MOFALI (2009): *National Mongolian Livestock Program (Draft)* [online]. [cit.2012-02-28]. Available from: <http://www.mofa.gov.mn/mn/images/stories/busad/mmeng.pdf>

MOFALI (2011): *First postscript to ordinance A/74 of The Ministry of Food, Agriculture and Light Industry of Mongolia (May 2011)*. Translated by Tamir Mend and Enkhtuya Batkhuu, 2011, Ulaan Baatar

MZV (2012): *Obchodní a ekonomická spolupráce s ČR* [online]. [cit.2012-03-11] Available from: <http://www.mzv.cz/jnp/cz/encyklopedie_statu/asie/mongolsko/ekonomika/obchodni_a_ekonomicka_spoluprace_s_cr.html>

Neary, M. and Yager, A. (2002): *Methods of Livestock Identification. Farm Animal* Management Purdue University, vol.12, 2002

Neupert, R., F. (1996): *Population and Pastoral Economy in Mongolia*. Asia-Pacific Population Journal, Vol. 11, No. 4, 1996

NSO (2007): *Töv Aimag Population Annual Report 2007*. Ulaan Baatar, 2007

NSO (2008): *Livestock 1970-2008* [online]. [cit.2012-02-12] Available from: <http://www.nso.mn/v3/index2.php?page=free_access>

NSO (2011): *Resident Population by Aimags and the Capital in 2003-2010* [online]. [cit. 2011-12-22]. Available from: <http://web.nso.mn:8080/userdata/Dialog/varval.asp?ma=2_3_Population_en&ti=&path=../Database/Mongolian/POPULATION/&lang=1>

NSO (2012): *Gross Domestic Product, by divisions, at 2005 constant prices by Sectors and Year, 1990-2010 year* [online]. [cit.2012-01-25]. Available from: <http://www.nso.mn/v3/index2.php?page=free_access>

NSO (2012b): *Author's personnal communiation with NSO worker* [2012-01-16]. Ulaan Baatar

NSO (2012c): *Number of households, by aimags and the Capital, urban and rural, at the end of the year, 2003-2010 year* [online]. [cit.2012-01-25] Available from: <http://www.nso.mn/v3/index2.php?page=free_access>

Odontsetseg, N.; Mweene, A., S. and Kida, H. (2005): *Viral and Bacterial Diseases in Livestock in Mongolia*. Japanese Journal of Veterinary Research, 52 (4), 2005

Potkanski, T. (1993): *Decollectivisation of the Mongolian pastoral economy (1991-92) – some economic and social consequences*. Nomadic Peoples, No. 33, 1993

Rees, W., E. (1992): *Ecological Footprints and Appropriated Carrying Capacity - What Urban Economics Leaves Out*. Environment and Urbanization, Vol. 4, No. 2, 1992

RFLC (2005): *Which livestock insurance is right for Mongolia?* Rural Finance Learning Center, Case Livestock Insureance, Mongolia, 2005

Rosario, M. *et al*. (2005): *The Mongolian Drop out Study*. Mongolian Education Alliance, Ulaan Baatar, 2005

Rosenberg, D. (1981): *The Collectivization of Mongolia's Pastoral Production*. Nomadic Peoples, No. 9, 1981

Roth, F. *et al.* (2003): *Human health benefits from livestock vaccination for brucellosis: case study*. Bulletin of the World Health Organization; 81:867-876, 2003

RPP (2012): *Rural Poverty in Mongolia* [online]. Rural Poverty Portal, [cit.2012-03-20] Available from: <http://www.ruralpovertyportal.org/web/guest/country/home/tags/mongolia>

Schmidt, S., M. (2006*): Pastoral Community Organization, Livelihoods and Biodiversity Conservation in Mongolia's Southern Gobi Region*. USDA Forest Service Proceedings RMRS-P-39, 2006

Scoones, I. (1998): *Sustainable Rural Livelihoods a Framework for Analysis*. Institute of Development Studies - Working Paper 72, 1998

SDC (2009): *"Green Gold" Pasture Ecosystem Management Project*. SDC, Ulaan Baatar, 2009

SDC (2010): *Livelihood study of herders in Mongolia*. Ulaan Baatar, 2010

Skees, J., R. and Enkh-Amgalan A. (2002): *Examining the Feasibility of Livestock Insurance in Mongolia*. World Bank Policy Research paper 2886, September 2002

