Mongolia Livestock and Agricultural Marketing Project (LAMP)

Baseline Household Survey Report

December 2013

Development Impact Evaluation (DIME) & Global Agriculture & Food Security Program (GAFSP)

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Acronyms and Abbreviations

DIME	Development Impact Evaluation Initiative
FANTA	Food and Nutrition Technical Assistance Project
FAO	Food and Agriculture Organization
GAFSP	Global and Agriculture Food Security Program
HHS	Household Hunger Scale
LAMP	Livestock and Agricultural Marketing Project
MAHFP	Months of Adequate Household Food Provisioning
MIA	Ministry of Industry and Agriculture
MNT	Mongolian Tugrugs
NGO	Non-Governmental Organization
USAID	United States Agency for International Development
WDDS	Women's Dietary Diversity Score

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Executive summary

--The World Bank's Development Impact Evaluation team (DIME) is conducting a rigorous impact evaluation of Mongolia's Livestock and Agricultural Marketing Project (LAMP). Out of a pool of 30 eligible districts, 15 were randomly selected to be part of the LAMP project and 15 served as controls. This report presents the results of the initial stage of the impact evaluation, the Baseline Household Survey. Members of 1,800 herder households spread across the 30 study districts were interviewed in the late spring and early summer of 2013. Herders were asked about their household livestock operations, group and cooperative membership, access to extension services, assets, income, expenditures, and more. Weights of small animals were also collected for a subset of the households.

The baseline data provides insights into key indicators for the two main components of LAMP. The Value Chain Development component focuses on increasing herder income by connecting herders to livestock processors, allowing them to increase commercialization of livestock products. The Livestock Productivity and Quality component seeks to improve animal health in order to improve their productivity. The baseline also provides key data on farmer groups and gender inequalities that will help assist the project with organization and targeting.

Key Findings:

Value Chains and Commercialization

-- Average herder household income in districts where the LAMP will be implemented is around 7.2 million MNT.[1] More than half of this comes from the household livestock operation.

--Many types of commercial transactions that the LAMP will attempt to increase the are currently uncommon. Sales of meat, milk and dairy products are rather rare, with under 26 percent of households having sold any of these types of goods over the course of 2012. The proportion of households who sold live animals to commercial organizations is higher at 42 percent, while the likelihoods of having sold wool or cashmere during 2012 are 75 and 87 percent, respectively. The share of marketed livestock output that is sold under contract with the buyer is less than 2 percent for all animal products except for wool. Only dairy and wool were sold to processor firms or other formal enterprises by more than 10 percent of households in 2012.

--The results of the survey suggest that herders concentrate on having larger herds of animals who receive fewer quality investments, rather than smaller herds consisting of animals that are better bred, fed and medically cared for. In particular, herds tend to consist of large numbers of small, more rugged species, and on average herd size increased over the course of 2012.

[1] The MNT/USD exchange rate in December, 2012—when herders would have collected a substantial proportion of their income—was about 1,390. This implies average annual income and expenditures of about $5,179 and $3,237, respectively.

Livestock Quality

-- Only 9 percent of all herders spent anything at all on breeding services in 2012; breeding bulls mostly came from either the household's own herd or from another herd within the household's sub-district.

--More than 40 percent of all herders did not cultivate any hay in 2012, and those households that did have access to hay fed less than half of their horses, sheep and goats.

--Reported brucellosis, rabies and anthrax vaccination rates rarely exceed 60 percent, and average amounts spent on other animal health treatments are quite low.

Project design and Targeting

--The LAMP's success will depend in large part on the vitality and activities of formal herder groups and cooperatives. Roughly 5 and 11 percent of all households reported containing members who belonged to groups or cooperatives having to do with livestock, respectively.

--The LAMP will also depend heavily on extension services to reach herders. While 46 percent of all households contained members who attended meetings held by local authorities at some point in 2012, the analogous number for meetings held by representatives from livestock output processing firms is only 3 percent.

--Households headed by females seem to frequently be disadvantaged relative to households headed by males. For example, incomes and expenditures, herd sizes, cooperative membership rates, and savings rates are considerably lower in female-headed households compared to their male-headed counterparts. However, it is to be noted that female-headed household livestock operations invest more per animal in many cases of health and nutrition activities; and members of female-headed households consume more of most food ingredients per capita.

--Households that own smaller herds are also frequently disadvantaged relative to households with larger herds. Income and expenditures, cooperative membership rates and access to extension services, and savings rates are all lower for smaller herd size households than for their larger herd size counterparts. But similarly to the case of female-headed households, smaller herd size households occasionally invest more per animal in livestock quality. This is true, for example, when it comes to vaccination rates for most species, other types of animal health treatments, quantities of hay produced and purchased per animal, and more. Thus, while female-headed and smaller herd size households are disadvantaged relative to other households in many ways, there is a substantial amount of evidence that they invest more in the quality of the animals they do have.

--The validity of DIME's impact evaluation of the LAMP rests on the assumption that households in comparison districts are similar on average to households in project districts. The baseline data allows us to test this assumption, and it is found to be valid for the great majority of variables considered.

1 Introduction

This report presents the main findings from a baseline survey for the impact evaluation of Mongolia's Livestock and Agricultural Marketing Project (LAMP), conducted between May and July 2013. After a brief introduction to the LAMP, the LAMP Impact Evaluation, and the baseline data collection exercise, the report provides descriptive statistics on the following topics: socioeconomic profile of the households, access to agricultural extension services, group and cooperative membership, the household livestock operation, crop cultivation, income and expenditures, food consumption and food security, brucellosis-related health behaviors, and household finances.

2 Background

2.1 Livestock and Agricultural Marketing Project

While Mongolian poverty levels have decreased since the period immediately following the collapse of the Soviet Union, they remain above 30%. Poverty is especially prevalent amongst the roughly 35% of Mongolians who depend on livestock herding for income. Herders typically individually sell unprocessed output to middle men, who do not offer differential pricing based on quality. Herders have little incentive to make investments into the quality of their herds, and the most common income maximizing strategy is based on increasing herd sizes. Consistent with this, the total number of animals in Mongolia increased from 26 million in 1996 to 43 million in 2010. However, larger herd sizes imply that livestock are highly vulnerable to severe wintertime climatic conditions known as *dzuds*.

Collective action problems, credit constraints, inadequate knowledge of market opportunities, and low quality of livestock output all work together to keep herders' incomes low. The Livestock and Agricultural Marketing Project (LAMP) aims to address these constraints simultaneously, via its two primary components:

1. **Component 1: Value Chain Development:** The objective of this component is to create productive partnerships between formalized herder groups and processors of animal products (meat, dairy and fiber). The project will then work with herder cooperatives to encourage the collection, handling, cleaning, sorting, packaging, and storage of livestock products. Improved market access for more valuable, processed output should provide incentives to invest in herd quality. This component will also support income diversification via a (relatively small) horticultural processing sub-component.

2. **Component 2: Livestock Productivity and Quality:** This component will complement the first by improving the productivity of the traditional species (sheep, goat, horse, cattle/yak and camel) through breeding, feeding and animal health sub-components. The breeding sub-component will increase the quality of livestock output by improving the genetic characteristics of Mongolian animals. This will be achieved through the introduction of higher quality animals for breeding and the formation of proper nucleus

herds[2]. The animal nutrition sub-component is intended to alleviate problems associated with the most important constraint in Mongolian livestock production, the lack of fodder. Specifically, investments will be made into forage plots, silvo-pastoral activities and micro-scale processing units. The animal health sub-component supports the development of export and increased domestic market opportunities through the strengthening of disease-free zones and veterinary services. In addition to the support and implementation of national-level anti-infectious disease programs, animal health will be addressed at the local level through veterinarian training and service upgrading.

The LAMP will be implemented in 15 districts evenly spread across 5 provinces. It is expected that 28,385 individuals in 8,110 herder households will directly benefit from the project.

2.2 Impact Evaluation of LAMP

The impact evaluation of the LAMP will identify the overall effect of the project on herder livelihoods and investments in animal quality. The effect of the project will be identified using the fact that implementation will take place in a set of 15 districts that were chosen randomly from an initial set of 30 eligible districts[3]. Data on a wide variety of intermediate outcomes, including cooperative membership status, a range of animal quality investment activities, and market-related behaviors will be used to document the contributions of different project activities to the overall effect.

The impact evaluation is led by the World Bank's Development Impact Evaluation Initiative (DIME), the World Bank's Mongolia Sustainable Development Unit (EASCS), and the LAMP project implementation unit. Data collection was done in collaboration with DIME's partner survey firm in Mongolia, MEC/MCDS.

3 Baseline Household Survey

3.1 Data Collection

The Baseline Household Survey used a multi-module questionnaire, which focused specifically on household livestock operations, group and cooperative membership, access to agricultural extension and food security. In addition, the questionnaire contains modules on housing, labor, education, health, assets, income and expenditures.

Fieldwork for the Household Survey started on May 18, 2013 and continued through July 9, 2013. There were 3 field teams, each including 5 enumerators and 1 supervisor. The survey was done electronically with the use of tablets, with the first entry of the data

[2] The great majority of any benefits associated with access to improved breeding resources are not expected to be realized for several years. This will likely mean in turn that these benefits will not be captured in the results of this impact evaluation.

[3] Before treatment district selection, the 30 study districts were grouped into 15 pairs based on agroclimatic zone and geographic location. One of these pairs was then chosen randomly to be a treatment district (for all pairs).

occurring in the field concurrent with data collection. Consistency checks and error reports were routinely run on this primary entry data to ensure high data quality. Following the conclusion of data collection, 6 data entry operators used audio recordings of interviews to conduct a secondary data entry. Primary and secondary entries were compared so that discrepancies could be corrected by examining interview recordings.

As with any household survey data set, small percentages of values were missing for a large number of questions (e.g., because respondents could not remember something or, more rarely, they would refuse to answer). We deal with these issues using multiple imputation. Multiple imputation begins with the generation of several[4] different predicted, non-missing values for each missing value using a substantial amount of information from the rest of the data set. Then statistics are calculated to take into account the differences within observations and across multiply imputed values. Except when otherwise noted, all statistics in this report are based on multiple imputation.

3.2 Sample

The Baseline Household Survey was conducted in all 15 project districts, plus a set of 15 control districts. The 30 study districts were each previously deemed eligible by Ministry of Industry and Agriculture (MIA) officials to be treated. The project intends to include all herder households in the treated districts in herder cooperatives, meaning that all herder households in treatment districts will potentially benefit from the LAMP. The study sample was therefore planned to consist of 60 households per study district, which were to be randomly selected from lists of all herder households (for each treatment and control study district). These lists of herder households that the intended sample households were chosen from came from the 2012 Livestock Census. In each of the 30 study districts, 100 households (60 sample households plus 40 replacements) were selected randomly from the complete list of herder households. When the survey teams arrived in each study district, they first met with local officials to try and learn which households were no longer present in the district and which remained there. The original sampling frame was found to be imperfect in that within the typical study district, there were several households that no longer resided in the district. These missing original sample households were replaced by randomly-selected households from the same sub-district. In cases where replacements from that same sub-district had already been exhausted, households from an adjacent sub-district were chosen to be replacements.

The final set of 1,800 interviewed households evenly spread across all 30 study districts ended up containing 75 households that have not owned any animals from December 2011[5] to Dec 2012. Therefore, the final sample that this report will be based on consists of 1,725 households[6]. Table 1 displays the distribution of sample households across study districts.

Table 1: Sample distribution across provinces and district

[4] In our case, 20 imputations were generated.

[5] The likelihood of not having had any animals is balanced across treatment and control districts. More specifically, conditional on matched district pair fixed effects, a district's treatment status is not a significant predictor of not having had any animals.

[6] These 1,725 households constitute the entire impact evaluation sample, and are more or less evenly split between treatment and control districts. The great majority of the results given in this report, however, will be for treatment district households only.

Numbers of HHs					
Arkhangai province	337	**Khuvsgul province**	346	**Govi-Altai province**	343
Bulgan district	55	Ikh-Uul district	61	Biger district	55
Chuluut district	57	Jargalant district	53	Chandmani district	58
Ikh-Tamir district	58	Shine-Ider district	56	Delger district	56
Khangai district	58	Tosontsengel district	59	Jargalant district	56
Tsakhir district	49	Tumurbulag district	57	Khaliun district	59
Undur-Ulaan district	60	Tunel district	60	Tugrug district	59
Bayankhongor province	352	**Zavkhan province**	347		
Baatsagaan district	60	Aldarkhaan district	60		
Bogd district	60	Durvoljin district	59		
Galuut district	59	Erdenekhairkhan district	56		
Jargalant district	56	Tsagaankhairkhan district	59		
Jinst district	58	Yaruu district	58		
Ulziit district	59	Zavkhanmandal district	55		

4 Validity of randomization

The impact evaluation will formally document the overall impact of the LAMP in the project districts, using as a comparison group the aforementioned set of similar, pre-identified districts that will not receive LAMP activities. The main identifying assumption underlying the impact evaluation is that the only difference between districts that receive LAMP interventions and those that do not is the project itself.

Selection of treatment and control districts ("soums" in Mongolia) was done randomly from matched pairs. These pairs were formed by matching pairs of districts with respect to agroclimatic zone and distance to the provincial center, and then one of each pair was randomly chosen to be a treatment district (for all 15 pairs). We use a linear regression to test the assumption that control districts and treatment districts do not systematically differ from each other. Future regression analyses will include dummies for each district pair in order to maximize statistical precision, so these are included in our balance tests. The specification we have used is as follows:

$$y_{idp} = \alpha + T_d * \beta + \sum_p D_p * \delta_p + \varepsilon_{idp}$$

Here y_{idp} refers to one of the many outcomes we consider in Table 2, for household i in district d and from district pair p. T_d is a dummy variable equal to 1 if district d is a treatment district (and equal to zero otherwise). Each of the D_p variables is a dummy variable corresponding to district pair p. Finally, standard errors are clustered at the district level.

The results of regressions conducted to test this assumption are displayed in Table 2. Data from the baseline survey shows that while control and treatment sites are indeed similar with respect to most observable characteristics, they are significantly different with respect to the household head's education, the total numbers of horses owned, the number of owned animals which are either sheep or goats (i.e., small animals) relative to other species, and finally the level of monthly household expenditure. It will therefore be important to closely examine the robustness of the final results to the inclusion of controls for household demographic characteristics and different aspects of the livestock operation.

Table 2: Balance between treatment and control households.

	Treatment mean	Treatment SD	Treatment N	Control mean	Control SD	Control N	Conditional difference in means	P-value
Female-headed HH	0.10	0.30	867	0.12	0.32	858	-0.14	0.26
Number of children aged 0-17	1.41	1.20	867	1.45	1.22	858	-0.04	0.31
HH head completed less than primary	0.16	0.37	867	0.17	0.37	858	0.00	0.92
HH head completed primary but not secondary	0.56	0.50	867	0.52	0.50	858	0.04	0.06
HH head completed secondary-plus	0.27	0.45	867	0.31	0.46	858	-0.04	0.04
Herd size								
Total number of all animals	223.77	217.18	867	212.26	216.42	858	12.30	0.31
Total number of camels	0.98	3.74	867	0.92	3.49	858	0.07	0.76
Total number of horses	8.63	12.41	867	10.19	13.96	858	-1.52	0.03
Total number of cattle	3.87	8.46	867	3.96	8.50	858	-0.04	0.95
Total number of yak	9.94	19.42	867	8.34	17.21	858	1.42	0.39
Total number of sheep	88.48	122.51	867	83.89	112.42	858	5.12	0.50
Total number of goats	109.61	111.19	867	101.89	109.33	858	8.06	0.15
Proportion of small animals to large	15.74	22.01	724	12.42	17.23	734	3.92	0.01
Income								
HH livestock operation income (MNT)	3,944,876	4,767,032	867	3,776,149	5,129,873	858	170,350	0.45
HH livestock operation costs (MNT)	854,600	1,410,474	867	833,878	1,434,027	858	22,321	0.70
HH livestock operation net income (MNT)	3,054,381	4,399,847	867	2,877,421	4,818,587	858	176,745	0.38
HH other income (MNT)	3,169,668	3,755,490	867	3,102,069	3,512,059	858	73,779	0.63
Total HH income (MNT)	7,156,057	5,768,146	867	6,876,853	6,143,127	858	286,842	0.27
Expenditure								
Monthly expenditure (MNT)	199,751	195,202	867	186,893	181,378	858	13,307	0.09
Yearly expenditure (MNT)	4,505,054	5,314,539	867	4,197,758	4,970,242	858	308,818	0.10
Food expenditure (MNT)	99,817	81,305	867	102,358	79,117	858	-2,340	0.44
Livestock operation								
HH members in group or cooperative	0.15	0.35	867	0.14	0.35	858	0.01	0.82
Amount spent on animal health (MNT)	40,373	62,007	867	37,645	57,863	858	2,810	0.44
Amount of hay given to animals (kgs)	1,050	1,828	867	1,042	1,775	858	18	0.88
Proportion of produced meat sold	0.07	0.18	839	0.08	0.20	829	-0.01	0.14
Proportion of produced milk sold	0.02	0.08	747	0.02	0.06	734	0.01	0.16
Proportion of produced wool sold	0.95	0.22	665	0.96	0.21	683	-0.01	0.67
Proportion of produced cashmere sold	1.00	0.08	755	1.00	0.09	760	0.00	0.93
Average small animal weights								
Average sheep weights (kgs)	52.64	4.52	440	53.03	4.43	453	-0.38	0.36
Average goat weights (kgs)	34.89	3.56	442	34.94	4.62	459	-0.06	0.88

Balance tests are based on linear regressions of outcomes on treatment indicators as well as a complete set of randomization pair dummies. Conditional differences in means are therefore equal to treatment district dummy coefficient estimates, and P-values correspond to tests that treatment district dummy coefficients equal zero.

Note: The remainder of the report refers to data from the treatment districts only.

5 Household profile

This section describes the socioeconomic status of study households and the physical characteristics of their dwellings. It should be kept in mind that the sample consists entirely of livestock-owning households. In the interest of being able to inform LAMP targeting activities, variables will commonly be analyzed separately for different subsets of

the sample. In particular, variable means will frequently be displayed by the gender of the household head and for each herd size quartile, as well as for the entire sample. The exact numbers of households in each of these groups is displayed in Table 3[7].

The numbers of households in the different herd size quartiles do not add up to the total number of households due to the fact that missing values for numbers of animals owned were based on multiply imputed data. This process naturally resulted in small numbers of households not properly fitting into a single herd size quartile, as they had differing quartiles for different imputations. Consequently, these 5 of households were dropped from consideration whenever descriptive statistics for the different herd size quartiles were calculated. Also, the herd size quartile variable cutoff values are constructed for households in treatment and control districts, as we feel these provide more accurate cut-offs. However, this results in the quartiles being slightly unbalanced for the treatment sample.

Table 3: Treatment sub-samples

	Numbers of HHs
Total sample	867
Female-headed HH	88
Male-headed HH	779
Herd size quartile 1	212
Herd size quartile 2	206
Herd size quartile 3	209
Herd size quartile 4	235

5.1 Household composition

The average household has just under 4 members, and about 32 percent of all sample households have at least one child under the age of 5.

The questionnaire contained questions on the household head's employment. Slightly less than 87 percent of heads worked in their own household's livestock operation at some point in the previous 12 months. Also, about 8 percent of heads worked in another household's livestock operation over the same time period, and 16 percent worked in some other occupation. The most common of these other occupations were, in order of frequency, education-related jobs, retail or service jobs, and finally casual/day labor.

Table 4 displays data on the ages of household heads, the share of household members who were ill in 2012, and the average number of days lost to illness (across all household members). It becomes clear that female-headed households are different from male-headed ones, and similarly, households that own small number of animals differ from those that own large numbers.

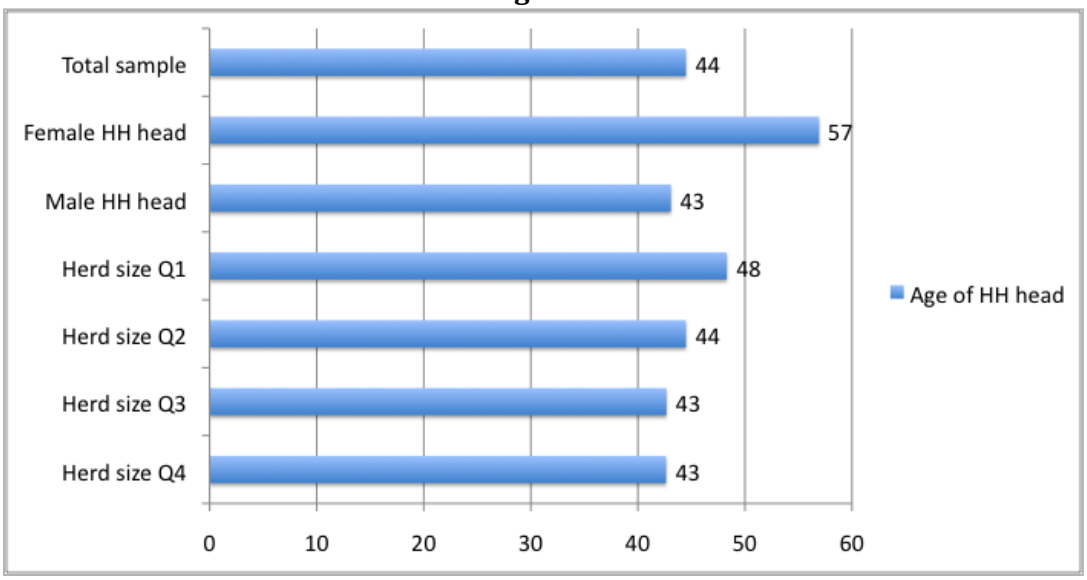
[7]

Table 4: Household member characteristics

		Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
Age of HH head	Mean	44.49	56.92	43.08	48.31	44.49	42.67	42.63
	SD	13.47	13.86	12.68	15.22	13.97	12.78	11.03
Share of HH members who were ill in 2012	Mean	0.12	0.17	0.11	0.16	0.12	0.10	0.09
	SD	0.22	0.31	0.21	0.28	0.24	0.18	0.18
Duration of HH members' illnesses (days)	Mean	5.59	6.30	5.51	6.41	5.86	5.61	4.58
	SD	18.89	22.50	18.46	20.92	20.35	17.22	17.04
Number of observations		867	88	779	212	206	209	235

The difference in average ages of between female and male heads is 14 years, with the analogous differences in average ages by herd size being smaller but still non-trivial.

Chart 1: Age of HH head



Also, as Charts 2 and 3 show, female-headed and smaller herd size households each contain greater proportions of members who were sick in 2012, and those members were sick for longer periods, as compared to their male-headed and larger herd size counterparts. Thus, gender of household heads and herd sizes provide important information on household members' living situations and well-being.

Chart 2: Share of HH members who were ill in 2012

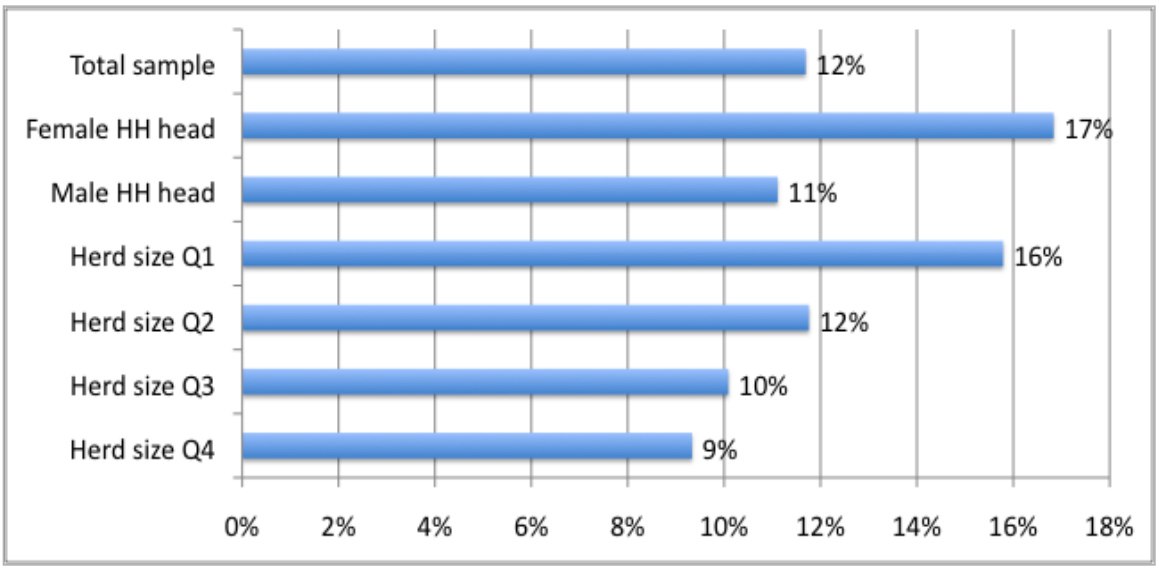
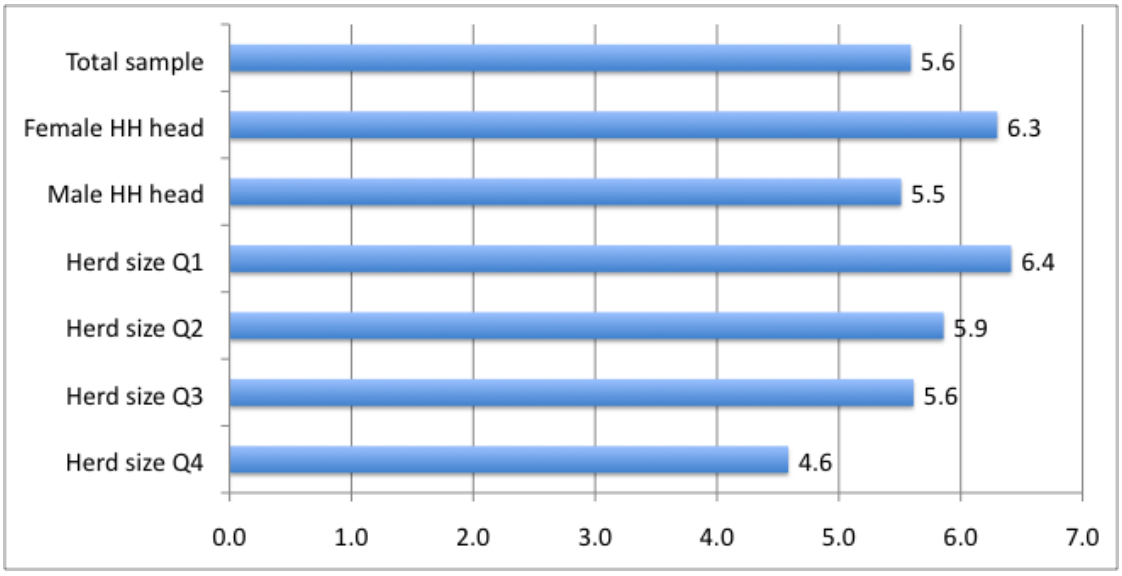
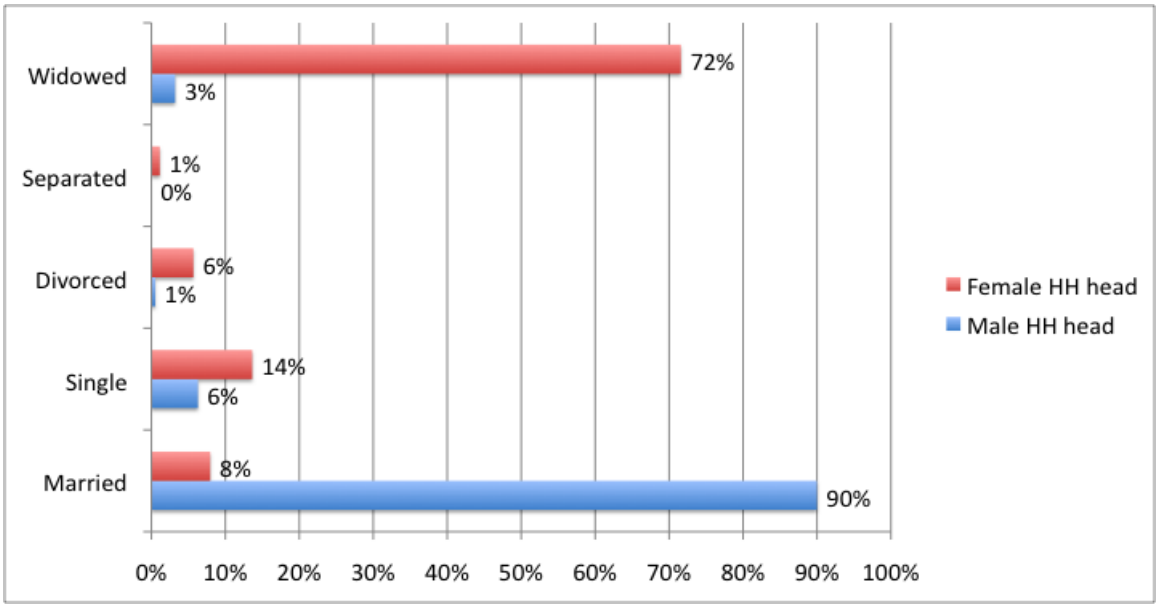


Chart 3: Duration of HH members' illnesses



The marital status of heads also differs substantially by gender (Chart 4), with the 10 percent of heads that are female being far less likely to be married and far more likely to be widowed. This data indicates that members of female-headed households are living in different types of households compared to members of male-headed households.

Chart 4: Marital status of HH heads



5.2 Characteristics of the dwelling

Table 5 shows that 89 percent of sample households live in gers (traditional houses), with most of the remainder living in winter houses. Female-headed households are slightly more likely to live in gers, as are households that own more animals (see Chart 5). Similarly, while about half of all sample households own an additional ger, ownership rates are higher for male-headed and larger herd size households. Most sample households rely on open water sources (such as rivers and lakes), but substantial minorities of households get their water from deep wells or hand wells. Larger herd size households are less likely to use deep wells and more likely to use hand wells (see Chart 6).

