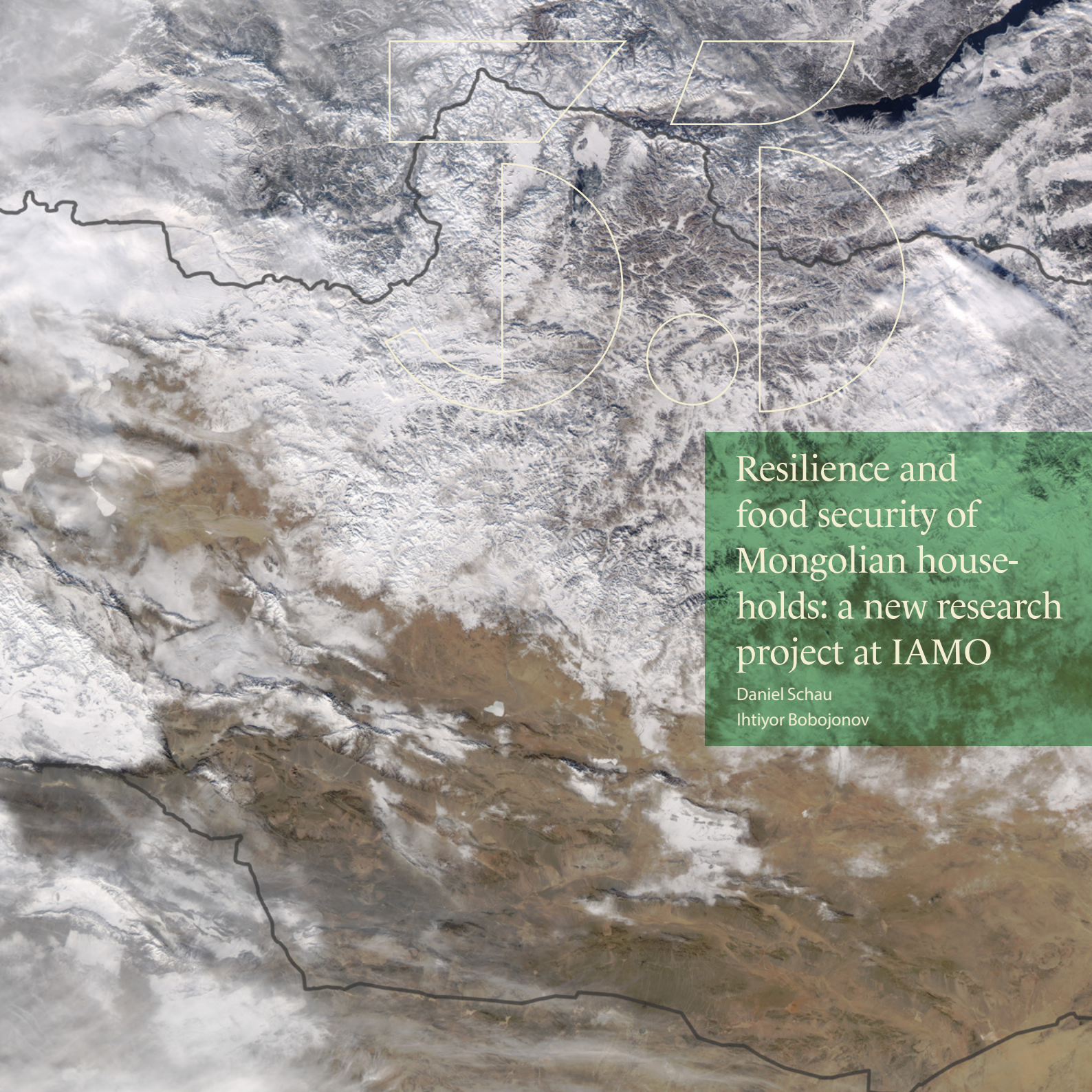

Resilience and food security of Mongolian households: a new research project at IAMO

Daniel Schau
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Introduction

With a total area of 1,566,600 square kilometres, Mongolia is more than four times the size of Germany. The country's agricultural land consists almost entirely of pasture with a limited share of cropland. Animal husbandry is an important sector of the Mongolian economy; its products are used for domestic consumption (meat and dairy products), as well as for the export of leather, sheepskins, cashmere, wool and other related processed products.