Sneath, D. (1993): *Social relations, network and social organisation in post-socialist rural Mongolia*. Nomadic Peoples, No. 33, 1993

Suttie, J., M. (2000): *Country Pasture and Forage Resource Profiles – Mongolia* [online]. FAO. [cit. 2012-01-11] Available from: <http://www.fao.org/ag/AGP/AGPC/doc/Counprof/mongol1.htm#3.%20CLIMATE%20AND%20AGROECOLOGICAL>

Templer, G.; Swift, J. and Payne, P. (1993): T*he changing significance of risk in the Mongolian pastoral economy*. Nomadic Peoples, No. 33, 1993

Thomas, H., T.; Hunt, J. and Baasanjav, O. (2010): *Gender Equality Results in ADB Projects – Mongolia Country Report*. Asian Development Bank, Philippines (2010). ISBN 978 92 9092 098 4

Toirkens, J. (2011): *Nomad*. Lannoo Publishers. Tielt, 2011. ISBN 978 90 209 9598 5

Tumendemberel, B. and Googijk, D. (2011): *Land rights in Mongolia – More or fewer regulations needed?* Farming Matters, December 2011

UN Mongolia Country Team (2010) - *Dzud appeal* [online]. Mongolia: 2010. [cit. 2012-02-04]. Available from: <http://www.undp.org/cpr/documents/recovery/mongolia_appeal.pdf>

UNDP (2010?): *Guidance note on recovery - Livelihood* [online]. India: 2010? [cit.2012-01-18]. Available from: <http://www.undp.org.in/sites/default/files/reports_publication/INDIA_LIVELIHOOD.pdf>

UNDP (2012): *International Human Development Indicators* [online]. [cit.2012-01-22]. Available from: <http://hdrstats.undp.org/en/countries/profiles/MNG.html>

UNESCAP (2007): *Country report for Seminar on the Social, Health and Economic Consequences of Population ageing in the Context of Changing Families* [online]. Bangkok, 2007. [cit.2012-03-08]. Available from: <http://www.unescap.org/esid/psis/meetings/Ageing_Change_Family/Mongolia.pdf>

UNESCO (2012): *World Heritage Convention* [online]. [cit. 2012-01-22]. Available from: <http://whc.unesco.org/en/tentativelists/936/>

UNICEF (2012): *Mongolia Statistics* [online]. [cit.2012-01-22]. Available from: <http://www.unicef.org/infobycountry/mongolia_statistics.html>

UNU-EHS (2010): *International Experiences in Regulating the Use and Management of Pastures - Pasture Law* [online]. [cit.2012-03-03] Available from: <http://www.ehs.unu.edu/palm/file/get/5220>

USDS (2012): *Bureau of East Asian and Pacific Affairs - Background Note: Mongolia* [online]. [cit.2012-01-18]. Available from: <http://www.state.gov/r/pa/ei/bgn/2779.htm>

Wädekin, K., E. (1990): *Communist agriculture – Farming in the Far East and Cuba*. Routledge, London 1990. ISBN 0 415 04205 4

WB (2008): *Sustainable Livelihoods Project Implementation Completion and Results Report*. Rural Development, Natural Resources and Environment Sector Unit of Sustainable Development Department of the World Bank. Report No: ICR0000665

WB (2012): *Mongolia* [online]. World Bank [cit.2012-02-25] Available from: <http://www.worldbank.org/en/country/mongolia>

Weatherford, J. (2006): *Čingischán a utváření moderního světa*. BB art, first edition, 2006. ISBN-10: 80 7341 776 6

WCED (1987): *Food 2000 - Global Policies for Sustainable Agriculture, a Report of the Advisory Panel on Food Security, Agriculture, Forestry and Environment to the World Commission on Environment and Development*. Zed Books Ltd., London and New Jersey, 1987

Xia, Z.; Sun, S. and Zhang, Y. (2011): *Empirical Study on the Factors Influencing the Willingness of Pig-breeding Farms and Farmers to Keep Breeding Records*. Management Science and Engineering, 5 (3), 2011

8. Annexes

List of annex:

Annex 1 - Extract from "National Mongolian Livestock Program" (MOFALI, 2009)

