

THESIS OF THE DOCTORAL (PHD) DISSERTATION

**POVERTY, SUSTAINABILITY AND LIVELIHOOD STRATEGIES OF
HERDER HOUSEHOLDS IN MONGOLIA**

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Debrecen

2023

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1. INTRODUCTION

The Mongolian economy is driven by mining, and the traditional nomadic lifestyle is an overall picture of the current days. Mongolia is a country with a population of 3.5 million and a territory of 1.5 million square kilometres; more than half of the population lives in urban areas. The livestock sector has been a traditional and essential sector of the Mongolian economy in the past and will keep its importance near future. In the early 1990s, Mongolia transitioned to a market economy, livestock was privatised, and the old socialist collective system collapsed. The new constitution of Mongolia noted that "Livestock is a national wealth and shall be protected by the state" even though livestock became private property.

Mongolian pastoral livestock has unique characteristics compared to other countries in that the traditional economics sector dominates the national economy. Low-input livestock production systems, such as pastoralism, have little impact on climate, biodiversity, and water and are environmentally friendly (Houzer & Scoones, 2021). Nomadic herders account for nearly thirty percent of Mongolia's population, and they own a total of 70 million heads of livestock. Herders are responsible for their livelihood, livestock production, inputs and outputs, and mitigating risks. Herders are not only the suppliers of meat and milk for the urban people and the raw material suppliers for wool, cashmere, leather and meat processing factories but also carriers of intangible cultural heritage, owners of vast territories, and notable contributors to the preservation of culture and traditions. Pasture and water are common pool resources in rural Mongolia. Thus, herders openly access these common pool resources. They apply seasonally moving and rotational grazing management of pastures as a common pasture management tool against overgrazing and degradation of pastureland.

The agriculture sector in Mongolia is recognised as a high-risk industry and vulnerable to climatic shocks and bad weather (drought and *dzud*¹), which pushes herders to greater poverty. Mongolian herders' livelihoods are excessively interrelated to the natural resource with a fragile ecosystem (World Bank, 2015). A *dzud* happens in some parts of the country annually, and many relief and support activities are organised nationwide. During the last two excessive *dzud* herders lost about 15 million animals. Mongolian Government and international organisations' various aid programs were implemented to recover the negative impact of each *dzud*.

In addition to natural risks, a new human and social shock, Covid-19, has emerged and caused extensive damage to health, economic and social life (Ali & Alharbi, 2020). The

¹Mongolian term referring to livestock dying in vast numbers due to following dry, hot summers and cold, snowy winters.

World Bank stated that Covid-19 would impact poverty (R. F. Luo et al., 2020). During Covid-19, the Mongolian economy declined by 10.7 percent. Livestock origin raw material price shock, decreasing meat export, and borders closing have negatively affected all households and shrunk export earnings of Mongolia.

The Government of Mongolia is continuously focusing on rural development and poverty reduction. The Government introduced subsidies for sheep, camel wool, and horse and cattle hides supplied to national processing companies. During Covid-19, Government subsidised cashmere to cover herders' losses due to the Chinese border closure.

Herder households do not pay income or profit taxes except the recently enforced livestock tax. In 2021, the law on payment of livestock tax came into force. According to this law, the annual fee per head ranges between 0-2000 Mongolian tugrik (MNT). The local administration has the right to discount or exempt from the livestock tax to support poor herders' livelihoods.

The total number of livestock is increasing dramatically, but rural poverty is not decreasing for nearly 30 years. Thirty percent of the rural population is still in poverty (NSO and WB, 2021). Mongolia uses livestock numbers as a measuring unit of herder households' poverty defined by Worldbank (2009). Full-time herder households with over 500 livestock numbers are wealthy; 200-500 are middle households, and less than 200 are poor (NSO, 2022)(NSO, 2022)(NSO, 2022b). Reducing poverty in rural areas would stimulate a sustainable livelihood and healthy food supply and promote people living on the vast Mongolian plateau.

To reduce poverty in rural areas need to increase income. Herders' households' livestock product income consists of wool and cashmere, meat sales and skin and hides income. Moreover, pensions and social welfare benefits income is ranked the most significant share in non-livestock income sources. Herders have been willing to increase their livestock numbers, as cashmere and meat are the primary sources of income. However, pasture carrying capacity is limiting. The researchers recommend that increasing livestock product export would help sustain and improve herders' income.

Mongolia's "VISION-2050" long-term development policy aims to be "a leading Asian country in terms of its social development, economic growth and citizens' quality of life". The policy measurements fit within all 17 Sustainable Development Goals (SDGs) that define national-level goals and activities based on the output or goal-based methodology.

The several parts of "VISION 2050" comprehensively touch on the herder's livelihood and livestock sector. Thus sectoral importance in terms of sustainable development triple pillars of economics, society and environment.

One of its long-term policies of Mongolia is to support economic diversification besides mining. About 50 percent of non-mining exports of Mongolia come from textiles, mainly wool, cashmere, and woven fabrics. More than 90 percent of export textile products are

made of goat cashmere, the *first*-ranked income source of herders. Besides bringing cash income from cashmere, pasture degradation concerns limit the increase of goat numbers; because goats are more harmful than other animals on pasture. Current statistics noted that approximately 70 percent of Mongolia's pastureland had been degraded to some extent.

The following potential export product is meat, which is herder households' *second* most significant income source. As a result of various policies and negotiations between governments for several years, meat export is increased since 2014 and reached their peak point in 2018.

The *third*-ranked income source is hides and skins. It is the by-product of meat production. Therefore, when meat production increases, hides and skin income grows as likely.

The *fourth* income source for herder households is government pensions and social welfare income. Due to herders' low financial literacy and voluntary contributors' status, herders' participation in insurance coverage and the pension amount are mostly minimal.

Many of the factors mentioned above negatively affect the livelihoods of Mongolian nomadic herders and lead them to poverty, changing their livelihood strategies. The scientific problem is that there is no systematic livelihood analysis to evaluate Mongolian herder households' livelihood strategies, including shocks, livelihood assets, activities, and outcomes and their underlying factors. Although scholars have studied the impact of cross-sectoral topics, rural poverty, natural disasters, *dzud*, and pasture degradation on the livelihoods of Mongolian herder households, there is currently no systematic study that suggests solutions based on sustainable livelihood theory. Therefore, the researcher wants to fill this gap and define the research objectives, questions and hypothesis.

1.1 Research objective

Overall, the PhD study aims to contribute to the literature by examining the current Mongolian herder households' livelihood strategies and possible interventions to cope with and recover from stresses and shocks and improve livelihood skills, capabilities, and assets. The research objective is **to explore the livelihood strategies of herder households in Mongolia, the factors influencing their choice, and contribute to finding ways out of poverty.**

1.2 Research questions

The research attempted to reach the research objective by answering the following research questions:

1. What is the importance of livestock number and its structure?

2. What are the critical primary livestock and non-livestock income sources?
3. What are the main essential capital elements, and what is their potential contribution to improve herder households' livelihood?
4. What are the main important type of risk (natural disaster risk, animal disease risk, income-related risk)? How do the herder households cope with that?
5. What kind of institution is responsible for pasture management and poverty reduction? Are their activities efficient?
6. What are the characteristics of the supply chain and market access?

1.3 Research hypothesis

To answer the research questions, the study needs to test the following hypothesis at the end of the study:

Hypothesis 1 (H1): The number of livestock is critical in differentiating rural livelihood strategies among the herders' households.

Hypothesis 2 (H2): Vulnerability factors are the driving factor for selecting household livelihood strategies. Any shocks are threatening their livelihood but at different rates and forms.

Hypothesis 3 (H3): Poor herder households have few income sources and limited access to assets, market, supply chain and innovation services.

Hypothesis 4 (H4): The impact of government policies positively and sustainably promote rural development and anti-poverty.

Hypothesis 5 (H5): The growth of the mining sector, which is essential for the Mongolian economy, harms the development of the agricultural sector.