Under extreme weather conditions, Mongolian pastoral nomads have practiced extensive livestock farming for centuries. Devastating weather events such as harsh winters and summer droughts have been familiar to Mongolian pastoral nomads since time immemorial. But there are clear signs that the frequency and magnitude of these natural disasters are currently increasing due to global climate change. *'Dzud'* is the Mongolian term for an exceptionally harsh winter preceded by a summer drought (July–September) (RAO et al. 2015). In normal years, cattle build up the necessary weight, strength, and fat reserves in summer to survive the harsh winter and spring. However, under *dzud*, livestock must enter the winter already undernourished. The animals also fall victim to the extremely low temperatures because there is not enough hay available as winter fodder after a drought.

Additional to risks associated with a *dzud*, increasing frequency of droughts also pose a threat to livestock. Their negative impact on livelihoods increases the longer they last and the larger the area affected. Successful livestock production requires secure access to water and fodder in particular. The drying up of water sources and the decline in fodder resources have a major impact on extensive Mongolian livestock production, especially vital milk production, and ultimately on herders' livelihoods.

> Temperate pasture regions are some of the most endangered ecosystems on earth.

The interplay of climate degradation, land overuse, and unsustainable changes in the agricultural institutions that regulate grazing threaten Mongolia's pastoral economy. Of particular concern are the potential ecological impacts of changing grazing practices—especially the declining use of remote grazing reserves as pastoralists become less mobile (FERNÁNDEZ-GIMÉNEZ et al. 2018). There is evidence of a reduction in economic performance as a result of economic individualisation and fragmentation of cultural landscapes during the transformation of the economy.

Social resilience based on traditional pastoral communities tends to be lost. Traditional pastoral communities that have been sustainable for centuries have already eroded in the central part of Mongolia (CHULUUN et al. 2017). Environmental challenges, labour shortages, and a lack of government support threaten the future of mobile pastoralism in Mongolia. Younger pastoralists and those without enough livestock to sustain their livelihoods are increasingly migrating to urban centres to find other sources of income. There is already a preponderance

Because Mongolian herder families are having to give up their traditional nomadic way of life, tent cities are growing, especially on the edges of cities like Ulaanbaatar, Erdenet and Darkhan.

of older men and women and there is almost no future generation to continue herding practices. It should be noted here that the use of the terms 'herder' and 'herder household' is no longer completely accurate, as most households are pluriactive in how they earn their livelihoods (THRIFT 2015).

However, there are pastoralist households that despite dzud, pasture privatisation, degrading rangelands, and deteriorating water access, manage successfully and cope with shocks better than others. This raises the question of the reasons for their adaptability. There are survey-based studies that qualitatively examine the determinants of adaptive capacity (e.g. FERNÁNDEZ-GIMÉNEZ et al. 2018, FERNANDEZ-GIMENEZ et al. 2012, CHULUUN et al. 2017, THRIFT 2015). Findings from this research state, among other things, that households with a large livestock population recover faster from a disaster and that livestock mobility and storage of fodder and hay are the most important strategies to limit livestock losses. Knowledge sharing, access to information, linkage to social capital, and proactive herders' behaviour improve adaptive capacity. The main barriers to successful adaptation to weather shocks are low levels of mutual aid, knowledge deficits, and limited development and implementation of formal guidelines to regulate pasture use and management, as well as limited herder mobility. The increase in livestock numbers and limited mobility lead to overgrazing and degradation of pastures, especially near roads and villages. Mobile pastoralism, on the other hand, represents a highly resilient resource use strategy that involves continuous adaptation to environmental change and uncertainty through mobility patterns, diverse and extensive resource use,

and flexible social organisation (THRIFT 2015). This mobility is increasingly constrained by property rights over land and wild mining.

