



MINISTRY OF FOOD,
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Livestock and Agricultural Marketing Project (LAMP)

End-line Survey

Final Report



Ulaanbaatar 31 July 2018



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Statistical Institute for Consulting and Analysis (SICA) LLC, was established in 2010 with strong commitment to contribute to Mongolia's upward social and business environment through statistical research and analysis as well as professional consulting services. We aim to provide the most valuable and reliable services with innovative and out of box ideas for current changing globalization.

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Acronyms and Abbreviations

DIME	Development Impact Evaluation
FAO	Food and Agriculture Organization
FMD	Foot and Mouth Disease
GAFFSP	The Global Agriculture & Food Security Program
GOM	Government of Mongolia
HH	Household
IRI	Intermediate Result Indicator
KII	Key Informant Interview
LAMP	Livestock and Agricultural Marketing Project
MIS	Management Information System
MNT	Mongolian Tugrug
MOFALI	Ministry of Food, Agriculture and Light Industry
NSO	National Statistical Office
PAD	Project Appraisal Document
PIU	Project Implementation Unit
Sig.	Statistical significance
VABU	The Veterinary Animal Husbandry and Breeding Units
WB	World Bank
WBG	World Bank Group

Mongolian terms

<i>Aimag</i>	Equivalent to a province
<i>Soum</i>	Equivalent to a district/county within a province

Glossary

Vulnerable households	Vulnerable household: Herd size is less than 100 animals, household head is illiterate, disabled household members, and low income of subsistence level in Khangai region 173,500, Western region 166,500 MNT monthly income of population (source: NSO, 2017)
Long-term agreement	Above 1 year or more
Short-term agreement	Up to 1 year

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Executive summary

The *Livestock and Agricultural Marketing Project* (LAMP) was part of a Global Agriculture and Food Security Programme (GAFSP) initiated by the G20 countries in response to the 2008 food crisis and implemented through the GAFSP Secretariat in the World Bank (WB). The LAMP project fund was approved in 2011 by GAFSP and appraised by the WB in 2012. The LAMP project was implemented by the Government of Mongolia (GOM) with the Ministry of Finance and Ministry of Food, Agriculture and Light Industry (MOFALI) with supervision by the WB under a grant of USD 11 million. Actual implementation was from March 2015 to 31 December 2017. The project was implemented in five provinces (*aimags*) and 15 districts (*soums*).

The LAMP Project Development Objective (PDO)¹ was: “to improve rural livelihoods and food security in selected *aimags* and *soums* through investments in enhancing productivity, market access and diversification in livestock-based production systems”. The LAMP goal was also “to contribute to the National Food Security Programme goals and was able to contribute to the Millennium Development Goals 1 (up to 2015) and currently under the Sustainable Development Goal 1 and 2. The aim of the End-Line Survey (ELS), as noted in the Project Appraisal Document (PAD) and monitoring and evaluation plan of the project, was to analyze the impact of the project and change after 5 years of LAMP interventions including effectiveness, efficiency, impact, relevance and sustainability.

Key Findings

The LAMP end-line survey collected various data about herders’ livelihood which are, rural households’ family members, asset ownerships including deposits and loans, and their main livelihoods, such as livestock and horticulture. Additionally herd size and herd management including animal health, animal breeding, animal feed and mobility were studied. From these data, household income changes, livestock productivity, livestock productivity market share and household various food consumption findings directly related to the project results were analyzed. The five main PDO’s results can be described as follows:

Number of intended and actual direct beneficiaries, gender disaggregated

The LAMP involved 13,684 beneficiaries in the selected areas, including 6,083 (44.0%) females and 7,601 (56.0%) males, during the intervention period². This number shows that the project overachieved its goal for reaching beneficiaries by 1,684 people.

Increase in household income from livestock and in selected cases, horticultural products

At the household level, sources of income and expenditures did not undergo major changes, but the amount of income has increased very significantly based on real value. Income derived from animal husbandry activities was the main income source for total households and the main expenditures were on food, clothing and loan repayment. As shown in Project Results Framework Table (Table 1), households (HHs) with livestock increased their income by 6,692.7 thousand MNT in real value or 73.9%. Households with horticulture increased their income by 151.2 thousand MNT in real value or 9.0 times over the baseline. Overall income increased by 44.3% (total income 10,327.8 thousand MNT in real value). Through results of regression analysis models, it can be confirmed that there was a

¹ Project Appraisal Document, World Bank Report No: 73827-MN, May 17, 2013

² PIU records, as of December 31, 2017

statistically significant increase within the treatment group households who earned **8.5 percent higher** income compared to the control group households who were not project beneficiaries. In other words, the treatment group households have earned more income than the control group households and the project achieved its goal to increase the income of the project beneficiaries.

For the income of households engaged in vegetable and potato cropping and fodder farming activities, the ELS survey results showed increased levels for production and marketing leading to significant increases in income. The tremendous increase in horticulture over the baseline was due to a very low level of horticulture income at the beginning of the project. LAMP interventions essentially successfully introduced significant horticulture production in treatment *soums*.

Share of marketed products going through contracts and established companies

The ELS data shows 57.3% of households in treatment *soums* and 53.4% of households in control *soums* sold livestock products based on written/verbal contracts. Sale of livestock products on the basis of written/official contracts was similar to the total trend in treatment *soums* and among female-headed and vulnerable households.

Also 61.6% of total treatment *soum* households made written/verbal contracts to supply potatoes and vegetables to the market. This trend was also observed among female-headed and vulnerable households. For female-headed households and vulnerable households, 11.5% and 8.7%, respectively, had written/official sale contracts. The percentage of treatment *soum* households with a written/official contract to supply produce to the market was twice as high compared to control *soums*. Cases of making verbal agreements were more widespread among treatment households - 52.8% in treatment *soums* against 45.2% in control *soums*. KII feedback notes that local sales of vegetables, potato and fodder were significant and would not have required contracts due to their direct sales within the *soum* where they were produced. This trend was also widespread among female-headed and vulnerable households. Among female-headed households in treatment *soums*, 72.2% had verbal agreements: this was the highest rate of written agreements. These numbers are comparable with data provided by the PIU in the LAMP Results Framework – Final Achievements publication (as of December 31, 2017).

The PIU household survey data also showed that the share of marketed products by category was: meat – 45.0%; milk – 37.0%; wool – 42.0%; green fodder – 53.0%; hay – 31.0%; and potatoes – 50.0%. Both, the LAMP Household Survey and the ELS, results confirm that the target of 30.0% was overachieved.

Increase in output of livestock products (meat, milk, wool, cashmere)

Growth of major livestock products such as meat, milk, wool and cashmere reached the target levels. Meat output of households in treatment *soums* covered by the survey averaged 758.5 kilograms in 2017 while that of households in control *soums*' meat output was 662.2 kilograms. The percentage of households in treatment *soums* that supplied meat to the markets was higher than that in the control *soums*. This trend was also observed among female-headed and vulnerable households in treatment *soums*.

The average output of milk in a treatment *soum* household was 2,657.6 liters, which was greater by 527.9 liters or 24.8% compared to that of control households. Production of fresh milk and dairy products was also greater in treatment against control *soum* households.

According to the results of the analysis, the treatment group's bovine milk output was 8.7% higher than the milk yield of control group households. This demonstrates that the project's goal of increasing the milk yield and milk consumption has been achieved.

The quantity of wool and cashmere prepared by the treatment group was greater than the quantity produced by the control group households, but it is not clear whether this difference is relevant to the involvement in the project statistically.

According to the project objectives for the fifth year, the sheep wool output was to reach 172.0 kilograms with cashmere output of 37.6 kilogram. These targets were achieved as the end-line survey data showed sheep wool output at 173.6 kilogram and goat cashmere output at 46.3 kilogram. In comparison to the output of households in control *soums*, output of wool in treatment *soums* was higher by 32.0 kilograms or 22.6%, the cashmere output was higher by 1.4 kilograms or 3.1%.

Change in per capita consumption of various food ingredients, disaggregated by gender in the households and vulnerable groups

Extreme hunger and hunger are rare in Mongolia, especially in the rural areas where there are large numbers of livestock. However, the traditional food basket is not so diverse, consisting mainly of dairy, meat and flour products. In recent years, treatment *soums'* herder households' food consumption has significantly diversified due primarily to pilot horticulture operations. Many treatment households and cooperative members claimed that their food consumption diversified compared to the baseline period. The end-line survey estimated four kinds of food consumption indices. The four measures of food security were designed and tested cross-culturally by the Food and Nutrition Technical Assistance (FANTA) Project of USAID and the FAO and were the same as the baseline questionnaire. The four food security measures were:

- Household Hunger Scale (HHS),
- Household Dietary Diversity Score (HDDS),
- Women's Dietary Diversity Score (WDDS),
- Months of Adequate Household Food Provisioning (MAHFP) and

Together these indices 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.

According to the HHS, there were no households included in the "severe hunger" category. Overall, more treatment households were in the "little to no hunger" category while more treatment households were in the "moderate hunger" as compare to controls (Table 20). This indicates that more treatment households had moved to higher levels for food security. This trend is seen as well for female-headed households and vulnerable households. Given that more milk and meat was consumed in the treatment households (Table 19) then lower hunger is clearly an outcome.

The HDDS measure uses 3 categories for dietary diversity including lowest diversity, medium diversity and high diversity. Most households were in the high diversity group (treatment 67.3%, control 58.9%). (See Table 21). Even female-headed and vulnerable households mostly belonged to the high dietary diversity group. As with the HHS, more treatment households were in the higher diversity category than control. Surveyed households said that food diversity is one of main impacts of LAMP's horticulture interventions. KII respondents noted in numerous cases the availability of fresh local and affordable vegetables were available at the soum level and that even adjacent soum residents could purchase locally grown vegetables.

WDDS was measured only in households with female members aged 15-49, and a trend was observed for the treatment group households to consume more diverse kinds of food compared to the control group households.

The MAHFP is measured on a scale of 0-12, in which 12 means the household meets its food needs in all 12 months, and 0 means the household is not able to meet its food needs in any of the 12 months. The treatment group averaged a score of 11.97 and control were 11.89 on average, showing that the treatment households had a significant although small difference with food shortages during the year. In fact, in Mongolian diets, milk and meat are storage as frozen or dried meat and dried curds, butter and cream. With the higher production, these products can be eaten year round.

Dietary diversification was observed in all treatment household groups including vulnerable and female-headed households. The per capita consumption of specific food ingredients including carrots, sea buckthorn (berry), horse meat and milk, and disaggregated by female headed and vulnerable households, increased beyond target levels (see Table 1). Horse meat, milk, carrot and sea buckthorn consumption was used as a proxy by the LAMP Project Steering Committee to assess food diversification. The ELS showed increases in treatment households' per capita consumption of horse meat (47.6%), milk (36.6%), carrot (20.8%) and sea buckthorn (2.3 times) indicating improved nutrition and diet diversification. In fact, some KII participants mentioned that as a result of LAMP interventions, household food consumption became more diverse including foods such as vegetables, pork and chicken. Consumption of additional food items such as potato, meat, sugar and sweets were also observed to back up the assumption. Also, with increasing incomes, local availability of vegetables, and project training on nutrition, the LAMP project appears to have achieved one of GAFSP key goals of increasing food security in dimensions of overall consumption and diversification.

Some notes for female-headed households

The LAMP project documentation notes that "Mainstreaming gender to ensure equity and empowerment will be a core aspect of project implementation. To advance this, a gender strategy for the project that takes into account all component activities will be developed. ... The action plan will be costed and included in annual work plans and budgets. In addition, all studies and follow up analysis, activities (based on the action plan) and monitoring and evaluation will be guided by gender considerations that will ensure the incorporation of the interests and needs of men and women in planning, implementation and monitoring of project activities. The focus on activity and income diversification of the project is expected to have positive impact on women and contribute to gender equity and empowerment for the benefit of the social structure."³

³ LAMP. PAD, 2013, p30

From the end-line survey data, female-headed households' income, and livestock output were lower than average households, but higher than control's and vulnerable households (see Table 16).

Comparing livestock and horticulture intervention success, horticulture operations had greater success for reaching female-headed households. Planting potatoes and vegetables, or animal feed production are becoming main income source of female-headed and vulnerable households (see Figure 25). For that reason, horticulture plot sizes were greater in treatment *soums*, among female-headed and vulnerable households (Figure 26). However, many of the LAMP activities fell into the area of men's responsibilities (especially livestock and marketing) so even in single women headed households, men benefited significantly.

Members of female-headed households participated more actively in cooperative activities and received more services, and they provided feedback in the ELS that progress was made in veterinary services, animal breeding and genetic improvement and animal feed processing (see Figure 14). They wish, if possible in the future programmes that Livestock Health, Meat Processing and Meat Products, Wool and Cashmere Processing sub-projects will be invested in and developed (see Table 29).

Significantly, the LAMP has benefited the local community including low and middle income households and female headed households.

Some notes for vulnerable households

In the report we wrote about vulnerable households, in most cases this definition related to persons with low income or disability to work. Most vulnerable households had larger family size, which were 5.2 members on average. The LAMP main objective was to improve rural livelihoods and food security in selected *aimags* and *soums* through investments in enhancing productivity, market access and diversification in livestock-based production systems⁴. According to the PDO, vulnerable households were included as key beneficiaries of the project which did not constrain access among the vulnerable groups.

Results of the end-line survey showed significant increase in vulnerable households' income, livestock output and horticulture production, and considerably higher than those in control vulnerable households (see Table 16).

Vulnerable households were more active than female-headed and average households in cooperative membership (see Figure 14). This tendency was observed in participation of the project intervention.

Finally, lessons voiced by ELS respondents on ways forward for scaling up the successful aspects of LAMP may include:

- Equipment and mechanization for animal service provision, hay/fodder production and horticulture was extremely useful to improve and expand production,
- Animal health services improved with mobility (motorbikes), mobile fences and better medicines and vaccines,
- Nucleus flocks helped to improve quality of animals and production of livestock products,
- Wool and cashmere pre-processing
- Meat and milk processing, especially meat storage,

⁴ LAMP, PAD, 2013, p37

- Training programmes for all the above.

However, they also noted that future programmes should:

- Ensure water supply and gravity fed irrigation is better addressed, especially for horticulture and fodder,
- Wool and cashmere local processing,
- Nucleus flocks settled and able to provide continuous services,
- Horticulture product storages for excess production.

Overall, in line with national rangeland degradation and declining livestock product quality, programmes should consider to:

- Continue to build on LAMP innovations such as increased fodder production, extension services for livestock and horticulture, improved animal care and breeding programmes and support for various equipment (e.g. tractors, bailers, processing, etc.) through programmes such as those proposed in the Mongolian Agenda for Sustainable Livestock using local pasture fees specifically used to support such programmes at *soum* and *aimag* level;
- Address subsidies, awards and other current means driving over-stocking and over-grazing through changes in award criteria (e.g. current 1000 animal award converted to 1000 “heavy, sustainably pastured certified and registered” animal award) and introduction of a “sustainably pastured” certification scheme and bonus subsidies aiming only at high quality primary products,
- Develop new means to reduce livestock numbers while ensuring income for herders such as local improved breeding (following on from LAMP progress), value addition to livestock products (e.g. cheese for export, pre-processing skins/hides and fibres) with improved *Soum*-level planning such as Pasture Use Plans limiting livestock numbers to carrying capacity
- Focus on developing a new cadre of animal and horticulture professionals to support training and media information for herders, and
- Support young herders and women household members through continuing education/extension programmes, low interest loans for added value activities and cultural events.

Finally, although much innovation and impact has been accomplished during the relatively short duration of the LAMP project, a longer term commitment by the Government of Mongolia needs to be developed. The recently prepared Mongolian Agenda for Sustainable Livestock, for example, provides a framework that incorporates many of the LAMP innovations, provides for a funding mechanism through pasture user fees and would be sufficiently long term to have meaningful results in areas such as human capacity development, livestock breeding, fodder production and capitalization for mechanization, livestock product processing and water supply.

Table 1. Results Framework Findings

#	PDO Level Results Indicator	Unit of measure	Baseline	Data source	Targets	End-line survey		Data source ¹	Difference	Growth rate over baseline	Methodology (ELS and LAMP, PIU)	Responsibility for data source
						Treatment	Control					
1	Indicator One: (GAFSP) Number of intended and actual direct beneficiaries, gender disaggregated ² .	Number	Counted as 0. Gender disaggregated	PIU, MIS records	12,000 people	13,684 beneficiaries		PIU			PIU records	PIU
		Number				Female: 6,083 (44.0%) Male: 7,601 (56.0%)						
2	Indicator Two: (GAFSP) Increase in household income from livestock and in selected cases, horticultural products The amount of income will be identified by its real value.	'000 MNT	Livestock 3,847.4	Baseline DIME 2013 ³	4.616,8	6,692.7	5,720.9	SICA, End-line survey	971.8	73.9%	Consist of wages from herd other HHS animal and income from livestock and livestock related operations	SICA LLC
		'000 MNT	Horticulture 16.7	Baseline DIME 2013	20.06	151.2	107.2	SICA, End-line survey	44.0	9.0 times	Consist of horticulture operations income	SICA LLC
	Amount	'000 MNT	7,156.0	Baseline DIME 2013	20.0%	10,327.8	9,112.4	SICA, End-line survey	1,215.4	44.3%	Consist of all income sources livestock, horticulture, wages, services, shares and gifts.	SICA LLC
3	Indicator Three: Share of marketed products going through contracts	Percent	Counted as 0%	PAD, attachment 1	30.0	Meat: 45.0%, Milk: 37.0%, Wool: 42.0%, Green		PIU		Meat: 45.0%, Milk: 37.0%, Wool: 42.0%, Green fodder: 53.0%,	Project records (Computation made from data sourced from: Project MIS,	PIU

¹ All the data were contributed by SICA and PIU; each contributor's will be responsible to their own data

² This number reflects beneficiaries across the range of interventions supported by LAMP including cooperative members

³ Baseline survey of LAMP, DIME, 2013

#	PDO Level Results Indicator	Unit of measure	Baseline	Data source	Targets	End-line survey		Data source ¹	Difference	Growth rate over baseline	Methodology (ELS and LAMP, PIU)	Responsibility for data source
						Treatment	Control					
	and established companies					fodder: 53.0%, Hay: 31.0%, Potatoes: 50.0%				Hay: 31.0%, Potatoes: 50.0%	TSPs, ASPs and beneficiaries reports)	
4	Indicator Four: Percentage of increase in output of livestock products (meat, milk, wool, cashmere)	Kg	Meat - 499.66	Baseline DIME 2013	600.0	758.5	662.2	SICA, End-line survey	96.3	51.8%	Amount of sold animals and consumed animals meat	SICA LLC
		Liters	Milk - 1,996.02	Baseline DIME 2013	2,395.0	2,657.6	2,129.7	SICA, End-line survey	527.9	33.1%	Amount of sold milk and consumed milk	SICA LLC
		Kg	Wool - 142.74	Baseline DIME 2013	172.0	173.6	141.6	SICA, End-line survey	32.0	21.6%	Amount of wool sold and consumed	SICA LLC
		Kg	Cashmere - 31.31	Baseline DIME 2013	37.6	46.3	44.9	SICA, End-line survey	1.4	47.8%	Amount of cashmere sold and consumed	SICA LLC
5	Indicator Five: (GAFSP) Change in per capita consumption of various food ingredients, disaggregated by gender in the households and vulnerable groups	Kg	Average HH: Horse meat- 2.1 kg	No baseline data, this indicator revised during the MTR, in April 2016	2.3	3.1	2.4	SICA, End-line survey	0.7	47.6%	Estimated from consumed horsemeat per month, per capita (sum of meat/number of persons)	SICA LLC
		Kg	Female headed HH: Horse meat – 0.75			3.1	1.9	SICA, End-line survey	1.16			
		Kg	Vulnerable HH ¹ : Horse meat – 0.75			2.4	2.1	SICA, End-line survey	0.36			

¹ Vulnerable household: Herd size is less than 100 animals, household head is illiterate, disabled household members, and low income of subsistence level in Khangai region 173,500, Western region 166,500 MNT monthly income of population (Source: NSO, 2017)

#	PDO Level Results Indicator	Unit of measure	Baseline	Data source	Targets	End-line survey		Data source ¹	Difference	Growth rate over baseline	Methodology (ELS and LAMP, PIU)	Responsibility for data source
						Treatment	Control					
		Liter	Average HH: Milk-23.25 liter	Baseline DIME 2013	29.8	31.8	27.5	SICA, End-line survey	4.3	36.6%	Estimated from consumed milk per month, per capita (sum of milk/number of persons)	SICA LLC
		Liter	Female-headed HH: Milk – 25.2			23.2	23.9	SICA, End-line survey	0.69			
		Liter	Vulnerable HH: Milk – 14.0			21.7	17.8	SICA, End-line survey	3.93			
		Kg	Average HH: Carrot -1.2 kg	No baseline data, this indicator revised during the MTR, in April 2016.	1.3	1.5	1.2	SICA, End-line survey	0.3	20.8%	Estimated from consumed carrot per month, per capita (sum of carrot/number of persons)	SICA LLC
		Kg	Female-headed HH: Carrot			1.5		SICA, End-line survey				
		Kg	Vulnerable HH: Carrot			1.3		SICA, End-line survey				
		Kg	Average HH: Sea buckthorn - 0.2 kg	No baseline data, this indicator revised during the MTR, in April 2016	0.2	0.5	0.4	SICA, End-line survey	0.3	2.3 times	Estimated from consumed sea buckthorn per month, per capita (sum of sea buckthorn/number of persons)	SICA LLC
		Kg	Female-headed HH: Sea buckthorn – 0.001			0.4		SICA, End-line survey				
		Kg	Vulnerable HH: Sea buckthorn – 0.7			0.4		SICA, End-line survey				

#	Intermediate Results Indicator ¹	Unit of measure	Baseline	Target	End of project accomplishment	Frequency	Data source/ Methodology	Responsibility for Data	Data source methodology LAMP	Comments
1	No. of functioning productive partnerships	Number	Considered as 0.	60	64	Annually	Project record	PIU	Project Records (Computation made from data sourced from: Project MIS, TSPs, ASPs, and beneficiary reports)	This number is based on the number of productive partnership agreements under meat, dairy, wool, nutrition and horticulture sub-projects as of December 31, 2017
2	Increase of farm production under improved post-harvest management (i.e. value chains) (GAFSP)	Percent	Considered as 0.	20	Green fodder and hay: 47%, Potatoes and other vegetables: 50%	Annually	Project, company, and association records	PIU	Project Records (Computation made from data sourced from: Project MIS, TSPs, ASPs, and beneficiary reports)	Increase reflects outputs of improved post-harvest handling, i.e. cooling, cleaning, sorting and packing
3	Number of herder cooperatives linked to markets	Number	Considered as 0.	40	86	Annually	<i>Soum</i> records, participating households	PIU	Project Records (Computation made from data sourced from: Project MIS, TSPs, ASPs, and beneficiary reports)	Number of benefitting entities with contracts to supply their products to the local processors and, in case of animal nutrition, to the local/regional emergency funds. Arhangai-15, Bayanhongor-20, Govi-Altai-15, Zavhan-15, Huvsgul-21)
4	Number of women trained and engaged in horticulture production	Number	Considered as 10.	700	1,270	Annually	<i>Soum</i> records, participating households	PIU	Project MIS	1,270 women beneficiaries of horticulture sub-projects were trained and engaged in horticulture production as of December 31, 2017.

¹ IRI data is provided by PIU in May 2018, which is informed as of December 2017

#	Intermediate Results Indicator ¹	Unit of measure	Baseline	Target	End of project accomplishment	Frequency	Data source/ Methodology	Responsibility for Data	Data source methodology LAMP	Comments
5	Number of herders who have adopted improved animal husbandry technologies (GAFSP indicator) disaggregated by gender	Number	Considered as 0.	5,000	Total: 6,125 Male: 3,020 (49%) Female 3,105 (51%)	Annually	Project record	PIU	Nutrition (winter feeding) -2,404 Veterinary (regular treatment) – 1,505 Animal breeding (improved strains) - 2,216 TSPs, ASPs, and beneficiaries reports	6,125 includes beneficiaries of nutrition sub-projects who kept their share of hay for internal consumption to feed their livestock during winter, number of herders who received regular treatment of their livestock and used improved livestock provided to animal breeding practitioners.
6	Number of collaborative research	Number	Considered as 0.	5	5	Annually	Project record	PIU	Project MIS	Collaborative researches completed: 2 in animal health, 2 in animal breeding, 1 in animal nutrition.
7.1	Increased reproductive rates	Percent		5	12%			PIU	Project Records (Computation made from data sourced from: Project MIS, TSPs, ASPs, and beneficiaries reports)	Based on number of offspring produced by the breeding animals supplied by the LAMP declared by the benefitting nucleus and male flock handlers (in total 1,780 young animals including 1085 lambs, 659 goat kids, 36 calves were received from 2,379 invested breeding animals)
7.2	Increased carcass weight	Percent		5	5%			PIU	2,379 animals were measured in May 2017 Spring live weight (sheep) 46.9 kg (relative carcass weight increase 5.9%) Spring live weight (goats)	Carcass weight is measured using standard conversion rate based on live weight of animals (NSO methodology) Live weight is measured in May (spring live weight) when livestock weight is at

#	Intermediate Results Indicator ¹	Unit of measure	Baseline	Target	End of project accomplishment	Frequency	Data source/ Methodology	Responsibility for Data	Data source methodology LAMP	Comments
									33.7 kg (relative carcass weight increase 6.3%) Spring live weight (cattle) 329 kg (relative carcass weight increase 1.7%) Project Records (Computation made from data sourced from: Project MIS, TSPs, ASPs, and beneficiaries reports)	its minimum after long winter.
8	Number of target group with use or ownership of land under forage production (disaggregated by female headed households)	Number	Considered as 0.	30	Total: 40 Female-headed: 4	Annually	VABU records, assessment	PIU	LAMP Household Survey 2017 Project Records (Computation made from data sourced from: Project MIS, TSPs, ASPs, and beneficiaries reports)	
9	Number of herders participating in training and awareness events (disaggregated by gender)	Number	Considered as 0.	8,000	Total: 8,000 + (Training and events participants: 7,450 Male: 4,552 Female: 2,898)	Annually	VABU records, assessment	PIU	Number of herders who attended training/capacity-building activities as well as market events funded by the LAMP Project Records (Computation made from data sourced from: Project MIS, TSPs, ASPs, and beneficiaries reports)	This figure does not include number of herders who were reached with awareness events that include media campaigns through TV and radio broadcasts, as well as hand-outs and materials distributed (19 types of extension materials including 3 types of hand-outs in 8,000 copies each, 10 types of video lessons, 140 minutes of TV nationwide broadcast, 114 minutes of nation-wide radio broadcast, etc.)

#	Intermediate Results Indicator ¹	Unit of measure	Baseline	Target	End of project accomplishment	Frequency	Data source/ Methodology	Responsibility for Data	Data source methodology LAMP	Comments
										Estimated number of herders participating in training and awareness events goes well beyond the target of 8,000.
10	Existence and use of cold chain and SOPs for vaccine and sample transportation	Number	Considered as 0.	5	5	Annually	VABU records, assessment	PIU	Project Records (Computation made from data sourced from: Project MIS, TSPs, ASPs, and beneficiaries reports)	Vaccine cold chains exist and operate in 5 <i>aimags</i> . Project supplied refrigerated vehicles to 5 <i>aimags</i> and vaccine refrigerators to 15 <i>soum</i> VABUs, successfully establishing and strengthening <i>aimag</i> cold chains.
11	Genetics and Breeding – No. of nucleus flocks established	Number	Considered as 0.	11	19	Annually	Project records from NH and multiple herds	PIU	Project Records (Computation made from data sourced from: Project MIS, TSPs, ASPs, and beneficiaries reports)	Number of nucleus flock established with LAMP support.
12	Genetics and Breeding – number of improved males distributed from nucleus flock	Number	Considered as 0.	1,500	2,904	Annually	Project records from NH and multiple herds	PIU	Project Records (Computation made from data sourced from: Project MIS, TSPs, ASPs, and beneficiaries reports)	Number of improved sires distributed from male flocks established by the Project for animal breeding beneficiaries.
13	Genetics and Breeding – number of AI operators trained	Number	Considered as 0.	90	90	Annually	Project records from NH and multiple herds	PIU	Project MIS	

#	Intermediate Results Indicator ¹	Unit of measure	Baseline	Target	End of project accomplishment	Frequency	Data source/ Methodology	Responsibility for Data	Data source methodology LAMP	Comments
14	Feeds and feeding –Ha of land allocated to forages at the <i>soum</i>	Ha	Considered as 0.	2,000	2,288	Annually	<i>Soum</i> records, participating households	PIU	Project Records (Computation made from data sourced from: Project MIS, TSPs, ASPs, and beneficiaries reports)	Land with formal title: 3,091 ha Land fenced: 2,288 ha
15	Efficient and effective project management	Text	Considered as 0.	Satisfactory	Satisfactory	Semi-annually	Supervisions, audits, mid-term evaluation, ICR	PIU	Supervisions, audits, mid-term evaluation	WB supervision (ISM Rating), audits (unqualified), GOM PCR
16	Quality of financial reports and audits	Text	Considered as 0.	Satisfactory	Satisfactory	Semi-annually	Supervisions, audits, mid-term evaluation, ICR	PIU	Supervisions, audits, mid-term evaluation	WB supervision (ISM Rating), audits (unqualified), GOM PCR
17	Quality of project progress reports	Text	Considered as 0.	Satisfactory	Satisfactory	Semi-annually	Supervision, audits, mid-term evaluation	PIU	Supervision, audits, mid-term evaluation	WB supervision (ISM Rating), audits (unqualified), GOM PCR
18	Quality of the M&E reports	Text	Considered as 0.	Satisfactory	Satisfactory	Semi-annually	Supervision, audits, mid-term review	PIU	Supervision, audits, mid-term review	WB supervision (ISM Rating), audits (unqualified), GOM PCR
19	Number of participants in M&E workshops, training events, seminars, conferences etc. (disaggregated by gender and affiliation)		Considered as 0.	600	Total: 685 Male: 308 (45%) Female: 376 (55%) Civil servants: 378 Private sector: 307	Annually	Project record	PIU	Project Records (Computation made from data sourced from: Project MIS, TSPs, ASPs, and beneficiaries reports)	

An aerial photograph of a vast, green valley. In the background, there are rugged, brown mountains under a clear sky. The foreground is a lush green field with some small structures and a circular stone wall visible. The entire image is overlaid with a semi-transparent green filter.

1

INTRODUCTION

Chapter 1. Introduction

Background

The Livestock and Agricultural¹ Marketing Project (LAMP) was part of a Global Agriculture and Food Security Programme (GAFSP) initiated by the G20 countries in response to the 2008 world food crisis and executed through the GAFSP Secretariat in the World Bank. The objective of GAFSP is “to improve incomes and food and nutrition security in low-income countries by boosting agricultural productivity”². The LAMP project was implemented by the Government of Mongolia (GOM) and supervised by the World Bank with technical inputs through a smaller Integrated Livestock-Based Livelihood Support Project technical assistance project implemented by the Food and Agriculture Organization (FAO). These projects were established in Mongolia in large part because of Mongolia’s dependence on imports for food security. The LAMP Project Development Objective (PDO)³ was:

...To improve rural livelihoods and food security in selected aimags and soums through investments in enhancing productivity, market access and diversification in livestock-based production systems.

To achieve this objective and ensure maximum impact, the project will address a set of closely linked constraints in market access, price-quality relationships and livestock production (animal health, animal breeding, genetics and nutrition) that need to be treated in an integrated manner. The demonstration of these integrated, market-driven approaches in a small geographic area (pilot) will provide successful models that the Government of Mongolia (GOM) can replicate through the National Livestock Program (NLP). The project will also support pro-poor income growth and nutrition diversification through the production of horticultural products at the household level.

The total GAFSP grant to the Government of Mongolia through the Ministry of Finance and MOFALI was USD 12.5 million. LAMP was funded under the GAFSP grant of USD 11 million and GOM input of USD 0.49 million with three components including:

Component 1: Linking Herders with Markets (USD 6.26 million)

Component 2: Raising Livestock Productivity and Quality (USD 4.23 million)

Component 3: Project Management (USD 1.00 million)

The Food and Agriculture Organization (FAO) directly implemented the Integrated Livestock-Based Livelihood Support Project, which was to provide technical assistance to LAMP with a grant of USD 1.5 million, although it did not report directly to the PIU.

The time frame of the project included formulation in 2010 and approval by GAFSP in 2011. The WB appraised the project in 2012 and signed with the GOM in November 2013 (effectiveness in February 2014). Actual implementation began in March 2015 due to a change in project target *soums*.

¹ “Agriculture” in Mongolia refers primarily to cropping agriculture.

² See: <http://www.gafspfund.org/>

³ Project Appraisal Document, World Bank Report No: 73827-MN, May 17, 2013

The project was implemented in five provinces (*aimag*) and 15 districts (*soums*) as shown in Table 2. Initial target *soums*, where the baseline survey was conducted, were superseded by a decision of the Project Steering Committee in May 28, 2014¹ so that the ELS was conducted in revised target *soums*. Table 3 shows the top level Project Development Objectives (PDO) of the LAMP overall.

Table 2. Initial target *soums* and revised target *soums* for LAMP implementation

No	<i>Aimag</i>	<i>Initial Soums</i>	<i>Revised Soums</i>
1	Arhangai	Chuluut	Chuluut
2		Khangai	Tsahir
3		Bulgan	Tsetserleg
4	Bayanhongor	Bogd	Bayantsagaan
5		Baatsagaan	Jargalan
6		Galuut	Galuut
7	Gobi-Altai	Delger	Bugat
8		Khaliun	Tsogt
9		Chandmani	Tseel
10	Zavhan	Zavhanmandal	Otgon
11		Erdenekhairkhan	Tsetsen-Uul
12		Tsagaankhairkhan	Yaruu
13	Huvsgul	Shine-Ilder	Burentogtokh
14		Tosontsengel	Tosontsengel
15		Tunel	Tunel

Table 3. LAMP results framework – final achievement

<i>Project Development Objectives</i>	<i>Target</i>	<i>Achieved</i>
Number of intended and actual direct beneficiaries, gender disaggregated	12,000	13,684 (of which, 6,083 female)
Increase in household income from livestock and in selected cases horticultural products.	20%	Livestock income 73.9% Horticulture income 9 times
Share of marketed products going through contracts and established companies.	30%	Livestock products 57.3% Horticulture products 61.6% Animal feed 73.9 %
Percentage increase in output of livestock products (meat, milk, wool, cashmere)	20%	Meat – 51.8% Milk – 21.6% Wool – 21.6% Cashmere – 47.8%
Change in per capita consumption of various food ingredients, disaggregated by gender and vulnerable groups.	10%	Horse meat – 47.6% Milk – 36.6% Carrot – 20.8% Sea buckthorn – 2.3 times

Aim of the End-line Survey

The End-Line Survey, as noted in the Project Appraisal Document (PAD) and monitoring and evaluation plan of the project, aims to analyze the impact of the project and change during 5 years of LAMP interventions. The end-line survey provides a systematic and objective means to assess the

¹ Midterm and End-line Terminal Evaluation Concept Note, April 6, 2016

interventions the project implementation, and its results with the aim to determine its relevance, efficiency, effectiveness, impact, and sustainability as defined below:

Relevance: The extent to which the project goal is suited to the priorities, needs, and policies of the GOM, GAFSP and beneficiaries. Contribution of project impact under each PDO and intermediate results to support national and local policy as well as expectations of beneficiaries.

Effectiveness: The extent to which LAMP attained its PDO level 1 and Intermediate Result Indicators.

Efficiency: The extent to which the project intervention costs are perceived as reasonable to achieve activities and objectives as planned.

Impact: Degree (positive and negative) to which interventions successfully achieved objectives of the project – sometimes achieved beyond specific planned objectives - be they intended or unintended

Sustainability: Extent to which project benefits will continue through policy, GOM, community action, individual champions and others beyond the period of the project implementation. Dimensions include institutional, technical, economic, social, and environmental.

The ELS used quantitative surveys results and KII results of beneficiaries in treatment *soums* and compared with control *soums* as described in Chapter 2: Methodology with analysis section. Chapter 3: Findings of Living condition of herders and food security provide a description of data collected and analyzed from surveys and KII. Chapter 4 and 5: Describe results from household survey and KII result analysis according to LAMP components such as linking herder to Markets, Rising livestock productivity and quality. Chapter 6. Discussion on project intervention achievements within the dimensions of effectiveness, efficiency, impact, sustainability and relevance. Chapter 7. Conclusion and Way Forward chapter shows achievements of project intervention in household level by PDO results and its components, while providing recommendations for LAMP follow-up programming.



2

METHODOLOGY

Chapter 2. Methodology

In order to ensure the ELS was based on comprehensive result-based findings, data collection followed three-steps including (i) desk review, (ii) quantitative survey and (iii) qualitative survey. The desk review covered lessons learned in the mid-term phases of the project as well as LAMP documentation. The quantitative survey involved an extensive questionnaire-based field survey (Annex 1) with 39 field enumerators and interviews with 1,800 persons. Questionnaire-based interviews were conducted with beneficiary and non-beneficiary households in both treatment and control *soums*.

In terms of the sampling distribution, selection of treatment household numbers was proportionally allocated in each *aimag* and *soum* weighted by numbers of direct beneficiaries. Control household numbers were determined in line with the number of treatment households. Treatment *soums* allocations were based on MIS beneficiary lists to be provided by the LAMP Project Implementation Unit (PIU). Tables 4 and 5 provide actual distribution in treatment and control *soums*, respectively.

Table 4. Treatment *soums*' sampling distribution

<i>Aimags</i>	<i>Soums</i>	Livestock herders		Horticulture farmers		Total	
		Planned	Actual	Planned	Actual	Planned	Actual
Arhangai	Chuluut	61	56	3	8	64	64
	Tsahir	83	83	3	3	86	86
	Tsetserleg	45	43	15	17	60	60
	Total	189	182	21	28	210	210
Bayanhongor	Bayantsagaan	47	46	4	5	51	51
	Galuut	48	49	12	11	60	60
	Jargalan	41	41	5	5	46	46
	Total	136	136	21	21	157	157
Gobi-Altai	Bugat	37	37	6	6	43	43
	Tsogt	44	44	3	4	47	48
	Tseel	57	70	25	11	82	81
	Total	138	151	34	21	172	172
Zavhan	Otgon	48	48	4	4	52	52
	Tsetsen-Uul	26	26	9	9	35	35
	Yaruu	26	27	10	9	36	36
	Total	100	101	23	22	123	123
Hovsgul	Burentogtokh	77	73	15	19	92	92
	Tosontsengel	44	42	18	20	62	62
	Tunel	68	76	16	8	84	84
	Total	189	191	49	47	238	238
Grand Total		752	761	148	139	900	900

Table 5. Control *soums*' sampling distribution

<i>Aimags</i>	<i>Soums</i>	Livestock herders		Horticulture farmers		Total	
		Planned	Actual	Planned	Actual	Planned	Actual
Arhangai	Ikhtamir/Tariat	54	62	13	5	67	67
	Undur-Ulaan	69	70	1	1	70	71
	Erdenemandal	66	65	7	7	73	72
	Total	189	197	21	13	210	210
Bayanhongor	Bogd	45	47	5	3	50	50
	Jinst	37	37	4	4	41	41
	Ulziit	54	54	12	12	66	66
	Total	136	138	21	19	157	157
Gobi-Altai	Biger	52	59	7	0	59	59
	Jargalan	35	37	21	19	56	56
	Tugrug	51	51	6	6	57	57
	Total	138	147	34	25	172	172
Zavhan	Aldarkhaan	40	41	18	17	58	58
	Durvuljin	37	37	1	1	38	38
	Tsagaankhairkhan	23	23	4	4	27	27
	Total	100	101	23	22	123	123
Huvsgul	Tumurbulag	64	63	11	14	75	77
	Jargalant	69	71	16	16	85	87
	Ikh-Uul	56	56	22	18	78	74
	Total	189	190	49	48	238	238
Grand Total		752	773	148	127	900	900

Although the sampling methodology was the same for each treatment *soum* and control *soum*, the sampling frames were different. In treatment *soums* household data from the Veterinary and Animal Breeding Unit (VABU) in the *soum* was used. In control *soums*, the *soum*'s statistical office data was used to compile the respondent list (see table 6).

Table 6. Household sampling steps in the treatment and control *soums*

Sampling steps	Treatment <i>soums</i>	Control <i>soums</i>
1	List of total households participating in the project obtained from the VABU.	The list of total herders and horticulture households received from the <i>soum</i> 's statistical office.
2	The treatment households classified into (i) direct beneficiaries (ii) indirect beneficiaries; training participants and the participants who received manual and extension materials from the project.	The list was classified into household main operations such as herder households, horticulture households and households running both livestock and horticulture.
3	For direct beneficiaries, the treatment households were classified by household main operations such as herder households, horticulture households and households running both livestock and horticulture.	The control household sampling selected based on classified household proportion.
4	Household sampling selected based on classified household proportion.	

The lists of eligible households used for the sampling was prepared on the basis of pre-defined main characteristics. Household characteristics were defined as:

- **Herder households:** Households herding livestock throughout the year and animal products are major source of their livelihood;
- **Horticulture households:** Households engage in crops, potatoes, vegetables and fodder production every year and the income derived from this activity is the main source of their livelihood; and

For the qualitative survey, Key Informant Interviews (KII) were undertaken using a set of entry questions in every treatment *soums*. The KII framework is in Annex 2. The results of KII were used to help interpret quantitative results and enrich findings on relevance and efficiency.

Survey Stages

While the scopes of quantitative and qualitative surveys are specifically identified in the previous section, technical actions included:

A. Preparation

Questionnaire/survey development was produced by consultants and a methodological team, including the manual for efficient use by enumerators consulted with WB experts.

- Questionnaire survey sheets for 1,800 samples printed.
- Key Informant Interview (KII) targeted group identified and structured and semi-structured techniques elaborated.

Data collection program and its testing phase paid special attention to the questionnaire readiness as well as error probability reduction during the data collection process. Data tablets were planned to be used for data entry and provided benefits such as ease of transmitting data from the primary units to the main network, improving data quality, security and labour efficiency. However, tablets showed serious deficiencies during the pilot such as impossibility to charge batteries in field and regularly stopped working with big data and complexity of the questions. For these reasons, SICA shifted the data collection process to paper based format. However, tablets are time and cost effective way for data collection but it in the countryside, with big questionnaire SICA found it was better to use paper based questionnaires.

Training: After the questionnaire form was approved by World Bank and the data entry software and other equipment was arranged, a 5-day training session was conducted between 10 – 14th of April in SICA's company office in Ulaanbaatar for enumerators. After completing the training, 45 participants took exams, and the required 39 persons were selected and signed employment contracts.

Pilot survey: A pilot survey was executed for testing the questionnaire quality and relevance from target respondents through trained enumerators and for updating the questionnaire with survey team and clients' feedback including 50 persons in Ulzii Khoroo for testing the questionnaire on 14 April 2018 during enumerators' training. The questionnaire was finalized accordingly.

2. Data collection

Data collection was conducted in the targeted areas within 20 days from 15 April to 4 May. The purpose of the interview was explained to interviewees during introduction of enumerators and scope of the work. Terms of confidentiality were addressed. Explained who will get access to their answers and how their answers analyzed. If their comments are to be used as quotes, get their written permission to do so. Explained all the information about the interviewees and their households will be used in research and note the confidentiality according to the “Law on Statistics of Mongolia” along with “Law on the Personal Information Confidentiality of Mongolia”.

A geographic information system (GIS) was used for data quality assurance and survey households’ distribution. Household locations are shown in Annex 3.

Data Collection Constraints

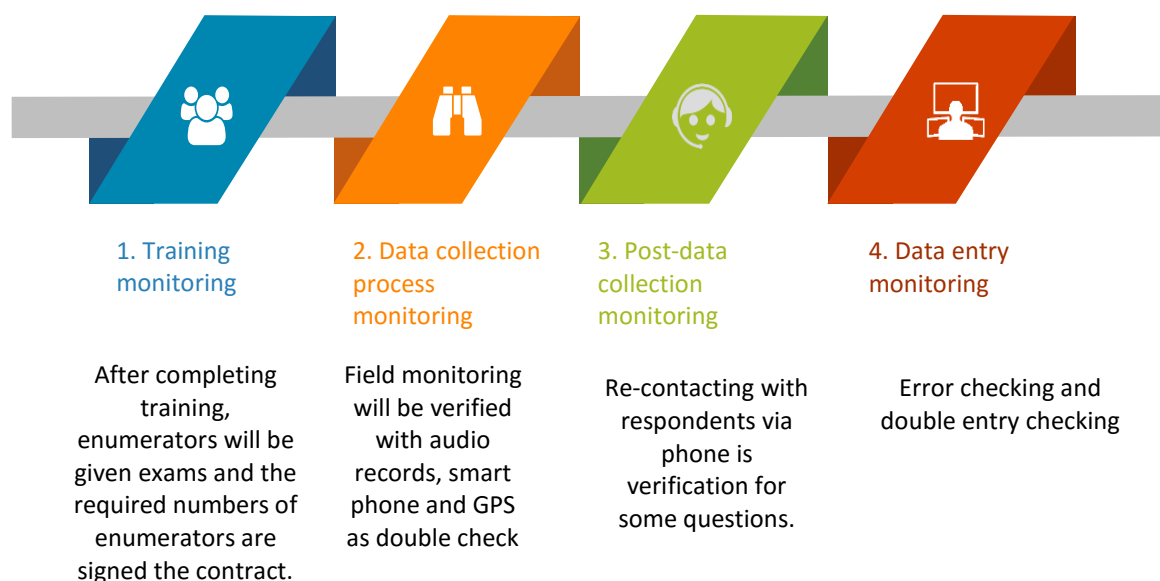
Eighteen hundred interviews were conducted against the expected 1,800 interviews. However, *soum* level interviews were different between planned and actual as shown in the tables above. The key problems encountered during interviews included:

- Most busy period of the year (combing the goat cashmere, giving birth of animals etc.),
- Movements of the herders from winter camp to spring camp,
- Weather condition were unstable, sunshine, snow storm, cold and spring flood met in one day is common. This weather condition scaused both emotional and physical stress,
- Due to Foot and Mouth Disease (FMD) quarantine, survey teams were not allowed to enter one *soum* so the SICA team replaced a control *soum* Ikh-Tamir with a comparable *soum*, Tariat in Arhangai *aimag* in consultation with WB experts.

3. Monitoring process

The SICA team implemented a 4 step monitoring process during the ELS as seen in Figure 1 below.

Figure 1. Monitoring steps



Field monitoring missions were carried out in all LAMP *aimags* and all field teams between 19-23 April. Members of monitoring team conducted on-site monitoring through visiting *aimag* and *soums* to inspect whether the enumerators were obtaining accurate information and data in accordance with the approved schedule. Any omissions, errors, or negligence identified during the on-site monitoring were immediately informed to team members and field supervisors and recorded properly.

After the field monitoring and post-data collection monitoring, data entry monitoring processes were conducted by SICA experts.

4. Data entry and processing

Data processing included primary and secondary data entry in order to ensure error reduction for data processing actions.

- Primary data entry: Used CPro 6.3 software format for data entry.
- Secondary data entry: In order to minimize (non-sampling) error during the data collection, enumerators also transcribed audio recordings obtained during interviews. With data entry process GIS location were re-checked.

5. Data Analysis

Data analysis stage started after data entry and processing level. In the data analysis stage, SPSS 25 software was used for data analysis of the survey results.

Data analysis mainly focused on household income growth and impacts of LAMP intervention in selected areas treatment households. First of all there calculated household income and its increase by real value. To calculate household income by real value here used CPI index. After calculating household income growth there made linear regression analysis to estimate LAMP intervention on household income.

1. For estimating household income with real value the Consumer Price Index (CPI) was used in this report by 2014-2017 years inflation rate. Changes in the CPI are used to assess price changes associated with the cost of living; the CPI is one of the most frequently used statistics for identifying periods of inflation or deflation.

Equation 1. Equation for CPI

$$I_{c2}^L = \left(\frac{P_{i2}}{P_{i1}}\right)\left(\frac{P_{i1}}{P_{i0}}\right)$$

I – index

P_{i0} – base year (2013)

P_{i1} – current year (2017)

The CPI has been calculated by the National Statistical Office¹ (NSO) for the following years: 2014 – 10.4%, 2015 – 1.9%, 2016 – 1.1%, 2017 – 6.4%.

¹ www.1212.mn

2. Data analysis mainly focused on household income increase (with gender disaggregation) by project interventions, which are meat, fiber and dairy products market development, pilot horticulture production, animal health, animal breeding management and animal nutrition.

For that reason, a regression analysis was used to measure the households' income changes in a statistically significant manner as a result of LAMP's interventions in the treatment households. By this method, possible indicators which influence household's income changes were included. Because of the households' diverse operations two different regressions were used to measure changes including one for livestock households and another for horticulture households.

In this report we chose a linear regression. Our model was as following.