4.2.4 Creating an animal registration database and network

4.2.4.1 *Register every animal with an individual identification number and establish an internationally compliant system for registering, monitoring and informing livestock and livestock products including origin and health certificate.*

4.2.4.2 *Establish an information database (with information about core herds, the origin of good quality male animals, and an animal's productivity with all health indicators) at sum, aimag and national level and provide information to customers.*

4.2.4.3 *Training and awareness activities on livestock registering and establishing the livestock information network will be delegated and executed by professional NGOs.*

4.2.4.4 *Provide necessary equipment and programs for livestock registration, expanding the database network, and using advanced technology for registration that meets international requirements.*

4.2.4.5 *Create a list of main animal diseases that are obligatory to report at the national level and collect, compile, assess and create a reporting and information network on sources of disease and levels of outbreak.*

4.2.4.6 *Improve monitoring scheme through and registration of livestock origin, productivity, quality, traceability and health, and livestock products' quality and safety.*

Annex 2 – List of Czech development projects since 1996 till 2012 (Source of data: MZV (2012))

No.	Project name	Guarantor	Period of realisation	Total budget [CZK]
1	Reconstruction of the tannery and shoe factory in Ulaan Baatar	MPO	1996-1997	11,500,000
2	Reconstruction and modernisation of hospital in Ulaan Baatar	MPO	1998-2003	29,000,000
3	Geological and geochemical mapping of Altai Gobi in Mongolia at a scale 1:200 000	MZP	1999-2003	33,000,000
4	Stepping up production of eggs and poultry meat in Mongolia	MZE	2001-2005	25,104,000
5	Solving the water sources system supply in Mandalgobi	MPO	2002-2005	44,000,000
6	Modernization of drives and management power plant No. 4 block, establishing a technical training	MPO	2003-2005	31,000,000

	center at the University of Ulaan Baatar			
7	Environmental Audit of extracted Cu-Mo deposits of ores Erdenet	MZP	2003-2005	6,782,000
8	Work exchange of administration workers	MPSV	2003-2005	1,400,000
9	Geological mapping of selected areas of Mongolia at a scale of 1:100 000 and/or 1: 50 000	MZP	2003-2006	23,000,000
10	Geological work in Mongolia - hydrogeological work, the fight against desertification in the region Dornogobi	MZP	2003-2006	10,500,000
11	Assistance in upgrading and desulphurization of organic limekiln Khutul	MPO	2005-2006	15,000,000
12	Modernization of teaching the Czech language at the Department of Slavic Languages Bohemistics Faculty of the Mongolian State University	MZV	2006	500,000
13	Survey and monitoring of areas contaminated by hazardous substances in the mining and quarrying in Selenge	MZP	2006-2008	9,820,000
14	Restoring security of water resources in semi-desert areas in Mongolia province Sukhbaatar	MZP	2007-2009	13,029,000
15	Identification of animals in the Central Region of Mongolia	MZE	2007-2009	9,700,000
16	Improvement of crop production in the province of Dornogobi in Mongolia	MZE	2007-2009	12,000,000
17	Sourcing and supply of drinking water in parts of new settlements in Ulaan Baatar	MZP	2006-2009	24,276,000
18	Supply of Erdenet city and its surrounding with drinking water	MŽP	2006-2009	12,799,000
19	Support of poultry breeding-intensification of eggs and poultry meat production	MZe	2006-2009	9,980,000
20	Renewal crop production in semi-arid areas of northern Gobi, Bukhel	MZe	2006-2009	6,200,000
21	Water supply units for the areas with lack of drinking water	MPO	2006-2010	27,440,000
22	Construction of sewage treatment in the leather factory in Darkhan	MPO	2006-2010	27,440,000
23	Establishment of Technopark for teaching control of rotating machinery on the Mongolian University of Ulaan Baatar	MPO	2006-2010	15,000,000