2. SUSTAINABLE LIVELIHOOD FRAMEWORK AND RESEARCH DESIGN

Similar to international publications, the study results show that livelihood strategies can be changed due to various factors. Based on the literature review, the study designed a Sustainable Livelihood Framework (SLF) for Mongolian herder households. The dissertation is thoroughly done within this framework. (Figure 2.1)

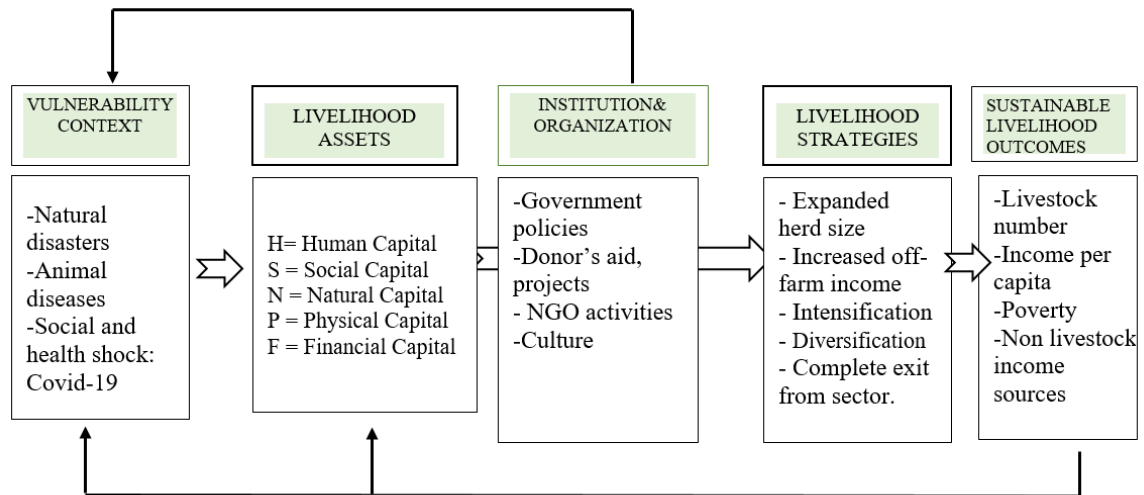


Figure 2.1. The sustainable livelihood framework for Mongolian herder households

Source: Author's compilation

The research covered several essential topics of SLF, namely the newly emerged shock impact of Covid-19; livelihood assets; government policy on meat exporting and its impact on herders' livelihoods; and one of the possible ways to increase non-livestock income - state pensions and welfare; livelihood strategies; and, poverty of herder households. The research was done with the following six stages.

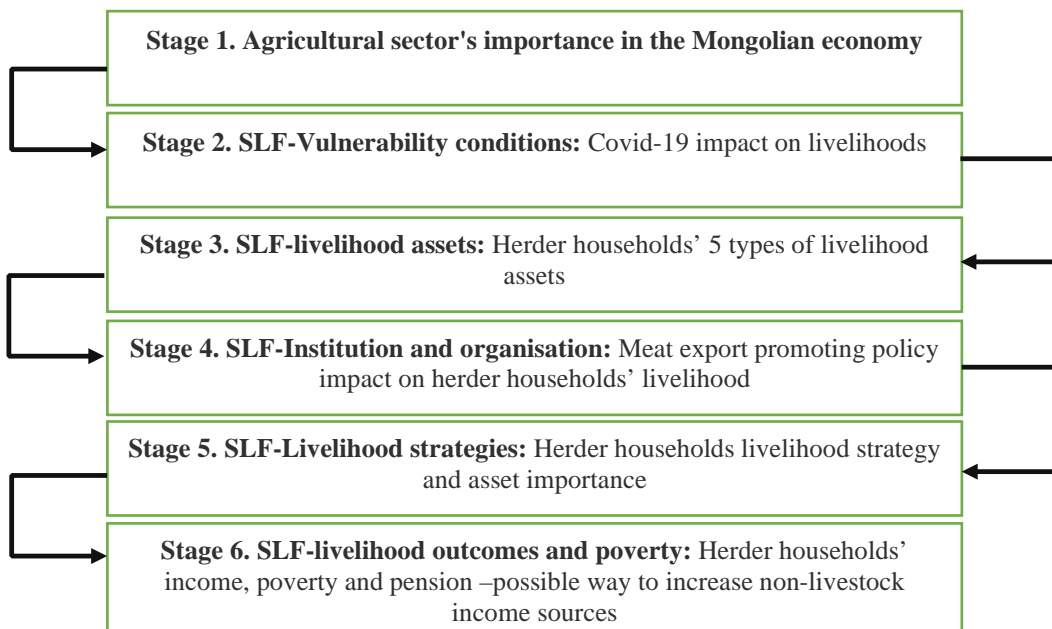


Figure 2.2. Research conceptual framework

Source: Author's compilation

3. MATERIALS AND METHODS

3.1 Introduction

This chapter describes the data and methodologies applied in the study. The dissertation used two sets of primary and two sets of secondary data. Two sets of primary data covered 350 and 362 households survey. The two secondary data set is from the official sources of the NSO and the Mongolian Customs General Administration (MCGA). The following table summarises the data, purposes and methodologies to analyse data (Table 3.1)

Table 3.1 Data sources and methods used throughout the dissertation

Sub section	Purposes	Methodology	Data
3.2	To define the agriculture sector's importance in the national economy	Growth model, Multivariate regression model	Time series data from NSO (2000-2019)
3.3	To compare Covid-19 impact on household livelihood	Principal component analysis and regression model	A telephone survey of 362 households in 2021
3.4	To analyse livelihood assets	Descriptive statistics	Survey of 350 herder households conducted in 2017
3.5	To assess meat export promoting policy impact on herder households' income	Log-Log regression model	22-year (1997-2018) time-series data from NSO
3.6	To define herder households' livelihood strategies and assets importance	Income-based cluster analysis and Seemingly unrelated regression model	Survey of 350 herder households conducted in 2017
3.7	To define herders' financial literacy and pension planning	Linear regression model	

Source: Author's compilation

3.2 Economic growth and agriculture sector importance

Variable: The variable selection was chosen based on a review of existing academic works that provide the primary economic growth variables and their explanations and studies that employed them.

Methodology: The study employed the most widely used growth model (Ronald, 2006; Sachs & Andrew, 2001). The researcher created a three-step economic growth model to analyse the sectoral influence on economic growth (Y1, Y2, and Y3). The Y1 model has three sub-models (Y1-1, Y1-2 and Y1-3) that exclude control variables.

Thus:

$$Y_t = \alpha + \beta \log PC_t + \gamma X_{i_t} + e \quad (1)$$

$$Y_t = \frac{\text{LogGDP}_t - \text{LogGDP}_{t-1}}{\text{LogGDP}_{t-1}} \quad (2)$$

Where:

Y- the annualised growth rate for Mongolia.

i- share mining, share agriculture, education, and share net tax

$\log PC_i$ is the initial level of Per Capita GDP in logarithm

$t \in \{0; 20\}$ $t_0 = 2000$ and $t_{20} = 2019$.

The growth model Y is explained in three different forms. Y1, Y2 and Y3. Y1 has three sub-models Y1-1, Y1-2 and Y1-3.

The first, the growth model Y1-1, calculated three independent variables: log GDP per capita, agriculture share and mining. Then next, the growth model Y1-2 is calculated to control variable Education added to the model Y1-1. The last, the growth model Y1-3, added tax share to the Y1-2.

$$Y_t^1 = \alpha + \beta \log PC_t + \gamma X_{i_t} + e; \quad (3)$$

where $Y_t^1 = \frac{\text{LogGDP}_t - \text{LogGDP}_{t-1}}{\text{LogGDP}_{t-1}}$

The growth model Y2- annual growth of GDP excludes the share of the agriculture sector; and

$$Y_t^2 = \alpha + \beta \log PC_t + \gamma X_{i_t} + e; \quad (4)$$

where $Y_t^2 = \frac{\text{Log}(\text{GDP}_t - \text{GAP}_t) - \text{Log}(\text{GDP}_{t-1} - \text{GAP}_{t-1})}{\text{Log}(\text{GDP}_{t-1} - \text{GAP}_{t-1})}$

The growth model Y3-annual growth of GDP excludes both resource extractive sectors, agriculture and mining.

$$Y_t^3 = \alpha + \beta \log PC_t + \gamma X_{i_t} + e; \quad (5)$$

where $Y_t^3 = \frac{\text{Log}(\text{GDP}_t - \text{GAP}_t) - \text{Log}(\text{GDP}_{t-1} - \text{GAP}_{t-1} - \text{GMP}_{t-1})}{\text{Log}(\text{GDP}_{t-1} - \text{GAP}_{t-1} - \text{GMP}_{t-1})}$

These various forms aim to look at the sectoral influences on economic growth. Experiment variables are GDP per capita, agriculture sector share (ShareAg), and mining sector share (ShareMining). Furthermore, control variables such as Education (Education) and Net taxes

(ShareNetTax) are chosen. The selected independent variables denoted X_i are the shares of selected variables in GDP, except for the variable Education.

