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EXPLORING LIVELIHOOD STRATEGIES OF HERDER HOUSEHOLDS IN MONGOLIA: INCOME-BASED APPROACH

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Abstract: *The classification of livelihood strategies is important for identifying different lifestyles and developing poverty reduction measures. The research was aimed to identify Mongolian herder households' livelihood strategies and assess capital factors that impact their choice and livelihood outcomes in connection with wealth and poverty. A total of 350 herder households were surveyed using the stratified sampling methods from four different economic regions. The Income-Based Approach was applied to identify herder households' livelihood strategies based on their primary income sources and Pearson correlation was used for assessing the influencing input. The study hypothesizes that herder households earn the majority of income sources from animal husbandry and an essential factor in the choice of livelihood strategy is the number of animals. The study found that livelihood strategies of nomadic herder households clustered into four main types: a) livestock income sources, solely b) earn from kinship and assistant herder salary in addition to livestock income; c) social benefits and pension income in addition to livestock income and d) income sources dependent on natural resources in addition to livestock income. Location, financial capital, and physical capital were the main factors for choosing a specific livelihood strategy. There was an insignificant difference between poor and wealthy herder households in terms of physical assets ownership. To reduce rural poverty, we need tailored sustainable development policies based on different herder households' livelihood strategies.*

Keywords: livelihood strategy, income based approach, herder households of Mongolia

JEL Code: Q01, Q12, I30, D19, D31

1. INTRODUCTION

The agriculture sector is the traditional economic sector and of which, the livestock sector accounts for 88 percent (Gombodorj et al., 2019). Total of 181 thousand herder households herding five types of animals like horse, cattle, camel, sheep, and goat throughout four seasons. Mongolia has a total of 1.56 million hectares of land, of which 1.1 million hectares is pastureland. The number of livestock reaches the highest in 2019, or 70.9 million heads (NSO, 2020). However, the livestock sector remains vulnerable to weather conditions, as seen from the severe dzuds (World Bank, 2012). Thus, herders' livelihoods are dependent on access to a natural resource with a fragile ecosystem (Worldbank.org, 2015), and they are responsible for all production inputs, risks, and decisions. In Mongolia, pasture land area decreased from 140 million ha to 112 million ha, and 65% of pastureland is degraded to a particular extent, varied by ecological zones (MoFA and SDC, 2015). Moreover, in particular herder household's livelihood

strategies, an increase in livestock numbers impact the quality of grassland and its ecosystem (Li et al., 2018; Tumur et al., 2018).

In addition to an increased number of animals and overgrazing problems, rural poverty has been a concern for nearly 30 years, its index ranges from 26.4 to 30.8 percent between 2014 to 2018 (NSO and World bank, 2020). NSO and World Bank (2020) was noted that increasing livestock product demand and prices, better connectivity to markets, more wage employment opportunities, government subsidies, and transfers have contributed to improving herders' wellbeing. However, their livelihoods, highly dependent on livestock, are still highly vulnerable to unexpected shocks, including livestock price fluctuations and natural disasters. The recent acceleration of pastoral degradation could also negatively affect the sustainability of herders' livestock activities and welfare.

Consequently, there is a demand to study ways to improve and sustain rural people's living conditions by overcoming natural disasters, economic shocks, and livestock disease

shocks. National and international researchers have been studied interdisciplinary topics, rural poverty, natural disasters, and pastureland degradation and how these issues affect herder households' livelihoods in Mongolia. Robin Mearns (2004) stated that income from animal husbandry is not the sole income source for the Mongolian herder households; some irregular income is accounted for. Additionally, assistant herders, who have very few animals, helping wealthier herders and receives a salary or material things without contracts are mostly classified as poor herder households (Murphy, 2015). It is traditionally named kin relationship help. Thus, their livelihood strategies and poverty trends are not clear yet.

The research objective is to identify Mongolian herder households' livelihood strategies and assess capitals that impact their choice in connection with wealth and poverty. The study hypothesize that herder households earn the majority of income sources from animal husbandry and an essential factor for the choice of livelihood strategy is the number of animals. The study result would provide helpful information for policymakers and researchers for developing sustainable livelihood programs for Mongolian herder households.