Equation 2. Equation for Linear Regression

$$Y_{ij} = \beta_j Z_{ij} + \gamma_j FI_{ij} + v_{ij}$$

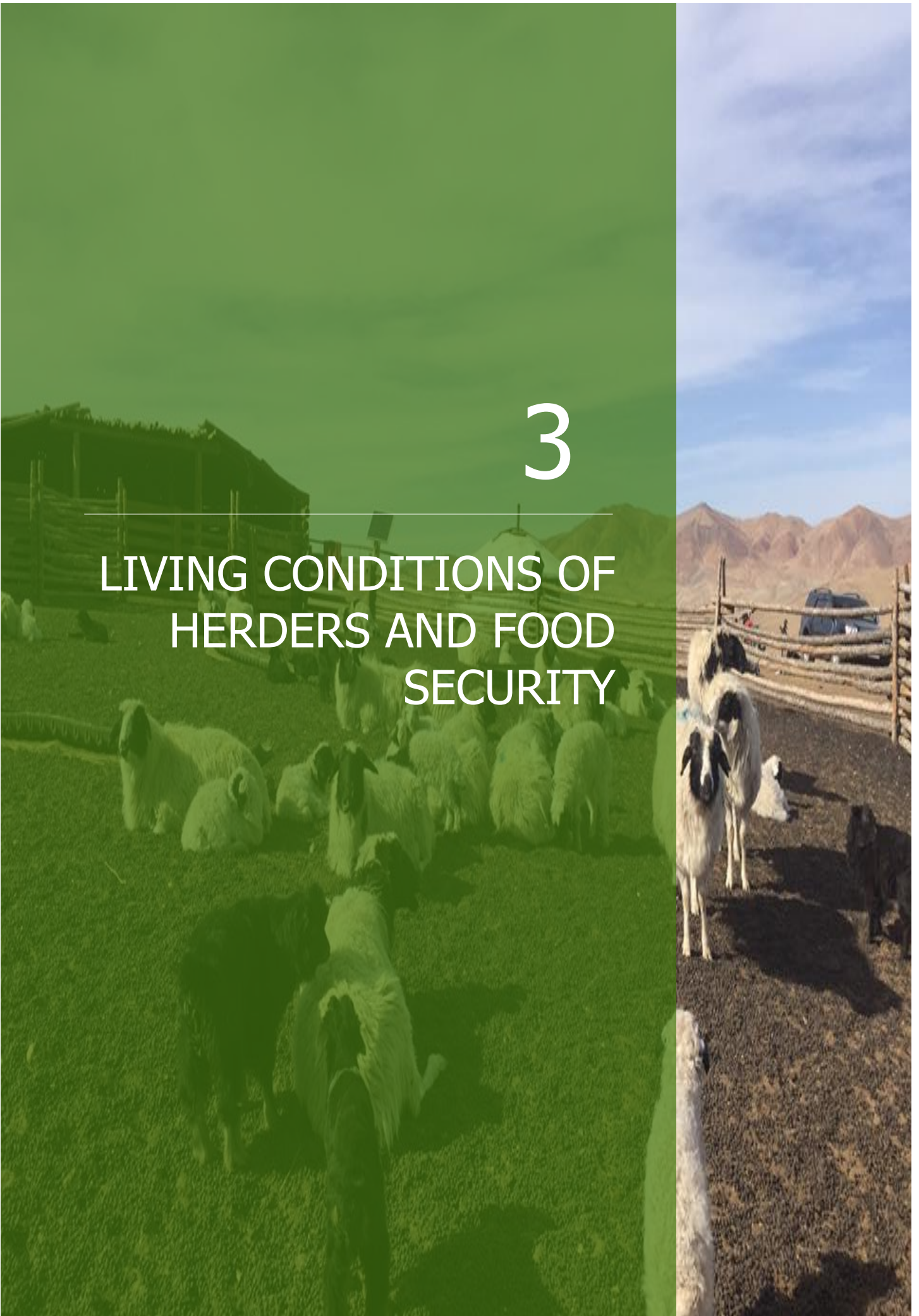
where: $i = \text{household ID}$; $j = \text{variable ID}$. v_{ij} is an error term and it is assumed $v_{ij} \sim iid(0, \sigma^2)$, and independent of explanatory variables $[E(v_{it} | Z_{ij}, FI) = 0]$; and serially uncorrelated. Y_{it} is the log level of household income in 2017 and Z_{ij} is a set of control variables for household i .

Z_{ij} includes all possible variable that would explain the household income and their values can be related to the project activities. In other words, Z_{ij} variables can represent the mixed effects of the project activity and household "own" activity. For example, a variable named as "vaccination" is dummy variable (it is 1 if the animals are vaccinated, otherwise it is 0). In this case, some animals can be vaccinated on account of LAMP project and some are not.

FI_{ij} is the variable that related to the project activity, directly. For instance, a variable "project breed" 1 means that the household took the breeding bulls from the LAMP nucleus flock. Moreover, "treatment" variable is in list of the FI_{ij} variables and it represents the whole LAMP project activities. Detailed descriptions are presented in the Chapter 6 Discussion.

3

LIVING CONDITIONS OF HERDERS AND FOOD SECURITY



Chapter 3. Living Conditions of Herders and Food Security

This chapter describes the socioeconomic status of the surveyed households including household profile, income and expenditure, herd size and mobility pattern. The ELS of LAMP covered a total of 1,800 households from treatment and control *soums* with 900 households in each group. The households included both herder and horticulture households. This section describes their living conditions disaggregated by household head gender, and vulnerability.

3.1. Household profile

The household composition, such as head of household gender, education with household possessions is described in this section. About 11% of surveyed households' in both treatment and control *soums* were female-headed households while 16.9% and 19.0% were vulnerable households respectively.

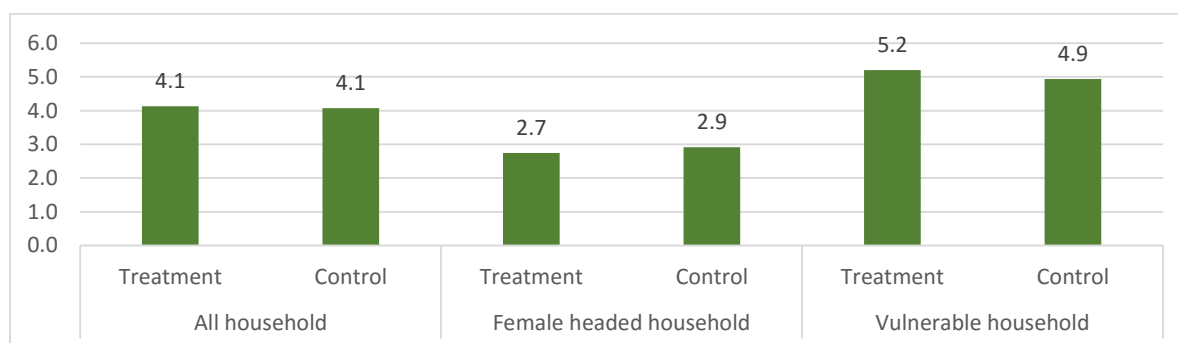
Table 7. The number of household by type

		Household				Vulnerable* household			
		Treatment		Control		Treatment		Control	
		Count	%	Count	%	Count	%	Count	%
HH head	Male	799	88.8%	793	88.1%	113	83.1%	136	81.0%
	Female	101	11.2%	107	11.9%	23	16.9%	32	19.0%
	Sum	900	100.0%	900	100.0%	136	100.0%	168	100.0%

*Vulnerable household: Herd size is less than 100 animals, household head is illiterate, disabled household members, and low income of subsistence level in Khangai region 173,500, Western region 166,500 MNT monthly income of population as defined by NSO in 2017

Households were composed of 4.1 individuals on average which is higher than the national average of 3.6 persons. Female-headed households consist of 2.7 and 2.9 members but there were 4.9 to 5.2 members in vulnerable Households in treatment and control *soums* respectively. The average of household heads were 43.5 and 47.6 in average households and female headed households respectively, and the average age of household members was 22.5 (see Figure 2, for more detail of household composition and members age see Annex 4 Table 1). In the baseline report, the average age of household head was 44.4 in average households and 56.9 in female-headed households¹.

Figure 2. Number of household members by household head and vulnerable

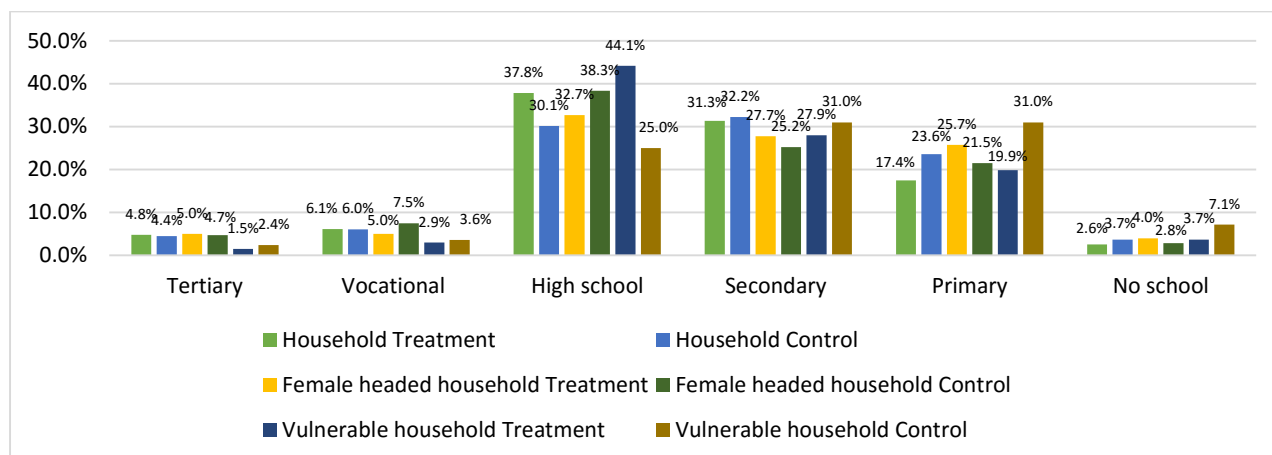


As can be seen from Figure 3, although the educational level of male and female household heads was comparable in treatment and control *soums* (4.4%-4.7% with tertiary and 25.0-38.3% with secondary education), the educational level of household heads in the vulnerable group was lower in both

¹ LAMP, Baseline report, 2013, p16

treatment and control *soums*. Since the educational level attained is directly related to the literacy rate, the literacy rate of the vulnerable group was relatively lower compared to that of other groups. Of total household heads, 1.9-3.6% could not read and write. According to the Population and Housing Census 2010 findings, the literacy rate at national level was 97.5%, while that of household heads in the vulnerable group was lower than the national average (for more detail see Annex 4 Table 2).

Figure 3. Education of household heads'



Households' dwelling characteristics were similar in both treatment and control *soums*. Ger dwelling are popular in surveyed households, however, a few own an apartment in urban or rural areas. Owning an apartment or extra ger indicators show no statistical significance between treatment and control. As shown in Tables 8 and 9, the average household dwelling and female-headed households' dwelling type was not changed from the baseline period.

Table 8. Household dwelling by household type

	End-line survey						Sig.	t
	Household		Female headed household		Vulnerable household			
	Treatment	Control	Treatment	Control	Treatment	Control		
Ger	97.4%	95.8%	96.0%	94.4%	97.1%	94.6%	0.00	-1.95
Additional ger	54.7%	52.9%	27.7%	35.5%	44.9%	26.8%	0.14	-0.75
Single detached house	33.1%	27.4%	27.7%	27.1%	19.1%	15.5%	0.00	-2.62
Apartment in urban and rural area	2.7%	2.9%	1.0%	1.9%	0.7%	0.0%	0.56	0.28

Table 9. Dwelling type in the baseline period¹

	Baseline survey	
	Total sample	Female-headed HH
Ger	89.0%	94.0%
Additional ger	52.0%	30.0%
Single detached house	10.0%	06.0%
Apartment in urban and rural area	--	--

¹ LAMP, Baseline report, 2013, p18

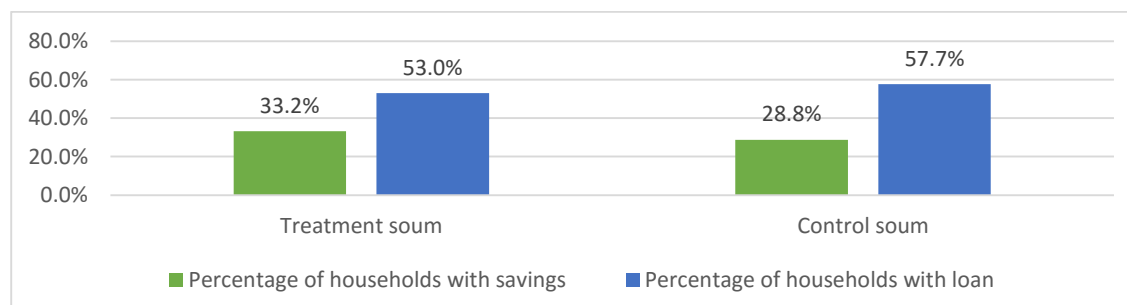
Dwelling types were similar in the surveyed households, but household assets were different between treatment and control groups. Except for cell phones, animal sheds and water wells, all other household applications and equipment ownership were higher in treatment households. Well or water hole ownership showed no statistical significance (see Table 10). Household assets were lower in female-headed and vulnerable households (for more detail see from Annex 4 Table 3).

Table 10. Household assets

	Treatment		Control		Sig.	t
	Count	%	Count	%		
Refrigerator and ice box	505	56.1%	455	50.6%	0.000	-2.365
TV and satellite antenna	823	91.4%	800	88.9%	0.000	-1.821
Solar panel	703	78.1%	679	75.4%	0.007	-1.340
Wind-powered generator	30	3.3%	16	1.8%	0.000	-2.092
Small-scale diesel generator	124	13.8%	92	10.2%	0.000	-2.323
Cell phone	876	97.3%	884	98.2%	0.010	1.279
Carriage drawn by animals	160	17.8%	131	14.6%	0.000	-1.857
Truck	297	33.0%	266	29.6%	0.002	-1.576
Passenger car	286	31.8%	202	22.4%	0.000	-4.476
Motorcycle	646	71.8%	606	67.3%	0.000	-2.050
Animal sheds	664	73.8%	709	78.8%	0.000	2.496
Well	184	20.4%	192	21.3%	0.354	0.464
Wool combing machine	26	2.9%	17	1.9%	0.005	-1.389
Haymaking machine	328	36.4%	366	40.7%	0.000	1.841
Planting equipment	122	13.6%	40	4.4%	0.000	-6.837
Ploughs	88	9.8%	28	3.1%	0.000	-5.810
Milk cream separator	83	9.2%	41	4.6%	0.000	-3.923
Land in urban areas	478	53.1%	437	48.6%	0.184	-1.934
Land in rural areas	85	9.4%	37	4.1%	0.000	-4.524

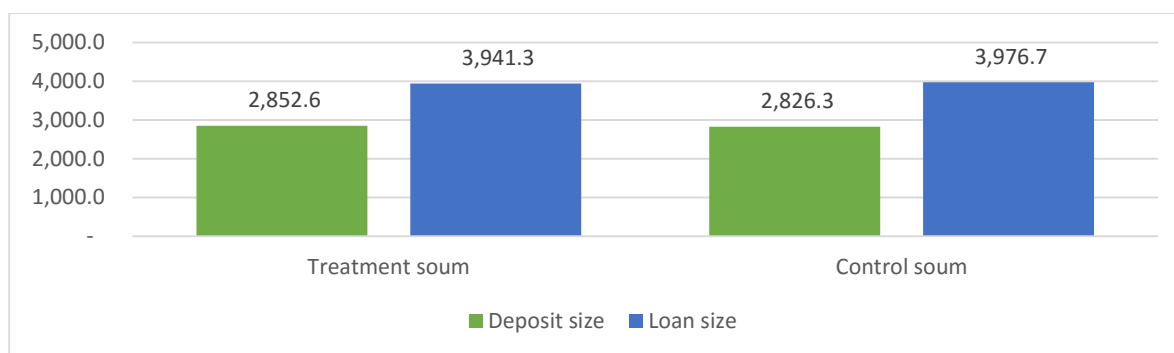
Surveyed households have savings and loans from bank and other financial organizations. Figure 4 and 5 show the size of savings and loan, which indicate similar levels in treatment and control *soums*. On average, one third of total households have savings but, one half have loans. The size of loans are bigger than the savings. During the baseline period this ratio was 1:3 for savings and loans. In the end-line period, household loans number decreased but the savings and loans size kept with the baseline which were savings at 2,570 million MNT and loans at 3,098 million MNT¹.

Figure 4. Household savings and loan



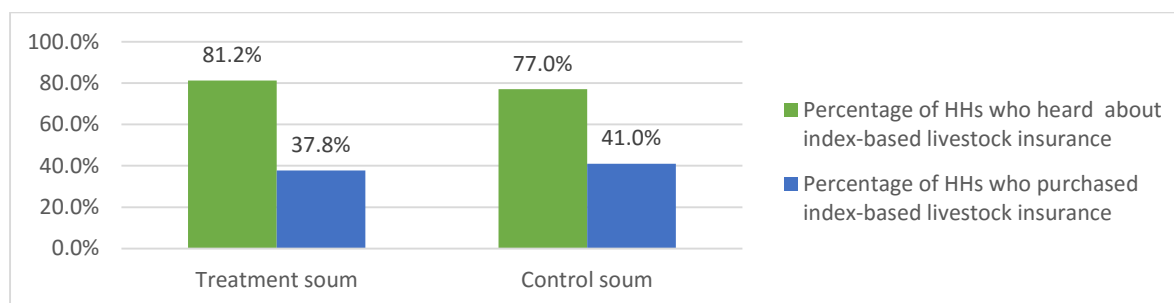
¹ LAMP Baseline report, 2013, p71

Figure 5. Amount of savings and loan million MNT



Moreover, knowledge of index-based livestock insurance was higher in treatment *soums*, but purchase of insurance was higher in control *soums* (small differences). During the baseline period, index-based livestock insurance was bit lower than in the end-line. Likewise “About 25 percent of all sample households have previously purchased livestock insurance, and that likelihood is higher for male-headed and larger herd size households¹”.

Figure 6. Livestock insurance



In summary, demographic indicators of treatment and control households show for the most part the households are quite similar with each other in areas such as education level, literacy rate, household head gender and number of members and even for amount of savings and loans. The few differences observed in household assets was a slightly high ownership of household appliances in treatment *soums*.

¹ LAMP Baseline report, 2013, p55

3.2. Herd size and mobility pattern

This section describes ELS findings on households' herd size and composition in each group. Herd size and composition are the key indicators of herder households' income source and livestock operation, especially for movement between pastures over the year.

Herd size

Table 11 shows an even distribution of the herd size of households in the survey sample. However, despite even distribution of the herd size in the sample, the herd size of female-headed households and those in the vulnerable group was smaller in both treatment and control *soums*.

Table 11. Herd size by herd size group in treatment and control *soums**

	Treatment		Control		Female headed household				Vulnerable household			
	Count	%	Count	%	Treatment		Control		Treatment		Control	
					Count	%	Count	%	Count	%	Count	%
Up to 100 livestock	155	20.4%	175	22.6%	38	50.7%	40	44.9%	51	45.1%	78	53.8%
101-200 livestock	174	22.9%	182	23.5%	19	25.3%	28	31.5%	32	28.3%	47	32.4%
201-500 livestock	298	39.2%	276	35.7%	13	17.3%	18	20.2%	27	23.9%	18	12.4%
501 or above	134	17.6%	140	18.1%	5	6.7%	3	3.4%	3	2.7%	2	1.4%
SUM	761	100.0	773	100.0	75	100.0	89	100.0	113	100.0	145	100.0

*Due to sampling design, the number of sampled households is almost equal under each interval of livestock number, so that the survey would not be affected (e.g. by having rich families in the control *soums* to be compared with poor families in the treatment *soums*).

As for the herd structure, sheep and goats formed the core of the herd and the number of horses, cattle and camels differed depending on the geographical location. While in treatment *soums* the size of the sheep herd was greater by 5% against that of the goat herd, in control *soums* the size of the goat herd was larger by the same number. As table 12 demonstrates, in both treatment and control *soums* the goat herd size of female-headed households and those in the vulnerable group was by 1.6% and 7.1% respectively larger than that of the sheep herd. Since the herd structure is a major indicator of livestock productivity, it was fitting to take into account the greater size of the goat herd in most groups. This indicator of the herd structure had statistical significance.

Table 12. Herd composition, by each groups

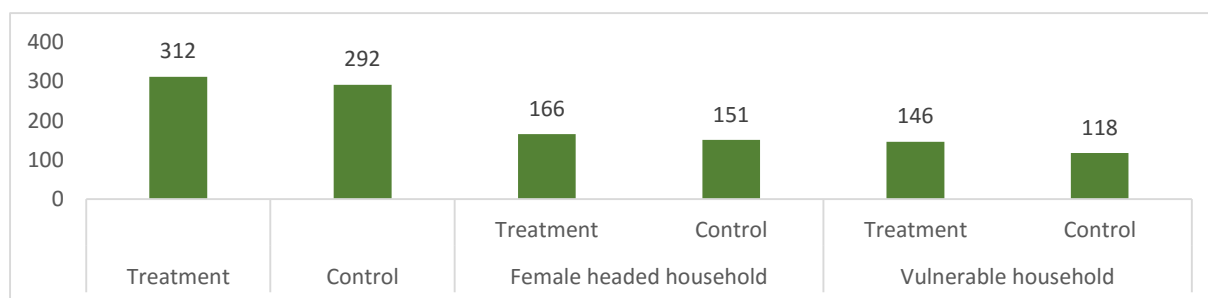
	Treatment <i>soum</i>	Of which		Control <i>soum</i>	Of which		Sig.	t
		Female headed HH	Vulnerable HH		Female headed HH	Vulnerable HH		
Camel	2.3%	0.7%	3.1%	8.5%	1.3%	3.1%	0.000	-2.233
Horse	5.7%	6.1%	5.7%	5.2%	8.1%	5.0%	0.020	1.522
Cattle	9.1%	13.9%	9.9%	7.5%	9.3%	9.7%	0.000	3.110
Sheep	43.3%	35.6%	38.2%	37.7%	34.0%	40.6%	0.013	2.321
Goat	39.5%	43.5%	43.1%	41.2%	47.1%	41.3%	0.197	-1.093
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	0.246	1.494

In the course of the baseline survey it was observed that the sheep and goat dominated the herd structure and the number of horses and camels was smaller compared to that of other animals.

From the baseline report, it was noted that “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”¹.

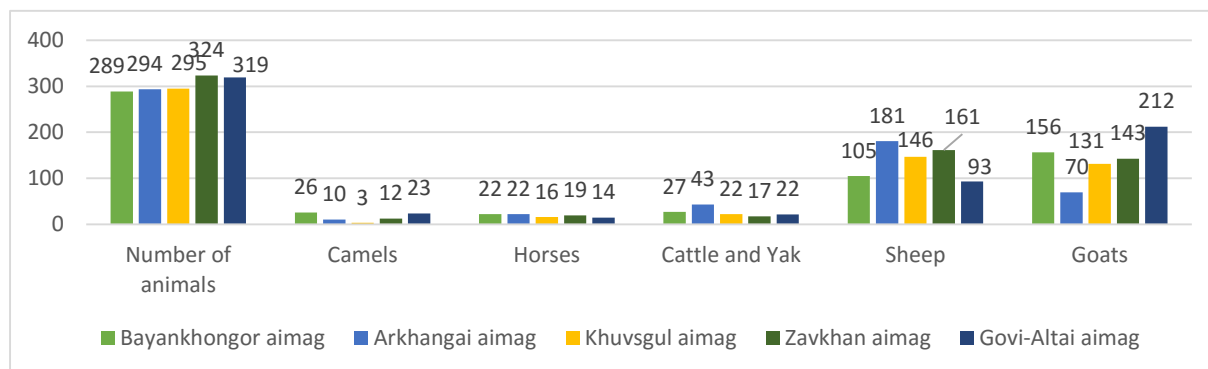
Figure 7 shows the average herd size of households in the ELS and reveals that the average herd size of female-headed households and those in the vulnerable group was as much as that of other households.

Figure 7. Households’ herd size, by types



The difference in animal numbers as related to *aimags’* geographical location is shown in Figure 8. In the Gobi region, herders tend to have more camels and goats, but in Khangai region, they tend to have more cattle, yaks and sheep due to ecosystem differences (desert vs. wetter and higher elevations).

Figure 8. Number of animal by aimags



The baseline survey observed that male-headed households had larger horse herds compared to female-headed households and this difference remained in the ELS.

Table 13 shows the number of livestock and their share in the herd by male, female and young animals. According to the sample distribution, the herd size in treatment and control *soums* was maintained at a similar level which also showed in the herd structure. There was no significant difference between treatment and control *soums*. The male to female animal ratio was also similar in the herds.

¹ LAMP Baseline report, 2013, p26

Table 13. Herd composition disaggregated by treatment and control *soums*, and groups, by percent

	Treatment <i>soum</i>		Of which				Control <i>soum</i>		Of which			
			Female headed HH		Vulnerable HH				Female headed HH		Vulnerable HH	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Male												
Camel	5	3%	2	1%	3	4%	17	10%	1	1%	3	4%
Horse	11	6%	8	7%	6	8%	10	6%	9	10%	5	7%
Cattle	16	9%	15	15%	8	11%	13	8%	9	10%	7	10%
Sheep	70	42%	34	34%	27	36%	61	36%	30	31%	26	38%
Goat	66	39%	43	43%	31	42%	70	41%	45	47%	28	41%
Sub-total	168	100%	102	100%	75	100%	171	100%	94	100%	69	100%
Female												
Camel	5	3%			3	3%	17	9%	3	3%	4	5%
Horse	11	6%	7	6%	6	5%	9	5%	9	9%	4	5%
Cattle	16	9%	15	14%	9	9%	14	7%	8	9%	8	9%
Sheep	82	44%	40	37%	40	40%	70	38%	33	34%	34	41%
Goat	72	39%	47	43%	43	43%	74	40%	44	46%	33	39%
Sub-total	186	100%	109	100%	101	100%	184	100%	97	100%	83	100%
Newborns												
Camel	3	3%			1	2%	7	6%	1	2%	1	2%
Horse	5	5%	4	6%	3	5%	5	5%	5	8%	3	6%
Cattle	9	8%	9	15%	5	9%	7	7%	5	9%	4	9%
Sheep	52	47%	25	39%	24	42%	45	42%	21	36%	20	43%
Goat	41	37%	26	41%	23	41%	42	40%	27	46%	19	41%
Sub-total	110	100%	64	100%	56	100%	106	100%	59	100%	47	100%
Grand total	464		275		232		461		250		199	

To sum up, although the herd size in treatment and control *soums* was similar, there were small differences by the kind of livestock. The share of horses and cattle in herds owned by female-headed households and those in the vulnerable group was smaller compared to other households. Differences in the herd structure depending on the geographical location were also observed.

Household mobility

The frequency of moves made by a herder households, existence of winter, autumn, spring and summer camps depend on the herd size of the given household. The baseline survey revealed that 74.0% of total herder households¹ moved 4 times a year, every season, while in the end-line survey this number not changed. When the frequency of seasonal moves is given in Table 14, the percentage of moves to the winter and summer camps was greater than that of moves to the autumn and spring camps. In both treatment and control *soums*, the percentage of moves to the winter and summer

¹ LAMP Baseline report, 2013, p55

camp and that of moves to the autumn and spring camps by female-headed and vulnerable group households was by approximately 10.0% and 15.0%, respectively, lower compared to other households.

Table 14. Household camps

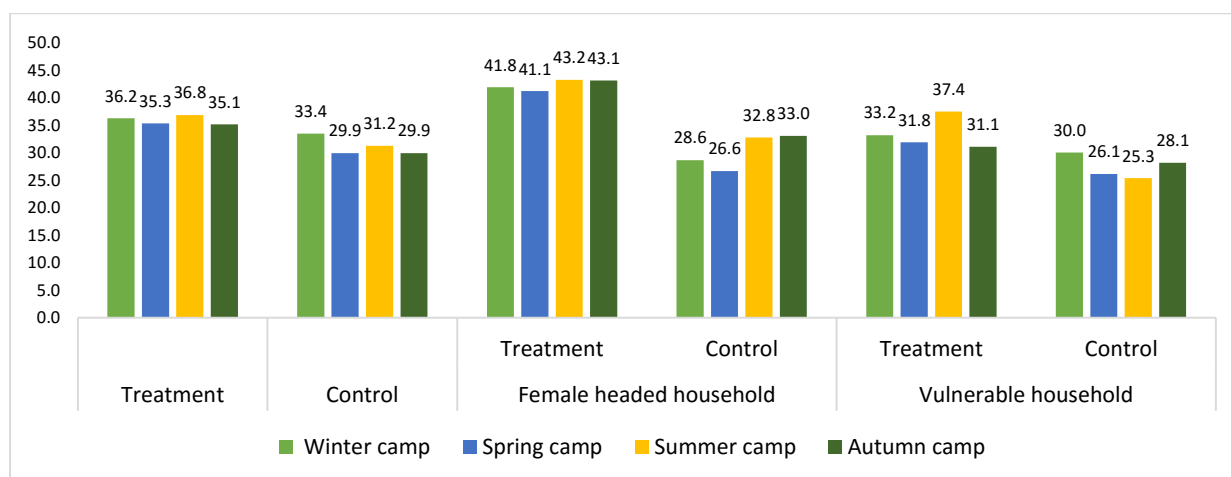
		Treatment	Control	Female headed household		Vulnerable household		Sig.	t
				Treatment	Control	Treatment	Control		
Winter camp	Yes	87.0%	90.2%	77.3%	78.7%	77.9%	76.6%	0.000	1.958
	No	13.0%	9.8%	22.7%	21.3%	22.1%	23.4%		
Spring camp	Yes	69.3%	68.2%	54.7%	56.2%	54.9%	54.5%	0.005	-1.389
	No	30.7%	31.8%	45.3%	43.8%	45.1%	45.5%		
Summer camp	Yes	83.0%	80.1%	76.0%	70.8%	77.0%	73.8%	0.003	-1.500
	No	17.0%	19.9%	24.0%	29.2%	23.0%	26.2%		
Autumn camp	Yes	66.2%	58.5%	58.7%	46.1%	57.5%	52.4%	0.000	-3.142
	No	33.8%	41.5%	41.3%	53.9%	42.5%	47.6%		

The distance of the move depended on the herd size. The greater the herd size, the further was the move. Winter, autumn, spring and summer camps of herders were mostly located within the territory of the *soum*, and only in a few cases herders moved to the territory of other *soums*. Movement across *soum* borders requires veterinary or local government permission so is an important finding (see Annex 4 Table 4 for more detail).

Animal movement was on foot while the main transportation for family mobility was by cars and trucks in all *soums*, and there is no seasonal difference (for more detail see Annex 4 Table 5).

Costs of the move averaged 25.3-43.2 thousand MNT for the groups and were higher in the treatment *soums* against lower costs in the control ones.

Figure 9. Cost for moving by thous.MNT



Although the trend of camp land adoption was higher in control *soums*, differences were observed among groups depending on the kinds of usage, adoption and ownership of land. [Note: “usage” is agreement between owner and user, “adoption” is local agreement, and “ownership” is a local government use agreement]. While the percentage of land adoption was high in treatment *soums*,

that of usage and tenure rights was higher in control *soums*. This trend was observed among female-headed and vulnerable group households as well.

Table 15. Seasonal camp usage by treatment and control *soums* with household type

		Treatment	Control	Female headed household		Vulnerable household		Sig.	t
				Treatment	Control	Treatment	Control		
Winter camp	Land usage license	8.5%	14.0%	0.0%	22.7%	9.1%	10.4%	0.000	-1.466
	Land adoption license	79.5%	63.4%	85.4%	52.3%	83.6%	64.2%		
	Land owner's certificate	12.1%	22.6%	14.6%	25.0%	7.3%	25.4%		
Spring camp	Land usage license	10.9%	16.3%	0.0%	20.8%	9.4%	17.9%	0.000	-1.927
	Land adoption license	77.6%	57.6%	79.2%	50.0%	84.4%	53.6%		
	Land owner's certificate	11.6%	26.1%	20.8%	29.2%	6.3%	28.6%		
Summer camp	Land usage license	11.5%	17.7%	25.0%	100.0%	12.5%	0.0%	0.008	-1.029
	Land adoption license	82.7%	59.7%	75.0%	0.0%	75.0%	78.6%		
	Land owner's certificate	5.8%	22.6%	0.0%	0.0%	12.5%	21.4%		
Autumn camp	Land usage license	12.0%	18.3%	0.0%	0.0%	20.0%	7.7%	0.001	-1.307
	Land adoption license	82.0%	55.0%	100.0%	100.0%	80.0%	69.2%		
	Land owner's certificate	6.0%	26.7%	0.0%	0.0%	0.0%	23.1%		

To summarize, herders moved seasonally about 11 to 22 kilometers and the herd size affected the distance between camps. The percentage of moves and the distances were higher among herders of the treatment group compared to that of herders from the control groups leading to the higher costs of move among herders of the treatment group. As for the land ownership certificate, while the percentage of herders with an ownership certificate was higher among herders of a treatment group, that of herders with a usage and adoption license was higher among the control group herders.

3.3. Household income and expenditure

In this section, household income and expenditure is examined by household type. The ELS found household income increased by a significant amount, especially income from livestock farming and animal feed processing in real value.

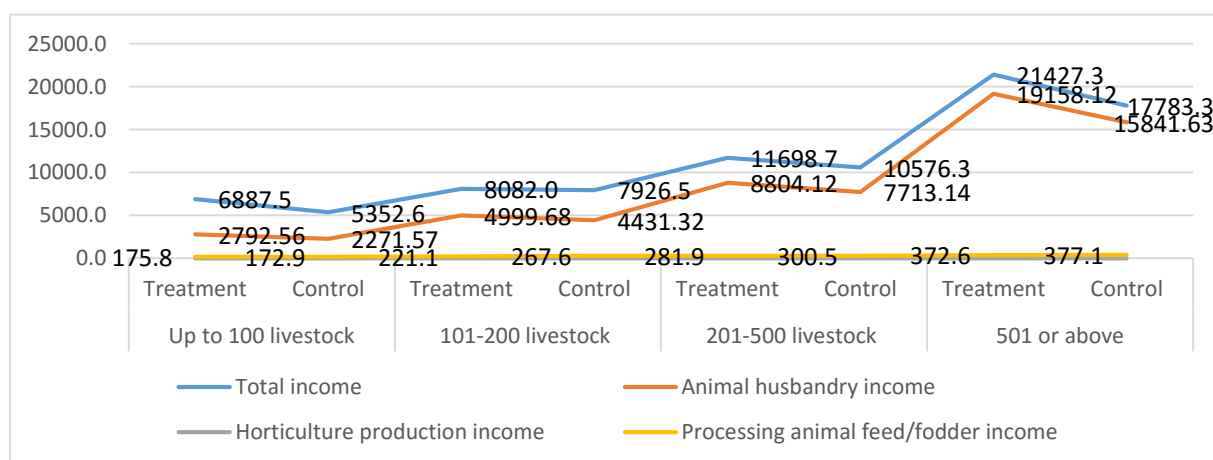
Table 16 shows disaggregated data of main income, indicators including for female headed households and vulnerable households, across income sources in treatment and control *soums*.

Table 16. Livestock and horticulture related income by household type, million MNT by real value

Income sources	Treatment <i>soums</i>	Of which		Control <i>soums</i>	Of which	
		Female headed HH	Vulnerable HH		Female headed HH	Vulnerable HH
Total income	10,327.8	7,173.4	4,559.8	9,112.4	6,764.5	3,704.8
Livestock	6,692.7	3,512.6	2,628.5	5,720.9	3,132.9	1,984.3
Horticulture	151.2	268.9	134.1	107.2	168.6	85.3
Animal feed and nutrition	258.6	149.5	105.3	234.3	118.4	132.9

Income derived by households in treatment *soums* from animal husbandry, horticulture production and animal fodder processing activities, as related to the main project interventions, was higher as compared to that of control *soums*. Furthermore, the target objective of a 20.0% increase of livestock derived income at the 5th year of the project was exceeded, growing by 73.9% (based on the above calculated CPI) as compared to the baseline survey level. At the time of the baseline survey the average household income equaled 7.1 million MNT and the income of a female-headed household averaged 4.6 million MNT. The results were impacted by the herd size which directly affected the household income, so the income of a household with up to 100 livestock was 4.9 million MNT, while that of a household with over 500 livestock was 10.4 million MNT¹ (for more detail see Annex 4 Table 6). At the time of the end-line survey a trend for higher income from agricultural activities was observed also among female-headed and vulnerable group households in treatment *soums* as compared to the baseline.

Figure 10. Household agriculture income by herd size, by current value



¹ LAMP, Baseline report, 2013, p59

KII quotes:

It has been changed. In the past, there was only one income source, the project brought additional income sources to cooperative member households.

VABU specialist, 52, female

Income of households in the soum increased with the LAMP. Crop and fodder farmers have increased their land. This increased size of hay and vegetables. Consequently, income increased and livestock improved.

Head of cooperative head, 36, female

The income of households in our soum is increasing. I think buying locally grown vegetables, instead of bringing from different soums and Ulaanbaatar have positive impact on the members of the cooperative. Herder household income is also improving.

Director of Veterinary clinic, 44, female

Table 17 shows results of income data (recall data 2017) in treatment and control *soums* (million MNT) by real value. Increase of livestock and horticulture operation income and difference between control *soums* is statistically significant. The household income in treatment *soums* was higher compared to that in control *soums*. However, table 17 showed that livestock income and income from animal fodder processing among these households was lower compared to that of other treatment groups. On the contrary, income derived from horticulture activities was higher among female-headed and vulnerable households compared to other treatment households.

Table 17. Household annual income by million MNT, all income sources by real value

	Treatment	Control	Female headed household		Vulnerable household		Sig.	t
			Treatment	Control	Treatment	Control		
Total income	10,327.8	9,112.4	7,173.4	6,764.5	4,559.8	3,704.8	0.011	3.736
Animal husbandry income	6,692.7	5,720.9	3,512.6	3,132.9	2,628.5	1,984.3	0	3.103
Horticulture production income	151.2	107.1	268.9	168.6	134.1	85.3	0	2.138
Processing animal feed/fodder income	258.6	234.3	149.5	118.4	105.3	132.9	0	1.313
Wages, salaries, pension, other aids	1,962.1	1,995.3	2,087.6	2,274.8	1,037.5	921.3	0.969	-0.249
Family production (sewing, felt making etc.)	163.8	238.8	267.2	401.5	160.9	156.4	0.048	-1.15
Other service income (transportation etc.)	72.6	86.6	60.3	89.9	61.5	48.0	0.402	-0.428
Trading income (doing a middleman etc.)	183.8	95.3	64.6	119.9	55.7	51.8	0	1.867
Other	840.8	632.0	760.2	456.5	375.0	323.9	0.002	2.313

While income from sales and other sources not related directly to the project indicators was higher in treatment *soums*, income from household production, salaries, pensions, aid, provision of transportation and other services was higher in control *soums*.

For kinds of expenditures, the baseline survey found that household expenditures averaged 4.5 million MNT, with 2.1 million MNT for female-headed households (for more detail see Annex 4 Table 7). The highest expenditure of 1.9 million MNT was included in the category of “other”, while the lowest expenditure of 5.4 thousand MNT was in the category “costs of the breeding procedure”¹.

In the ELS, expenditures of households in treatment and control *soums* were calculated at real value and the difference between income and expenditure was comparable among groups. The statistical significance of expenditure disparities among groups was negligible. Expenditure of female-headed and vulnerable households, the same as for the income, was in average half as much as compared to other groups.

In the ELS, repayment of loans (240.3-1,128 thousand MNT), food (747.3-1,109.1 thousand MNT), clothing (585.8-992.4 thousand MNT), costs of holidays and vacation (543.3-960.8 thousand MNT) constituted the major part of expenditures with a large range of values across groups. This trend was similar among all groups in treatment and control *soums*. The lowest expenditures of households were for breeding (11.1-74.8 thousand MNT) and ‘other’ (9.2-83.9 thousand MNT). Compared to the baseline survey results, the lowest expenditure was that for breeding.

Table 18. Household annual expenditures by thousand MNT, by real value, 2017

	Treatment	Control	Female headed household		Vulnerable household		Sig.	t
			Treatment	Control	Treatment	Control		
Total expenses	7,663.2	7,612.3	5,163.0	5,576.8	3,812.3	3,736.0	0.312	0.206
Food	1,109.1	1,071.9	747.3	868.1	783.7	753.3	0.035	1.083
Clothing	992.4	940.3	639.2	778.4	632.0	585.8	0.715	1.329
Tuition/training fee	501.4	529.3	397.2	223.6	152.1	212.6	0.628	-0.473
Health service (medicine, visit doctors etc.)	280.9	287.3	305.5	263.3	156.5	138.4	0.839	-0.236
Household items	273.0	268.0	204.4	199.3	166.8	164.2	0.633	0.381
Buying and maintaining a vehicle	420.8	336.2	139.0	151.7	107.2	116.4	0.09	1.903
Transportation (between and within the city)	268.2	286.4	174.1	182.7	141.5	143.8	0.186	-0.877
Communication cost - Expenses	204.5	198.7	152.0	162.9	136.0	135.9	0.593	0.648
Firewood, gas, coal etc.	168.8	159.4	194.6	184.5	111.0	115.6	0.318	0.968
Holidays (White moon and Naadam etc.)	960.8	928.3	816.7	827.1	585.0	543.3	0.271	1.077
Hobby, entertainment	140.8	176.3	54.7	41.9	19.3	32.2	0.077	-0.93

¹ LAMP, Baseline report, 2013, p59

	Treatment	Control	Female headed household		Vulnerable household		Sig.	t
			Treatment	Control	Treatment	Control		
Sheds, animal fence	144.7	137.8	92.7	106.8	51.6	52.0	0.342	0.549
Forage and fodder	568.4	677.2	289.0	436.4	155.8	260.7	0.355	-1.352
Animal vaccination and medicine	112.6	114.7	67.7	96.9	66.2	58.4	0.784	-0.291
Animal breeding and improving productivity	56.8	70.2	13.8	74.8	15.2	11.1	0.009	-0.944
Horticulture operation	133.7	110.7	185.1	109.0	65.9	62.9	0.241	0.747
Tax, fees	156.4	137.8	119.9	63.7	70.0	61.4	0.374	1.174
Loan repayment	1,128.0	1,098.0	561.0	746.6	383.9	240.3	0.858	0.345
Other	41.6	83.9	9.2	59.0	12.5	47.7	0.002	-1.598

To conclude, the kinds of income and expenditure did not undergo major changes as compared to the baseline, but the amount has increased slightly. The household income and expenditure in treatment *soums* was higher against that in control *soums*. Income and expenditure of female-headed and vulnerable households was the lowest both at the time of the baseline and the end-line surveys. Income derived from animal husbandry activities was the main income source for total households and the main expenditures were on food, clothing and loan repayment. The sum of total expenditure on agricultural activities was still lower than that spent on food and clothing. For instance, total expenditure on animal fences, sheds, feed, vaccination, breeding and medicine for livestock reached 1,016.2 thousand MNT in treatment *soums* versus 1,110.5 thousand MNT in control *soums*.

3.4. Household food security

Improving food security is one of the key aspects reflected in the LAMP PDO. Lessons learned from the first National Plan of Action for Food Security (NFSP) (2001 to 2007) were used to develop an improved NFSP for the period of 2009 to 2016. In line with the LAMP goal for households' livelihood improvement, the NSFP, and GAFSP the change in per capita consumption of various food ingredients, disaggregated by gender and vulnerable groups is examined.

This section shows three measures of food security designed and tested cross-culturally by the Food and Nutrition Technical Assistance (FANTA) Project, USAID and the FAO as also used in the baseline survey. The four food security measures are:

- Household Hunger Scale (HHS),
- Women's Dietary Diversity Score (WDDS),
- Household Dietary Diversity Score (HDDS), and
- Months of Adequate Household Food Provisioning (MAHFP).

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.

Table 19 displays per capita consumption over the previous 30 days of the most commonly consumed ingredients of the Mongolian diet. Substantial amounts of milk and milk products, meat (lamb, beef, and horse meat) and flour are commonly consumed.

Table 19. Household food consumption (per capita, per month)

		Treatment	Control	Treatment		Control	
				Female headed HH	Vulnerable HH	Female headed HH	Vulnerable HH
Meat, kg	Mean	9.09	8.20	11.90	5.33	9.16	4.70
	SD	7.45	5.70	13.39	2.90	7.46	2.83
Milk and milk products, liter	Mean	38.47	32.98	56.08	22.86	49.77	16.31
	SD	64.16	54.55	116.52	62.58	85.31	18.74
Flour, kg	Mean	8.90	9.13	11.13	7.26	11.27	7.02
	SD	4.81	5.72	7.04	3.58	8.18	2.81
Rice, kg	Mean	1.90	2.11	2.63	1.41	3.10	1.39
	SD	1.53	2.62	1.90	1.30	3.49	1.23
Potato, kg	Mean	2.27	2.12	3.86	1.65	3.21	1.67
	SD	2.36	2.26	4.26	1.28	3.24	1.61
Sugar and sweets, kg	Mean	0.71	0.68	1.06	0.44	1.02	0.36
	SD	0.86	0.82	0.98	0.40	0.99	0.28
Oil, kg	Mean	0.41	0.44	0.67	0.32	0.67	0.42
	SD	0.38	0.76	0.70	0.34	0.96	1.06
Tea, pieces	Mean	0.41	0.43	0.61	0.25	0.49	0.39
	SD	0.89	1.15	0.98	0.33	0.59	1.13
Salt, kg	Mean	0.38	0.37	0.59	0.29	0.56	0.29
	SD	0.33	0.33	0.60	0.27	0.49	0.21
Vodka and beer, liters	Mean	0.43	0.46	0.32	0.28	0.22	0.26
	SD	0.52	1.56	0.33	0.25	0.22	0.27
Cigarettes/tobacco, pieces	Mean	2.20	2.02	2.98	1.45	1.66	1.40
	SD	3.47	3.06	2.78	2.20	3.73	2.34

Household hunger scale

The HHS is a household food deprivation scale, derived from research to adapt the United States (U.S.) household food security survey module for use in a developing country context and from research to assess the validity of the Household Food Insecurity Access Scale (HFIAS) for cross-cultural use. The approach used by the HHS is based on the idea that the experience of household food deprivation causes predictable reactions that can be captured through a survey and summarized in a scale.

According to Table 20, the percentage of households included in the Moderate and Severe Hunger categories of the Household Hunger Scale /HHS/ in the control group was 1.8 points higher compared to that of a treatment group. A trend for vulnerable households to enter the Moderate and Severe Hunger categories of the HHS was relatively higher. For instance, while 1.5% of vulnerable households in the treatment group was included in the Moderate Hunger category, 4.8% of vulnerable households in the control group were included in this category. There were no households included in the Severe Hunger category.

While at the time of the baseline survey, 98.8% of female-headed households were included in the Little to No hunger category, this indicator went up to 100% at the time of end-line survey, showing improvement.

Table 20. Household hunger scale

HH hunger categories		Little to no hunger in HH		Moderate hunger in HH		Severe hunger in HH		N
HH hunger score		0-1		2-3		4-6		
# / %		Number	Percent	Number	Percent	Number	Percent	
Treatment		898	99.8%	2	0.2%	0	0.0%	900
Control		882	98.0%	18	2.0%	0	0.0%	900
Treatment	Female-headed HHs	101	100.0%	0	0.0%	0	0.0%	101
	Vulnerable HHs	134	98.5%	2	1.5%	0	0.0%	136
Control	Female-headed HHs	103	96.3%	4	3.7%	0	0.0%	107
	Vulnerable HHs	160	95.5%	8	4.8%	0	0.0%	168

Household Dietary Diversity Score

Household dietary diversity is the number of different food groups consumed over a given reference period. The percentage of households with high dietary diversity in the treatment group was higher compared to the control group, i.e. 67.3% consumed food from over 6 food groups, while the percentage of households in the control group that consumed food from over 6 food groups was by 8.4% lower. The percentage of households that used 3 and less food groups was 6.2% in the control group, which was by 2.3% higher than the treatment.

While at the time of the baseline survey, 66.3% of households covered by the survey consumed 4-5 food groups, at the time of the end-line survey the percentage of households in the treatment group that consumed food from over 6 or more food groups rose to 67.3%, showing significant improvement (see Table 21).

Table 21. Household food diversity scale

HDDC		Lowest Dietary Diversity		Medium Dietary Diversity		High Dietary Diversity		N
Food groups		(<= 3 groups)		(4-5 groups)		(>=6 groups)		
# / %		Number	Percent	Number	Percent	Number	Percent	
Treatment		35	3.9%	259	28.8%	606	67.3%	900
Control		56	6.2%	314	34.9%	530	58.9%	900
Treatment	Female-headed HHs	6	5.9%	24	23.8%	71	70.3%	101
	Vulnerable HHs	12	8.8%	50	36.8%	74	54.4%	136
Control	Female-headed HHs	8	7.5%	37	34.6%	62	57.9%	107
	Vulnerable HHs	21	12.5%	68	40.5%	79	47.0%	168

KII quotes

*Household food consumption changed, became more diverse. Food basket enriched with vegetables, greens, even pork and chicken from cooperatives...
Head of cooperative, 36, female*

*Consumption of potatoes and vegetables increased and consumption of meat and flour decreased.
Head of cooperative, 52, female*

In addition to the meat, milk and dairy products, vegetable consumption has increased among the herder households with the project implementation. In the past, potatoes and vegetables transported from Ulaanbaatar which did not comply with storage and transportation requirements. However,

when this project began to be implemented, people have been provided with ecologically clean products grown locally.

Head of cooperative, 60, female

The Ranks table is the first table that provides information regarding the output of the actual Mann-Whitney U test. It shows mean rank and sum of ranks for the two groups tested (i.e., the treatment and control groups):

Mann-Whitney Test

		Ranks		
Control or treatment group		N	Mean Rank	Sum of Ranks
HDDS	Treatment	900	939.70	845730.50
	Control	900	861.30	775169.50
	Total	1800		

The table above is very useful because it indicates which group can be considered as having the higher food groups, overall; namely, the group with the highest mean rank. In this case, the treatment group had the highest food groups.

This table shows us the actual significance value of the test. Specifically, the **Test Statistics** table provides the test statistic, *U* statistic, as well as the asymptotic significance (2-tailed) *p*-value.

Test Statistics^a

		HDDS
Mann-Whitney U		369,719.5
Wilcoxon W		775,169.50
Z		-3.255
Asymp. Sig. (2-tailed)		.001

a. Grouping Variable: Control or treatment group

From this data, it can be concluded that food groups consumption in the treatment group was statistically significantly higher than the control group ($U = 369,719.5$, $p = .001$).

Women Dietary Diversity Scale

The WDDS resulted from a preliminary step in the process of developing the dichotomous MDD-W (Minimum Dietary Diversity-Women). MDD-W is a dichotomous indicator of whether or not women 15–49 years of age have consumed at least five out of ten defined food groups the previous day or night. The proportion of women 15–49 years of age who reach this minimum in a population can be used as a proxy indicator for higher micronutrient adequacy, one important dimension of diet quality.

This indicator was measured only in households with female members aged 15-49, and a trend was observed for the treatment group households to consume more diverse kinds of food compared to the control group households (see Table 22).

Table 22. Women Dietary Diversity Scale

WDDC	Lowest Dietary Diversity		Medium Dietary Diversity		High Dietary Diversity		N
	(≤ 3 groups)		($4-5$ groups)		(≥ 6 groups)		
Food groups	Number	Percent	Number	Percent	Number	Percent	
# / %							

Treatment		33	4.9%	136	20.1%	509	75.1%	678
Control		45	6.6%	173	25.3%	466	68.1%	684
Treatment	Female-headed HHs	2	4.2%	8	16.7%	38	79.2%	48
	Vulnerable HHs	13	10.9%	29	21.3%	77	56.6%	119
Control	Female-headed HHs	3	4.7%	23	35.9%	38	59.4%	64
	Vulnerable HHs	16	10.2%	57	36.3%	84	53.5%	157
Baseline survey		13	2.2%	394	66.3%	187	31.5%	594

The Ranks table is the first table that provides information regarding the output of the actual Mann-Whitney U test. It shows mean rank and sum of ranks for the two groups tested (i.e., the treatment and control groups):

Mann-Whitney Test

		Ranks		
Control or treatment group		N	Mean Rank	Sum of Ranks
WDDS	Treatment	678	709.80	481245.5
	Control	684	653.45	446957.5
	Total	1362		

The table above is very useful because it indicates which group can be considered as having the higher food group diversity, overall; namely, the group with the highest mean rank. In this case, the treatment group had the highest food groups.

This table shows us the actual significance value of the test. Specifically, the **Test Statistics** table provides the test statistic, *U* statistic, as well as the asymptotic significance (2-tailed) *p*-value.