24	Modernization of drives and management of power plant No. 4 block	MPO	2006-2010	33,000,000
25	Preparation and implementation of Social Work degree program – Ulaan Baatar	MPSV	2006-2010	12,100,000
26	Renewal of production equipment for small skin plant processing	MPO	2007-2010	12,500,000
27	Socio-economic stabilization of geographically and socially isolated communities, Mongolia	MPSV	2008-2010	15,176,000
28	Solution to the crisis in water supply in remote *sums* in the province of Bulgan	MZP	2008-2010	16,550,000
29	Technical and technological support for the elimination of environmental damages caused by illegal mining in the central part of Mongolia	MZP	2008-2010	12,600,000
30	Information and communication platform for social and health sector, Mongolia	MPSV	2008-2010	1,991,470
31	Reintegration and stabilization activity of the Czech Republic in Mongolia	MV	2009-2010	1,500,000
32	Supply of laboratory equipment for electrical rotating machines in Mongolian Technical University	CzDA	2010-2011	1,513,299
33	Support for processing of livestock products - "Meat and skin processing plant"	MPO	2006-2011	27,440,000
34	Modernisation of technical equipment and human resources development in the National Central Hospital in Ulaan Baatar	MPO	2006-2011	27,440,000
35	The survey and design of pollution remediation in the industrial complex Hargia in Ulaanbaatar	CzDA	2010-2012	16,970,000
36	Construction of new water sources for rural areas Zalugiin Gol and Ulaan Tolgoi in the wider area of Erdenet	CzDA	2010-2012	14,993,000
37	The livestock identification system	CzDA	2010-2012	14,200,000
38	An examination of the technical condition of water supply sources of Ulaan Baatar city for drinking water supply and determination of damaged wells appropriate for rehabilitation	CzDA	2011	1,402,500
39	Support for improving the quality of crop production in Dornogobi	CzDA	2011-2012	11,000,000
40	Development of water resources management in the province Khuvsgul	CzDA	2011-2012	9,500,000

41	Rehabilitation of non-functional water supply source for drinking water in Ulaan Baatar city	CzDA	2011-2013	15,800,000
42	Saving endangered species of Mongolian fauna (Przewalski horse) in protected areas of the western Mongolia in the context of socio-economic development	CzDA	2011-2013	8,500,000
43	Improving standards of Mongolian precise frequency and time, creating a basic national standards for measuring length	CzDA	2011-2013	17,500,000
44	Automation of chemical water treatment for power plant No. 4 in Ulaan Baatar	CzDA	2011-2013	42,000,000
45	Support for secondary education in Mongolia with an emphasis on vocational education	CzDA	2011-2012	12,000,000
46	Promoting access to medical care in remote areas of Mongolia	CzDA	2011-2013	18,000,000
	Total			742,146,269

Annex 3 - Gers in Ulaan Baatar (Source: authors' archive (2011))

Annex 4 - Questionnaire pilot testing (Source: authors' archive (2011))

Annex 5 – LIS first application in Bornuur *sum* within Czech developing project "Livestock Identification System" (Source: authors' archive (2011))

Annex 6 – Filled questionnaire for livestock owners and herders

B3

48° 28' 30.57"N
106° 10' 35.75"E

Questionnaire

Collected data will be used only for inner purposes of our project "Evidence of Livestock in Central Mongolia in ajmak Tuv" which is implemented in cooperation with MOFALI and Czech University of Life Sciences in Prague.

Jan Šlocar

Date of interview: 5.8.2011 Place of interview: 6. Khureltein.t.a.
Name of farmer: Z.....Identification CODE of farmer (if has some): .....

1. What is your age? .....45.....years
2. What is your sex? a) male (b) female
3. What is your education? a) unlettered b) elementary school (.....years)
   c) secondary school (10.years) d) university (.....years)
4. What is your marital status? a) single (b) married c) divorced d) widow/er
5. Number of family members: .....9.....
6. What is your family structure?

Age	Male [n]	Female [n]	Study [n]	Work on farm [n]	Work out of farm [n]	Semi work [n]
<7 years						
7-14 years						
15-60 years	3	4	1		6	
60 years>	1	1				