Conceptual framework

The ability to adapt has a decisive influence on the resilience of an economy. The fact that resilience to shocks is not a directly measurable variable makes it difficult to conduct quantitative research on resilience. However, households, firms, and countries are increasingly exposed to climatic, economic, and social risks. Resilience is therefore increasingly becoming a focus of scientific research. The concept of resilience is applied in various fields, such as ecology, psychology, and epidemiology, and increasingly in the social sciences and especially in the analysis of complex systems. This is particularly the case in developing countries, where agriculture, agroforestry, and fisheries are the livelihoods of many communities.

The use of the resilience concept in development research is relatively new and only recently has there been a comprehensive theoretical framework for defining and measuring resilience. One example is **the newly developed FAO Resilience Capacity Index (RCI)**, which is based in the first step on a factor analysis followed by structural equation modelling. Then probit models are estimated to test whether resilience has a positive impact on food security and improves the ability to recover from a shock.

The Resilience Measurement Technical Working Group (RM-TWG), an expert group established in 2013 by FAO, IFPRI, and WFP (World Food Program), agreed upon an internationally accepted definition of resilience as the ability of negative stressors and shocks not to have long-lasting negative consequences for development. Thus, resilience is an outcome-based concept with a statement on or measurement of poverty, food security, and other welfare indicators. Resilience needs to be analysed in relation to the experience of specific shocks and associated risks. Unlike similar concepts, such as vulnerability, resilience focuses on long-term impacts on the outcome variable. Resilience explicitly requires the actor's ability to adapt and transform to offset the negative effects of shocks and stressors. In the scope of this study, we use the resilience index for measuring the food security of Mongolian households after a shock (*dzud*).

The Resilience Capacity Index (RCI) pioneered by Ciani and Romano (2011) combines direct and indirect measures of resilience to predict the development of food security. The aim of our research project, which is still in its initial stages, is to obtain information on the resilience of Mongolian herder households and their expected levels of food security with particular focus on the FAO's Resilience Capacity Index (RCI) and by using the Resilience Index Measurement Analysis (RIMA) approach (2016). Our study is based on a survey carried out in Mongolia from 2012–13 to 2014–15.

Materials and methods

Data

Household-level data, collected through face-to-face interviews, form the basis of this study. The survey covers selected households in western Mongolia in the three *Aimags* (provinces) of Govi-Altai, Zavkhan (Dzavhan), and Uvs (see **Figure 1**). The survey was conducted by DIW Berlin together with NSOM (National Statistical Office of Mongolia) (KRAEHNERT et al. 2017). A sample of 1,768 house-