Test Statistics ^a		WDDS
Mann-Whitney U		212687.5
Wilcoxon W		446957.5
Z		-2.665
Asymp. Sig. (2-tailed)		.008

a. Grouping Variable: Control or treatment group

From this data, it can be concluded that food group diversity in the treatment group was statistically higher than the control group ($U = 212687.5$, $p = .008$).

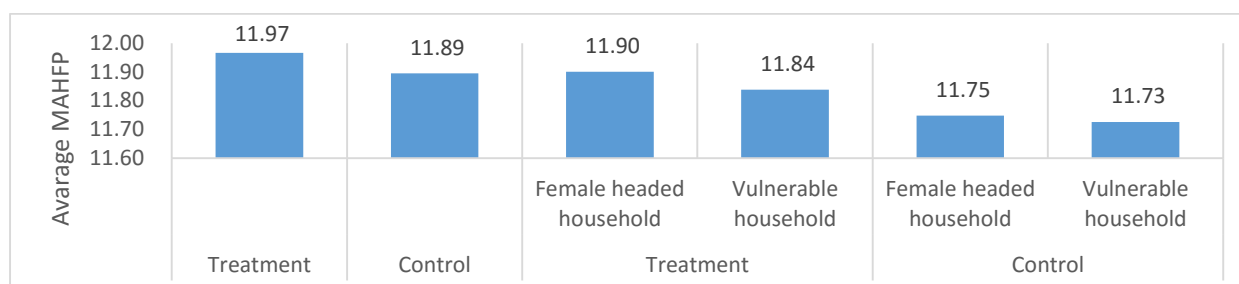
MAHFP

Months of adequate household food provisioning (MAHFP) focus on the desired outcome of improved food access – improved household food consumption. Food access depends on the ability of households to obtain food from their own production, stocks, purchases, gathering, or through food transfers from relatives, members of the community, the government or donors. A household's access to food also depends on the resources available to individual household members and the steps they must take to obtain those resources, particularly exchange of other goods and services.

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. Treatment group averaged at score of 11.97 on average, showing that the households had relatively less food shortage.

The result of the baseline survey for the average MAHFP score was 11.95 which is lower than 0.02 points end-line survey result.

Figure 11. Average MAHFP



Mann-Whitney Test

WDDS	Ranks			
	Control or treatment group	N	Mean Rank	Sum of Ranks
	Treatment	900	915.51	823955.50
	Control	900	885.49	796944.50
	Total	1800		

The table above is very useful because it indicates which group can be considered as having the higher MAHFP, overall; namely, the group with the highest mean rank. In this case, the treatment group had the highest MAHFP.

This table shows us the actual significance value of the test. Specifically, the **Test Statistics** table provides the test statistic, *U* statistic, as well as the asymptotic significance (2-tailed) *p*-value.

Test Statistics ^a		MAHFP
Mann-Whitney U		391494.500
Wilcoxon W		796944.500
Z		-3.818
Asymp. Sig. (2-tailed)		.000

a. Grouping Variable: Control or treatment group

From this data, it can be concluded that MAHFP in the treatment group was statistically significantly higher than the control group ($U = 391494.5$, $p = .000$).

Households experienced the most food shortage in February, March and April.

Table 23. Households with food shortage in months

	Treatment	Control	Treatment		Control	
			Female headed HHs	Vulnerable HHs	Female headed HHs	Vulnerable HHs
N	17	47	5	11	7	19
2018 Mar	58.8%	46.8%	80.0%	63.6%	85.7%	52.6%
2018 Feb	11.8%	14.9%	20.0%	18.2%	42.9%	15.8%
2018 Jan	5.9%	19.1%		9.1%	28.6%	21.1%
2017 Dec	5.9%	17.0%			14.3%	15.8%
2017 Nov	11.8%	10.6%		18.2%	28.6%	10.5%
2017 Oct	17.6%	12.8%	40.0%	18.2%	14.3%	10.5%

	Treatment	Control	Treatment		Control	
			Female headed HHs	Vulnerable HHs	Female headed HHs	Vulnerable HHs
2017 Sep	11.8%	6.4%	20.0%	9.1%	14.3%	5.3%
2017 Aug	5.9%	6.4%		9.1%	28.6%	10.5%
2017 Jul	11.8%	6.4%		9.1%	28.6%	10.5%
2017 Jun		10.6%			28.6%	15.8%
2017 May	5.9%	14.9%		9.1%	28.6%	26.3%
2017 Apr	29.4%	36.2%	40.0%	36.4%	42.9%	47.4%

Hunger scale and hunger is rare occasion in Mongolia, especially in rural areas. However, the traditional food basket is not so diverse, consist only dairy, meat and flour. In recent years, treatment *soums'* herder households' food consumption was diversified, and that result appears to be the consequence of LAMP's pilot horticulture operations. Many treatment households and cooperative members claimed that their food consumption diversified comparing to baseline period.

Table 24. Change in per capita consumption of various food ingredients, disaggregated by gender in the households and vulnerable groups

Various food consumption		Target	Treatment	Control
Horse meat – kg	Average HH	2.3	3.12	2.36
	Female headed HH		3.07	1.91
	Vulnerable HH		2.42	2.06
Milk – liters	Average HH	29.8	31.77	27.47
	Female-headed HH		23.18	23.87
	Vulnerable HH		21.72	17.79
Carrot – kg	Average HH	1.3	1.45	1.22
	Female-headed HH		1.48	
	Vulnerable HH		1.27	
Sea buckthorn – kg	Average HH	0.22	0.46	0.38
	Female-headed HH		0.39	
	Vulnerable HH		0.38	

Finally, the per capita consumption of specific food ingredients as determined by the LAMP PSC including carrots, sea buckthorn, horse meat and milk and disaggregated by female headed and vulnerable households, increased over target level (see Table 24, for more detail see Table 1, PDO 5). Some KII participants mentioned that as a result of LAMP interventions, household food consumption became more diverse including foods such as veggies, pork and chicken. The food consumption diversification is observed in all treatment groups' households including vulnerable and female-headed households.

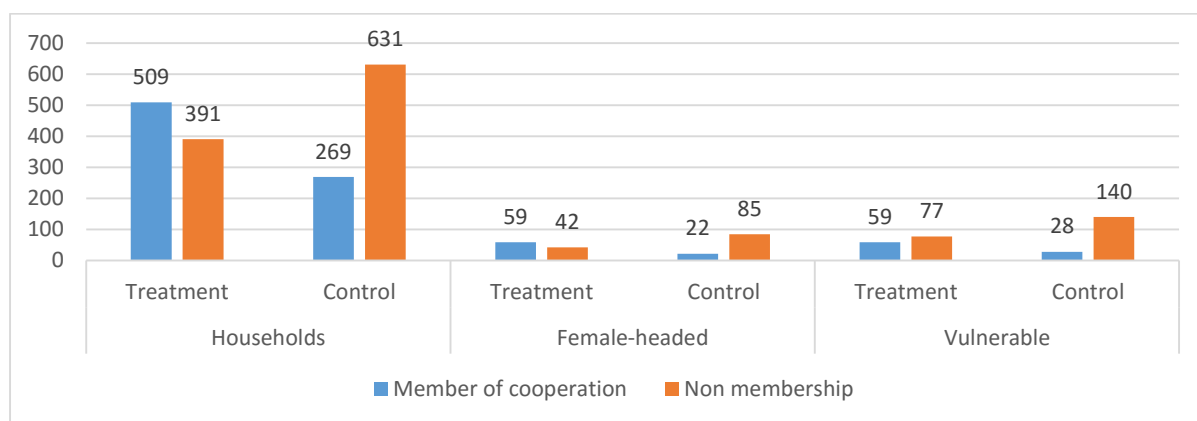
3.5. Cooperative membership and the project attendance

Value chain and dairy market development from the first LAMP component and animal nutrition efforts will be promoted and implemented through partnerships between formal herder cooperatives and contracted Service Providers (SP). The end-line survey focused on herder households' cooperative membership and attendance of the project activities, to measure the project impact and sustainability.

Cooperative membership

Treatment *soums*' membership rate in herder cooperatives is higher than control *soums*. About the organization type, there are herder cooperatives, partnerships and companies. Of the household members, 93.9% belong to cooperatives, 4.1% belong to partnerships and 2.0% belong to LLCs. Compared to the baseline period, cooperative membership rate increased in treatment *soums*. The baseline survey report that "With only 5.0% and 13.0% 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"¹, and in the end-line period this number increased to 56.6% (for more detail see Annex 4 Table 8).

Figure 12. Membership of organization, by household heads



However, cooperative membership rate shows increase, but some cooperatives lack operational value chain activities.

KII note

There were lack of management and organizational issues. People were not organized. Looks like they're working because they were funded. For example, they rented out the hay machine, and instead they should have cultivated and used the machine for themselves.

Soum governor, 45, male

Horticulture cooperatives were established with fewer members. It was not possible for them to fully use the land and equipment received from the project. It should have been larger and integrated better.

Head of VABU, 59, male

¹ LAMP, Baseline report 2013, p23

As shown in Table 25, 54.4% of cooperatives operate accessing wool promotion, 38.1% percent buying raw material, 35.6% buying cashmere, and only 6.3% train herders, 3.9% buying milk, 8.4% selling meat, respectively. Up to 1/3 of herder cooperatives operate farming vegetables and preparing forage.

Table 25. Cooperatives' main activity

	Treatment	Control	Female headed household		Vulnerable household	
			Treatment	Control	Treatment	Control
Selling meat	8.4%	22.3%	16.9%	22.7%	1.7%	21.4%
Buying raw material (leather and wool)	38.1%	56.1%	42.4%	50.0%	25.4%	57.1%
Accessing wool promotion	54.4%	63.9%	49.2%	54.5%	45.8%	71.4%
Buying cashmere	35.6%	60.6%	33.9%	36.4%	27.1%	64.3%
Buying milk	3.9%	7.8%	6.8%	0.0%	5.1%	0.0%
Training herders	6.3%	8.2%	3.4%	4.5%	13.6%	10.7%
Farming potato and vegetables	32.6%	12.6%	45.8%	31.8%	49.2%	7.1%
Preparing forages	25.1%	7.1%	10.2%	4.5%	13.6%	7.1%

Table 26 shows assets owned by cooperatives. It can be seen that cooperatives own fenced and open areas, tractors and other tools for land processing. As for ownership, there were no substantial differences between treatment and control groups.

Table 26. Cooperative possession

	Treatment	Control	Female headed household		Vulnerable household	
			Treatment	Control	Treatment	Control
Fenced land	58.7%	42.0%	59.3%	50.0%	61.0%	32.1%
Unfenced land	59.7%	42.8%	59.3%	54.5%	62.7%	39.3%
Tractors	39.9%	8.6%	40.7%	22.7%	49.2%	10.7%
Other cultivation equipment	31.2%	6.7%	35.6%	4.5%	32.2%	10.7%
Water point (well, borehole, etc)	15.9%	10.4%	15.3%	13.6%	22.0%	7.1%
Milk collection/processing centre	3.5%	1.1%	0.0%	0.0%	6.8%	0.0%
Slaughter house	4.5%	11.5%	11.9%	0.0%	3.4%	17.9%
Wool/cashmere collection/processing centre	25.3%	41.6%	23.7%	40.9%	20.3%	50.0%
Vegetable/hay storage	15.3%	10.0%	25.4%	18.2%	25.4%	10.7%
Store for agriculture products storage/marketing	23.2%	34.6%	28.8%	36.4%	18.6%	42.9%
Other (write)	21.6%	31.2%	30.5%	27.3%	20.3%	32.1%

Households mostly accessed information from cooperatives and received such services as income generation training, making agreements and contracts with buyers, veterinary services. As Table 27 shows, cooperatives in treatment *soums* operated more actively with service provision. Members of female-headed households participated more actively in cooperative activities and received more services, while vulnerable households received relatively few services compared to other households.

Table 27. Services received from cooperatives

	Treatment	Control	Female headed household		Vulnerable household	
			Treatment	Control	Treatment	Control
Negotiations with buyers	18.1%	19.0%	23.7%	13.6%	13.6%	21.4%
Provide information	41.7%	22.7%	55.9%	22.7%	37.3%	28.6%
Access veterinary	17.3%	10.8%	18.6%	0.0%	11.9%	3.6%
Access loan	8.1%	7.4%	10.2%	0.0%	5.1%	3.6%
Learning how to increase income	21.0%	9.3%	32.2%	27.3%	25.4%	10.7%
Allocate common pasture or water resources	6.3%	3.0%	10.2%	4.5%	3.4%	0.0%
Prevent public ownership resources from outsiders	13.2%	4.8%	11.9%	0.0%	10.2%	0.0%
Nothing to serve	34.8%	51.3%	27.1%	54.5%	40.7%	46.4%

While the number of cooperative members per household was similar in treatment and control households, households from treatment *soums* participated more actively in cooperative meetings (for more detail see Annex 4 Table 9). Table 28 shows the number of cooperative members, member fees and dividends received. On average one member of a female-headed household and two members from other households joined cooperatives. While the membership fees in cooperatives at treatment *soums* were greater by 800 to 6,500 MNT against that of cooperatives at control *soums*, the amount of dividends was also greater by 329.6 to 261.6 thousand MNT in treatment *soums*. While the amount of membership fees for female-headed households was higher than that of other households, the received dividend was lower against that of other groups. This phenomenon was observed especially in control *soums*.

Table 28. Membership of cooperative

	Treatment	Control	Female headed household		Vulnerable household		Sig.	t
			Treatment	Control	Treatment	Control		
Number of household members	2	2	1	1	2	2	0.556	0.842
Membership fees per month (thous.MNT)	13.5	12.8	14.1	16.3	11.1	17.6	0.322	0.596
Amount of dividends (thous.MNT)	538.7	209.1	347.9	86.3	185.8	532.5	0.035	1.598

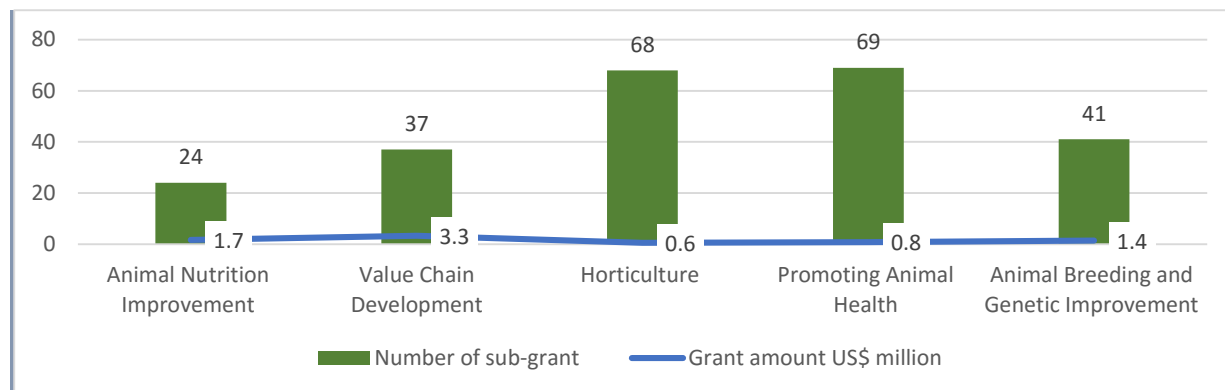
To sum up, cooperative membership has increased since the time of the baseline survey, and the kinds of activities conducted by cooperatives as well as their assets have increased, especially in treatment *soums*. Cooperatives in treatment *soums* provided services to their members more actively and the dividends received by members were higher, accordingly.

Project attendance

The present part examines the way the LAMP project activities reached the household level and the results achieved. In the frame of survey questionnaires participants were asked to evaluate the LAMP project activities in 13 main directions and assess the distributed handouts.

In the frame of the LAMP project and its major components, namely, Linking Herders to Markets (6.258US\$ million), (ii) Raising Livestock Productivity and Quality (4.228US\$ million)¹sub-projects of 239 organizations were financed and activities involving 13,684 persons were conducted².

Figure 13. Number of sub-grants and the grant amount



The surveyed households were asked whether they received any support in the frame of the project such as Grant for meat processing, Grant for dairy processing, Grant for wool and cashmere processing, Grant for horticulture operation, Grant for greenhouse operation, Grant for animal feed and forage, Nucleus flock, Veterinary service equipment, Agricultural equipment, Support to livestock products market, Support to horticulture products market, Support for animal feed market and whether any progress was achieved as a result.

KII notes ...

This project implemented in our soum has given a significant positive impact to the community and the soum's socio-economy. In our cooperative, we make sales of about 10 million MNT annually. A portion of this is spent on operating expenses. Using its capabilities, we are looking for opportunities to cultivate the farmland by creating reservoirs using river water. We are proposing to proceed with such a comprehensive project.

Head of cooperative, 60, male

Since 2013, a policy note on improvement of productivity for livestock development in our soum has been adopted. In doing so, we have been exploring where to look to improve livestock productivity.

This project is 100 percent aligned with this development policy to improve animal quality.

Head of cooperative, 48, male

Households mostly participated in such activities as using bulls, rams and bucks from the nucleus flock for breeding, veterinary services, financing of animal feed production, agricultural equipment, financing of horticulture production. Household members that participated in major project activities and received support were mostly men, and this trend was observed among female-headed and vulnerable households as well (for more detail see Annex 4 Table 10).

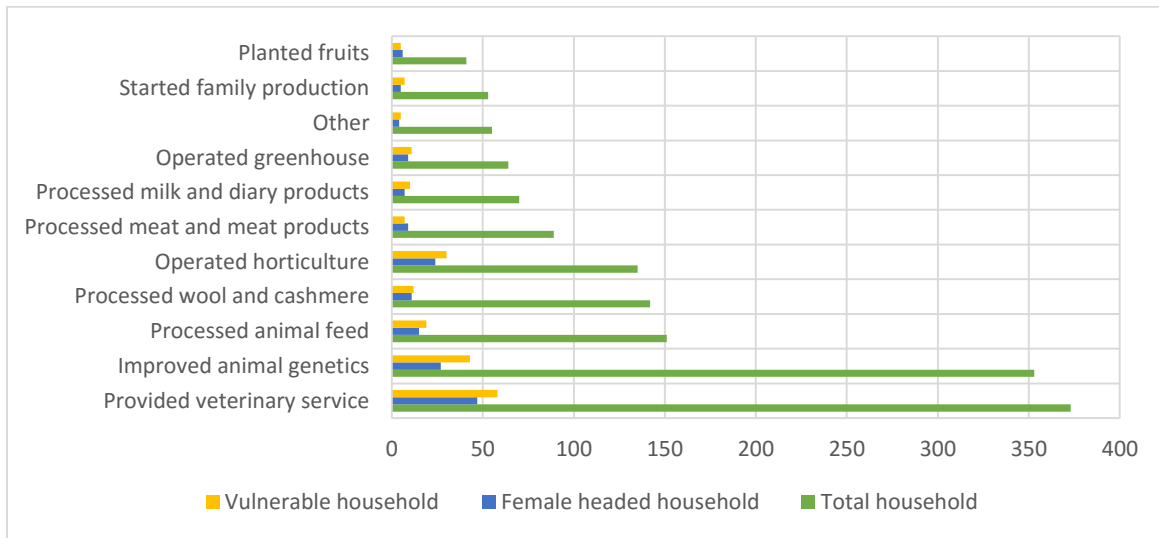
As mentioned in project documents, the largest investment was made in sub-projects on value-added chain and animal feed production. However, survey participants evaluated that progress was made in

¹ PAD, Livestock and Agricultural Marketing Project (LAMP), May 17, 2013, p23

² Mongolia: Livestock and Agricultural Marketing Project brochure, 2018

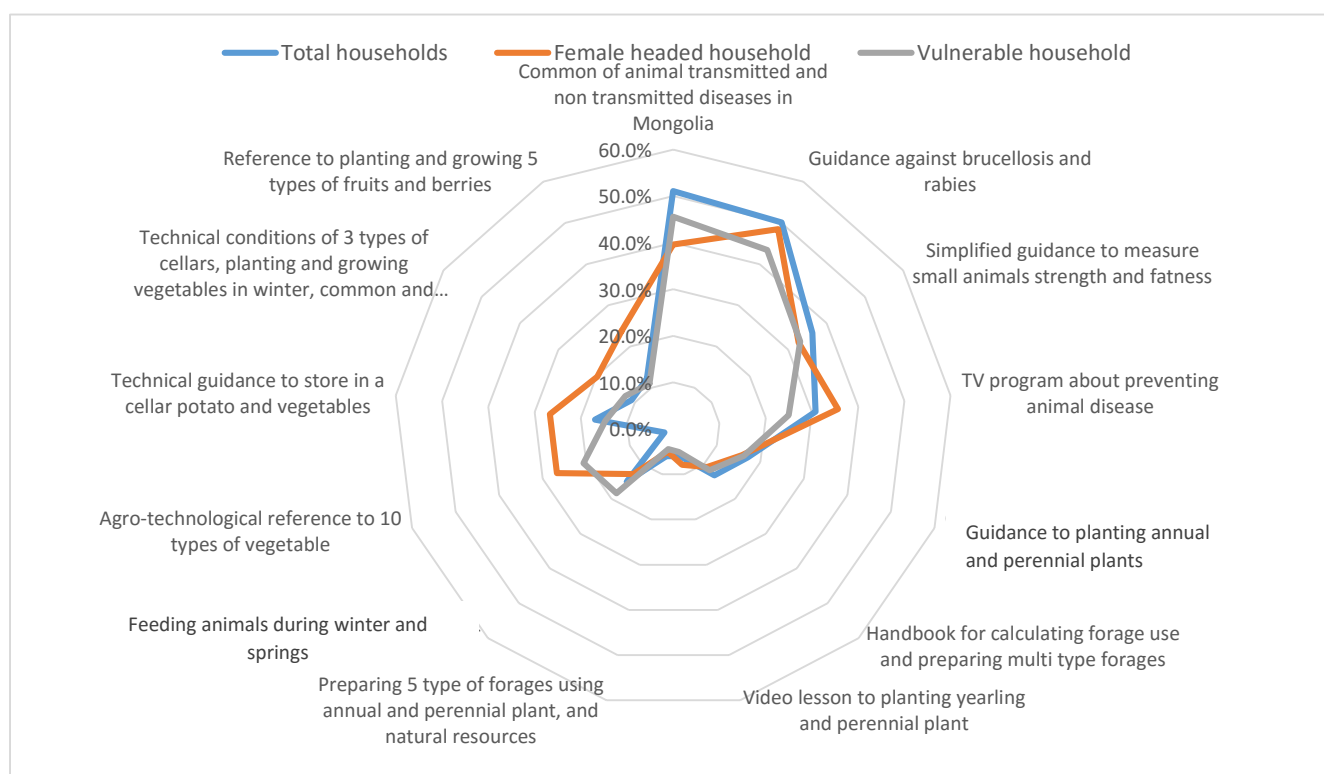
veterinary services, animal breeding and genetic improvement and animal feed processing. This trend was observed among female-headed and vulnerable households as well.

Figure 14. Household level improvement after receiving sub-grants, by household types



The percentage of use of handouts, books and materials distributed to households in the frame of the project was approximately 50%, i.e. one in every two households used these materials. *Common symptoms of animal transmittable and non-transmittable diseases in Mongolia, Guidance against brucellosis and rabies, Simplified guidance to measure small animal's strength and fatness* were the most widely used handouts. On the contrary, *Agro-technological reference to 10 types of vegetables, Preparing 5 types of forage using annual and perennial plants and natural resources, Video lessons to planting yearling and perennial plants* were the least used materials.

Figure 15. Usage of hand-outs in households



Households covered by the survey said that, in case of further implementation of similar projects, directing activities towards households (40.7%) and cooperatives (36.7%) would be more effective and the form of investment should be material (43.0%) and financial (23.9%) (see Annex 4 Table 11). Moreover, Livestock Health, Meat Processing and Meat Products, Wool and Cashmere Processing were listed by project participants as sub-projects to be invested in and developed in the future. This trend was observed among female-headed and vulnerable households as well (see Table 29).

Table 29. Projects need to invest in the future

	Total households		Female headed household		Vulnerable household	
	Count	%	Count	%	Count	%
Meat and meat product processing	326	36.2%	31	30.7%	38	27.9%
Milk and dairy product processing	274	30.4%	28	27.7%	42	30.9%
Wool and cashmere processing	289	32.1%	27	26.7%	41	30.1%
Animal feed	279	31.0%	25	24.8%	35	25.7%
Animal health	376	41.8%	38	37.6%	49	36.0%
Horticulture	204	22.7%	27	26.7%	40	29.4%
Household production	119	13.2%	12	11.9%	19	14.0%
Other	32	3.6%	1	1.0%	3	2.2%

In conclusion, the project activities on veterinary services, animal breeding and genetic improvement and animal feed processing reached more households rather than activities on linking herders to markets, in which the LAMP invested the most. Male members of households were the main project participants and recipients of financial and other support from the project at the household level, and this trend was common at total household level (see Chapter 4.4. Household labor distribution).

Of handouts distributed in the frame of the project materials on livestock health were mostly used. In addition, survey participants viewed that the present model used by the LAMP, which targeted households and cooperatives by providing them material assistance, was effective and should be used for implementation of projects on livestock health, wool and cashmere processing and animal feed processing.

Beneficiaries' satisfaction

In order to measure the project evaluation by beneficiaries, the satisfaction level was determined with the use of a total of 37 indicators in 6 parts. The level of satisfaction was measured by a five step Likert scale in which “five” has the most positive meaning and “one” has the most negative meaning:

1. 11 indicators related to the changes at the households' level
2. 5 indicators related to the changes in the linking to the markets
3. 7 indicators related to the changes in agriculture and horticulture activities

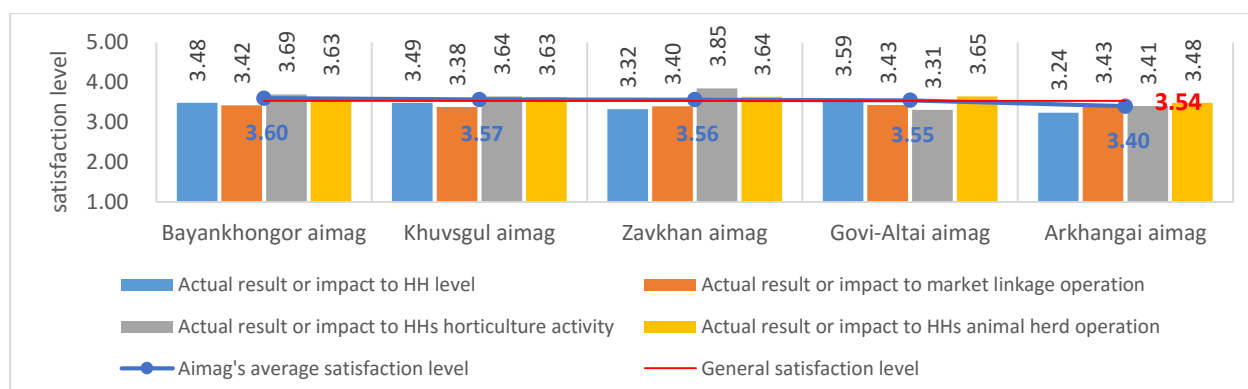
14 indicators related to the changes in animal husbandry including:

1. 5 indicators related to the changes in livestock health
2. 5 indicators related to the changes in animal breeding, genetics and productivity
3. 4 indicators related to the changes in the animal feed and nutrition

The project beneficiaries gave the project an overall evaluation of 3.54, which shows that the project achieved certain positive, good results, but also indicated that results could have been better than this level.

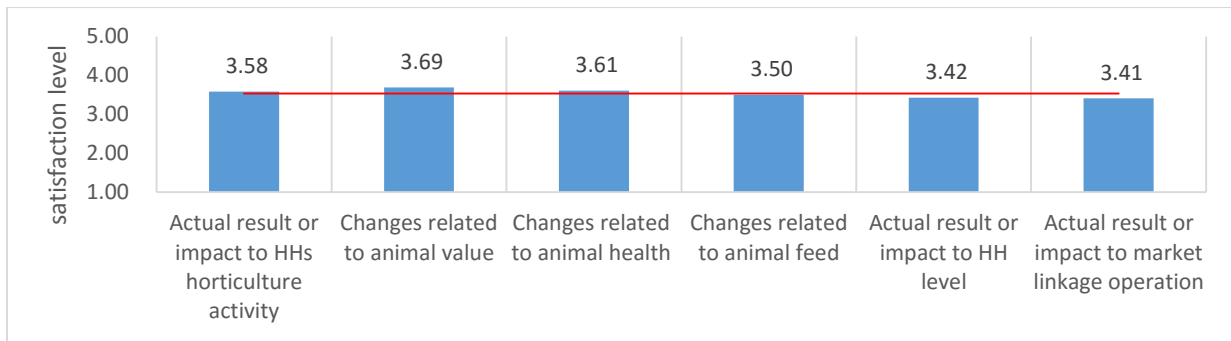
Figure 16 shows the satisfaction level by *aimags*. The Bayankhongor *aimag* beneficiaries had the highest satisfaction level compared to beneficiaries from other *aimags* at 3.60, while the Arkhangai *aimag* beneficiaries gave the lowest score of 3.40.

Figure 16. Beneficiaries satisfaction, disaggregated by *aimags* and groups



When satisfaction was examined in detail by activities that received project investment, the group of indicators with the highest satisfaction level were the ones related to agriculture and horticulture. The group that had the lowest evaluation from beneficiaries was the one related to linking to the markets.

Figure 17. Beneficiaries satisfaction, disaggregated by groups



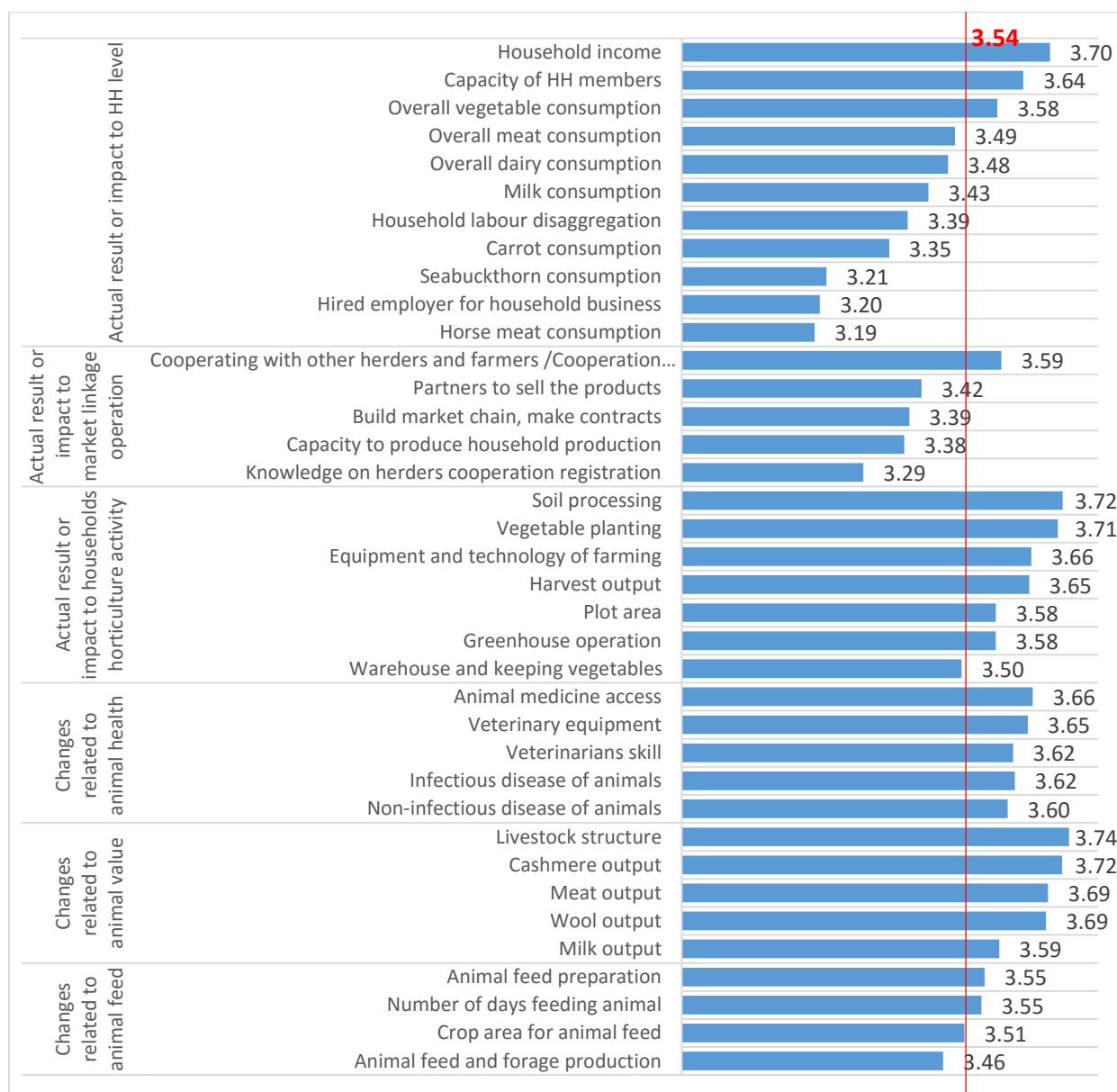
- The herd structure, establishment of the nucleus flock (3.74),
- Cashmere output (3.72)
- Methods and technology of the land cultivation (3.72)
- Horticulture (3.71)
- Household income (3.70)

On the contrary, the following indicators were evaluated as the ones that did not have positive changes, i.e. remained at the same level as before the project implementation:

- Horse meat consumption (3.19)
- Seabuckthorn consumption (3.20)
- Hired employees for household business (3.21)
- Knowledge on registration of herders' cooperatives (3.29)
- Carrot consumption (3.35)

Treatment households have more satisfaction in changes related to animal breeding and animal health interventions. Most low satisfaction point is on market linkage intervention. This section provided information related to project relevance and effectiveness.

Figure 18. Beneficiaries satisfaction, disaggregated by unit indicator



4

LINKING HERDERS TO MARKETS



Chapter 4. Linking herders to Markets

The objective of the Linking Herders to Markets component was to create productive partnerships between formalized herder groups and processors of animal products (meat, dairy and fiber). The project was designed to work with herder cooperatives to improve the collection, handling, cleaning, sorting, packaging, and storage of livestock products. Improved market access for more valuable processed output would provide incentives to invest in herd quality. This component would also support income diversification via dairy and horticultural processing¹. The facilities were to be owned by the herder cooperatives. The investment package included all the equipment, tools, facilities, and power, water and hygiene systems necessary to ensure safe food production. The training and technical assistance package addressed on-farm and in-plant food safety, processing techniques, marketing, financial management and cooperative management. All applications required viable business plans that include the training required to build production and management capacity².

Livestock products output

This chapter describes agricultural products processing, and selling practices from output level by households' labor distribution, in other words who process what and how do they sell their products.

Table 30 shows livestock product outputs by volume in treatment and control *soums*. Livestock key products output is higher in treatment *soums* than control *soums* products.

Table 30. Livestock product output, PDO 4

Livestock product output	Treatment <i>soum</i>	Of which		Control <i>soum</i>	Of which	
		Female headed HH	Vulnerable HH		Female headed HH	Vulnerable HH
Milk output, l	2,657.6	1,831.4	1,849.1	2,129.7	1,794.3	1,429.2
Meat output, kg	758.5	476.0	360.4	662.2	351.0	288.3
Cashmere output, kg	46.3	29.7	20.4	44.9	30.2	17.3
Wool output, kg	173.6	79.9	77.3	141.6	68.2	61.3

Growth of major livestock products such as meat, milk, wool and cashmere reached the target levels and detailed results are shown in the table on achievement of the project objectives (for more details see Table 1, LAMP results framework, Final achievement in the Executive summary).

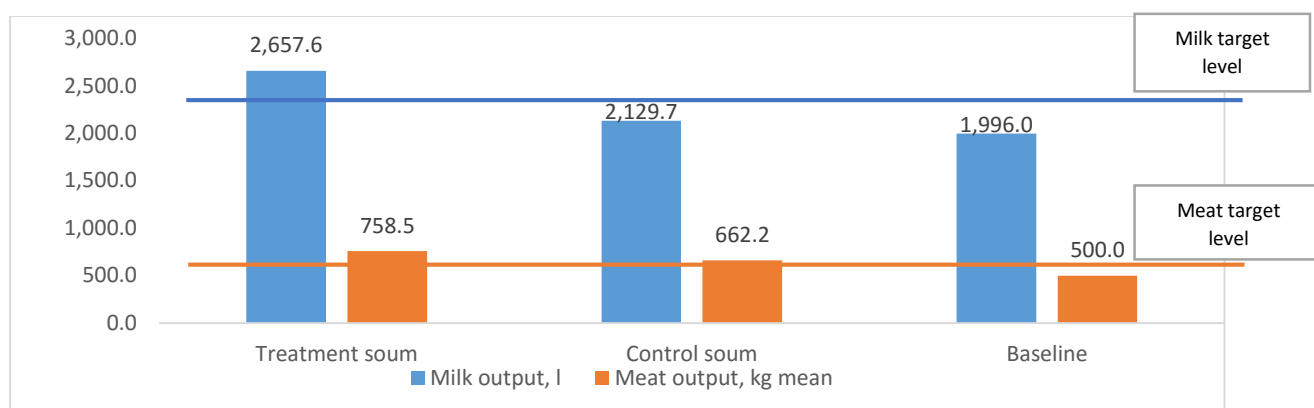
Figure 19 shows the present level of meat and milk output in comparison to the target level, by treatment and control *soums*.

According to the end-line survey results the average output of milk in a treatment *soum* household was 2,657.6 liters, which was greater by 527.9 liters or 24.7% compared to that of control households. The baseline survey results were 1,996.0 liters with an objective to increase this indicator to 2,395.0 liters by 2017 which was exceeded by 9.9%.

¹ Mongolia, LAMP, Impact Evaluation Concept Note, 2013, p6

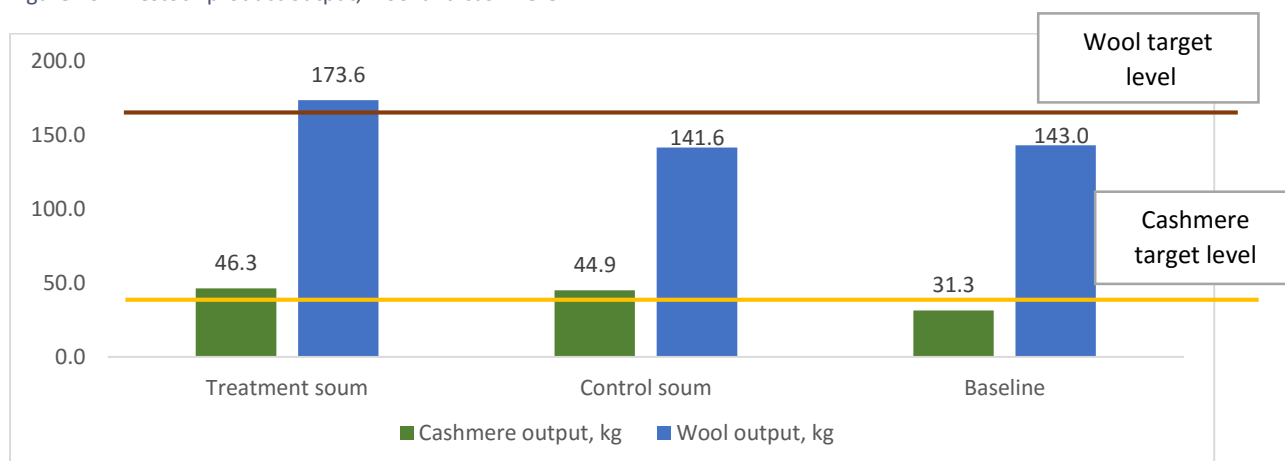
² PAD, LAMP, 2013, p19

Figure 19. Livestock product output, milk and meat



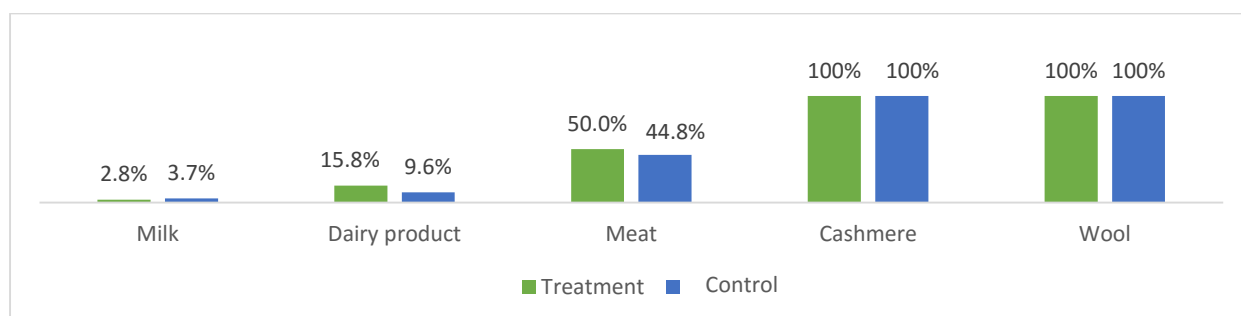
According to the project objectives for the fifth year, the sheep wool output was to reach 172 kilograms with cashmere output of 37.6 kilogram, which was achieved, as the end-line survey results showed the sheep wool output of 173.6 kilogram and goat cashmere output of 46.3 kilogram. In comparison to the output of households in control *soums* output of wool in treatment *soums* was by 32 kilograms or 23.1%, the cashmere output was by 1.4 kilograms or 3.1% higher.

Figure 20. Livestock product output, wool and cashmere



The Figure 21 shows the share of livestock products supplied to the market. Compared to the baseline survey results the end-line survey results showed a decreased percentage of milk and dairy products supplied to the markets with other products showing increase of the market supply. Supply of livestock products to the market among households in treatment *soums* had higher indicators compared to that in control *soums*.

Figure 21. Share of livestock products supplied to the market



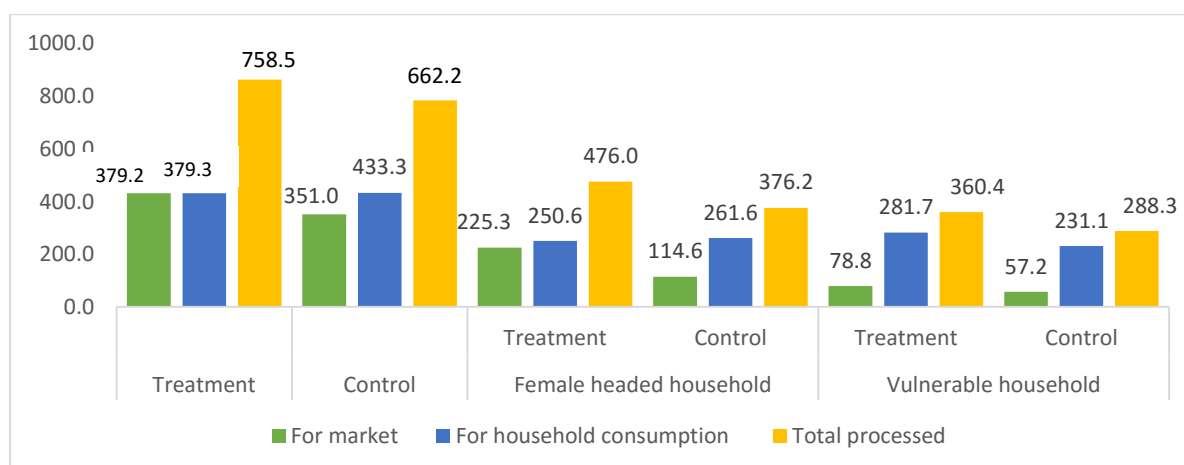
To sum up, four indicators of livestock productivity, namely, meat, milk, wool and cashmere output have grown since the time of the baseline survey and the project objectives have been exceeded and household income increased significantly.

4.1. Meat and fiber market development

According to the LAMP documentation¹, the objective of this sub-component was to improve efficiencies along the value chain of the selected livestock products, namely: meat, cashmere, and wool through productive partnerships (PPs) between producer groups and buyers. This would reduce the risks to agribusiness to invest in more remote regions and increases the value added income for herders. A unique combination of incentives, infrastructure, market conditions and sustainable supply would be needed to create and sustain well-functioning productive partnerships. Formalized herder groups (NGOs or cooperatives) would be linked with buyers and or processors of meat and fiber. Investments with the herder groups would improve basic collection, handling, cleaning, sorting, packaging, storage and similar activities. This would allow partners in the value-chain to formulate profitable strategies and coordinate operations. “...The component would strengthen contractual agreements and collaboration within value chains between partners, ensuring market development. Attention would be paid to proactively identifying capable women’s groups (formal and informal) during the beneficiary identification process”.

While meat output of households in treatment *soums* covered by the survey averaged 758.5 kilograms in 2017, that of households in control *soums* was 662.2 kilograms. The percentage of households in treatment *soums* that supplied meat to the markets was higher than that in the control *soums*. This trend was also observed among female-headed and vulnerable households in treatment *soums* (see Figure 22).

Figure 22. Processed meat in household, by kg



While herders in treatments *soums* mostly supplied beef and mutton to the markets, herders in control *soums* provided mutton and goat meat to the market. Although small by amount, the kinds of products supplied to the markets by female-headed and vulnerable households in treatment *soums* followed the common trends of households in treatment *soums* and the kinds of products were similar.

¹ PAD, LAMP, 2013, p19

KII note

Cooperatives sell their produce to their members at discounted prices. In some cases, sales were made to herders came from neighboring soums.

Head of cooperatives, 60, female

Table 31 shows differences in the amount of meat supplied to the markets by herders in different soums, which has statistical significance.

Table 31. Marketed meat, by kg in household level, 2017

		Camel meat	Horse meat	Beef	Lamb	Goat meat
Treatment	Mean	460.0	485.1	781.0	770.3	417.8
	N	1	58	192	193	146
Control	Mean	439.2	369.6	588.1	574.6	412.8
	N	12	75	161	204	172
Sig.			0.104	0.001	0.015	0.426
t		0.093	1.291	2.094	2.051	0.077
Female headed household	Treatment	Mean	240.0	970.7	522.2	250.6
		N		3	15	10
	Control	Mean	300.0	359.7	176.2	254.5
		N		4	14	14
Vulnerable household	Treatment	Mean	200.0	556.0	261.4	259.2
		N		1	10	13
	Control	Mean	172.0	285.5	219.3	167.0
		N		5	11	18

Beef and mutton were consumed the most in total households. Households in treatment soums compared to households in control soums had a higher consumption of all kinds of meat except goat meat. This trend was observed among female-headed and vulnerable households. Since female-headed and vulnerable households in treatment soums included in the sample did not have camels, they did not consume or process any camel meat. Table 32 shows differences in meat consumption at the household level, which has little statistical significance.

Table 32. Amount of consumed meat, by kg in household level

		2017, Camel meat	2017, Horse meat	2017, Beef	2017, Lamb	2017, Goat meat	
Treatment	Mean	243.3	156.8	227.2	192.4	154.0	
	N	3	181	541	698	661	
Control	Mean	232.7	155.2	206.9	178.8	173.2	
	N	28	238	494	706	682	
Sig.		0.871	0.295	0.066	0.156	0.013	
t		0.116	0.269	1.856	1.551	-2.346	
Female headed household	Treatment	Mean		185.0	215.6	138.7	124.5
		N	0	4	39	60	63
	Control	Mean	150.0	152.0	166.3	115.2	136.6
		N	1	10	40	77	79
Vulnerable household	Treatment	Mean		153.8	195.1	125.0	111.7
		N	0	13	69	97	96
	Control	Mean	300.0	131.4	163.2	97.8	108.4
		N	1	22	71	115	118

Households in treatment *soums* covered by the survey prepared and supplied to the market an average of 46.3 kilograms of cashmere in 2017, while households in control *soums* supplied 44.9 kilograms of cashmere. As for wool, the average output for households and treatment *soums* was 173.6 kilograms, while that of control *soums* was 141.6 kilograms. As for other livestock raw materials and products, supply of horse hides and goat skins to the market by households in treatment *soums* was greater compared to control *soum* households and supply of other livestock raw materials and products indicators of treatments *soums* was greater.

Table 33. Average amount of produced and marketed fibers, by kg

	Treatment	Control	Female headed household		Vulnerable household		Sig.	t
			Treatment	Control	Treatment	Control		
Cashmere	46.3	44.9	29.7	30.2	20.4	17.3	0.376	0.515
Wool	173.6	141.6	79.9	68.2	77.3	61.3	0.000	3.104

Output of meat, wool and cashmere and the percentage of their supply to markets is an indicator related to the herd structure and the goat herd size was greater in control *soums* against the treatment ones. However, the amount of cashmere output was greater in treatment *soums*. Other indicators of livestock productivity such as camel and yak wool, skin and hides output is shown in detail in Annex 4 Table 12.

While sale of live livestock or carcasses had similar levels in both treatment and control *soums*, a trend remained to sell it to a mediator rather than through the cooperative or to the final buyer. The percentage of herder households, who sold slaughtered or live livestock to the mediator in the *soum* was 66.0%-74.2%. There was no significant difference observed in treatment and control *soums* with regard to the trend to sell the meat to mediators. However, there was a slight difference at the *aimag* level. While sale of meat to mediators was widespread in Zavhan and Huvsgul *aimags* (78.3-86.5%), sale to the final consumer happened more often in Arhangai and Gobi-Altai *aimags* (13.0-28.0%) (For more detail see Annex 4 Table 13).

As for cashmere and wool, this trend was observed as well, but a small percentage of herders (10.4-24.0%) preferred to supply their products to their own cooperatives (For more detail see Annex 4 Table 14).

Since meat, wool and cashmere was sold to mediators, the sale of products took place in their own *soum* (sometimes just outside the ger), which did not provide herders with an opportunity to add value to their products. Contracts on sale of meat, wool and cashmere are discussed in the end of the next chapter.

4.2. Dairy market development

The objective of this sub-component was to add value to milk and diversify the incomes of producers and link them to markets. The project would support investments in small-scale milk collection and processing plants and training to provide the opportunity to process dairy products locally, add value and extend the marketing season¹.

¹ PAD, LAMP, 2013, p20

In order to increase sale of fresh milk it is necessary to focus on its storage and processing. Cow milk, sheep and goat milk, yogurt and other dairy products are the products most commonly produced by herder households. According to tradition, Mongolians widely use dairy products in their consumption, but are not used to drinking fresh milk on its own. Since storage of fresh milk requires large capacity refrigerators and other equipment, processing of milk to produce other dairy products is easier at the household level. After processing the value of the milk product goes up.

Production of fresh milk and dairy products was greater in households in treatment *soums* compared to control *soums*. Table 34 shows statistical significance of differences in the volume of milk and dairy products in all kinds products expect for the camel milk. In the Annex 4 Table 15 shows milk and dairy product production and supply to the markets at the *aimag* and *soum* level. As we mentioned earlier, the herd size and structure directly affect the livestock productivity indicators, so the milk and dairy product production differed at the *aimag* level.