Table 5: Dwelling characteristics

	Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
Housing type							
Dwelling is a ger	0.89	0.94	0.89	0.81	0.87	0.91	0.96
Dwelling is a winter house	0.10	0.06	0.11	0.17	0.12	0.08	0.04
Dwelling is another type	0.01	0	0.01	0.02	0.01	0	0
HH owns an additional ger	0.52	0.30	0.55	0.27	0.47	0.63	0.69
Water source							
Water source is a deep well	0.19	0.17	0.19	0.30	0.21	0.13	0.12
Water source is a hand well	0.14	0.20	0.14	0.07	0.15	0.18	0.18
Water source is open (e.g. river, lake)	0.64	0.59	0.65	0.60	0.62	0.66	0.68
Water source is another type	0.02	0.03	0.02	0.03	0.02	0.03	0.02
Number of observations	867	88	779	212	206	210	235

Chart 5: HH dwelling is a ger

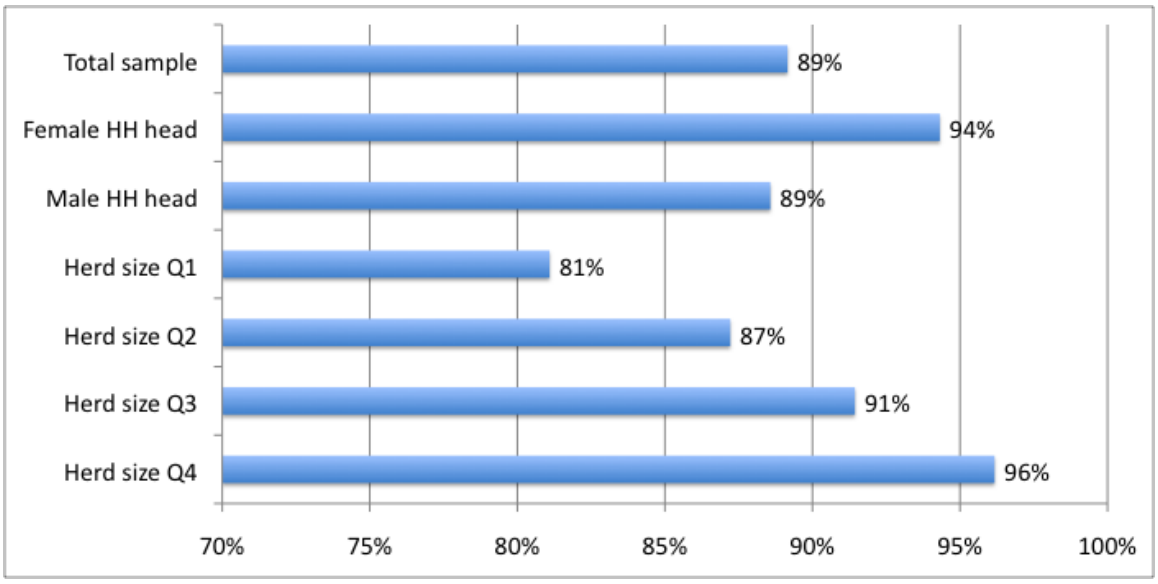
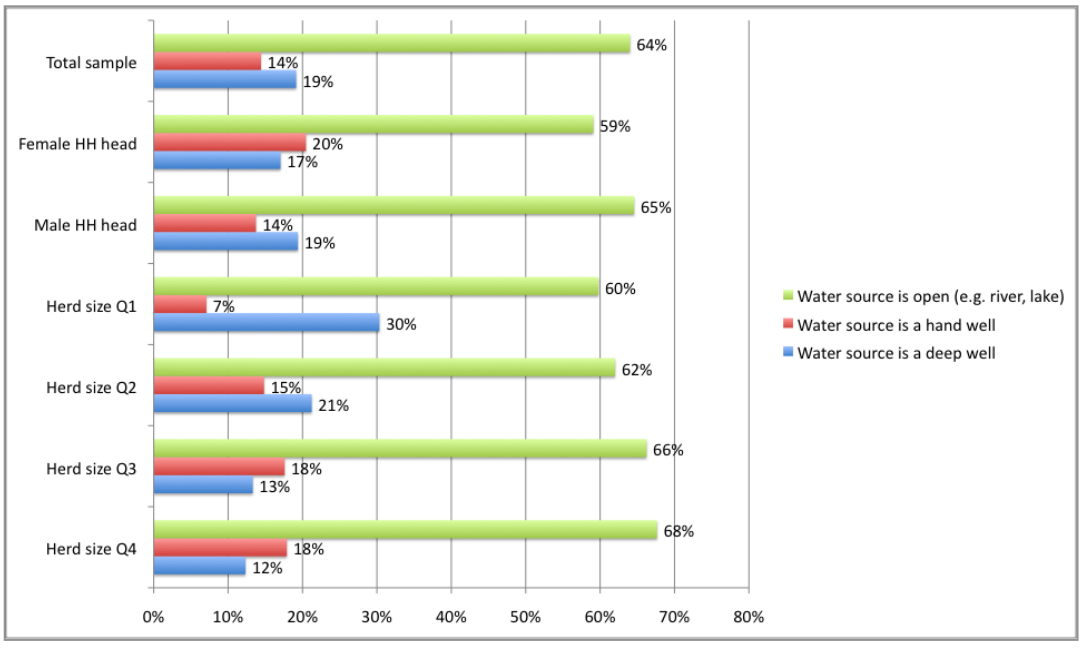


Chart 6: HH water sources



6 Access to extension services

6.1 Extension meeting attendance

The key way in which the LAMP will engage and work with beneficiary herders will be through extension services, and so it is important for the project to understand what kinds of extension services herders currently receive. With this in mind, we collected data on herders' recent interactions with extension service providers and related topics. Table 6 displays the likelihood of some household member having attended any meetings or workshops (that had to do with livestock herding) held by local authorities, NGOs or private processor firms at some point in 2012.

Table 6: Access to extension and veterinary contracts

	Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
Attended meetings held by local authorities	0.46	0.39	0.47	0.41	0.42	0.49	0.51
Attended meetings held by NGOs	0.06	0.05	0.06	0.06	0.06	0.06	0.04
Attended meetings held by private companies	0.03	0.05	0.03	0.02	0.02	0.04	0.03
Has a contract with a veterinarian	0.64	0.63	0.64	0.53	0.61	0.71	0.71
Number of observations	867	88	779	212	206	210	235

It is immediately clear that meetings with local (i.e., bag, soum or aimag) officials are by far the most commonly attended, and that meetings between herders and representatives of processor firms are quite rare (see Chart 7). Thus, to the extent that the success of the LAMP will depend on effective, direct interactions between herders and processor firms, there is substantial room for an increase in these activities. Households are also in relatively close contact with veterinarians, with 64 percent of sample households having some sort of contract with them. Finally, as Chart 8 shows, it is male-headed and larger herd size households that are more likely to have attended meetings with local authorities and to possess contracts with veterinarians.

Chart 7: Access to extension services

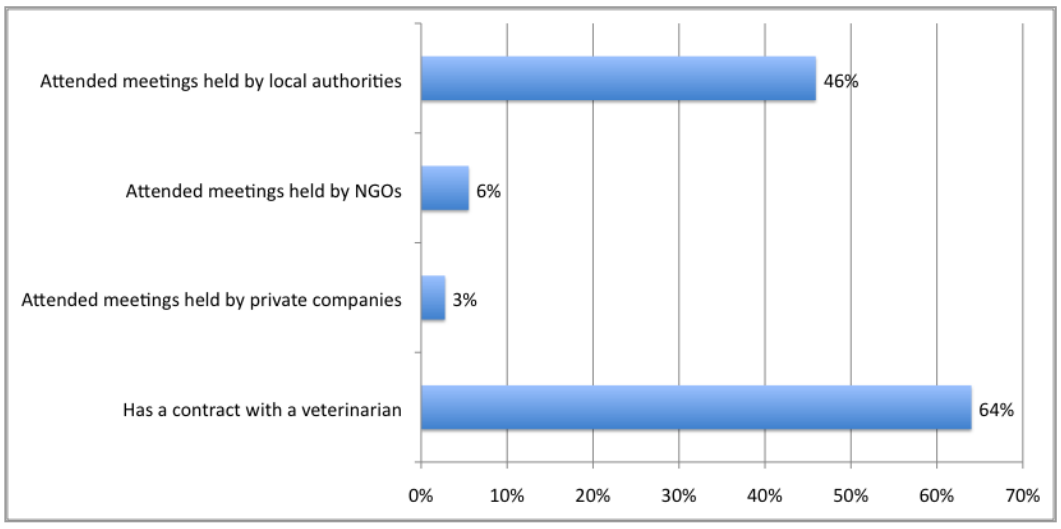


Chart 8: HH extension services by HH type

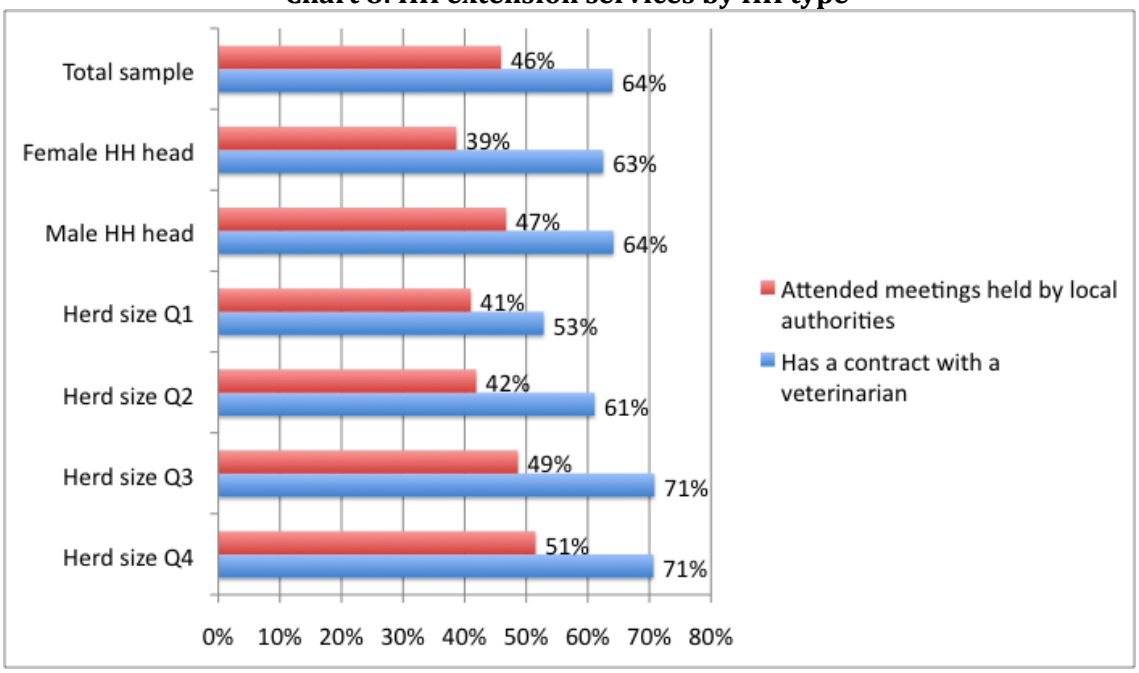
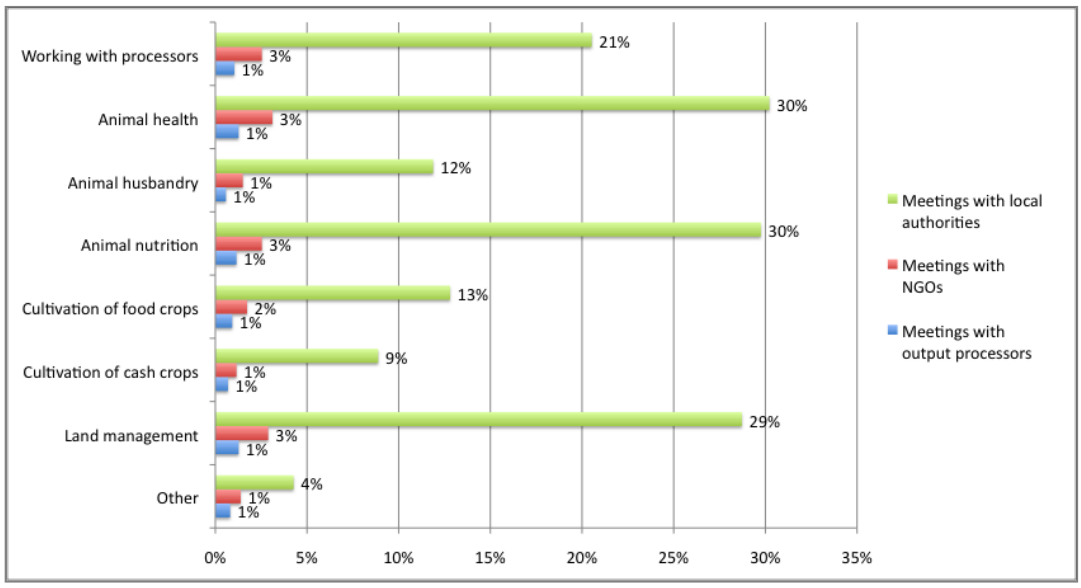


Chart 9 presents likelihoods (for all sample households) of having attended various kinds of meetings where different topics were discussed. The topic of working with processor firms was not commonly discussed at meetings held by local authorities. Traditional topics, such as animal health, animal nutrition and land management were more frequent topics of discussion.

Chart 9: HHs who discussed various extension topics



6.2 Household access to information and communication technology

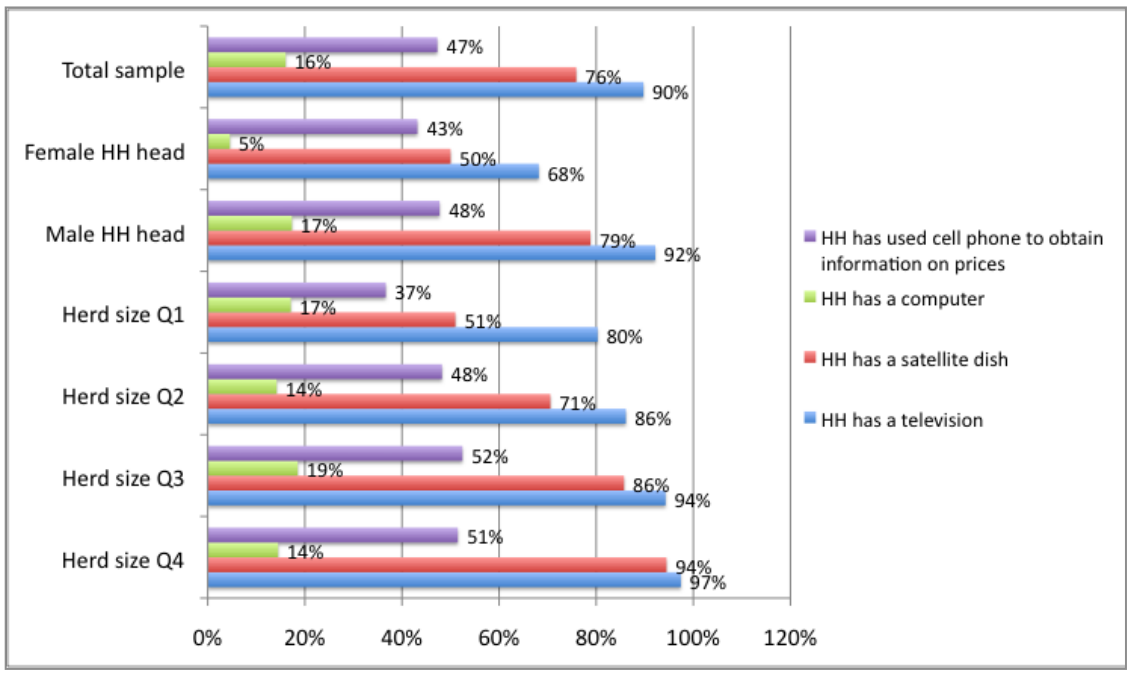
Given the distances between herder households and representatives from any organization that might be charged with implementing the LAMP, it is important to understand the types of ways in which the project might be able to communicate with households. Data was collected on the types of communication devices owned by sample households as well as the frequency with which these devices had been used to obtain information on livestock output prices in the past.

Table 7. Household access to information and communication technology

	Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
HH has a television	0.90	0.68	0.92	0.80	0.86	0.94	0.97
HH has a satellite dish	0.76	0.50	0.79	0.51	0.71	0.86	0.94
HH has a radio	0.22	0.22	0.22	0.15	0.19	0.28	0.25
HH has a computer	0.16	0.05	0.17	0.17	0.14	0.19	0.14
HH has a cell phone	0.96	0.88	0.97	0.91	0.96	0.98	0.99
HH has used cell phone to obtain information on prices	0.47	0.43	0.48	0.37	0.48	0.52	0.51
Number of observations	867	88	779	212	206	209	235

The great majority of households contain members who own cell phones and televisions. Satellite dishes are also quite common, but radio and computer ownership rates are less so. A bit less than half of sample households have used cell phones to obtain price information. However, female-headed and smaller herd size households are less likely to own these types of devices or to have used cell phones to obtain price information(see Chart 10). Thus, certain types of households are likely to be more difficult to reach than others.

Chart 10: HH access to ICT



7 Group and cooperative membership

7.1 Group and cooperative membership rates

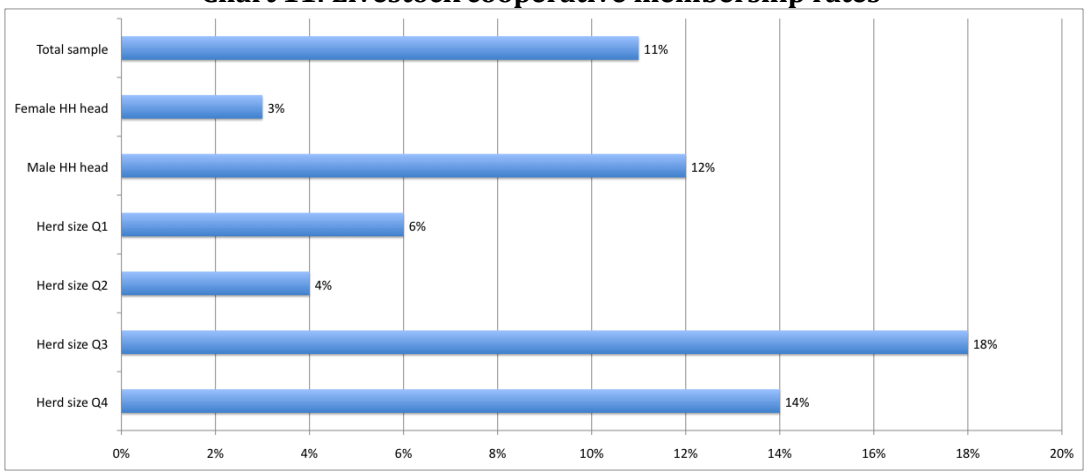
The great majority of LAMP activities will involve the project working with groups of herders organized into cooperatives, and it is therefore important to understand the quantity and characteristics of herder households that contain members who belong to herder groups or cooperatives. Table 8 displays the results of the section of the household questionnaire that deals with these issues.

Table 8. Group and Cooperative Membership

	Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
Groups							
HH members belong to a group of any kind	0.05	0.03	0.05	0.04	0.03	0.04	0.06
HH members belong to a livestock group	0.05	0.03	0.05	0.04	0.03	0.04	0.06
HH members belong to a formally registered group	0.03	0.02	0.03	0.01	0.03	0.03	0.05
Cooperatives							
HH members belong to a cooperative of any kind	0.13	0.06	0.14	0.08	0.07	0.20	0.18
HH members belong to a livestock cooperative	0.11	0.03	0.12	0.06	0.04	0.18	0.14
HH members belong to a formally registered cooperative	0.12	0.06	0.13	0.08	0.06	0.19	0.15
Number of observations	867	88	779	212	206	209	235

With only 5 and 13 percent of households containing members of any kind of group and cooperative, respectfully, it is clear that if the project intends to work with groups and cooperatives, membership in these organizations will need to increase. As Chart 11 shows, it is once again male-headed and larger herd size households that are likely more closely in touch with the kinds of activities and institutions that the LAMP will depend on for success.

Chart 11: Livestock cooperative membership rates



7.2 Group and cooperative characteristics

Households with members in groups or cooperatives tend to contain fewer female members than male members, and the average numbers of livestock owned by group and cooperative members are about 26 and 46, respectively (see Chart 9). For both types of organizations, the average tenure of the longest-belonging household member is around 3 years, which is

slightly lower than the average number of years since the organization's founding. Finally, both types of organization had between 1 and 2 meetings in 2012 on average.

Table 9. Group and Cooperative Characteristics

		Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
Groups								
Number of female group members (for HHs with members in groups)	Mean	0.88	1.67	0.81	0.89	0.71	1.11	0.80
	SD	0.94	0.58	0.94	1.05	0.76	1.17	0.86
	N	40	3	37	9	7	9	15
Number of male group members (for HHs with members in groups)	Mean	1.90	2.00	1.89	1.89	1.71	2.00	1.93
	SD	1.10	1.00	1.13	1.05	1.11	1.22	1.16
	N	40	3	37	9	7	9	15
Number of livestock group members (for HHs with members in livestock groups)	Mean	25.83	27.67	25.68	51.11	13.29	22.56	18.47
	SD	35.66	16.50	36.91	64.48	12.91	20.00	17.66
	N	40	3	37	9	7	9	15
The longest any HH member has been a part of a group (years, for HHs with members in a group)	Mean	2.98	3.33	2.95	2.22	3.29	3.00	3.27
	SD	2.13	2.08	2.16	1.64	3.15	1.66	2.19
	N	40	3	37	9	7	9	15
Years since the HH's main livestock group was formed (for HHs with members in livestock groups)	Mean	3.43	3.00	3.46	2.11	4.71	4.11	3.20
	SD	2.71	2.65	2.74	1.76	4.50	2.32	2.14
	N	40	3	37	9	7	9	15
Number of livestock group meetings that took place in 2012 (for HHs with members in livestock groups)	Mean	1.30	2.00	1.24	1.56	1.86	0.89	1.13
	SD	1.51	2.00	1.48	1.42	1.35	1.17	1.81
	N	40	3	37	9	7	9	15
Cooperatives								
Number of female cooperative members (for HHs with members in cooperatives)	Mean	0.71	1.00	0.70	1.08	0.67	0.63	0.68
	SD	0.68	0.00	0.69	1.00	0.50	0.67	0.59
	N	93	3	90	12	9	38	34
Number of male cooperative members (for HHs with members in cooperatives)	Mean	1.77	1.00	1.80	2.08	1.44	1.71	1.82
	SD	0.95	0.00	0.95	1.08	0.53	0.87	1.06
	N	93	3	90	12	9	38	34
Number of livestock cooperative members (for HHs with members in livestock cooperatives)	Mean	46.09	139.33	42.98	53.67	61.89	43.50	42.12
	SD	75.00	225.92	66.06	72.59	130.68	58.97	75.97
	N	93	3	90	12	9	38	34
The longest any HH member has been a part of a cooperative (years, for HHs with members in a cooperative)	Mean	3.18	3.67	3.17	3.00	4.89	2.97	3.03
	SD	3.35	3.79	3.35	3.10	4.96	3.31	2.98
	N	93	3	90	12	9	38	34
Years since the HH's main livestock cooperative was formed (for HHs with members in livestock cooperatives)	Mean	3.28	4.33	3.24	2.92	4.56	3.24	3.12
	SD	3.51	3.21	3.53	3.12	5.27	3.35	3.35
	N	93	3	90	12	9	38	34
Number of livestock cooperative meetings that took place in 2012 (for HHs with members in livestock cooperatives)	Mean	1.72	1.33	1.73	2.00	1.22	1.76	1.71
	SD	1.35	0.58	1.37	1.13	1.39	1.26	1.53
	N	93	3	90	12	9	38	34

Table 8 Household livestock operations

Here we begin displaying the main set of results from the baseline survey. Livestock herding in Mongolia is believed to be characterized by a trade-off between animal quality and quantity, with herders seeking to build up the size of their herds at the expense of investments in their animals. This focus on having larger numbers of animals rather than smaller numbers of better-fed, healthier, higher genetic quality animals is driven in large part by the risk of winter disasters, or dzuds. These extreme winter weather events periodically substantially reduce herd sizes, and so herders feel compelled to maintain large herd sizes, with "buffer stocks" of animals, to ensure the future viability of their livestock operations should a dzud occur. With all this in mind, we begin our analysis of household livestock operations by presenting data on herd sizes, species compositions, and recent changes in herd sizes.

8.1 Herd sizes, compositions and size changes

Table 10 shows the likelihoods of owning any of each of the 6 species we asked about in our questionnaire (camels, horses, cattle, yak, sheep and goats), as well as the total numbers of animals owned (for the subset of sample households that owned any of the species in question). Among the total sample, camels, cattle and yak are much less commonly owned than are horses, sheep and goats, whose ownership rates are each above 65 percent. This is consistent with expectations and the idea that one of the ways herders deal with their risky environment is to build up herds containing more members of the smaller, more rugged species'. This tendency to own more small animals is also reflected in the total numbers of each species owned. Indeed, the average numbers of both sheep and goats owned (conditional on owning any) are each above 100 animals, while the analogous numbers for all other species are below 30.

Table 10. Herd Sizes

		Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
Groups								
Number of female group members (for HHs with members in groups)	Mean	0.88	1.67	0.81	0.89	0.71	1.11	0.80
	SD	0.94	0.58	0.94	1.05	0.76	1.17	0.86
	N	40	3	37	9	7	9	15
Number of male group members (for HHs with members in groups)	Mean	1.90	2.00	1.89	1.89	1.71	2.00	1.93
	SD	1.10	1.00	1.13	1.05	1.11	1.22	1.16
	N	40	3	37	9	7	9	15
Number of livestock group members (for HHs with members in livestock groups)	Mean	25.83	27.67	25.68	51.11	13.29	22.56	18.47
	SD	35.66	16.50	36.91	64.48	12.91	20.00	17.66
	N	40	3	37	9	7	9	15
The longest any HH member has been a part of a group (years, for HHs with members in a group)	Mean	2.98	3.33	2.95	2.22	3.29	3.00	3.27
	SD	2.13	2.08	2.16	1.64	3.15	1.66	2.19
	N	40	3	37	9	7	9	15
Years since the HH's main livestock group was formed (for HHs with members in livestock groups)	Mean	3.43	3.00	3.46	2.11	4.71	4.11	3.20
	SD	2.71	2.65	2.74	1.76	4.50	2.32	2.14
	N	40	3	37	9	7	9	15
Number of livestock group meetings that took place in 2012 (for HHs with members in livestock groups)	Mean	1.30	2.00	1.24	1.56	1.86	0.89	1.13
	SD	1.51	2.00	1.48	1.42	1.35	1.17	1.81
	N	40	3	37	9	7	9	15
Cooperatives								
Number of female cooperative members (for HHs with members in cooperatives)	Mean	0.71	1.00	0.70	1.08	0.67	0.63	0.68
	SD	0.68	0.00	0.69	1.00	0.50	0.67	0.59
	N	93	3	90	12	9	38	34
Number of male cooperative members (for HHs with members in cooperatives)	Mean	1.77	1.00	1.80	2.08	1.44	1.71	1.82
	SD	0.95	0.00	0.95	1.08	0.53	0.87	1.06
	N	93	3	90	12	9	38	34
Number of livestock cooperative members (for HHs with members in livestock cooperatives)	Mean	46.09	139.33	42.98	53.67	61.89	43.50	42.12
	SD	75.00	225.92	66.06	72.59	130.68	58.97	75.97
	N	93	3	90	12	9	38	34
The longest any HH member has been a part of a cooperative (years, for HHs with members in a cooperative)	Mean	3.18	3.67	3.17	3.00	4.89	2.97	3.03
	SD	3.35	3.79	3.35	3.10	4.96	3.31	2.98
	N	93	3	90	12	9	38	34
Years since the HH's main livestock cooperative was formed (for HHs with members in livestock cooperatives)	Mean	3.28	4.33	3.24	2.92	4.56	3.24	3.12
	SD	3.51	3.21	3.53	3.12	5.27	3.35	3.35
	N	93	3	90	12	9	38	34
Number of livestock cooperative meetings that took place in 2012 (for HHs with members in livestock cooperatives)	Mean	1.72	1.33	1.73	2.00	1.22	1.76	1.71
	SD	1.35	0.58	1.37	1.13	1.39	1.26	1.53
	N	93	3	90	12	9	38	34

Also, as Charts 12 and 13 show, female-headed households are both less likely to own each species and, conditional on ownership, tend to own fewer animals compared to male-headed households. Thus, here we see another way in which female-headed households seem to be disadvantaged compared to male-headed ones.