2. LITERATURE REVIEW

The basic premise of the Sustainable Livelihood Framework is a DFID framework based on the work of Chambers & Conway (1992)(DFID, 2001). Later, Ian Scoones, (2015) developed his work in 1998 and created a well known diagram that illustrates different assets and resources that would lead to certain types of livelihood strategies outcomes, influenced by a set of context and institutional processes. Batterbury (2015) argued that all actors in sustainable development framework emphasize in different ways, however, all come to the one idea that sustainability of rural livelihoods should form the basis for improved rural development and poverty alleviation. 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 resources base.

Classification of livelihood strategy and investigation of its transitions in a systemic and quantitative approach is essential for understanding the dynamics of rural livelihoods, the determinants of livelihood strategy choices and mobility, and the implications for designing significant poverty alleviation and rural development strategies (Jiao et al., 2017; Yang et al., 2020). Households are challenging to receive various income sources. Thus household strategies indeed mix various activities. In a joint publication, United Nations Food and Agriculture Organization (FAO) and World Bank (WB), Farming systems and poverty, small producers in developing countries around the world, supply most of their food but remain in poverty, described their livelihood strategies based on similar new qualities to

improve their livelihoods. As a result, 72 farming systems were identified in six developing regions, with an average agricultural population of about 40 million inhabitants. This research invented the eight broad categories of the farming system. Mongolia is classified in "Rainfed farming systems in dry or cold low potential areas, with mixed crop-livestock and pastoral systems merging into systems with very low current productivity or potential because of extreme aridity or cold categories global farming system" (Dixon & Gulliver, Aidan with Gibbon, 2001).

Rural households of less developed or developing countries often engage in a diverse set of income-generating activities to diversify their income base to reduce risk exposure, maintain consumption requirements in the event of shocks, and accumulate wealth. After shifting to the market economy in Mongolia, some studies were carried on the herders' livelihood. However, those available studies are multidisciplinary studies mainly focused on pasture management, overcoming natural disaster-dzud, community-based rangeland management (G.BrownArunAgrawal, 2013), (María E.Fernández-Giménez, B.Batkhishiga, B.Batbuyan, 2012),(Mearns, 2004b) (Schmidt, 2006), (María E.Fernández-Giménez, 2015), (Peng et al., 2017). Robin and Mearns studied Mongolia's pastoral livelihood and Poverty assessment in 2000 based on the sustainable livelihood theory using an income-based approach. However, in his study, due to insufficient data could be gathered for very poor households to include this category in this analysis with any degree of confidence; and, inter- household transfers and kinship support — while a very important livelihood source is absent (Mearns, 2004b).

Like in most agriculture-based countries, socio-economic and ecological developments are inextricably linked in Mongolia. The number of animals is regarded as a proper approximate measure of the wealth of herding households in Mongolia as the animal origin product is the primary income source of herder households. Although the number of animals increases, herder's income inequality has been extending. A share of herders' households with less than 200 animals is 43% of the total number of herder households, while their herd size accounts for only 12% of the total number of animals (FAO and MoFALI, 2018). A study conducted by the Japan International Cooperation Agency (JICA) and the Ministry of Food and Agriculture (MoFALI) in 2006 on the income of herders with different herd sizes are reported: herders with herds of between 101-200 animals have expenditures roughly equal to income, but at a subsistence level; no funds remain. They are not worth the expenditure on long-distance moves. Furthermore, other investments, such as purchasing improved breeds, are not feasible (JICA and MoFA, 2006).

Classification of livelihood strategy and investigation of its transitions in a systemic and quantitative approach is essential. Methods of classifying livelihood strategies incorporate the asset-based approach, activity choice approach and income-based approach (Sun et al., 2019).

The formal method of determining the livelihood of herder households is an asset-based approach. The asset-based approach is from the perspective of input used across different activities, while the income-based approach classifies livelihood strategies from the perspective of output according to income from a certain source such as nonfarm income, forest income, cash transfer income (Sun et al., 2019). Income-based Cluster analysis is the most commonly used approach (Nielsen et al., 2013). Compared with the asset-based approach and income-based approach, the activity choice approach stems from the definition and essence of livelihood strategies and classifies livelihood strategies from the perspective of the process. Input, activity and output are interlinked. Thus, Nielsen et al., (2013) emphasized that activity variables should connect assets and the outputs. Although the livelihood survey focuses on household income and expenditure, some middle-class households fall into the extremely poor category due to excluding some irregular incomes (Mearns, 2004a). This study classified the herders' livelihood strategies adapting income-based approach. . Mongolian National Statistical Office and other livelihood studies classify herder households' livelihoods using their livestock number (Altangerel et al., 2015; Marion et al., 2018; Mearns, 2004b; Mongolia Ministry of labour and Social Protection Mongolia, 2019; Murphy, 2015; Oniki & Dagys, 2017). Mongolia conducts an annual livestock census in December. According to the official government welfare grouping indicator, herder households are classified as very poor is having 0–50 animals; poor 51–100 animals; an average 101–500 animals; better-off 501–1000 animals; and wealthy is over 1000 animals (Leisher et al., 2012)