Table 34. Produced milk and dairy products, by household type

		Camel milk, l	Mare's milk, l	Cow milk, l	Milk of sheep and goat, l	Dried yogurt, kg	Fresh yogurt, l	Sour cream, kg	Milk cream, kg	
Treatment	Mean	750.0	899.0	2672.1	1140.0	82.4	553.0	63.3	132.0	
	N	6	41	558	346	682	587	603	553	
Control	Mean	580.3	897.6	1788.8	1097.7	60.2	394.3	40.6	86.6	
	N	20	57	527	477	671	556	574	531	
Sig.		0.354	0.960	0.000	0.032	0.000	0.000	0.000	0.001	
t		0.443	0.007	8.503	0.635	2.951	3.680	5.042	2.972	
Female headed household	Treatment	Mean	1500.0	2156.7	918.0	74.6	378.9	55.6	88.6	
		N	0	1	43	33	63	54	52	43
	Control	Mean	270.0	767.5	1695.0	1080.7	61.9	406.0	31.3	127.2
		N	1	4	47	61	79	69	61	54
Vulnerable household	Treatment	Mean	276.0	2022.2	816.3	56.8	352.7	52.7	115.7	
		N	0	5	72	51	97	78	83	71
	Control	Mean	675.0	625.0	1345.8	850.6	32.3	256.6	26.1	38.2
		N	1	4	82	90	121	91	103	82

Table 35 shows the percentage of milk and dairy products supplied to the markets by households. Supply of fresh milk to the markets was relatively low at the total household level. Up to 2.0% of sheep and goat milk, nearly 4.0% of fresh cow milk was supplied to the market. Although the number of camels was smallest among total households, the percentage of camel *sour cream* supplied to the market was the highest. As for milk of other animals, a trend to supply to the market dairy products such as cream, curd, cottage cheese dominated. When households in treatment *soums* were compared to the control ones, supply to the market of dairy products such as curd, cream and cottage cheese was dominant.

Table 35. Marketed milk products by household type

	Treatment	Control	Female headed household		Vulnerable household	
			Treatment	Control	Treatment	Control
Camel milk, l	11.8%	30.1%		0.0%		0.0%
Mare's milk, l	3.6%	14.3%	0.0%	7.0%	6.8%	0.0%
Cow milk, l	3.0%	3.9%	1.6%	6.9%	3.0%	4.8%
Sheep and goat milk, l	1.9%	1.5%	4.9%	1.5%	0.2%	0.9%
Dried yogurt, kg	28.5%	24.4%	34.4%	14.8%	24.9%	21.1%

	Treatment	Control	Female headed household		Vulnerable household	
			Treatment	Control	Treatment	Control
Fresh yogurt, l	4.3%	2.6%	6.4%	0.3%	0.5%	2.6%
Sour cream, kg	28.2%	17.1%	6.9%	7.7%	22.0%	13.4%
Milk cream, kg	34.4%	17.5%	24.0%	4.0%	23.4%	10.1%
Other	34.7%	24.7%	30.2%	10.3%	33.6%	27.2%

Households in control *soums* supplied greater amounts of the mare’s milk and cow milk to the market compared to the treatment *soums*. Households in treatment *soums* had a relatively high indicator of supply of dairy products such as yogurt, curd, cream etc to the market. Table 36 showed statistical significance of these differences.

Table 36. Average amount of marketed milk and dairy products

		Camel milk, l	Mare's milk, l	Cow milk, l	Milk of sheep and goat, l	Dried yogurt, kg	Fresh yogurt, l	Sour cream, kg	Milk cream, kg	
Treatment	Mean	600.0	272.0	417.1	532.1	98.8	427.3	86.7	206.5	
	N	1	5	110	14	227	34	173	185	
Control	Mean	500.0	450.3	473.6	337.9	66.2	197.0	41.5	116.3	
	N	10	19	80	24	197	30	116	84	
Sig. t		0.149	-0.618	-0.611	0.893	2.662	1.202	4.776	2.193	
Female headed household	Treatment	Mean		750.0	520.0	154.3	279.0	35.8	109.1	
		N	0	0	2	3	16	5	6	11
	Control	Mean		115.0	733.8	333.3	47.1	25.0	22.7	48.0
		N	0	2	8	3	18	3	7	6
Vulnerable household	Treatment	Mean		100.0	341.5	100.0	65.3	36.3	56.0	114.3
		N	0	1	13	1	28	4	22	22
	Control	Mean			1380.0	720.0	36.1	204.0	27.7	50.6
		N	0	0	4	1	29	3	15	7

Figure 23 shows that 14.2% of households in treatment *soums* and 12.4% of households in controlled *soums* sold livestock products based on written/official contracts. Sale of livestock products on the basis of written/official agreements was similar to the total trend in treatment *soums* and among female-headed and vulnerable households. The percentage of sale of livestock products based on written/official contracts was on average 5.0% higher than that of households in control *soums*.

Figure 23. Written contract rate by household type

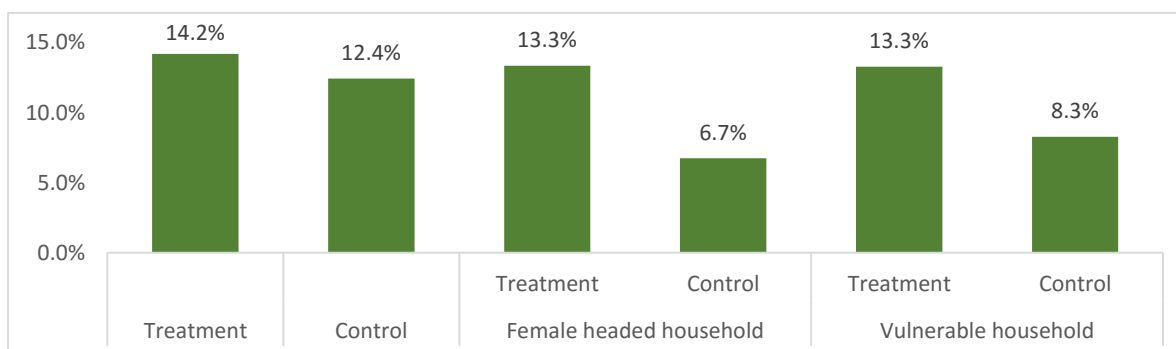


Table 37 shows duration of written/official agreements. The percentage of one-time agreements was higher among treatment *soum* households against that of control *soum* households. Although the number of written/official agreements was fewer among control *soum* households, the percentage of

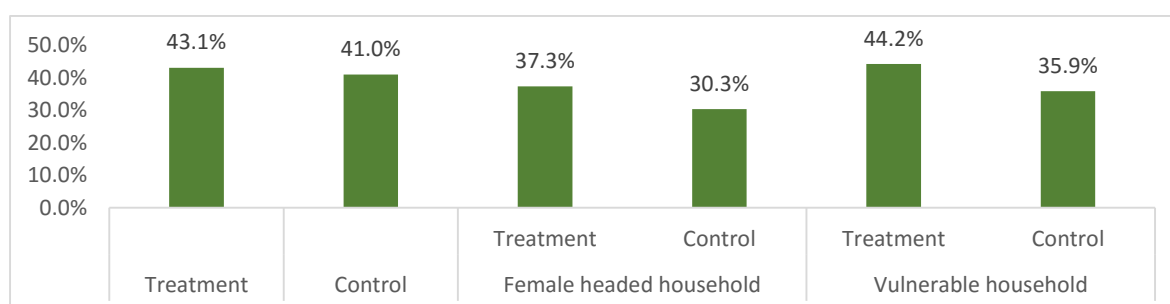
long-term agreements was higher. This trend was also observed among female-headed and vulnerable households.

Table 37. The written contract duration

	Treatment	Control	Female headed household		Vulnerable household		Sig.	t
			Treatment	Control	Treatment	Control		
One-time	63.0%	52.1%	70.0%	66.7%	53.3%	58.3%	0.067	-1.730
Short-term written agreement	33.3%	40.6%	30.0%	16.7%	46.7%	33.3%		
Long-term written agreement	3.7%	7.3%	0.0%	16.7%	0.0%	8.3%		
Sum	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%		

The percentage of unofficial/verbal agreement was high among the treatment *soum* households (See figure 24). The percentage of female-headed and vulnerable households that sold their produce based on verbal agreements was also high.

Figure 24. Verbal agreement rate



As table 38 shows, the duration of unofficial/verbal agreement was higher among the treatment *soum* households compared to the percentage of short-term agreements among control *soum* households. As for control *soums*, they had a higher percentage of one-time verbal agreements.

Table 38. The verbal agreement duration

	Treatment	Control	Female headed household		Vulnerable household		Sig.	t
			Treatment	Control	Treatment	Control		
One-time	76.2%	83.0%	78.6%	88.9%	76.0%	92.3%	0.003	1.712
Short-term verbal agreement	21.6%	14.5%	17.9%	11.1%	24.0%	7.7%		
Long-term verbal agreement	2.1%	2.5%	3.6%	0.0%	0.0%	0.0%		
Sum	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%		

The main sales channels and buyers of milk and dairy products operated on the same principles as in the meat, wool and cashmere sale. The difference from sale of meat, wool and cashmere is that households more commonly used milk for their own consumption rather than selling it. Although the situation with sale of milk and dairy products was comparable in treatment and control *soums*, it was slightly different at the *aimag* level.

KII note 23

There is an opportunity if we have a chain butcher store in the city. We think that it is possible to sell meat through that chain store. It is also possible to supply barley flour to the city. Other products cannot be sent to the city. However, they can be supplied to nearby soums. It is possible to raise the nucleus herd and increase the number of livestock in the Altai aimag by supplying the herd animals to other neighboring soums. You can make a profit when you build contract supply animals from nucleus flock.

Member of cooperatives, Gobi-Altai, 44, male

KII note 26

They used to rent a truck to sell their meat on their own, but now they sell them in bulk as a cooperative. The rest of the meat is stored in a refrigerated storage in the center of the soum. They no longer waste time searching for buyers to sell the meat immediately. They sell the meat after they come into an agreement with someone. The cooperative pays dividends and VAT to its members, therefore, the members sell the wool and cashmere through the cooperatives. They get bonuses for wool and leather provided. They no longer sell the products to middlemen traders. Herders themselves give their products to cooperatives without having to worry about storage issues. It is the cooperative responsibility to handle them from then on. They have dedicated fence and cellar.

Head of cooperative, Gobi-Altai, 36, female

Of 5 aimags where the project was implemented, sale of fresh milk had the highest percentage in Arhangai (35.9%) and Zavhan (28.7%) aimags, while it was occasional in other aimags. The percentage of dairy product sale was relatively high compared to that of fresh milk, but lack of sale was also high (29.7-82.8%). Similar to meat, wool and cashmere sales, the percentage of sale to the final consumer was the highest in Zavhan (10.7%) and Gobi-Altai (11.5%) aimags, while most aimags in treatment and control soums sold their produce in their own soums to mediators (for more detail see Annex 4 tables 13-15).

When the baseline survey results were reviewed, there were very few cases when herder households were engaged in horticulture activities, so sale of agricultural products based on contracts was not included. The baseline survey report included the percentage of sold meat, milk, wool and cashmere, where the percentage of products sold on the contract basis (except wool) was 0.02 to 3.0% (meat, milk, dairy products 0.0-2.0%, cashmere 0.0-3.0%). The percentage of wool sale on the contract basis was 20.0-67.0%, which was explained by the research team in relation to the Regulations on financial settlement from the Government of Mongolia to be provided to a cooperative member or a herder, who prepared and sold sheep and camel wool to the national industry.

The above mentioned results clearly show that certain progress was made in production and processing activities, which are the first part of adding value to the livestock and agricultural products and creation of sales channels. The treatment soum household productivity of production and processing was high and this trend was also observed among female-headed vulnerable households. A practice of selling livestock and horticulture products as well as animal fodder on contract basis was not yet in place, which showed unsatisfactory level of work related to development of herder cooperatives and activation of financial marketing activities under the project component objectives.

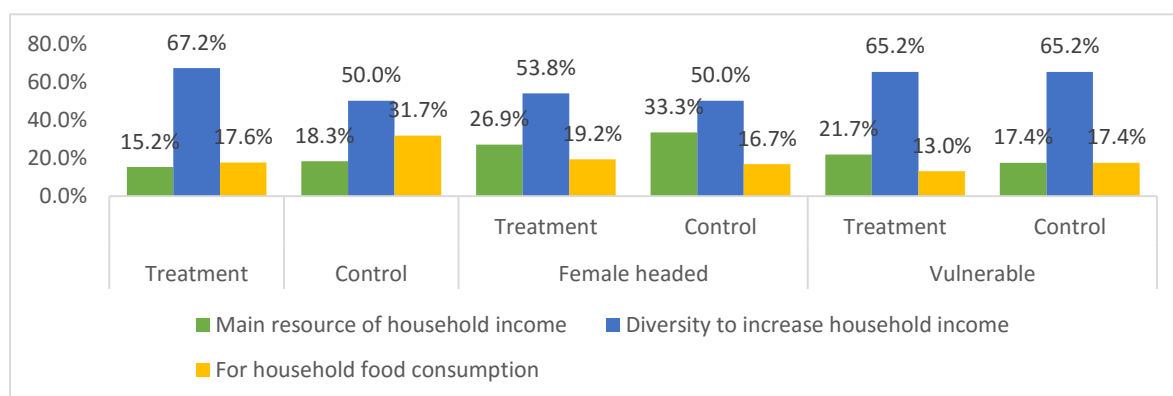
The good indicator was that the trend to make official, written contracts was more often observed among households in treatment *soums* compared to control *soums* and this trend was similar in all households in treatment *soums*.

4.3. Horticulture production

The objective of this sub-component was to diversify the sources of household nutrition and incomes for small scale herders. The project supported income and nutrition diversification through horticulture production and processing. This was a pro-poor investment, therefore horticulture production focused on female-headed households, groups of unemployed families and herders with animal heads below the national average, to establish basic vegetable production plots¹.

Households mostly planted potatoes and vegetables to contribute to their household income and this trend was observed similarly in both treatment and control households. As figure 25 shows, cases when female-headed and vulnerable households used horticulture production as the main income source more often took place in treatment *soums*.

Figure 25. Purpose of horticulture operation



KII note 26

The project for cultivation was the most effective for our cooperative. For example, alfalfa was rarely grown in our area. The yellow alfalfa is now growing in areas for cultivation. Previously, alfalfa grew in areas of just 2 households. People grow what is more productive and cost effective. We are more focused on improving feed quality.

Head of cooperative, Gobi-Altai, 36, female

KII note 31

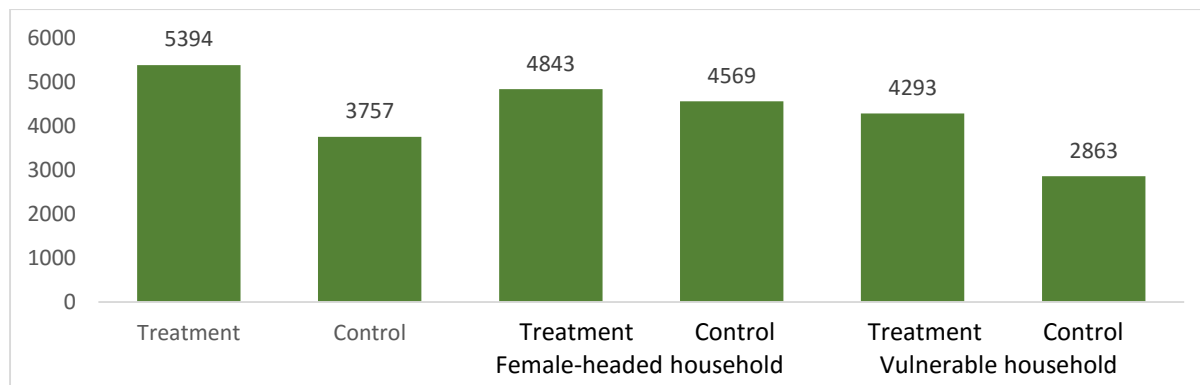
I think it's good to increase the area for growing green fodder, potatoes and vegetables. It is more accessible because it is near the market and 40 km from the aimag center. Exhibitions are always constant and can be sold in the soum.

Veterinarian, Huvsgul, 54, female

¹ PAD, LAMP, 2013, p20

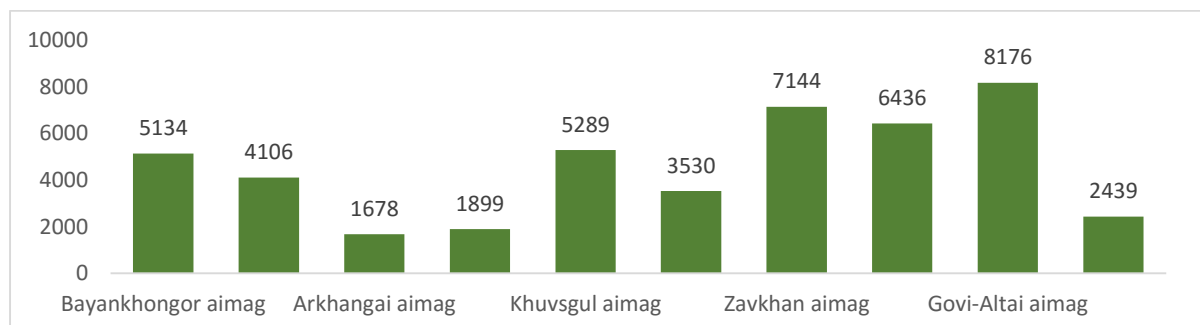
Figure 26 shows that the size of a household land plot with planted vegetables was greater in treatment *soums* against the control ones and this trend was observed also among female-headed and vulnerable households.

Figure 26. Size of plot area, by m²



As for *aimags*, in Gobi-Altai and Zavkhan *aimags* the planted area was the greatest, while households in Arhangai *aimag* planted on the smallest area. In most *aimags* the size of the planted land plot was greater in treatment against control *soums*. Planting of potatoes and vegetables was a new activity at the local level and as a result of support provided in the project frame the above areas were planted with potatoes, vegetables and animal fodder.

Figure 27. Size of plot area, by *aimags*, m²



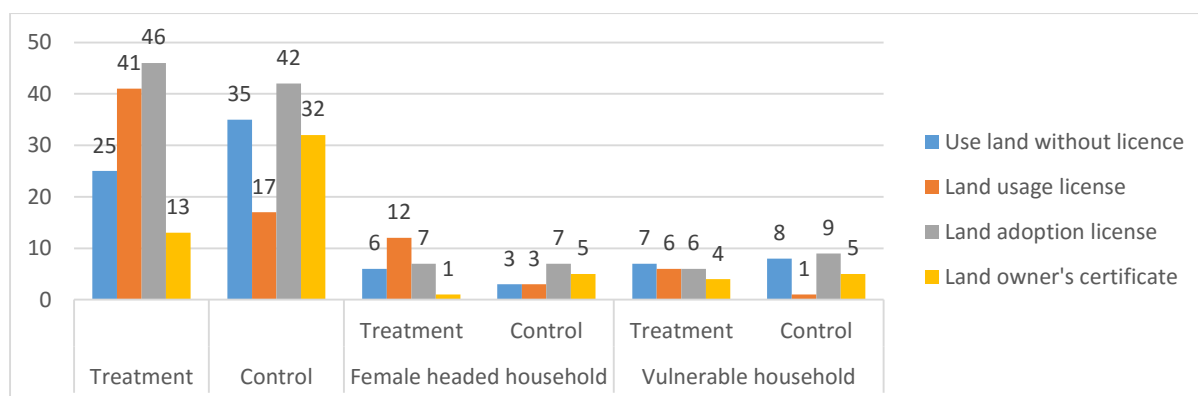
KII note 26

*The project created jobs for the unemployed people in the *soum*. Some citizens and businesses have been provided with equipment for small and medium sized enterprises. People became quite eager to do business. When they are given equipment, they work to see the benefits. They have a number of vegetable greenhouses and farm equipment. Following this, people's livelihood improved. There is a meat cellar and people are working to get a meat processing plant.*

Director of Veterinary clinic, Gobi-Altai, 44, female

The land ownership forms differed in treatment and control *soums*. Cases, when the areas without any license were planted, were widespread in control *soums*. The percentage of land adoption and usage licenses was high among treatment households, but the percentage of ownership of land plots was higher in control *soums*.

Figure 28. Land ownership by *aimags*, by mean



In 2017, households in treatment *soums* planted and harvested potatoes, carrots, cabbage, cucumber, tomatoes, bell peppers, seabuckthorn and other vegetables. The amount of harvested potatoes, cabbage, cucumbers and seabuckthorn was higher in treatment *soums*. The yield of carrots, peppers and other kinds of vegetables was higher in control *soums* compared to the treatment ones. Table 39 shows that the harvest of vegetables other than carrots and peppers was higher among female-headed and vulnerable households.

Table 39. Average amount of harvest

	Treatment	Control	Female headed household		Vulnerable household		Sig.	t
			Treatment	Control	Treatment	Control		
Potato, ton	2.6	1.8	2.5	2.0	1.1	1.0	0.000	1.743
Carrot, kg	314.9	346.5	404.0	679.6	93.2	393.4	0.000	-0.319
Cabbage, kg	320.2	271.5	444.5	257.3	191.7	148.8	0.000	0.597
Cucumber,kg	244.0	150.2	188.0	99.3	135.0	65.7	0.046	0.885
Tomato, kg	81.7	81.5	39.4	58.1	36.0	63.3	0.444	0.006
Pepper, kg	29.1	192.9	5.5	611.6	19.0	608.6	0.805	-0.844
Sea buckthorn, kg	85.9	69.6		25.0	120.0	83.3	0.339	0.385
Other, kg	459.6	712.8	630.0	137.4	93.6	103.4	0.056	-0.480

Depending on the yield, the amount of vegetables supplied to the markets differed in treatment and control *soums*. That is why the percentage of supply to the markets was taken into account rather than the real amount of produce sold at the markets. Table 40 shows that households in treatment *soums* supplied 45.4-83.1% of the harvest to the markets, while households in control *soums* supplied 13.5-92.2% of harvest to the market. Households in treatment *soums* supplied to the market other kinds of vegetables, cucumbers, cabbage and carrots apart from their own harvest, while households in control *soums* supplied to the markets other kinds of vegetables, peppers and cabbage. Female-headed and vulnerable households supplied to the market 43.1-83.5% of the harvest. Compared to the total households' results, the percentage of every kind of harvest supplied to the market was relatively equal.

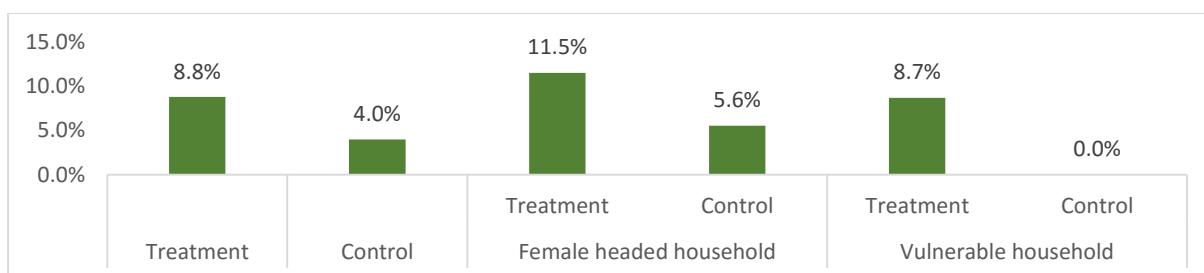
Table 40. Average percent of marketed vegetables

	Treatment	Control	Female headed household		Vulnerable household	
			Treatment	Control	Treatment	Control
Potato, ton	63.6%	60.6%	63.4%	76.3%	69.5%	67.9%
Carrot, kg	74.2%	60.5%	83.5%	32.5%	75.5%	82.1%

	Treatment	Control	Female headed household		Vulnerable household	
			Treatment	Control	Treatment	Control
Cabbage, kg	78.1%	74.2%	81.8%	82.0%	64.3%	76.9%
Cucumber,kg	79.9%	63.9%	74.4%	77.0%	70.7%	72.6%
Tomato, kg	59.3%	51.7%	43.1%	60.2%	52.8%	44.5%
Pepper, kg	68.1%	80.6%	60.6%	83.2%	73.7%	83.0%
Sea buckthorn, kg	45.4%	13.5%		60.0%	70.8%	10.0%
Other, kg	83.1%	92.2%	78.2%	80.4%	63.8%	51.9%

A relatively small percentage of households supplied harvest to the market on the contract basis. Figure 29 shows that only 8.8% of total treatment *soum* households made an written/official contract to supply potatoes and vegetables to the market. This trend was also observed among female-headed and vulnerable households. Of female-headed households 11.5%, of vulnerable households 8.7% had an written/official sale contract. The percentage of treatment *soum* households with an written/official contract to supply harvest to the market was twice higher against that of control *soums*.

Figure 29. Written contracts to sell the harvested products



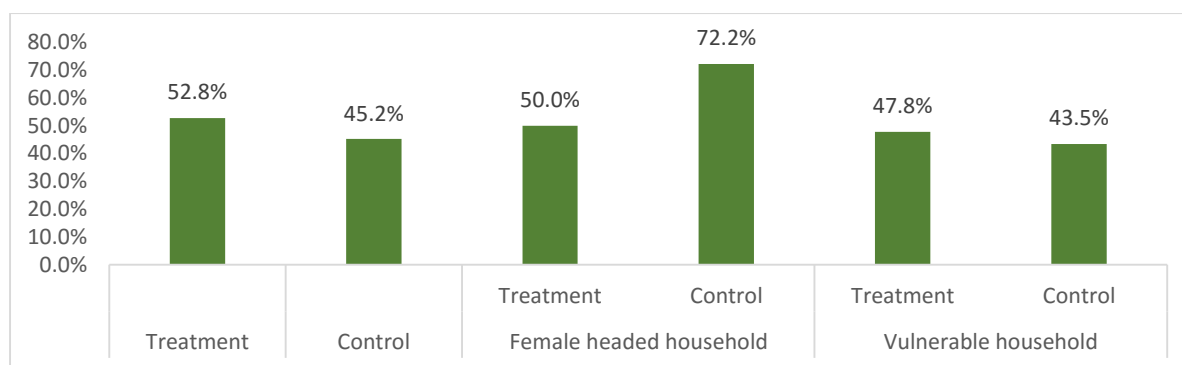
Of 8.0% of households with an written/official contract to sell their produce to the market had a short-term agreement, there were no cases of long-term contracts made by households.

Table 41. The written contract duration

	Treatment	Control	Female headed household		Vulnerable household		Sig.	t
			Treatment	Control	Treatment	Control		
One time	27.3%	0.0%	0.0%	0.0%	50.0%	0.0%	0.000	-1.899
Short-term written agreement	72.7%	80.0%	100.0%	100.0%	50.0%	0.0%		
Long-term written agreement	0.0%	20.0%	0.0%	0.0%	0.0%	0.0%		
Sum	100.0%	100.0%	100.0%	100.0%	100.0%	0.0%		

As figure 30 shows, a trend to make verbal/unofficial agreements was widespread among households in both treatment and control *soums*. Cases of making verbal/unofficial agreements were more widespread among treatment households and 52.8% of total households had an verbal/unofficial agreement. This trend was also widespread among female-headed and vulnerable households. Among female-headed households in treatment *soums* 72.2% had an verbal/unofficial agreement, which was the highest indicator of verbal agreements.

Figure 30. The verbal agreements to sell products



Although verbal/unofficial agreements had a one-time character in both treatment and control *soums* households, table 42 shows that short- and long-term agreements were also made.

The households in treatment *soums* mostly had verbal agreements for one-time purchases, while among households in control *soums* a trend to make verbal/unofficial short and long term agreements was observed more often.

Table 42. The verbal agreement duration

	Treatment	Control	Female headed household		Vulnerable household		Sig.	t
			Treatment	Control	Treatment	Control		
One time	66.7%	61.4%	84.6%	61.5%	63.6%	60.0%	0.000	-0.712
Short-term verbal agreement	28.8%	31.6%	7.7%	30.8%	36.4%	40.0%		
Long-term verbal agreement	4.5%	7.0%	7.7%	7.7%	0.0%	0.0%		
Sum	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%		

As for planting potatoes and vegetables, the size of land cultivated by the treatment groups was greater and participation of female-headed and vulnerable households was high.

KII note 3

I consider this project has benefited the local community. Mainly low and middle-income households and female household heads who involved in the LAMP project became potato and vegetable growers. Due to the poor financial capability, they propose to continue the next phase of the project. They express their desire to process the harvested vegetables and sell them as ready-made products. For this purpose, they intend to have storage area and packaging equipment and create local brand products.

VABU specialist, Arhangai, 67, female

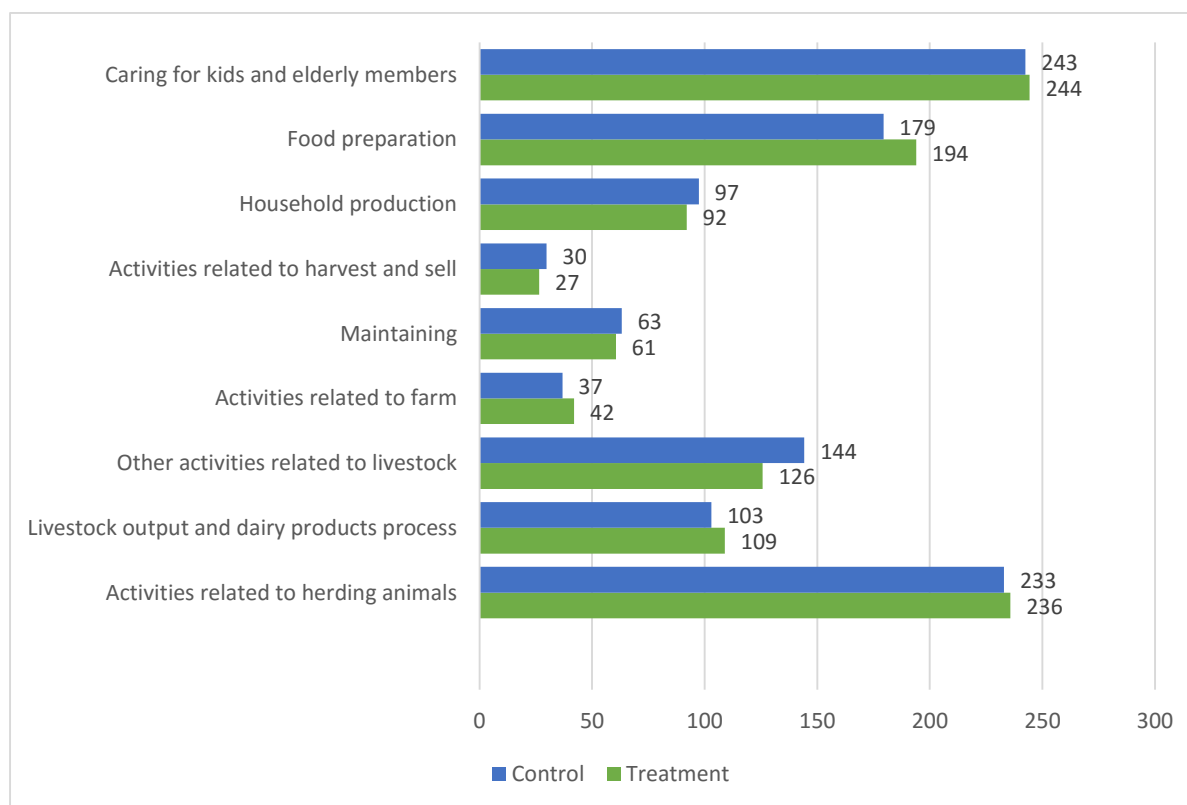
Along with a greater number of cases when female-headed and vulnerable households were engaged in horticulture as the main source of livelihood, sale on a contract basis, short- and long- term sale agreements were also more widespread among these households. Since horticulture was either a main source of livelihood or a new source for added income, the percentage of produce sold at the market by female-headed and vulnerable groups was higher compared to the average households.

4.4 Household labor distribution

Hours spent on household production by household members aged 15 and over among 1,800 households covered by the ELS in treatment and control *soums* were computed and presented in this section. As was mentioned in the section on the household profile, the surveyed households had an average of 4.1 members and the average age of household members was 23.1 in treatment households and 23.6 in control households.

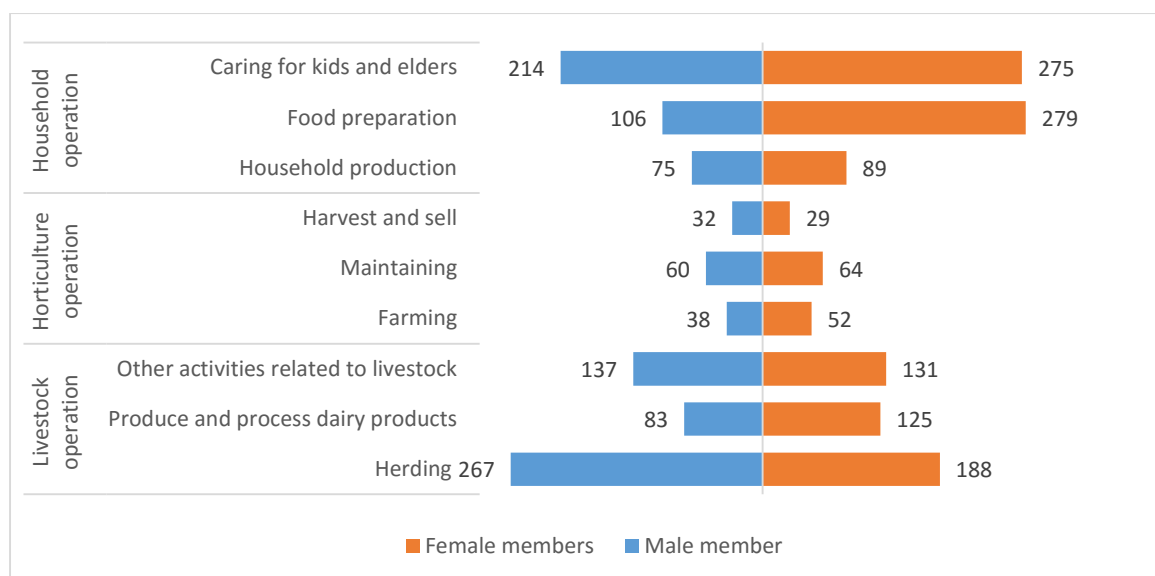
As Figure 31 shows, household members spent the most time on herding, cooking and caring for children and the elderly, while the least time was spent on crop cultivation activities. When this trend was shown by kinds of household activities, if activities related to animal husbandry were divided into 3 parts, two thirds of them were carried out by mostly by male household members (herding and other activities related to animal husbandry), women were in charge of the remaining one third (milk and dairy product processing).

Figure 31. Spent days in household main activities, by treatment and control *soums*



The household head and adult household members spent in average 228 days annually on animal herding activities (men - 267 days, women- 188 days). Male household members spent in average 79 days more on such activities compared to female household members (see figure 32).

Figure 32. Household members' herding operation, by day



As for female-headed households, adult household members spent in average 230 days (men - 259 days, women- 181 days) on animal herding activities.

The household head and adult household members spent in average of 104 days (men - 83 days, women- 125 days) on milk processing and dairy product making with female household members spending in average of 42 days more on such activities.

As for female-headed households, the household head and adult household members spent in average of 87 days (men - 54 days, women- 110 days) on milk processing and dairy product making. In vulnerable households' adult household members spent in average of 92 days (men - 63 days, women- 121 days).

Adult household members spent in average of 134 days (men - 137 days, women- 131 days) on other activities related to animal husbandry. As for female-headed households, adult household members spent in average 146 days (men - 169 days, women- 131 days) on other activities related to animal husbandry.

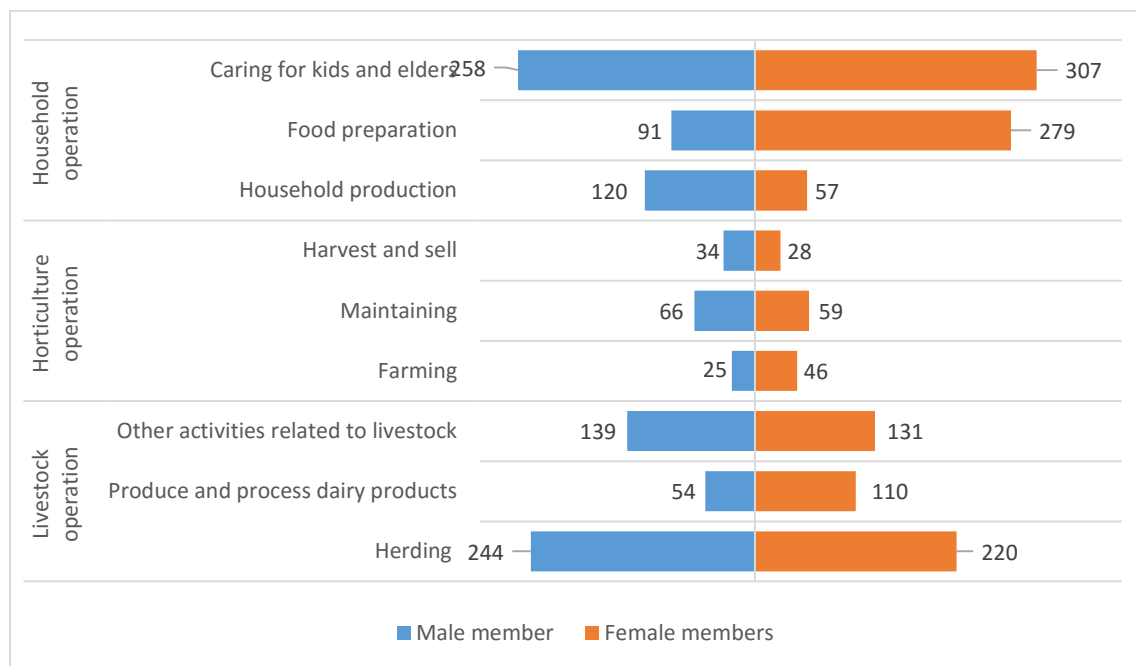
If agricultural activities are divided into 3 parts, two thirds of them were carried out by female household members (planting, nursing, watering), 1/3 (harvesting and sale) were mostly implemented by men (see figure 33).

Adult household members spent in average 45 days (men - 38 days, women- 52 days) on plowing and planting activities. As for female-headed households, adult household members spent in average 37 days (men - 25 days, women- 46 days). In vulnerable households' adult household members spent in average 35 days (men - 41 days, women- 28 days) on such activities.

Adult household members spent in average 62 days (men - 60 days, women- 64 days) on nursing, watering, soil processing, and applying pesticides activities. As for female-headed households, adult household members spent 63 days (men - 66 days, women- 59 days). In vulnerable households' adult household members spent in average 86 days (men - 91 days, women- 81 days) on such activities.

Adult household members spent in average 30 days (men - 32 days, women- 29 days) on harvesting, storage, sale activities, children spent 14 days (boys - 17 days, girls- 16 days) on such activities. In female-headed households, adult household members spent 31 days (men - 34 days, women- 28 days). In vulnerable households' adult household members spent in average 34 days (men - 36 days, women- 33 days).

Figure 33. Horticulture operation



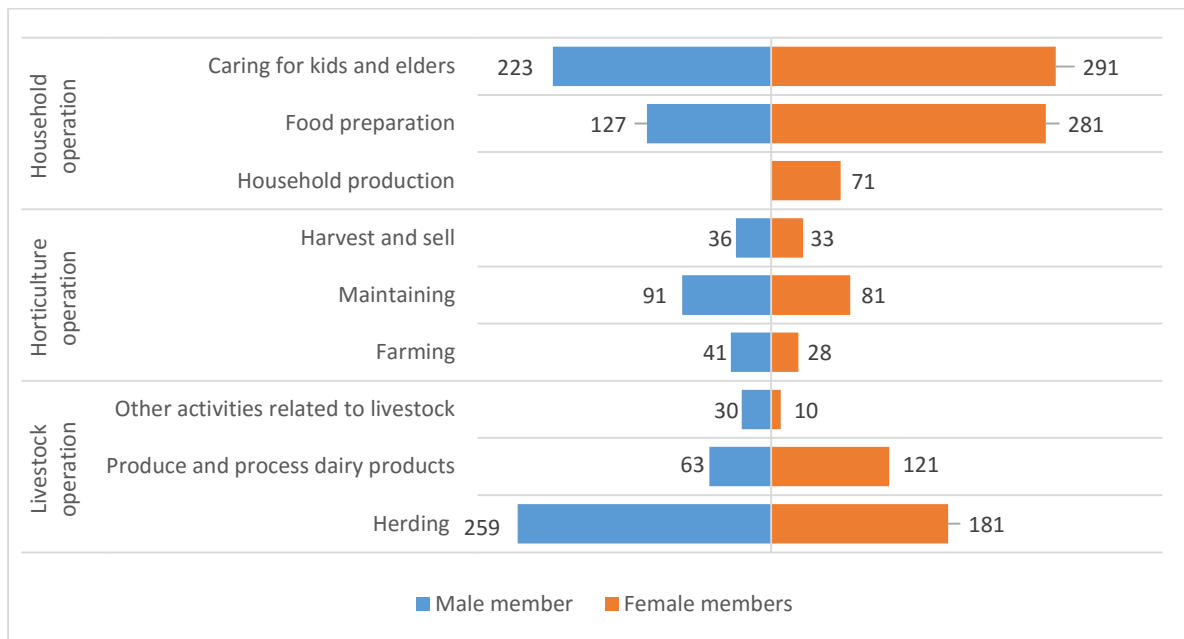
Women played a major role in all household activities and spent most of the year on food preparation, cooking, caring for children and the elderly.

Adult household members spent in average 82 days (men - 75 days, women- 89 days) on household production, crafts, and other activities to increase the household income. In female-headed households, adult household members spent 78 days (men - 120 days, women- 57 days) on household production activities. In vulnerable households' adult household members spent 71 days on household production activities (see figure 34).

Adult household members spent in average 193 days (men - 106 days, women- 279 days) on food preparation and cooking activities. In female-headed households, adult household members spent 203 days (men - 91 days, women- 279 days). In vulnerable households' adult household members spent 204 days (men - 127 days, women- 281 days) on food preparation and cooking activities.

Adult household members spent in average 245 days (men - 214 days, women- 275 days) on caring for children and elderly. In female-headed households, adult household members spent 287 days (men - 258 days, women- 307 days) on caring for children and elderly. In vulnerable households' adult household members spent 257 days (men - 223 days, women- 291 days) on such activity.

Figure 34. Household operation



In brief, in the rural areas, livestock and horticulture labour tend to divide into male and female work such as herding animal and other livestock activities, harvesting and selling horticulture products, household production belonging to men’s business, while what’s left are women’s responsibility. Even in female-headed and vulnerable households, this pattern of labour distribution was observed. Household production and livestock output comes from these activities while livestock and horticulture output mostly tend to belong male members.



5

RAISING LIVESTOCK PRODUCTIVITY AND QUALITY



Chapter 5. Raising livestock productivity and quality

This chapter describes the LAMP project component on the improvement of livestock productivity through animal health, breeding and nutrition investments. Raising livestock productivity and quality component aimed to ensure productivity increases and quality products for the markets. Support was provided through extension services in the areas of animal health, nutrition, breed improvement and feeding to improve the productivity of the five to six traditional species (sheep, goat, horse, cattle/yak, camel) within the semi-nomadic production system through breeding, feeding and animal health. The target group for support was the herder groups participating in component 1 to ensure complementarity and synergy and also was implemented through three sub-components¹. This chapter considers the three sub-components achievements.

5.1. Animal health

In the frame of this work 40 private veterinary units, 15 *Soums* VABUs, 8 *aimags* Veterinary Divisions and Laboratories, 6 Buffer zone check points were supported with 0,8 million USD. Supply of refrigerated vehicles for vaccine transportation, drugs, and temperature and humidity data loggers were supplied to the Veterinary Divisions of *aimags* and refrigerators and data loggers supplied to *soums* VABUs which created a modern cold chain system to ensure and guarantee the quality of vaccines and drugs. Supply of office equipment and veterinary diagnostics, analysis, and service equipment and tools to 69 veterinary entities and enterprises contributed to better work environments².

During the baseline survey, the research team measured the vaccination rate of relevant species against 3 of the most important infectious diseases in the study area, brucellosis, anthrax and rabies. For all 3 diseases, vaccination rates were rarely above 70.0%, and for many species-disease combinations they are well below 50.0%³. This tendency kept through the end-line period and survey result shows slightly high rate of animal health service access both treatment and control *soums* (see table 43).

The percentage of households that received veterinary services and vaccinated animals was high in both treatment and control *soums*. The percentage of female-headed and vulnerable households that received veterinary services was lower in control *soums* compared to the similar groups in treatment households. The following indicators show results of veterinary-related activities implemented in the frame of the project:

1. Herders covered by the survey listed animal health issues as indicators that improved as a result of project implementation at the household level (see the project coverage in Table 28 in Chapter 3.5)
2. Households and cooperatives that benefitted directly or indirectly from project investment gave a good evaluation in the course of the qualitative survey
3. An acute infectious FMD (foot and mouth disease) that plagued livestock in the Eastern, Central, Khangai regions of Mongolia in February to May, 2018, did not spread in the project

¹ PAD, LAMP, 2013, p20-21

² Mongolia: Livestock and Agricultural Marketing Project. Brochure 2018, p11

³ LAMP, Baseline report, 2013, p31

soums. In the course of data collection for the end-line survey FMD cases took place in one control *soum* (Arhangai- Ikh Tamir), so the *soum* had to be replaced by another *soum* (see the part on Survey limitations).

Table 43. Veterinary service access

	Treatment	Control	Female headed household		Vulnerable household		Sig.	t
			Treatment	Control	Treatment	Control		
Received animal health care service in 2017	97.9%	96.6%	100.0%	96.6%	96.5%	94.5%	0.002	-1.513
Not Received animal health care service in 2017	2.1%	3.4%	0.0%	3.4%	3.5%	5.5%		
Received vaccination service in 2017	96.4%	91.4%	94.7%	89.5%	93.6%	87.6%	0.000	-4.008
Not received vaccination service in 2017	3.6%	8.6%	5.3%	10.5%	6.4%	12.4%		
Received medicine service in 2017	89.5%	91.8%	92.0%	89.5%	90.8%	93.4%	0.002	1.531
Not received medicine service in 2017	10.5%	8.2%	8.0%	10.5%	9.2%	6.6%		

When households covered by the survey evaluated the *soum* veterinary services at 4 levels, 100% of households in treatment and control *soums* viewed that measures should be taken to strengthen the capacity of veterinarians, provide vaccines and medicines for livestock, provide breeding equipment, improve the quality of vaccines for animals (see for more detail Annex 4 Table 16).

KII note 24

*I think it was a timely project. There was no veterinary pharmacy in our *soum*. The pharmacy is operating in a building constructed as a laboratory. Our enterprise was the main beneficiary. We keep the medicines in a warm place and prevent the vaccine from freezing. The departments are connected to the cold chain.*

Director of Veterinary Clinic, Bayanhongor, 50, male

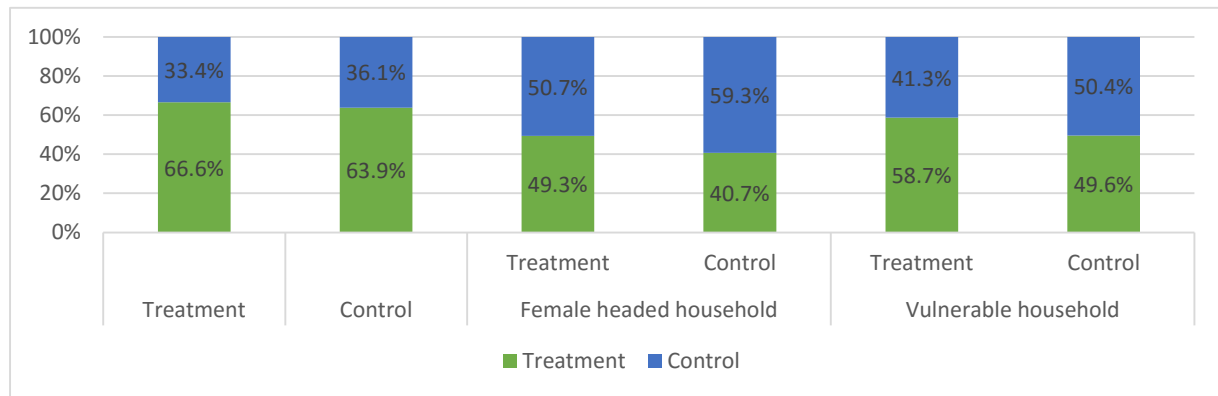
KII note 26

First, veterinary projects have been the most accessible. Veterinary services could not reach everyone previously and the local government did not provide any other assistance except little amount of money for delivering veterinary services. Project equipped the veterinary clinic with animal washing pond and portable fences. The portable fences are loaded on vehicles and transported by us. Local herders are grateful that they are getting their veterinary service fast thanks to motorcycles provided by the project. The meat storage cellar is considered to be quite accessible to herders.

Director of Veterinary Clinic, Gobi-Altai, 44, male

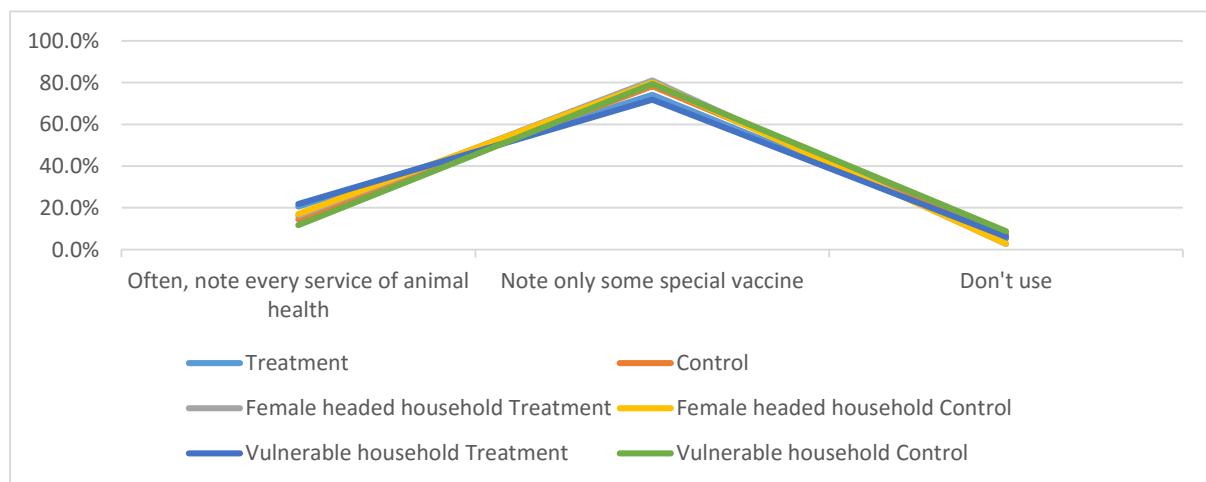
Of households covered by the survey, nearly 2/3 had an Animal health history book, but in both treatment and control *soums* the percentage of female-headed households with an Animal health history book was lower compared to other groups. Although the percentage of vulnerable households with an Animal health history book was lower compared to other households, it was still by 10% higher against that of female-headed households (see figure 35).