Chart 12: Species ownership rates

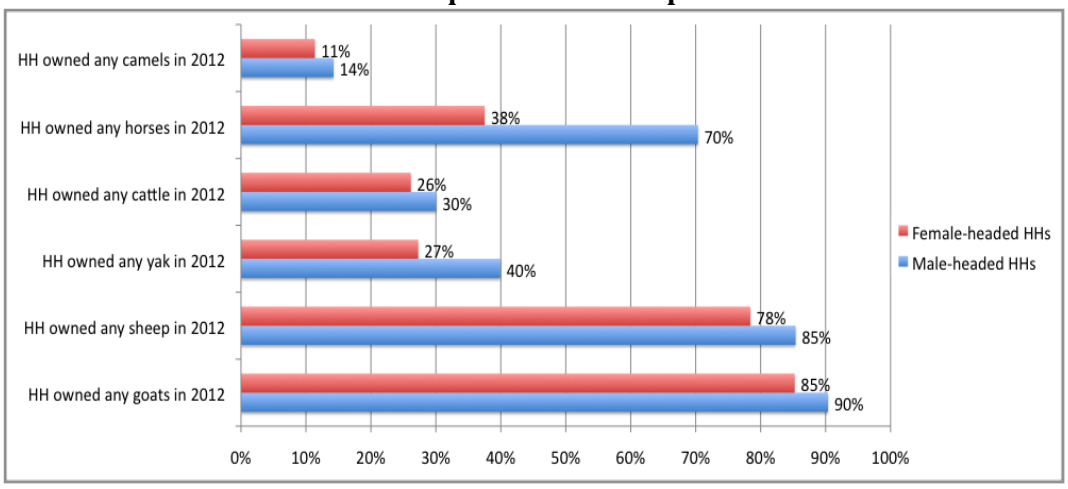


Chart 13: Numbers of animals owned

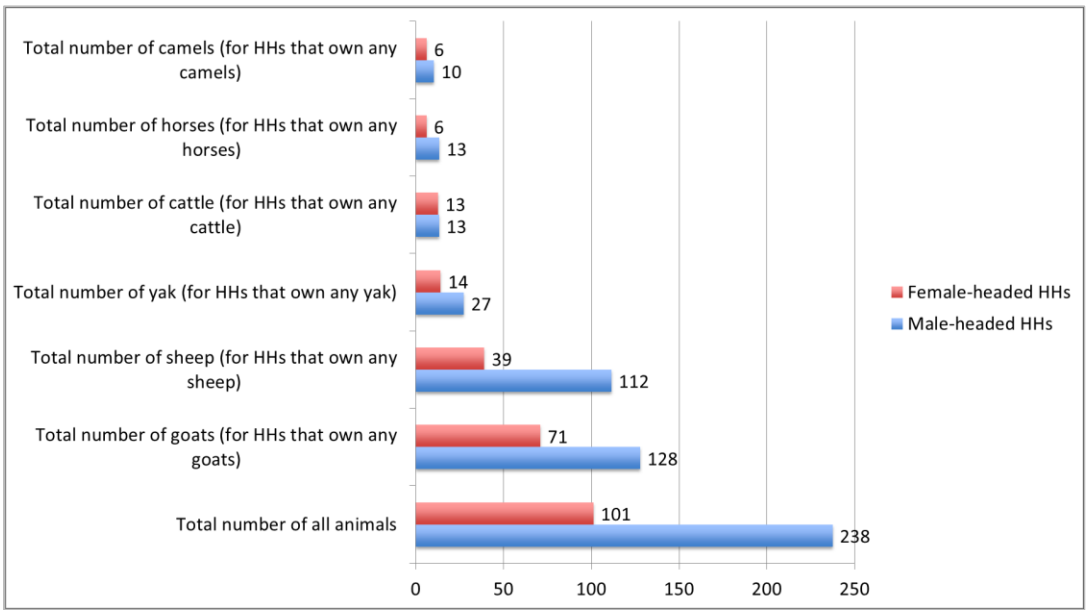


Table 11 presents data on different herd management arrangements. Since our sample is of livestock-owning households (as opposed to, say, full-time herders only), we have in our data households with varying degrees of attachment to livestock herding. For example, 24 percent of the households in our sample are so-called absentee herders (i.e., their animals were managed by another herder at some point in 2012, for each of the species that they owned any of). The data indicates that female-headed and smaller herd sizes households are more likely to be among the absentee herder households. These types of herders own considerably fewer animals compared to their non-absentee counterparts. Finally, the management of other herders' animals is a fairly limited activity, both in terms of the proportion of households who engage in it and the numbers of animals they manage. Perhaps unsurprisingly, this is especially true for female-headed and smaller herd size households.

Table 11. Herd Management Practices

		Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
Absentee herder status	Mean	0.24	0.35	0.23	0.43	0.29	0.19	0.06
	N	867	88	779	212	206	209	235
Total numbers of animals owned by absentee herders	Mean	124.94	60.34	136.32	31.63	109.07	206.73	569.84
	SD	192.47	67.60	204.83	17.57	24.28	43.63	528.99
	N	207	31	176	89	59	40	14
Total numbers of animals owned by non-absentee herders	Mean	260.54	123.74	273.47	35.91	108.33	213.77	521.75
	SD	245.59	112.09	250.84	19.55	22.29	35.83	255.74
	N	660	57	603	121	146	169	221
Managed other herders' animals status	Mean	0.13	0.10	0.13	0.07	0.14	0.16	0.15
	N	867	88	779	212	206	209	235
Total numbers of other herders' animals managed (for HHs that also owned some of these species)	Mean	15.13	4.55	16.33	9.67	19.40	19.09	12.79
	SD	61.33	20.33	64.23	55.69	63.55	69.49	56.08
	N	867	88	779	212	206	209	235

Next we consider changes in herd sizes over the course of 2012. This serves as a fairly normal period of time to consider herd size changes over, in the sense that the winter of 2011-2012 did not play host to widespread extreme weather events. These harsh winter conditions are responsible for some of the greatest shocks to herd sizes, in the form of high mortality rates in late winter and spring.

The average numbers owned of each species grew in 2012, with total herd sizes increasing by slightly more than 32 animals for male-headed households (see Chart 14). Unsurprisingly given lower herd sizes overall, female-headed households' herd sizes increased by only 9.5 animals over 2012. This growth in herd sizes is consistent with a herding strategy whereby herders steadily increase the size of their herds so that their livestock operations can remain viable following dzuds.

Chart 14: Changes in herd sizes over 2012

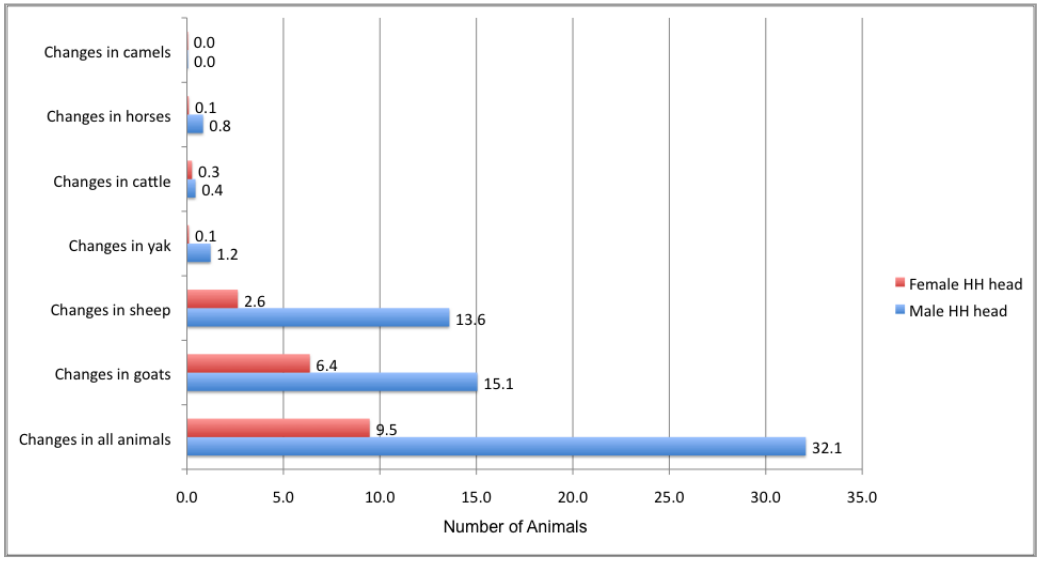
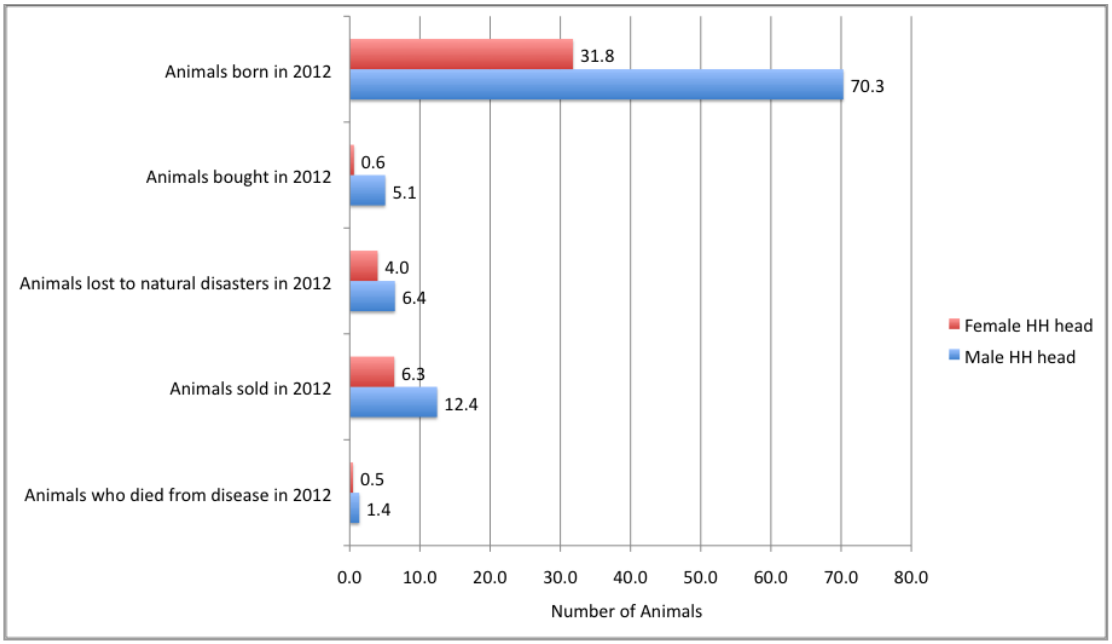


Chart 15 displays data on most of the major contributors to herd size changes. Animal losses due to natural disasters (including weather events) are low, which is perhaps not surprising given that the winter of 2011-2012 was not an extremely cold one. Deaths from disease are even lower. Animal sales and purchases both make small contributions to overall herd size changes compared to the main factor driving herd size changes: animal births. Finally, once again, changes for female-headed households are considerably smaller than changes for male-headed households. In conclusion, households in our sample have herds that tend to consist of large numbers of the rugged sheep and goats, and their herd sizes tended to register a substantial increase over the course of 2012.

Chart 15: Herd size changes over 2012



8.2 Animal breeding

A main component of the LAMP is designed to encourage investments in animal quality of Mongolian herders. We start by considering the kinds of investments that herders make in the genetic quality of their animals, which is the basis for the breeding sub-component of the LAMP's second component. Chart 16 contains data on the main sources from which herders in the autumn of 2012 obtained breeding bulls (for each of the species we collected data on). Inbreeding is one of the main constraints on livestock genetic quality improvement in Mongolia, so it is important to determine the extent to which inbreeding might be taking place and whether herders are employing prevention efforts. Chart 16 makes clear that for all 6 species, over 40 percent of herders sought breeding bulls from outside their herd but within their bag of residence. Moreover, breeding bulls from herders' own herds was the second most common source of bulls for every species. The proportions of sheep- and goat-owning households who obtained bulls from their own herd are particularly high at 34 percent and 39 percent, respectively.

Chart 16: Breeding bull sources

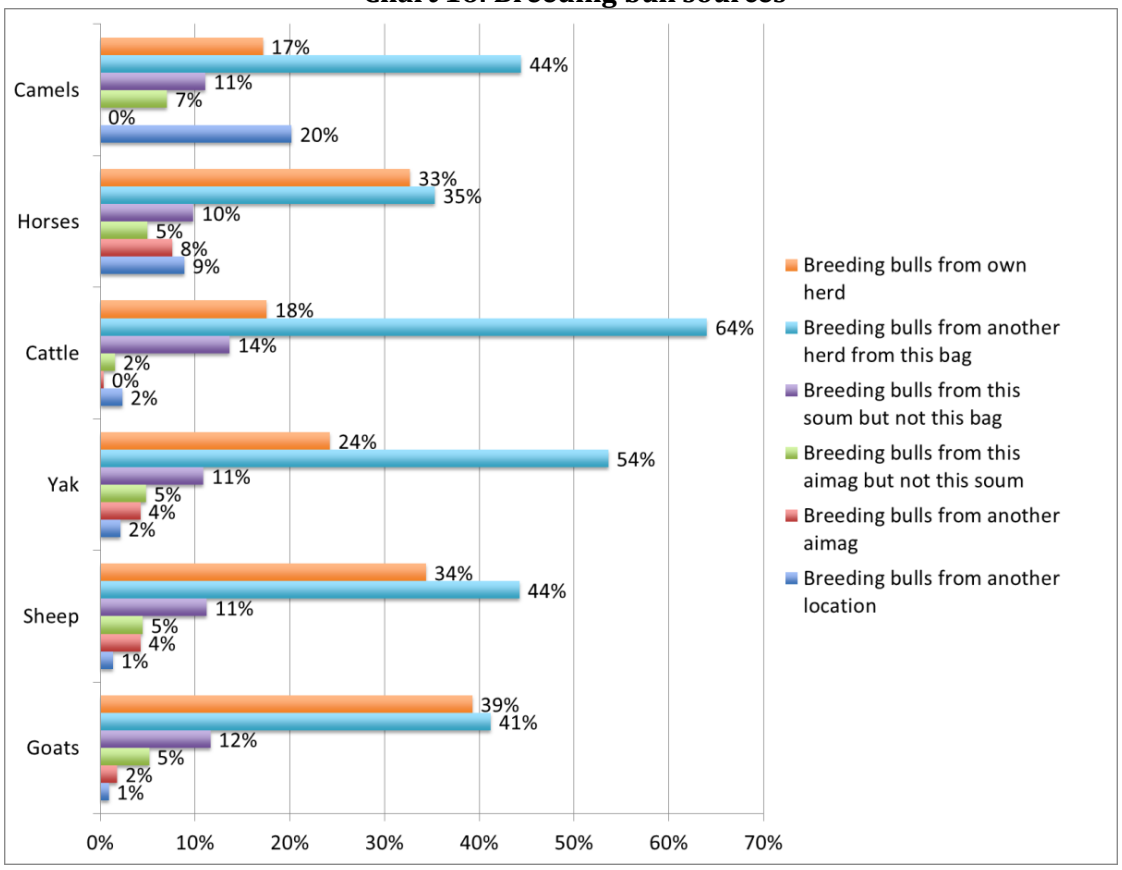


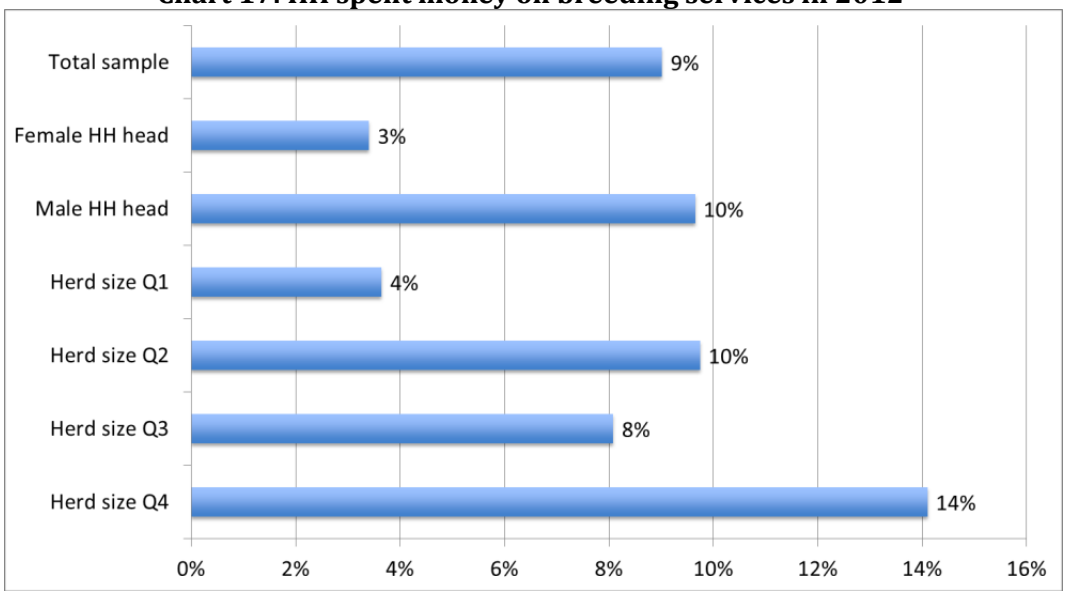
Table 12 considers other dimensions of the investments that herders make in their animals' genetic quality. As the table shows, less than 9 percent of all households spent any money at all on breeding services, and the average amounts spent are low. These low figures, combined with the previous set of results on the sources of breeding bulls, suggest that herders mainly use their own animals for breeding or swap bulls with other, nearby herders for breeding purposes.

Table 12: Breeding Practices

		Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
HH spent money on breeding services in 2012	Mean	0.09	0.03	0.10	0.04	0.10	0.08	0.14
Amount spent on breeding services in 2012 (MNT)	Mean	5,753	909	6,300	1,040	5,237	5,002	11,171
	SD	23,277	5,547	24,428	5,998	21,153	20,405	33,970
HH utilized artificial insemination for breeding in 2012	Mean	0.01	0.01	0.01	0	0.01	0.01	0
Number of observations		867	88	779	212	206	209	235

Also, as Chart 17 highlights, female-headed and smaller herd size households were less likely to have spent any money on breeding services compared to male-headed and larger herd size households. Finally, only 1 percent of all sample households utilized artificial insemination (AI) technologies for breeding purposes in 2012.

Chart 17: HH spent money on breeding services in 2012



8.3 Animal health

A second set of animal quality activities that the LAMP will focus on (and which we collected data on) is animal health investments. We begin by considering vaccination rates for relevant species against 3 of the most important infectious diseases in the study area, brucellosis, anthrax and rabies. As Table 13 shows, for all 3 diseases, vaccination rates are rarely above 70 percent, and for many species-disease combinations they are well below 50 percent.

Table 13: Vaccination Rates

		Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
Brucellosis								
Camel-owning HHs that had their camels vaccinated against brucellosis	Mean	0.28	0.31	0.28	0.40	0.22	0.24	0.30
	N	121	10	111	5	14	32	69
Cattle-owning HHs that had their cattle vaccinated against brucellosis	Mean	0.68	0.69	0.68	0.79	0.72	0.65	0.64
	N	257	23	234	49	39	67	99
Yak-owning HHs that had their yak vaccinated against brucellosis	Mean	0.64	0.64	0.64	0.67	0.68	0.65	0.54
	N	337	24	313	94	90	70	81
Sheep-owning HHs that had their sheep vaccinated against brucellosis	Mean	0.60	0.63	0.59	0.61	0.56	0.58	0.63
	N	734	69	665	117	176	205	231
Goat-owning HHs that had their goats vaccinated against brucellosis	Mean	0.58	0.60	0.58	0.61	0.55	0.56	0.61
	N	779	75	704	133	200	207	234
Anthrax								
Cattle-owning HHs that had their cattle vaccinated against anthrax	Mean	0.72	0.62	0.73	0.77	0.84	0.69	0.67
	N	257	23	234	49	39	67	99
Yak-owning HHs that had their yak vaccinated against anthrax	Mean	0.69	0.55	0.70	0.70	0.70	0.82	0.54
	N	337	24	313	94	90	70	81
Sheep-owning HHs that had their sheep vaccinated against anthrax	Mean	0.37	0.31	0.38	0.36	0.35	0.39	0.37
	N	734	69	665	117	176	205	231
Goat-owning HHs that had their goats vaccinated against anthrax	Mean	0.36	0.31	0.37	0.37	0.37	0.37	0.35
	N	779	75	704	133	200	207	234
Rabies								
Camel-owning HHs that had their camels vaccinated against rabies	Mean	0.26	0.23	0.26	0.40	0.23	0.12	0.32
	N	121	10	111	5	14	32	69
Horse-owning HHs that had their horses vaccinated against rabies	Mean	0.22	0.26	0.22	0.22	0.21	0.21	0.25
	N	581	33	548	79	118	167	213
Cattle-owning HHs that had their cattle vaccinated against rabies	Mean	0.52	0.59	0.52	0.54	0.59	0.47	0.53
	N	257	23	234	49	39	67	99
Yak-owning HHs that had their yak vaccinated against rabies	Mean	0.35	0.33	0.35	0.43	0.36	0.31	0.26
	N	337	24	313	94	90	70	81
Sheep-owning HHs that had their sheep vaccinated against rabies	Mean	0.29	0.20	0.30	0.30	0.29	0.29	0.28
	N	734	69	665	117	176	205	231
Goat-owning HHs that had their goats vaccinated against rabies	Mean	0.30	0.22	0.31	0.36	0.30	0.30	0.28
	N	779	75	704	133	200	207	234

While brucellosis vaccination rates are higher for female-headed households than they are for male-headed households (see Chart 18), there is a less clear pattern when comparing the vaccination rates between smaller and larger herd size households. However, overall, it is uncommon for the vaccination rates in small herd size households to be higher than that of large size households (see Chart 19).

Thus, despite the fact that female-headed and smaller herd size households seem to have fewer resources at their disposal in general, their livestock vaccination rates are at least occasionally higher than for their male-headed and larger herd size counterparts, respectively.

Chart 18: Brucellosis vaccination rates, by HH head gender

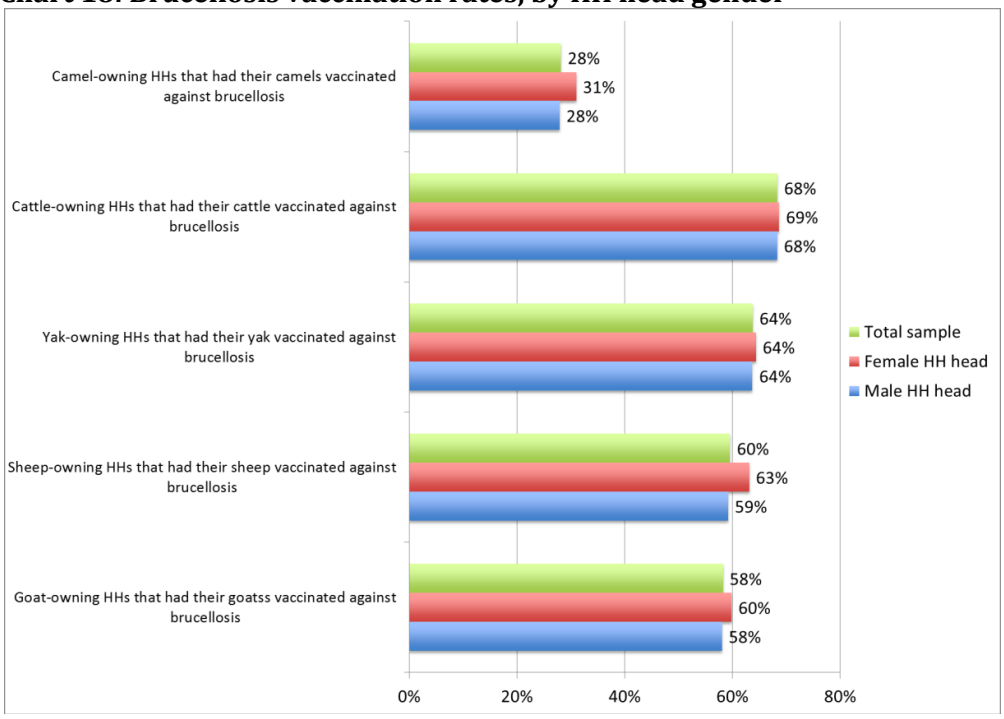
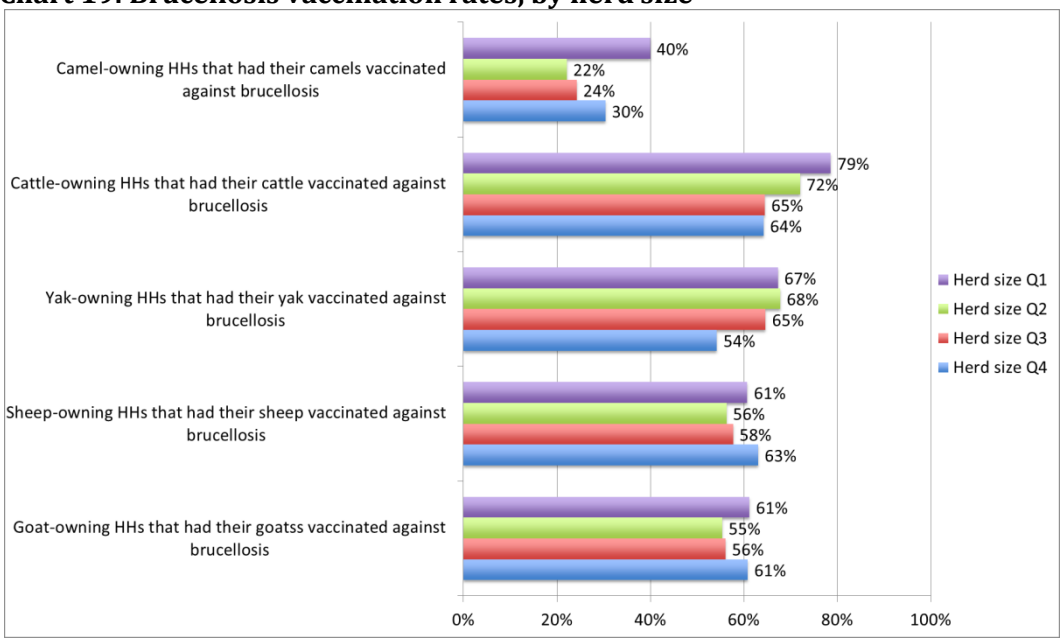


Chart 19: Brucellosis vaccination rates, by herd size



We next consider a set of animal health treatments that protect livestock from the effects of parasitic diseases: de-worming treatments, IVOMEC treatments and chemical showers (for sheep and goats). Table 14 presents data on the proportions of animals owned that received these treatments as well as the total amount (summed across species) spent on them.

Table 20. Other Animal Health Treatments

		Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
De-worming treatment								
Proportion of camels de-wormed	Mean	0.14	0.11	0.14	0.20	0.09	0.13	0.14
	N	110	9	101	4	14	29	63
Proportion of horses de-wormed	Mean	0.19	0.31	0.19	0.26	0.13	0.17	0.21
	N	565	31	534	74	112	164	211
Proportion of cattle de-wormed	Mean	0.34	0.31	0.34	0.45	0.45	0.30	0.27
	N	254	23	231	47	39	66	99
Proportion of yak de-wormed	Mean	0.24	0.24	0.24	0.30	0.22	0.26	0.20
	N	330	24	306	92	89	69	79
Proportion of sheep de-wormed	Mean	0.60	0.69	0.59	0.62	0.60	0.55	0.62
	N	726	67	658	113	174	204	231
Proportion of goats de-wormed	Mean	0.54	0.60	0.53	0.54	0.55	0.49	0.57
	N	773	74	698	128	199	207	234
Total amount spent on de-worming treatments (MNT)	Mean	18,523	11,131	19,358	4,771	10,041	17,274	39,655
	SD	30,444	19,936	31,309	10,796	17,254	22,740	43,700
	N	867	88	779	212	206	209	235
IVOMEC treatment								
Proportion of horses given IVOMEC	Mean	0.31	0.27	0.31	0.39	0.31	0.34	0.26
	N	565	31	534	74	112	164	211
Proportion of cattle given IVOMEC	Mean	0.56	0.70	0.55	0.73	0.66	0.49	0.49
	N	254	23	231	47	39	66	99
Proportion of yak given IVOMEC	Mean	0.36	0.40	0.35	0.45	0.37	0.29	0.29
	N	330	24	306	92	89	69	79
Proportion of sheep given IVOMEC	Mean	0.50	0.63	0.49	0.63	0.51	0.44	0.48
	N	726	67	658	113	174	204	231
Proportion of goats given IVOMEC	Mean	0.47	0.53	0.46	0.53	0.49	0.41	0.46
	N	773	74	698	128	199	207	234
Total amount spent on IVOMEC treatments (MNT)	Mean	12,719	8,652	13,178	4,278	7,712	12,962	24,609
	SD	22,987	20,060	23,259	8,267	11,815	16,948	35,808
	N	867	88	779	212	206	209	235
Chemical spray treatment								
Proportion of sheep given chemical spray	Mean	0.32	0.33	0.32	0.40	0.29	0.31	0.32
	N	726	67	658	113	174	204	231
Proportion of goats given chemical spray	Mean	0.29	0.30	0.28	0.33	0.26	0.29	0.28
	N	773	74	698	128	199	207	234
Total amount spent on chemical spray treatments (MN	Mean	7,259	7,029	7,285	1,797	3,374	6,386	16,445
	SD	19,140	18,398	19,233	6,755	10,084	13,484	30,570
	N	867	88	779	212	206	209	235
Winter shed cleaned								
HH cleaned their shed at least once last winter (for	Mean	0.32	0.40	0.31	0.30	0.30	0.35	0.32
HHs with winter sheds)	N	596	52	544	100	127	157	209
Number of times shed was cleaned last winter (for	Mean	0.52	0.67	0.51	0.56	0.50	0.59	0.46
HHs with winter sheds)	SD	0.92	1.04	0.91	1.00	0.88	1.04	0.81
	N	596	52	544	100	127	157	209

While male-headed and larger herd size households typically spend more in total on these animal health treatments, it is common for the proportions of animals treated to be higher for female-headed and smaller herd size households than for their counterparts. As Charts 20 and 21 show, this is particularly true in the case of IVOMEC. Thus, here we once again see evidence of apparently disadvantaged households investing more in the quality of their animals (conditional on herd size).