3. METHODOLOGY

Two steps analysis was applied in this study. In the first step, different household livelihoods are classified by their income using the nearest neighbor clustering method of SPSS covering 350 herder households Mongolia. Total eight income sources including livestock income, wage, growing crops and vegetables, natural resources, services, small business, social welfare, and handicrafts income are included in the survey.

In the next step, 33 major factors (variables) are included in the Pearson correlation analysis to identify the affecting factors to pursue specific livelihood strategies. These include the variables loan, saving, whether a commercial bank account, share of livestock income in the total income, the income share of wages, agriculture, family business, social welfare, natural resource, services and handcraft income; livestock insurance coverage, educated family member percentage in the family, number of working-age household members, family literacy level, family member coverage of health insurance, percentage of family member attendance of adult and continuing education training, number of housing, water accessibility, water sources for animals, number of

winter and spring places owned, percentage of fertile plants in the livestock pastures, family members' coverage of social insurance, participation level in the local election, number of mobile phones in the households, information source of "A" level animal diseases spread, membership status of cooperative, and pasture user group which support herders' activities. All 33 variables are grouped into Financial capital, Human capital, Physical Capital, Natural capital, and Social capital.

Sample selection

This study was conducted in Mongolia, covering four economic regions: Khangai, Central, East and Western regions. The primary data was selected from the Socio-economic Baseline Study of herder Households. Data were collected with a nationwide survey between July to August 2017 by Mongolian Marketing Consulting Group, financed by the Green Gold and Animal health project of Swiss Development Cooperation. Income-based cluster analysis was used to classify the herder households, and calculations were made using the SPSS program. Pearson correlation analysis was used for correlations between herder household income and livelihood sources with a significance of 1 percent and 5 percent.

The data collection was applied to two-stage stratified sampling methods. Animal numbers and herder households at soum (the second administration unit of Mongolia) and the bag level (The first level of the administrative unit of Mongolia) were taken from the annual animal census-2015 of the National Statistical Office Mongolia. Herder households are nomadic. The study excluded the households with livestock at 330 soums centres and 21 aimag centres (The third level of the administrative unit of Mongolia). The first stage or soum sampling considered every zone's representation, the number of herder households (1-499 and 500 more), and distance to aimag centres (1-199 km and 200 km more). According to these indicators, every soum (total 309 soums) has been divided into stratum. One soum per stratum was selected.

The following formula determined the number of herder households for sampling

$$n = (Z^2 p(1-p)) / e^2 \quad (1)$$

Where: n – sample size, Z – Z table value in confidence interval (1.96), p – phenomena expectation (unit weight of herder households to a total number of households), e – accuracy expressed by relative expectation. Survey sample size (95.0%-confidence interval, 5.0%-accuracy).

Thus, a total of 350 herder households were selected. The number of survey respondent units from the chosen soums are done by the equal distribution method (350:15=23). As a result, 23-24 households per selected soum were involved. Herder households were selected from 10 different livestock groups numbers: up to 10, 11-30, 31-50, 51-100, 101-200, 201-500, 501-999, 1000-1499, 1500-2000 and 2000 above at each soum . Finally, a total of 350 herder households were involved in surveying. One herder household represented 410 herder households on average.

Figure 1. Selected 15 soums for sampling.



In result, from Khangai region-Arkhangai aimag-Ikhtamir, Battsengel, Tsakhir soums, Bayankhongor aimag- Bayanlig, Bayantsagaan soum, Khuvsigul aimag- Alag-Erdene, Arbulag soum; Uvurkhangai aimag-Bogd soum; Central region- Tuv aimag- Undurshireet, Buren, Delgerkhaan soum, Umnugobi aimag-Mandal-Ovoo soum; Western region- Zavkhan aimag-Erdenekhairkhan soum, Khovd- Chandmani soum; Eastern region- Dornod aimag- Tsagaan-Ovoo soum. 15 soums of 9 aimags have been selected as the survey respondents.