7. What is your religion? (a) Buddhism b) Christian c) Islam d) Shamanism
   e) none f) other: .....
8. Which type of farm/breeding do you practise?
   (a) extensive b) intensive (c) semi-intensive
9. What is your position related to animal which you breed? (a) owner b) breeder
10. Who is the owner of area where do you keep your animals?
    a) government (b) you c) other
11. What is the size of area where you keep your animals? Area: 7 (ten).....ha
12. Is any source of water in area where do you keep your animals? (a) yes b) no 500m
13. If YES, who is the owner of source of water in area where do you keep your animals?
    a) government b) you (c) other: .....
14. What is the size of your herd? .....43..... heads
15. What is the number of bulls in herd? .....3..... heads
16. Which breeds do you keep?
    a) alatau b) talin ylaan c) shar tarlan d) khar tarlan e) limoussine
    f) kazakhin cagaan tolgoy g) dornod talin ulaan h) selenge i) sarlag
    (j) mongol k) piedmontese l) khar angus m) ylaan angus n) hereford
    o) charolais p) alatay X m q) khar tarlan X m r) talin ulaan X m
    s) limoussine X m t) kazakhin cagaan tolgoy X m u) dornod talin ulaan X m
    v) selenge X m w) sarlag X m x) piedmontese X m
    y) other: .....

1/4

17. Which type of breeding do you use?
(a) natural b) artificial insemination c) controlled

18. What is the type of your production?

	meat	dairy products	leather	live animals	Other:
Quantity [kg/month]		100kg			

19. What are the prices of product in market (which you sell)?

S/W	meat		dairy products		Leather		live animals		Other:	
T/kg	3500	5000	milk sunmo 250	1000	14000	7000	25000	45000		

20. What do you do with your products? (a) self usage b) sell in market as raw c) barter as raw
d) sell in market as processed e) barter as processed

21. Which type of product do you produce and which type of processing do you use?

Product	milk	yogurt			
Method					

22. Who is responsible for following activities?

	children	wife	husband	other:.....
Milking		✓		
Cooking		✓		
Take care about animals	✓		✓	sometimes
Feed storage		✓		
Processing of products		✓		
Slaughtering			✓	

23. Who sells your products in market, if you sell it?
a) children b) you (c) wife / husband d) relatives e) other: .....

24. What is the distance from your place to the market? ..... 5 ..... km

25. Which type of transport do you use?
a) car b) van c) truck d) horses e) other:..... on foot .....

26. Where do you live?

	summer	winter
Ger	✓	
wooden house		✓
brick house		
Prefab		
other:		

27. Do you use any kind of animal evidence?
a) ear tags b) branding c) colouring d) collars (e) none f) other: …

28. Do you know MOFALI ordinance for livestock evidence?
a) yes (b) no

29. What do you expect from livestock evidence?
.....ear tags because it's easy recognition.....
.....

30. How are you registered in governmental breeder registration system?
a) name (b) registration number (c) no registration d) other:.....

31. Do you have any governmental financial support as a breeder? a) yes (b) no

32. If YES, how much (for one head of animal) do you get? Amount: ..... [T/head]

33. Do you get financial support from other sources? a) yes (b) no

34. If YES, from who you get financial support?.....

35. Do you prepare animal feed store for winter? (a) yes b) no
c) other: .....

36. If YES, how do you prepare animal feed store for winter?
(a) make yourself b) buy somewhere c) other: .....

37. If YES, what do you use as animal feed?
(a) hay b) silage c) feed mixtures d) other: .....

38. Do you use mineral supplements (blocks) for animals? (a) yes b) no

39. If YES, how do you get mineral supplements (blocks) for animals?
(a) collect from nature b) buy in market c) make yourself d) other:.....

40. Do you use any seasonal workers? a) yes (b) no

41. If YES, when do you usually use them and for which type of work (how many workers, for how long, where are they from)?

When:..... Number:.....
For how long:..... Where are they from:.....

42. Do you migrate during year with your animals?
a) yes (b) no

43. If YES, how often and in which stage of season do you migrate?

	spring	summer	autumn	winter
Number				

44. Where do you slaughter your animals?
(a) at your place b) at local place (slaughterhouse in some city) c) other: .....

45. Who slaughter your animals?
a) you (b) other family member (.....) c) local butcher
d) other:.....

46. How do you get new animals?
(a) buy in local market b) change with neighbours c) breed yourself
d) other: .....

47. Do you have access to veterinary medicine and services? (a) yes b) no

48. Do you vaccinate your livestock? (a) yes b) no

49. If YES, against which diseases do you vaccinate your livestock?
a) anthrax b) TBC (c) foot disease d) mouth disease e) blue tong
(f) brucellosis g) other: .....
.....