Chart 20: Percentages of animals given IVOMEC, by HH head gender

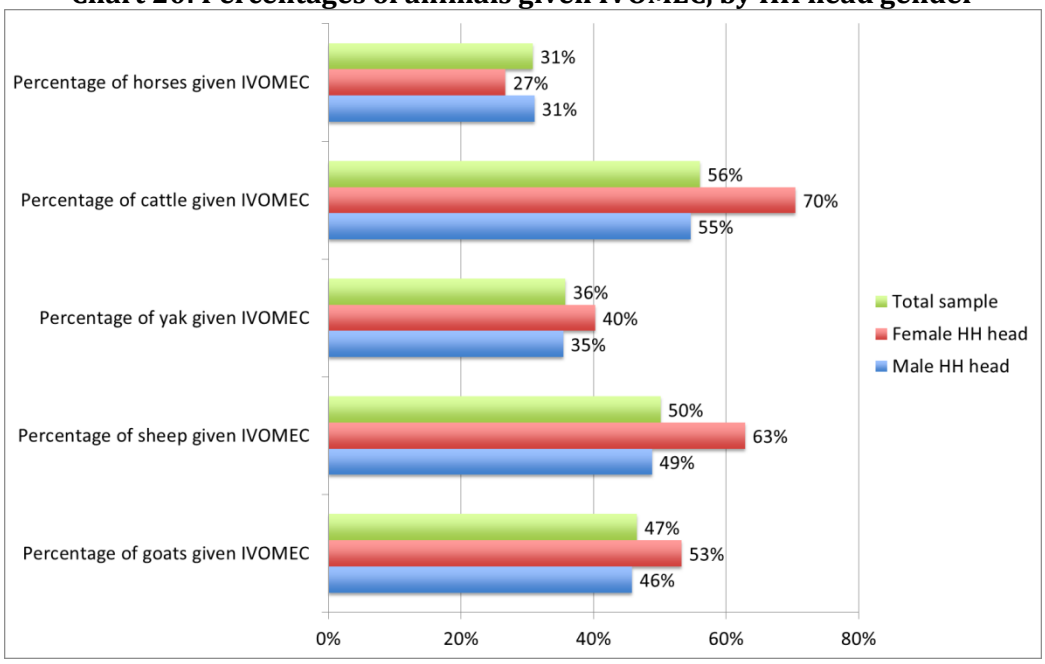


Chart 21: Percentages of animals given IVOMEC, by herd size

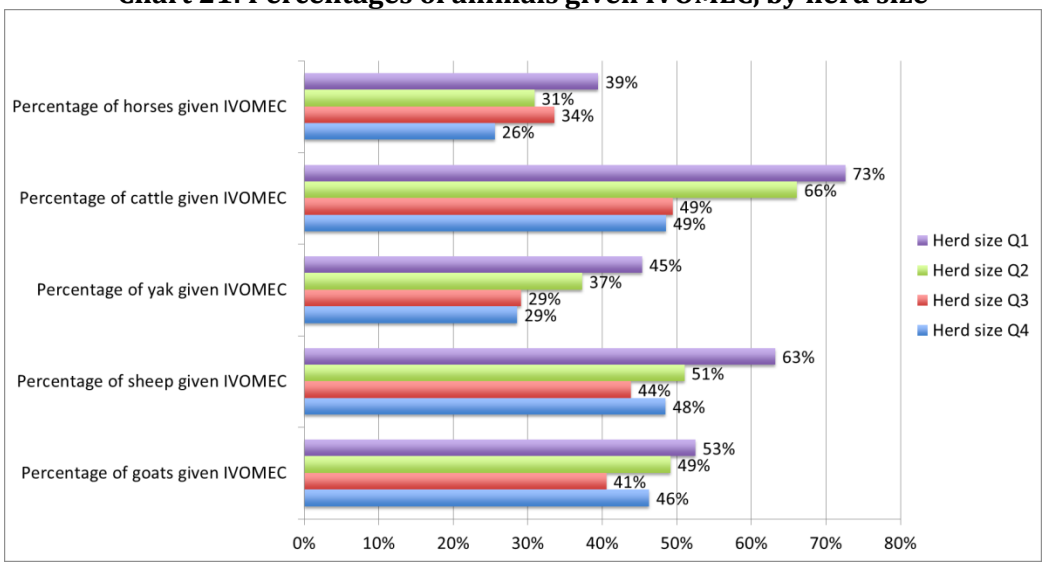


Table 14 also contains information on the use of aerosol sprays to clean winter sheds over the winter of 2012-2013 (for households with winter sheds). About 32 percent of all households with winter sheds cleaned them at all, and the average number of cleanings over the course of the season was about 0.52. These numbers are higher for female-headed households than for male-headed ones.

8.4 Animal nutrition

The animal quality component of the LAMP will focus on what is widely believed to be another important part of livestock quality and productivity, animal nutrition. We begin our analysis by considering the amounts of hay and oats produced by sample households in

2012. (We collected data on the production of several other types of feed, but data on these is not presented since less than 1 percent of all households engaged in the production of these types of feed in 2012.) As Table 15 makes clear, there are a substantial number of households where no hay production takes place at all[8]. Also, lower proportions of female-headed and smaller herd size households produced hay and oats compared to other types of households. Finally, while the quantities of hay produced per animal (for those households that produced any hay) are greater for male- than female-headed households, it is smaller herd size households who produced greater quantities of hay per animal as compared to larger herd size households.

Table 15: Feed production

		Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
Any hay produced in 2012	Mean	0.57	0.41	0.59	0.54	0.59	0.55	0.59
	N	867	88	779	212	206	209	235
Quantity of hay produced per	Mean	32	24	32	88	22	15	8
animal (kgs, for HHs that	SD	86	27	89	162	29	25	9
produced any hay)	N	488	34	452	111	120	114	137
Any oats produced in 2012	Mean	0.01	0.01	0.01	0.00	0.00	0.02	0.02
	N	867	88	779	212	206	209	235
Quantity of oats produced per	Mean	20	3	22	.	3	22	2
animal (kgs, for HHs that	SD	44	.	47	.	.	37	2
produced any oats)	N	8	1	7	0	1	3	4

We turn next to animal feed purchases in Table 16. Purchases of many kinds of feed are considerably more common than the production of them, and purchase rates for hay, wheat, combi-forage, khorgoljin, saltlick, oats and bran all exceed 10 percent. Once again, it is typical for smaller proportions of female-headed households to have purchased these different types of feed. For those female-headed households that did purchase feed, the quantities per animal purchased are typically higher than for male-headed households. Similarly, smaller herd size households were typically less likely to have purchased the different kinds of feed, but the smaller herd size households that did purchase feed bought more per animal than did larger herd size, feed-purchasing households. For example, the 35 households in the smallest herd size quartile who purchased hay bought 28 kgs per animal on average, as compared to only 3 kgs per animal for the 72 households from the largest herd size quartile who purchased any hay.

[8] Herders were also asked how much fiber, rye, wheat, combi-forage, barley, waste rice, alfalfa, green forage and brome grass they cultivated. However, since fewer than 1 percent of all sample households produced any of these types of feed, the results are not shown.

Table 16: panel A, Feed Purchases

		Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
Hay								
Any hay purchased in 2012	Mean	0.25	0.23	0.25	0.17	0.23	0.27	0.31
	N	867	88	779	212	206	209	235
Quantity of hay purchased per animal (kgs, for HHs that purchased any hay)	Mean	8	14	7	28	5	3	3
	SD	21	29	20	44	8	4	7
	N	213	20	193	35	47	57	72
Hay expenditures in 2012 (MNT, for HHs that purchased any hay)	Mean	132,647	66,813	139,379	115,367	88,370	116,112	185,246
	SD	201,346	71,724	208,362	239,294	93,372	201,457	225,492
	N	216	19	196	35	49	58	72
Wheat								
Any wheat purchased in 2012	Mean	0.13	0.09	0.14	0.05	0.11	0.13	0.22
	N	867	88	779	212	206	209	235
Quantity of wheat purchased per animal (kgs, for HHs that purchased any wheat)	Mean	3	2	3	14	2	2	1
	SD	7	2	7	19	1	2	1
	N	114	8	106	11	23	28	51
Wheat expenditures in 2012 (MNT, for HHs that purchased any wheat)	Mean	103,674	172,750	98,277	52,727	51,642	142,686	117,523
	SD	155,730	351,652	131,234	100,388	35,240	259,188	109,325
	N	110	8	102	11	23	28	48
Combi-forage								
Any combi-forage purchased in 2012	Mean	0.12	0.14	0.12	0.08	0.12	0.17	0.11
	N	867	88	779	212	206	209	235
Quantity of combi-forage purchased per animal (kgs, for HHs that purchased any combi-forage)	Mean	4	9	4	15	3	2	1
	SD	12	14	12	27	5	3	1
	N	103	12	91	17	24	34	26
Combi-forage expenditures in 2012 (MNT, for HHs that purchased any combi-forage)	Mean	86,405	145,177	79,742	38,734	56,832	104,444	122,159
	SD	122,308	217,150	106,551	34,666	117,401	141,863	126,082
	N	100	10	90	16	24	33	26
Khorgoljin								
Any khorgoljin purchased in 2012	Mean	0.27	0.18	0.28	0.16	0.26	0.29	0.34
	N	867	88	779	212	206	209	235
Quantity of khorgoljin purchased per animal (kgs, for HHs that purchased any khorgoljin)	Mean	2	2	2	5	2	1	1
	SD	3	4	3	5	2	1	1
	N	231	16	215	34	54	62	80
Khorgoljin expenditures in 2012 (MNT, for HHs that purchased any khorgoljin)	Mean	54,269	61,688	53,716	30,968	43,784	50,532	74,454
	SD	60,305	86,808	58,090	29,758	58,907	40,601	76,157
	N	229	16	213	35	54	59	80
Saltlick								
Any saltlick purchased in 2012	Mean	0.22	0.20	0.22	0.20	0.23	0.24	0.21
	N	867	88	779	212	206	209	235
Quantity of saltlick purchased per animal (kgs, for HHs that purchased any saltlick)	Mean	2	2	2	5	2	2	1
	SD	4	3	4	7	2	2	1
	N	189	17	172	41	47	49	50
Saltlick expenditures in 2012 (MNT, for HHs that purchased any saltlick)	Mean	57,589	59,018	57,440	36,399	47,792	56,463	86,255
	SD	60,217	55,699	60,828	44,143	52,359	54,741	73,643
	N	180	17	163	40	47	46	47

Table 16, panel B: Feed purchases

		Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
Barley								
Any barley purchased in 2012	Mean	0.02	0.01	0.02	0.00	0.00	0.02	0.04
	N	867	88	779	212	204	209	235
Quantity of barley purchased per animal	Mean	1	0	1	7	.	1	0
(kgs, for HHs that purchased any barley)	SD	2		2		.	1	0
	N	16	1	15	1	0	5	10
Barley expenditures in 2012 (MNT, for HHs	Mean	56,438	40,000	57,534	35,500	.	76,000	50,223
that purchased any barley)	SD	53,316		55,001	707	.	49,295	61,013
	N	16	1	15	2	0	5	9
Straw								
Any straw purchased in 2012	Mean	0.03	0.00	0.03	0.02	0.01	0.02	0.06
	N	867	88	779	212	206	209	235
Quantity of straw purchased per animal	Mean	4	.	4	6	3	2	2
(kgs, for HHs that purchased any straw)	SD	8	.	8	6	3	2	4
	N	23	0	23	3	3	4	13
Straw expenditures in 2012 (MNT, for HHs	Mean	375,486	.	375,486	145,250	203,667	138,750	573,365
that purchased any straw)	SD	822,985	.	822,985	263,284	259,808	96,986	1,108,143
	N	23	0	23	4	3	4	12
Oats								
Any oats purchased in 2012	Mean	0.16	0.05	0.17	0.04	0.09	0.18	0.31
	N	867	88	779	212	206	209	235
Quantity of oats purchased per animal	Mean	1	1	1	4	2	1	1
(kgs, for HHs that purchased any oats)	SD	2	1	2	3	2	1	1
	N	136	4	132	8	18	37	72
Oats expenditures in 2012 (MNT, for HHs	Mean	191,413	147,000	192,767	113,813	158,316	198,290	205,372
that purchased any oats)	SD	193,868	95,198	196,132	141,652	124,240	182,718	218,052
	N	135	4	131	8	19	36	71
Bran								
Any bran purchased in 2012	Mean	0.59	0.55	0.60	0.44	0.65	0.63	0.65
	N	867	88	779	212	206	209	235
Quantity of bran purchased per animal	Mean	3	4	3	9	2	2	1
(kgs, for HHs that purchased any bran)	SD	6	7	6	12	2	1	1
	N	514	48	465	93	132	132	153
Bran expenditures in 2012 (MNT, for HHs	Mean	87,646	71,317	89,300	58,151	67,121	85,046	125,794
that purchased any bran)	SD	99,762	97,332	99,958	90,073	74,833	84,442	122,869
	N	508	47	461	91	133	129	152

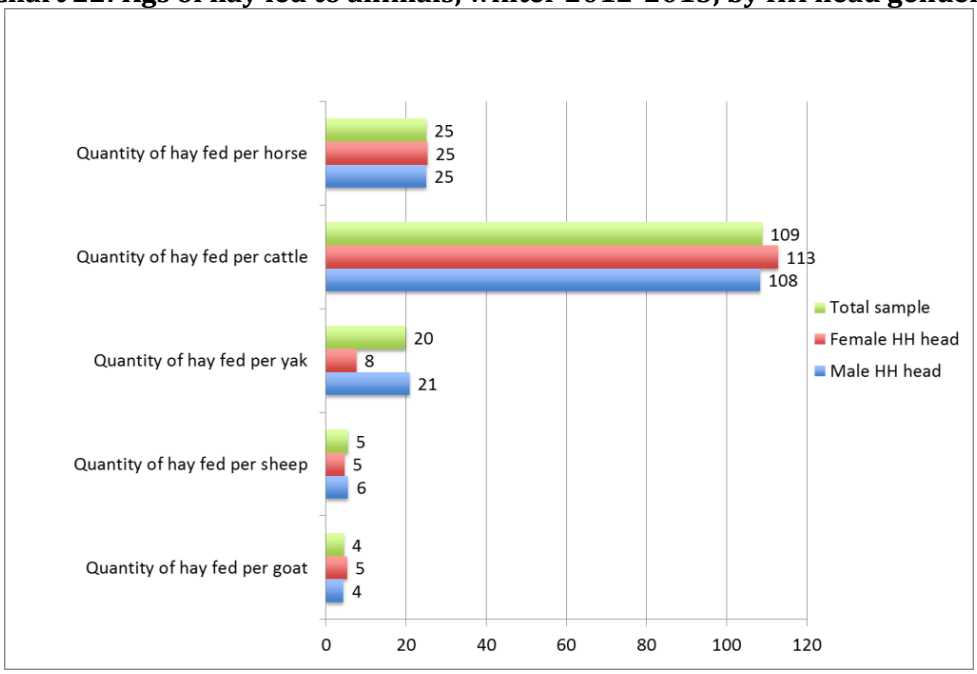
Table 17 displays data on quantities of hay fed to animals and the proportions of animals fed any hay at all during the winter of 2012-2013 (for households that fed their animals any hay). The quantities of hay fed to the average cattle are far larger than the quantities fed to other species, and sheep and goats typically received the least hay.

Table 17: Feeding practices

		Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
Quantity of hay fed per animal								
Quantity of hay fed per horse (in kgs)	Mean	25	25	25	26	29	22	25
	SD	75	81	75	82	93	67	68
	N	565	31	534	74	112	164	211
Quantity of hay fed per cattle (in kgs)	Mean	109	113	108	215	129	100	55
	SD	190	248	184	272	195	159	129
	N	254	23	231	47	39	66	99
Quantity of hay fed per yak (in kgs)	Mean	20	8	21	30	11	20	17
	SD	48	21	50	69	21	51	36
	N	330	24	306	92	89	69	79
Quantity of hay fed per sheep (in kgs)	Mean	5	5	6	13	7	4	2
	SD	15	12	15	25	17	9	6
	N	726	67	658	113	174	204	231
Quantity of hay fed per goat (in kgs)	Mean	4	5	4	9	6	3	2
	SD	11	11	10	17	12	6	4
	N	773	74	698	128	199	207	234
Proportions of animals fed any hay at all								
Proportion of horses fed hay (for HHs that fed any horses)	Mean	0.39	0.68	0.38	0.59	0.53	0.37	0.32
	N	240	8	232	24	38	76	100
Proportion of cattle fed hay (for HHs that fed any cattle)	Mean	0.77	0.83	0.77	0.86	0.78	0.84	0.66
	N	173	17	156	36	31	46	57
Proportion of yak fed hay (for HHs that fed any yak)	Mean	0.51	0.58	0.50	0.58	0.49	0.49	0.45
	N	153	9	144	46	44	30	33
Proportion of sheep fed hay (for HHs that fed any sheep)	Mean	0.46	0.61	0.45	0.73	0.55	0.38	0.31
	N	355	31	323	61	82	98	110
Proportion of goats fed hay (for HHs that fed any goats)	Mean	0.38	0.54	0.37	0.63	0.45	0.32	0.24
	N	446	43	402	72	118	124	129

Also, as Chart 22 makes clear, female-headed households that fed any hay to their animals typically fed them the same amount per animal as did male-headed households.

Chart 22: Kgs of hay fed to animals, winter 2012-2013, by HH head gender



But once again, we see in Chart 23 evidence of smaller herd size households investing more per animal than larger herd size households, this time with respect to the amount of hay the typical animal was fed. This is consistent with the data showing smaller households purchased more hay per animal than larger herd households.

Chart 23: Kgs of hay fed to animals, winter 2012-2013, by herd size

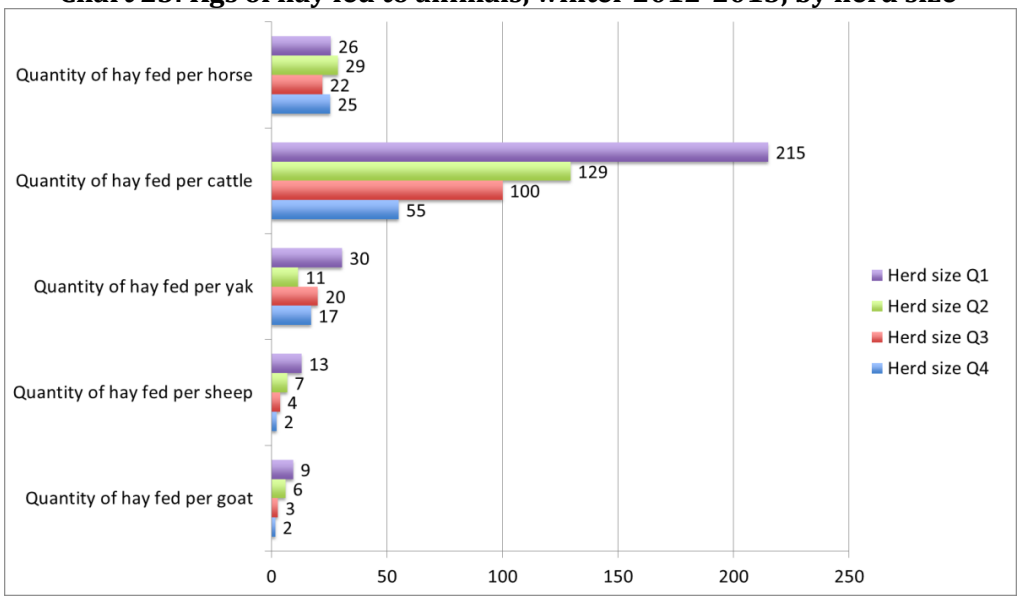
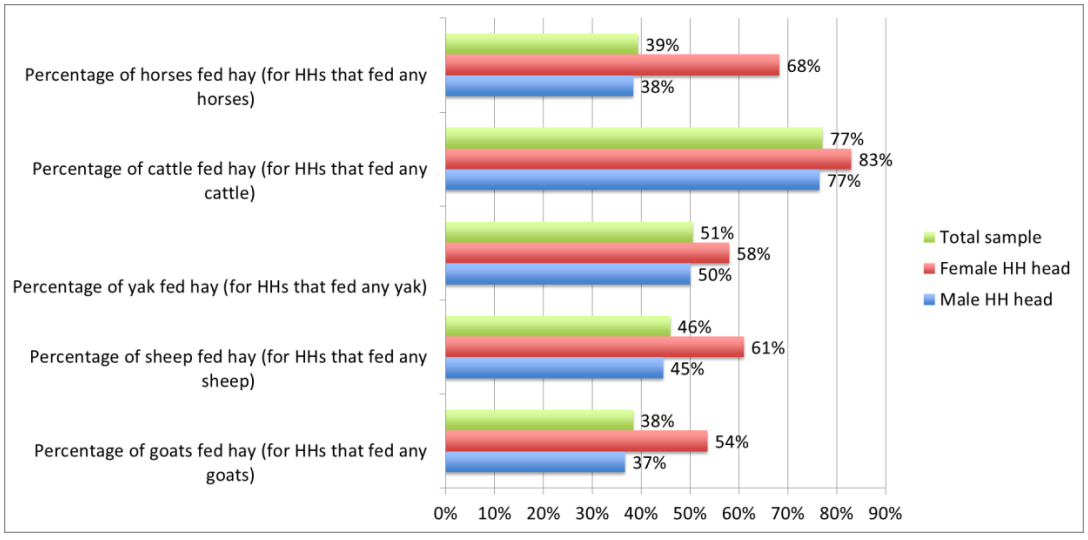


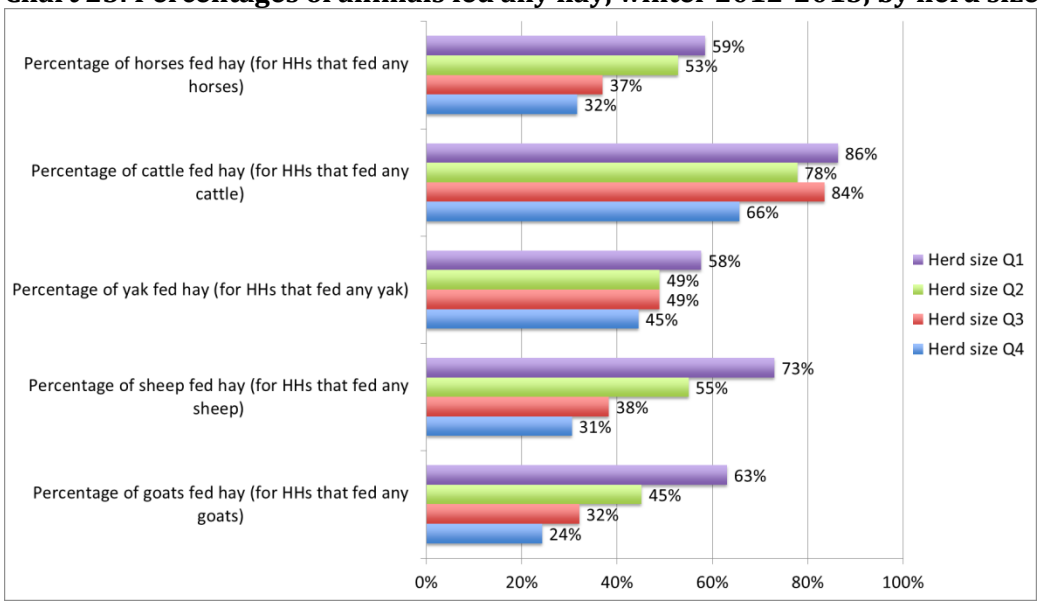
Table 17 shows that cattle that were fed the highest proportion of hay of all livestock species in the winter of 2012-2013, Besides cattle, however, the percentage of animals fed (out of the households who fed their species any hay at all) never exceeds 51, and thus it is typically a minority of animals who receive feed even in the households that had hay at their disposal in the winter of 2012-2013. Female-headed households are again an exception; for the female-headed households that fed their animals any hay, greater proportions of the species they kept were given hay, as compared to their male-headed counterparts. This was consistent across all species (see Chart 24).

Chart 24: Percentages of animals fed any hay, winter 2012-2013, by HH head gender



A similar pattern exists for smaller herd size households: The smaller herd size households (who fed any of their animals hay) fed greater proportions of their animals than did their larger herd size household analogs (see Chart 25).

Chart 25: Percentages of animals fed any hay, winter 2012-2013, by herd size



In conclusion, we see yet another way in which households with fewer animals or other resources invest more in the quality of their animals than do other households. This is consistent with the possibility that, along certain dimensions at least, households with fewer animals focus more on animal quality than do households with more animals.

8.5 Animal weights

In an attempt to obtain a relatively objective measure of animal quality and well-being, approximately 7 one year old sheep and 7 one year old goats were weighed in about half of all households (in treatment as well as control districts). Due to the cost and difficulty associated with obtaining a fully representative sample in an environment where animals might be several kilometers away from the household for large portions of the day, the sample of animals that were weighed is one of convenience. In particular, when a herder's animals were sufficiently close to the household, they were found and weighed. Also, it should be noted that these measurements took place between late August and late September of 2012, a few months after the household survey data was collected. This is important to keep in mind when interpreting results, given the strong seasonal effects that help characterize these types of measures of animal nutrition and health in Mongolia. The results can be seen in Table 18.

Table 18: Average small animals weights

		Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
Arkhangai province								
Average sheep weight (kgs)	Mean	52.4	54.6	52.3	50.1	50.3	55.4	56.0
	SD	6.0	4.5	6.1	5.7	6.6	4.4	3.6
	N	84	3	81	20	30	21	13
Average goat weight (kgs)	Mean	35.2	34.7	35.2	34.7	34.6	36.2	35.8
	SD	3.5	4.2	3.5	3.2	3.2	4.2	3.6
	N	85	3	82	23	29	21	12
Bayankhongor province								
Average sheep weight (kgs)	Mean	50.6	51.8	50.5	49.0	50.8	50.3	50.9
	SD	3.9	5.8	3.7	4.8	3.2	3.9	4.2
	N	92	7	85	4	19	33	35
Average goat weight (kgs)	Mean	34.2	35.4	34.1	32.3	33.7	34.0	34.8
	SD	3.6	4.9	3.5	1.2	2.6	3.1	4.5
	N	93	8	85	4	20	33	35
Govi-Altai province								
Average sheep weight (kgs)	Mean	53.6	52.0	53.7	53.1	52.7	53.6	54.2
	SD	3.0	2.1	3.0	1.8	3.6	2.8	2.9
	N	88	8	80	6	19	30	32
Average goat weight (kgs)	Mean	35.9	35.3	36.0	36.7	35.1	35.3	37.0
	SD	3.5	3.5	3.5	2.4	3.1	3.7	3.5
	N	88	8	80	6	19	30	32
Khuvsgul province								
Average sheep weight (kgs)	Mean	53.2	51.8	53.3	49.6	53.1	53.9	53.4
	SD	4.3	3.9	4.4	6.7	3.5	3.7	4.5
	N	91	9	82	8	30	21	32
Average goat weight (kgs)	Mean	33.9	34.3	33.9	32.6	34.0	34.2	33.8
	SD	4.2	4.7	4.2	3.8	4.4	4.5	4.1
	N	91	9	82	8	30	21	32
Zavkhan province								
Average sheep weight (kgs)	Mean	53.5	49.5	54.0	49.3	55.6	54.2	54.4
	SD	4.3	8.9	3.2	6.4	4.0	2.8	2.7
	N	85	9	76	16	11	30	28
Average goat weight (kgs)	Mean	35.3	34.6	35.4	34.3	36.0	35.5	35.5
	SD	2.6	1.7	2.7	1.6	1.9	2.8	3.0
	N	85	9	76	16	11	30	28

Means of sheep and goat weights within households were calculated, and then averaged once again across households, and it is these second averages that are given as means in the table. Average sheep weights are mostly between 50 and 55 kilograms, and average goat weights are mostly between 33 and 37 kilograms. Indeed, the low levels of variation displayed in the table are somewhat striking. Also, in many cases it seems that animals are slightly heavier in male-headed and larger herd size households. To the extent then that these results can be taken as solid indicators of animal well-being in sampled households, female-headed and smaller herd size households do seem to be disadvantaged relative to other households.

8.6 Livestock output production, sales and earnings

The LAMP's most prominent goals are to increase livestock output production, sales and earnings, so it is essential to collect and display data on these types of variables at baseline.

We begin with the production of meat, milk, wool and cashmere[9], and in Table 19 we present average amounts of these types of output produced across all households, for peak and non-peak seasons[10].

Table 19: Livestock output production

		Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
Horse, cattle, yak, sheep and goat meat								
Total amount of meat produced, Oct-Dec 2012 (kgs)	Mean	368	234	383	174	300	397	577
	SD	345	234	352	153	235	252	480
Total amount of meat produced, Jan-Sep 2012 (kgs)	Mean	108	54	114	30	80	125	188
	SD	139	66	144	53	89	122	189
Camel, mare, cattle, yak, sheep and goat milk								
Total amount of milk produced, Jul-Sep 2012 (liters)	Mean	1,411	887	1,471	711	1,178	1,708	1,989
	SD	1,449	1,043	1,477	952	1,256	1,581	1,552
Total amount of milk produced, Jan-Jun and Oct-Dec 2012 (liters)	Mean	726	449	757	463	684	826	913
	SD	996	580	1,028	788	1,020	1,073	1,022
Sheep and yak wool								
Total amount of wool produced, Apr-Sep 2012 (kgs)	Mean	97	34	104	12	39	84	238
	SD	146	72	151	39	69	82	195
Cashmere								
Total amount of cashmere produced, Apr-Sep 2012 (kgs)	Mean	34	18	35	5	18	34	73
	SD	39	21	40	6	13	21	49
Number of observations		867	88	779	212	206	209	235

As the table and Charts 26 and 27 (for peak season production only) make clear, female-headed and smaller herd size households each produce considerably less than other households, for every type of output and for both sets of seasons. This is clear evidence that female-headed and smaller herd size households benefit less from herding than do other households.

[9] The questionnaire included specific questions about each of the following types of livestock output: Horse, cattle/yak, sheep and goat meat; milk from each of the 6 species we asked about; sheep and yak wool; and cashmere from goats. See Appendix 1 for peak and non-peak season production of each of these types of output (with the exception of camel milk, which was not produced by any of the households in the treatment districts). Also, meat was considered to have been produced by the household if household members at least engaged in the slaughter of the animals used to make the meat.