Figure 35. Having animal health book



Although accessibility of services improved, and herders received animal health-related services at satisfactory level, lack of regular records in the Animal health history, lack of washing, disinfection for livestock demonstrated that these have not yet become regular practice for herders. Figure 36 shows that herders did not keep regular records in the Animal health history book.

Figure 36. Note rate in animal health book



Households in treatment and control *soums* that received animal health services had 100% of vaccination against brucellosis, against ecthyma, against contagious agalactia, Ivomec and Alamycin injections. There were no differences observed between treatment and control groups with regard to selection and use of vaccination and injections (for more detail see Annex 4 Table 17).

At the time of the end-line survey, in 2017, 1.5% of treatment and 3.3% of control households had cases of communicable animal diseases, 20.8% of treatment and 25.8% of control households had cases of non-communicable animal diseases. As table 44 shows, incidence of animal diseases was

lower in female-headed and vulnerable households compared to average households due to the lower number of animals held by the female-headed and vulnerable households.

Table 44. Animal disease rate in 2017

	Treatment	Control	Female headed household		Vulnerable household		Sig.	t
			Treatment	Control	Treatment	Control		
Got infectious illness	1.5%	3.3%	0.0%	1.2%	1.8%	0.7%	0.000	2.357
Got non-infectious illness	20.8%	25.6%	22.7%	22.1%	18.3%	16.8%	0.000	2.182

Below Table 45 shows herder households' disinfection and sanitation service rate from animal veterinary service. Compared to the vaccination rates and injections the percentage of herders, who received services on decontamination and disinfection, was low. It illustrated that along with a need to improve veterinary services, there is a need to raise awareness of households on personal sanitation and hygiene, to introduce proper practices.

Table 45. Households' disinfection, sanitation service received rate

	Treatment	Control	Female headed household		Vulnerable household		Sig.	t
			Treatment	Control	Treatment	Control		
Dipping	7.4%	6.2%	6.7%	10.5%	5.5%	5.1%	0.973	0.411
De-worming	29.7%	33.6%	24.0%	27.9%	34.9%	29.9%		
Both	50.5%	47.9%	57.3%	48.8%	45.9%	45.3%		
Neither	12.5%	12.3%	12.0%	12.8%	13.8%	19.7%		
After animal disease received rate of disinfection	44.8%	50.2%	38.7%	57.0%	44.0%	51.1%	0.005	2.078
No	55.2%	49.8%	61.3%	43.0%	56.0%	48.9%		

In 2017, in treatment *soums* 7,423 and in control *soums* 9,219 livestock died. Table 46 shows the number of dead animals by its kinds. In total 826 or 11.1% of animals that died in households in treatment *soums* died due to diseases, while in control *soums* 1,393 or 15.1% of livestock died of diseases. The number of animal deaths due to diseases in female-headed and vulnerable households in treatment *soums* was lower than that in control *soums* (for more detail see Annex 4 Table 18).

Table 46. Total number of lost animals due to illness and natural diseases

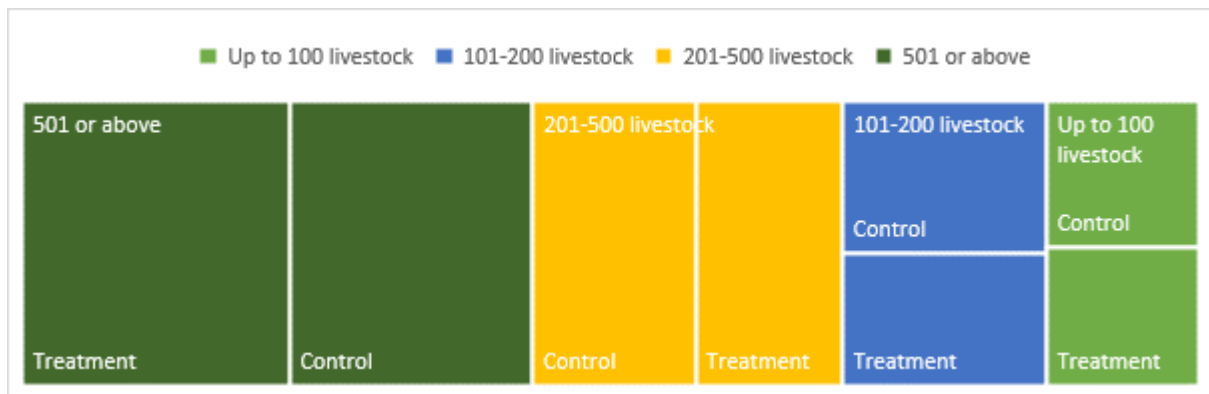
	Treatment	Control	Female headed household		Vulnerable household	
			Treatment	Control	Treatment	Control
Camels	5	26				
Horses	303	389	3	8	17	50
Cattle and Yak	929	801	52	44	82	120
Sheep	3,257	3,729	111	195	363	281
Goats	2,929	4,274	125	388	403	569
Total	7,423	9,219	291	635	865	1,020

Table 47 shows costs of veterinary services paid by households in treatment and control *soums*. Households paid slightly different costs for services depending on the herd size and location as Figure 37 demonstrates. Although households in treatment *soums* paid slightly less for veterinary services according to Table 47, it did not have a statistical significance.

Table 47. Veterinary service fee by household types, by thousand MNT

	Treatment	Control	Female headed household		Vulnerable household		Sig.	t
			Treatment	Control	Treatment	Control		
Veterinary service fee	126.7	130.7	89.4	106.5	74.2	78.6	0.627	-0.574

Figure 37. Total service fee by herd size (shown by relative size of box)



Herders of treatment groups covered by the survey were more satisfied with veterinary services compared to herders from control groups. The gap in satisfaction between two groups was 0.332 and had a statistical significance. Although households in treatment and control groups received services and paid costs at the similar level, households in treatment *soums* had higher satisfaction levels. Especially female-headed and vulnerable households were more satisfied. In treatment households the herd size did not affect the satisfaction level.

Figure 38. Satisfaction level by household type

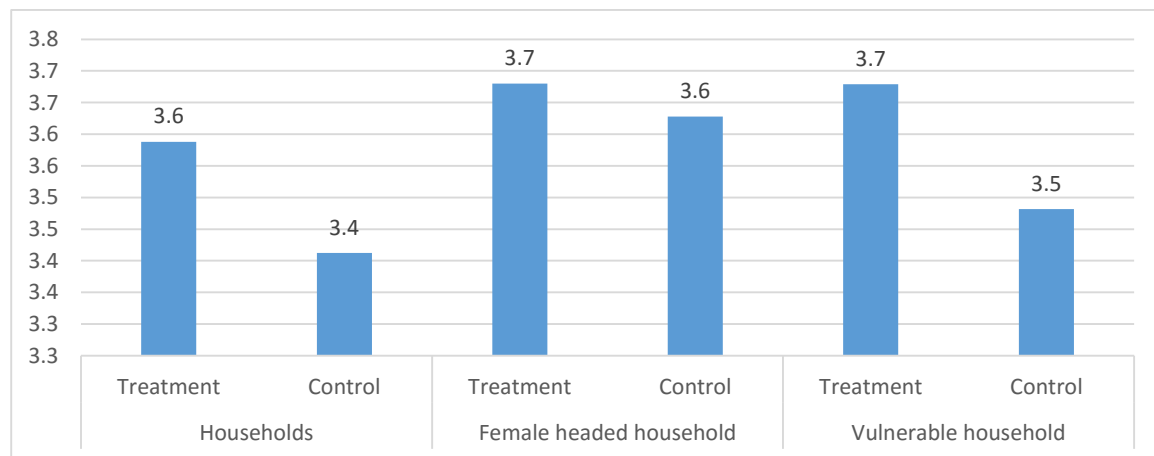
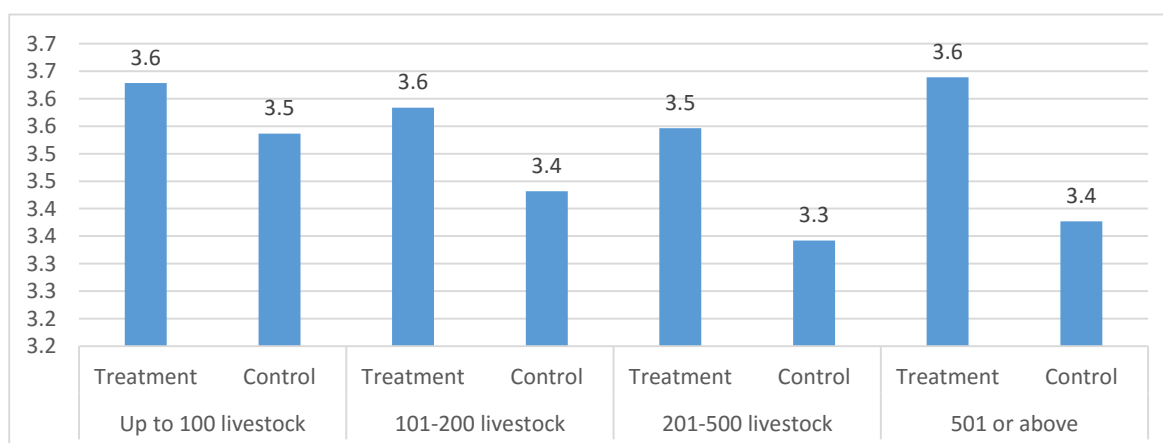


Figure 39. Satisfaction level by herd size



To sum up, 100% of households had anti-brucellosis vaccination of livestock as one of activities conducted in the frame of the project sub-component, and cases of FMD that took place in project *aimags* were not registered in treatment *soums*. Accessibility of animal health services improved and households received veterinary services without any problems. However, in order to improve the animal health and reduce death of livestock due to diseases it is necessary to teach herders animal hygiene practices.

5.2. Genetic improvement and breeding management

The breeding sub-component was implemented with an aim to increase the quality of livestock output by improving the genetic characteristics of Mongolian animals. This section describes achievement of this sub-component through the introduction of higher quality animals for breeding and the formation of proper nucleus herds for breeding.

In the frame of the project 1.4 million US dollars was provided to 41 entities and cooperatives through sub-projects on genetic improvement and breeding¹. In this frame of work 19 nucleus flocks were established with population of 3,739 heads and 20 male flocks consisting of 2,904 heads of rams and bucks.

Animal breeding management system was upgraded to a professional level through provision of hay, fodder, and winter camps, targeted breeding of young sires and rams under the control of professional breeding entities, separation of breeding sires and rams out of mating season, herding them in line with prescribed technology and full exposure to veterinary services, supply of high quality sires and rams to herders on contractual basis.

As of 2017, breeding animals supplied by the project reached a total of 9,873 heads including mature and offspring livestock. Number of cows increased by 69 heads or 30.9%, sheep by 2,017 heads or 33.4%, and goats by 1,144 heads or 32.9%. 3,496 rams and 2,132 bucks were selected among offspring and raised to upgrade male flock².

¹ Mongolia: Livestock and Agricultural Marketing Project. Brochure 2018, p3

² Mongolia: Livestock and Agricultural Marketing Project. Brochure 2018, p13

During the baseline period, for all 6 species, over 40 percent of herders sought breeding bulls, rams and bucks from outside their herd but within their *bagh* 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, respectively¹.

Compared to the time of the baseline survey, households covered by the end-line survey tended to select the bull for breeding from herds of other households. As Table 48 shows, selection of a bull from other herds reached 55.9-64.3% and 36.8-44.1% for big and small animals, respectively, in treatment *soums*. This trend was also observed in control *soums*.

The percentage of households in treatment *soums* that got the bull from the LAMP nucleus flock was 24.9% for bucks, 40.7% for rams, 0.8% for bulls. There were cases when households in control *soums* also got rams, bucks and bulls from the LAMP nucleus flock. Female-headed and vulnerable households more often than others used bulls from the nucleus flock. The herd size did not affect selection of a bull (for more detail see Annex 4 Table 19).

Table 48. Breeding sires' origin, by household type

Animal species	Breeding sires' origin	Treatment	Control	Female headed household		Vulnerable household	
				Treatment	Control	Treatment	Control
Camels	from own flock	35.1%	28.2%	0.0%	33.3%	0.0%	50.0%
	from others flock	59.5%	70.6%	0.0%	33.3%	100.0%	50.0%
Horses	from own flock	44.0%	45.4%	50.0%	56.7%	36.5%	32.4%
	from others flock	55.9%	53.9%	50.0%	40.0%	63.5%	67.6%
Cattle and Yak	from own flock	34.8%	34.1%	34.8%	19.2%	28.8%	21.7%
	from others flock	64.3%	65.1%	65.2%	80.8%	71.3%	78.3%
	from LAMP nucleus flock	0.8%	0.9%	0.0%	0.0%	0.0%	0.0%
Sheep	from own flock	22.5%	42.6%	25.8%	38.8%	18.7%	33.6%
	from others flock	36.8%	56.7%	37.9%	61.3%	52.3%	64.8%
	from LAMP nucleus flock	40.7%	0.7%	36.4%	0.0%	29.0%	1.6%
Goats	from own flock	30.9%	43.5%	30.4%	39.5%	30.6%	35.6%
	from others flock	44.1%	55.7%	39.1%	58.1%	56.5%	62.2%
	from LAMP nucleus flock	24.9%	0.8%	30.4%	2.3%	13.0%	2.2%

KII note 1

... Previously, herders were not aware of the nucleus flock of the project, but now everyone is knowledgeable.

¹ LAMP, Baseline survey report, 2013, p29

KII note 25

The nucleus flock project was the most effective project. We have over 400 breeding dames. It's been a good year in terms of new born animals. This project aim matches protecting "Baidrag" breed sheep before they are extinct and improving livestock quality and improving breeds are in line with soum development policy. a good breed of rams has improved yields from sheep and goat such as cashmere, wool and meat. Therefore, the income of herders has increased.

Head of cooperative, Bayanhongor, 55, male

Households covered by the survey had 39.3-69.5% of offspring depending on the livestock kinds. The percentage of livestock breeding was comparable in treatment and control *soums* except that of camels. The percentage of livestock breeding in female-headed and vulnerable households was at similar level with average households and in some cases even higher (see table 49).

Table 49. Offspring received in 2017

	Treatment	Control	Female headed household		Vulnerable household		Sig.	t
			Treatment	Control	Treatment	Control		
Camels	60.7%	39.3%		33.3%	53.3%	33.3%	0.006	-1.547
Horses	56.3%	54.6%	52.6%	46.3%	55.0%	60.4%	0.101	0.965
Cattle and Yak	57.8%	56.6%	67.7%	57.1%	59.1%	61.7%	0.000	3.207
Sheep	69.2%	69.5%	65.5%	71.2%	74.1%	65.6%	0.013	2.205
Goats	60.5%	59.7%	56.6%	60.5%	65.2%	60.2%	0.459	-0.539

During the baseline period, households spent around 5,753 MNT on breeding service, while the end-line survey this kind of cost reached 61,2 MNT in treatment *soums*, 75,7 MNT in control *soums*, respectively. For female headed households, and vulnerable households tend to spend less money on breeding service. While at the time of the baseline survey herders selected bulls from their own herd and spent little on breeding activities, at the time of the end-line survey 2/3 of households tended to select a bull from a nucleus flock or from other herders' herds, and expenditure on breeding activities increased.

Since work on genetic improvement and breeding requires a relatively long term and much investment compared to other LAMP activities, it might not be possible to fully measure its results at the time of the ELS. At present, based on the household questionnaire and KII results, it can be concluded that herders paid more attention to livestock breeding and genetic improvement issues and attained certain knowledge in this field. Moreover, expenditure on breeding activities increased and the tendency to select bulls from own herd decreased.

5.3. Animal nutrition

This sub-component aimed to improve herders' capacity to produce feeds and manage livestock feeding programs especially during the winter season. The improved nutritional levels will improve reproductive rates and weight gains and contribute directly to enhancing household incomes¹.

In the frame of this sub-component, 24 cooperatives and entities engaged in animal nutrition activities funded by the project and processed 2,194.3 ha of land in 2015, 2,394 ha in 2016, and 3,091 ha in 2017. Cooperatives and beneficiaries of the project, brought under cultivation hitherto fallow areas and received of US\$ 1.7 million in renovation and upgrade of their equipment and technology².

Four types and scales of investment have been identified. The actual number and exact type of investment will depend on herder groups that are identified, the willingness and ability of herder groups to take on the investments, and the approval of a financially and technically viable business plan. The anticipated types of matching grant investments include: (i) large-scale forage plots (50 ha) growing improved perennial forages (alfalfa, brome grass) and cereals (barley and oats) to be fed as baled or as silage to beef cattle on a commercial basis; (ii) medium scale plots (10-20 ha) of alfalfa and/or cereals (barley and oats) for dairy farms and nucleus herds of goats and sheep; (iii) support to silvo-pastoralism whereby 15 hectares of land utilized for a combination of livestock feeds, vegetables, potatoes and berry bushes; and (iv) micro-scale processing units to be used by herder groups at the *soum* to make fodder products. The project would learn from the experience of other projects piloting land use rights for fodder production and complement the activity. Special attention will be paid to proactively identifying capable women's groups (formal and informal) who are engaged in animal activities³.

Of 98 households that produced animal feed 75 were from treatment and 23 were from control *soums*. While of households that produced animal feed in control *soums* all were non-vulnerable households, of 75 households from treatment *soums* 5 were female-headed and 7 were vulnerable households. As figures 40 and 41 demonstrate, the number of households that produced animal feed and the amount of harvest were greater in treatment *soums*. The majority of households that produced animal feed planted green forage and natural hay accounted for the most part of the remaining kinds of feed.

Although production and preparation of animal feed increased in comparison to the time of the baseline survey, no significant changes took place with regard to female-headed and vulnerable households. "There are a substantial number of households where no hay production takes place at all. 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"⁴.

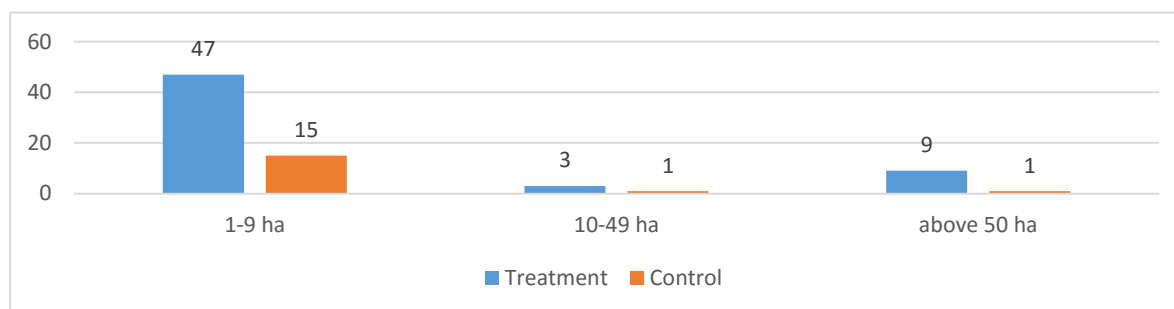
¹ PAD, LAMP, 2013, p21

² Mongolia: Livestock and Agricultural Marketing Project. Brochure 2018, p15

³ PAD, LAMP, 2013, p21

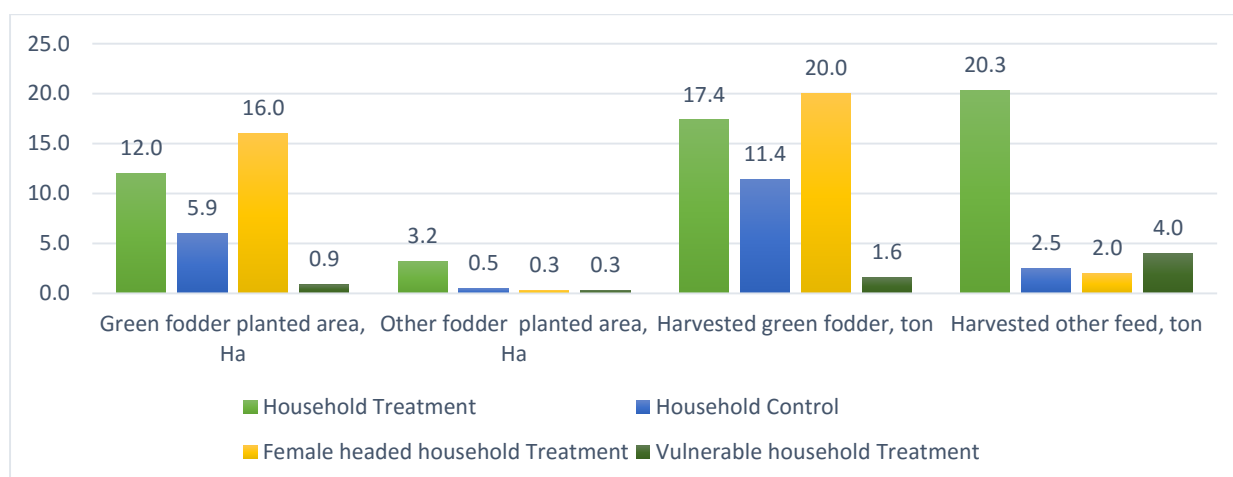
⁴ LAMP, Baseline survey, 2013, p36

Figure 40. Number of household by plot size



According to figure 40, the percentage of feed production was higher in treatment *soums*. Of project objectives to cultivate animal feed plants on large, medium and small plots, the objective to plant on small plots was achieved. As for kinds of feed, they have not been differentiated as alfalfa, brome grass, barley and oats (for more detail see Annex 4 Table 20).

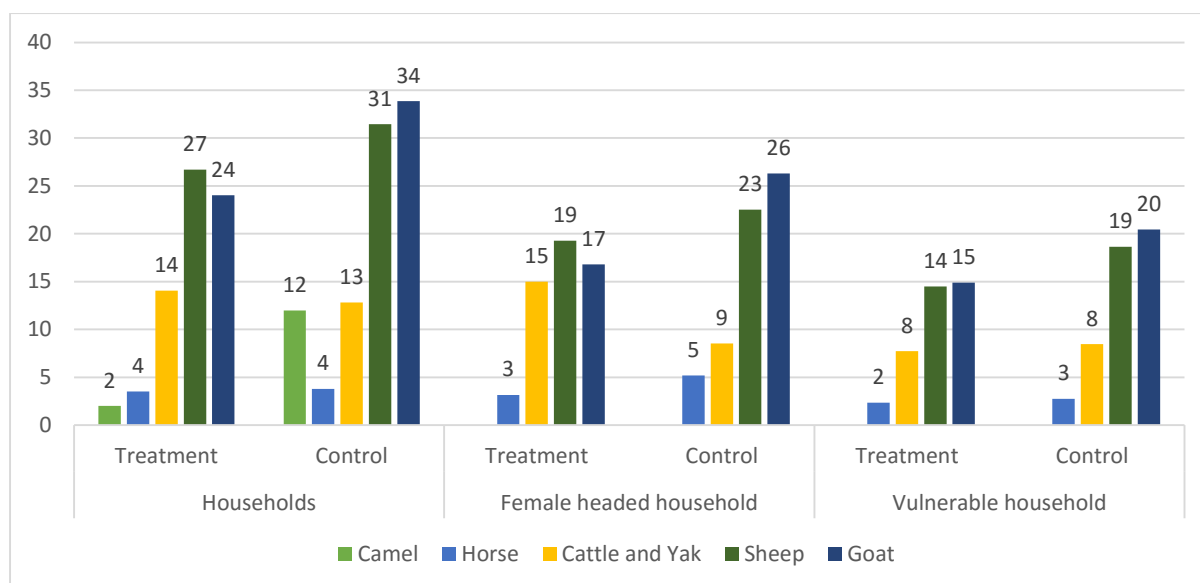
Figure 41. Planted area and harvest size, by household type



Herders had to work themselves to harvest the yield. As the size of land plots increased, they tended to use agricultural equipment to process the land, to plow and plant, to enrich the soil, to use pesticides, to harvest. The percentage of agricultural equipment usage was especially high in treatment *soums* compared to the control ones (for more detail see Annex 4 Table 21).

Duration of livestock feeding differed depending on the kinds of animals. No differences were observed in feeding patterns with regard to the household conditions or between households in treatment and control *soums*. Herders usually fed pregnant sheep, goats, lambs or kids and duration of feeding was approximately 101-150 days depending on the kinds of animals. Cattle was the most fed animal following the sheep and goats, as well as pregnant cows and newborn calves. Depending on the herd size herder households in treatment *soums* fed in total 2-27 animals, those in control *soums* fed 4-34 animals.

Figure 42. Average number of fed in 2017 winter



The average number of fed livestock, its kinds, duration of feeding was similar in total herder households. As Figure 41 shows, households in treatment *soums* fed livestock for 101 days at least up to 150 days at the most. This indicator was 99-122 days for female-headed households and 88-104 days for vulnerable households.

Figure 43. Average number of days fed animals in 2017 winter

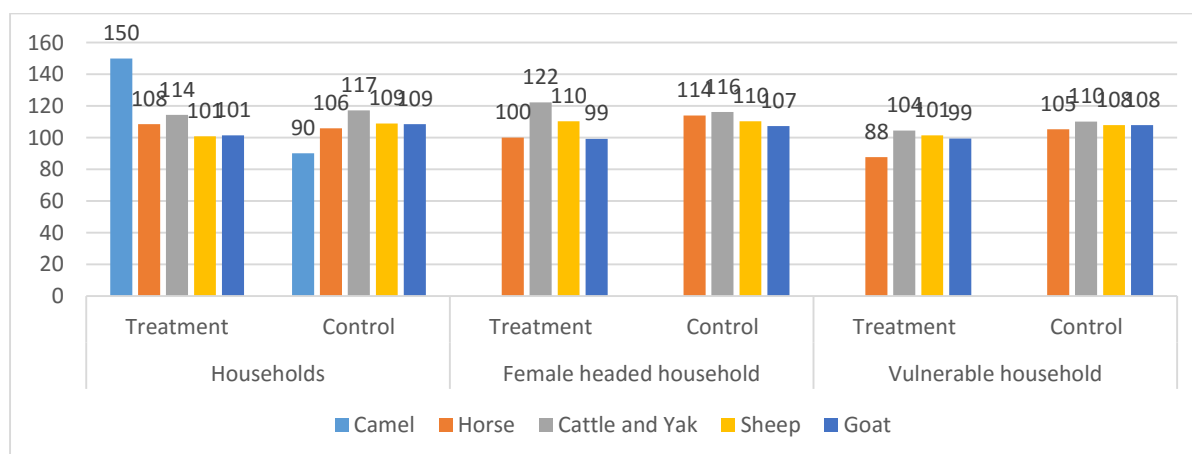


Table 50 shows costs of planting animal feed plants by treatment and control *soums* and the size of land plots. The size of the land plot did not affect much costs of the planting period, and the highest expenditure was on purchase of seeds. Households in treatment *soums* spent little less on planting compared to households in control *soums*, and planted less. This trend was also observed among female-headed and vulnerable households.

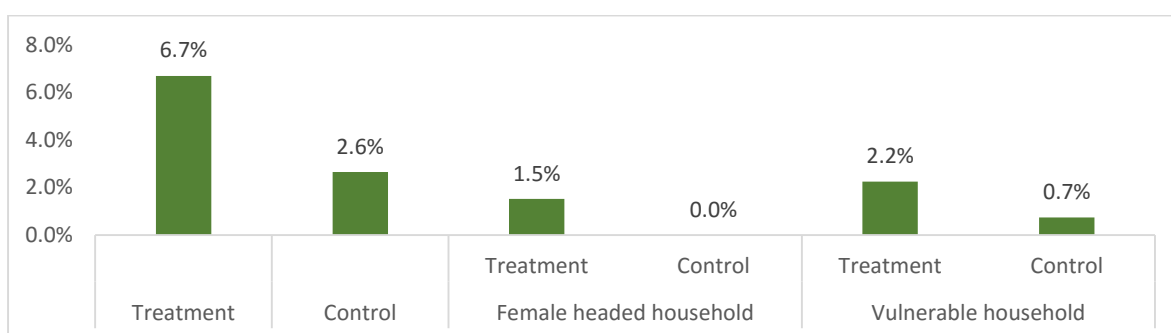
Table 50. Amount of planting expenditure (by thousand MNT)

	1-9 Ha		10-49 Ha		50 +Ha	
	Treatment	Control	Treatment	Control	Treatment	Control
	Mean	Mean	Mean	Mean	Mean	Mean
Soil processing	185.3	317.4	176.7		64.4	200.0

	1-9 Ha		10-49 Ha		50 +Ha	
	Treatment	Control	Treatment	Control	Treatment	Control
	Mean	Mean	Mean	Mean	Mean	Mean
Buying seeds	450.4	427.0	240.0	40.0	234.4	1200.0
Plow and planting	206.0	442.9	200.0	150.0	292.2	200.0
Soil fertilizing	115.3	78.8	200.0	25.0	50.0	100.0
Soil enriching	118.6	47.5			50.0	
Pesticide	73.8	73.3	140.0	25.0	150.0	50.0
Harvesting	263.3	373.3	266.7	1000.0	565.6	600.0
Total amount	1,412.7	1,760.2	1,223.4	1,240.0	1,406.6	2,350.0

As Figure 44 shows, sale of produced animal feed was greater in treatment *soums* and the difference had a statistical significance. However, sale of produced animal feed was lower than sale of livestock products, potatoes and vegetables.

Figure 44. Sales rate of green feed and fodder



Green fodder and hay were the most commonly produced and sold animal feed. Households in treatment *soums* spent an average of 1,412.7 thousand MNT on feed production and prepared 11.2 tonnes of hay and fodder, which they sold at the market generating an income of 2,306.8 thousand MNT.

Production of animal feed by households in treatment *soums* led to longer duration of herd feeding and consumption of a larger amount of feed, which affected greatly animal productivity and output.

Table 51. Sales amount and income (by thousand MNT)

	Treatment	Control	Female headed household		Vulnerable household		Sig.	t
			Treatment	Control	Treatment	Control		
Natural hay, ton	1.8	4.9			1.0	1.0	0.007	-2.162
Green fodder, ton	6.6	7.5			1.0		0.692	-0.310
Other, ton	2.7	3.0	2.0					-0.096
Total amount	11.2	15.3	2.0	0.0	2.0	1.0		
Sales income								
Natural hay	446.0	763.1			150.0	70.0	0.402	-1.532
Green fodder	1,036.3	779.2			140.0		0.082	0.742
Other	824.4	780.0	1000.0					0.079
Total amount	2,306.8	2,322.2	1,000.0	0.0	290.0	70.0		

Herders in treatment and control *soums* tended to sell produced animal feed on the basis of verbal agreements. This trend was also observed among female-headed and vulnerable households. Table

52 illustrates that households in treatment *soums* made written/official sale contracts more often compared to households in control *soums*. This difference had a statistical significance.

Table 52. Contract rate and type, by household type

	Treatment	Control	Female headed household		Vulnerable household		Sig.	t
			Treatment	Control	Treatment	Control		
Written contract	10.9%	15.0%	0.0%	0.0%	0.0%	0.0%	0.363	0.466
Verbal agreement	63.0%	70.0%	0.0%	0.0%	50.0%	0.0%	0.250	0.538

Official/written sale contracts made by households in treatment and control *soums* were mostly one-time or short-term contracts (see table 53). However, in some cases verbal agreements made by households in treatment *soums* were long-term ones. With regard to making contracts, determining contract conditions and terms there was no difference observed between households in treatment and control *soums*, female-headed and vulnerable households.

Table 53. Contract duration by type

		Treatment	Control	Sig.	t
Written	One time	60.0%		0.000	-1.837
	Short-term written agreement	40.0%	100.0%		
	Long-term written agreement				
Verbal	One time	69.0%	85.7%	0.011	1.240
	Short-term verbal agreement	27.6%	14.3%		
	Long-term verbal agreement	3.4%	0.0%		

In conclusion, it could be seen that animal feed production was high in treatment *soums* and its sale became of income sources. Although the number of livestock to feed and duration of feeding did not differ significantly in treatment and control *soums* and in some cases households in treatment *soums* fed animals for fewer days, the amount of produced and sold animal feed was greater in treatment *soums*.

Herders mostly tended to feed pregnant cows, ewes, goats and calves, lambs and kids. The duration of feeding averaged 100 days. This indicator was relatively lower in female-headed and vulnerable households, while in non-vulnerable households the number of animals fed and duration of feeding were relatively greater.

The project objectives such as increasing the kinds of animal feed plants to plant depending on the size of the land plot, making animal feed an indicator affecting livestock productivity are being implemented at the level of households that planted green fodder on land plots of 0-49 hectares.

There is a need for further assistance to households engaged in planting animal fodder at the local level to increase the size of land plots for planting, to diversify the kinds of plants, to promote use of handouts and educational materials. The advantageous aspect is that production and sale of animal feed became an income source for a household and thus there is a possibility for continuity of this activity.

An aerial photograph of a vast, green landscape, likely a grassland or tundra. In the background, there are mountains with a mix of green and brownish hues. The foreground is a flat, green expanse with some faint tracks or paths. The overall scene is serene and expansive.

6

DISCUSSION

Chapter 6. Discussion

6.1 Discussion on main LAMP indicators

The main result of the end-line survey on the LAMP was that, overall, herder households' livelihood and their food supply improved and in line with LAMP project targets due project interventions.

According to the LAMP project, the herder households' livelihoods were evaluated with 4 major indicators as follows:

- The growth of household income derived from the animal husbandry
- Increase forms of supply to the market of products produced by herder households and improve the methods of adding value and processing the products
- Increase in productivity and output
- Enhancement of food supply

In this section, we applied regression analysis in order to determine whether project activities (such as improving the herd structure, herd genetics and breeding, increasing the animal feed, improving the quality and accessibility of animal health services etc.) have significantly influenced in improving household income and livestock productivity. In doing so we attempted to estimate project impact on the dependent variable (household income and livestock productivity) after controlling all possible/available factors which would influence income or productivity regardless of whether the household has been involved in the project.

The following consists from two parts; household income regression is in Part 1 while Part 2 is about the livestock productivity regressions. The regression specification is described in Chapter 2 and regressions are estimated by ordinary least squares (OLS) with heteroscedasticity and autocorrelation consistent (HAC) standard errors.

A dozen regressions were estimated in total: five regressions for household income that involved animal husbandry and only one regression for horticulture engaged households. The remaining five regressions were about livestock productivity such as the average output of milk, wool, and cashmere. It is because only 266 out of 1,800 households surveyed were engaged only in crop and fodder farming activities that scarcity of data for the horticulture household made it impossible to run a meaningful regression analysis.

The variables that are applied to the regression analysis are described in Table 54.

Table 54. Variable description

Variable name	Description
totalincome2017	total income of a household in 2017, thousand tugrugs
gender	= 1 if household head (HH) sex if female, 0 is for male
age	age of the (HH), in years
educ4	= 1 if the education level of HH is vocational, 0 otherwise
educ5	= 1 if the education level of HH is college/university graduated, 0 otherwise
married	= 1 if HH is married, 0 otherwise
famsize	number of person in household, person
kids6	Number of children whose age is less than 6
vulnerable	= 1 if the household is vulnerable, 0 otherwise

Variable name	Description
bodtotalanimal2013	Total number of livestock in 2013, by sheep head equivalents
totalincome2013	total income of household in 2013, thousand tugrugs
bodtotalanimal2017	Total number of livestock in 2017, by cow head equivalents
aminalgrowth	Growth of total number of livestock, yeas of 2013 to 2017, by percents
a2animal	Total working hours of household members for agriculture activities
herdjob	If heard someone's livestock with payment, it equals 1 and if not equals 0
camp	Number of the seasonal camp of a household
feedanimalcost	Cost of fodder, thous.tug
otherproject	If participate in other projects, it equals 1 and if not equals 0
infec_illness	If household's livestock infected transmitted diseases, it equals 1 and if not equals 0
noninfec_illness	If household's livestock infected non-transmitted diseases, it equals 1 and if not equals 0
disinfection	If disinfected livestock fence, it equals 1 and if not equals 0
vaccination	if vaccinate livestock, it equals 1 and if not equals 0
medicine	If medicine livestock, it equals 1 and if not equals 0
dipp_deworm	If dip and depletive livestock, it equals 1 and if not equals 0
projectbreed1	<i>If got breeding animal from nucleus flock, it equals 1 and if not equals 0</i>
supportnumber	<i>Number of supporting from LAMP</i>
guidance	<i>Number of uses of guidance and other printed document</i>
member	<i>Someone is the member of any organization</i>
marketshare	<i>A share of market income in the total income</i>
contract_anim	<i>Official contract for trading, it equals 1 and if not equals 0</i>
treatment	<i>A Household involved project, it equals 1 and if not equals 0</i>
Additional variables for horticulture household	
projectseed	<i>Get seeds from the project, it equals 1 and if not equals 0</i>
plantfodder	<i>Size of sown areas of fodder crops, hectare</i>
plotquare	<i>Size of cereal areas, hectare</i>
hortiexpent	<i>Total cost for crop, thous.tug</i>
fertilizer	<i>If use fertilizer, it equals 1 and if not equals 0</i>
contract_hor	<i>Official contract for trading, it equals 1 and if not equals 0</i>
Additional variables for cow milk output	
cowoutput	The average output of cow milk, liter
babycow	Number of calves
feedcow	Number of days for feeding cows, cow days
cowhigh	If average output of cow milk is 4 liter and above equals 1 and if not equals 0
cowoutput2013	Average output of cow milk in 2013
Additional variables for goat milk output	
goatoutput	The average output of goat milk, liter
babygoat	Number of kids
feedgoat	Number of days for feeding goats, goat days
goathigh	If average output of cow goat is 2 liter and above equals 1 and if not equals 0
goatoutput2013	Average output of goat milk in 2013
Additional variables for wool and cashmere output	
wool	The average output of wool, kilogram
totsheep	Total number of sheep
feedsheep	Number of days for feeding sheep, sheep days
cashmere	The average output of cashmere, kilogram
totgoat	Total number of goat

As discussed in Chapter 2, the variables that have been selected for the analysis are directly and indirectly linked to the LAMP, and the variables in *Italics* in Table 54 indicate that they are directly linked to the LAMP. Therefore, the goal of the analysis was to determine whether the impact of these variables on the household income and livestock productivity were statistically significant after controlling all other factors.

Table 55 displays descriptive statistics of variables.

Table 55. Data description

Variables	Mean	Median	Max	Min	Std. dev.	Obs.
LOG(TOTALINCOME2017)	9.19	9.21	11.19	5.65	0.66	1800
GENDER	0.12	0.00	1.00	0.00	0.32	1800
AGE	47.33	47.00	89.00	19.00	11.81	1800
EDUC4	0.07	0.00	1.00	0.00	0.26	1800
EDUC5	0.09	0.00	1.00	0.00	0.29	1800
MARRIED	0.86	1.00	1.00	0.00	0.35	1800
FAMSIZE	4.10	4.00	9.00	1.00	1.56	1800
KIDS6	0.43	0.00	4.00	0.00	0.69	1800
VULNERABLE	0.17	0.00	1.00	0.00	0.37	1800
LOG(BODTOTANIMAL2013)	2.85	2.98	5.72	-2.04	1.12	1497
LOG(TOTALINCOME2013)	8.17	8.22	11.22	3.47	0.92	1800
LOG(BODTOTANIMAL2017)	3.92	4.04	6.73	0.00	1.01	1531
ANIMALGROWTH	3.06	2.02	321.79	-1.00	9.09	1497
LOG(A2ANIMAL)	8.49	8.59	10.37	2.77	0.76	1582
HERDJOB	0.15	0.00	1.00	0.00	0.35	1534
CAMP	3.01	4.00	4.00	0.00	1.22	1534
LOG(FEEDANIMALCOST)	5.79	5.77	9.49	1.95	1.27	1308
OTHERPROJECT	0.07	0.00	6.00	0.00	0.33	1800
INFEC_ILLNESS	0.02	0.00	1.00	0.00	0.15	1492
NONINFEC_ILLNESS	0.23	0.00	1.00	0.00	0.42	1492
DISINFECTION	0.48	0.00	1.00	0.00	0.50	1492
VACCINATION	0.94	1.00	1.00	0.00	0.24	1492
MEDICINE	0.91	1.00	1.00	0.00	0.29	1492
DIPP_DEWORM	2.18	2.00	3.00	0.00	1.01	1492
PROJECTBREED1	0.19	0.00	1.00	0.00	0.39	1800
SUPPORTNUMBER	0.70	0.00	13.00	0.00	0.95	1800
GUIDANCE	1.39	0.50	13.00	0.00	1.97	1800
MEMBER	0.43	0.00	1.00	0.00	0.50	1800
LOG(MARKETSHARE)	-0.94	-0.65	0.10	-4.61	0.92	1735
CONTRACT_ANIM	0.13	0.00	1.00	0.00	0.34	1534
TREATMENT	0.50	0.50	1.00	0.00	0.50	1800
PROJECTSEED	0.08	0.00	1.00	0.00	0.27	251
PLANTFODDER	0.07	0.00	1.00	0.00	0.25	1444
PLOTSQUARE	4572	3000	10000	2.00	4324	251
HORTIEXPEND	822	400	16200	0.00	1609	245
FERTILIZER	0.86	1.00	1.00	0.00	0.35	251
CONTRACT_HOR	0.06	0.00	1.00	0.00	0.24	251
LOG(COWOUTPUT)	0.49	0.51	1.95	-1.61	0.48	1076
BABYCOW	8.15	6.00	70.00	1.00	8.12	1129
FEEDCOW	1562	1065	15750	1	1690	764
COWHIGH	0.04	0.00	1.00	0.00	0.20	1076
LOG(COWOUTPUT2013)	0.43	0.43	2.12	-1.39	0.51	1146
LOG(GOATOUTPUT)	-1.15	-1.20	0.69	-2.30	0.46	782

Variables	Mean	Median	Max	Min	Std. dev.	Obs.
BABYGOAT	41.41	30.00	360.00	1.00	42.28	1435
FEEDGOAT	3214	1800	37800	15	4223	1052
GOATHIGH	0.01	0.00	1.00	0.00	0.09	729
GOATOUTPUT2013	0.35	0.30	2.00	0.10	0.20	729
WOOL	1.17	1.00	2.83	0.45	0.39	1369
TOTSHEEP	139.17	85.00	1750.0	1.00	163.79	1441
FEEDSHEEP	3017	1500	84000	15	5039	891
CASHMERE	0.34	0.32	0.65	0.10	0.09	1461
TOTGOAT	138.78	100.00	970.00	1.00	130.71	1464

6.1.1. Household income regressions

Due to differences in regression factors, we estimate separate regressions for two types of household.

a) Regression analysis of livestock household income

In this regression analysis, a dependent variable (Y) is the log level of household income in 2017 and independent variables are as follows.

- Household-specific characteristics (age, gender and education level marital status of the household head, household size, number of kids whose age is less than six, and whether or not a vulnerable household etc.)
- Other factors such as whether the household has an additional income, the time spent on animal husbandry, expenditure on fodder, whether or not involved in other projects, livestock diseases and veterinary services
- Baseline/start-up conditions of the household (total number of livestock and household income in 2013)
- Treatment variable.

The results of the OLS estimators of equation (Model 1-5) are shown in Table 56 along with its diagnostic tests. The Wald Test indicates that all models are significant. Since we use HAC standard error and covariance, heteroscedasticity and serial correlation are adjusted if they were. Jarque-Bera test reports that error terms distribute normally. The selected factors for the model explained about 70 percent of household income variations.

Table 56. Results of the regression analysis for income of the animal husbandry household

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
INTERCEPT	5.692***	5.695***	5.744***	5.729***	5.703***
	(0.175)	(0.175)	(0.181)	(0.185)	(0.190)
GENDER	0.115**	0.116**	0.126***	0.124***	0.131***
	(0.047)	(0.047)	(0.047)	(0.047)	(0.047)
AGE	0.004***	0.004***	0.003***	0.003***	0.002*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
EDUC4	0.109**	0.111**	0.117**	0.117**	0.123**
	(0.053)	(0.053)	(0.053)	(0.053)	(0.052)
EDUC5	0.194***	0.19***	0.195***	0.196***	0.171***
	(0.047)	(0.048)	(0.047)	(0.048)	(0.048)
MARRIED	0.068*	0.068*	0.07*	0.069*	0.069*
	(0.040)	(0.040)	(0.041)	(0.041)	(0.042)
FAMSIZE	0.064***	0.064***	0.063***	0.063***	0.06***

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
KIDS6	-0.026 (0.016)	-0.025 (0.017)	-0.023 (0.017)	-0.023 (0.017)	-0.016 (0.017)
VULNERABLE	-0.506*** (0.035)	-0.503*** (0.035)	-0.51*** (0.035)	-0.504*** (0.035)	-0.488*** (0.034)
LOG(BODTOTANIMAL2013)	0.062** (0.024)	0.063** (0.025)	0.068*** (0.024)	0.069*** (0.024)	0.085*** (0.025)
LOG(TOTALINCOME2013)	0.224*** (0.018)	0.223*** (0.018)	0.219*** (0.018)	0.22*** (0.018)	0.225*** (0.017)
LOG(BODFEMANIMAL2017)	0.197*** (0.023)	0.197*** (0.023)	0.195*** (0.023)	0.193*** (0.023)	0.198*** (0.024)
ANIMAL GROWTH RATE	0.01** (0.005)	0.01** (0.005)	0.01** (0.005)	0.01** (0.005)	0.012** (0.005)
LOG(A2ANIMAL)	0.004 (0.016)	0.003 (0.016)	0.003 (0.016)	0.000 (0.016)	-0.006 (0.017)
HERDJOB	0.124*** (0.032)	0.124*** (0.032)	0.129*** (0.032)	0.128*** (0.032)	0.124*** (0.031)
CAMP	-0.01 (0.011)	-0.011 (0.011)	-0.013 (0.010)	-0.012 (0.010)	-0.014 (0.010)
LOG(FEEDANIMALCOST)	0.064*** (0.009)	0.064*** (0.009)	0.065*** (0.009)	0.065*** (0.009)	0.063*** (0.009)
OTHERPROJECT		0.034 (0.025)	0.039 (0.027)	0.041 (0.026)	0.04 (0.028)
INFEC_ILLNESS			-0.162** (0.075)	-0.152** (0.076)	-0.161** (0.072)
NONINFEC_ILLNESS			-0.052** (0.023)	-0.047** (0.023)	-0.047** (0.022)
DISINFECTION			0.019 (0.020)	0.014 (0.020)	0.009 (0.020)
VACCINATION				0.05 (0.042)	0.032 (0.039)
MEDICINE				-0.041 (0.040)	-0.045 (0.040)
DIPP_DEWORM				0.014 (0.012)	0.011 (0.011)
PROJECTBREED1					0.035 (0.032)
SUPPORTNUMBER					0.011 (0.015)
GUIDENCE					0.008 (0.009)
MEMBER					0.104*** (0.023)
LOG(MARKETSHARE)					-0.06*** (0.018)
CONTRACT_ANIM					0.068** (0.029)
TREATMENT	0.092*** (0.025)	0.096*** (0.026)	0.088*** (0.026)	0.085*** (0.025)	0.02 (0.039)
Observations	1235	1235	1210	1210	1208
Adjusted R-squared	0.690	0.690	0.687	0.687	0.700
Wald F-statistic	150.5	142.0	118.7	105.6	92.2
Prob(Wald F-statistic)	0.000	0.000	0.000	0.000	0.000

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
JB test	0.66	0.69	0.99	1.09	3.13
Prob (JB test)	0.72	0.71	0.61	0.58	0.21

***, ** and * denotes 1, 5 and 10 percent level of significance. HAC standard errors are in parenthesis.

Treatment variables have been determined to be significant after controlling the effect of household-specific characteristics, other factors and baseline conditions of the household (Model 1-4). According to the Model 4 results, treatment group households earned **8.5 percent higher** income compared to the control group households or those who have not benefited from the project. In other words, the treatment group households have earned more income than the control group households or the project achieved its goal to increase the income of the project beneficiaries.

When model 5 was estimated adding all project variables in the equation, the effect of treatment variable disappears. This shows these variables reflect the project effectiveness.

b) Regression analysis of crop and fodder farming household income

The same strategy is used for estimating the regression of the income of households engaged in crop and fodder farming. The result is shown below in Table 56.

Table 56. Results of the regression analysis for income of the horticulture engaged household

Variable	Model 6	
	Coefficient	Std. Error
INTERCEPT	9.038**	2.661
GENDER	-1.379	1.231
AGE	0.027	0.036
EDUC5	0.094	0.441
MARRIED	-1.530	1.490
FAMSIZE	0.558	0.345
KIDS6	-0.276	0.373
VULNERABLE	-1.116	1.680
LOG(TOTALINCOME2013)	-0.240	0.327
MEMBER	-0.433	0.411
OTHERPROJECT	0.192	0.325
MARKETSHARE	-2.075	1.363
CONTRACT_HOR	0.280	0.740
SUPPORTNUMBER	0.031	0.193
GUIDENCE	0.040	0.088
PLANTFODDER	-1.223	1.432
PLOTSQUARE	0.000	0.000
HORTIEXPEND	0.000	0.000
PROJECTSEED	-0.501	0.664
FERTILIZER	1.199	0.775
TREATMENT	0.314	0.812
Observations	28	
Adjusted R-squared	0.426	
F-statistic	2.00	
Prob(F-statistic)	0.176	

***, ** and * denotes 1, 5 and 10 percent level of significance. HAC standard errors are presented.

The model 5 is not statistically significant, indicating that the model is not adequate to analyze the income of these households because of the data availability with an observation number limited to only 28.

6.1.2. Livestock productivity

One objective of the LAMP was to increase livestock productivity through improvement in animal health, breeding and nutrition investments. Therefore, we estimated regressions for each livestock product, namely, the average output of cow and goat milk, the average output of wool and cashmere. As independent variables, the following were chosen:

- Household-specific characters (gender and education level marital status of the household head, household size, number of kids whose age is less than six, and whether or not a vulnerable household)
- Baseline conditions of the household (household income and average cow/goat milk output in 2013)
- Other common factors such as whether the household has a camp, expenditure on fodder, whether or not involved in other projects, whether or not the household members herd someone's livestock with payment, livestock diseases and veterinary services, animal growth rate, household income)
- Treatment variable
- Specific factors for each livestock product output (for example, specific factors such as the number of calves, number of days for feeding cows in cow days and high output cow are for the cow milk output. Please refer to the Table 53 for detailed information.)

The estimation results are presented in Table 57 along with its diagnostic tests. The Wald test indicates that all models are significant. HAC standard errors were also estimated in those regressions. The selected factors for the model 7 and 8 explain about 50 percent of average milk output variations while for the model 9 and 10 explain only 5 percent on average.

When we look at the treatment variable, it is significant in average cow milk output regression and is not significant for the rest (Model 8-10).