Figure 1: Study area with Aimags Uvs, Zavkhan, Govi-Altai; Mongolia

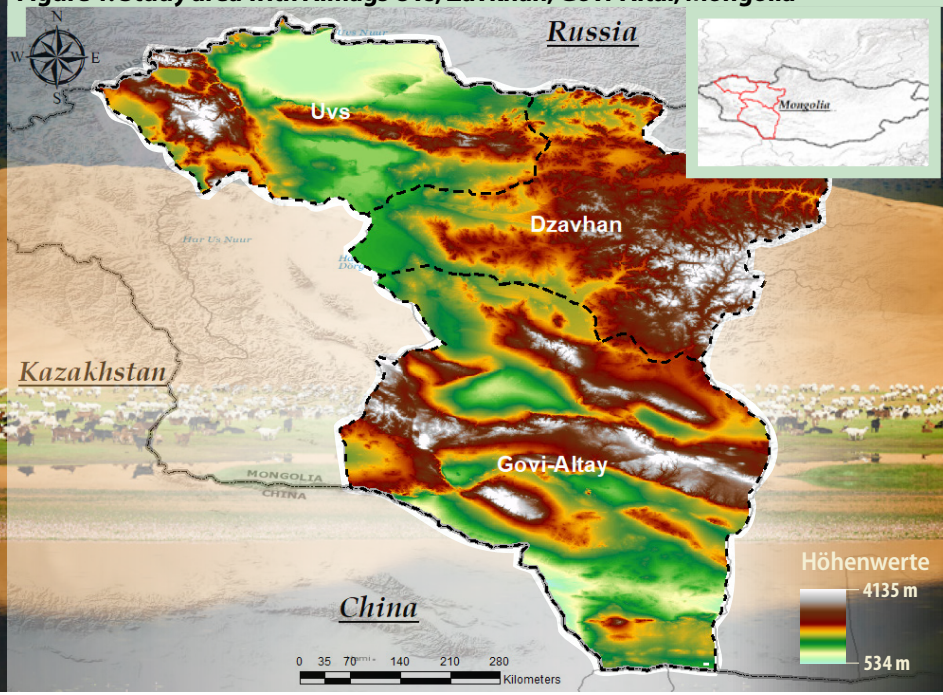


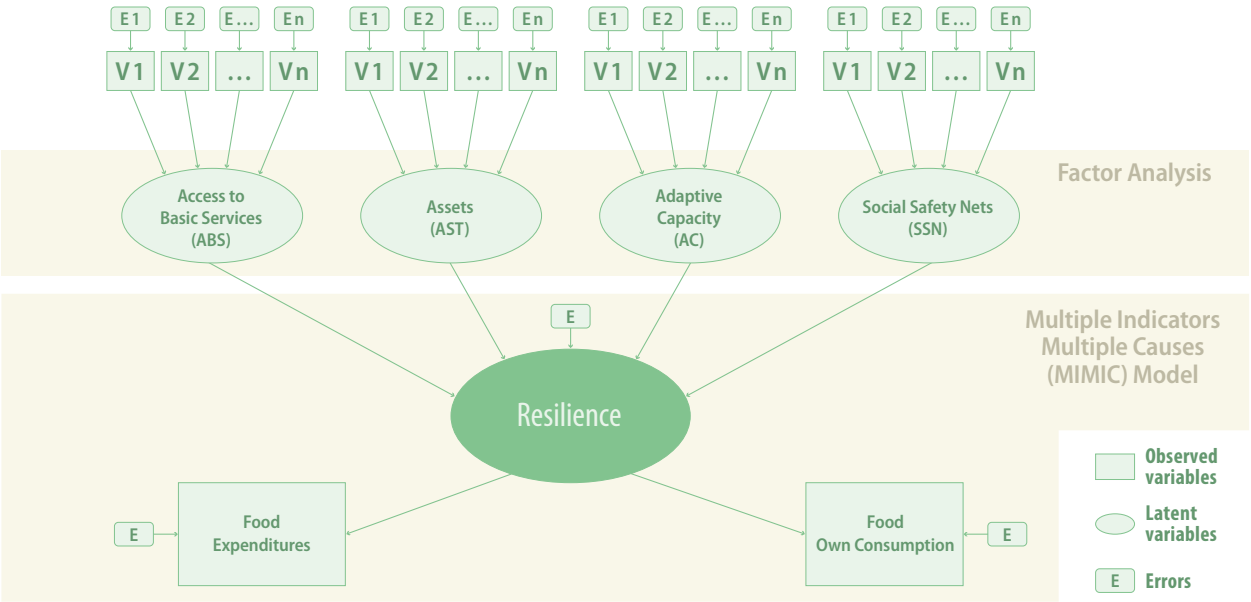
Table 1: The sample (number of household interviews)

Provinces (Aimags)	Provincial capital	County town (Soums)	Rural area	total
Zavkhan	288	64	240	**592**
Govi-Altai	288	80	216	**584**
Uvs	296	80	216	**592**
total	872	224	672	**1,768**

Table 2: Descriptive analysis of the model variables for resilience estimation

Variable	Obs.	Mean	Std. Dev.	Min	Max
Female HH	1,768	0.11877	0.32361	0	1
Age of HH Head	1,768	44.15328	13.09612	11	87
HH Size	1,768	4.07296	1.52132	0	11
Dependency Ratio (Children ≤ 14 years + Senior ≥ 65 years)/HHMember 15–64 years	1,768	0.60829	0.61239	0	4
Farming Activity	1,767	0.18506	0.38846	0	1
Herding Activity	1,768	0.41459	0.49279	0	1
Dzud XP 2009	1,768	0.54808	0.49782	0	1
Highest Certificate of HH Head Master=1 … Secondary=6 Basic=7 Primary=8 None=9	1,716	6.24767	1.88190	1	9
Total SFU SFU per type of animal is 5 SFU per camel, 7 SFU per horse, 6 SFU per cow or yak, and 0.9 SFU per goat	1,768	163.8	246.7	0	2484.4
Total Area of Land in ha	1,768	0.06468	0.44411	0	10