4. RESULTS AND DISCUSSION

Livelihood strategies adapting income-based approach using Nearest neighbour cluster analysis

As a result of the first step of the analysis, the herder households livelihood strategies were classified the following:

Cluster 1, herder households that have primary income from wages and salaries;

Cluster 2, herder households that are reliant on the income from livestock-related products and activities, solely;

Cluster 3, herder households that are dependent on the social welfare; pension, allowances and special care services,

Cluster 4, herder households that are reliant on undermining natural resources.

The result shows that 88.9 percent of the herder households' livelihood is dependent on livestock (Cluster 2). All other three clusters account for 11.1 percent only. The result is relatively

close to the different research results on herder livelihood carried out by other researchers. For instance, the joint study of The research institute of labour and social protection & Ministry of Labour and Social Protection (2018) has stated in their research that 66.8 percent of herder households get their income from livestock sources, 10.7 percent from salaries, wages, 17.2 percent from pension, benefits, and the remaining 5.3 percent get their income from other sources.

The herder households that earn wages and salaries make up around 3 percent. These herder households own comparatively few animals (see Table 1) which is not sufficient for their livelihood. Therefore, herders households look after the herds of absentee herders who live in soum centres and other urban areas. They have paid wages in a combination of cash and in-kind. Kinship, or also known as an assistant herder, is a new type of labour for herders. As of 2019, out of the 285.5 thousand herders, 94.7 percent of them are main herders, 15.2 thousand or 5.3 percent are assistant herders (NSO, 2018). In Mongolia, the number of wage-based and share-based labour contracts has grown but has not displaced clientelism or kin-based cooperation (Murphy, 2015). With the increasing number of livestock heads, there is a tendency for an increased number of herders who are strategically thinking to become assistant herders. As for wage distribution, many forms are being used as a combination.

As for Cluster 2, herder households generate direct income from cashmere, wool, meat and dairy product sales. Herders' income from the livestock differs between regions. Khangai region depends more on animal origin income. Khangai region differs from the other regions by their ability to create income from milk and dairy products as they have more cows, yak and many animals. Herders who own more livestock generate more income. The Mongolian government provides monetary incentives for every kilogram of wool and cattle and horse hides. Those with few animals require income diversification, while others with more livestock are primarily busy and are not dependent on other types of income sources. A study conducted by the Japan International Cooperation Agency (JICA) and the Ministry of Food and Agriculture (MoFALI) in 2006 on the income of herders with different herd sizes are reported: herders with herds of between 101-200 animals have

Table 1. Clustered livelihood strategies

		Type of Cluster							
		Cluster 1		Cluster 2		Cluster 3		Cluster 4	
		Count	Mean	Count	Mean	Count	Mean	Count	Mean
Regions/ Households	Central	2		87		3		-	
	Khangai	6		160		22		2	
	Western	-		45		-		-	
	Eastern	2		19		2		-	
	Total	10		311		27		2	
Total (%)		2.9		88.86		7.71		0.57	
The average number of livestock per household			90		546		171		55
Annual income, mln MNT			6.3		10.9		5.7		0.8
Annual household income, thousand USD (ex. rate 2454, by 2017)			2.6		4.4		2.3		0.3

Source: Author estimated result

Table 2. The correlation between household income and livelihood resources (capital).

Dependent variable: Household income

Independent variables			Region			
			Central	Khangai	Western	Eastern
Financial capital	Number of Livestock	Pearson Correlation	.710**	.605**	.674**	.784**
		N	92	190	45	23
	Saving	Pearson Correlation	.399**	.277*	.550**	
		N	92	74	22	
	Insurance of Livestock	Pearson Correlation	.241*		.661**	.598**
		N	92		45	23
Human capital	Education	Pearson Correlation				.416*
		N				23
Physical capital	Number of housing, yurt, and barns	Pearson Correlation	.273**	.274**	.373*	
		N	92	190	45	
	Number of winter and spring housing	Pearson Correlation	.270**	.436**		
		N	92	190		
Social capital	Percentage of family members with social insurance	Pearson Correlation			.334*	
		N			45	
	Percentage of a mobile phone user	Pearson Correlation	.215*			
		N	92			

Source: Author estimated results

Note: *. Correlation is significant at the 0.05 level (2-tailed) **. Correlation is significant at the 0.01 level (2-tailed)

expenditures roughly equal to income, but at a subsistence level; no funds remain. They are not worth the expenditure on long-distance moves. Furthermore, other investments, such as purchasing improved breeds, are not feasible (JICA and MoFA, 2006).