50. Who pay vaccination?
(a) you (b) government c) other:.....

51. Who manages vaccination (strategy)?
a) you b) government (c) veterinary surgeon d) other:.....

52. Do you use veterinary preparations? (a) yes b) no

53. Do you have access to consultation service? a) yes (b) no

54. If YES, to which type of consultation service do you have access?
a) public b) private c) other: .....

55. What are the main problems (5) you are facing (for example: weather, diseases, lack of money, etc.) to? Range by the importance.
1).....animal feed.....
2).....pastures (lack of grass).....
3).....
4).....
5).....

56. What do you miss in order to improve your life standard?
.....
.....to have more animals.....
.....
.....
.....

Annex 7 – Filled questionnaire for livestock specialists

Questionnaire

Collected data will be used only for inner purposes of our project "Evidence of Livestock in Central Mongolia in ajmak Tuv" which is implemented in cooperation with MOFALI and Czech University of Life Sciences in Prague.

Jan Šlocar

Date of interview: 6.8.2017
Place of interview: Bayan chandmani
Name of livestock specialist:

1. How many breeders are in somon?
   Total: 240
   Breeders: 40-50
   Owners: 15+2 (podniky) (čistokrevná plemena)
   ⇒ skoro se vždy stejní

2. How many breeders don't migrate (has farm)?
   Number: ..... 2 .....
   1. 250 ; 2. 30

3. Can you divide breeders by number of animals?
   a) up to 50 heads of animals: .....
   b) 50 – 99 heads of animals: .....
   c) 100 – 149 heads of animals: .....
   d) 150 – 200 heads of animals: .....
   e) more than 200 heads of animals: .....
   bude formulář (stejný)
   na velkou (čk. ph.)

4. Are they somehow registered?
   (a) all of them b) only breeders (c) only owners d) none
   15+2

5. If YES, how are they registered?
   (a) registration code b) ID number (c) name d) other
   15+2
   ostatní

6. How many cattle heads are in somon?
   Number: ..... 500 - 5000 ..... heads

7. How many heads of other animals are in somon?
   Sheep: ..... 15000 .....heads
   Goats: ..... 14000 .....heads
   Horses: ..... 3000 .....heads
   Camels: ..... – .....heads
   Pigs: ..... do 50 .....heads
   Poultry: ..... 120 000 .....heads
   + soukromníci (vesnice) do 10ks domácích
   bude formulář (stejný)
   dvůr zvlášť

8. Which breeds are presented in somon?
   (a) alatau b) talin ylaan (c) shar tarlan (d) khar tarlan (e) limoussine
   (f) kazakhin cagaan tolgoy g) dornod talin ulaan h) selenge (i) sarlag
   (j) mongol k) piedmontese l) khar angus m) ylaan angus n) hereford
   o) charolais (p) alatay X m (q) khar tarlan X m r) talin ulaan X m
   s) limoussine X m (t) kazakhin cagaan tolgoy X m u) dornod talin ulaan X m
   v) selenge X m w) sarlag X m x) piedmontese X m
   y) other: .....
   normandy

1/2

9. Do you have any veterinary station in somon?
(a) yes b) no

10. If YES, how many veterinary stations do you have in somon?
Number: ..... 2 .....

11. Do you have veterinary surgeon in somon?
(a) yes b) no

12. If YES, how many veterinary surgeon do you have in somon?
Number: ..... 2 .....

13. How many breeders are under supervision of one veterinary surgeon?
Number per one veterinary surgeon: ..... 120 .....

14. Are veterinary surgeons/service:
(a) private b) public c) other:.....

15. If yes, do you provide some precautionary controls?
(a) yes b) no

16. If YES, how often you provide precautionary controls?
(a) ones a year b) twice a year c) three times a year
(d) just in case of breeder/owner demand

17. How many breeders are controlled by one veterinary?
Number: .....

18. Do you provide insemination support?
(a) yes b) no

19. If yes, do you keep protocols about insemination?
(a) yes b) no

20. Do you provide any consultation for breeders?
(a) yes b) no

21. If YES, which type of consultation do you provide?
(a) personal (in farms) (b) collective seminars c) other: .....

22. If NO, do they have access to private consultation?
(a) yes b) no v rámci projektů (hodně seminářů)

23. Are some organisations/donors (projects, volunteer support, etc.) operating in somon?
(a) yes b) no

24. If YES, which organisations or donors operating in somon?
JAJKA (Japonci), Milenium devel. challenge, World vision,
.....
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(Mongolsky)