Table 57. Results of the regression analysis for livestock product output productivity

Independent/ Dependent variables	LOG(COWOUTPUT) Model 7	LOG(GOATOUTPUT) Model 8	WOOL Model 9	CASHMERE Model 10
INTERCEPT	0.466* (0.276)	-0.593** (0.318)	0.337 (0.247)	0.224*** (0.065)
GENDER	0.146*** (0.048)	0.024 (0.053)	-0.041 (0.041)	0.003 (0.010)
EDUC4	0.075 (0.062)	-0.02 (0.064)	0.086 (0.068)	0.018 (0.012)
EDUC5	-0.031 (0.061)	-0.106 (0.062)	-0.063 (0.057)	0.02 (0.015)
FAMSIZE	0.019* (0.011)	-0.016 (0.012)	-0.023** (0.011)	-0.003 (0.002)
KIDS6	-0.033 (0.025)	0.003 (0.024)	-0.004 (0.024)	0.011** (0.005)
VULNERABLE	0.03 (0.054)	-0.001 (0.012)	0.075 (0.048)	-0.018 (0.011)
LOG(TOTALINCOME2013)	-0.021 (0.021)	-0.021 (0.025)	0.007 (0.019)	0.006 (0.004)
OTHERPROJECT	-0.106 (0.082)	-0.062** (0.027)	0.039 (0.028)	0.007 (0.009)
CAMP	0.007 (0.016)	0.017 (0.013)	-0.008 (0.012)	-0.001 (0.003)

Independent/ Dependent variables	LOG(COWOUTPUT) Model 7	LOG(GOATOUTPUT) Model 8	WOOL Model 9	CASHMERE Model 10
LOG(TOTALINCOME2017)	-0.011 (0.037)	0.064 (0.041)	0.1*** (0.033)	0.01 (0.008)
PROJECTBREED1	0.006 (0.041)	0.076 (0.052)	0.015 (0.045)	0.015 (0.009)
HERDJOB	0.01 (0.050)	-0.098** (0.044)	0.075 (0.047)	0.024** (0.010)
CONTRACT_ANIM	0.011 (0.039)	-0.054 (0.044)	-0.058 (0.039)	-0.007 (0.008)
LOG(FEEDANIMALCOST)	0.001 (0.013)	-0.022 (0.015)	-0.008 (0.013)	-0.006** (0.003)
INFEC_ILLNESS	-0.067 (0.089)	0.086 (0.112)	0.072 (0.101)	0.000 (0.016)
NONINFEC_ILLNESS	-0.001 (0.032)	-0.029 (0.039)	-0.047 (0.030)	-0.019*** (0.007)
ANIMAL GROWTH RATE	-0.002 (0.005)	0.005 (0.007)	0.002 (0.003)	0.000 (0.000)
DISINFECTION	0.03 (0.030)	0.041 (0.032)	0.017 (0.026)	0.005 (0.006)
TREATMENT	0.087** (0.036)	-0.08 (0.046)	0.033 (0.037)	0.003 (0.009)
COWHIGH	0.601*** (0.068)			
LOG(COWOUTPUT2013)	0.488*** (0.039)			
BABYCOW	-0.009*** (0.002)			
FEEDCOW	0.000 (0.000)			
BABYGOAT		-0.002*** (0.000)		
FEEDGOAT		0.000 (0.000)		
GOATHIGH		-0.382 (0.317)		
LOG(GOATOUTPUT2013)		0.638*** (0.045)		
FEEDSHEEP			0.000 (0.000)	
VACCINATION			0.097*** (0.032)	-0.001 (0.012)
MEDICINE			-0.033 (0.062)	0.003 (0.012)
DIPP_DEWORM			-0.022 (0.014)	-0.004 (0.003)
TOTSHEEP			-0.0001* (0.000)	
TOTGOAT				0.000*** (0.000)
FEEDGOAT				0.000 (0.000)
Observations	611	503	804	957
Adjusted R-squared	0.472	0.495	0.036	0.066
Wald F-statistic	34.063	24.637	2.235	3.958
Prob(Wald F-statistic)	0.000	0.000	0.000	0.000

***, ** and * denotes 1, 5 and 10 percent level of significance. HAC standard errors are in parenthesis.

According to the results of the analysis, the treatment group's average cow milk output was 8.7 percent higher than the milk yield of control group households.

There has been no change in the control group's goat milk yields which has to be milked during the hottest summer days due to the hot and dry summers in recent years, and a decrease in grass yield (Model 8). On the other hand, there has been no real change yet as it is too early to see the results of the project activities implemented to improve the breed productivity of livestock.

Moreover, the wool and cashmere outputs of the treatment group households covered by the survey did not change significantly between 2013-2017 (Model 9 and 10). This is because it is too early to see the result of the project activities implemented among the treatment group to improve the productivity of wool and cashmere and improve genetic traits of the livestock by establishing highly productive nucleus flock. The results of the selective breeding program can be seen in 5 to 10 years. Mongolian sheep and goat become mature at the age of 3 years, and cattle at the age of 5 years, and sheep and goats are used for breeding for 5 years and cattle for 8 years. The breeding period of an animal depends on many factors, such as the amount of productivity, life expectancy, and quality of offspring.

The above statistical analysis focused on whether wool and cashmere yields have grown since 2013; this section analyzes whether there is a difference between the treatment and control group's wool and cashmere yields (Table 58).

Table58. The significance of wool and cashmere output (Difference in control and treatment)

	Control or treatment group	N	Mean	Std. Deviation	Std. Error Mean	t statistics	Sig. (2-tailed)
wool	Control	686	1.1466	.37770	.01442	-2.521	0.012
	Treatment	683	1.1997	.40159	.01537		
cashmere	Control	732	.3298	.09012	.00333	-2.521	0.012
	Treatment	729	.3412	.09405	.00348		

The quantity of wool and cashmere prepared by the treatment group is greater than the quantity produced by the control group households but it is not clear whether this difference is relevant to the involvement in the project.

6.2. Project results by OECD dimensions

Relevance

In line with the National Programme for Food Security policy, as well as *Aimag* and *Soum* policies to promote livestock health and productivity, diversification of income and job creation, the LAMP activities have been relevant in terms of increasing both the volume and diversity of products, especially in horticultural products.

KII results with representatives of *Soum* Administration and VABU specialists gave a rating of 4.13 out of a maximum of 5 points. They noted that horticulture programmes benefited poor households but also benefited *Soum* residents and herders by increasing access to affordable healthy locally grown potatoes and vegetables while livestock projects helped individual farmers themselves with improved animal health services and nucleus flocks for better rams. Increased hay and fodder production was mentioned most often in the KII among this group noting, as with vegetables, that locally grown and afford products increased animal productivity and was even in demand from neighboring *Soums*. Meat processing and milk processing were also mentioned by *Soum* representative such as in *Otgon Soum*. VABU specialists mentioned the importance of improved or new facilities, motorbikes to give better service and medicines held at correct temperatures (not too cold to freeze, not too warm to degrade).

Access to water was a major concern voiced more by *Soum* Administrators, especially for vegetable production. Some *Soums* addressed water problems with wells or irrigation from rivers but more often water shortages were identified as a critical need.

KII results for Representatives of *Soum* cooperatives had a higher average rating for the relevance than *Soum* and VABU officials with a rating of 4.4. Clearly, although sometimes critical of some aspects of the LAMP (see more below), *Soum* cooperative representatives noted: the critical role of equipment for mechanization of horticultural and hay/fodder production (tractors, seed sowers, rakes, bailers); equipment for veterinarians (fencing, motorbikes, building); dip tanks (“baths”); refrigerated truck and meat drying. This equipment allowed for labour saving as well as new actions such as hay/fodder sales as well as rapid animal health service provided by veterinarians on motorbikes. Training was also mentioned in the KII as crucially important to be able to use these equipment and machines as well as undertake hay/fodder and horticulture production. Given the lack of extension services in Mongolia, the project filled a key role based on the needs of cooperatives and their members. Nucleus herds with access to quality rams were highly regarded.

Overall, according to key informants, the LAMP components were highly relevant to both support policy and the needs of beneficiaries.

Effectiveness

KII ratings for the effectiveness for Representatives of *Soum* Administration and VABU specialists was 3.4 out of 5 as compared to *Soum* cooperative heads who gave an average of 4.3 out of 5. *Soum* Administrators noted that the first year was sometimes lost to planning and often noted that the project period was too short. *Soum* cooperative heads on the other hand noted the direct benefits in terms of mechanization, access to improved health services and improved nucleus flocks as well as increased production of hay, fodder and vegetables. *Soum* Administrators also noted that for the beneficiaries, the project had been effective, but that the number of beneficiaries overall was small compared to the overall *soum* population as beneficiaries were primarily the most vulnerable households. Cooperative heads were of course direct beneficiaries so their viewpoint was from their own experience.

In the area of horticulture, the project was clearly very effective in terms of increasing outputs and building horticultural skills which were very limited. Provision of greenhouses, seeds and tillage equipment along with extensive training for learning vegetable and potato production were seen as effective aspects of LAMP to support vegetable and potato production. Shortcomings mentioned in the KII primarily focused on irrigation and lack of storage facilities, although beneficiaries and at least one *Soum* were able to improve cellars themselves. Marketing seemed to be mostly local due to high demand in the *soums* as well as for schools, mines and even a military camp. It was mentioned several times in the KII that the increase in affordable local vegetables also greatly benefited local residents.

Hay and fodder production was also mentioned by all respondents in the KII as being very effective. Again, as with vegetables, mechanization with tractors, seeders, bailers and rakes was critical for extending area of planting and reducing labour requirements. Training to use this equipment and to test a number of fodder crops with quality seed ensured that the equipment itself was effectively utilized. Affordable local hay production and sales were noted in the KII as important for animal production and sales, even in neighboring *soums*.

For livestock, animal health services, fodder and nucleus flocks for better rams were mentioned repeatedly in the KII. Animal health service improvement seemed to be based on better facilities, being mobile on a motorbike, having mobile fencing for faster vaccination, right temperature for medicines/vaccines (cold chain but not frozen). Veterinarians appreciated their training but having mobility and tools to actually implement their animal health services was noted in the KII. Fodder and hay was mentioned as being important for being “local and affordable” and improved cashmere and

wool production with heavier animals. Given the goal of higher quality animals for better future of Mongolian products – this increase in quality is critical. The role of the improved rams from nucleus herds was also noted by many key informants – although with some concerns for the future of the nucleus herds without continued LAMP support.

It is interesting to note that marketing was not mentioned often. As noted above, there appeared to be a high demand for the increased vegetable and potatoes within the *soums* themselves such that marketing was not an issue where local markets were not saturated as with meat. For hay and fodder, local herders and neighboring *soums* were also able to absorb quickly additional production. For meat and dairy, local meat and milk processing facilities (including camel milk in Tsogt *Soum*) appear helpful to absorb local production. For milk, local schools appear to be a good market for local production. For meat, cold storage was seen as very helpful to be able to store carcasses until prices were favorable. Other local markets mentioned where a military installation and mine. Given survey results showing a lower than expected number of contracts, this may be due to the high local demand for key products produced by LAMP beneficiaries.

The grants were mentioned as being effective tools for planning while financial statements and other planning tools were helpful to Cooperative heads. Some cooperatives were able to pay dividends and hire staff based on their projects. It would appear that the Grant procedures, training for cooperatives and leadership were effective tools to help build cooperative social capital.

The lack of support for water irrigation was mentioned as a constraint to vegetable and fodder production. Future programmes should include more emphasis on water issues to be more effective.

Efficiency¹

According to results of the KIIs, local authorities and beneficiaries' perceptions were that the project was implemented efficiently with little that could be improved in terms of implementation costs. Cost/benefit analysis by World Bank consultants will provide in depth analysis of various investments.

The greatest number of criticisms on the efficiency of the LAMP project were related to procurement of equipment and inputs. KII respondents variously noted that equipment quality was not what they had expected, inputs sometimes arrived late, the procurement cost was higher than locally available equipment and because the equipment was not procured locally – after service was a problem. These are common problems in most internationally implemented projects and do not have easy solutions. However, they should be taken into consideration in follow-up programmes.

Low access to replacement parts and non-professional maintenance of equipment may reduce the effectiveness and efficiency of project inputs over time and should be addressed.

Impact

The LAMP project for the most part appears to have achieved its overall project development objective (see Table 1) of improving *“rural livelihoods and food security in selected aimags and soums through investments in enhancing productivity, market access and diversification in livestock-based production systems.”*

The project strategy was *“to achieve this objective and ensure maximum impact, the project will address a set of closely linked constraints in market access, price-quality relationships and livestock production (animal health, animal breeding, genetics and nutrition) that need to be treated in an integrated manner. The demonstration of these integrated, market-driven approaches in a small*

¹ Financial cost/benefit efficiency is measured elsewhere through World Bank economic studies.

geographic area (pilot) will provide successful models that the Government of Mongolia (GOM) can replicate through the National Livestock Program (NLP). The project will also support pro-poor income growth and nutrition diversification through the production of horticultural products at the household level.

As presented above, the project components worked effectively and efficiently to achieve the PDO including for vulnerable and female-headed households.

Sustainability

Finally, there is a question if the benefits of the project will be sustained over time. KII respondents from *Soum* Authorities note that to some extent, local government will continue to provide support for animal health services (this may be especially true under the new Animal Health Law going into effect 1 June 2018). There are concerns in some *Soums* that they lack key staff for training support in areas such as horticulture and animal husbandry.

KII respondents note the uncertain future fate of nucleus flocks: while mentioning the high quality animals as one of the key benefits of the LAMP, they also worry in terms of future support. While the benefits of higher quality breeding stock is clear to all, future financial arrangements do not appear clear for continuing their development. Some aspects of the new Animal Genetic Law may inform a way forward, but there appears to be a need for a good business model that would provide key support to the nucleus flock development.

KII respondents also noted the issue of equipment maintenance – as noted above, equipment for the most part was not procured locally, so provision of spare parts may become an issue. This specific issues needs to be addressed to ensure that equipment will not end up non-functional for lack of simple parts and maintenance.

One key area mentioned in the PAD was rangeland degradation. The LAMP did little to address this issue although there were KII respondents who clearly realized that quality over quantity in animal production and livestock products (e.g. cashmere and wool) are important. Future projects need to address this issue with sustainable business models, sustainability certification, more equipment for measuring quality parameters of livestock and wider support for pasture user agreements with local government for reducing over-grazing and over-stocking in line with local carrying capacity.

Training, communication and information dissemination were mentioned as one of the great benefits of the LAMP by KII respondents. Simply worded and practical materials have been developed at some expense in the project. Ensuring continuous access to these outputs with downloads of pdf-format soft copies should allow for these materials to be used by the general public and future programmes.



7

CONCLUSION AND WAY FORWARD

Chapter 7. Conclusions and Way Forward

In this chapter shows brief results of project interventions achieved level by its five development objectives and three components.

7.1 Results of project interventions

PDO 1. Number of intended and actual direct beneficiaries, gender disaggregated

The LAMP involved 13,684 beneficiaries in the selected areas, including 6,083 (44.0%) females and 7,601 (56.0%) males, during the intervention period¹. This number shows that the project overachieved its goal for beneficiaries by 1,684 people.

PDO 2. Increase in household income from livestock and in selected cases, horticultural products

As a result of regression analysis, it can be confirmed that there is a statistically significant increase within the treatment group households who earned **8.5 percent higher** income compared to the control group households or those who are not project beneficiaries. In other words, the treatment group households have earned more income than the control group households and the project achieved its goal to increase the income of the project beneficiaries.

For the income of households engaged in vegetable and potato cropping and fodder farming activities, the ELS survey results showed increased levels for production and marketing leading to significant increases in income. The tremendous increase in horticulture over the baseline was due to a very low level of horticulture income at the beginning of the project. LAMP interventions introduced horticulture production in treatment *soums*.

Comparing livestock and horticulture intervention success, horticulture operations had greater success for reaching female-headed households. The focus on activity and income diversification of the project is expected to have positive impact on women and contribute to gender equity and empowerment for the benefit of the social structure². Related to this approach planting potatoes and vegetables, or animal feed production are becoming main income source of female-headed and vulnerable households (see Figure 25). Briefly, the LAMP has benefited the local community including low and middle income households and female headed households.

PDO 3. Share of marketed products going through contracts and established companies

The ELS data shows 57.3% of households in treatment *soums* and 53.4% of households in control *soums* sold livestock products based on written/verbal contracts. Sale of livestock products on the basis of written/official contracts was similar to the total trend in treatment *soums* and among female-headed and vulnerable households.

Also 61.6% of total treatment *soum* households made written/verbal contracts to supply potatoes and vegetables to the market. This trend was also observed among female-headed and vulnerable households. For female-headed households and vulnerable households, 11.5% and 8.7%, respectively, had official sale contracts. The percentage of treatment *soum* households with an official contract to

¹ PIU records, as of December 31, 2017

² LAMP. PAD, 2013, p30

supply produce to the market was twice as high compared to control *soums*. Cases of making verbal agreements were more widespread among treatment households - 52.8% in treatment *soums* against 45.2% in control *soums*. KII feedback notes that local sales of vegetables, potato and fodder were significant and would not have required contracts due to their direct sales within the *soum* where they were produced. This trend was also widespread among female-headed and vulnerable households. Among female-headed households in treatment *soums*, 72.2% had verbal agreements: this was the highest rate of written agreements. These numbers are comparable with data provided by the PIU in the LAMP Results Framework – Final Achievements publication (as of December 31, 2017).

The PIU household survey data also showed that the share of marketed products by category was: meat – 45.0%; milk – 37.0%; wool – 42%; green fodder – 53.0%; hay – 31.0%; and potatoes – 50.0%. Both, the LAMP Household Survey and the ELS, results confirm that the target of 30% was overachieved.

PDO 4. Increase in output of livestock products (meat, milk, wool, cashmere)

Growth of major livestock products such as meat, milk, wool and cashmere reached the target levels. Meat output of households in treatment *soums* covered by the survey averaged 758.5 kilograms in 2017 while that of households in control *soums* was 662.2 kilograms. The percentage of households in treatment *soums* that supplied meat to the markets was higher than that in the control *soums*. This trend was also observed among female-headed and vulnerable households in treatment *soums*.

The average output of milk in a treatment *soum* household was 2,657.6 liters, which was greater by 527.9 liters or 24.7% compared to that of control households. Production of fresh milk and dairy products was greater in treatment against control *soum* households.

According to the results of the analysis, the treatment group's bovine milk output was 8.7% higher than the milk yield of control group households. This demonstrates that the project's goal of increasing the milk yield and milk consumption has been achieved.

The quantity of wool and cashmere prepared by the treatment group is greater than the quantity produced by the control group households, but it is not clear whether this difference is relevant to the involvement in the project statistically.

According to the project objectives for the fifth year, the sheep wool output was to reach 172.0 kilograms with cashmere output of 37.6 kilogram. These targets were achieved as the end-line survey data showed sheep wool output at 173.6 kilogram and goat cashmere output at 46.3 kilogram. In comparison to the output of households in control *soums*, output of wool in treatment *soums* was higher by 32.0 kilograms or 23.1%, the cashmere output was by 1.4 kilograms or 3.1% higher.

PDO 5. Change in per capita consumption of various food ingredients, disaggregated by gender in the households and vulnerable groups

Many treatment households and cooperative members claimed that their food consumption diversified when compared to the baseline period. The end-line survey estimated four kinds of food consumption surveys, which are designed and tested cross-culturally by the Food and Nutrition Technical Assistance (FANTA) Project of USAID and the FAO and were the same as the baseline questionnaire. The food security measures, as well as change in consumption of various foods were:

- Household Hunger Scale (HHS),
- Household Dietary Diversity Score (HDDS),
- Women's Dietary Diversity Score (WDDS),
- Months of Adequate Household Food Provisioning (MAHFP) and
- Change in per capita consumption of various foods

Together these 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.

According to the HHS, there were no households included in the "severe hunger" category. Overall, more treatment households were in the "little to no hunger" category while more treatment households were in the "moderate hunger" as compare to controls (Table 20). This indicates that more treatment households had moved to higher levels for food security. This trend is seen as well for female-headed households and vulnerable households. Given that more milk and meat was consumed in the treatment households (Table 19) then lower hunger is clearly an outcome.

The HDDS measure uses 3 categories for dietary diversity including lowest diversity, medium diversity and high diversity. Most households were in the high diversity group (treatment 67.3%, control 58.9%). (See Table 21). Even female-headed and vulnerable households mostly belonged to the high dietary diversity group. As with the HHS, more treatment households were in the higher diversity category than control. Surveyed households said that food diversity is one of main impacts of LAMP's horticulture interventions. KII respondents noted in numerous cases the availability of fresh local and affordable vegetables were available at the soum level and that even adjacent soum residents could purchase locally grown vegetables.

WDDS was measured only in households with female members aged 15-49, and a trend was observed for the treatment group households to consume more diverse kinds of food as compared to the control group households, following the trends of the above measures..

By the MAHFP, measured on a scale of 0-12, in which 12 means the household meets its food needs in all 12 months, and 0 means the household is not able to meet its food needs in any of the 12 months. The treatment group averaged a score of 11.97 and control were 11.89 on average, showing that the treatment households had a significant although small difference with food shortages during the year. In fact, in Mongolian diets, milk and meat are storage as frozen or dried meat and dried curds, butter and cream. With the higher production, these products can be eaten year round.

The ELS data showed food consumption diversification was observed in all treatment household groups including vulnerable and female-headed households. The per capita consumption of specific food ingredients selected by the LAMP PSC included carrots, sea buckthorn (berry), horse meat and milk, and disaggregated by female headed and vulnerable households. These were used a proxies for overall improvement of diets. It was seen that their consumption increased over target levels (see Table 1). The ELS showed increases in consumption of horse meat (47.6%), milk (36.6%), carrot (20.8%) and sea buckthorn (2.3 times) indicating a likely increase in diet diversifications. In fact, some KII participants mentioned that as a result of LAMP interventions, household food consumption became more diverse including foods such as vegetables, pork and chicken. Also, with increasing incomes, local

availability of vegetables, and project training on nutrition, the LAMP project appears to have achieved one of GAFSP key goals of increasing food security in dimensions of overall consumption and diversification.

7.2 LAMP Components' Results

The three components of the LAMP provided support for (1) market linkages and horticultural cultivation, (2) livestock production and (3) project management. The first two components were spread out over a large number of *soums* and *aimags* but were well focused on specific beneficiary groups including vulnerable households and female-headed households. LAMP introduced new technologies for marketing (e.g. cooperative sales and contracts) and horticultural cropping in open field and greenhouses – especially for more sedentary female-headed households; and combined animal health – animal feed – animal breeding into a strong results chain. The activities have been shown in the above Chapters to have significantly increased knowledge, actions and income for target beneficiaries at a higher rate than overall development processes – including the influence of other projects – as measured in control *soums*.

Component 1: Linking Herders with Markets

The ELS results clearly show that significant progress was made in production and processing activities, which were the first part of adding value to the livestock and agricultural products and creation of sales channels. The treatment *soum* household production and processing was higher than control and baselines and this trend was also observed among female-headed households and vulnerable households. A practice of selling livestock and horticulture products as well as animal fodder on the contract basis was not yet in place, which showed that contracts themselves may not be very relevant to project success and more closely related to development of herder cooperatives and activation of financial marketing activities. Sales increased significantly for dairy, fodder, vegetables and potatoes in local *soum* markets and indicate contractual agreements may not be a good measure of marketing success. However, indicators showed that the trend to make official written contracts was more often observed among households in treatment *soums* compared to control *soums* and this trend was similar in all beneficiary households in treatment *soums* (Table 37 and 38, Figure 23 and 24).

The ELS data shows, 61.6% of total treatment *soum* households made written/verbal contracts to supply potatoes and vegetables to the market. This trend was also observed among both female-headed and vulnerable households. Of the female-headed households and vulnerable households, 61.5% and 56.5% respectively had written/verbal sale contracts. The percentage of treatment *soum* households with an official contract to supply harvest to the market was twice as high compared to that of control *soums* (Figure 29 and 30).

The horticulture sub-component was doubtlessly one of the greatest successes in the project, especially for its impact on single-women headed households and vulnerable households. Impressive increases in production (see Table 38 and 39) were well timed with emerging consumer demand for greater diversity in diets. Vegetable and potato production increases and marketed locally were repeatedly praised by KII respondents and was a major income boost for some households.

Component 2: Raising Livestock Productivity and Quality

This component covered animal health, animal nutrition and breeding activities. Compared to Component 1, outcomes will take a longer time. Nonetheless, project showed results and KII interviews showed beneficiaries perceived and understood progress made – even with animal breeding where the existence of the new nucleus herds were mentioned as one important aspect of the LAMP project.

As an example, investments in animal health services and extension services led to 100% anti-brucellosis vaccination of livestock as one of activities conducted in the frame of the project sub-component. In addition, no cases of Foot and Mouth Disease (FMD), which has created such difficulties for Mongolian meat exports, took place in treatment *soums* despite having FMD within the project *aimags*. Accessibility of animal health services improved and households received veterinary services without any problems due to distribution of motorbikes, development of cold chain and new offices/equipments. However, in order to improve animal health and reduce livestock mortality due to diseases it is necessary for herders to continue learning about animal health practices.

It could be seen that animal feed/fodder production increased in treatment *soums* and its sale became one key income source selling within the *soum* and in neighboring *soums* (according to KII feedback). Although the number of livestock to feed and duration of feeding did not differ significantly in treatment and control *soums* and in some cases households in treatment *soums* fed animals for fewer days, the amount of animal feed produced and sold was greater in treatment *soums* due to increased access to seeds, farm equipment and expertise.

Herders mostly tended to feed pregnant cows, ewes, goats and calves, lambs and kids. The duration of feeding averaged 100 days. This indicator was relatively lower in female-headed and vulnerable households, while in non-vulnerable households the number of animals fed and duration of feeding were relatively greater.

The project objectives aim to increasing the diversify animal feed species planted depending on the size of the land plot. Green fodder animal feed production was carried out at household level on field areas of up to 49 hectares.

There was a need for further assistance to households engaged in planting animal fodder at the local level to increase the size of land plots for planting, to diversify the kinds of plants, to promote use of handouts and educational materials. The advantageous aspect was that production and sale of animal feed became a key source of income for households and thus there is a stronger possibility for sustaining this activity. Households have more satisfaction in changes related to animal breeding and animal health interventions. Because, those activities on veterinary services, animal breeding and genetic improvement and animal feed processing reached more households rather than activities on linking herders to markets. Male members of households were the main project participants due to their key responsibilities for livestock and marketing activities. Women and vulnerable households benefited even while male members also benefited. Key activities of the project tended to focus more on the area of men's responsibilities within labour distribution.

Component 3: Project Management

The LAMP interventions covered big geographical area and same time many agricultural operations both livestock and horticultural (farming vegetables, berries and animal feed). Related to this situation the ELS data showed different results in different areas.

LAMP project management in the PSC and PIU had to oversee activities covering a wide geographical area. The large LAMP team maintained technical inputs and regular monitoring of LAMP activities and impact. PIU databases provided extensive evidence on project implementation, impact and progress.

Numerous handouts were developed and distributed during the project. According to ESL data, materials on livestock health were used the most. In addition, survey participants viewed that the implementation model used by the LAMP, which targeted households and cooperatives by providing them material assistance was effective and should be used for implementation of projects on livestock health, wool and cashmere processing and animal feed processing in future programmes.

Future Programmes / Way Forward

LAMP stakeholders and beneficiaries highlighted that the following were very beneficial:

- Equipment and mechanization for animal service provision, hay/fodder production and horticulture was extremely useful to improve and expand production,
- Animal health services improved with mobility (motorbikes), mobile fences and better medicines and vaccines,
- Nucleus flocks helped to improve quality of animals and production of livestock products,
- Meat and milk processing, especially meat storage,
- Training programmes for all the above.

However, they also noted that future programmes should:

- Ensure water supply and gravity fed irrigation is better addressed, especially for horticulture and fodder,
- Wool and cashmere local processing,
- Nucleus flocks settled and able to provide continuous services,
- Horticulture product storages for excess production.

Overall, in line with national rangeland degradation and declining livestock product quality, programmes should :

- To allow uptake and sustainability, the GOM should continue to build on LAMP innovations such as increased fodder production, public extension services for livestock and horticulture, improved animal care and breeding programmes and support for various equipment (e.g. tractors, bailers, processing, etc.) through programmes such as those proposed in the Mongolian Agenda for Sustainable Livestock using local pasture fees specifically used to support such programmes at *soum* and *aimag* level;
- Address subsidies, awards and other current means driving over-stock and over-grazing through changes in award criteria (e.g. current 1000 animal award converted to 1000 “heavy, sustainably pastured certified and registered” animal award) and introduction of “sustainably pastured” certification scheme and bonus subsidies aiming only at high quality products;
- Develop new means to reduce livestock numbers while ensure income for herders such as local improved breeding (following on from LAMP progress), value addition to livestock products (e.g. cheese for export, pre-processing skins/hides and fibres) with improved *Soum*-level planning such as Pasture Use Plans limiting numbers to carrying capacity;

- Focus on developing a new cadre of animal and horticulture professionals to support training and media information for herders, and;
- Support young herders and women household members through continuing education/extension programmes, low interest loans for added value activities and cultural events.

Finally, although much has been accomplished during the relatively short duration of the LAMP project, a longer term commitment by the Government of Mongolia needs to be developed. The recently prepared Mongolian Agenda for Sustainable Livestock, for example, provides a framework that incorporates many of the LAMP innovations, provides for a funding mechanism through pasture user fees and would be sufficiently long term to have meaningful results in areas such as human capacity development, livestock breeding, fodder production and capitalization for mechanization, livestock product processing and water supply.

Annex 1: Questionnaire

The questionnaire of the End-line Survey of the LAMP Project (sample responses included)					
My name is I am an enumerator of SICA LLC. We are conducting end-line survey on Livestock and Agricultural Marketing project funded by World Bank Group. We will ask you about changes of your household's economic circumstances as a result of the project impact and information gathered through this survey will be protected in accordance with the "Law of Mongolia on Personal Secrecy". Your information would be used for only research process and won't be published or shared with anyone outside the project team. The interview will take about one and half hours. If you have any further questions about the survey, please contact our office at: 7012-6009					
A0. GENERAL INFORMATION ABOUT RESPONDENTS					
IDENTIFICATION					
No	Question	Answer			Step
1	IDENTIFICATION	i # of Interviewer/Enumerator:	0	3	Supervisor will communicate the code to you
		ii # of Questionnaire:	5	8	
		iii # of Local leader:		2	
		iv # of Data enterer:	1	1	
CRITERIA					
2	Control or treatment group:	Control	1		
		Treatment	2		
3	Please define your main household operation? (If operates both choose higher income)	Livestock	1		Question 6
		Horticulture	2		
4	How many livestock do you have? (See supervisor's number)	up to 100 livestock	1		
		101-200 livestock	2		
		201-500 livestock	3		
		501 or above	4		
5	What is the area of your land holding for cropping? (See supervisor's number)	up to 500 m.sq (0.05 ha)	1		
		501 m.sq - 5000 m.sq	2		
		5001 m.sq - 1.0 ha	3		
		above 1 ha	4		
ADDRESS					
No	Question	Answer			Step
6	LOCATION (To be filled in by enumerator before HH visit)	Aimag: Arhangai	6	5	
		Soum: Chuluut	5	2	
		Bagh: Khurem	5	1	
		Locality: Baruun Jargalant			
7	Household number:	<input type="text"/>			
8	Name of HH Head's:	T.Ganbat			
9	Telephone number	№1	_____		
		№2	_____		
10	Number of household member	Number			
11	Start time of interview:	Month	0	1	A1-1
		Day	3	0	
		Hour	1	4	
		Minute	0	9	
12	End time of interview:	Hour			Fill this area when finish the questionnaire
		Minute			

A1. HH member information

ID of HH members	1. First and Last name of HH members		2. Relationship to HH Head	3. Age	4. Sex 1. Male, 2. Female	5. Education	6. Literacy level	7. Health condition: Disabled or not 1. Yes, 2. No	8. Marital status	9. Employment	10. Did the HH member migrate last year? 1. Yes, 2. No	11. If yes, what was the reason
	1		2	3	4	5	6	7	8	9	10	11
	First name	Last name										
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												

CODE

2. Relationship to HH head refer to 2nd column	1 - HH Head, 2 - Spouse, 3 - Son/Daughter, 4 - Son/Daughter-in-law, 5 - Parent, 6 - Brother/Sister, 7 - Grandparent, 8 - Grandchild, 9- Brother/sister in law, 10 - Niece/nephew, 11 - No relation
3. Age 3rd column	Please define full age
5. HH members education 5th column	1- High education, 2- Vocational training, 3- High school, 4- Secondary school education, 5- Primary, 6- No school
6. Literacy level 6th column	1- Can read and write, 2- Can read, can't write 3- Can't read and write
7. Health condition 7th column	1. Yes, disabled, 2. No, healthy
8. Marital status 8th column	1 - Married, 2 - Single, 3 - Divorced, 4 - Separated, 5 - Widower, 6 - Below age 16
9. Employment 9th column	1- Herder, 2- Public service, 3- Private sector employee, 4- Entrepreneur, 5- Child stays home, 6- Student in secondary and primary school, 7- Unemployed, 8- Retired, 9- Person with special needs
11. Migration purpose 11th column	1- To find job, 2- To attend school or training, 3- To get treatment, 4- To care others, 5- Other (specify)

A2. HOUSEHOLD LABOR DISTRIBUTION

Personal ID	I. HH livestock activities						II. Horticultural activities						III. House work					
	1		2		3		4		5		6		7		8		9	
	Activities related to herding animals (It includes: To herd, water and feed animal and other related activities)		Activities related to produce and process dairy products (It includes: To milk animal, to process dairy food and shear sheep, goats and camel).		Other activities related to livestock (It includes: To clean the shed, barn and dung, to build and maintain the shed and barn).		Activities related to farm (It includes: to plough and to prepare land).		Maintaining (It includes: Watering, thinning soil, insects and pests removing, weeding and fertilizing).		Activities related to harvest and sell (It includes: To harvest, to store in the cellar etc.).		Household production (It includes all activities related to create extra income source such as handicraft, baking, to raise chicken).		Food preparation (It includes: To prepare daily meal and meat for winter etc.).		Caring for kids and elderly members of the HH	
	If engaged above activities how many weeks have involved within past year?	Average hours for these engaged weeks?	If engaged above activities how many weeks have involved within past year?	Average hours for these engaged weeks?	If engaged above activities how many weeks have involved within past year?	Average hours for these engaged weeks?	If engaged above activities how many weeks have involved within past year?	Average hours for these engaged weeks?	If engaged above activities how many weeks have involved within past year?	Average hours for these engaged weeks?	If engaged above activities how many weeks have involved within past year?	Average hours for these engaged weeks?	If engaged above activities how many weeks have involved within past year?	Average hours for these engaged weeks?	If engaged above activities how many weeks have involved within past year?	Average hours for these engaged weeks?	If engaged above activities how many weeks have involved within past year?	Average hours for these engaged weeks?
1																		
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

Ask 15 or above years old HH members

A3. HH FOOD AND FOOD SECURITY

№	Questions	Answers	Note/Step																																																																																																		
1	<p>Now I would like to ask you about the types of foods that you or anyone else in your household ate yesterday during the day and at night. Read the list of foods.</p> <p>Place a ONE in the box if anyone in the household ate the food in question, place a TWO in the box if no one in the household ate the food.</p>	<p>A Any boorstog and gambir (local food), bread, rice noodles, biscuits, or any other foods made from millet, sorghum, maize, rice, wheat?</p> <p>B Any potatoes, yams, manioc, cassava or any other foods made from roots or tubers?</p> <p>C Any vegetables?</p> <p>D Any fruits?</p> <p>E Any beef, pork, lamb, goat, rabbit wild game, chicken, duck, or other birds, liver, kidney, heart, or other organ meats?</p> <p>F Any eggs?</p> <p>G Any fresh or dried fish or shellfish?</p> <p>H Any foods made from beans, peas, lentils, or nuts?</p> <p>I Any cheese, yogurt, milk or other milk products?</p> <p>J Any foods made with oil, fat, or butter?</p> <p>K Any sugar or honey?</p> <p>L Any other foods, such as condiments, coffee, tea?</p>																																																																																																			
2	<p>Ask from a women of reproductive age who are defined as those 15–49 years of age. Now I would like to ask you about the types of foods that you ate yesterday during the day and at night. Read the list of foods.</p> <p>Place a ONE in the box if you ate the food in question, place a TWO in the box if did not eat the food.</p>	<p>A Foods made from grains - {Porridge, bread, rice, pasta/noodles or other foods made from grains}</p> <p>B White roots and tubers and plantains - {White potatoes, white yams, cocoyam, taro or any other foods made from white-fleshed roots or tubers, or plantains}</p> <p>C Pulses (beans, peas and lentils) - {Mature beans or peas (fresh or dried seed), lentils or bean/pea products, including hummus, tofu and tempeh}</p> <p>D Nuts and seeds - {Any tree nut, groundnut/peanut or certain seeds, or nut/seed "butters"}</p> <p>E Milk and milk products - {Milk, cheese, yoghurt or other milk products but NOT including butter, ice cream, cream or sour cream}</p> <p>F Organ meat - {Liver, kidney, heart or other organ meats or blood-based foods, including from wild game}</p> <p>G Meat and poultry - {Beef, pork, lamb, goat, rabbit, wild game meat, chicken, duck or other bird}</p> <p>H Fish and seafood - {Fresh or dried fish, shellfish or seafood}</p> <p>I Eggs - {Eggs from poultry or any other bird}</p> <p>J Dark green leafy vegetables - {List examples of any medium-to-dark green leafy vegetables, including wild/foraged leaves}</p> <p>K Vitamin A-rich vegetables, roots and tubers - {Pumpkin, carrots, squash or sweet potatoes that are yellow or orange inside}</p> <p>L Vitamin A-rich fruits - {Ripe mango, ripe papaya }</p> <p>M Other vegetables</p> <p>N Other fruits</p> <p>O Oils and fats - {Oil; fats or butter added to food or used for cooking, including extracted oils from nuts, fruits and seeds; and all animal fat}</p> <p>P Sweets - {Sugary foods, such as chocolates, candies, cookies/sweet biscuits and cakes, sweet pastries or ice cream}</p> <p>Q Sugar-sweetened beverages - {Sweetened fruit juices and "juice drinks", soft drinks/fizzy drinks, chocolate drinks, malt drinks, yoghurt drinks or sweet tea or coffee with sugar}</p> <p>R Condiments and seasonings - {Ingredients used in small quantities for flavour, such as chilies, spices, herbs, fish powder, tomato paste, flavour cubes or seeds}</p> <p>S Other beverages - {Tea or coffee if not sweetened, clear broth, alcohol}</p>																																																																																																			
3	<p>Now I would like to ask you about your household's food supply during</p>	<p>YES</p> <p>NO</p>	<p>1</p> <p>2</p>	A3-5																																																																																																	
4	<p>If yes, which were the months in the past 12 months during which you did not have enough food to meet your family's needs? What was the main problem? (Code: 1-Dzud, 2-Drought, 3-Floods, 4-Irregular rains, 5-Livestock disease, 6-High food prices, 7-Loss or reduced employment, 8-Illness/accident of HH member, 9-Death of HH member, 10-Theft of productive resources, 11-Deteriorated land, 12-Crop pests and disease, 13-Other (specify))</p>	<table border="1"> <thead> <tr> <th rowspan="2"></th> <th rowspan="2"></th> <th colspan="2">Identify</th> <th colspan="3">Reasons</th> </tr> <tr> <th>YES</th> <th>NO</th> <th>Code1</th> <th>Code2</th> <th>Code3</th> </tr> </thead> <tbody> <tr><td>2018</td><td>Mar</td><td>1</td><td>2</td><td></td><td></td><td></td></tr> <tr><td>2018</td><td>Feb</td><td>1</td><td>2</td><td></td><td></td><td></td></tr> <tr><td>2018</td><td>Jan</td><td>1</td><td>2</td><td></td><td></td><td></td></tr> <tr><td>2017</td><td>Dec</td><td>1</td><td>2</td><td></td><td></td><td></td></tr> <tr><td>2017</td><td>Nov</td><td>1</td><td>2</td><td></td><td></td><td></td></tr> <tr><td>2017</td><td>Oct</td><td>1</td><td>2</td><td></td><td></td><td></td></tr> <tr><td>2017</td><td>Sep</td><td>1</td><td>2</td><td></td><td></td><td></td></tr> <tr><td>2017</td><td>Aug</td><td>1</td><td>2</td><td></td><td></td><td></td></tr> <tr><td>2017</td><td>Jul</td><td>1</td><td>2</td><td></td><td></td><td></td></tr> <tr><td>2017</td><td>Jun</td><td>1</td><td>2</td><td></td><td></td><td></td></tr> <tr><td>2017</td><td>May</td><td>1</td><td>2</td><td></td><td></td><td></td></tr> <tr><td>2017</td><td>Apr</td><td>1</td><td>2</td><td></td><td></td><td>s</td></tr> </tbody> </table>			Identify		Reasons			YES	NO	Code1	Code2	Code3	2018	Mar	1	2				2018	Feb	1	2				2018	Jan	1	2				2017	Dec	1	2				2017	Nov	1	2				2017	Oct	1	2				2017	Sep	1	2				2017	Aug	1	2				2017	Jul	1	2				2017	Jun	1	2				2017	May	1	2				2017	Apr	1	2			s			
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2017	May	1	2																																																																																																		
2017	Apr	1	2			s																																																																																															
5	<p>In the past [4 weeks/30 days], was there ever no food to eat of any kind</p>	<p>YES</p> <p>NO</p>	<p>1</p> <p>2</p>	A3-7																																																																																																	
6	<p>How often did this happen in the past [4 weeks/30 days]?</p>	<p>Rarely (1–2 times)</p> <p>Sometimes (3–10 times)</p> <p>Often (more than 10 times)</p>	<p>1</p> <p>2</p> <p>3</p>																																																																																																		

7	In the past [4 weeks/30 days], did you or any household member go to sleep	YES	1	A3-9
		NO	2	
8	How often did this happen in the past [4 weeks/30 days]?	Rarely (1–2 times)	1	
		Sometimes (3–10 times)	2	
		Often (more than 10 times)	3	
9	In the past [4 weeks/30 days], did you or any household member go a whole	YES	1	A4-1
		NO	2	
10	How often did this happen in the past [4 weeks/30 days]?	Rarely (1–2 times)	1	
		Sometimes (3–10 times)	2	
		Often (more than 10 times)	3	

A4. Migration pattern

№	Question	Answer	A. Winter	B. Spring	C. Summer	D. Autumn	Note/Step
			camp	camp	camp	camp	
<i>Migration (This section of the questions will be asked from households who herd animals in 2017)</i>							
1	Is there a usual [SEASON] camp where your household spends the [SEASON]?	Yes	1	1	1	1	
		No	2	2	2	2	B1-1
2	In which aimag/soum is your usual [SEASON] camp?	in the current soum	1	1	1	1	
		in the another soum	2	2	2	2	
		in the another aimag	3	2	2	2	
3	What is the distance (in km) between your usual [SEASON] camps?	Distance km	□□□□	□□□□	□□□□	□□□□	
4	What is the cost of moving between your usual camps?	Moving cost thous.tog	□□□□□□	□□□□□□	□□□□□□	□□□□□□	
5	How many days does it take to move ? <i>(including time spent in preparation and travelling)</i>	Number of days	□□□□	□□□□	□□□□	□□□□	
6	What kind of transportation is used to move?	1- By own vehicle 2- Rent vehicle 3- Carriage drawn by animal 4- Other	□	□	□	□	
7	Do you have a land title for your usual [SEASON] camp?	Yes	1	1	1	1	
		No	2	2	2	2	A4-9
8	If you have possession of a licence what type of licence do you have? /Ask to show the title document/	Land usage license	1	1	1	1	
		Land adoption license	3	3	3	3	
		Land owner's certificate	4	4	4	4	
9	Was your household located in your usual [SEASON] camp last [SEASON]?	Yes	1	1	1	1	B1-1
		No	2	2	2	2	
10	If you were not located in your usual camp, what was the reason?	Please specify your reason dzud, rain, etc.					