[10] Questions on the production of wool and cashmere during the non-peak season were not included in the questionnaire since production at these times is extremely rare. Similarly for questions on the sale of and earnings from fibers during the non-peak season.

Chart 26: Peak-season output production, by HH head gender

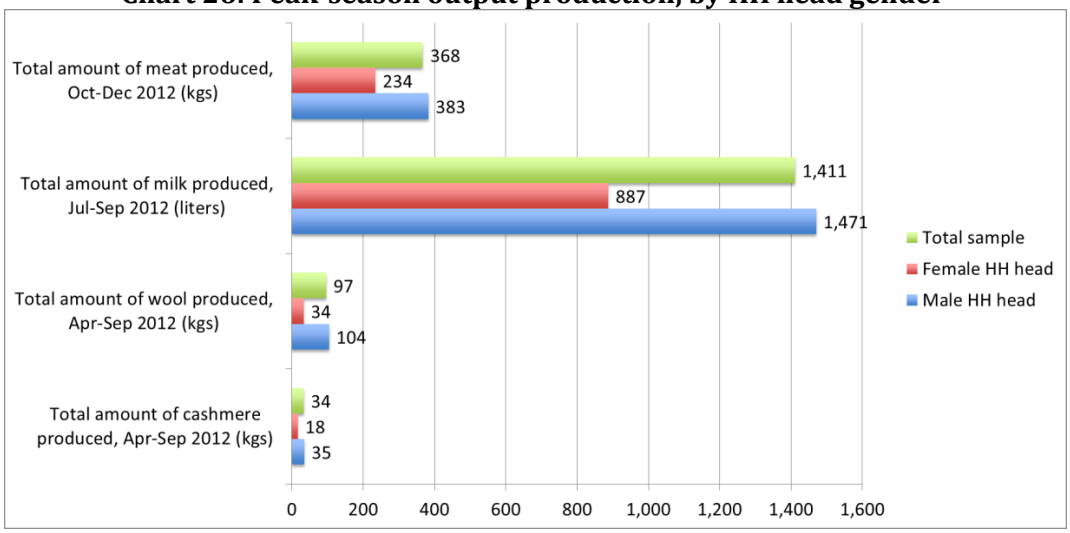
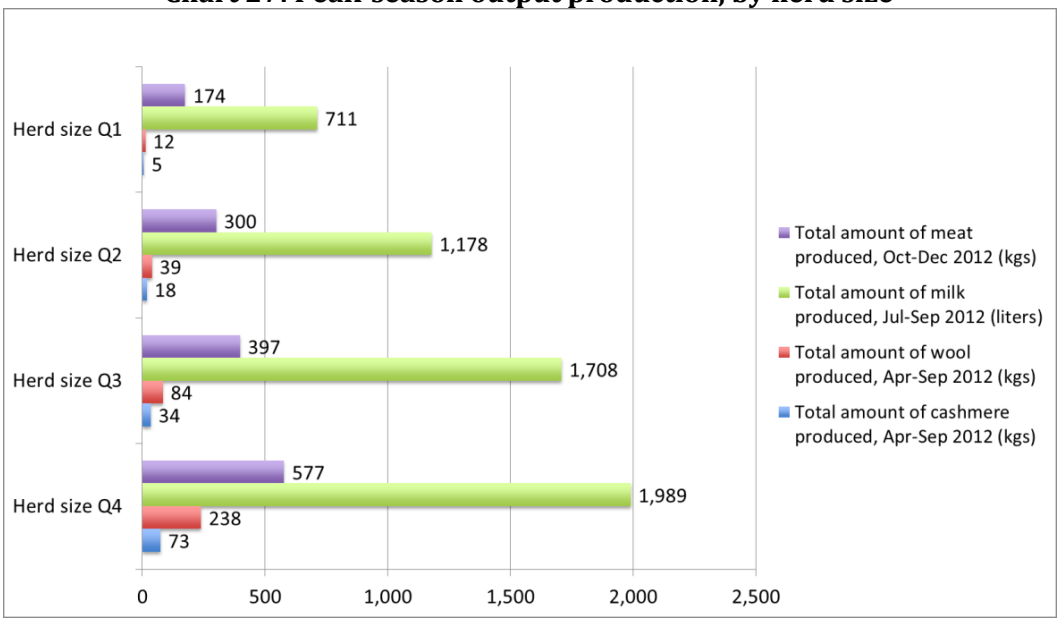


Chart 27: Peak-season output production, by herd size



Market participation is a necessary condition for and a key component of success for the LAMP. Table 20 displays data on the likelihoods of having sold in 2012 any meat, live animals (to commercial organizations of any sort), milk, dairy products[11], wool and cashmere[12].

[11] The dairy products we asked about in our questionnaire include fresh yogurt, sour cream and dried yogurt.
[12] See Appendix 1 for market participation likelihood data for each product separately.

Table 20: Proportion of households who sold output

	Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
HH sold any meat in 2012	0.17	0.10	0.18	0.08	0.16	0.15	0.29
HH sold any live animals to commercial organization in 2012	0.42	0.25	0.44	0.21	0.35	0.47	0.64
HH sold any milk in 2012	0.10	0.02	0.11	0.07	0.12	0.10	0.12
HH sold any dairy products in 2012	0.26	0.18	0.27	0.23	0.26	0.30	0.26
HH sold any wool in 2012	0.75	0.51	0.77	0.44	0.71	0.88	0.94
HH sold any cashmere in 2012	0.87	0.83	0.88	0.59	0.94	0.96	0.99
Number of observations	867	88	779	212	206	209	235

Market participation rates vary widely across output types, with 10 and 87 percent of households having sold any milk and cashmere, respectively. The sale of live animals is not especially common (with 42 percent of all households having engaged in this practice in 2012), but it is considerably more common than selling dairy products, and finally meat. There is therefore ample room for increases in these rates. Another clear result is that market participation rates are substantially dependent on the gender of the household head and the size of the herd; the likelihood of having sold output is often considerably higher for male-headed and larger herd size households (see Charts 28 and 29).

Chart 28: Output market participation rates, by HH head gender

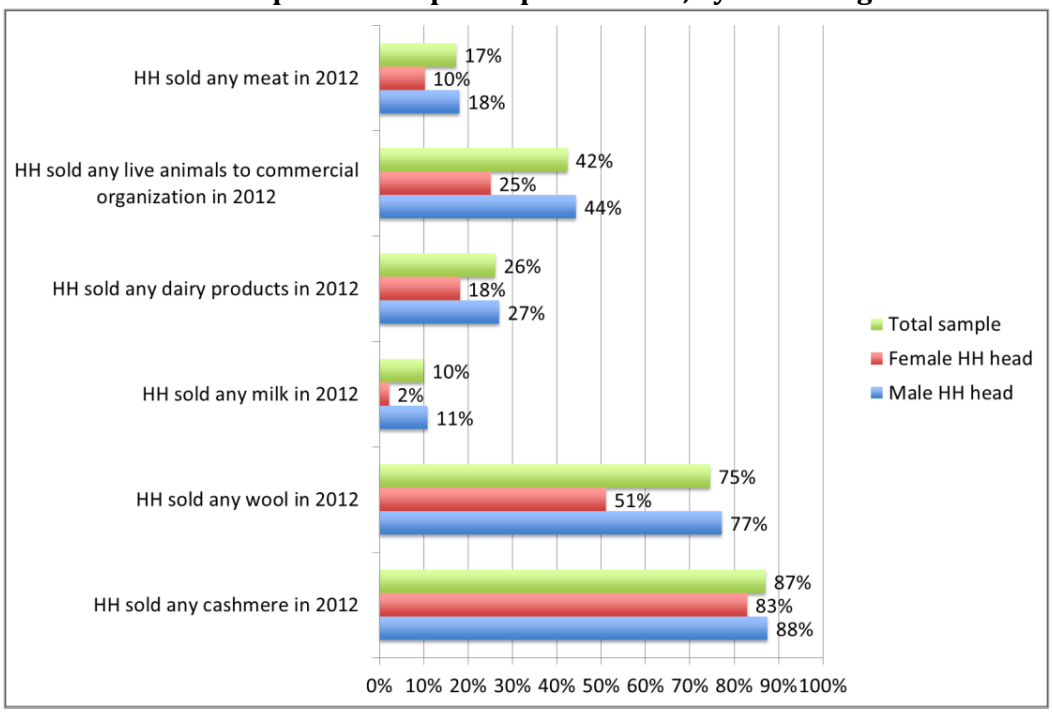
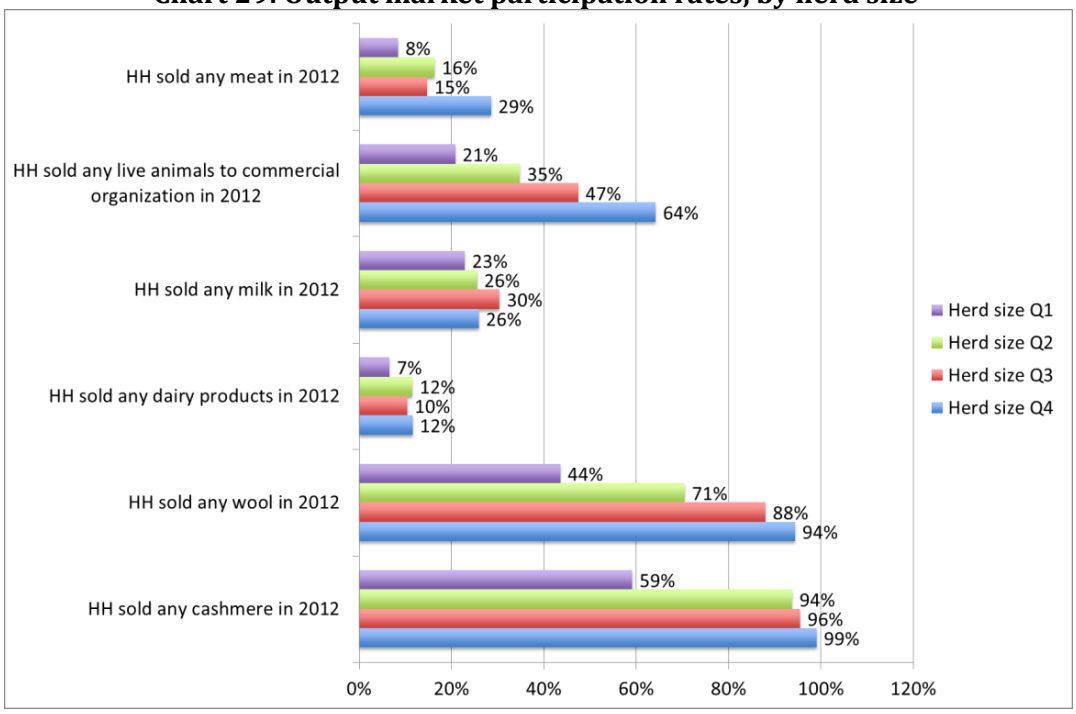


Chart 29: Output market participation rates, by herd size



On a closely related note, Table 21 and Charts 30 and 31 each display data on the quantities of meat, live animals, milk, wool and cashmere sold (averaged across all sample households), during peak and non-peak seasons[13].

Table 21: Output sold

		Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
Horse, cattle, yak, sheep and goat meat								
Total amount of meat sold, Oct-Dec 2012 (kgs)	Mean	55	21	59	15	39	29	128
	SD	209	97	218	76	141	124	344
Total amount of meat sold, Jan-Sep 2012 (kgs)	Mean	13	3	14	3	6	11	30
	SD	69	19	72	20	34	61	111
Live animals sold to commercial organizations in 2012	Mean	12	6	12	2	5	9	29
	SD	26	21	26	7	16	19	39
Camel, mare, cattle, yak, sheep and goat milk								
Total amount of milk sold, Jul-Sep 2012 (liters)	Mean	25	0	28	9	32	25	34
	SD	144	4	152	78	164	137	174
Total amount of milk sold, Jan-Jun and Oct-Dec 2012 (liters)	Mean	33	12	35	19	52	25	35
	SD	148	107	152	114	190	125	150
Sheep and yak wool								
Total amount of wool sold, Apr-Sep 2012 (kgs)	Mean	95	32	102	12	36	77	239
	SD	146	73	150	39	65	63	198
Cashmere								
Total amount of cashmere sold, Apr-Sep 2012 (kgs)	Mean	33	17	35	5	18	34	72
	SD	38	21	39	6	13	21	49
Number of observations		867	88	779	212	206	209	235

[13] See Appendix 1 for these sales quantity data disaggregated by product.

Chart 30: Peak-season output quantities sold, by HH head gender

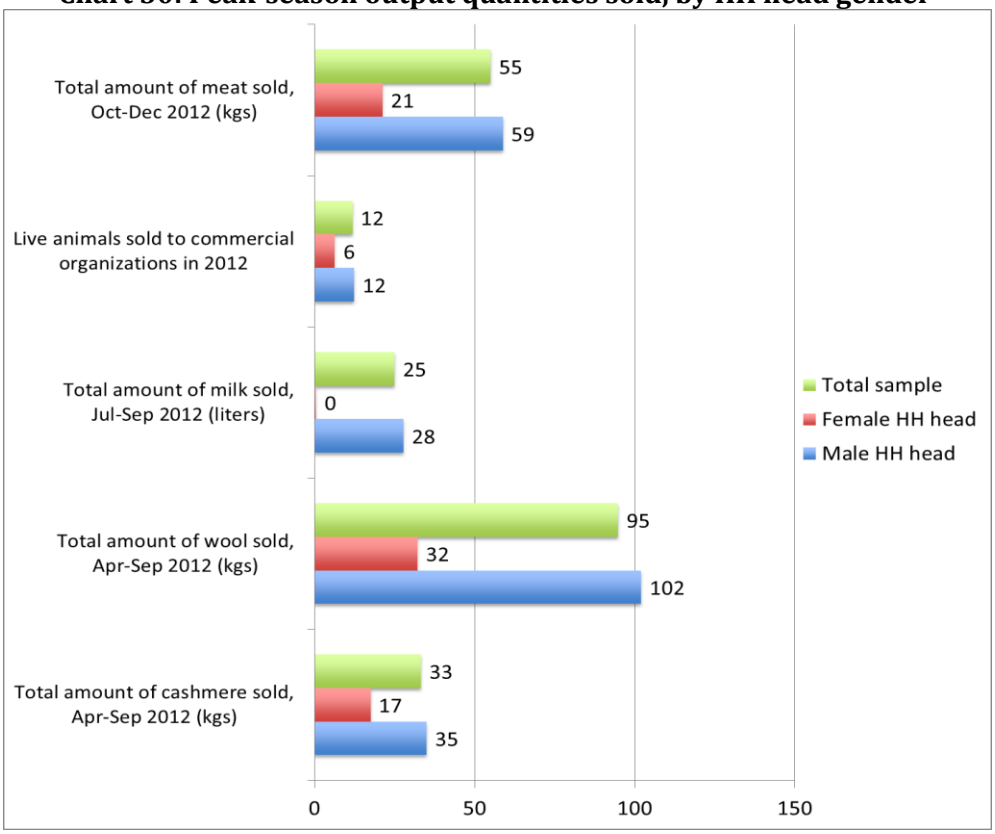
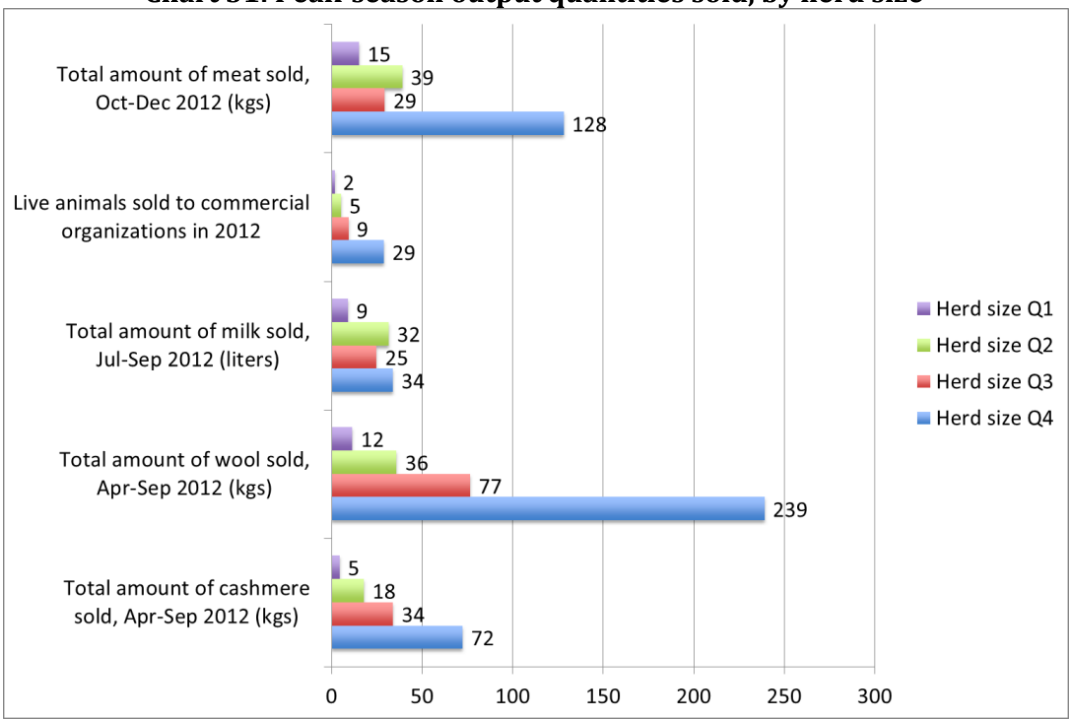


Chart 31: Peak-season output quantities sold, by herd size



A finding here is that female-headed and smaller herd size households sell considerably less than other households. Also, as Table 22 highlights, for meat and milk at least, the average proportions of produced output that are sold are quite low—households consume most of the meat and milk they produce, and commercial activity is therefore quite limited for these types of output. Wool and cashmere are commonly sold, however, with at least 95 percent of produced quantities being sold for each type of fiber. For most types of output, the proportions that are sold do not tend to differ very much by either the gender of the head or by herd size. Exceptions include wool, where female-headed households only sell 85 percent of produced output (as compared to 96 percent for male-headed households), and meat, where larger herd size households sell larger proportions of produced output.

Table 22: Proportions of output sold

		Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
Proportion of produced meat sold	Mean	0.07	0.04	0.07	0.04	0.07	0.05	0.12
	SD	0.18	0.14	0.18	0.15	0.17	0.14	0.23
	N	839	81	757	195	199	206	234
Proportion of produced milk sold	Mean	0.02	0.00	0.02	0.01	0.03	0.02	0.02
	SD	0.08	0.03	0.08	0.06	0.10	0.08	0.08
	N	747	74	673	157	172	187	227
Proportion of produced wool sold	Mean	0.95	0.85	0.96	0.94	0.91	0.95	0.98
	SD	0.22	0.36	0.20	0.24	0.29	0.21	0.16
	N	665	53	612	94	152	189	225
Proportion of produced cashmere sold	Mean	1.00	0.99	1.00	1.00	1.00	1.00	0.99
	SD	0.08	0.06	0.08	0.03	0.06	0.10	0.09
	N	755	73	682	125	192	200	233

Income from the household livestock operation will be one of the key measures of the LAMP's effectiveness and success, and it is this set of variables we turn our attention to now. Table 23 presents data on average earnings associated with peak and non-peak season sales of meat, live animals, dairy products, wool and cashmere[14]. As the results for the total sample show, cashmere and the sales of live animals are the largest income sources, resulting in more than 1.6 million MNT and 1.5 million MNT in additional income annually, respectively. Wool and meat earnings are next highest, followed by earnings from dairy products and finally milk.

[14] Again, non-peak season earnings data for wool and cashmere are omitted here due to the miniscule volumes of sales of these goods that took place. Also, see Appendix 1 for these same data disaggregated with respect to product.

Table 23: Output earnings

		Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
Horse, cattle, yak, sheep and goat meat								
Total earnings from meat sold, Oct-Dec 2012 (MNT)	Mean	199,452	75,852	213,415	51,306	127,390	141,801	449,570
	SD	858,622	395,641	895,093	295,271	496,146	700,667	1,378,949
Total earnings from meat sold, Jan-Sep 2012 (MNT)	Mean	51,324	8,523	56,159	8,456	17,647	43,365	127,224
	SD	303,912	46,598	319,900	68,438	131,237	252,199	506,822
Earnings from live animals sold to commercial organizations in 2012 (MNT)	Mean	1,530,459	462,761	1,651,072	431,918	640,454	1,477,600	3,364,139
	SD	2,927,449	1,492,040	3,024,368	1,362,099	1,465,596	2,386,805	4,224,227
Camel, mare, cattle, yak, sheep and goat milk								
Total earnings from milk sold, Jul-Sep 2012 (MNT)	Mean	19,640	227	21,832	7,201	23,538	19,403	27,730
	SD	113,526	2,132	119,575	61,565	127,623	105,972	139,971
Total earnings from milk sold, Jan-Jun and Oct-Dec 2012 (MNT)	Mean	35,260	9,545	38,164	21,922	52,126	23,633	42,902
	SD	159,958	85,338	166,082	130,684	192,692	112,579	185,513
Fresh yogurt, dried yogurt and sour cream								
Total earnings from dairy products sold, Jul-Sep 2012 (MNT)	Mean	55,763	9,693	60,967	45,272	57,264	75,658	46,189
	SD	201,418	46,792	211,296	166,110	204,752	229,791	200,485
Total earnings from dairy products sold, Jan-Jun and Oct-Dec 2012 (MNT)	Mean	59,685	33,670	62,623	32,364	42,116	70,914	90,035
	SD	220,993	111,872	229,951	141,198	160,262	239,861	294,001
Sheep and yak wool								
Total earnings from wool sold, Apr-Sep 2012 (MNT)	Mean	208,569	78,197	223,297	29,633	74,663	175,385	519,460
	SD	330,135	182,680	339,772	99,849	98,777	152,280	470,729
Cashmere								
Total earnings from cashmere sold, Apr-Sep 2012 (MNT)	Mean	1,611,237	862,057	1,695,868	223,215	879,895	1,686,024	3,453,988
	SD	1,808,697	1,177,991	1,848,129	304,604	630,206	1,115,902	2,214,547
Number of observations		867	88	779	212	206	209	235

Also, as the table shows and Charts 32 and 33 highlight (for peak season sales), and perhaps unsurprisingly at this point, female-headed and smaller herd size households tend to earn far less from sales of output than do other households.

Chart 32: Output earnings by HH head gender

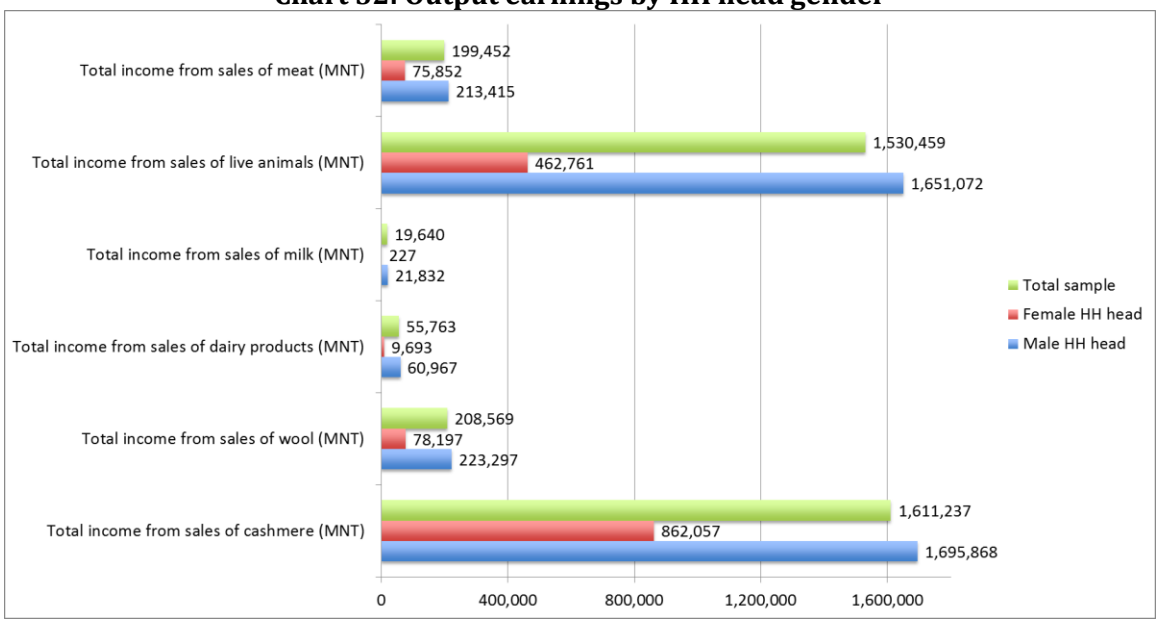
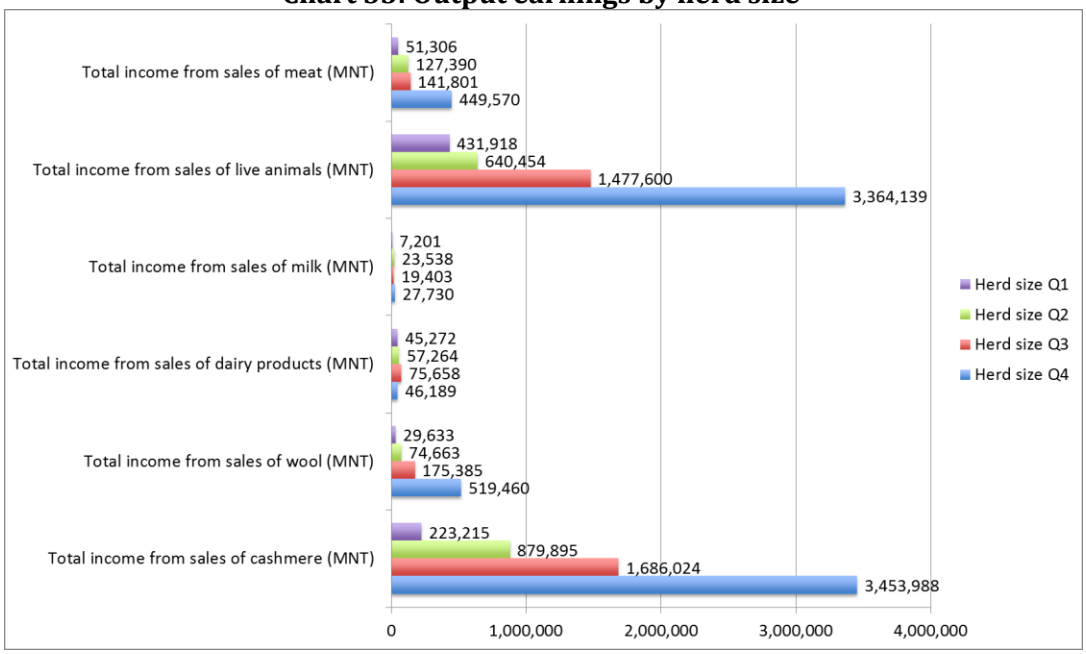


Chart 33: Output earnings by herd size



8.7 Livestock output processing and labor use

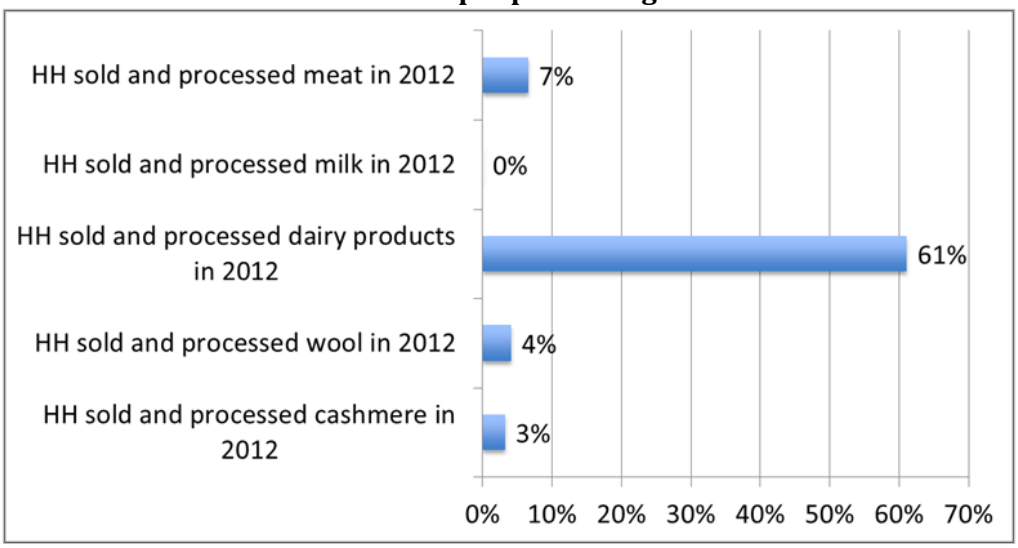
One of the main goals of the LAMP is to increase herder household incomes by successfully encouraging herders (likely organized into cooperatives) to engage in more processing activities. With this in mind, it is useful to understand the extent to which herders engage in processing of livestock output at the baseline. Table 24 displays the likelihoods of having engaged in any processing activities for any of the types of meat, milk, dairy products, wool and cashmere that were asked about[15] (for households that sold any of these types of output). With the exception of dairy products, the processing of output that is sold is quite rare.

Table 24: Output processing

		Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
HH sold and processed meat in 2012	Mean	0.07	0.11	0.06	0.11	0.06	0.03	0.07
	N	150	9	141	18	34	31	67
HH sold and processed milk in 2012	Mean	0	0	0	0	0	0	0
	N	87	2	85	14	24	22	27
HH sold and processed dairy products in 2012	Mean	0.61	0.44	0.62	0.71	0.68	0.56	0.52
	N	227	16	211	49	53	64	61
HH sold and processed wool in 2012	Mean	0.04	0.07	0.04	0.04	0.05	0.03	0.05
	N	647	45	602	92	145	184	222
HH sold and processed cashmere in 2012	Mean	0.03	0.04	0.03	0.02	0.04	0.02	0.04
	N	755	73	682	125	193	199	233

[15] Examples of processing activities that were asked about include sorting, cutting, cleaning, de-hairing, sterilizing, fermenting, sealing and packaging.