Cluster 3, herder households rely on social welfare, pension, allowances, and special care services. The average number of livestock is 171 and at the subsistence level. Therefore, it is difficult to live without additional sources of income. Herders' retirement age has decreased to 50 and 55, which has increased the chance to create income from their pension (Gombodorj et al., 2019). Those on a pension or on temporary disability welfare do not have the workforce's capacity to herd many animals. Due to the Covid 19 pandemic, starting from March 2020, 100 thousand Mongolian tugriks are being distributed to those under 18, and these types of social welfare support directly to increase herder households' income.

Cluster 4, herder households that are reliant on undermining natural resources. They take up less than one percent of those involved in the research and are only located in the Khangai region. The Khangai region has a reach of pine nuts, fruit in the autumn, and abundant wild animals for hunting, allowing them to gather their primary income source from nature while herding a few animals.

Correlations livelihood resources and income with regional differences

In the second step of the analysis, we chose a total of 33 factors that affect herder household's income and livelihood strategies: 13 factors from financial capital resources, 5 from human capital, 7 from physical capital, 4 from natural capital, and 4 from social capital. Statistically significant variables are exhibited in Table 2. Correlation analysis results show

that herder households' income has positive correlations with livestock insurance, savings, and livestock numbers across all regions. Education effects exist only in Eastern-Steppe regions. That might be explained that the steppe region has less availability of natural and physical resources. Housing for humans and animals is an essential factor in the Central and Khangai regions. The Group of factors of the social capital relations to the herders' livelihood is various.

5. CONCLUSION

We have analyzed the Mongolian herder households' income diversification with regional differences using The Income-Based Cluster Analysis method. The result shows that livestock number is important in the income diversification and choice of livelihood strategy. Thus, the research hypothesis is accepted. The higher the number of livestock, the higher the herder's reliance on their livestock-related income, as they have livelihood strategies revolving around their livestock. However, as the number of livestock decreases, a herder household's income consists mainly of social welfare income and other income sources. Financial and physical capital has a positive effect on the decision making of a herder household's livelihood strategy and income. Tailored policies based on different herder households' livelihood strategies are needed to reduce rural poverty and enhance sustainable rural development.