B1. Livestock quantity

No	Questions	Answers	A. Camels	B. Horses	C. Cattle	D. Sheep	E. Goats	Note/Step
<i>Difference of livestock quantity between livestock census of the 2016 and the 2017</i>								
1	What is the total number of [ANIMALS] of your household at the 2017 Livestock Census? (all animals that your household herds and owns)	Total						
		Males						
		Females						
2	In 2017, how many [ANIMALS] did your household buy? (including animals received as a gift)	Number of animals						
3	In 2017 spring, how many [ANIMALS] were born into your ownership?	Number of newborns						
4	In 2017, how many [ANIMALS] did you sell to others ?	Number of animals <i>(Sold while still alive)</i>						
5	In 2017, how many [ANIMALS] did your household slaughter and sell?	Number of animals <i>(Slaughtered by yourselves and sold)</i>						
6	In 2017, how many [ANIMALS] did your household use for your own consumption?	Number of animals <i>(HH consumption)</i>						
7	In 2017, how many [ANIMALS] did your household gift to others?	Number of animals <i>(Gifted)</i>						
8	In 2017, how many [ANIMALS] were lost due to natural disaster or illness (e.g., dzuds or wolves)?	Number of animals						
9	What was the total number of [ANIMALS] of your household at the 2016 Livestock Census?	Total						
		Males						
		Females						
10	From where did you get breeding bulls in 2017?	from own flock						
		from others flock						
		from LAMP nucleus flock						
11	What is the total number of [ANIMALS] of your household at the 2013 Livestock Census? (all animals that your household herds and owns)	Total						
		Males						
		Females						

B2. Livestock health

№	Questions	Answers	Note/Step
<i>Health care services in 2017</i>			
1	Does your HH receive animal health care service?	Yes	1
		No	2
2	Did the livestock of your household receive vaccination service in 2017?	Yes	1
		No	2
3	If yes what kind of vaccination service was received? (show posters)	Against brucellosis	A
		Against ecthyma	B
		Against contagious agalactia	C
4	Did the livestock of your household receiving medicine service in 2017?	Yes	1
		No	2
5	If yes what kind of medicine was received? (show posters)	Ivomec	A
		Alamicin	B
		Other (specify)	C
6	Did the livestock of your household receive dipping or de-worming in 2017?	Dipping	1
		De-worming	2
		Both	3
		Neither	4
7	Does your household have animal health journal? /Ask to show the journal/	Yes	1
		No	2
8	If yes how often do you use?	Often, note every service of animal health	1
		Note only some special vaccine	2
		Don't use	3
9	Did your livestock get infectious illness in 2017?	Yes	1
		No	2
10	If yes please specify which animal diseases? (show posters)		
11	Did your livestock get non-infectious illness in 2017?	Yes	1
		No	2
12	If yes please specify animal disease? (show posters)		
13	Did you have disinfection service from veterinarian in your animal fence in 2017?	Yes	1
		No	2
14	How much money did you pay in above veterinary service in 2017?	Amount, thous.MNT	
		Free of charge	2
15	If the veterinary services were free of charge who paid for this?	LAMP	1
		GoM	2
		Other project, program	3
		Don't know	4
16	What kind of service is needed to your soum's veterinary centre ?	Need to train veterinarian	A
		Need to supply veterinary medicine	B
		Need to supply animal breeding technique	C
		Need to improve veterinary vaccine quality	D
		Don't know	E
17	How are you satisfied with veterinary service?	Very satisfied	1
		Satisfied	2
		Neutral	3
		Not satisfied	4
		Don't know	5

B3. Livestock output

№	Questions	Answers						Step
Meat, dairy and fibres obtained HH								
№	Questions	Types		Outputs in 2017		Outputs in 2013		
		A		1		2		
1	Milk output (Amount of daily milk output, l)	Cow	May					
			July					
			September					
			November					
		Camel	May					
			July					
			September					
		Mare	August					
			September					
		Goat	June					
			July					
		Sheep	June					
			July					
		2	Meat output (Carcass weight, kgs)	Cattle	Male			
Female								
Horse	Male							
	Female							
Camel	Male							
	Female							
Goat	Male							
	Female							
Sheep	Male							
	Female							
3	Wool and cashmere output (kgs)	Sheep wool						
		Goat cashmere						
		Yak wool						
		Cattle wool						
		Camel wool						
		Baby camel wool						

B4. Livestock value

No	Questions	Answers	Step					
Livestock value (as of 2017 and 2013 year)								
1	Did your household get paid to manage and herd animals of other's ownership in the last year?	Yes	1					
		No	2					
2	How much did you earn? (include animals and other goods)	Income, thous.MNT	B4-3					
3	How much did you earn from selling your animals (while still alive) to other herders?	2017		2013				
			Quantity	Unit price		Quantity		
		Horse	n	thous.tug	n	n		
		Cattle	n	thous.tug	n	n		
		Camel	n	thous.tug	n	n		
		Goat	n	thous.tug	n	n		
4	How much did you earn from selling your animals to be slaughtered or to commercial organizations?	2017		2013				
			Quantity	Unit price		Quantity		
		Horse	n	thous.tug	n	n		
		Cattle	n	thous.tug	n	n		
		Camel	n	thous.tug	n	n		
		Goat	n	thous.tug	n	n		
5	How much did you use for HH consumption?	2017		2013				
			Quantity	Unit price		Quantity		
		Horse	n	thous.tug	n	n		
		Cattle	n	thous.tug	n	n		
		Camel	n	thous.tug	n	n		
		Goat	n	thous.tug	n	n		
6	Amount of dairy product that your HH produced from livestock in the last year?	Prepared amount		For market		Нэгжийн үнэ		
		A Cow milk	l	thous.tug	l	thous.tug		
		B Mare's milk	l	thous.tug	l	thous.tug		
		C Milk of sheep and goat	l	thous.tug	l	thous.tug		
		D Dried yogurt	l	thous.tug	l	thous.tug		
		E Fresh yogurt	kg	thous.tug	kg	thous.tug		
		F Camel milk	l	thous.tug	l	thous.tug		
		G Sour cream	kg	thous.tug	kg	thous.tug		
		H Milk cream	kg	thous.tug	kg	thous.tug		
		I Other (specify)	kg	thous.tug	kg	thous.tug		
7	Amount of dairy product that your HH produced from livestock in 2013 year?	Prepared amount		For market		Нэгжийн үнэ		
		A Cow milk	l	thous.tug	l	thous.tug		
		B Mare's milk	l	thous.tug	l	thous.tug		
		C Milk of sheep and goat	l	thous.tug	l	thous.tug		
		D Dried yogurt	l	thous.tug	l	thous.tug		
		E Fresh yogurt	kg	thous.tug	kg	thous.tug		
		F Camel milk	l	thous.tug	l	thous.tug		
		G Sour cream	kg	thous.tug	kg	thous.tug		
		H Milk cream	kg	thous.tug	kg	thous.tug		
		I Other (specify)	kg	thous.tug	kg	thous.tug		
8	Amount of cashmere and skin product that your HH produced from livestock in the last year?	2017 онд		2013 онд				
			Quantity	Unit price		Quantity		
		A Cashmere, kgs	kg	thous.tug	kg	thous.tug		
		B Sheep wool, kgs	kg	thous.tug	kg	thous.tug		
		C Camel wool, kgs	kg	thous.tug	kg	thous.tug		
		D Cattle wool, kgs	kg	thous.tug	kg	thous.tug		
		E Horse skin	n	thous.tug	n	thous.tug		
		F Cow hide	n	thous.tug	n	thous.tug		
		G Goat skin	n	thous.tug	n	thous.tug		
		H Sheep skin	n	thous.tug	n	thous.tug		
I Camel skin	n	thous.tug	n	thous.tug				
	How much [PRODUCT] did your HH sell to the market? Code 1 1 = Changers (middleman) 2 = A cooperative that I belong to	Code 1		Code 2				
		A Sold animal still alive		B Slaughtered animal				

9	3= A cooperative that I do not belong to 4 = A representative from a processor who came to me 5 = Sell to direct costumers Code 2 1 = In the soum centre 2 =In the aimag centre 3 = In the Ulaanbaatar 4 = In the other aimag and soum 5 = From home	C Milk D Dairy product E Cashmere, kgs F Wool G Big animal wool H Animal hide and skin	<table border="1"> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td> </td></tr> </table>							<table border="1"> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td> </td></tr> </table>								
10	Do you have a formal agreement (e.g., written contract, MOU) with the buyer you sold [PRODUCT] to?	Yes No	1 2	B4-11														
11	What was the contract duration?	One-time Short-term written agreement Long-term written agreement	1 2 3															
12	Do you have an informal agreement (e.g., verbal agreement) with the buyer you sold [PRODUCT] to?	Yes No	1 2	B5														
13	What was the contract duration?	One-time Short-term verbal agreement Long-term verbal agreement	1 2 3															

B5. Animal feed

No	Questions	Answers	Note/Step																																																															
Animal feed <i>between 2016 and 2017 Livestock Census</i>																																																																		
1	Do you prepare hay or fodder for winter?	Yes No	1 2																																																															
2	Do you plant an animal feed or fodder?	Yes No	1 2																																																															
3	Size of your plot area	<table border="1"> <tr> <th colspan="4">Planted area, Ha</th> <th colspan="4">Harvest ton</th> </tr> <tr> <td>Green fodder</td> <td></td><td></td><td></td> <td></td><td></td><td></td><td></td> </tr> <tr> <td>Other (write)</td> <td></td><td></td><td></td> <td></td><td></td><td></td><td></td> </tr> </table>	Planted area, Ha				Harvest ton				Green fodder								Other (write)								B5-6																																							
Planted area, Ha				Harvest ton																																																														
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8	How many animals did your HH feed in what period for last year? (between November to March, Code: 1-Sire, 2- Pregnant animal, 3-Sick and injured animal, 4-High-Value-Animal, 5-Other animals)	<table border="1"> <tr> <th>Animal feed</th> <th>Number of animals</th> <th>Number of days</th> <th>Animal types, code 1</th> </tr> <tr> <td>A Camel</td> <td></td><td></td><td></td> </tr> <tr> <td>B Horse</td> <td></td><td></td><td></td> </tr> <tr> <td>C Cattle</td> <td></td><td></td><td></td> </tr> <tr> <td>D Sheep</td> <td></td><td></td><td></td> </tr> <tr> <td>E Goat</td> <td></td><td></td><td></td> </tr> </table>	Animal feed	Number of animals	Number of days	Animal types, code 1	A Camel				B Horse				C Cattle				D Sheep				E Goat																																											
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C. Horticulture

№	Questions	Answers	Step					
1	Does your household own a plot area?	Yes	1					
		No	2					
2	If you own a plot area what kind of certificate do you have?	Use land without licence	1					
		Land usage license	2					
		Land adoption license	3					
		Land owner's certificate	4					
3	Size of your plot area?	m.sq	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> </tr> </table>					
4	Did your household plant any crop in 2017?	Yes	1					
		No	2					
5	Scale of your plot area (Code: 1= YES, 2= NO)	Planted vegetables Тариалсан талбай						
			unit	Code	in 2017	Code	in 2013	
		A	Potato	ha				
		B	Carrot	sq.m				
		C	Cabbage	sq.m				
		D	Cucumber	sq.m				
		E	Tomato	sq.m				
		F	Pepper	sq.m				
		G	Sea buckthorn	sq.m				
H	Other vegetables	__						
6	What is your purpose of planting?	Main resource of household income	A					
		Diversity to increase household income	B					
		For household food consumption	C					
7	Harvested plant in 2017 /kg/		Quantity	For market	Unit price			
		A	Potato					
		B	Carrot					
		C	Cabbage					
		D	Cucumber					
		E	Tomato					
		F	Pepper					
		G	Sea buckthorn					
		H	Other vegetables					
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		A	Potato					
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		C	Cabbage					
		D	Cucumber					
		E	Tomato					
		F	Pepper					
		G	Sea buckthorn					
		H	Other vegetables					
8	How much did you spend last year on farming activities? (by resources and thous.tugs, Code: 1- Human labour, 2- Animal power 3- Mechanization 4-Agricultural technique) How much did you spend for each of the stages in	Total expenditure	Code	Costs, thous.tog				
		A	Soil processing					
		B	Buying seeds					
		C	Plow and planting					
		D	Soil fertilizing					
		E	Soil enriching					
		F	Pesticide					
		G	Removal					

	last year in farming activities?	H Irrigate I Harvesting J Other (<i>Write</i>)								
10	Where did you buy seeds in 2017?	From own resources							1	
		From others							2	
		From LAMP							3	
11	What kind of fertilizer did you use in 2017?	Natural							1	
		Chemical							2	
		Don't know							3	
12	Where does your household sell the harvest? (Please select up to 3 answers that has highest amount of sales)	In own soum							1	
		In own aimag centre							2	
		In other soums							3	
		In the city							4	
13	Did you make any official contracts to sell your products?	Yes							1	
		No							2	C-15
14	If you have any kind of contracts, what was the contract duration?	One time							1	
		Short-term written agreement							2	
		Long-term written agreement							3	
15	Did you make any informal/ verbal contracts to sell your products?	Yes							1	
		No							2	D1
16	If you have any kind of contracts, what was the contract duration?	One time							1	
		Short-term verbal agreement							2	
		Long-term verbal agreement							3	

D. Implemented projects and programmes

№	Question	Answer	Step
1	In which year was your household involved in agricultural marketing project from WBG?	<div style="display: flex; justify-content: space-between;"> Year <div style="border: 1px solid black; width: 100px; height: 20px;"></div> </div> <div style="display: flex; justify-content: space-between;"> Month <div style="border: 1px solid black; width: 100px; height: 20px;"></div> </div>	
2	Which member of your household was involved in following services from agricultural marketing project? (Code: 1-Female member of the HH, 2-Male member of the HH, 3-Both, 4-Neither)	<p>Projects activity</p> <ul style="list-style-type: none"> A Grant for meat processing B Grant for dairy processing C Grant for wool and cashmere processing D Grant for horticulture operation E Grant for greenhouse operation F Grant for animal feed and forage G Nucleus flock H Veterinary service equipment I Agricultural equipment J Support to livestock products market K Support to horticulture products market L Support for animal feed market M Other (Write) 	Code
3	What kind of activity did your household operate as a result of WBG, LAMP involvement	<ul style="list-style-type: none"> Improved animal genetics Processed meat and meat products Processed milk and dairy products Processed wool and cashmere Processed animal feed Provided veterinary service Operated horticulture Planted fruits Operated greenhouse Started family production Other (Write) 	A B C D E F G H I J K
4	Which of the following materials does your household have? (multiple response)	<p>About animal health</p> <ul style="list-style-type: none"> A Common of animal transmitted and non transmitted diseases in Mongolia B Guidance against brucellosis and rabies C Simplified guidance to measure small animals strength and fatness D TV program about preventing animal disease <p>About animal nutrition</p> <ul style="list-style-type: none"> E Guidance to planting yearling and perennial plant F Handbook for calculating forage use and preparing multi type forages G Video lesson to planting yearling and perennial plant H Preparing 5 type of forages using annual and perennial plant, and natural resources I Feeding the animals during winter and springs <p>Vegetables and fruits</p> <ul style="list-style-type: none"> J Agro-technological reference to 10 types of vegetable K Technical guidance to store in a cellar potato and vegetables L Technical conditions of 3 types of cellars, planting and growing vegetables in winter, common and booth greenhouse M Reference to planting and growing 5 types of fruits and berries 	A B C D E F G H I J K L M N
5	Can you name the programs up to 3 sub-projects that was the most beneficial from agricultural marketing project? /Show catalogue/	<ul style="list-style-type: none"> 1 _____ 2 _____ 3 _____ 	
6	If there will be second phase of LAMP, in which sector is investment required?	<ul style="list-style-type: none"> Meat and meat product processing Milk and dairy product processing Wool and cashmere processing Animal feed Animal health Horticulture Household production Other (Write) Cooperatives 	A B C D E F G H A

7	Who should be the targets?	Households Entrepreneurs Vulnerable Other (Write)	B C D E
8	What kind of investment will be more effective?	Loan Material investment Grant Capacity building trainings Other (Write)	A B C D E

E. Agricultural organization

№	Question	Answer					Step
1	Is anyone in your household a member of an [ORGANIZATION]?	Yes					1
		No					2
2	Type of the organization	Cooperative					1
		Partnership					2
		Companionship					3
		LLC					4
		Other (write)					5
3	How many members of your household are members of an [ORGANIZATION]?						
4	When was the [ORGANIZATION] formed?	year <input type="text"/> <input type="text"/> month <input type="text"/> <input type="text"/>					
5	How much did household members pay for membership/sign-up fees to this primary [ORGANIZATION] per month?	Cost amount thous.tog <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>					
6	What is the activity type of your primary [ORGANIZATION]?	Selling meat Buying raw material (leather and wool) Accessing wool promotion Buying cashmere Buying milk Training herders Farming potato and vegetables Preparing forages Other (write)					A B C D E F G H I
7	Does your organization own (or has long-term lease or use of) assets? (Please include rent or leasing)	Fenced land Unfenced land Tractors Other cultivation equipment Water point (well, borehole, etc) Milk collection/processing centre Slaughter house Wool/cashmere collection/processing centre Vegetable/hay storage Store for agriculture products storage/marketing Other (write)					A B C D E F G H I J K
8	How often does your household attend a primary [ORGANIZATION] meeting?	Often Sometimes Not attend					A B C
9	Did your HH receive dividends/benefits from your organization in 2017? In cash or in-kind?	Yes					1
		No					2
10	If yes how much did you receive? /If in-kind, estimate the value/	Amount (thous.tug) <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>					
11	Which of the following services does your primary [ORGANIZATION] offer you, and which services did you receive?	Negotiations with buyers Provide information Access veterinary Access market Allocate common pasture or water resources Learning how to increase income Prevent public ownership resources from outsiders Nothing to serve					A B C D E F G H

F. Beneficiaries satisfaction

№	Question	Answer					Note/Step	
			Well improved	Improved	Same	Worsened	Much more worsened	
1	Do you think that your involvement in the project has an actual result or impact to your life and your household? <i>(please answer in each row)</i>	Project results						
		Changes in household						
		1 Household income	5	4	3	2	1	
		2 Capacity of HH members	5	4	3	2	1	
		3 Household labour disaggregation	5	4	3	2	1	
		4 Hired employer for household business	5	4	3	2	1	
		5 Horse meat consumption	5	4	3	2	1	
		6 Milk consumption	5	4	3	2	1	
		7 Carrot consumption	5	4	3	2	1	
		8 Sea buckthorn consumption	5	4	3	2	1	
		9 Overall meat consumption	5	4	3	2	1	
		10 Overall vegetable consumption	5	4	3	2	1	
11 Overall dairy consumption	5	4	3	2	1			
2	Do you think that your involvement in the project has an actual result or impact to your market linkage operation? <i>(please answer in each row)</i>	Changes related to market linkages						
		1 Cooperating with other herders and farmers /Cooperation operation/	5	4	3	2	1	
		2 Partners to sell the products	5	4	3	2	1	
		3 Knowledge on herders cooperation registration	5	4	3	2	1	
		4 Capacity to produce household production (Activities related to basic level of processing <i>For example: To sell meat, skin of animals after slaughter not selling while Process and pickle vegetables not selling directly from harvest</i>)	5	4	3	2	1	
5 Build market chain, make contracts	5	4	3	2	1			
3	Do you think that your involvement in the project has an actual result or impact to your households horticulture activity? <i>(please answer in each row)</i>	Changes related to vegetable planting						
		1 Plot area	5	4	3	2	1	
		2 Soil processing	5	4	3	2	1	
		3 Vegetable planting	5	4	3	2	1	
		4 Equipment and technology of farming	5	4	3	2	1	
		5 Harvest output	5	4	3	2	1	
		6 Greenhouse operation	5	4	3	2	1	
7 Warehouse and keeping vegetables	5	4	3	2	1			
4	Do you think that your involvement in the project has an actual result or impact to your animal herd operation? <i>(please answer in each row)</i>	Changes related to animal health						
		1 Animal medicine access	5	4	3	2	1	
		2 Veterinary equipment	5	4	3	2	1	
		3 Veterinarians skill	5	4	3	2	1	
		4 Infectious disease of animals	5	4	3	2	1	
		5 Non-infectious disease of animals	5	4	3	2	1	
		Changes related to animal value						
		6 Livestock structure	5	4	3	2	1	
		7 Meat output	5	4	3	2	1	
		8 Milk output	5	4	3	2	1	
		9 Wool output	5	4	3	2	1	
		10 Cashmere output	5	4	3	2	1	
		Changes related to animal feed						
		11 Crop area for animal feed	5	4	3	2	1	
12 Animal feed and forage production	5	4	3	2	1			
13 Animal feed preparation	5	4	3	2	1			
14 Number of days feeding animal	5	4	3	2	1			

G. Other projects and programmes

№	Question	Answer					Step																																																																																																
A. Other projects																																																																																																							
1	Was your household involved in any other projects or programmes besides LAMP since 2013?	Yes				1																																																																																																	
		No				2	H-1																																																																																																
2	If Yes what was the name of project implementer and project itself? (Please indicate all projects you involved in)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Project name</th> <th colspan="4">Year</th> </tr> </thead> <tbody> <tr> <td>1 _____</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>2 _____</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>3 _____</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>					Project name	Year				1 _____					2 _____					3 _____																																																																																	
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3	What was the project intended topic area? (please indicate all sections involved in)	Livestock Horticulture Animal feed and nutrition Milk and diary products processing Animal health Wool and cashmere processing Household production Other (specify)				A																																																																																																	
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4	Compared to 2013, how did your household condition changed? (Please answer each row)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Changes in household</th> <th>Well improved</th> <th>Improved</th> <th>Same as before</th> <th>Worsened</th> <th>Much more worsened</th> </tr> </thead> <tbody> <tr> <td>A Animal breeding</td> <td>5</td> <td>4</td> <td>3</td> <td>2</td> <td>1</td> </tr> <tr> <td>B Livestock value</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td 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supply chain in market	5	4	3	2	1	H Animal feed preparation and consumption	5	4	3	2	1	I Agricultural equipment	5	4	3	2	1	J Animal health	5	4	3	2	1	K Crop farming	5	4	3	2	1	L Vegetable supply chain in market	5	4	3	2	1	M Household food diversity	5	4	3	2	1	N Household food supply	5	4	3	2	1	O Household income	5	4	3	2	1	
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H. Household living condition

No	Question	Answer	Whether have or not*		Ownership status		Note/Step					
			Yes	No	Own	Others'						
1	What is your household dwelling type?	A Ger	1	2	1	2	* if Yes, please ask ownership status					
		B Extra ger	1	2	1	2						
		C Single detached house	1	2	1	2						
		D Apartment in urban and rural area	1	2	1	2						
		E Other (specify)	1	2	1	2						
		<i>Cottage</i>	1	2	1	2						
2	Do you possess any of the following items?	A Refrigerator and Ice box	1	2	1	2						
		B TV and satellite antenna	1	2	1	2						
		C Solar panel	1	2	1	2						
		D Wind-powered generator	1	2	1	2						
		E Small-scale diesel generator	1	2	1	2						
		F Cell phone	1	2	1	2						
		G Carriage drawn by animals	1	2	1	2						
		H Truck	1	2	1	2						
		I Passenger car	1	2	1	2						
		J Motorcycle	1	2	1	2						
		K Animal sheds	1	2	1	2						
		L Well	1	2	1	2						
		M Wool combing machine	1	2	1	2						
		N Haymaking machine	1	2	1	2						
		O Planting equipment	1	2	1	2						
		P Ploughs	1	2	1	2						
		Q Milk cream separator	1	2	1	2						
		R Land in urban areas	1	2	1	2						
S Land in rural areas	1	2	1	2								
3	How much were your income sources for your household in 2013 and 2017 for each item?	Income source	Income, thous.MNT in 2017				Income, thous.MNT in 2013					
		Total income	1	0	0	0	0	1	0	0	0	0
		A Animal husbandry			3	5	2			3	5	2
		B Horticulture production			5	5	0			5	5	0
		C Processing animal feed/fodder			2	0	0			2	0	0
		D Wages, salaries, pension, other aids				1	4	0			1	4
		E Family production (sewing, felt making etc.)				0	0				0	0
		F Other service income (transportation etc.)				0	0				0	0
		G Trading income (doing a middleman etc.)				1	0	0			1	0
		H Rent income (land, house, ger and techniques etc.)				0	0				0	0
		I Dividend and benefit from cooperation				2	0	0			2	0
		J Interest income				5	0				5	0
		K Gift from others				2	5	2			2	5
L Other				3	0	0			3	0		
4	How much money did your household spend per year in 2013 and 2017 for each item?	Living expenses	Expenses, thous.MNT in 2017				Expenses, thous.MNT in 2013					
		Total expenses										
		A Food										
		B Clothing										
		C Tuition/training fee										
		D Health service (medicine, visit doctors etc.)										
		E Household items										
		F Buying and maintaining a vehicle										
		G Transportation (between and within the city)										
		H Communication cost										
		I Firewood, gas, coal etc.										
		J Holidays (White moon and Naadam etc.)										
		K Hobby, entertainment										
		L Sheds, animal fence										
M Forage and fodder												
N Animal vaccination and medicine												
O Animal breeding and improving productivity												
P Horticulture operation												
Q Horticulture equipment												
R Tax, fees												
S Loan repayment												
T Other												
5	What is the amount of your food consumption for your household per month?	Food consumption	Amount									
		A Flour kg										
		B Noodles, kg										
		C Rice kg										
		D Lamb kg										
		E Beef kg										
		F Horse meat kg										
		G Potato kg										
		H Carrot kg										
		I Soft drinks/juice l										
		J Seabuckthorn kg										
		K Milk l										
		L Milk products kg										
		M Vegetable oil, l										
		N Tea box, number										
		O Salt, kg										
		P Sweet-stuff kg										
Q Cigarettes, tobacco, box												

		R Alcohol, wine, I			
6	Does your household have any savings? (term deposit account or no term deposit account)	Yes			1
		No			2
7	What is your current amount of savings?		Thous.tug	<input type="text"/>	
8	Does your household have any outstanding loans from any source?	Yes			1
		No			2
9	What is the current amount of outstanding loans from all sources? (If in-kind, estimate the value)		Thous.tug	<input type="text"/>	
10	What are all the sources from where the household received loans?	Banks			A
		Micro-finance institutions			B
		Cooperatives			C
		Individual business people (including changers)			D
		The Soum Development Fund			E
		Donor organizations (International donors, state organizations and NGOs)			F
		Others (<i>write</i>)			G
11	Have you heard about index-based livestock insurance?	Yes			1
		No			2
12	Have you ever purchased index-based livestock insurance?	Yes			1
		No			2

Thank you for your attendance

Annex 2: Key Informant Interviews (KII)

This Annex 2 provides a summary of discussions held with cooperative leaders and veterinary service providers in all five *aimags* and fifteen treatment *soums*. Interviews were conducted by field supervisors during 15 April to 4 May 2018 as part of the LAMP ELS. Table A gives the distribution of KII group discussions. Table B provides a summary of KII feedback points as provided by heads of cooperatives and veterinarians in response to lead questions as shown in the table.

Table A. KII distribution

<i>Aimag</i>	<i>Soum</i>	Head of horticultures' cooperative	Head of herders' cooperative	Head of veterinary center and veterinarian	Total
Arhangai	Chuluut	1		1	2
	Tsahir		1		1
	Tsetserleg	1		1	2
Bayanhongor	Bayantsagaan		1		1
	Galuut	1		1	2
	Jargalan		1		1
Gobi-Altai	Bugat	1		1	2
	Tsogt		1		1
	Tseel	1		1	2
Zavhan	Tsetsen-Uul	1		1	2
	Yaruu		1		1
Huvsgul	Burentogtokh	1		1	2
	Tosontsengel		1		1
	Tunel	1		1	2
Total		8	7	8	22

Table B. Summary of key points raised in response to leading questions during KIIs.

Focus area	Lead Questions	Discussion summary
Relevance	1. How did the interventions improve HH livelihoods? Which activity? How were they implemented?	<ul style="list-style-type: none"> - As a result of project interventions, HHs livelihood improved and most intervention activities showed positive impacts. - Project intervention plan included various areas, such as horticulture, animal health and breeding, animal feed and nutrition. Even meat value chain activities were involved. For example, <ul style="list-style-type: none"> - In Arhangai, Bayanhongor and Huvsgul <i>aimags</i> animal breeding and health, horticulture activities most impacted in HH livelihoods. - Bayanhongor, Zavhan and Gobi-Altai <i>aimags'</i> most successful projects were on horticulture projects. - Project's horticulture interventions tended to cover low income and vulnerable households. - Within the project frame cooperatives received breeding bulls, horticulture equipment (tractors

		<p>etc.), green houses, and meat refrigerators. Furthermore, veterinarians, herders, horticulture herders received training and enhanced their activities.</p>
	<p>2. Did the LAMP activities meet the expectations of the local communities or people? Could you give the details?</p>	<ul style="list-style-type: none"> - Sub-projects intervention accesses varied by areas. Most direct beneficiaries evaluate their benefit by high score but felt local impact with indirect beneficiaries was not sufficient. <ul style="list-style-type: none"> - In Arhangai <i>aimag</i>, animal breeding, animal feed and nutrition sub-projects succeeded and have been giving profit share to their members. Animal feed sub-projects succeeded not only in their area, but their neighbours even want to buy their products. - In Huvsgul vegetable plant and animal breeding sub-projects succeeded, but meat processing, animal feed sub-projects had some issues. Especially animal feed operation did not have a good harvest because of weather, and meat processing sub-project not accessible for all cooperative members. For horticulture sub-project in Tunel has some issues because of not enough fund-rising from cooperative members, few of them became direct beneficiaries. - In Bayanhongor animal feed, animal breeding, and animal health projects succeeded, there are number of direct and in-direct beneficiaries. These need some improvement related to irrigation systems for animal fodder planting. - In Gobi-Altai most accessible sub-project was animal health. Cooperatives work by various ways such as livestock product trade, animal feed plant and health care service by camel milk. - In Zavhan animal breeding and feed, horticulture (especially green house) sub-projects have good results and met beneficiaries' expectation.
	<p>3. How did the interventions support your local policy objectives?</p>	<p>All interviewers noted project intervention supported local policies well. In some case they claim project made big effort for saving animal breeds and local development without local policy. For example, project saved Baidrag breed of sheep in Bayanhongor <i>aimag</i>, and animal feed operating again in Arhangai <i>aimag</i> after socialist era.</p>
	<p>4. How would you rate the relevance of LAMP interventions from</p>	<p>Project direct beneficiaries rated the relevance of LAMP intervention from 3.4 to 5 score. Here we show the average scores of <i>aimags</i>.</p> <ul style="list-style-type: none"> • Arhangai – 4.8,

	a scale of 1 to 5 (with 1 being the lowest), in improving your HH incomes?	<ul style="list-style-type: none"> • Huvsgul – 3.4 • Bayanhongor – 4.75 • Gobi-Altai – 4.4 • Zavhan – 5
Efficiency	1. Were sub-projects and other interventions (trainings and investments e.g.) achieved in cost effective ways?	<ul style="list-style-type: none"> - Most beneficiaries evaluated the project interventions achieved in effective ways, especially trainings and veterinary service and horticulture equipment investments. - 22 of 22 direct beneficiaries named the project trainings and extension materials were very useful and effective. They titled animal health, horticulture trainings in classroom, field training and knowledge sharing operation all were very effective. - Most effective parts of trainings were knowledge sharing from different areas, and networking with each other. Bayanhongor and Gobi-Altai <i>aimags</i> organized this kind of trainings. - Interviewees thought training modules and investments are best ways to achieve project objectives. Most trainings organized in their local area, and they did not need to pay for transportation cost. - But in Arhangai Chuluut <i>soum's</i> veterinary centre was not well satisfied for their building's quality with 19 m.MNT. - Gobi-Altai Tseel <i>soum's</i> cooperative received a number of horticulture equipment but still no way to use these equipment because of no agronomist. They wanted professional training for someone who will use these.
	2. Were there better ways to achieve the same objective?	<ul style="list-style-type: none"> - In Arhangai, beneficiaries found most interventions achieved cost effective to the project objective, except from Chuluut <i>soum's</i> veterinary building. - In Huvsgul, beneficiaries said project not achieved cost-effective way, maybe next time it will be better to involve target groups or households directly. Focusing on cooperatives is less effective. They spent too much on training and administration cost. - In Bayanhongor, beneficiaries felt all interventions achieved in cost effective way. It is impossible to be less cost. - In Gobi-Altai, trainings organized cost-effective way - In Zavhan, there might opportunity to organize trainings with lower cost. But the local trainings were all effective.

Impact	1. How much was your <i>cooperative</i> herders' livelihood improved? What evidence do you have?	Cooperative members' livelihood improved significantly. Livestock number and quality improved. As result of animal feed herders feed their animals in winter time, as a result of breeding service animal breed improved and wool, cashmere, meat output and quality increased.
	2. Among the LAMP interventions, which sub-project provided the most benefits or was appreciated most by beneficiaries? Why?	Interviewees claim most sub-projects provided benefit to the households, especially animal feed sub-projects. In Bayanhongor and Gobi-Altai <i>aimags</i> many households without livestock gained their own animals, became herders from unemployed.
	3. What were the lessons learned from the project, and what was the main area of focus?	<ul style="list-style-type: none"> - Herder and horticulture cooperatives and veterinary units learned many good practices from the project. Even they could obtain equipment and technology that before they only could dream about. - In some cases, they received less materials that was good for their business than they wanted. - Most valuable lessons learned from the project was they learned to define their needs for their business.
	4. Who were the main beneficiaries? How did they benefit?	<ul style="list-style-type: none"> - Main beneficiaries were cooperative members. - For veterinary services, the beneficiaries were herders and locals. For horticulture sub-projects, main beneficiaries were target groups and unemployed locals. - Locals that accessed veterinary service, consumer of the vegetable and animal feed were also the main beneficiaries.
	5. How well did the cooperatives work? What evidence do you have?	<ul style="list-style-type: none"> - All interviewees claimed that they worked their best. Evidences of their efforts are, <ul style="list-style-type: none"> - Supply animal feed in their local area - Built fences and electricity pole - Decreased animal transmitted disease - Animal injection service became faster - Trained herders and cooperative members - Grew vegetable in Zavhan - Learned team work in Huvsgul - Created employment in Gobi-Altai etc. - Meantime with their efforts, there were some barriers to reduce their achievements such as lack of irrigation system in dry weather, low self-esteem to grow plants. But project beneficiaries negotiated all these barriers.
	6. Were you able to improve market linkages for your products? How?	<ul style="list-style-type: none"> - Most sub-projects succeeded in local area, and herders and horticulture households found ways that they could improve market linkages for their products. For instance,

	<p>Please cite specific examples.</p>	<ul style="list-style-type: none"> - In Gobi-Altai they are thinking to supply beef from Bugat to UB, - In Gobi-Altai Tseel <i>soum</i> there are operating one of biggest companies of Mongolia Altayn Huder, and locals have chance to sell their products to the company, - In Arhangai Chuluut and Tsetserleg <i>soums'</i> cooperatives supply animal feed to their local area, Tsetserleg <i>soum's</i> veterinary service expanded neighbour <i>soums</i>, - In Huvsgul Tunel <i>soum's</i> cooperative needs to build warehouse for animal feed for more harvest and service, - In Huvsgul Burentogtoh <i>soum</i> they are organizing exhibition between <i>soums</i> and supplying local area, - In Bayanhongor Galuut <i>soum's</i> cooperative have plan to supply kindergarten with their dairy products, - In Bayanhongor Jargalant <i>soum</i> examining their livestock for healthy animal and healthy food, - In Zavhan they have resource to supply local <i>soum</i> and neighbouring <i>soums</i> by vegetables.
	<p>7. Were there unintended impacts (both good and bad) from the LAMP project?</p>	<ul style="list-style-type: none"> - The interviewees claim there were only good consequences from the project. There were not any negative impacts. - Household income increased, learned new things such as to plant vegetables and feeds, to make reservation, and to write big size project. Most important things from project intervention were real actions and people received equipment and other necessary items. For example, equipment cost of 160,0 MNT received, received fences for veterinary service.
	<p>8. Did the households income improve? How?</p>	<ul style="list-style-type: none"> - Household income increased by two main ways. First, households obtained new income source related to project intervention, from horticulture operation. For example, vegetables, greens, animal fodder income. - Second, households' livestock income increased. As a result of project intervention livestock became healthier than before. Livestock meat, wool, cashmere, and milk output increased after breeding, veterinary and feeding intervention.
	<p>9. Did the households food consumption change? How?</p>	<ul style="list-style-type: none"> - Household food consumption changed, became more diverse. Food basket enriched with vegetables, greens, even pork and chicken from cooperatives. - Cooperatives collaborate each other and exchange their products.

		<ul style="list-style-type: none"> - Local schools and kindergartens supplied by project vegetables. - Locals use healthier meat and healthier milk from healthy animals. - This tendency is observed in all project areas.
Effectiveness	1. Were there any better options to improve livestock and horticulture operation?	<ul style="list-style-type: none"> - In general, most interventions succeeded, but need some improvements. For instance, in horticulture operations need irrigation system in each area. Livestock breeding activity need to expand more area. - After-production sales management needs special support from local government. For example, local cooperative's products have special right to supply local kindergartens and schools etc.
	2. For instance, better ways to improve HH income? Including other ways to increase livestock output, meat, milk, wool and fibre?	<ul style="list-style-type: none"> - Improve livestock breeding, served by nucleus flock bulls to local households, improve animal health. - Import new technologies, such as produce dry milk, and milk processing etc. - Support sales activity in local organizations.
	3. Has the project achieved with its planned outcomes? And Why?	<ul style="list-style-type: none"> - Most interviewees claimed the project achieved its planned outcomes. <ul style="list-style-type: none"> - Cooperatives' activity sustained for last years. - Cooperatives' production recognized local level and consumers prepared for their products, such as animal feed, veterinary service. - Cold-chain system implemented and veterinarians trained. - Rest of interviewees said that the project was established well ground and will need more time to achieve with its planned outcomes. <ul style="list-style-type: none"> - Trained and organized number of cooperatives for breeding and horticulture.
	4. Was the project duration just right? Please rate from 1 to 5, with 1 being the lowest.	<p>For project duration, <i>aimags</i> and projects rated different scores depending on their sub-project's characteristics.</p> <ul style="list-style-type: none"> - Arhangai <i>aimag</i> – 4.2 - Huvsgul – 3.75 - Bayanhongor – 4.25 - Gobi-Altai – 4.3 - Zavhan – need to continue (no one gave a score)
Sustainability	1. Do cooperatives have plans or capacity to continue their activity without LAMP's support?	<ul style="list-style-type: none"> - Most cooperatives plan to continue their activity with members, with their children and with new group. Breeding techniques, horticulture equipment and veterinary services will continue their activities specifically.

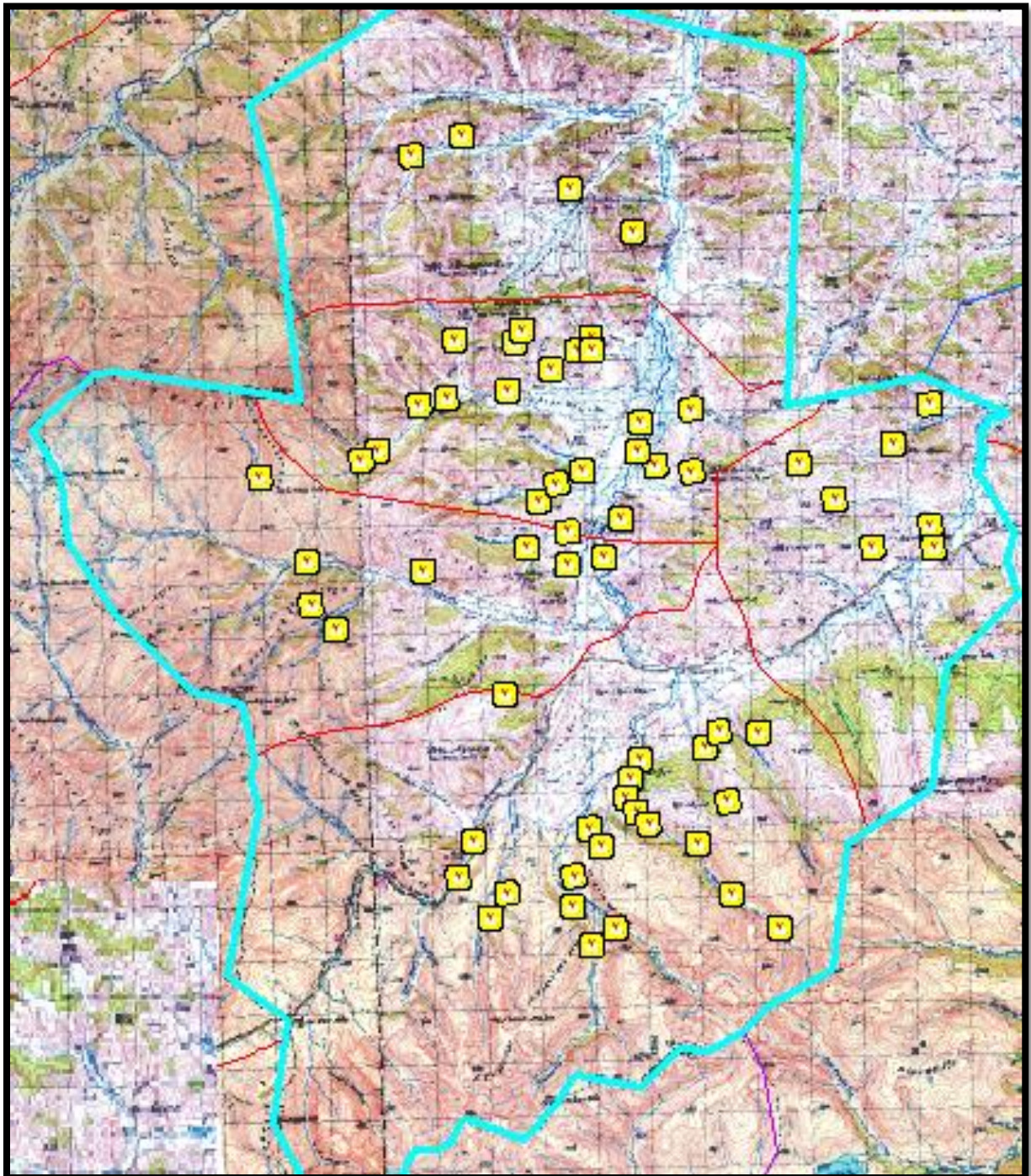
	<p>2. Who are the successors of the LAMP, in terms of management, skill development, market linkages etc. for the sub-projects?</p>	<ul style="list-style-type: none"> - Most sub-projects succeeded. Especially veterinarians and horticulture cooperatives well trained. But cooperative management, market linkage activities need more professional support. - Cooperative management and market linkage operations difficult to say well trained and succeeded.
	<p>3. Are changes in attitudes, behaviour patterns and institutional arrangements likely to last once the project is closed?</p>	<ul style="list-style-type: none"> - Cooperative members' attitudes, behaviours and institutional arrangements were changed in positive ways. - They significantly changed their attitudes and behaviors related to animal health, animal feed, animal breeding and cooperative work. - They involve their animals' vaccination, tend to prepare animal feed in autumn. - Herders and horticulture households changed their mind to work in teams. A head of "Ar Tovtsog" cooperative said cooperative is the best way for herders, like "One person will not be home, one tree will not fire".