Chart 34: Output processing rates



A related set of variables to consider is the amounts spent on paid labor to help produce the different types of output we collected data on[16]. As Table 25 shows, these amounts were quite low on average.

[16] A person-day was considered to have been spent producing some type of output if an individual worked at all on that day producing the type of output in question.

Table 25: Person-days spent producing output

		Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
Horse, cattle, yak, sheep and goat meat								
HH member and unpaid labor person-days used to produce meat	Mean	19	13	19	7	17	22	27
	SD	16	13	16	6	15	13	18
Paid labor person-days used to produce meat	Mean	0.39	0.43	0.39	0.22	0.54	0.35	0.46
	SD	2	2	2	1	2	2	2
Total amount paid to paid labor to produce meat (MNT)	Mean	3,348	1,830	3,519	1,355	3,327	2,710	5,750
	SD	17,001	8,806	17,685	7,902	16,144	14,177	24,350
Number of observations		867	88	779	212	206	209	235
Camel, mare, cattle, yak, sheep and goat milk								
HH member and unpaid labor person-days used to produce milk	Mean	265	216	271	184	237	295	338
	SD	228	202	230	201	215	240	223
Paid labor person-days used to produce milk	Mean	1.31	0	1.45	0.66	0.43	1.71	2.30
	SD	10	.	11	7	6	12	14
Total amount paid to paid labor to produce milk (MNT)	Mean	3,304	0	3,678	3,015	963	4,422	4,637
	SD	24,364	.	25,678	21,516	13,878	28,566	29,454
Number of observations		867	88	779	212	206	209	235
Fresh yogurt, dried yogurt and sour cream								
HH member and unpaid labor person-days used to produce dairy products	Mean	316	291	319	254	286	350	369
	SD	246	221	249	244	229	256	239
Paid labor person-days used to produce dairy products	Mean	0	0	0	0	0	0	0
	SD	.	.	.	.	.	.	.
Total amount paid to paid labor to produce dairy products (MNT)	Mean	0	0	0	0	0	0	0
	SD	.	.	.	.	.	.	.
Number of observations		867	88	779	212	206	209	235
Sheep and yak wool								
HH member and unpaid labor person-days used to produce wool (for HHs that owned sheep or yak)	Mean	10	6	11	3	6	11	19
	SD	13	13	13	6	8	12	17
Paid labor person-days used to produce wool (for HHs that owned sheep or yak)	Mean	0.17	0	0.19	0.01	0.04	0.22	0.35
	SD	1.14	.	1.19	0.08	0.28	1.23	1.73
Total amount paid to paid labor to produce wool (MNT, for HHs that owned sheep or yak)	Mean	1,775	0	1,965	0	480	2,727	3,325
	SD	11,838	.	12,443	.	3,528	14,639	16,698
Number of observations		805	78	727	173	189	205	233
Cashmere								
HH member and unpaid labor person-days used to produce cashmere (for HHs that owned goats)	Mean	24	18	24	5	14	25	41
	SD	25	19	26	7	13	24	30
Paid labor person-days used to produce cashmere (for HHs that owned goats)	Mean	2.26	1.21	2.37	0.11	0.74	2.01	5.01
	SD	7.63	7.44	7.64	0.85	2.52	6.02	11.99
Total amount paid to paid labor to produce cashmere (MNT, for HHs that owned goats)	Mean	27,586	5,333	29,957	1,000	9,199	18,987	66,413
	SD	91,959	32,438	95,861	9,201	33,091	54,667	149,325
Number of observations		779	75	704	133	200	207	234

8.8 Livestock output buyers and sales under contract

Another one of the LAMP's key goals is to increase the amount of output sales that are made to formal commercial enterprises (as opposed to middle men). It is therefore obviously important to understand the extent to which herders currently interact with non-middle man buyers. Table 26 displays the likelihood of having sold any of the various types of output to either middle men, enterprises in the soum or aimag center, a representative from a processor firm, or another buyer[17].

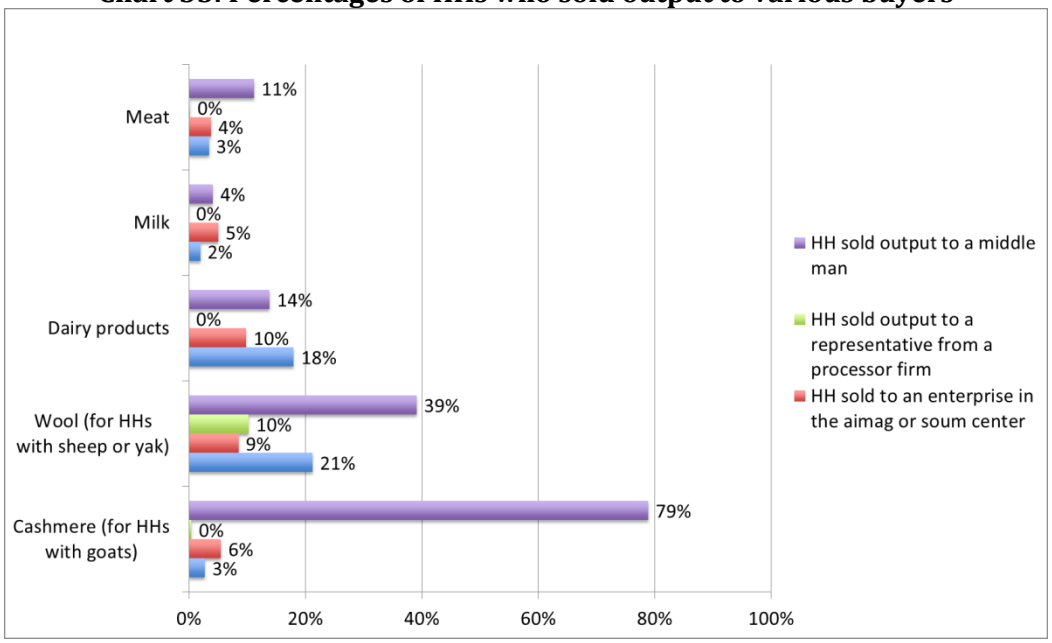
[17] Other buyers included own group or cooperative, other group or cooperative, and other households.

Table 26: Output buyers

		Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
Horse, cattle, yak, sheep and goat meat								
HH sold meat to a middle man	Mean	0.11	0.05	0.12	0.05	0.10	0.09	0.20
HH sold meat to a representative from a processor firm	Mean	0	0	0	0	0	0	0
HH sold meat to an enterprise in the aimag or soum center	Mean	0.04	0.06	0.04	0.02	0.05	0.02	0.06
HH sold meat to another buyer	Mean	0.03	0.00	0.04	0.02	0.02	0.03	0.06
Number of observations		867	88	779	212	206	209	235
Camel, mare, cattle, yak, sheep and goat milk								
HH sold milk to a middle man	Mean	0.04	0.01	0.04	0.02	0.06	0.03	0.05
HH sold milk to a representative from a processor firm	Mean	0	0	0	0	0	0	0
HH sold milk to an enterprise in the aimag or soum center	Mean	0.05	0.01	0.06	0.04	0.05	0.07	0.05
HH sold milk to another buyer	Mean	0.02	0.00	0.02	0.02	0.02	0.02	0.02
Number of observations		867	88	779	212	206	209	235
Fresh yogurt, dried yogurt and sour cream								
HH sold dairy products to a middle man	Mean	0.14	0.09	0.14	0.14	0.14	0.14	0.14
HH sold dairy products to a representative from a processor firm	Mean	0	0	0	0	0	0	0
HH sold dairy products to an enterprise in the aimag or soum center	Mean	0.10	0.06	0.10	0.07	0.09	0.13	0.10
HH sold dairy products to another buyer	Mean	0.18	0.14	0.18	0.17	0.19	0.19	0.17
Number of observations		867	88	779	212	206	209	235
Sheep and yak wool								
HH sold wool to a middle man (for HHs that owned sheep or yak)	Mean	0.39	0.26	0.41	0.30	0.43	0.46	0.38
HH sold wool to a representative from a processor firm (for HHs that owned sheep or yak)	Mean	0.10	0.06	0.11	0.03	0.09	0.12	0.17
HH sold wool to an enterprise in the aimag or soum center (for HHs that owned sheep or yak)	Mean	0.09	0.09	0.08	0.06	0.07	0.09	0.12
HH sold wool to another buyer (for HHs that owned sheep or yak)	Mean	0.21	0.13	0.22	0.07	0.17	0.28	0.31
Number of observations		805	78	727	173	189	205	233
Cashmere								
HH sold cashmere to a middle man (for HHs that owned goats)	Mean	0.79	0.70	0.80	0.55	0.82	0.87	0.91
HH sold cashmere to a representative from a processor firm (for HHs that owned goats)	Mean	0	0	0.01	0	0	0.01	0
HH sold cashmere to an enterprise in the aimag or soum center (for HHs that owned goats)	Mean	0.06	0.10	0.05	0.03	0.10	0.04	0.05
HH sold cashmere to another buyer (for HHs that owned goats)	Mean	0.03	0.02	0.03	0.01	0.02	0.04	0.03
Number of observations		779	75	704	133	200	207	234

As Chart 35 shows, for most types of output, sales to middle men tend to account for a large share of all sales: 79 percent of all households sold cashmere to middle men, and 11 percent of meat-selling households—which makes up the majority of sales--sold to them, for example.

Chart 35: Percentages of HHs who sold output to various buyers



A final market-related, key indicator of project success will be the number of sales of livestock output that take place under contracts between herders and buyers. Table 27 presents data on the likelihoods of having sold any of the various types of output under

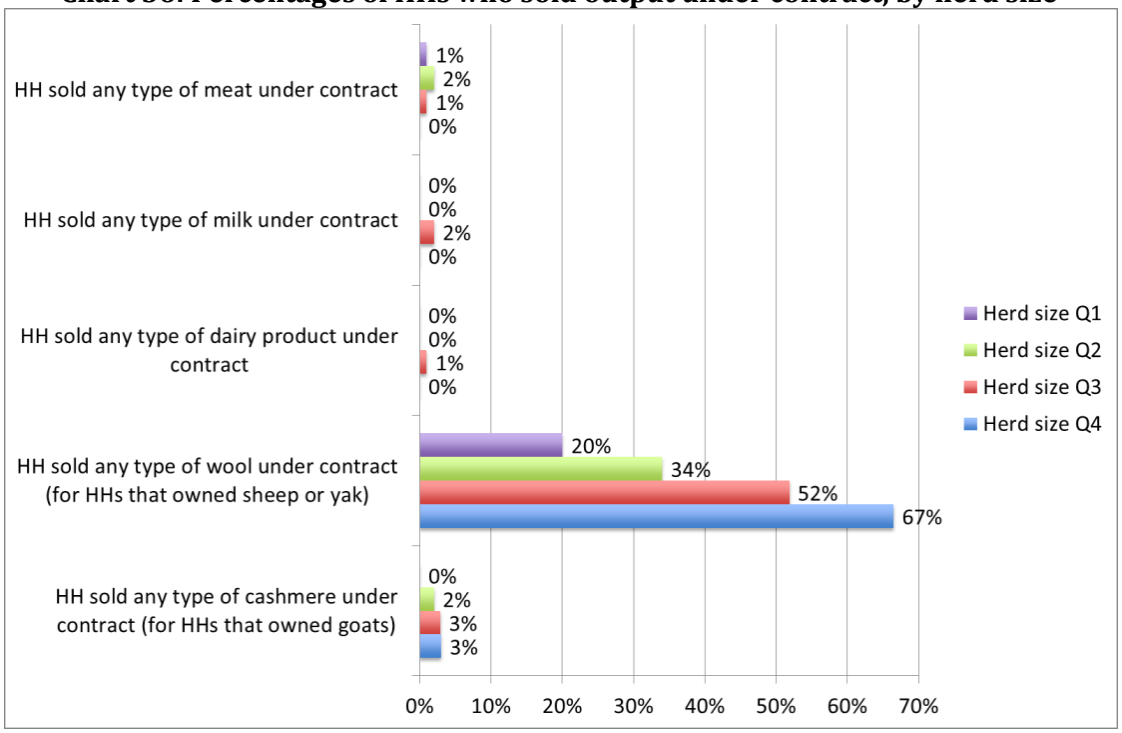
contract in 2012[18], and makes clear that with the exception of sales of wool, these more structured transactions are exceedingly rare.

Table 27: Output sales under contract

		Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
HH sold any type of meat under contract	Mean	0.02	0.02	0.02	0.01	0.02	0.01	0.02
	N	867	88	779	212	206	209	235
HH sold any type of milk under contract	Mean	0.01	0	0.01	0	0	0.02	0.01
	N	867	88	779	212	206	209	235
HH sold any type of dairy product under contract	Mean	0.01	0.01	0.01	0	0	0.01	0.01
	N	867	88	779	212	206	209	235
HH sold any type of wool under contract (for HHs that owned sheep or yak)	Mean	0.45	0.38	0.46	0.20	0.34	0.52	0.67
	N	805	78	727	173	189	205	233
HH sold any type of cashmere under contract (for HHs that owned goats)	Mean	0.02	0.03	0.02	0	0.02	0.03	0.03
	N	779	75	704	133	200	207	234

The fact that such a relatively large proportion of all sheep- or yak-owning households sold wool under contract is likely related to the rules governing the receipt of per-unit subsidies for wool sales. In particular, herders were eligible to receive the subsidy only if they sold wool to representatives of processor firms (as opposed to ordinary middle men), and it is likely that cooperatives were typically formed to facilitate these types of transactions. Thus, while the tiny proportions of sales that took place under contract might initially seem like a cause for pessimism, the example given by wool is evidence that sales under contract can be drastically increased if herders are given clear incentives. Such wool sales under contract are more common for larger herd size households.

Chart 36: Percentages of HHs who sold output under contract, by herd size



[18] These likelihoods are defined for all households that owned any of the relevant types of species. For example, the likelihood of having sold wool under contract in 2012 is only defined for households that owned sheep or yak, the species responsible for production of the 2 types of wool we asked about.

8.9 Livestock insurance and migration practices

Index-based livestock insurance provides payouts to herders who purchased it when district-wide livestock mortality rates are sufficiently high following winter disasters. The hope is that this type of insurance will allow herders to insulate their livestock operations from risk to some extent, and in turn that herders will be encouraged to invest more in the quality of their animals. Thus, livestock insurance coverage is arguably a meaningful indicator of the extent to which herders are focused on the quality of their herds, and so we present data on livestock insurance coverage in Table 28. About 25 percent of all sample households have previously purchased livestock insurance, and that likelihood is higher for male-headed and larger herd size households. Data on the annual amount spent on insurance (conditional on having purchased any) is also displayed, and female-headed and smaller herd size households report having spent less on livestock insurance than other households.

Table 28: Livestock insurance

		Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
Respondent has heard of livestock insurance	Mean	0.79	0.58	0.81	0.63	0.82	0.81	0.87
	N	867	88	779	212	206	209	235
HH has purchased livestock insurance	Mean	0.25	0.17	0.26	0.13	0.21	0.32	0.34
	N	867	88	779	212	206	209	235
Annual amount spent on insurance (MNT, for HHs that purchased insurance)	Mean	114,317	72,770	117,357	52,027	69,025	98,295	173,181
	SD	167,752	72,065	172,387	54,684	72,970	118,618	235,009
	N	220	15	205	27	42	68	81

Tables 29 and 30 present data on sample herders' migration habits and practices. Given that migration patterns are driven to some extent by the quality of available pasture and water resources, once again we have here a potentially useful set of indicators of the kinds of investments that herders make into their animals' quality. Table 29 first shows that 74 percent of sample households are migratory, and then displays the proportions of these migratory households who have usual camps where they spend their seasons. Herders are more likely to have winter and summer camps than they are for the other 2 seasons, which reflects the tendencies of certain herders to migrate fewer times per year than others[19].

Table 29: Household migration

		Total sample
Migratory HH	Mean	0.74
	N	867
Migratory HH has a winter camp	Mean	0.88
	N	642
Migratory HH has a spring camp	Mean	0.66
	N	642
Migratory HH has a summer camp	Mean	0.86
	N	642
Migratory HH has an autumn camp	Mean	0.72
	N	642

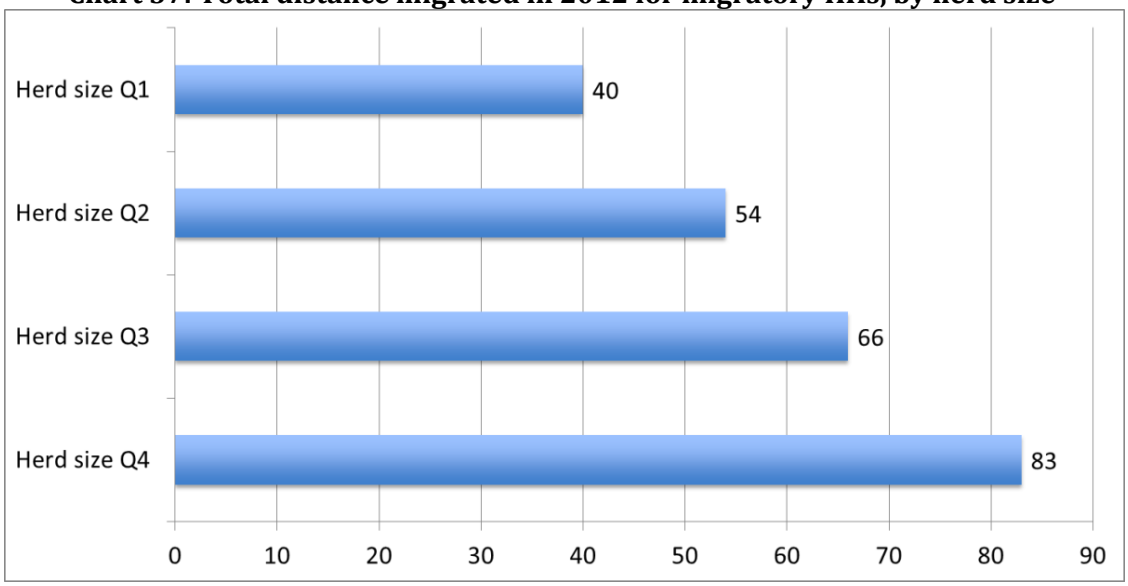
Table 30 and Chart 37 display the average distances migrated for the different herd size quartiles, and they clearly display that larger herd size households tend to migrate longer distances over the course of the year.

[19] Fewer than 2 percent of all households reported not being in one of their usual seasonal camps in 2012 due to poor pastureland quality or limited water availability.

Table 30: Distance migrates and camp licenses

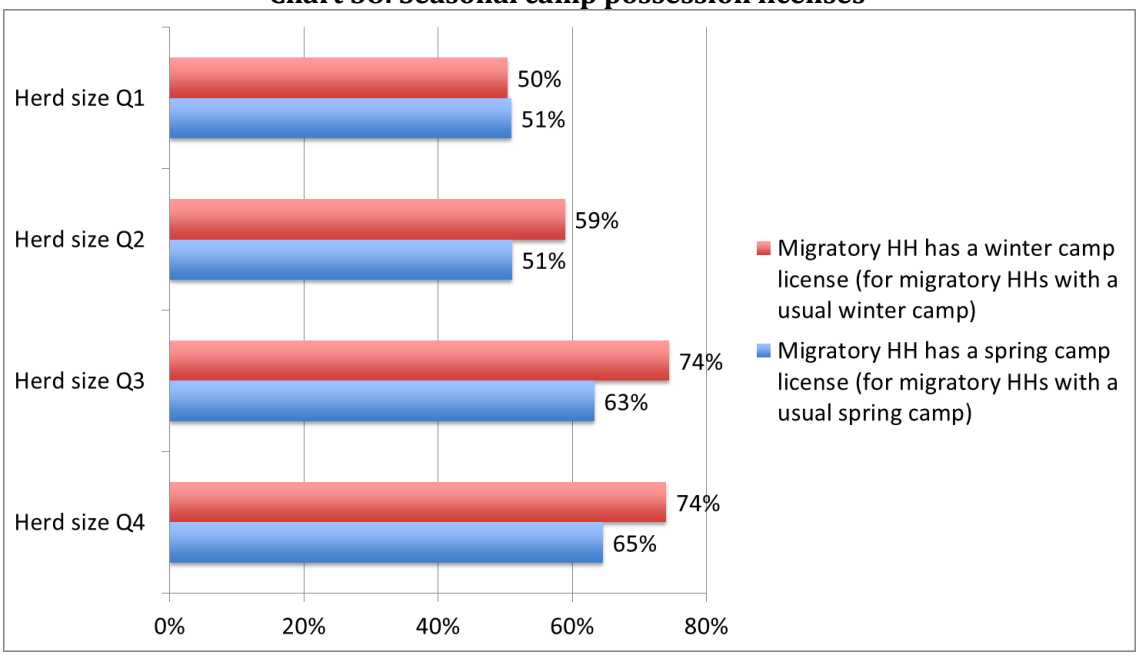
		Total sample	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
Total distance migrated in 2012 (for migratory HHs)	Mean	65	40	54	66	83
	SD	62	53	51	65	64
	N	642	104	146	166	223
Migratory HH has a winter camp license (for migratory HHs with a usual winter camp)	Mean	0.67	0.5	0.59	0.74	0.74
	N	564	81	124	144	212
Migratory HH has a spring camp license (for migratory HHs with a usual spring camp)	Mean	0.6	0.51	0.51	0.63	0.65
	N	426	51	94	119	161

Chart 37: Total distance migrated in 2012 for migratory HHs, by herd size



Finally, Table 30 also shows the proportions of migratory households with usual spring or winter camps who own possession licenses for these camps. These licenses give herders the right to prevent other herders' animals from grazing on covered pastureland, and so license ownership can be understood to be an indicator of herders' animal quality investment tendencies. While around two-thirds of migratory households with the relevant usual seasonal camps have winter and spring possession licenses, we see that it is larger herd size households that are especially likely to have these licenses (see Chart 38).

Chart 38: Seasonal camp possession licenses



Thus, with respect to livestock insurance and migration, we have now seen a few more ways in which female-headed and smaller herd size households seem to be doing less than other households to invest in the quality of their animals.

9 Crop cultivation

Crop cultivation among sampled households was quite rare. Only about 5 percent of both female- and male-headed households engaged in this practice. Those households that do cultivate crops tend to grow only a couple of crops, and they do so on fairly small plots. Input use is also quite low, with only 35 percent of households reporting that they used manure (which is quite readily available) as an input during the 2012 growing season. Table 31 also displays the average value of produced crops, as well as evidence that once again, female-headed households produce less than their male-headed counterparts.

Table 31: Crop cultivation

		Total sample	Female HH head	Male HH head
HH cultivated crops for human consumption in 2012	Mean	0.05	0.05	0.05
	N	867	88	779
Number of plots that were cultivated in 2012 (for HHs that cultivated crops)	Mean	1.10	1.25	1.08
	SD	0.38	0.50	0.37
	N	40	4	36
Plot size (ha, for HHs that cultivated crops)	Mean	1.85	1.00	1.94
	SD	2.75	0.82	2.88
	N	39	4	35
Number of crops cultivated (for HHs that cultivated crops)	Mean	2.08	3.50	1.92
	SD	1.46	3.00	1.16
	N	40	4	36
HH used organic fertilizer/manure in 2012 (for HHs that cultivated crops)	Mean	0.35	0.25	0.36
	N	40	4	36
HH used insecticide in 2012 (for HHs that cultivated crops)	Mean	0.18	0.75	0.11
	N	40	4	36
HH used another input in 2012 (for HHs that cultivated crops)	Mean	0.05	0.00	0.06
	N	40	4	36
Person-days spent cultivating by HH members and unpaid labor in 2012 (for HHs that cultivated crops)	Mean	65	67	64
	SD	77	51	80
	N	40	4	36
Person-days spent cultivating by paid labor in 2012 (for HHs that cultivated crops)	Mean	12	1	14
	SD	38	1	40
	N	40	4	36
Value of crops cultivated per hectare (MNT, for HHs that cultivated crops)	Mean	755,712	604,158	766,285
	SD	1,363,298	671,192	1,402,900
	N	46	3	43

Table 32 displays the 2012 quantities produced and sold per hectare, the proportions of produced crops that spoiled, and the amounts earned from sales of crops per cultivated hectare. These data are shown for the 3 most commonly grown crops: potatoes, yellow turnips and carrots. Again, we see that the proportions sold are rather low. Finally, spoilage was not reported to be a major problem.

Table 32: Most commonly produced crops

		Total sample	Female HH head	Male HH head
Potatoes				
Quantity of potatoes produced per cultivated hectare (kgs)	Mean	3,027	3,611	2,970
	SD	4,290	3,802	4,387
	N	34	3	31
Quantity of potatoes sold per cultivated hectare (kgs)	Mean	936	222	1,003
	SD	2,095	385	2,179
	N	35	3	32
Proportion of potatoes spoiled	Mean	0.01	0.03	0.01
	SD	0.04	0.06	0.03
	N	36	4	32
Total amount earned from sales of potatoes per cultivated hectare (MNT)	Mean	1,570,108	166,667	1,710,452
	SD	1,974,356		2,022,490
	N	11	1	10
Yellow turnips				
Quantity of yellow turnips produced per cultivated hectare (kgs)	Mean	3,322	2,600	3,482
	SD	3,194	849	3,536
	N	11	2	9
Quantity of yellow turnips sold per cultivated hectare (kgs)	Mean	160	0	196
	SD	256	0	272
	N	11	2	9
Proportion of yellow turnips spoiled	Mean	0.02	0.00	0.03
	SD	0.05	0.00	0.05
	N	11	2	9
Total amount earned from sales of yellow turnips per cultivated hectare (MNT)	Mean	1,585,000	.	1,585,000
	SD	1,342,473	.	1,342,473
	N	4	0	4
Carrots				
Quantity of carrots produced per cultivated hectare (kgs)	Mean	1,132	1,700	989
	SD	973	990	981
	N	10	2	8
Quantity of carrots sold per cultivated hectare (kgs)	Mean	570	1,450	350
	SD	841	1,344	612
	N	10	2	8
Proportion of carrots spoiled	Mean	0	0	0
	SD	.	.	.
	N	10	2	8
Total amount earned from sales of carrots per cultivated hectare (MNT)	Mean	482,480	176,200	686,667
	SD	478,061	245,790	520,128
	N	5	2	3

10 Household income and expenditure

10.1 Household income

Household income is one of the most important indicators of the LAMP's success. Table 33 shows that income from sales of live animals to commercial organizations and cashmere were biggest contributors to household livestock operation income. Other major sources of household income include wages and salaries and welfare payments and social transfers. The large percentage of income made from the sale of live animals in sampled households suggests that the LAMP's interventions, if successful, should have significant impacts on the economic wellbeing of herding households.

Table 33: Household income

		Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
Total income from watching other herders' animals (MNT)	Mean	48,282	6,916	52,954	27,787	56,804	65,205	44,262
	SD	215,800	46,464	226,509	168,115	228,083	242,988	216,984
Total income from sales of live animals (MNT)	Mean	1,530,459	462,761	1,651,072	431,918	640,454	1,477,600	3,364,139
	SD	2,927,449	1,492,040	3,024,368	1,362,099	1,465,596	2,386,805	4,224,227
Total income from sales of meat (MNT)	Mean	270,647	84,375	291,689	59,761	145,036	187,900	647,643
	SD	1,093,254	398,293	1,143,803	301,657	510,369	765,185	1,839,108
Total income from sales of milk (MNT)	Mean	60,112	9,773	65,798	34,320	79,400	45,685	79,458
	SD	246,020	85,446	257,364	191,326	285,784	193,803	288,840
Total income from sales of dairy products (MNT)	Mean	121,589	43,364	130,426	79,966	108,522	147,790	147,589
	SD	339,378	119,425	354,740	242,671	321,706	359,694	403,049
Total income from sales of wool (MNT)	Mean	210,062	80,148	224,738	31,999	75,805	176,588	520,727
	SD	330,766	184,831	340,347	103,795	99,518	153,157	471,541
Total income from sales of cashmere (MNT)	Mean	1,616,153	862,057	1,701,339	225,609	879,895	1,703,142	3,454,626
	SD	1,808,080	1,177,991	1,847,205	307,634	630,206	1,110,939	2,214,814
Total HH livestock operation gross income (MNT)	Mean	3,944,876	1,549,393	4,215,483	916,711	2,077,080	3,889,284	8,401,452
	SD	4,767,032	2,406,618	4,891,307	1,629,776	2,160,724	2,911,896	6,207,465
Total HH livestock operation net income (MNT)	Mean	3,054,381	1,253,438	3,257,825	631,787	1,416,601	2,894,962	6,849,349
	SD	4,399,847	2,221,635	4,537,403	1,566,571	2,515,738	3,006,086	5,787,275
Total income from sales of crops (MNT)	Mean	4,084	5,295	3,947	210	6,596	4,972	4,595
	SD	30,704	35,019	30,201	3,077	38,811	34,345	32,776
Total income from wages and salaries (MNT)	Mean	1,245,354	512,267	1,328,168	1,806,017	1,589,193	1,245,703	431,006
	SD	2,777,116	1,802,750	2,855,452	3,204,259	3,245,228	2,736,219	1,460,923
Total income from other HH businesses (MNT)	Mean	213,190	4,545	236,760	278,650	321,122	197,526	72,124
	SD	1,065,117	42,640	1,121,210	1,229,179	1,328,029	984,529	597,788
Total income from welfare and social transfers (MNT)	Mean	1,570,682	2,589,553	1,455,584	1,816,133	1,714,271	1,413,466	1,360,984
	SD	1,693,531	1,588,538	1,667,209	1,736,785	1,891,630	1,531,297	1,571,545
Total income from other miscellaneous sources (MNT)	Mean	23,895	11,148	25,335	7,032	27,312	35,799	25,569
	SD	133,071	72,131	138,229	67,571	139,103	164,439	140,041
Total non-livestock HH income (MNT)	Mean	3,169,668	3,142,726	3,172,712	4,016,445	3,779,783	3,018,483	1,994,905
	SD	3,755,490	2,812,076	3,848,969	3,851,099	4,454,361	3,674,539	2,585,554
Total HH income (MNT)	Mean	7,156,057	4,694,580	7,434,119	4,970,925	5,956,866	6,942,929	10,400,000
	SD	5,768,146	3,592,476	5,901,597	4,319,530	5,169,614	4,700,109	6,821,516
Number of observations		867	88	779	212	206	209	235

As Chart 39 makes clear, female-headed households had substantially lower incomes of all types than did male-headed households, with the exception of other (non-livestock operation) income.