3.3 SLF: Vulnerability context: Covid-19 impacts on livelihood

Data. The research was conducted during the Covid-19 quarantine to assess its impact on different households' livelihoods. The Institute of Natural Resource and Agriculture Economics NGO researcher executed a telephone survey using a semi-structured questionnaire with 205 questions between June and July 2021. The survey included 362 families from 16 soums throughout eight provinces and six districts in the capital city.

To compare the influence of Covid-19 on herder households' livelihoods, researchers chose households residing in ger districts.², apartment households, vegetable grower households, and small farmer businesses nearby suburban areas. The stratified random sampling method is used to sample herder families. The households in each stratum are sorted by livestock number. From each livestock group, two to three herder families were chosen from the sampling *soums*. A total of 362 households were included in the survey; 72 were herder households, 40 were vegetable growing households, 137 were households living in the *ger* district, 109 were households living in apartments, and 4 were small farming households in the suburban city. The questionnaire asked for general information on each household, income sources, household and satisfaction with government measures against Covid-19, main challenges before and during Covid-19, risks, and market-related information.

Methodology:

1. Principle Component Analysis (PCA)

A Principle Components Analysis (PCA) is utilised to get insight into the survey respondents' perceptions of their answers. PCA minimises the number of correlated variables to a few factors that best explain the variation in the variables. The PCA process begins with the correlation matrices between all variables to determine whether there are correlations. Furthermore, the determinant of the correlation matrix was tested to ensure multicollinearity/singularity. The data was extracted using the Principal Component Analysis technique, and the rotation method was Varimax with Kaiser Normalization. These elements can be viewed as the underlying perceptions that led to the responses to our survey questions. KMO, Barlett's test of Sphericity, anti-image choices, and general PCA approaches are used for studies (Andy, 2013).

2. Multiple linear regression analyses

²Traditional Mongolian house district in the capital city

Multiple regression analyses the relationship between income and other explanatory variables. The regression variables have been selected after running the PCA explained briefly in the previous section. Therefore, stepwise multiple regression is used to determine the smallest number of predictors needed, which significantly contribute to explaining the maximum amount of variance in the criterion variable, what these independent variables are, and how much of the variance of the criterion variable they explain. It is helpful to use multiple regression since we have many predictor variables and want a quick impression of which explains most of the variance in the criterion variable (Howitt et al., 2011).

3. Model setting:

For analysing the association between income change and independent variables, the following model is estimated:

$$Y_i = \text{constant} + \beta_1 P_i + \beta_2 H_i + \beta_3 V_i + e_i \quad (6)$$

Where: i = household type

Y – Income changes as a dependent variable

Independent variables are:

P – set of factors relating to respondents' perceptions of various government policies

H – set of variables to define respondents' experiences (age), education level and family size

V – set of variables showing the risk and vulnerability from Covid-19 impact

Data cleaning and aggregation were completed in MS Excel, and regression analysis was done using SPSS and Stata. Due to not reflecting the whole population, '4 small farmer households' are removed from the model.

3.4 SLF: Herder household's livelihood assets

The dissertation used a 350 herder households survey conducted in 2017. Descriptive statistical analysis explained the five types of assets owned by herder households. Before performing descriptive statistical analysis, assets were classified based on the literature review and scholarly articles. Among the Descriptive statistical analysis types, range, mean, and standard deviation are mainly used using SPSS-25 software.

3.5 SLF: Institutions and processes: Meat export promoting policy impact on herders' livelihood

Selected variables are based on scholarly articles, and values are converted to the logarithm to reduce wide-ranging quantities. The following regression model has been set to examine how the amount of meat export impacts the livelihood of herder households.

$$Y_t = \alpha + \beta X_t + \varepsilon_t, \text{ for } t = 1, \dots, 22 \quad (7)$$

Where:

- Y_t = Rural household income per month of year t ;
- X_t = set of independent variables in year t ;
 - ε_t = Error term with standard properties

A regression model was estimated using SPSS. Monthly rural household income is selected as a dependent variable. The urban household income, livestock product export, number of livestock, the export price of beef, the export price of horse meat, the export price of ovine goat meat and average domestic market meat price explain this variable.

3.6 SLF: Methodology for herder households livelihood strategy

Data. Primary data was obtained from a socio-economic survey of herder households in 2017. Out of 309 soums, 15 soums from 9 aimags were regrouped based on standard deviations in the number of livestock from herder households. The survey questionnaire consists of general information about household members and their housing conditions, as well as access to water and electricity, rangeland management practices, animal health and hay, fodder preparation, income and expenditure, loan saving and banking services, participation in elections, and information about challenges and risks.

Variable: Approximately 120 variables from 350 households survey were considered to select the appropriate indicators to represent the livelihood assets of herding households. The most appropriate variables are selected based on descriptive statistics and other relevant statistical tests.

Multiple equation models - Seemingly unrelated regression is selected to estimate the relationship between the household income of four clusters and evaluation indicators of five different assets. The model aims to investigate assets' effects on income and analyse herders' household livelihood strategies. SUR model could solve the identification problem that individual equations cannot be consistently estimated. Order and rank conditions are checked for consistency in estimating a system of simultaneous equations (Marno, 2008). The following system of simultaneous equations is estimated using the standard software Stata (Lee C. Adkins, 2011):

$$(1) y_1 = b_{12}y_2 + b_{13}y_3 + b_{14}y_4 + \sum b_{1j}x_{ij} + \varepsilon_{ij} \quad (8)$$

$$(2) y_2 = b_{21}y_1 + \sum b_{2j}x_{ij} + \varepsilon_{ij} \quad (9)$$

$$(3) y_3 = b_{32}y_2 + \sum b_{3j}x_{ij} + \varepsilon_{ij} \quad (10)$$

$$(4) y_4 = b_{41}y_1 + \sum b_{4j}x_{ij} + \varepsilon_{ij} \quad (11)$$

Here x_{ij} is the actual value of the livelihood assets indicator j of sample i .

Each equation has a single response variable $y_{1,2,3,4}$ and a k -dimensional vector of regressors x_{ij} . If we stack observations corresponding to every four equations into j -dimensional vectors and matrices, then the model can be written in vector form as:

$$\begin{pmatrix} y1 \\ y2 \\ y3 \\ y4 \end{pmatrix} = \begin{pmatrix} X1 & 0 & 0 & 0 \\ 0 & X2 & 0 & 0 \\ 0 & 0 & X3 & 0 \\ 0 & 0 & 0 & X4 \end{pmatrix} \begin{pmatrix} B1 \\ B2 \\ B3 \\ B4 \end{pmatrix} + \begin{pmatrix} \varepsilon1 \\ \varepsilon2 \\ \varepsilon3 \\ \varepsilon4 \end{pmatrix} = X\beta + \varepsilon. \quad (12)$$

3.7 SLF: Methodology for herder households livelihood outcomes and poverty: Financial literacy and pension planning

Variable: Ten variables were developed based on the association between financial behaviour, financial literacy, pension planning, and data availability.