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REFERENCES

- Altangerel, A., Kupul, J., Shurentsetseg, K., Saijaa, N., & Nyamosor, D. (2015). The study of herders livelihood, health, sanitary condition. 1–8.
- Batterbury, S. (2015). Prelims - Sustainable Livelihoods and Rural Development. Sustainable Livelihoods and Rural Development, 23(Figure 1), iv–xvi. <https://doi.org/10.3362/9781780448749.000>
- Chambers, R., & Conway, G. R. (1992). Sustainable rural livelihoods: practical concepts for the 21st century. IDS Discussion Paper, 296.
- DFID. (2001). Sustainable Livelihoods Guidance Sheets. SL Approaches in practice. Ids Discussion Paper, 1–24. <https://doi.org/10.1002/smj>
- Dixon, J., & Gulliver, Aidan with Gibbon, D. (2001). Farming Systems and Poverty: Improving Farmers' Livelihoods in a Changing World. In M. Hall (Ed.), FAO, Rome; World Bank, Washington, D.C. FAO and WB.
- FAO and MoFALI. (2018). Action plan for the Mongolian agenda for sustainable livestock. In Global agenda for sustainable livestock.
- Gombodorj, G., Van Ophem, J., & Nyam-Ochir, G. (2019). FINANCIAL LITERACY AND PENSION PLANNING OF MONGOLIAN HERDERS. The Annals of University of Oradea. Economic Science, XXVIII(2), 137–149.
- Jiao, X., Pouliot, M., & Walelign, S. Z. (2017). Livelihood Strategies and Dynamics in Rural Cambodia. World Development, 97, 266–278. <https://doi.org/10.1016/j.worlddev.2017.04.019>
- JICA and MoFA. (2006). Mongolia The study for improvement plan of Livestock farming system in Rural Area. https://openjicareport.jica.go.jp/pdf/11821865_01.pdf
- Leisher, C., Hess, S., Boucher, T. M., van Beukering, P., & Sanjayan, M. (2012). Measuring the impacts of community-based Grasslands management in Mongolia's Gobi. PLoS ONE, 7(2). <https://doi.org/10.1371/journal.pone.0030991>
- Li, A., Wu, J., Zhang, X., Xue, J., Liu, Z., Han, X., & Huang, J. (2018). China's new rural "separating three property rights" land reform results in grassland degradation: Evidence from Inner Mongolia. Land Use Policy, 71(December 2017), 170–182. <https://doi.org/10.1016/j.landusepol.2017.11.052>
- Marion, M., Lukas, D., Buuveibaatar, B., & Ganzorig, G. (2018). Keep on moving-How to facilitate nomadic pastoralism in Mongolian in the light of current societal transformation process.
- Mearns, R. (2004a). Decentralisation, Rural Livelihoods and Pasture-Land Management in Post-Socialist Mongolia. The European Journal of Development Research, 16(16), 133–152. <https://doi.org/https://doi.org/10.1080/09578810410001688770>
- Mearns, R. (2004b). Sustaining livelihoods on Mongolia's pastoral commons: Insights from a participatory poverty assessment. Development and Change, 35(1), 107–139. <https://doi.org/10.1111/j.1467-7660.2004.00345.x>
- MoFA and SDC. (2015). National report on the rangeland health of Mongolia.
- Mongolia Ministry of labour and Social Protection Mongolia. (2019). Малчдын аж байдлын судалгаа (Herders' livelihood studies).
- Murphy, D. J. (2015). From kin to contract: labor, work and the production of authority in rural Mongolia. Journal of Peasant Studies, 42(2), 397–424. <https://doi.org/10.1080/03066150.2014.974569>
- Nielsen, Ø. J., Rayamajhi, S., Uberhuaga, P., Meilby, H., & Smith-Hall, C. (2013). Quantifying rural livelihood strategies in developing countries using an activity choice approach. Agricultural Economics (United Kingdom), 44(1), 57–71. <https://doi.org/10.1111/j.1574-0862.2012.00632.x>
- NSO. (2018). Review of the agriculture sector (Mongolian National Statistical Office (ed.)).
- NSO. (2020). Mongolian statistical information service. National Statistics Office of Mongolia. https://www.1212.mn/tables.aspx?tbl_id=DT_NSO_2400_009V1&CL_LAND_select_all=0&CL_LANDSingleSelect=_0_62&YearY_select_all=0&YearYSingleSelect=&viewtype=table
- NSO and World bank. (2020). Mongolia poverty update 2018.
- Oniki, S., & Dagys, K. (2017). Recovery from a winter disaster in Töv Province of Mongolia. Journal of Arid Environments, 139, 49–57. <https://doi.org/10.1016/j.jaridenv.2016.12.010>
- Peng, W., Zheng, H., Robinson, B. E., Li, C., & Wang, F. (2017). Household livelihood strategy choices, impact factors, and environmental consequences in Miyun Reservoir Watershed, China. Sustainability (Switzerland), 9(2), 1–12. <https://doi.org/10.3390/su9020175>
- Scoones, I. (2015). Sustainable Livelihoods and Rural Development: Agrarian Change and Peasant Studies.
- Sun, R., Mi, J., Cao, S., & Gong, X. (2019). Classifying livelihood strategies adopting the activity choice approach in rural China. Sustainability (Switzerland), 11(11). <https://doi.org/10.3390/su11113019>
- The research institute of labour and social protection, & Ministry of Labour and Social Protection. (2018). Herders' livelihoods

hood study (Малчдын аж байдлын судалгаа). http://www.rilsp.gov.mn/upload/2018/sudalgaa//Малчдын_аж_байдлын_судалгаа_2018.pdf

Tumur, E., Wim J.M, H., Nico, H., & Agipar, B. (2018). Critical factors enabling sustainable rangeland management in Mongolia. *China Economic Review*, 10(Volume 60). <https://doi.org/https://doi.org/10.1016/j.chieco.2018.10.004>

World bank. (2012). Lessons from the Dzud: Adaptation and Resilience in Mongolian Pastoral Social-Ecological Systems. In World Bank.

Yang, L., Qing, Z., Qingfu, L., Yongzhi, Y., Wanxin, H., Deyong, Y., & Jianguo, W. (2020). Different household livelihood strategies and influencing factors in the inner Mongolian grassland. *Sustainability*, 12(3), 839. <https://doi.org/https://doi.org/10.3390/su12030839>