Chart 39: HH income, by HH head gender

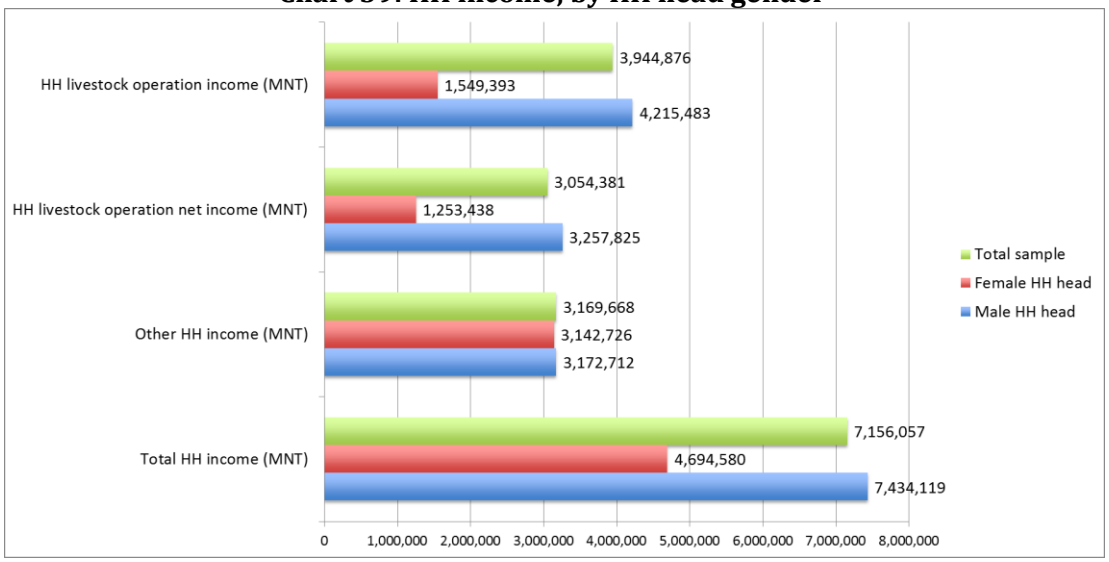
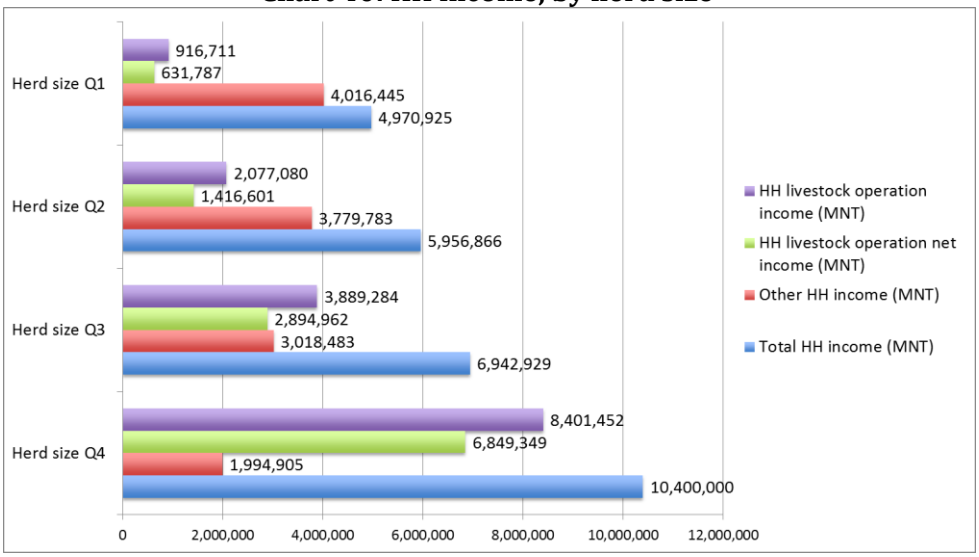


Table 33 shows that it is female-headed households' higher income from welfare and social transfer payments that is responsible for this. Moreover, as Chart 40 displays, larger herd size households had higher incomes of all types except other household income. Of course, these higher non-livestock operation incomes for smaller herd size households do not offset the tendency for the other types of income to be lower, as total household income is still increasing with herd size.

Chart 40: HH income, by herd size



10.2 Household expenditure

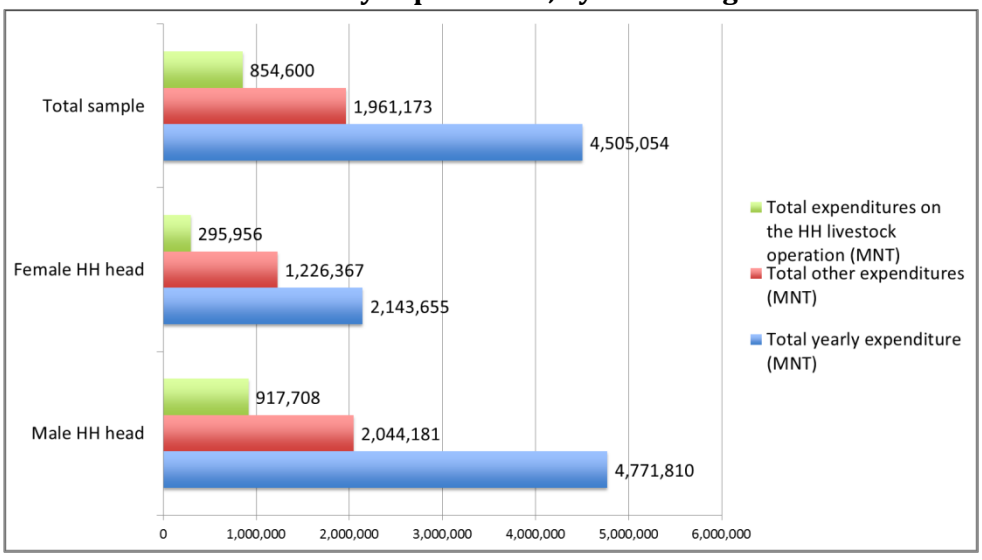
Table 34 displays results for another very important set of household welfare indicators, yearly expenditures on the household livestock operation and other goods and services. Purchases of animals and animal nutrition are the biggest livestock-related expenditures, reflecting a focus on herd sizes and the most basic component of animal well-being,. Non-livestock operation expenditures are largest for household members' educational costs, housing amenities, vehicles and health care.

Table 34: Household yearly expenditure

		Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
Total expenditures on livestock purchases (MNT)	Mean	406,506	34,432	448,537	125,085	319,593	485,305	668,988
	SD	1,138,080	205,571	1,191,460	622,885	974,335	1,194,955	1,472,824
Total expenditures on animal breeding (MNT)	Mean	5,753	909	6,300	1,040	5,237	5,002	11,171
	SD	23,277	5,547	24,428	5,998	21,153	20,405	33,970
Total expenditures on animal health (MNT)	Mean	40,373	27,063	41,876	10,921	22,273	37,881	85,406
	SD	62,007	52,559	62,837	17,076	30,130	40,197	92,661
Total expenditures on animal nutrition (MNT)	Mean	171,827	119,199	177,772	68,400	123,630	186,979	295,002
	SD	280,354	229,294	285,039	186,322	193,099	287,210	353,870
Total expenditures on migration (MNT)	Mean	80,172	57,089	82,779	35,490	61,210	88,973	129,724
	SD	93,268	74,244	94,865	65,933	74,152	98,137	100,407
Total expenditures on paid labor (MNT)	Mean	41,674	6,375	45,661	7,880	16,849	35,583	99,819
	SD	142,729	30,974	149,705	49,547	56,113	112,512	232,416
Total expenditures on transportation to output buyers (MNT)	Mean	88,262	50,680	92,507	31,901	66,629	94,583	153,028
	SD	189,408	133,158	194,352	101,968	125,726	187,774	264,998
Total expenditures on the HH livestock operation (MNT)	Mean	854,600	295,956	917,708	282,021	627,444	957,813	1,484,197
	SD	1,410,474	420,742	1,468,118	761,373	1,087,506	1,413,245	1,802,498
Total expenditures on HH members' education (MNT)	Mean	384,340	180,375	407,381	298,162	307,683	467,285	456,317
	SD	827,434	486,650	854,615	676,987	744,709	852,418	976,286
Total expenditures on housing amenities (MNT)	Mean	784,183	227,808	847,034	734,585	598,747	628,093	1,132,852
	SD	2,481,283	474,533	2,605,570	2,140,184	1,776,858	2,147,658	3,393,337
Total expenditures on vehicles (MNT)	Mean	830,563	288,551	891,791	488,236	606,314	792,621	1,374,073
	SD	2,393,108	1,199,078	2,485,340	1,827,370	2,019,393	2,365,574	3,008,621
Total expenditures on health care and medicine (MNT)	Mean	252,677	187,945	259,989	221,785	186,345	322,884	276,568
	SD	535,952	354,096	552,358	486,129	413,531	621,843	583,064
Total expenditures on other agricultural items (MNT)	Mean	81,301	32,609	86,801	51,727	86,230	87,126	98,654
	SD	267,894	169,592	276,351	235,661	281,288	291,450	260,783
Total expenditures on personal goods (MNT)	Mean	37,387	28,511	38,389	34,843	35,571	37,092	41,571
	SD	38,649	31,500	39,262	36,250	37,910	38,024	41,719
Total expenditures on other items (MNT)	Mean	1,961,173	1,226,367	2,044,181	1,564,350	1,718,685	1,948,302	2,548,175
	SD	1,586,739	1,033,510	1,617,118	1,514,325	1,550,087	1,239,393	1,785,851
Total yearly expenditure (MNT)	Mean	4,505,054	2,143,655	4,771,810	3,445,099	3,757,534	4,426,435	6,200,510
	SD	5,314,539	2,106,945	5,499,144	4,394,634	4,795,666	4,652,587	6,538,981
Number of observations		867	88	779	212	206	209	235

Household expenditures of all types are lower for female-headed than for male-headed households (see Chart 41), although it is notable that female-headed household expenditures on animal health and animal nutrition are larger relative to male-headed expenditures on these things compared to other livestock operation expenditures.

Chart 41: Yearly expenditure, by HH head gender



Also, smaller herd size households spend less on every type of livestock operation activity compared to larger herd size households, and likewise for every non-livestock operation activity besides health care (see Chart 42). The average yearly expenditure for a female headed household was approximately half that of male households. Similarly, yearly expenditures of the smallest herd size households was a little over half that of the largest herd sized households. Thus, here we see perhaps the most compelling evidence yet that female-headed and smaller herd size households are disadvantaged relative to other households.

Chart 42: Yearly expenditure, by herd size

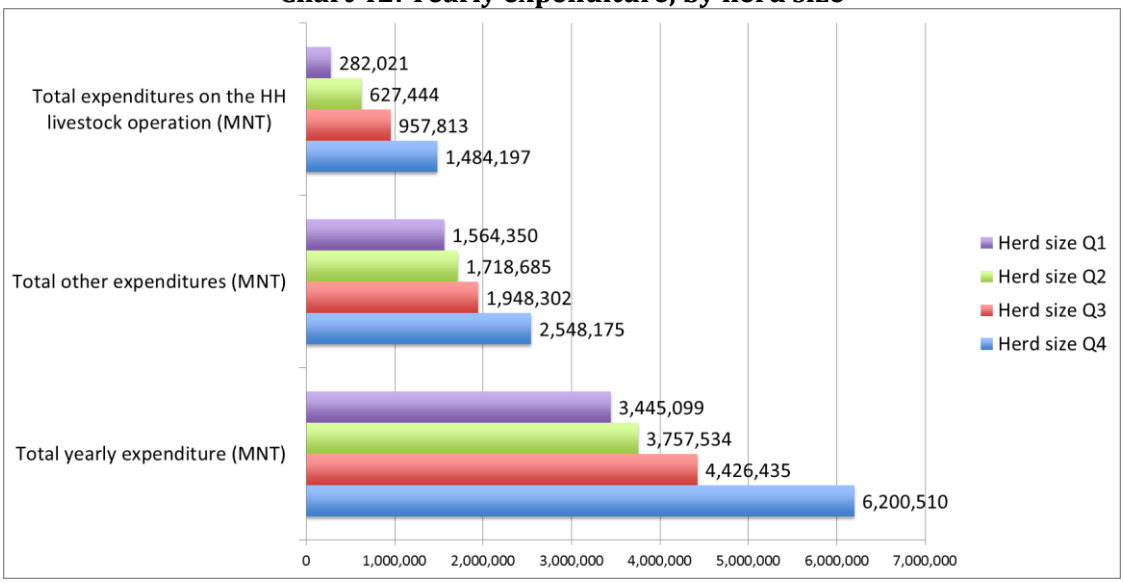


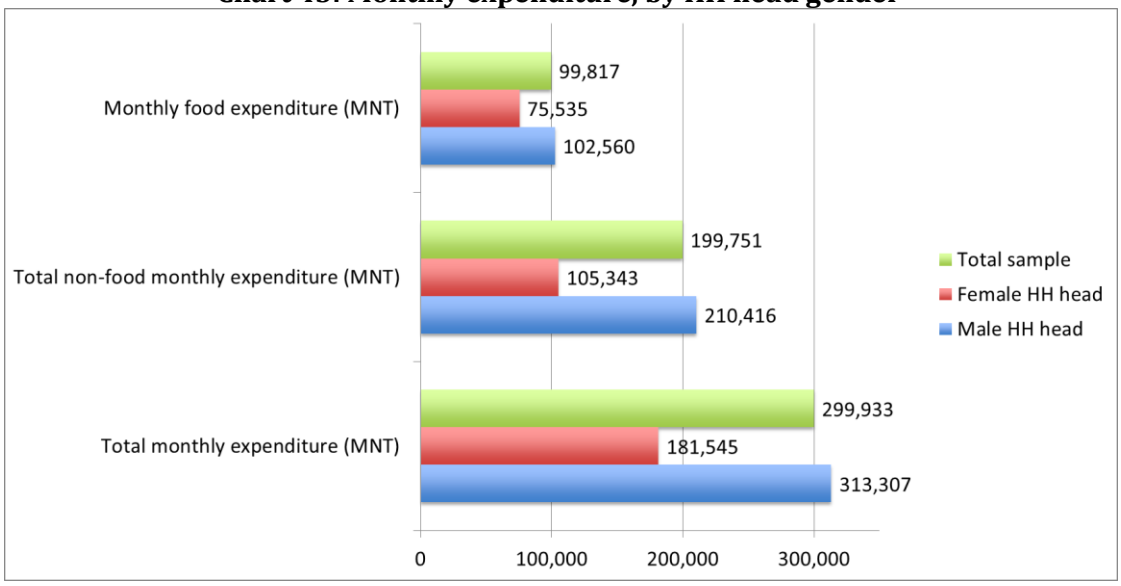
Table 35, which displays average monthly expenditures on a variety of categories, corroborates the main results from the previous table.

Table 25: Household monthly expenditure

		Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
Monthly expenditure on transportation (MNT)	Mean	117,262	55,915	124,192	85,026	108,518	125,976	146,533
	SD	128,512	79,910	131,126	128,539	126,399	119,960	130,830
Monthly expenditure on communication (MNT)	Mean	26,720	17,351	27,778	24,039	27,499	27,207	28,035
	SD	27,240	24,958	27,299	28,031	27,611	25,875	27,366
Monthly expenditure on personal goods (MNT)	Mean	35,570	27,636	36,466	32,973	33,962	34,863	39,988
	SD	37,205	30,872	37,761	34,871	36,930	35,448	40,701
Monthly expenditure on leisure activities (MNT)	Mean	1,711	876	1,806	2,337	1,516	1,373	1,617
	SD	6,905	3,945	7,158	8,258	5,968	6,412	6,744
Monthly expenditure on HH non-agricultural enterprise (MNT)	Mean	6,021	0	6,701	10,190	9,678	3,376	1,361
	SD	44,940	.	47,366	57,750	59,047	31,502	20,217
Monthly expenditure on water (MNT)	Mean	734	749	733	986	499	1,048	432
	SD	2,652	2,173	2,701	2,577	1,479	3,848	2,118
Monthly expenditure on electricity (MNT)	Mean	3,704	2,361	3,856	5,507	4,710	2,764	2,013
	SD	6,469	4,340	6,652	7,244	6,975	5,726	5,215
Total non-food monthly expenditure (MNT)	Mean	199,751	105,343	210,416	176,454	193,709	203,002	223,386
	SD	195,202	97,015	200,596	233,387	193,805	171,785	175,165
Monthly food expenditure (MNT)	Mean	99,817	75,535	102,560	96,109	97,276	100,804	104,556
	SD	81,305	60,459	82,917	91,062	78,035	72,721	82,253
Total monthly expenditure (MNT)	Mean	299,933	181,545	313,307	273,217	292,309	303,104	328,149
	SD	235,641	133,222	240,952	279,071	234,172	203,888	217,688
Number of observations		867	88	779	212	206	209	235

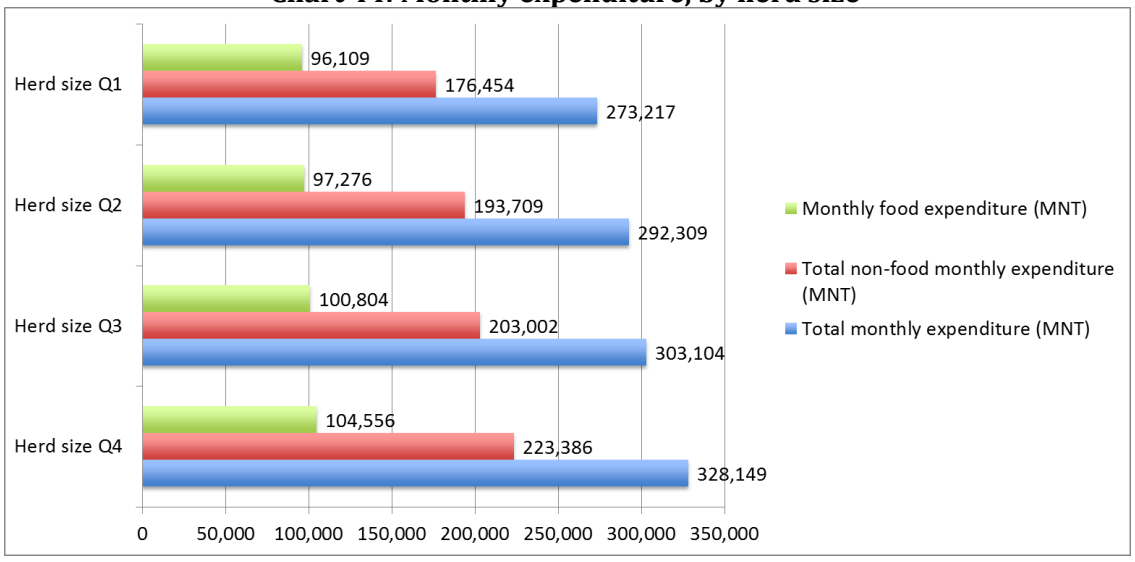
Once again, expenditures for female-headed households are almost always less than they are for male-headed households (see Chart 43).

Chart 43: Monthly expenditure, by HH head gender



Monthly expenditures by herd size are not so easily characterized; while expenditures on things like transportation and personal goods are indeed higher for larger herd size households, expenditures on leisure, the household non-agricultural enterprise and electricity are higher for smaller herd size households (see Chart 44). This likely reflects the higher likelihoods for smaller herd size households of being located in district centers and relying on sources of income other than the household livestock operation.

Chart 44: Monthly expenditure, by herd size



11 Household food consumption and food security

11.1 Household food consumption

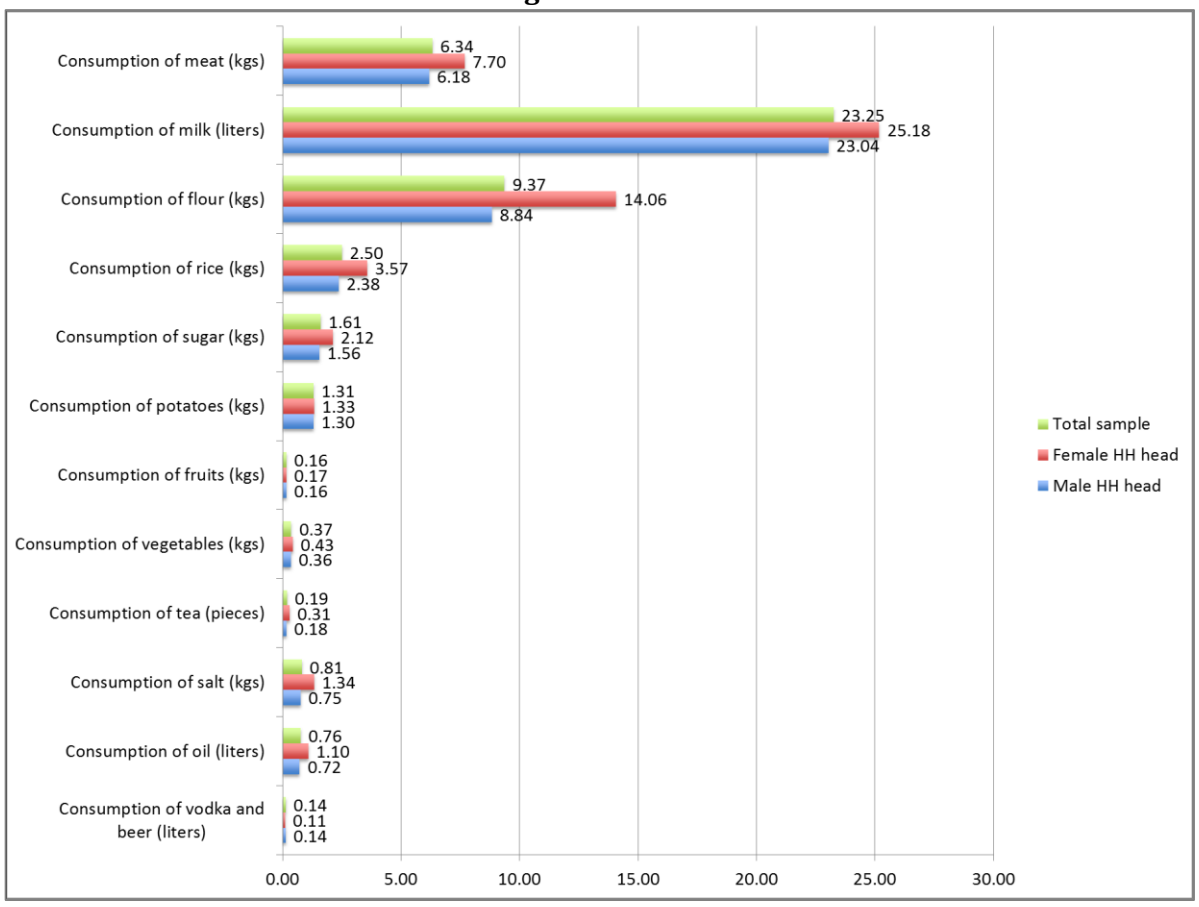
Table 36 displays per capita consumption over the previous 30 days of the most commonly consumed ingredients of the Mongolian diet. Substantial amounts of milk products, rice and flour products, and to a somewhat lesser extent, meat are commonly consumed.

Table 36: Per capita consumption of various food ingredients

		Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
Per capita monthly consumption of meat (kgs)	Mean	6.34	7.70	6.18	5.86	6.06	7.02	6.41
	SD	5.35	6.70	5.15	5.55	5.53	5.57	4.71
Per capita monthly consumption of milk (liters)	Mean	23.25	25.18	23.04	19.10	24.18	25.09	24.58
	SD	36.63	35.94	36.72	34.46	37.26	39.11	35.61
Per capita monthly consumption of flour (kgs)	Mean	9.37	14.06	8.84	10.24	9.14	9.06	9.06
	SD	9.27	14.71	8.28	10.86	10.18	8.20	7.62
Per capita monthly consumption of rice (kgs)	Mean	2.50	3.57	2.38	2.22	2.64	2.63	2.51
	SD	3.50	5.38	3.20	3.40	4.39	3.28	2.82
Per capita monthly consumption of sugar (kgs)	Mean	1.61	2.12	1.56	1.29	1.68	1.72	1.76
	SD	2.31	2.69	2.26	1.93	2.52	2.33	2.39
Per capita monthly consumption of potatoes (kgs)	Mean	1.31	1.33	1.30	1.49	1.38	1.17	1.19
	SD	2.24	2.45	2.21	2.54	2.32	1.91	2.14
Per capita monthly consumption of fruits (kgs)	Mean	0.16	0.17	0.16	0.14	0.16	0.18	0.16
	SD	0.47	0.56	0.46	0.42	0.48	0.50	0.48
Per capita monthly consumption of vegetables (kgs)	Mean	0.37	0.43	0.36	0.47	0.41	0.36	0.26
	SD	0.87	1.10	0.84	1.06	0.86	0.83	0.70
Per capita monthly consumption of tea (pieces)	Mean	0.19	0.31	0.18	0.21	0.19	0.17	0.18
	SD	0.26	0.38	0.24	0.31	0.27	0.21	0.23
Per capita monthly consumption of salt (kgs)	Mean	0.81	1.34	0.75	1.05	0.90	0.58	0.72
	SD	1.70	2.28	1.61	2.00	1.90	0.97	1.70
Per capita monthly consumption of oil (liters)	Mean	0.76	1.10	0.72	0.78	0.72	0.74	0.82
	SD	1.03	1.50	0.96	1.22	0.98	0.92	0.98
Per capita monthly consumption of vodka and beer (liters)	Mean	0.14	0.11	0.14	0.06	0.18	0.10	0.21
	SD	0.69	0.67	0.69	0.30	0.88	0.41	0.91
Number of observations		867	88	779	212	206	209	235

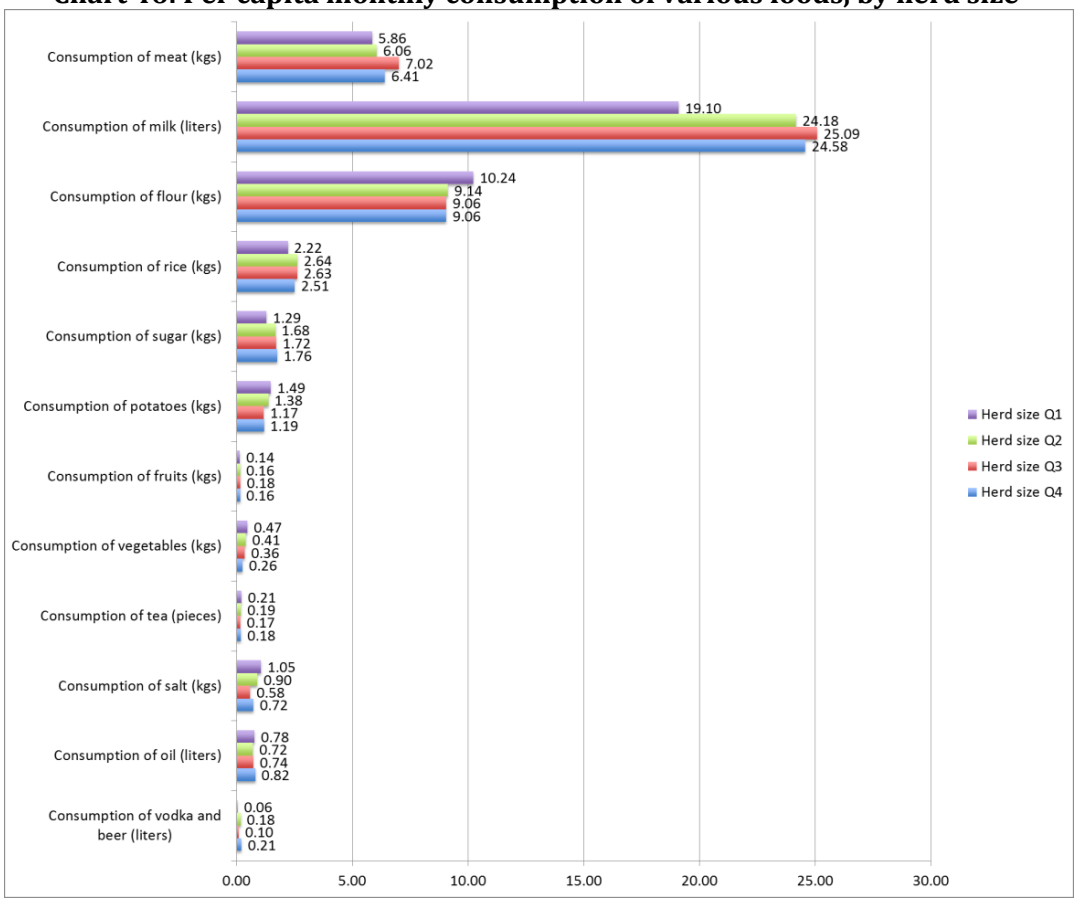
As the table shows and Chart 45 highlights, however, food consumption per capita is one area in which female-headed and smaller herd size households are not disadvantaged relative to other households. Indeed, for nearly all ingredients, consumption per capita is higher in female-headed households.

Chart 45: Per capita monthly consumption of various food ingredients, by HH head gender



Finally, as Chart 46 shows, there is not a clear relationship between the quantity of food consumed and herd size.