The variable age is expected to be positive for the payment of social insurance fees. A researcher wanted to see how this coverage rate connected to herders' willingness to pay the social insurance fee in the model. We expected this variable to be positive. Respondents were asked how many times they had attended a regular *bag* meeting. *Bag* meetings investigate information and awareness for other herders, so herders with more motivation and knowledge are expected to pay more than herders with less information.

Five criteria were chosen to demonstrate herders' economic competence. The number of animals, total revenue, and savings are predicted to be positively related to the dependent variable, but total cost and loan are correlated to be negatively related. Since social insurance payments and credit are herders' cost items that compete with consumption costs; as a result, herders with higher expenses would put off paying voluntary social insurance. More than 80 percent of herder household income comes from livestock. In this regard, multicollinearity was discovered between the number of livestock and the overall revenue of the herder household. The variable- total income- was included in the model based on the test assessment.

Model setting: To analyse the herders' financial literacy, an expectation of the amount of old age pension, attitude readiness to pay voluntary social insurance and identify reasons, the researcher defined ten variables based on the relevant research. The following model is set to examine the relationship between the social insurance fee (amount) paid by each herder and a set of economic and social variables:

$$Y_i = f(A_i, B_i) + \varepsilon_i, \text{ for } i = 1, \dots, 350 \quad (13)$$

Where:

Y_i = Social insurance fee paid by a herder i voluntarily, continues variable, in money term;

- A_i = Set demographic and social variables of herder i ;
- B_i = Set of economic variables for herder i ;
- ε_i = Error term with standard properties

Computation is made using SPSS and typical econometric processes. (Andy, 2013; Marno, 2008)

4. RESEARCH FINDINGS

4.1 Agricultural sector's importance in the economic growth of Mongolia

Growth model – 1. The three steps explain the growth model Y1. The regression results of the first type of growth model (Y1-1 to Y1-3) are presented in Table 4.1.

Table 4.1. Mining and agricultural sectors contribution to economic growth (2000-2019)

	Variables	Y1-Annual economic growth rate		
		Y1-1	Y1-2	Y1-3
X ₁	Log GDP per capita	-0.014 (-1.65*)	-0.015 (-1.61*)	-0.005 (-0.576)
X ₂	ShareMINING	0.055 (1.88**)	0.057 (1.81*)	0.73 (2.49**)
X ₃	ShareAG	-0.061 (-0.85)	-0.072 (-0.81)	0.002 (0.022)
X ₄	Education		0.00 (-0.22)	0.00 (0.233)
X ₅	ShareNetTax			0.269 (2.088**)
Constant		0.057 (1.5*)	0.072 (0.943)	0.026 (-0.31)
R-squared		0.266	0.268	0.452
Adj R-squared		0.119	0.059	0.241
Durbin Watson		1.91	1.92	2.3

Note: *t*- statistics in parentheses;

*, ** indicates that significant at 10 and 5 percent levels, respectively.

Source: Author's estimation

The log GDP per capita coefficient interprets a conditional rate of convergence. This coefficient is statistically significant in two regression models, i.e. Y1-1 and Y1-2. The ShareMINING variable is positive and highly significant, indicating that Mongolia's economic growth depends on the mining sector's contribution. The variable ShareNetTax is highly significant and positively related to GDP growth. This result implies that an increase in tax income supports economic growth.

Growth model – 2 and 3

The second type of regression analysis excluded the contribution of the agriculture and mining sector in the GDP growth. Model Y2 estimated the exclusion of agriculture's share in GDP, and model Y3 ran without considering both agriculture and mining sectors' share in GDP growth.

Table 4.2. Regression of annual growth of GDP less the contribution of agriculture and mining sectors (2000-2019)

Variable	Y2	Y3
	(exclude agriculture in Y)	(exclude both sectors in Y)
Log GDP per capita	-0.012 (-1.185)	0.001 (0.081)
ShareAG	-0.044 (-0.457)	0.035 (0.311)
ShareMINING	0.071 (2.186**)	0.058 (1.51*)
Education	8.819 (0.128)	0.00 (0.16)
ShareNetTax	0.248 (1.74*)	0.389 (2.32**)
Constant	1.012 (11.1***)	0.941 (8.73***)
R-squared & Adj R-squared	0.45 & 0.239	0.367 & 0.124
Durbin Watson	2.36	2.19

Note: t- statistics in parentheses;

*, **, *** indicate that significance at 10, 5 and 1 percent levels, respectively.

Source: (Gombodorj & Pető, 2022a)

The estimation results are pretty similar to the results of the growth model Y1. ShareMINING and ShareNetTax are positive and remain highly significant. The subtraction of agriculture and mining sector contribution to the economic growth has not affected the mining sector's importance in economic growth. In sum, the contribution of mining to the current economy is much higher than that of agriculture.

4.2 SLF: Vulnerability context- Covid-19 impacts on livelihood

The descriptive statistics findings are shown in the following table.

Table 4.3 Basic characteristics of different households

Variables	Unit	Household types									
		Urban				Rural				Sub-urban	
		Apartment		Ger district		Herder		Vegetable grower		Small farmer	
		M	Sd	M	Sd	M	Sd	M	Sd	M	Sd
Age	Years	43	15	43	14	48	12	45	11	46	13
Male head respondents	percent	.55	.50	.48	.50	.69	.46	.53	.51	.75	.50
Education level	1-5	4.36	1.06	3.92	1.23	3.00	1.40	3.55	1.36	3.75	.50
Family Size	Person	3.60	1.19	4.00	1.62	4.42	1.65	3.95	1.67	5.00	.81

Income change	(Mln.M NT)	-1.9	8.5	-1.2	5.6	1.6	14.5	1.1	26.9	-2.4	2.7
Government measures importance	1-5 points	3.4	1.4	3.6	1.3	3.3	1.4	3.0	1.4	3.4	0.7
Interruption of main foodstuffs during Covid-19	1-5 points	3.5	0.8	3.3	0.9	3.7	0.7	3.6	0.7	3.7	0.3
Price changes	1-5 points	3.6	1.0	3.7	1.0	3.5	1.2	3.3	1.1	3.6	0.3
Valid (listwise)	N N	109		138		72		40		4	

Note: Mean (M) and Standard deviation (Sd)

Source: (Gombodorj & Petó, 2022b)

During the Covid-19 restriction, public services, including food and health services, were allowed to operate. Other types of business almost all completely or partially stopped, and income shocks happened in other developing countries (Kansiime et al., 2021). The income of households in the ger district and apartments was decreased while vegetable grower and herder households' income increased thanks to government measures against Covid-19.

Principal component analysis (PCA) results

The following Table 4.4 summarises the PCA findings that are statistically significant.

Table 4.4 Perception by household types, a principal component analysis result

Variables	Urban households						Rural households					
	Apartment			Ger district			Herders			Vegetable growers		
Components	1	2	3	1	2	3	1	2	3	1	2	3
Vulnerability assessment by extended code double-counted more than one person in a household.			.52		-			.60			-	
A number of measures need to take to cope Covid19			.88		.67			.53			.54	
Increased child money amount and covered all kids									-	.79		
Food vouchers for the poor	.80			.74			.72					.60
Increased social welfare benefits	.75			.68			.73			.68		
Free electricity and water		.60					.75			.72		
Deferred mortgage loans	.55			.77			.69			.78		
Soft loans for SMSs	.77			.81			.71				.55	
Tax and social insurance discounts	.64			.67			.80			.71		
Distributed 300 thousand MNT to each		.58			.58			-80				

1 mln MNT old age pensioners				.58		.51				.61					
Food Shortage				-.52		.60			.78		-.62				
Price increase				.64		.64			.50		-.66				
Before Covid 19, a number of problematic issues										.52					
During Covid, 19 Number of problematic issues				.83		.56		.64		.58	-.57				
Variance explained (percent)	22	21	18	27	23	28	23	18	25	24	22				
KMO Measure of Sampling Adequacy				.628				.723				.673			.550
Bartlett's Test of Sphericity (Sig.)				0.000				0.000				0.000			0.000
Number of observations				109				138				72			40

Source: (Gombodorj & Petó, 2022b)

Variables of *component 1* are specified and significant for all four types of households. This component did not include any other factors. Component 1 would only address government actions: food vouchers for vulnerable households, the increased monthly amount of social welfare benefits for a disabled person, government subsidy for free electricity and water for all citizens and businesses, deferred mortgage loans, a soft loan package for SMSs and tax and social insurance discounts. *Component 2* addresses respondents' perceptions of the obstacles posed by Covid-19 problems and challenges. It included cash transfers, food shortages and price increases. *Component 3* discusses the risk and vulnerability of Covid-19. This categorisation includes variables about fast vulnerability assessment, food scarcity, and price increase. The variables in components 2 and 3 are not specified as component 1. As a result, the subsequent regression analyses are based on component 1 and include identified variables from components 2 and 3.