Figure 2: I) Creation of components (Access to Basic Services, Assets, Adaptive Capacity, Social Safety Nets) using factor analysis; II) MIMIC (SEM) modelling of resilience



holds were interviewed in western Mongolia. Interviews were conducted in provincial capitals (*Aimags*), district towns (*Soums*), and in rural areas (see **Table 1**). The survey lasted three years, from May 2012 to April 2015, and the data was collected in three waves. Each household has thus participated in surveys three times at intervals of exactly 12 months (KRAEHNERT et al. 2017).

Table 2 contains the descriptive analysis of the most important variables from the estimates. According to this, about 12 per cent of the household heads are women (Female HH). The average age of the household heads is 44 years old and a household consists of 4 members on average (Age of HH Head & HH Size). The dependency ratio is 0.6 or 60 per cent (the age-population ratio of those not in the labour force and those in the labour force). About 19 per cent of the households are engaged in arable farming with an average farmland of 0.06 hectares total area (Farming Activity) and 41 per cent are pastoralists (Herding Activity) with an average Sheep Forage Unit (SFU) of about 164 (Total SFU). Almost 55 per cent of the households experienced the 2009/2010 *dzud* (Dzud XP 2009).

Estimation of resilience

The two-step FAO-RIMA method was used to estimate the RCI (Resilience Capacity Index) at the household level (FAO 2016, **Figure 2**). In the first step, Factor Analysis was used to form components that explain to a very high degree the latent variable, resilience, which itself cannot be measured directly. These components can be summarised in four groups: Access to Basic Services (ABS), Assets (AST), Social Safety Nets (SSN), and Adaptive Capacity (AC). In our model, we additionally implemented the risk affinity of the household head, which potentially influences the household's adaptive capacity to shocks and thus individual resilience.

In the second step, a Multiple Indicators Multiple Causes (MIMIC) model was used. A MIMIC model explains the relationship between the components or observed variables and the latent variable (FAO 2016). We investigated the relationship between resilience and food security using a probit model. Food security, measured as food consumption, was extended in our study to include own-consumption of animal products.

Expected results

The expected results of this project, which was financed by The Volkswagen Foundation, are that certain factors contribute more to household resilience than others. In particular, Access to Basic Services is likely to play a prominent role. The demographic dependency ratio and education are also likely to be important determinants of Mongolian household resilience. Moreover, following the literature, diversity of income sources and herd composition are likely to promote resilience (e.g. CHULUUN et al. 2017, THRIFT 2015, FERNANDEZ-GIMENEZ et al. 2012). The same is true for social safety nets. Moreover, strong household resilience is expected to reduce the loss of food security after a shock and accelerate recovery after a shock.

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Sources and credits

Title Blanket of snow over Mongolia. Satellite image from 9 January 2017. National border is marked. © NASA image by Jeff Schmaltz, using MODIS data from LANCE/EOSDIS Rapid Response

▶ In 2017, the year the data was collected, people in Mongolia had to battle an unusually cold and snowy winter for the second year in succession. The dimensions of such a dzud are shown by figures from 2009–10: then, 80 per cent of Mongolia was covered in knee-high snow. In Uvs aimag the extreme cold, which fell to –47 °C at night, lasted almost 50 days. It is estimated that 4.5 million animals (around 10 per cent of the total livestock) died. (Sources: image description and Wikipedia)

p. 37/43 Tent city on the edge of Ulaanbaatar, September 2018 © Taylor Weidman

Fig. 1 Study area with Aimags Uvs, Zavkhan, Govi-Altai. Map © Shovkat Khodajev. Image in collage:

p. 39 Sheep and horse herd at Khar Nuur lake, Aimag Zavkhan, Mongolia © Tuul and Bruno Morandi/Alamy Stock Photo

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