Chart 46: Per capita monthly consumption of various foods, by herd size



11.2 Household food security

The baseline questionnaire included three measures of food security designed and tested cross-culturally by the Food and Nutrition Technical Assistance (FANTA) Project, USAID and the FAO. The three food security measures are: Household Hunger Scale, Women's Dietary Diversity Score, and Months of Adequate Household Food Provisioning. Together the indicators provide a comprehensive profile of food security. Multiple measures are necessary, since food security depends at once on adequate availability of food, adequate access to food, and appropriate food utilization and consumption.

The Household Hunger Scale is a simple, cross-culturally applicable indicator developed by FANTA to measure the prevalence of household hunger. The HHS is the most basic measure of the GAFSP food security indicators. It consists of six questions that measure occurrence and frequency of food insecurity events (such as a household member going to sleep hungry because there was not enough food). It estimates the proportion of households affected by three different severities of household hunger: little to no hunger, moderate hunger, and severe hunger, using a reference period of the previous 12 months. The HHS focuses on the food quantity dimension of food access. It measures food availability and access, but does not measure dietary quality.

The Women's Dietary Diversity Score (WDDS) is an indicator developed by the Food and Agriculture Office (FAO). It is meant to reflect, in a snapshot form, the economic ability of a household to access a variety of foods. Individual dietary diversity scores aim to reflect

nutrient adequacy, as the evidence shows that an increase in individual dietary diversity score is related to increased nutrient adequacy of the diet. The WDDS is an aggregate of nine food groups with important micronutrients. Although there is no internationally-recognized benchmark, a low WDDS is proven internationally to be correlated with micronutrient deficiencies such as anemia or low vitamin A. The dietary diversity module was administered to an adult female household member, using a reference period of the previous 24 hours. The respondent was asked about her own food consumption.

The Months of Adequate Household Food Provisioning is a simple indicator of household food access. Respondents are asked if in any months of the past 12, there was not enough food to meet the needs of all household members, and in which months the shortages occurred. The MAHFP is measured on a scale of 0-12, in which 12 means the household met its food needs in all 12 months, and 0 means the household was not able to meet its food needs in any of the 12 months.

As Chart 47 shows, no female- or male-headed households reported experiencing severe hunger, and even moderate hunger was experienced by only 1.2 and 0.4 percent of female- and male-headed households, respectively. This is consistent with the widely-held perception that rural Mongolian households typically do not want for food.

Chart 47: Household Hunger Scores

HH hunger score	HH hunger categories	# female-headed HHs	% female-headed HHs	# male-headed HHs	% male-headed HHs
0-1	Little to no hunger in HH	81	98.8	510	99.6
2-3	Moderate hunger in HH	1	1.2	2	0.4
4-6	Severe hunger in HH	0	0	0	0

While the HHS shows that accessing sufficient calories is not a significant problem for most households in the sample, the nutritional composition of diets is a slightly greater concern. In each sample household, an adult female in the household was asked detailed questions about her food consumption during the day prior to the interview. The results are displayed in Chart 48. Less than a third of women report a highly diverse diet (6 or more food categories). The majority of women had medium levels of dietary diversity, consuming 4-5 different food groups. Only 2.2% of women had low dietary diversity, consuming foods from 3 or fewer food groups. The most commonly consumed food groups are starchy staples, dairy products and meat

Chart 48: Women's Dietary Diversity Scores

Food Groups Consumed by ≥50% of women by Dietary Diversity Tertile		
Lowest Dietary Diversity (≤3 groups)	Medium Dietary Diversity (4 – 5 food groups)	High Dietary Diversity (≥6 food groups)
Starchy Staples	Starchy Staples	Starchy Staples
Dairy	Dairy	Dairy
	Meat and fish	Meat and fish
		Other Fruits & Vegetables
n = 13	*n = 394*	*n = 187*
2.2%	*66.3%*	*31.5%*

Finally, only about 2.5 percent of all households where an adult female was available to answer food security questions reported having any shortage of food at any point in the previous 12 months. Indeed, the average MAHFP score is greater than 11.95 (compared to a possible 12). For the 15 households with an MAHFP score of less than 12, the average score is about 10.27.

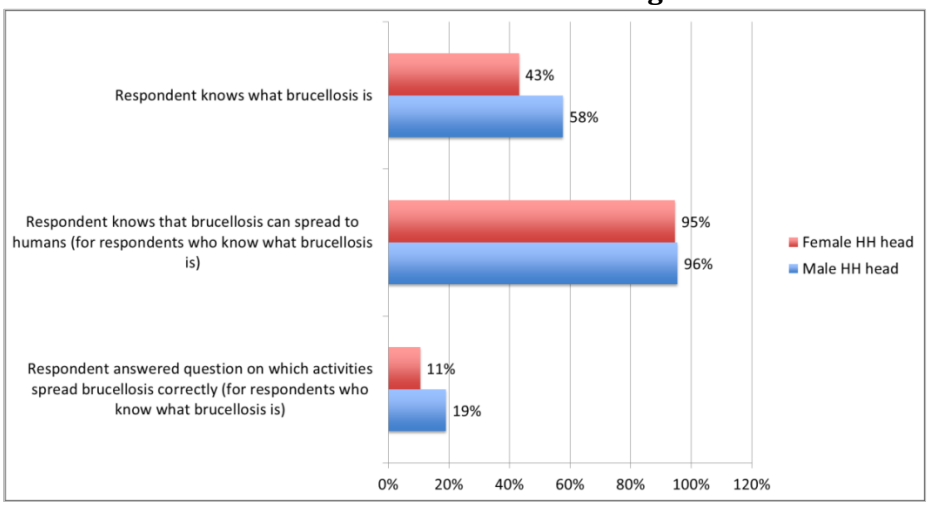
12 Brucellosis knowledge and risk factors

The survey also included questions on what respondents know about brucellosis (as it pertains to people rather than livestock) and what they do to avoid becoming infected by it. The results are displayed in Table 37 (and, in the case of brucellosis knowledge, Chart 49).

Table 37: Brucellosis risky behaviors and knowledge

		Female HH head	Male HH head
Respondent knows what brucellosis is	Mean	0.43	0.58
	N	88	779
Respondent knows that brucellosis can spread to humans (for respondents who know what brucellosis is)	Mean	0.95	0.96
	N	38	450
Respondent answered question on which activities spread brucellosis correctly (for respondents who know what brucellosis is)	Mean	0.11	0.19
	N	38	450
Working with meat avoided when HH member responsible has an open wound	Mean	0.74	0.76
	N	88	779
Working with newborn animals avoided when HH member responsible has an open wound	Mean	0.27	0.26
	N	88	779
Proportion of the time knives are washed after use with newly slaughtered animals	Mean	0.03	0.02
	N	88	779
Proportion of the time milk is boiled before consumption	Mean	0.01	0.03
	N	88	779
Some HH member occasionally consumes raw or not fully cooked meat	Mean	0.02	0.04
	N	88	779

Chart 49: Brucellosis knowledge



Only 43 percent of female-headed and 58 percent of male-headed households are familiar with brucellosis, but nearly all of these households know that brucellosis can spread from livestock to humans. Fairly modest minorities of respondents answered properly when asked which of 4 different types of behaviors could result in a brucellosis infection, and respondents in female-headed households seem to be less familiar with the risks of the disease compared to respondents in male-headed households.

About three-quarters of all households contain members who are usually responsible for cutting and preparing meat, and who avoid doing those activities when they have an open wound on their hand. Far fewer households contain members who avoid dealing with newborn animals when they have open wounds on their animals. Almost all respondents report engaging in safe behaviors with respect to the washing of knives after use with newly slaughtered animals, the sterilization of milk and the consumption of un-cooked meat.

13 Household finances

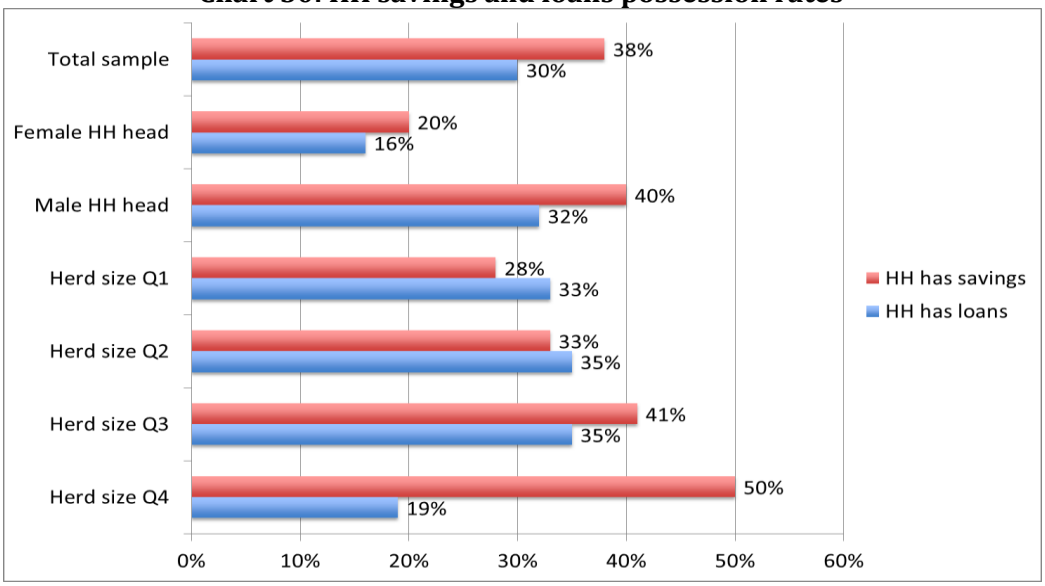
The questionnaire also contained questions on households' savings and loans. The results are contained in Table 38 and in Charts 50 and 51.

Table 38: Household finance

		Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
HH has savings	Mean	0.38	0.20	0.40	0.28	0.33	0.41	0.50
	N	867	88	779	212	206	209	235
Amount of savings (MNT, for HHs with savings)	Mean	2,570,809	1,027,222	2,659,014	748,266	2,794,892	1,816,611	3,915,650
	SD	3,998,537	1,366,214	4,081,563	933,124	4,308,087	2,979,780	4,852,663
	N	333	18	315	57	68	86	118
HH has loans	Mean	0.30	0.16	0.32	0.34	0.35	0.35	0.19
	N	867	88	779	212	206	209	235
Amount of loans (MNT, for HHs with loans)	Mean	3,098,636	1,791,071	3,172,154	3,739,463	3,470,053	2,304,757	2,769,568
	SD	4,303,854	1,738,136	4,394,132	5,069,713	5,503,690	1,823,586	3,435,656
	N	263	14	249	70	72	74	44

As Table 38 and Chart 50 show, 38 and 30 percent of all households in the sample have any savings and loans, respectively. Female-headed households are considerably less likely to have both savings and loans than their male-headed counterparts.

Chart 50: HH savings and loans possession rates



Larger herd size households are more likely to have savings and less likely to have loans. For savings, this is more evidence that female-headed and smaller herd size households are at a disadvantage relative to other households.

Chart 51: HH savings and loans amounts

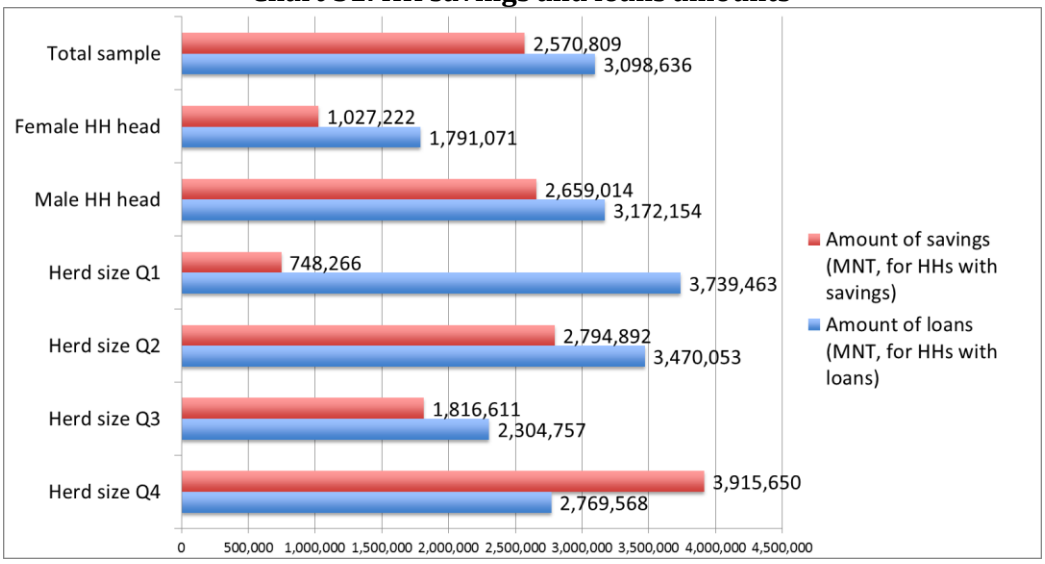


Chart 51 displays the values of savings and loans (for households that possess any) for different types of households. Once again, it is clear that female-headed households are less connected to formal financial markets. The chart also shows that smaller herd size households tend to have smaller amounts saved and more in outstanding loans.

Appendix 1: Livestock Product-specific Tables[20]

Table A1.1: Livestock output production

		Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
Horse, cattle, yak, sheep and goat meat								
Total amount of horse meat produced, Oct-Dec 2012 (kgs)	Mean	34	15	36	15	24	36	59
	SD	85	52	88	60	68	83	112
Total amount of horse meat produced, Jan-Sep 2012 (kgs)	Mean	2	0	3	0	1	4	5
	SD	18	0	19	0	12	23	25
Total amount of beef produced, Oct-Dec 2012 (kgs)	Mean	107	64	112	91	94	102	137
	SD	165	135	167	130	148	147	213
Total amount of beef produced, Jan-Sep 2012 (kgs)	Mean	5	4	5	2	6	3	9
	SD	33	21	34	14	38	25	44
Total amount of mutton produced, Oct-Dec 2012 (kgs)	Mean	103	69	107	33	69	122	180
	SD	128	105	130	52	94	120	161
Total amount of mutton produced, Jan-Sep 2012 (kgs)	Mean	63	29	66	20	36	72	116
	SD	87	49	89	48	52	79	111
Total amount of goat meat produced, Oct-Dec 2012 (kgs)	Mean	113	81	117	37	105	136	172
	SD	149	105	153	57	130	145	190
Total amount of goat meat produced, Jan-Sep 2012 (kgs)	Mean	35	22	36	9	37	42	51
	SD	56	36	58	24	50	55	72
Camel, mare, cattle, yak, sheep and goat milk								
Total amount of cow milk produced, Jul-Sep 2012 (liters)	Mean	730	445	763	582	684	839	812
	SD	1056	786	1078	839	1025	1260	1055
Total amount of cow milk produced, Jan-Jun and Oct-Dec 2012 (liters)	Mean	487	252	513	376	517	535	523
	SD	849	463	879	702	922	953	810
Total amount of mare milk produced, Jul-Sep 2012 (liters)	Mean	109	10	120	36	136	112	152
	SD	481	69	506	284	578	433	567
Total amount of mare milk produced, Jan-Jun and Oct-Dec 2012 (liters)	Mean	11	0	13	8	15	2	20
	SD	94	0	99	85	113	22	120
Total amount of small animal milk produced, Jul-Sep 2012 (liters)	Mean	520	417	532	78	389	697	889
	SD	850	767	858	195	601	915	1100
Total amount of small animal milk produced, Jan-Jun and Oct-Dec 2012	Mean	194	197	193	62	156	256	294
	SD	374	342	377	167	288	432	470
Sheep and yak wool								
Total amount of sheep wool produced, Apr-Sep 2012 (kgs)	Mean	91	33	98	8	33	77	231
	SD	135	72	139	20	38	63	181
Total amount of yak wool produced, Apr-Sep 2012 (kgs)	Mean	2	1	2	1	2	2	1
	SD	5	3	5	4	5	7	4
Cashmere								
Total amount of cashmere produced, Apr-Sep 2012 (kgs)	Mean	33	17	35	5	18	34	72
	SD	38	21	40	7	13	22	49
Number of observations		862	88	774	222	196	209	235

[20] Results in this Appendix are based on non-imputed data.

Table A1.2: Proportion of households that sold output

	Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
HH sold any horse meat in 2012	0.03	0.00	0.03	0.02	0.02	0.03	0.05
HH sold any beef in 2012	0.06	0.06	0.06	0.01	0.08	0.04	0.09
HH sold any mutton in 2012	0.06	0.05	0.07	0.03	0.04	0.06	0.12
HH sold any goat meat in 2012	0.07	0.00	0.08	0.02	0.06	0.04	0.17
HH sold any cow milk in 2012	0.07	0.02	0.07	0.05	0.09	0.07	0.06
HH sold any mare milk in 2012	0.02	0.01	0.02	0.00	0.03	0.01	0.02
HH sold any small animal milk in 2012	0.03	0.00	0.03	0.01	0.02	0.04	0.04
HH sold any dried yogurt in 2012	0.23	0.17	0.24	0.20	0.23	0.27	0.23
HH sold any fresh yogurt in 2012	0.02	0.01	0.02	0.01	0.02	0.03	0.03
HH sold any sour cream in 2012	0.14	0.07	0.15	0.14	0.17	0.14	0.10
HH sold any sheep wool in 2012	0.69	0.49	0.72	0.32	0.66	0.87	0.93
HH sold any yak wool in 2012	0.14	0.08	0.15	0.17	0.17	0.13	0.09
HH sold any cashmere in 2012	0.87	0.83	0.87	0.61	0.93	0.95	0.98
Number of observations	862	88	774	222	196	209	235

Table A1.3: Livestock output sales

		Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
Horse, cattle, yak, sheep and goat meat								
Total amount of horse meat sold, Oct-Dec 2012 (kgs)	Mean	4	0	5	3	1	3	10
	SD	34	0	35	24	11	28	52
Total amount of horse meat sold, Jan-Sep 2012 (kgs)	Mean	0	0	0	0	0	0	0
	SD	0	0	0	0	0	0	0
Total amount of beef sold, Oct-Dec 2012 (kgs)	Mean	15	11	16	6	16	9	29
	SD	79	66	80	52	78	52	113
Total amount of beef sold, Jan-Sep 2012 (kgs)	Mean	2	3	1	0	3	1	3
	SD	15	19	14	0	19	10	20
Total amount of mutton sold, Oct-Dec 2012 (kgs)	Mean	11	10	11	2	6	10	24
	SD	71	70	71	19	45	72	107
Total amount of mutton sold, Jan-Sep 2012 (kgs)	Mean	4	1	4	2	0	4	8
	SD	24	13	25	16	4	25	35
Total amount of goat meat sold, Oct-Dec 2012 (kgs)	Mean	14	0	16	2	12	5	36
	SD	70	0	74	25	66	30	111
Total amount of goat meat sold, Jan-Sep 2012 (kgs)	Mean	1	0	1	0	0	1	3
	SD	9	0	9	1	5	6	14
Camel, mare, cattle, yak, sheep and goat milk								
Total amount of cow milk sold, Jul-Sep 2012 (liters)	Mean	3	0	3	3	4	3	2
	SD	23	0	24	21	26	24	19
Total amount of cow milk sold, Jan-Jun and Oct-Dec 2012 (liters)	Mean	19	8	20	18	30	12	16
	SD	95	74	97	102	122	57	87
Total amount of mare milk sold, Jul-Sep 2012 (liters)	Mean	4	0	4	1	7	3	4
	SD	32	4	33	20	43	29	31
Total amount of mare milk sold, Jan-Jun and Oct-Dec 2012 (liters)	Mean	0	0	0	0	0	0	0
	SD	0	0	0	0	0	0	0
Total amount of small animal milk sold, Jul-Sep 2012 (liters)	Mean	4	0	5	0	3	6	7
	SD	33	0	35	1	31	39	42
Total amount of small animal milk produced, Jan-Jun and Oct-Dec 2012	Mean	1	0	1	0	1	2	1
	SD	9	0	9	5	10	12	6
Fresh yogurt, dried yogurt and sour cream								
Total amount of dried yogurt sold, Jul-Sep 2012 (kgs)	Mean	6	1	6	5	7	8	4
	SD	20	5	21	18	22	23	18
Total amount of dried yogurt sold, Jan-Jun and Oct-Dec 2012 (kgs)	Mean	8	6	8	5	5	11	11
	SD	29	20	30	19	21	36	34
Total amount of fresh yogurt sold, Jul-Sep 2012 (kgs)	Mean	0	0	0	0	0	0	0
	SD	0	0	0	0	0	0	0
Total amount of fresh yogurt sold, Jan-Jun and Oct-Dec 2012 (kgs)	Mean	2	2	2	2	3	2	2
	SD	17	16	17	17	21	13	15
Total amount of sour cream sold, Jul-Sep 2012 (kgs)	Mean	6	1	6	4	7	8	4
	SD	25	7	26	20	25	30	23
Total amount of sour cream sold, Jan-Jun and Oct-Dec 2012 (kgs)	Mean	4	2	4	2	3	5	5
	SD	18	13	19	11	14	24	21
Sheep and yak wool								
Total amount of sheep wool sold, Apr-Sep 2012 (kgs)	Mean	90	32	96	8	31	74	230
	SD	135	73	139	20	36	64	182
Total amount of yak wool sold, Apr-Sep 2012 (kgs)	Mean	2	1	2	1	2	2	1
	SD	5	3	5	4	5	7	4
Cashmere								
Total amount of cashmere sold, Apr-Sep 2012 (kgs)	Mean	33	17	35	5	18	34	72
	SD	38	21	40	7	13	22	49
Number of observations		862	88	774	222	196	209	235

Table A1.4: Livestock output earnings

		Total sample	Female HH head	Male HH head	Herd size Q1	Herd size Q2	Herd size Q3	Herd size Q4
Horse, cattle, yak, sheep and goat meat								
Total earnings from horse meat sold, Oct-Dec 2012 (MNT)	Mean	15307	0	17048	8559	2806	12416	34681
	SD	113018	0	119153	75769	27823	102315	176260
Total earnings from horse meat sold, Jan-Sep 2012 (MNT)	Mean	0	0	0	0	0	0	0
	SD	0	0	0	0	0	0	0
Total earnings from beef sold, Oct-Dec 2012 (MNT)	Mean	61057	35182	63999	21126	56153	42297	119553
	SD	321962	209735	332302	201522	275977	239789	472436
Total earnings from beef sold, Jan-Sep 2012 (MNT)	Mean	6230	6477	6202	0	9541	2871	12340
	SD	60144	42778	61831	0	71255	41503	86336
Total earnings from mutton sold, Oct-Dec 2012 (MNT)	Mean	34735	29318	35351	7613	23133	31439	72966
	SD	229098	232289	228876	89626	159287	223023	343350
Total earnings from mutton sold, Jan-Sep 2012 (MNT)	Mean	16730	4773	18089	5946	1378	20871	36038
	SD	111839	44772	116997	60859	14056	128927	163975
Total earnings from goat meat sold, Oct-Dec 2012 (MNT)	Mean	38999	0	43433	4784	31043	13707	100451
	SD	202227	0	212976	46808	178582	91301	329989
Total earnings from goat meat sold, Jan-Sep 2012 (MNT)	Mean	4505	0	5017	378	1250	2907	12540
	SD	33351	0	35161	5638	13647	24494	57288
Camel, mare, cattle, yak, sheep and goat milk								
Total earnings from cow milk sold, Jul-Sep 2012 (MNT)	Mean	2281	0	2540	2207	2939	2297	1787
	SD	18201	0	19192	17099	20795	19077	16073
Total earnings from cow milk sold, Jan-Jun and Oct-Dec 2012 (MNT)	Mean	20568	9545	21822	20405	34367	11646	17149
	SD	108596	85338	110908	115681	142305	56859	103742
Total earnings from mare milk sold, Jul-Sep 2012 (MNT)	Mean	2900	227	3204	1081	5102	2392	3234
	SD	25208	2132	26577	16108	33470	23452	25749
Total earnings from mare milk sold, Jan-Jun and Oct-Dec 2012 (MNT)	Mean	0	0	0	0	0	0	0
	SD	0	0	0	0	0	0	0
Total earnings from small animal milk sold, Jul-Sep 2012 (MNT)	Mean	2871	0	3198	90	1939	4785	4574
	SD	22480	0	23703	1342	17136	29024	29155
Total earnings from small animal milk produced, Jan-Jun and Oct-Dec 2012	Mean	1206	0	1344	450	1531	2392	596
	SD	10796	0	11385	6712	12308	15318	7015
Fresh yogurt, dried yogurt and sour cream								
Total earnings from dried yogurt sold, Jul-Sep 2012 (MNT)	Mean	26084	4580	28528	20901	26949	36435	21051
	SD	104426	23793	109653	90320	104426	119985	101922
Total earnings from dried yogurt sold, Jan-Jun and Oct-Dec 2012 (MNT)	Mean	35073	22989	36446	15734	23133	46962	52726
	SD	134150	85130	138603	67061	109020	156287	171581
Total earnings from fresh yogurt sold, Jul-Sep 2012 (MNT)	Mean	0	0	0	0	0	0	0
	SD	0	0	0	0	0	0	0
Total earnings from fresh yogurt sold, Jan-Jun and Oct-Dec 2012 (MNT)	Mean	1854	1477	1897	1509	2653	1675	1674
	SD	14396	13858	14464	13271	18428	12191	13434
Total earnings from sour cream sold, Jul-Sep 2012 (MNT)	Mean	28210	5114	30836	19162	31660	38411	24809
	SD	124887	25005	131280	92020	122060	149272	130297
Total earnings from sour cream sold, Jan-Jun and Oct-Dec 2012 (MNT)	Mean	16067	5000	17326	8432	11643	20842	22723
	SD	83346	42804	86693	45958	55374	101278	108424
Sheep and yak wool								
Total earnings from sheep wool sold, Apr-Sep 2012 (MNT)	Mean	197620	73574	211723	16639	65100	159919	512646
	SD	320571	180915	329894	47435	87630	160960	447048
Total earnings from yak wool sold, Apr-Sep 2012 (MNT)	Mean	10197	5307	10753	8780	11523	14376	6715
	SD	33366	22167	34375	26296	34034	44358	26417
Cashmere								
Total earnings from cashmere sold, Apr-Sep 2012 (MNT)	Mean	1623425	887830	1707059	255410	902048	1700478	3448894
	SD	1809878	1176671	1850441	336550	640954	1139299	2210516
Number of observations		862	88	774	222	196	209	235

Appendix 2: Livestock Product Sales by District[21]

Table A2.1 Proportions of households who sold output, by district

	HH sold any meat in 2012	HH sold any milk in 2012	HH sold any dairy products in 2012	HH sold any wool in 2012	HH sold any cashmere in 2012
Arkhangai province					
Bulgan district	0.31	0.27	0.47	0.58	0.73
Chuluut district	0.25	0.11	0.75	0.74	0.67
Ikh-Tamir district	0.32	0.16	0.56	0.82	0.79
Khangai district	0.14	0.31	0.78	0.76	0.57
Tsakhir district	0.24	0.04	0.65	0.73	0.76
Undur-ulaan district	0.29	0.03	0.41	0.80	0.83
Bayankhongor province					
Baatsagaan district	0.13	0.07	0.32	0.48	0.95
Bogd district	0.22	0.12	0.25	0.63	0.95
Galuut district	0.20	0.03	0.37	0.81	0.88
Jargalant district	0.09	0.09	0.34	0.68	0.68
Jinst district	0.31	0.07	0.28	0.81	0.97
Ulziit district	0.28	0.21	0.31	0.79	0.91
Govi-Altai province					
Biger district	0.11	0.04	0.16	0.80	0.96
Chandmani district	0.02	0.04	0.25	0.82	0.91
Delger district	0.11	0.00	0.04	0.84	0.91
Jargalant district	0.13	0.04	0.16	0.86	0.95
Khaliun district	0.19	0.17	0.20	0.69	0.93
Tugrug district	0.05	0.09	0.05	0.66	0.91
Khuvsgul province					
Ikh-Uul district	0.20	0.02	0.15	0.75	0.87
Jargalant district	0.17	0.10	0.15	0.73	0.92
Shine-Ider district	0.15	0.07	0.13	0.89	0.87
Tosontsengel district	0.22	0.07	0.03	0.83	0.93
Tumurbulag district	0.23	0.16	0.18	0.91	0.96
Tunel district	0.23	0.08	0.03	0.75	0.90
Zavkhan province					
Aldarkhaan district	0.10	0.22	0.13	0.68	0.95
Durvuljin district	0.03	0.02	0.10	0.81	0.95
Erdenekhairkhan district	0.11	0.02	0.02	0.80	0.89
Tsagaankhairkhan district	0.12	0.10	0.10	0.75	0.95
Yaruu district	0.10	0.03	0.07	0.83	0.83
Zavkhanmandal district	0.07	0.07	0.20	0.83	0.94

[21] Results in this Appendix are based on non-imputed data.

Appendix 3: Data Quality Monitoring Regimen

Numerous activities were undertaken before, during and after data collection to ensure that the data is of sufficiently high quality. Before the survey, the questionnaire was piloted twice (in 2 different locations), and enumerators were trained for a total of 2 weeks. The first 12 days of the survey itself involved DIME's Field Coordinator and Assistant Field Coordinator physically observing interviews. The Assistant Field Coordinator continued this observation work for the majority of the remainder of the survey. The data was collected electronically using tablets, which allowed for early and regular examination of the data to further verify that there were not substantial problems. Interviews were also recorded, so that unanticipated responses could be investigated by listening to the relevant parts of the interviews in question. Brief data audits were also conducted over the phone with the roughly 15 percent of households that the Field Coordinator's team was able to reach (given cellular coverage constraints), and physical data audits were conducted for a further 5 percent of sample households. Finally, the data and the audio recordings were examined closely in an attempt to identify and explain several dozen possible logical inconsistencies across questions.