Covid-19 impacts on livelihood: Multiple regression model results

Table 4.5 The impact of COVID-19 on the different types of households presents the multiple regression model results of calculating the factors that affected the household income changes due to the impact of Covid-19 for each of the four types of households, where Income Changes are the dependent variable.

Table 4.5 The impact of COVID-19 on the different types of households

Variables	Urban households		Rural households	
	Apartment	Ger district	Herder	Vegetable growing
(Constant)	28.9 (3.22***)	20.8 (3.31***)	24.2 -1.44	-66.9 (-2.9***)
Family Size	0.156 (1.6*)	0.324 (3.59***)	0.073 -0.51	0.212 -1.2

Covid impact (Y=1 otherwise 0)	-0.176	-0.206	-0.172	0.027
	(-1.73*)	(-2.41***)	(-1.44)	-0.18
Age	-0.253	-0.001	-0.169	0.55
	(-2.45**)	-0.012	(-1.27)	(2.58***)
Profession_V	0.24	-0.042	-0.043	0.192
	(2.51**)	(-0.49)	(-0.36)	-1.2
Increase in the amount of child allowance	-0.137	-0.111	-0.062	0.109
	(-1.19)	(-1.17)	(-0.42)	-0.58
Food vouchers for poor	-0.001	-0.142	-0.049	0.652
	(-0.005)	(-1.37)	(-0.32)	(3.2***)
Deferred loan repayment	-0.119	0.153	-0.255	0.154
	(-1.04)	-1.09	(-1.75*)	-0.8
Soft loans for entities	0.265	-0.005	0.073	0.093
	(2.06**)	(-0.04)	-0.44	-0.43
Tax and social insurance waive/exemption	0.084	0.033	0.347	-0.105
	-0.79	-0.28	(2.04**)	(-0.51)
Cash transfer of 300 thousand MNT to each	-0.046	-0.185	-0.027	0.055
	(-0.45)	(-2.03**)	(-0.22)	-0.36
1 million MNT to the retired people	-0.146	0.078	193	0.362
	(-1.31)	-0.82	-1.45	(1.62*)
R	49.4	43.4	49.1	65.9
Adj. R Sqr.	15.8	11.8	10.2	21.3

Notes: *, **, *** indicate significance at 10 percent, 5 percent, and 1 percent levels, respectively.

Source: (Gombodorj & Petó, 2022b)

The number of family members positively relates to apartment and ger district household income. More family members get more cash transfers from the government. Covid19 negatively impacted the income change of the apartment and ger district. To Dudek & Śpiwak (2022), Covid-19 had a lower impact on non-labour-intensive agriculture like Mongolian pastoralism. A border closure impacted herder households' livelihoods on two sides negatively and positively; meat export decreased, and domestic meat prices increased. Horse meat and beef sales were down. Sheep and goat sales slightly increased.

Luo et al. (2020) found that the income of poor rural households is highly dependent on non-farm income. However, for Mongolian herders, income diversification is low, and most of the income is earned only from livestock; thus, their income has not decreased.

The regression results show no statistically significant Covid-19 factors impact herder households. This is consistent with Du et al. (2020), who discovered that Covid-19 had no direct effect on family farms compared to other types of risks.

4.3 SLF: Institutions and processes: Meat export enhancing policy impacts on herders' livelihoods

Meat is the second-largest source of cash income for herder households. Special programs on meat export promotion have been implemented to increase export income, reduce overgrazing and poverty and increase herders' income, reduce poverty in rural since 2015. The policy paid off. Livestock numbers have been rising continuously, but meat exports have not kept up with the increase in livestock numbers.

The log-log regression model results, which estimated whether the meat export increase affected herder households' income, are presented in Table 4.6

Table 4.6 Key factors of the herder households' income

	Variables	Explanation	Coefficient	t Stat
Y	Dependent variable: Ir	Monthly income of herder household		
X ₁	Iu	Urban household income	0.6638***	3.8676
X ₂	ExportL	Livestock product export	-0.0662	-0.8388
X ₃	Livestock	Number of livestock	0.2037**	2.1225
X ₄	PxBeef	Export price beef	-0.4576**	-2.3866
X ₅	PxHorse	Export price Horse meat	0.0246	0.1444
X ₆	PxSheep Goat	Export price Sheep Goat meat	-0.1565**	-1.8964
X ₇	PDm	Average domestic market meat price	0.5578**	2.2970
	T	Time	0.0207*	1.6988
	Adj. R Sqr.	Adjusted R Square		0.928
	Obs.	Number of the observation year		22

Notes: *, **, and *** indicate 10 percent, 5 percent, and 1 percent significance levels, respectively.

Source: (Gombodorj & Tumur, 2020)

The income of herder households is highly dependent on the income of urban households. The amount of meat export shares has no notable effect on the herders' livelihood. Thus, meat export benefits the upper level of the value chain, such as logistics companies and meat processors. Domestic meat prices impact herder households' income positively. Domestic meat prices are the same (or higher) than export prices; logically, meat producers and exporting companies will have little interest in exports.

4.4 SLF: Livelihood strategies and livelihood assets

The income-based approach is used for classifying herders' livelihood strategies (LS) of the selected herding households in Mongolia. The following four clusters have been defined:

Cluster 1, (LS1)	Herder households that are reliant on the income from livestock-related products and activities solely
Cluster 2 (LS2)	Herder households that have primary income from wages (paid income)

Cluster 3 (LS3)	Herder households that are dependent on social welfare, pension, allowances and special care services
Cluster 4 (LS4)	Herder households rely on undermining natural resources and livestock income.

The result shows that 88.9 percent of the herder households' livelihood depends on livestock that belongs to Cluster 1. The other three clusters contribute 11.1 percent to herder households' income (Table 4.7).

Table 4.7 Basic characteristics of four livelihood strategies clusters

Variables	Livelihood strategies clusters			
	LS1 Livestock	LS2 Wage	LS3 Social Benefits	LS4 Natural Resource
Number of households	311	10	27	2
Households, (percent)	88.9	2.9	7.71	0.57
The average number of livestock per household	546	90	171	55
Annual income, mln MNT	10.9	6.3	5.7	0.8
Annual household income, thousand US\$ (ex. rate 2454, by 2017)	4.4	2.6	2.3	0.3
Livestock income share in total income (percent)	90.22	16.00	31.99	2.32
Wage income in total income (percent)	1.74	72.89	.24	0
Pension and state welfare income share in total income (percent)	6.66	3.62	63.55	8.54
Natural resource income share in total income (percent)	0.44	0.30	0.63	67.80
Other income source share in total income (percent)	0.94	7.19	3.59	21.34

Source: (Gombodorj & Gurjav, 2020))

Linkages of Livelihood capitals and livelihood strategy: SUR model results

The following results were gathered after running the SUR model methodology. The results indicate that the five different types of capital impact the four main herder household livelihood strategies that we abbreviated as **LS1-LS4**.

All four equations in the SUR model has interrelated, i.e. equation of **LS1** is explained by the other three dependent variables, namely **LS2**, **LS3** and **LS4**. Wage income and income from social benefits significantly positively influence livestock income; in other words, LS1 is supported by LS2 and LS4. The LS1 supports the LS2 and LS4, and LS3 is supported by the LS2 (Table 4.8).

Table 4.8 Relationship between livelihood strategies and livelihood assets

	Explanatory variables	LS1 Livestock	LS2 Wage	LS3 Social Benefits	LS4 Natural resources
Livelihood strategies L1-L4	Income Livestock (LS1)		0.1667*** (4.65)		0.0531** (1.89)
	Income Wage (LS2)	0.3010*** (4.09)		0.2356** (1.95)	
	Income Social Benefits (LS3)	0.2057*** (6.36)			
	Income Natural resources (LS4)	0.1397 (1.47)			
Natural Assets	Land	-0.07415 (-0.77)	-0.4118 (-0.51)	0.1253 (0.74)	-0.0348 (-0.54)
	Otor move	0.1558*** (5.6)	0.0093 (0.39)	0.0671* (1.38)	-0.0199 (-1.08)
	Pasture quality	0.0981*** (6.9)	0.0359*** (2.95)	0.1561* (6.24)	0.0309*** (3.26)
Physical Assets	Smart tools	0.0031 (0.15)	0.0419** (1.66)	-0.0465 (-0.91)	
	Home electric appliances	0.0279 (1.15)	0.0228 (0.78)	0.2838*** (4.79)	0.0343 (1.49)
	Livestock number	0.5113*** (17.1)	-0.0334 (-0.92)		
Human Assets	Human resource	0.0758* (1.47)	0.1144*** (2.69)		-0.0142 (-0.42)
	Education Index	0.0953*** (3.14)	0.0073 (0.29)	0.1099*** (2.09)	0.0353** (1.78)
	Health Insurance	0.0502** (1.8)	-0.0081 (-0.35)	0.0622 (1.29)	
Financial Assets	Social Insurance	0.2542*** (9.97)	0.0767*** (3.48)	0.2415*** (4.98)	0.0474*** (2.76)
	Loan	0.1012*** (1.45)	0.0264 (0.44)	0.0810 (0.61)	0.0111 (0.23)
	Savings	0.6996*** (8.55)	-0.235 (-0.33)	0.2873** (1.85)	
Social Assets	Political participation	0.0655*** (6.28)	0.0162** (1.67)	0.1195*** (6.05)	0.0139** (1.83)
	Participation in the local community	0.0433 (1.47)		0.0181 (0.32)	
	Gift exchange	0.5341*** (9.34)	0.0015 (0.03)	0.0616 (0.57)	
R-sq		0.4746	0.053	0.1997	0.0273
Chi2		368.932	19.636	89.2222	9.838
P		0.0000	0.0010	0.0000	0.0243

Note: Values within brackets are 'z' values.

* significant at 10 percent, ** significant at 5 percent, *** significant at 1 percent, respectively

Source: Author's estimation

In addition to the SUR analyses, the following figure compared the weighted average of the quality score of each asset for the respective livelihood strategies. Overall larger radar of

LS1 represents most of the herders who participated in the survey having this strategy as having primary income sources of livestock Figure 4.1

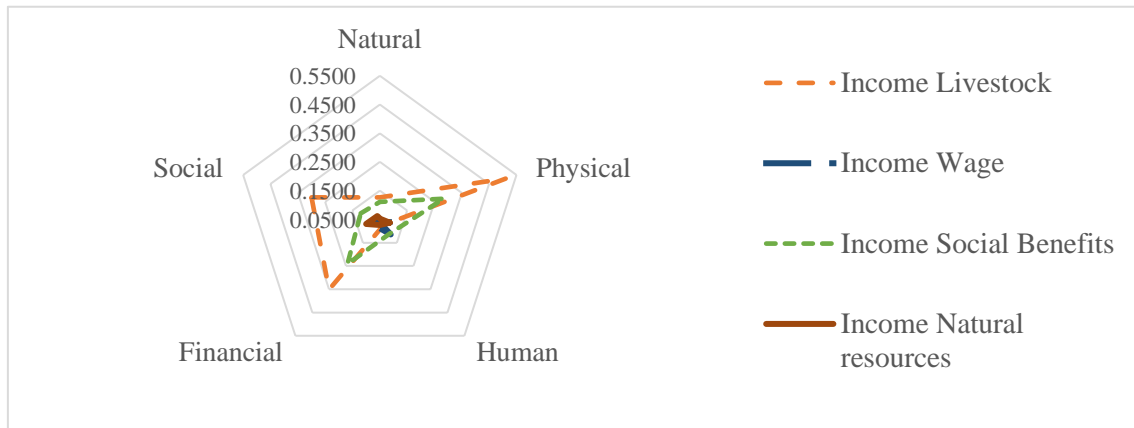


Figure 4.1. Comparison of an average weight of assets score.

Source: Author's compilation

4.5 SLF: Sustainable livelihood outcomes and poverty

A livelihood strategy's successes are referred to as a livelihood outcome. Income growth may help people feel better, develop resilience, improve food security, and use natural resources sustainably. All those contribute to reducing local poverty. According to the researcher on the poverty of rural households, increased income diversification is one of the ways out of poverty. However, income diversification is low in all clusters.

33.1 percent of survey respondents answered that they have non-livestock income sources, i.e. state pensions and benefits, wage, handicraft income, and natural resource digging (fruit picking, logging, dung picking, onion picking and precious stone picking). Non-livestock income accounts for more than 90 percent of the income of poor and low-income households, while it accounts for less than 1 percent of the total income of the wealthiest households. Regarding the composition of non-livestock income, pension income is the highest proportion.

Herder households' livelihood: comparison of livestock number and income per capita

A livestock number is a proxy indicator for herder households' wealth and poverty in Mongolia. The study used Worldbank's (2009) classification; full-time herder households with over 500 livestock numbers are wealthy; 200-500 are middle or lower-wealth households, and less than 200 are poor. Total herder households are classified into three groups. According to the international scholars' methodology, households' wealth and poverty are measured by Income Per Capita per day in US dollars. Therefore, the IPC indicator estimation was included.

Table 4.9 Herder households' livelihood: comparison of livestock number and income per capita (actual head, MNT per year)

Descriptive statistics	Poor		Middle		Wealthy	
	Livestock number	IPC	Livestock number	IPC	Livestock number	IPC
Mean	106	959136	358	1672345	1250	3436673
Median	104	959136	354	1376960	947	2418964
Std.Dev	56	724420	82	1490371	807	3606577
Range	188	2662500	294	12884250	4025	22523333
Minimum	11	120000	203	123750	502	145833
Maximum	199	2782500	497	13008000	4527	22669167
Count	57		109		184	
Percentage	16.3		31.1		52.6	

Source: Author's estimation

In our sample, 16.3 percent of all herders fall into the poor category. This percentage is two times lower than the official statistics. Half of the total interviewed herders (52.6) are wealthy. Therefore, it is appropriate to study *actual herder households* separately from households with livestock to calculate poverty.

Non-livestock income sources: Pension and welfare income contribution

As of 2021, 35.2 percent of 305 thousand herders participated in voluntary social insurance. Law Amendment for the Pension and Benefits Provided by the Social Insurance Fund (2017) gave herders a higher chance of benefiting from the old-age pension system than regular workers. However, herders' low financial literacy, herders could not catch up with all benefits. Therefore, the study aimed to analyse which factors relate to higher fee payers and getting more benefits. Table 4.10 represents the regression results examining the relationship between herders' social insurance payment amount and some economic and social indicators.

Table 4.10. Relationship between social insurance payment amount and economic and social variables

Variables	Unstandardised Coefficients		Standardised Coefficients	t statistics
	B	Std. Error	Beta	
<i>(Y: Payment of Social Insurance Fee)</i>				
<i>A_j: Demographic and social variables</i>				
Age			.258	2.604**
Education level	5.888	2.164	.372	2.721**
Social insurance coverage	34.542	7.835	.448	4.409**
Bag meeting	-.283	2.215	-.014	-.128
<i>By: Economic variables</i>				
Total revenue	.170	.204	.093	.837
Total cost	.483	.530	.099	.911

Loan amount		-18.018	9.466	-.209	-1.903*
Size of savings		-.442	.692	-.051	-.639
R Square					.499
F statistics (.000)					14.962

Notes: *and ** indicate significance at 5 percent and 1 percent, respectively.

Source:(Gombodorj et al., 2019)

In the estimation, we exclude already pensioned people. The average education level of respondents was secondary education, with 6-9 years of schooling. Hence, 42 percent of the herders have social insurance coverage, whereas 27 percent of participants paid the social insurance fee. The research result is similar to Raaij's (2016) study, concluding that people pay too much attention to their careers and family, therefore not paying concern to their life after retirement. A regression model result shows that older people are more concerned about pensions. Variable education was significant; thus, more educated herders were willing to pay more for their social insurance. People who have received previous opportunities for compensation paid their social insurance payments to have more understanding and desire to pay the social insurance fee. Household expenditure and loan has negative impacts. *Bag*³ The meeting was insignificant.

5. CONCLUSIONS AND RECOMMENDATIONS

H1: The number of livestock is critical in differentiating rural livelihood strategies among the herders' households. Hypothesis accepted.

The larger the number of animals, the higher the income, and LS relies on an on-farm activity. On the other hand, as the number of livestock decreases, the ability to have other sources of income and discover other opportunities is increasing. Herders' households having many animals brings negative aspects such as dependence on them, inability to use many other opportunities, and not providing subjective well-being. Therefore, one should consider the ideas of the researchers who say that one needs to review the old concept that if households have animals and big lands, they are rich. For example, living with many animals and living a nomadic life limits the possibility of obtaining the necessities of modern life. Bulky items can hinder herding households, which must move up to 30 times a year.

Social insurance participation also contributes to all households' livelihood, and the new law amendments give herders an even more crucial future income source. In this case, herders might not increase the number of livestock when they take the LS3 strategy.

The number of herding households with LS2 or wage and salary income livelihood strategy tends to increase. Due to the increased number of livestock, mining sites, business entities,

³Official meeting in the smallest administrative level of Mongolia.

and wealthier herders need to hire assistant herders. This has the effect of increasing households holding the LS2 strategy. Poor herders with a few livestock earn additional income from herding someone's livestock. In addition, herders benefit from milking cattle, sheep, and goats when they herd. This is one of the traditional in-kind support for poor people.

For herder households with the LS4 strategy, if the number of livestock increases and income sources varies, they might switch to LS 1, LS2, and LS3 or have a mixed strategy. Households that depend on hunting and natural resources are a unique strategy followed by a small number of households, such as hereditary hunters.

Previous studies have shown that migration is often chosen by households that have lost livestock due to natural disasters as an exit strategy. Therefore, LS 2 and LS 3 strategies are the most stable and work-life balancing strategies.

This study has shed light on the factors contributing to choosing LS1, LS2, LS3, and LS4 strategies. Future studies could examine the long-term viability of different livelihood strategies in changing economic, environmental, and social conditions. Moreover, a study has highlighted the potential benefits of social insurance participation for herders. Future studies could explore the extent to which these benefits materialise in practice and assess the impact of social insurance on herders' financial stability and overall well-being.

H2: Vulnerability factors are the driving factor for selecting household livelihood strategies. Any shocks are threatening their livelihood but at different rates and forms. Hypothesis Rejected.

Many studies proved that poor, rural farmers and nomadic herders are vulnerable to shocks, weather, and other risks. Many previous studies have concluded that due to the dzud disaster, nomadic herders' pastoralist families changed their livelihood strategies and moved to central settlements.

A new social and health shock, Covid-19, has impacted every livelihood worldwide. According to the results of a comparative study of households, which mainly included Vulnerable households, Mongolian rural households are more resistant to the Covid-19 shock than urban households. Herder households and vegetable farmer households are rural households. Rural households were largely self-sufficient in food, making them less vulnerable to shocks. During Covid-19, the demand for goods and services other than food and consumer goods fell sharply, and people became more important than having enough food and being healthy. At this time, households that prepare most of their food from their farms have reduced the need to spend on other types of expenses. As a result, despite Covid-19, herders did not need to alter their livelihood strategies. Therefore, the hypothesis is rejected.

The study has limitations as follows. This study aimed to detect the impact of Covid-19, so other vulnerability factors were omitted. Because the impact of adverse natural and climatic factors, the most significant factor in changing herders' livelihood strategies, happened very few in recent years, a limited number of questions related to natural disasters were included in the questionnaire. Moreover, the sampling of households was small due to the lockdown and the pandemic. Since the study was conducted when the disease outbreak in Mongolia was at its peak, only short-term results are reflected, and further follow-up studies should be conducted to assess the long-term effects.

Additionally, future studies could focus on identifying the factors that enable rural households to maintain their resilience over time and how these can be supported by policies that address rural development and livelihood diversification. Furthermore, future research could examine the long-term effects of Covid-19 on rural livelihoods and explore whether there are any changes in the resilience of rural households due to the pandemic over time. Ultimately, these studies would contribute to understanding how rural communities can be supported in the face of shocks and vulnerabilities.

H3: Poor herder households have few income sources and limited access to assets, market, supply chain and innovation services. *Hypothesis partially rejected.*

This research is contrary to many international studies that show that wealthy rural households have multiple sources of income. The study result shows that poor and middle-income households have more sources of income than wealthy herders. This is the main distinctive characteristic of nomadic herders.

Regardless of income, they live in a ger suitable for moving and use simple necessities. If we look at the list of physical capital, there is no significant difference between poor, middle and wealthy households except for the number of animals. However, they are distinguished by other types of assets.

Suppose the herders export a large amount of meat and, consequently, the number of livestock is decreased. In that case, human resources and other types of assets are freed, and poor and middle-income herders can access the market more quickly, attend any training, and receive helpful information. They might get smart tools to simplify and facilitate their lives and work.

A tradition that relatives and friends help each other, including poor herders, is called kinship support. This prevents them from falling into extreme poverty, so poor herders do not face extreme difficulties with basic physiological needs such as food and shelter.

The poor herders are not playing a part in the supply chain; thus, their livestock is mainly for the subsistence resources of their livelihood. In other words, they have too little share and power in the market. However, currently supporting collective action models could bring them into the part of the supply chain through any form of herders organization on the market.

For the more significant number of livestock, there is a persistent general tendency toward higher income per capita. However, some households are in the "poor" category concerning livestock numbers, but their income per capita is higher than the mean of households in the "middle" category. Therefore, if the income per capita is considered when calculating poverty, the official level of rural poverty might decrease slightly. It takes time to apply the income-based poverty approach to herder households. Reasons include no regular record of the things used for free from their farm, additional income not recorded, such as working as an assistant herder, and some types of income being in physical form.

The research concluded that the number of poor herder households is lower than rural poverty defined by the official statistical office. The reason might be that all rural households' mixture of herder households and households with livestock determines the national rural poverty in statistics. In official statistic info, households classification by the number of animals is only grouped by households with livestock. Therefore, it is challenging to distinguish herder households from rural households in the current publicly based on an available statistical database. Therefore, it should separate those households when considering herders' poverty issues.

Some legal acts and frameworks related to the herders' and herders' household status were developed relatively recently, and detailed statistical data on herder households emerged much later. A new category was added to the Social Insurance Law: "herder insured" in 2005; "the assistant herders" was amended to the Labor Law Mongolia in 2020, and the agricultural census conducted once every three years makes it challenging to study herders' livelihood in chronological order.

Future research can examine how much kinship support networks contribute to reducing extreme poverty among herders. This will help develop strategies to strengthen social safety nets and enhance community resilience. Moreover, research can be conducted to develop an

income-based poverty calculation approach for herder households that accurately captures their unique income sources.

H4: The impact of government policies positively and sustainably promote rural development and anti-poverty. Hypothesis partially accepted.

This dissertation analyses the impact of two policies implemented by the government of Mongolia to support household livelihood. The Government policies implemented during Covid-19 had a positive and direct impact on the household's livelihood, while the policies to promote meat export have not impacted the herders' livelihood.

The study result confirmed that the Government of Mongolia implemented several programs to promote the national economy and support the citizens' livelihood during the Covid pandemic, which was particularly important in overcoming the mental and health crisis. The people benefited from these programs and were grateful.

In addition to the Government of Mongolia's inclusive program, it paid particular attention to herders and implemented a cash transfer program to ensure their income did not decrease. In 2019, when cashmere prices fell due to the closure of the Chinese border, Government subsidies were given to herders based on the number of goats, which directly affected herder households' income. Also, other cash transfer policies to all citizens paid off, and herders' cash income slightly increased compared to the previous year. The impact of government policies positively and sustainably promote rural development and anti-poverty.

Another Government policy aims to increase meat export. The meat export promoting policy's main goal was to diversify non-mining export income, reduce the issue of overgrazing and pasture degradation, create jobs, and increase the herder households' income. The study showed that government policy implemented successfully until 2019 had not impacted herders' income. The reason might be that herders are meat producers and not exporters. Agricultural producers benefit from participation at the beginning of the value chain. Although agricultural producers participate at the beginning of the value chain, they receive low benefits.

However, when examining other factors influencing the income of herder households, the changes in urban household income and the price of meat in the domestic market rather than export were the most influential. Mongolians have a high meat consumption; thus, the domestic market meat price is high. In the current situation, where the price of meat for export and the domestic market is almost the same, producers have little incentive to export meat without adding value. Also, getting an official permit for meat export is complex; very few meat processing factories have passed the requirement and gotten a license. Export meat processing is a risky business when outbreaks of animal diseases continue. Therefore, due

to the unstable market of meat exports, meat processing companies do not enter into stable supply contracts with herders or herder cooperatives.

The main conclusion is that the government should encourage herders to participate in the meat export value chain through rural cooperatives or other arrangements to bring more benefits from the meat export to herder households' livelihoods.

The study has limitations. Not all government policies are studied. Future research should examine the effectiveness of different government programs to enhance the living conditions of herders and create equitable and sustainable economic growth.

H5: The growth of the mining sector, which is essential for the Mongolian economy, harms the development of the agricultural sector. Hypothesis rejected.

Natural resources are a significant source of economic growth. However, the overuse of renewable and non-renewable resources resulted in biodiversity loss, environmental degradation, and other negative consequences. Nowadays, the issue of natural resource use is becoming more critical. The study focused on the natural resource user in two main sectors, mining and agriculture. It concluded that although both sectors are essential, the Mongolian economy highly depends on the mining sector. The mining sector does not harm the development of other sectors and does not affect the growth of the agricultural sector. The study results prove Mongolia's economic growth is positive and highly dependent on the mining sector. Likewise, the net tax share in GDP is highly significant and positively related to GDP per capita growth. The result implies that an increase in tax income promotes economic growth, which explains the relatively high Government tax on a portion of natural resource income and extraction. The log GDP per capita coefficient interprets a conditional rate of convergence. Thus, the resource endowment of Mongolia is not supporting reducing poverty. Therefore, since mining resources are depleting, their benefits should be used to support the development of renewable sectors, namely agriculture. Mongolia has vast pasture land, and the manufacturing sector lies on renewable resources. Mongolia is known for its organic meat and pasture-fed animal and as a high-quality cashmere supplier to the world market. Based on these advantages, there is an excellent opportunity to use the capital from mining and mining restoration for agricultural purposes.

The study has limitations. The study's main limitation was a lack of reliable data. As a result, the follow-up investigation could also consider gathering more data from various sources, including primary and secondary sources. Similarly, the regression model needs to be expanded to include additional experimental and control variables with significant panel data.

6. MAIN CONCLUSIONS AND NEW FINDINGS OF THE DISSERTATION

The research contributes to the literature by examining the current Mongolian herder households' livelihood strategies and possible interventions to cope and recover from stresses and shocks and help maintain or enhance their capabilities and assets now and in the future. The research objective was to identify Mongolian herder households' livelihood strategies and assess factors that impact their choice and livelihood outcomes related to wealth and poverty.

The main conclusions from the research are as follows:

1. The research proved that having multiple sources of income *does not offer* a wealthy lifestyle for the nomadic households and allows them to earn a high income. However, it is the most appropriate life strategy for sustainability, allows them to be less vulnerable to natural disasters and shocks, and helps secure a work-life balance.
2. Based on my research, I verified that animal number is crucial to differentiate between herders' livelihoods. Five types of different assets have different effects on livelihood strategy choices. About 90 percent of herder households belong to the cluster LS1-livestock dependent. Thus, the number of animals is significant when choosing the LS1 strategy. Meanwhile, social welfare was significant to four livelihood strategies.
3. The study result proves that, due to herders' lack of financial literacy, they lose the opportunity to earn non-livestock income.
4. Pastoral households are vulnerable to many shocks and risks, but they are sometimes the least vulnerable type of lifestyle to some shocks, such as Covid-19.
5. Using the results of my investigation, I confirmed that using the number of animal heads to measure the livelihood of herder households ignores the other incomes of herder households and contributes to the high poverty level. We must consider using other methods to measure the livelihood of herder households, such as income per capita and subjective well-being.
6. During the research, it has been confirmed that livestock household statistics are reported together with rural livestock households, which hinders the generalisation of research and the development of poverty reduction policies aimed at livestock herders.
7. The research has shown that although the government is continuously working to support the livelihood of herders and to reduce poverty, all policies and programs are not sufficiently achieving their all goals.

The following number of points explain this research work's new findings and practical importance:

1. The PhD research verified that a comprehensive study of the livelihood of Mongolian

nomadic herders using the SLF had added a new case to international rural livelihood studies.

2. Mongolian herder household's livelihood strategies are classified into four clusters using the income-based cluster analysis. The type of clusters based on more important income types are: Income Livestock (LS1), Income Wage (LS2) Income Social Benefits (LS3), Income Natural resources (LS4). Based on the results of examining relationship between livelihood strategies, livelihood assets and poverty issues this study proves that the characteristics of Mongolian nomadic livestock farming are different from the general findings of rural research in other countries.
3. The possibility of increasing non-livestock income by raising pension insurance coverage and benefits has been investigated for the first time. Improving herders' financial literacy could impact participation in social insurance coverage and increase the amount of fees paid. In this way, herders can benefit from the new law changes and increase cash income without increasing their number of animals.
4. Assistant herders and those with wage income are classified into cluster 2 livelihood strategies. This type of income is ranked after social welfare income among non-livestock incomes, and the trend is likely to increase further. It is a source of income for families with few animals and younger herder households.
5. One of the policies implemented by the Mongolian government to reduce the poverty of herders and rural areas was the meat export promoting policy. The study results showed that the policy did not affect the income of herder households. The income of livestock farmers depends on the domestic market, not meat export.
6. Pastoral herder households are vulnerable to many shocks and risks, but they are sometimes the least vulnerable type of lifestyle to some shocks, such as Covid-19. The study proved that the Covid-19 shock less impacted Mongolian rural households than urban households. They were more resistant because they lived in remote areas, were non-labour intensive, and were family farmers.
7. According to the study result, it is proven that the contribution of mining to the current economy is much higher than that of the agriculture sector. However, mining is a non-renewable resource, and agriculture is a renewable resource. Thus, investing appropriately in the renewable resource sector, which will bring long-term sustainable development, is crucial.
8. According to international rural studies, households that depend on natural resources and herders should be the poorest, and households with a combination of strategies should be the richest. However, this was not proven in our study. This study proves that the characteristics of Mongolian nomadic livestock farming are different from the general findings of rural research in other countries.
9. Using the results of my investigation, I confirmed that using the number of animal heads to measure the livelihood of herder households ignores the other incomes of herder households and contributes to the high poverty level. We must consider using other methods to measure the livelihood of herder households, such as income per capita and subjective well-being.

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Registry number: DEENK/107/2023.PL
Subject: PhD Publication List

Candidate: Gombodorj Ganchimeg
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MTMT ID: 10067573

List of publications related to the dissertation

Articles, studies (5)

1. **Ganchimeg, G.:** Exploring livelihood strategies of herder households in Mongolia: income-based approach.
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Total IF of journals (all publications): 3,889

Total IF of journals (publications related to the dissertation): 3,889

The Candidate's publication data submitted to the iDEa Tudóstér have been validated by DEENK on the basis of Web of Science, Scopus and Journal Citation Report (Impact Factor) databases.

12 April, 2023