Annex 3: Geographic Location of Interviewed Households

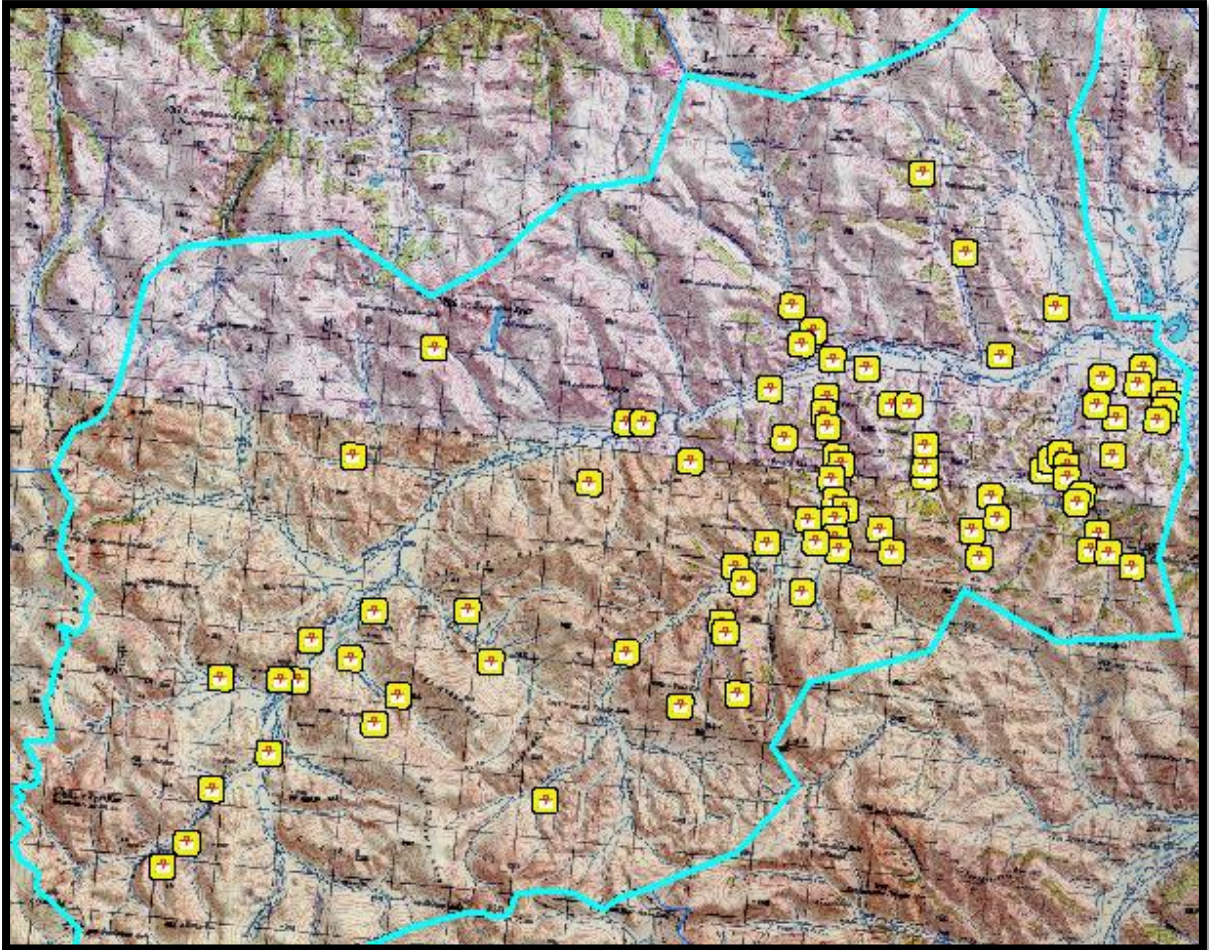
Sampling distribution in GIS

Treatment *soums*

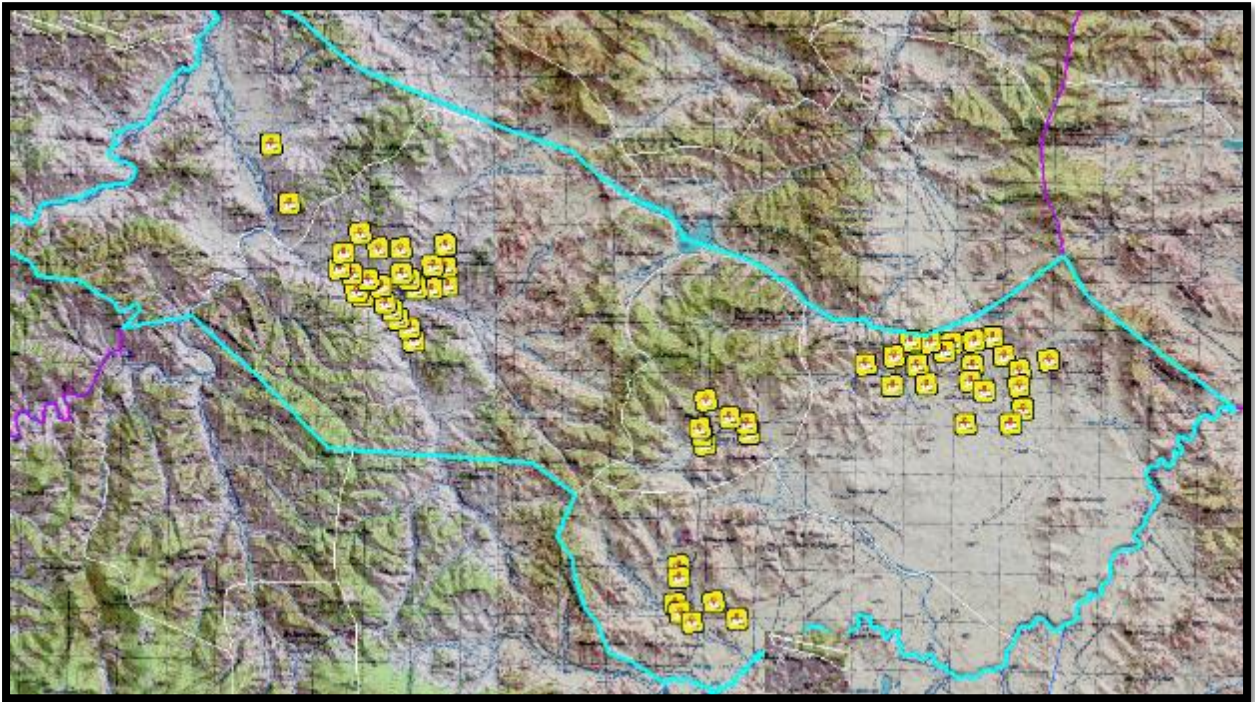
1. Arhangai, Chuluut



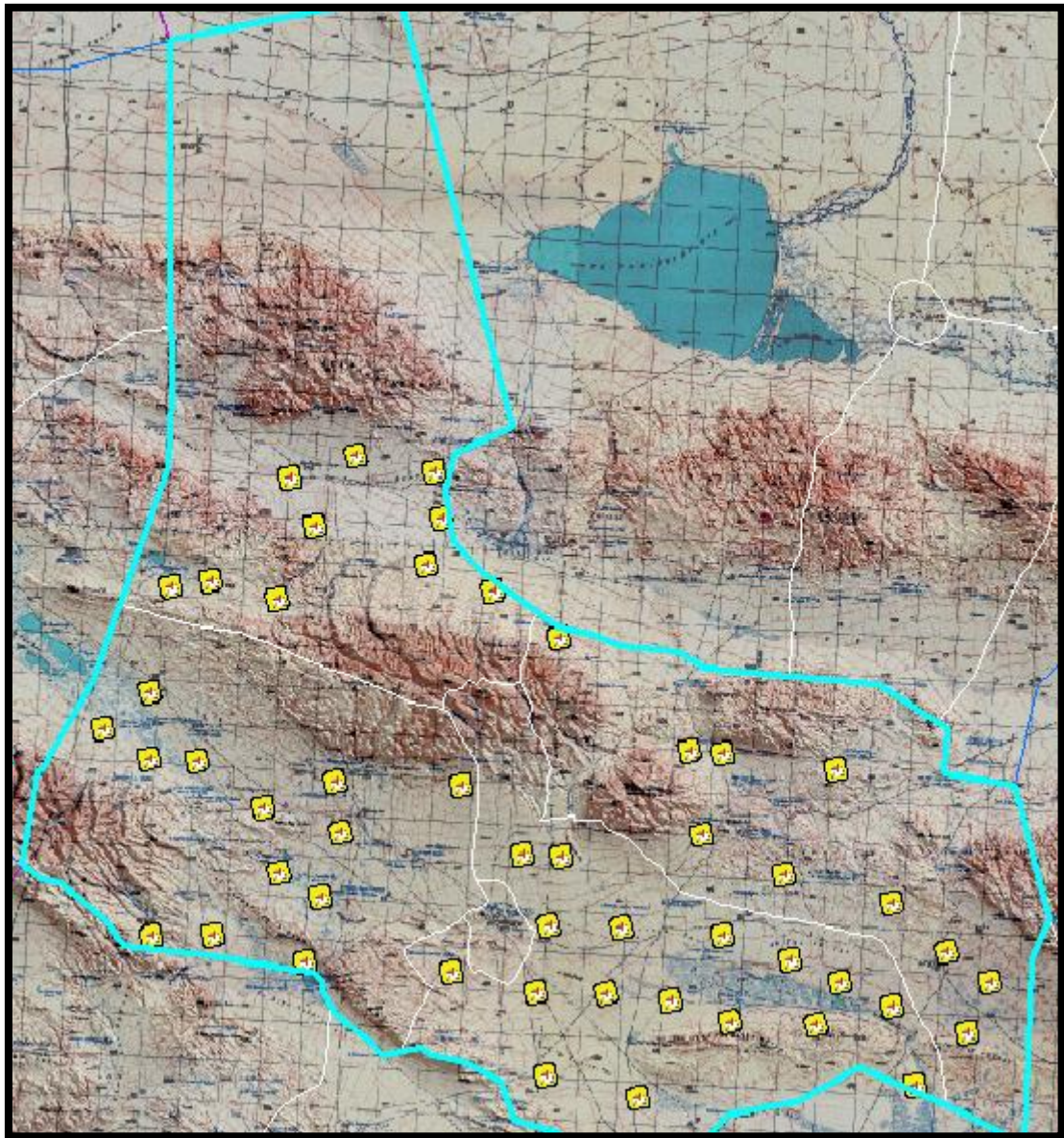
2. Arhangai, Tsahir



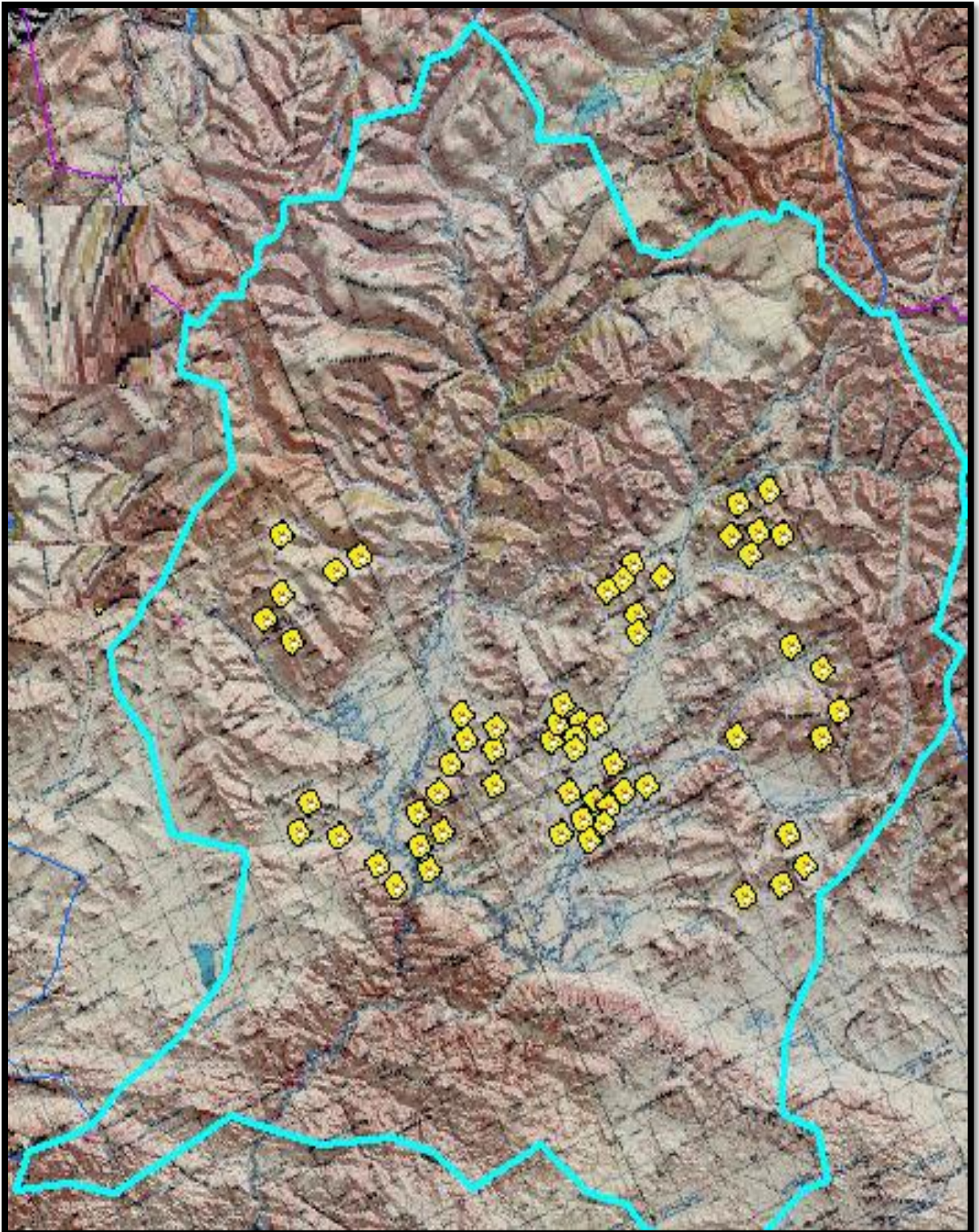
3. Arhangai, Tsetserleg



4. Bayanhongor, Bayantsagaan



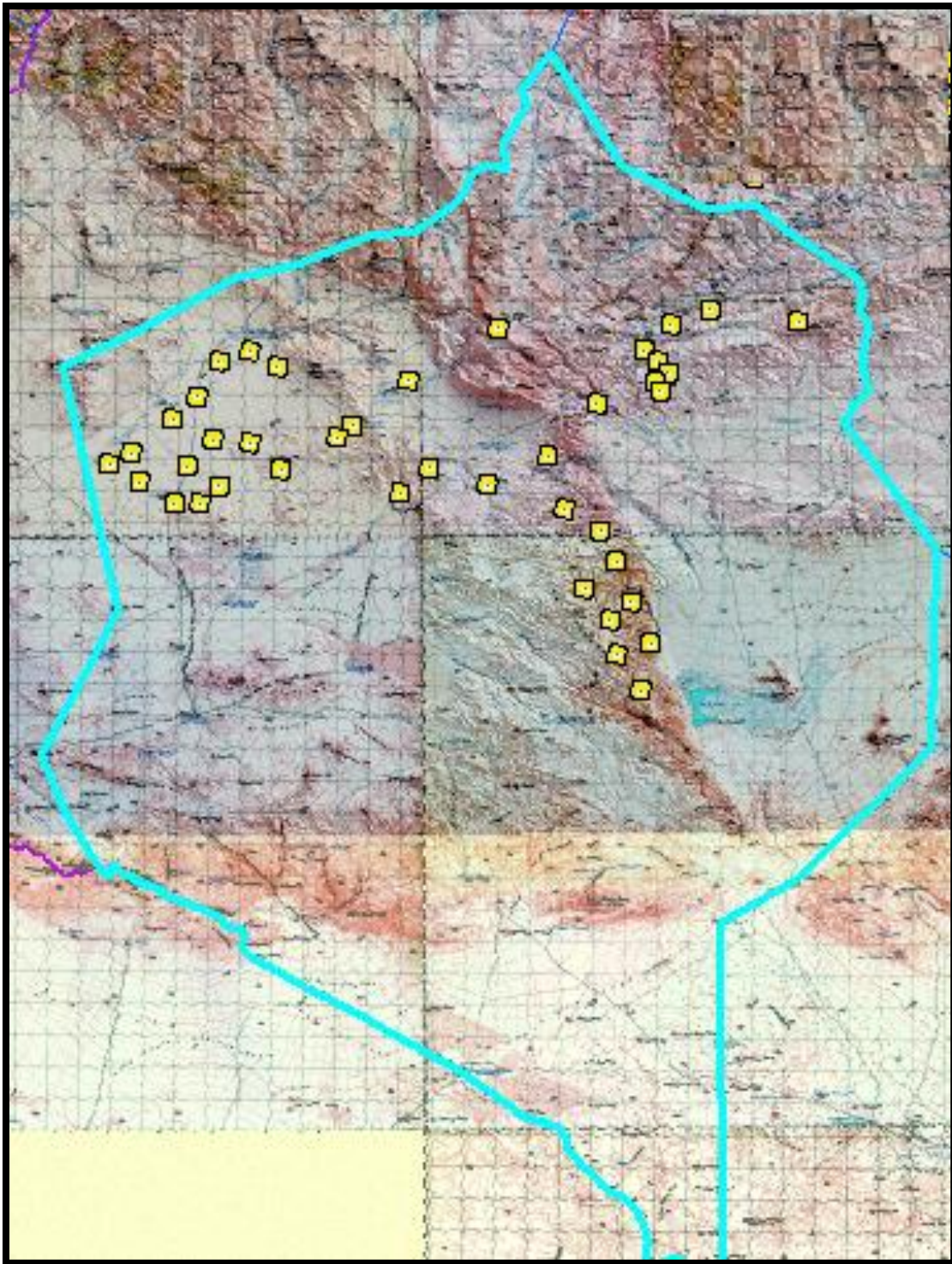
5. Bayanhongor, Galuut



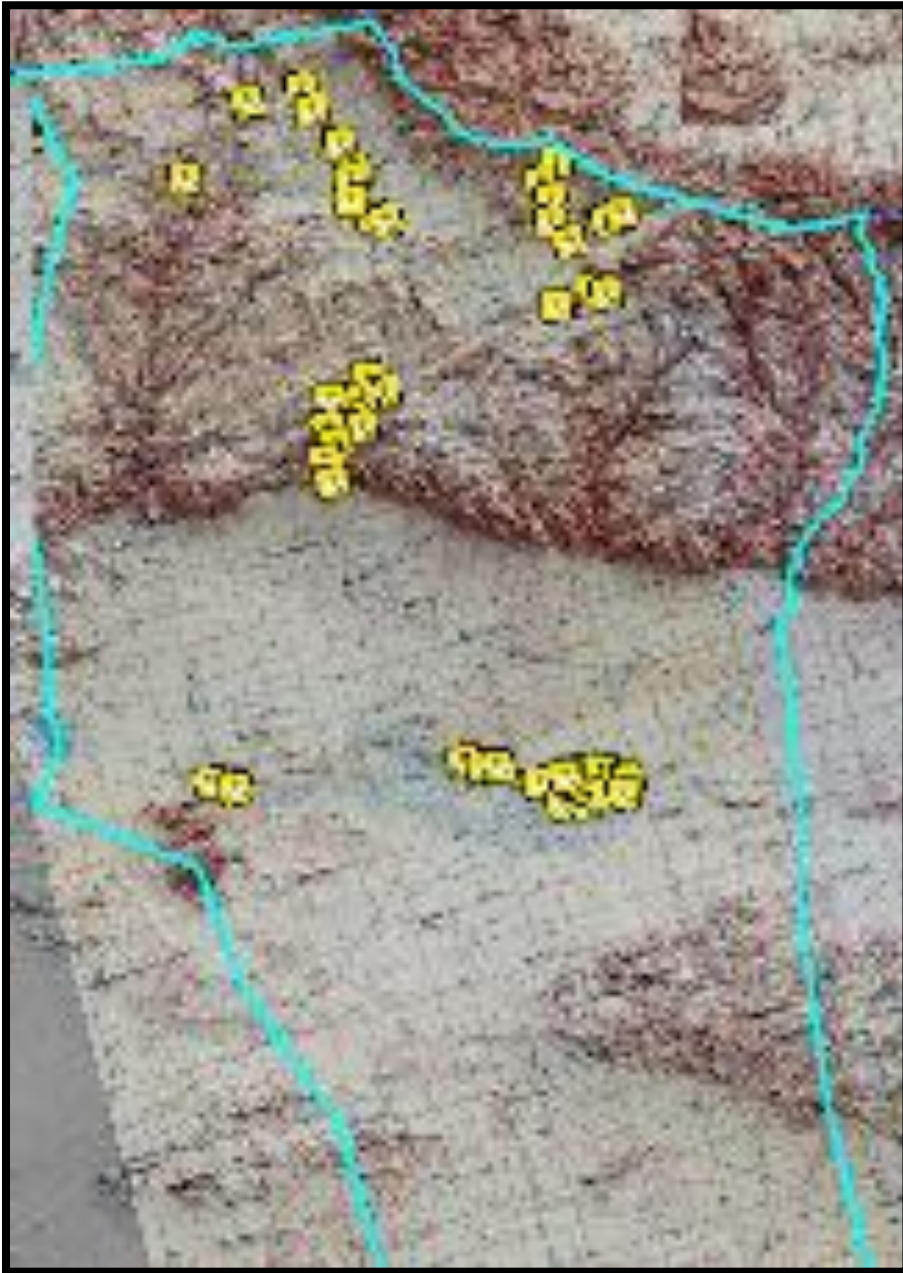
6. Bayanhongor, Jargalan



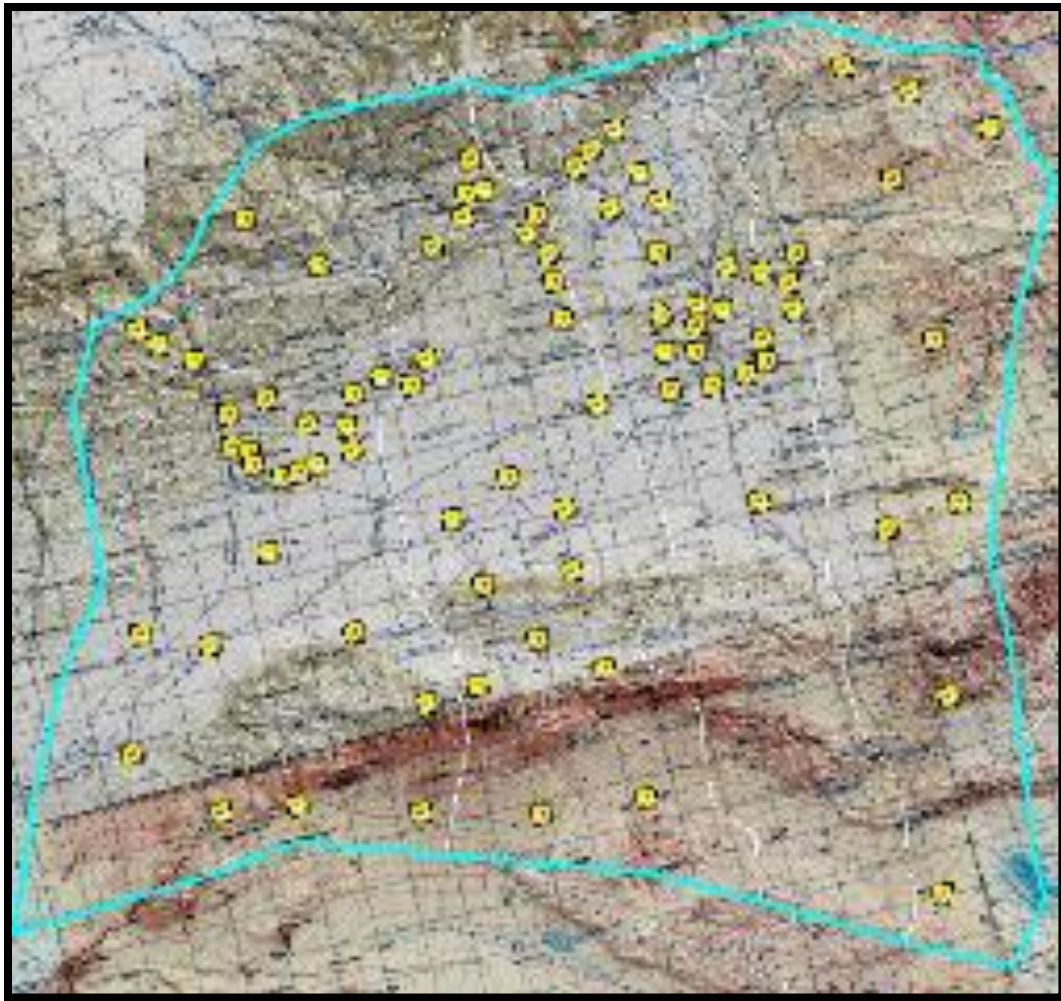
7. Gobi-Altai, Bugat



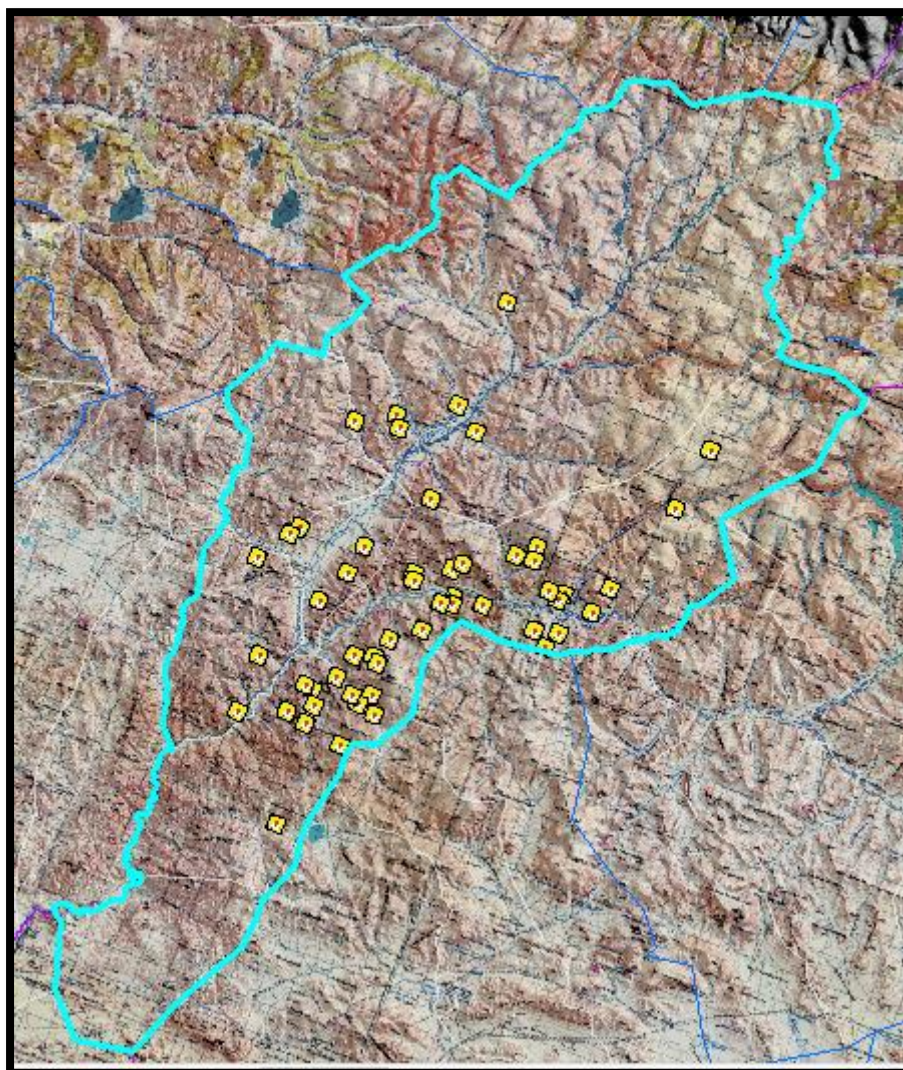
8. Gobi-Altai, Tsogt



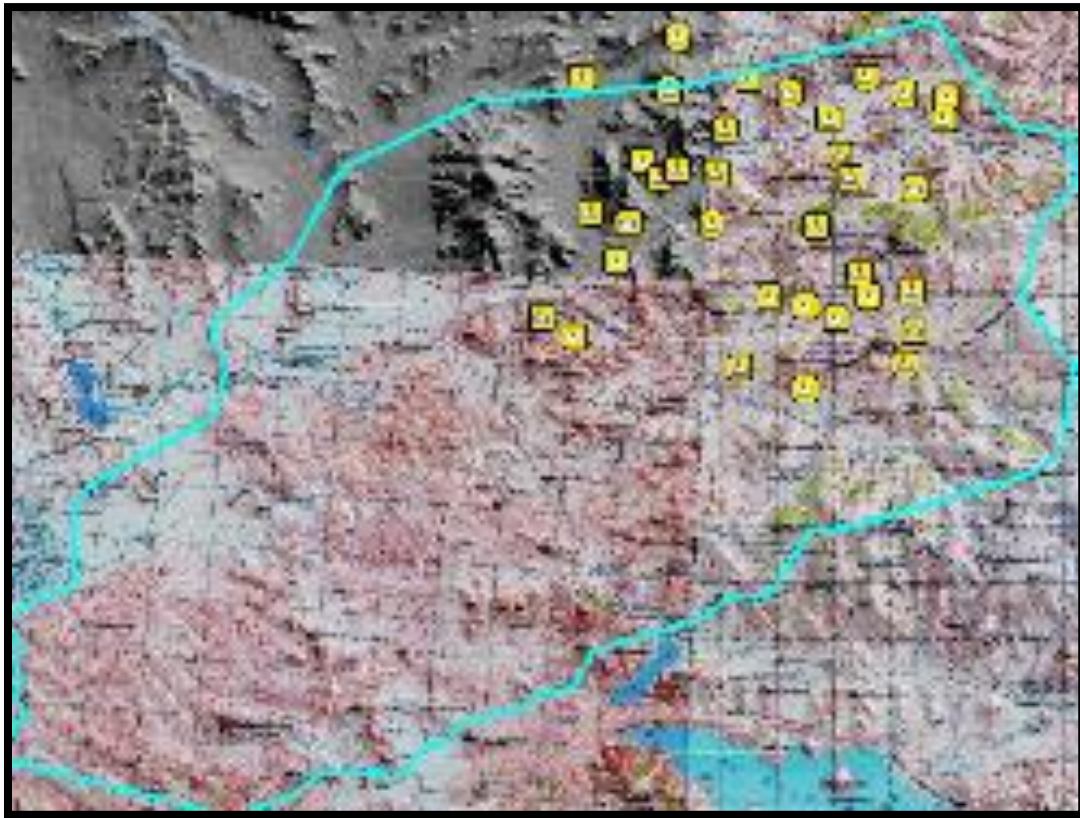
9. Gobi-Altai, Tseel



10. Zavhan, Otgon



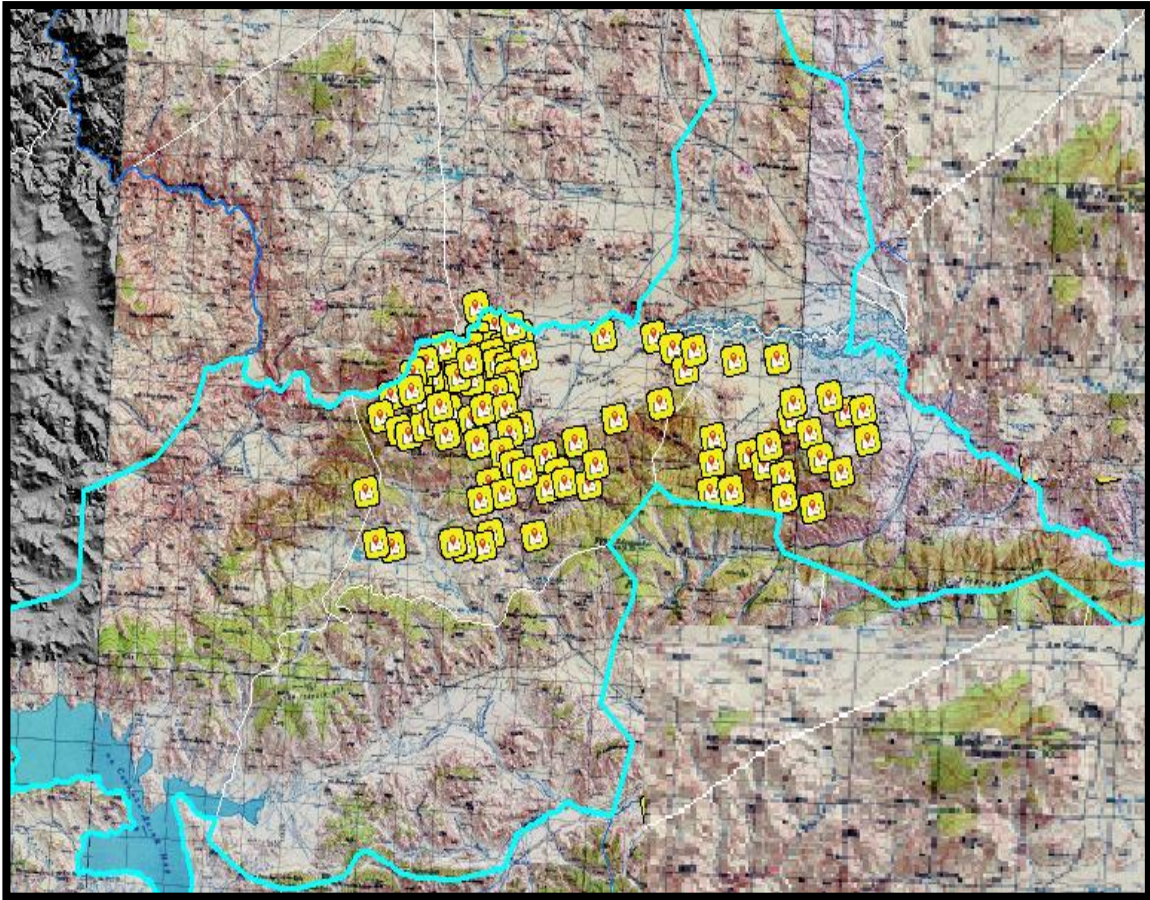
11. Zavhan, Tsetsen-Uul



12. Zavhan, Yaruu



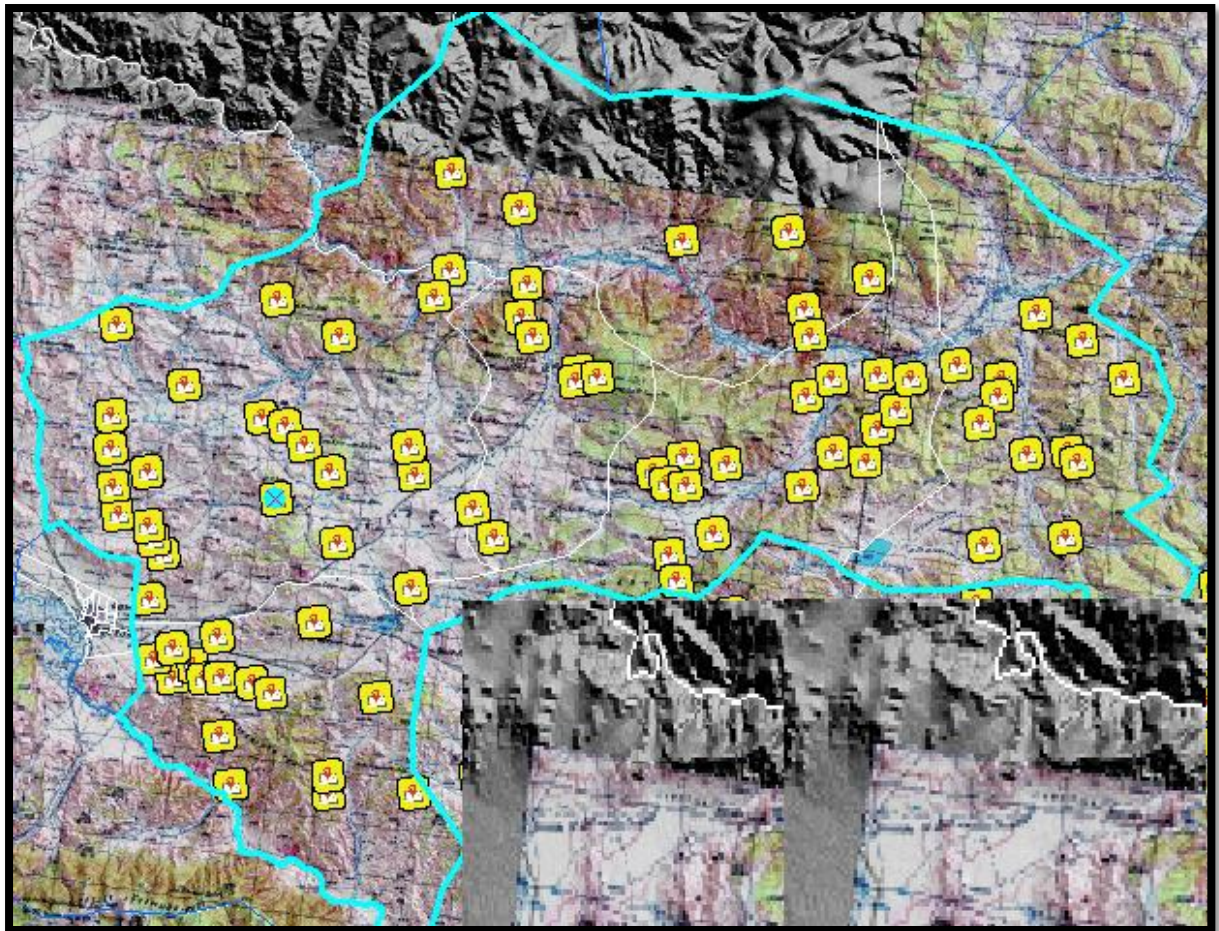
13. Huvsgul, Burentogtoh



14. Huvsgul, Tosontsengel

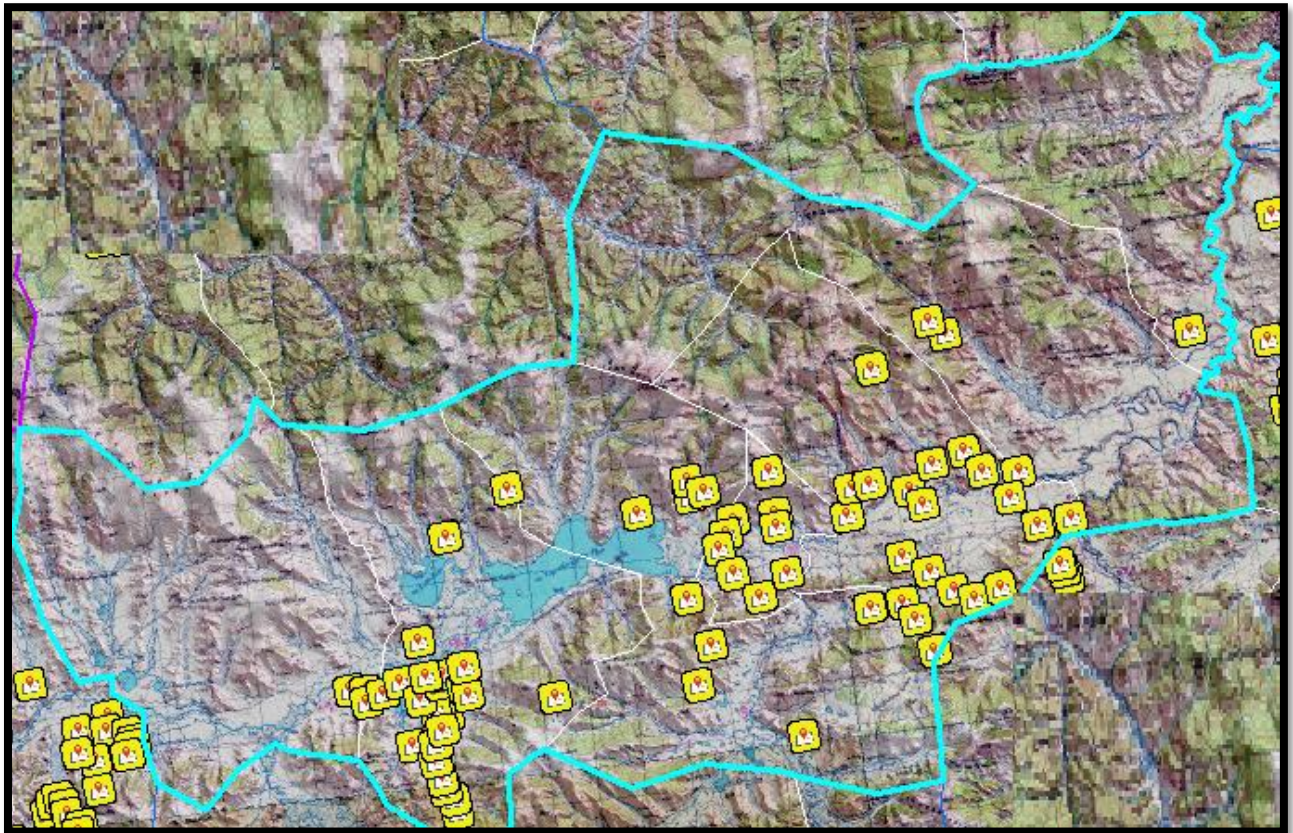


15. Huvsgul, Tunel

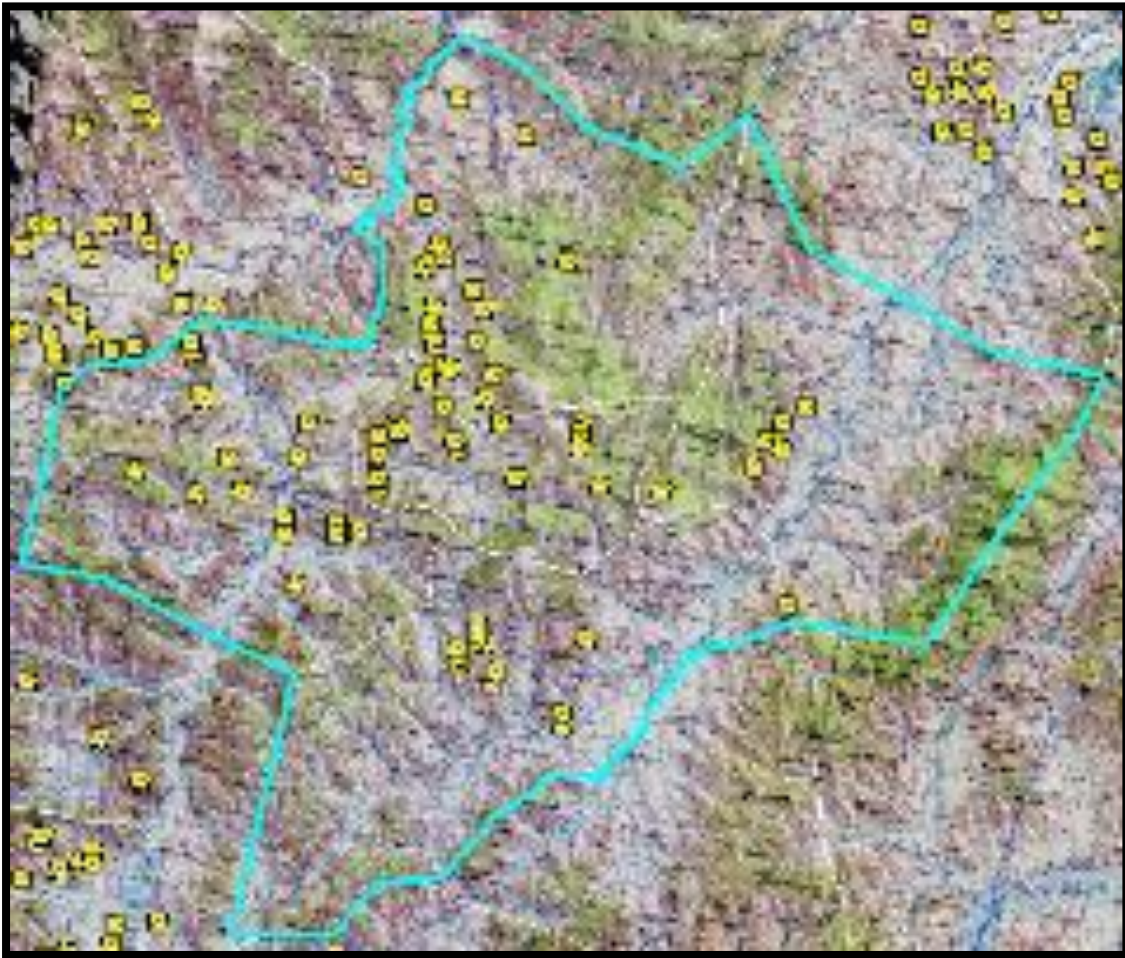


Control soums

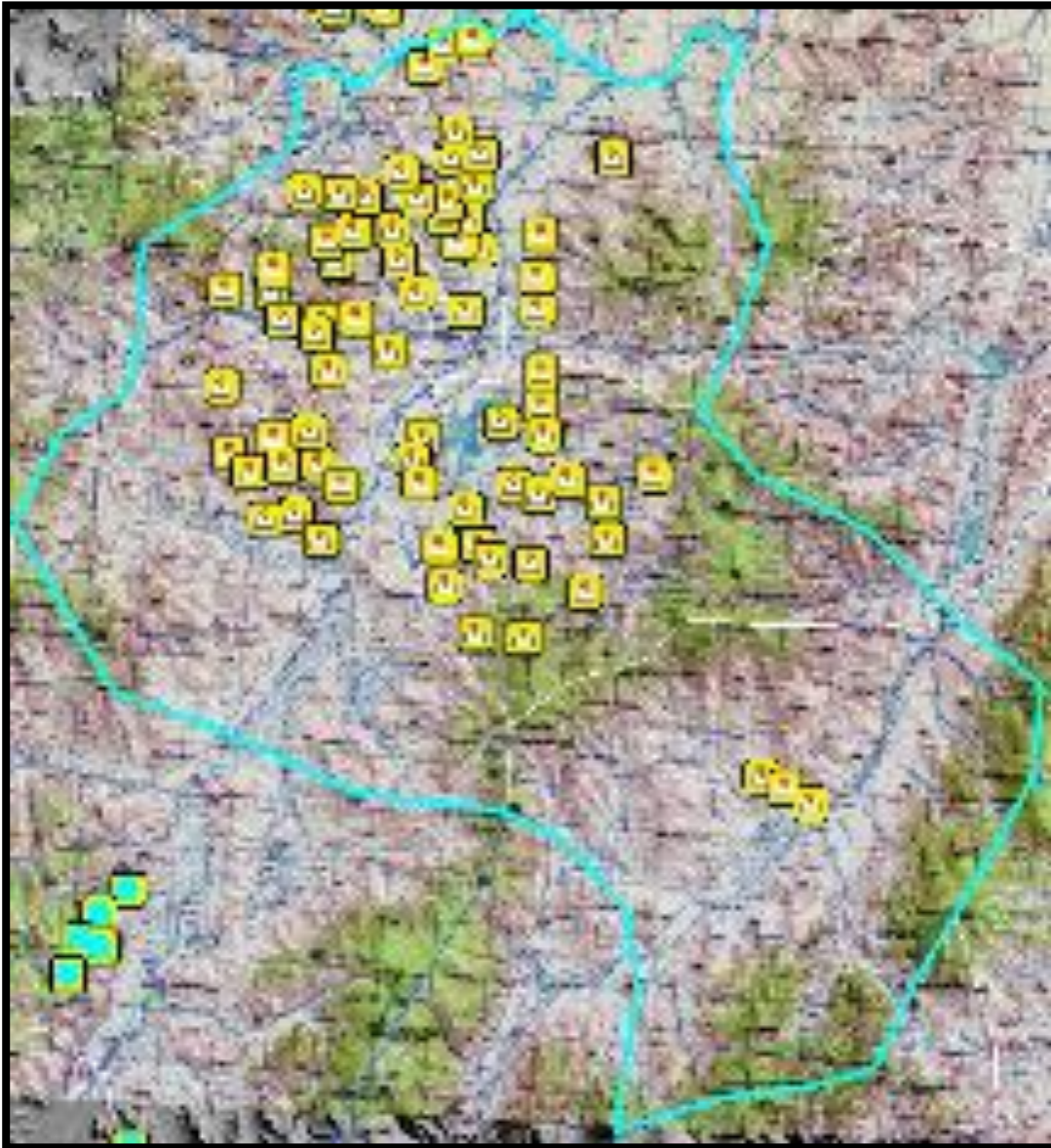
1. Arhangai, Tariat



2. Arhangai, Undur-Ulaan



3. Arhangai, Erdenemandal



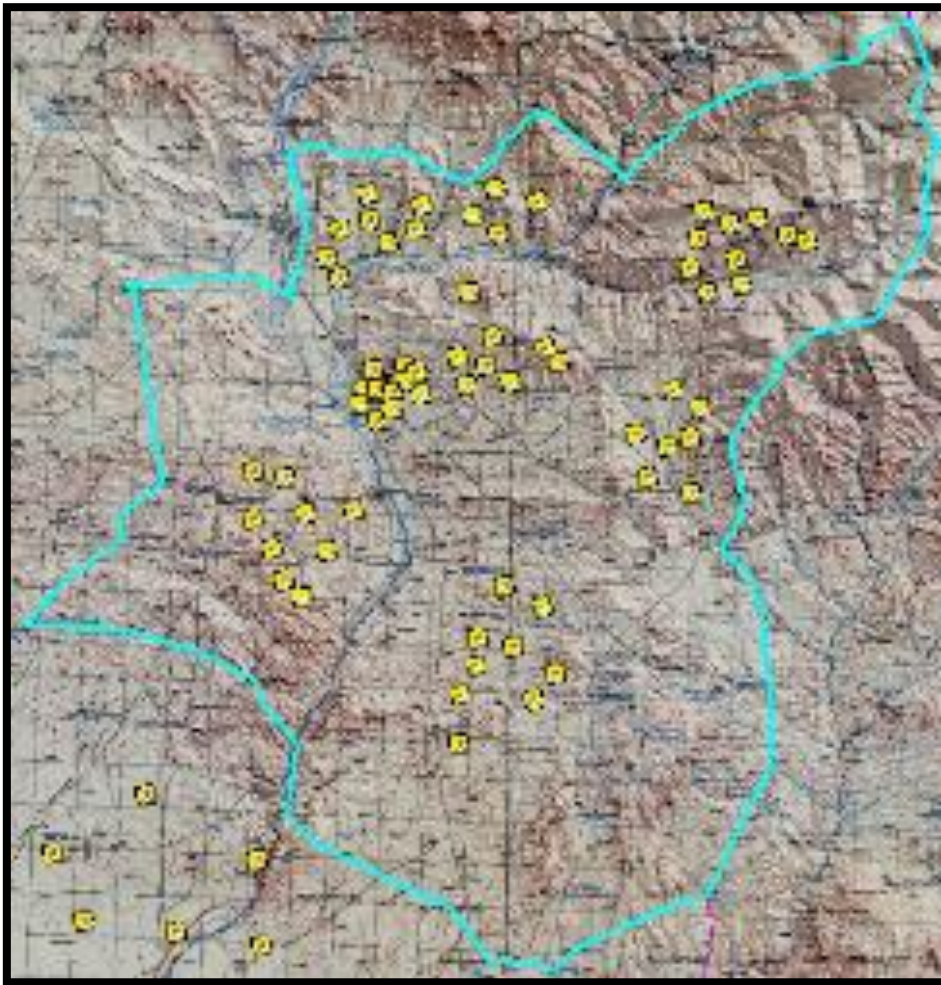
4. Bayanhongor, Bogd



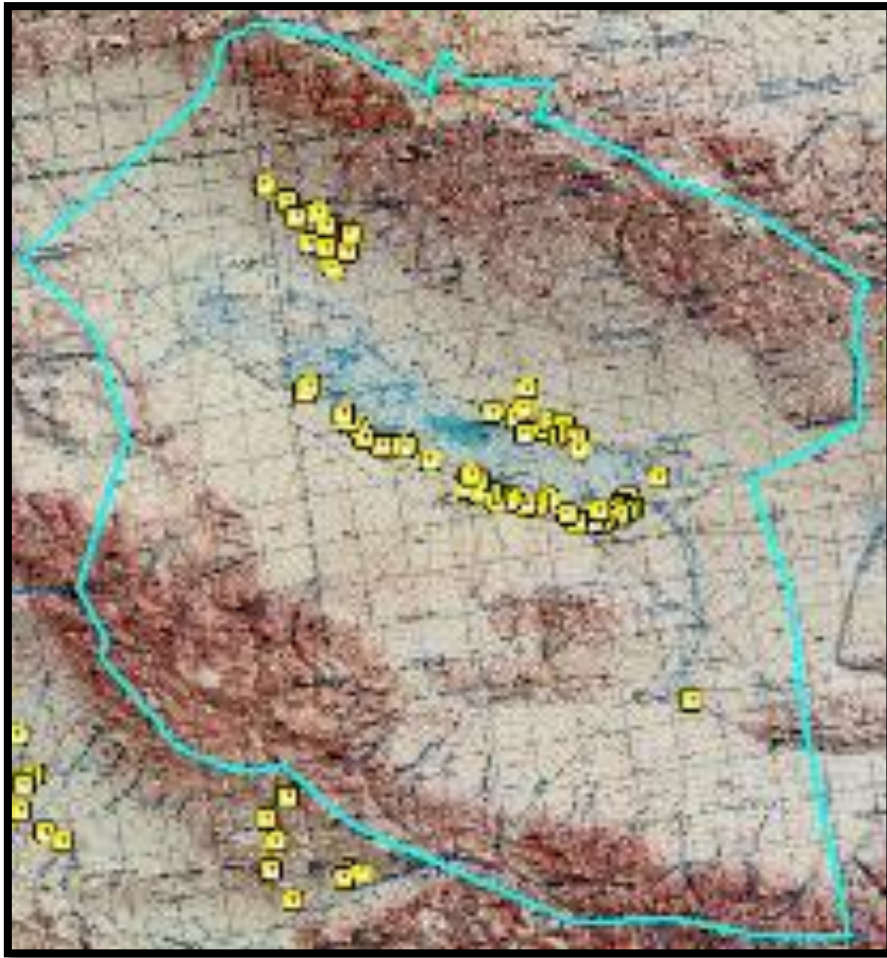
5. Bayanhongor, Jinst



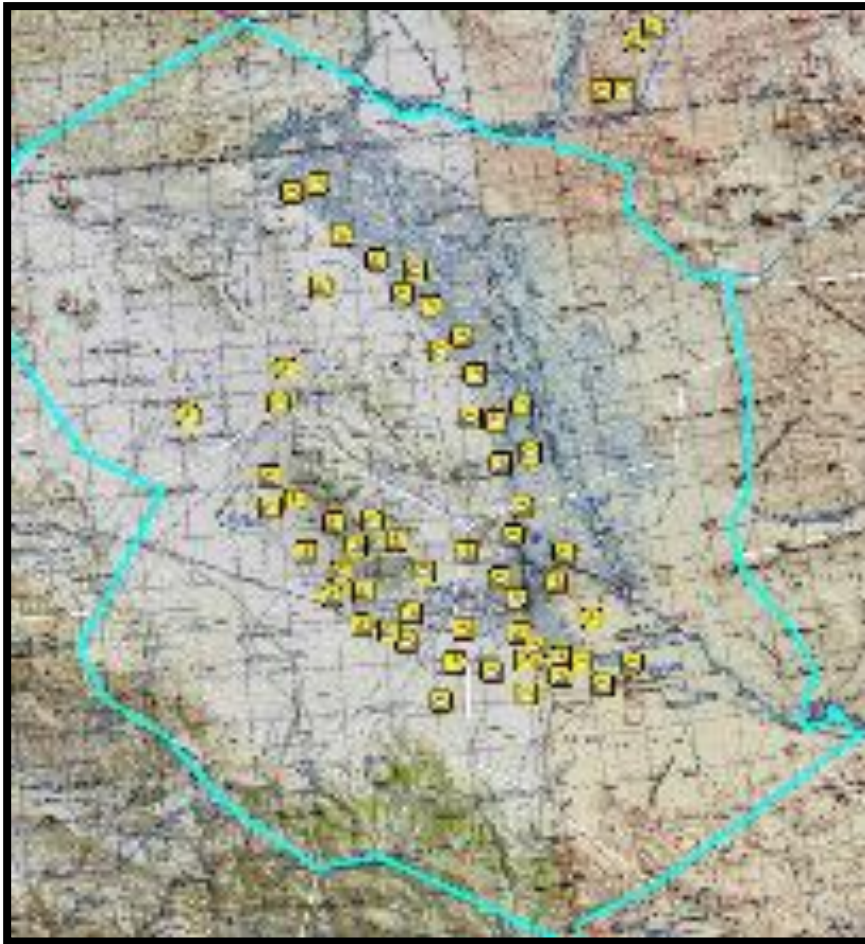
6. Bayanhongor, Ulziit



7. Gobi-Altai, Biger



8. Gobi-Altai, Jargalan



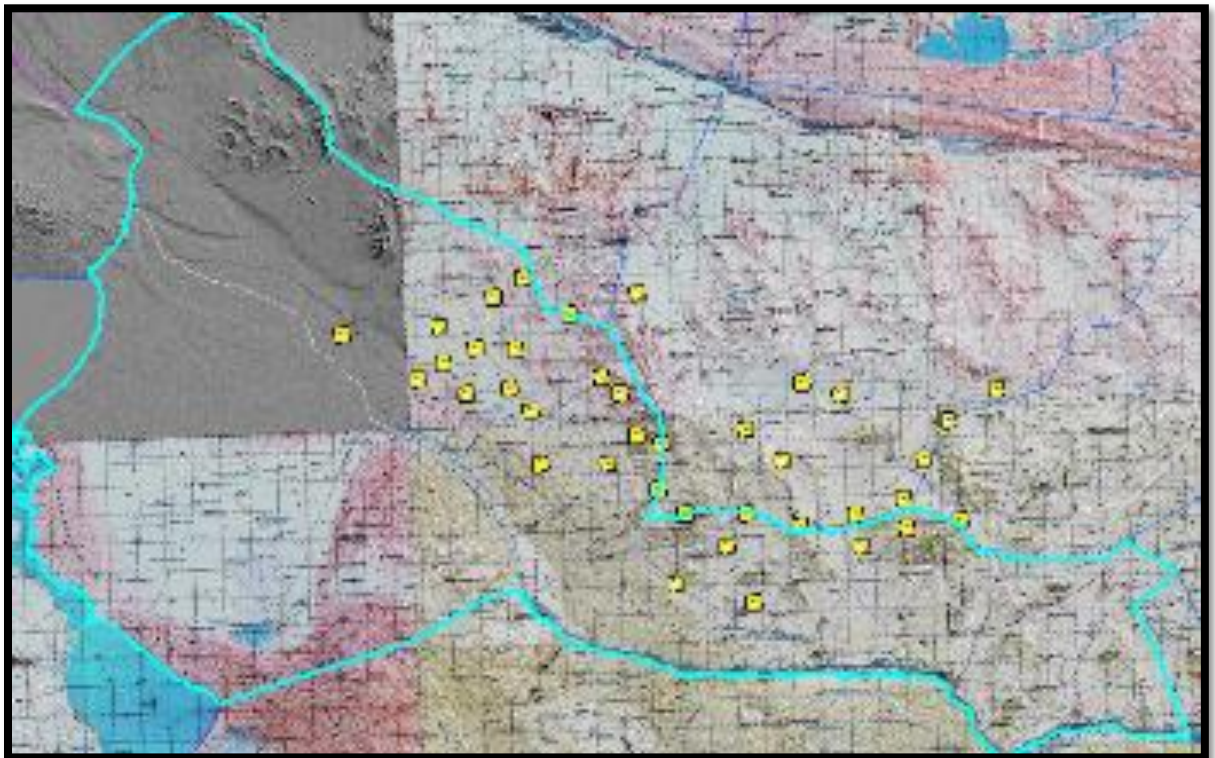
9. Gobi-Altai, Tugrug



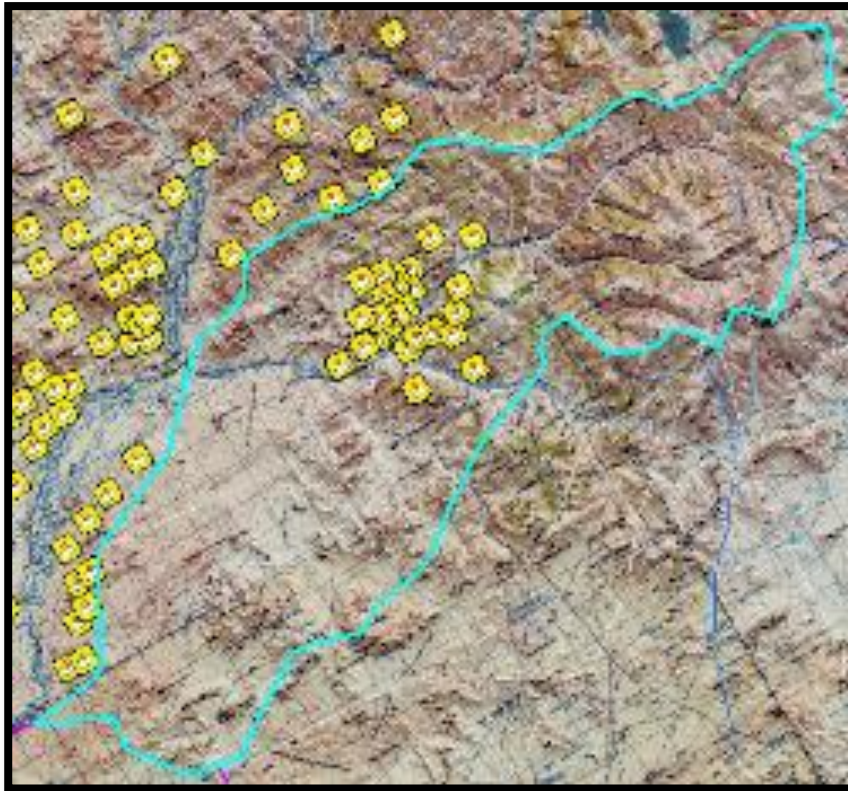
10. Zavhan, Aldarhaan



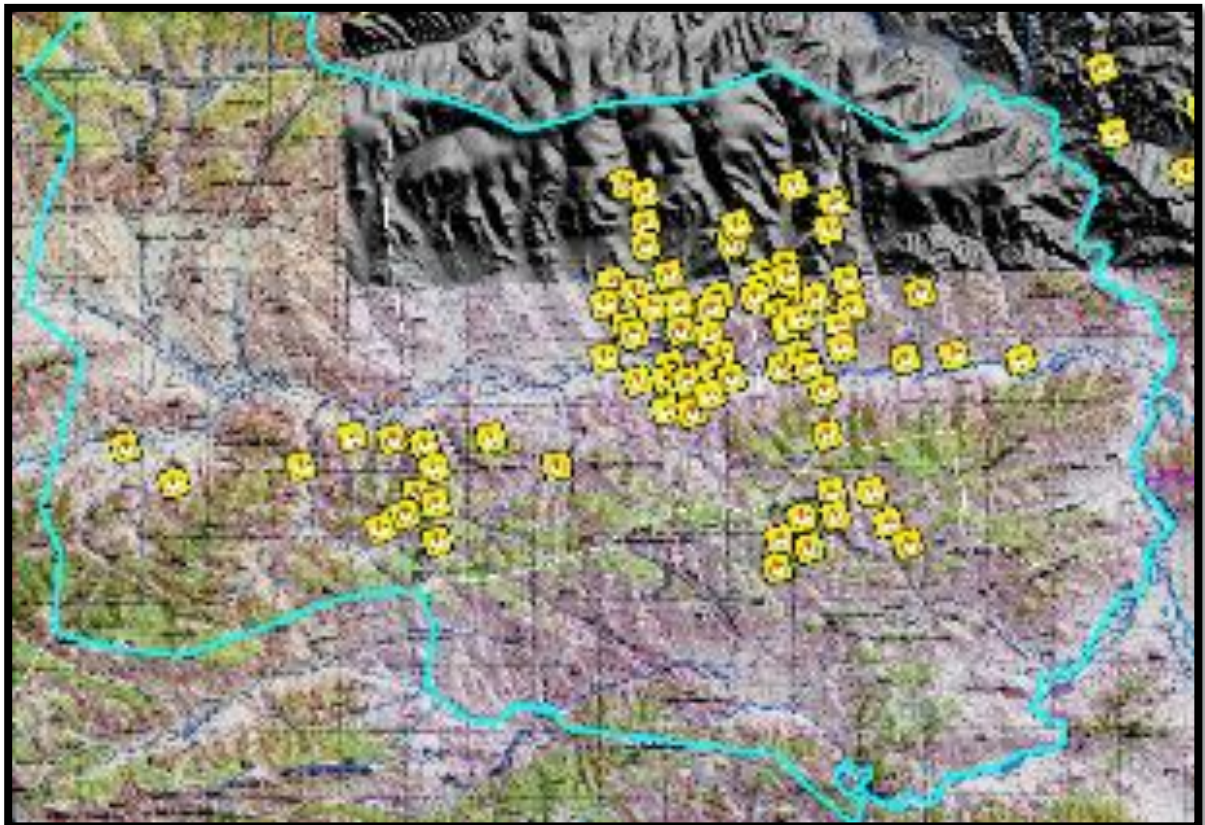
11. Zavhan, Durvuljin



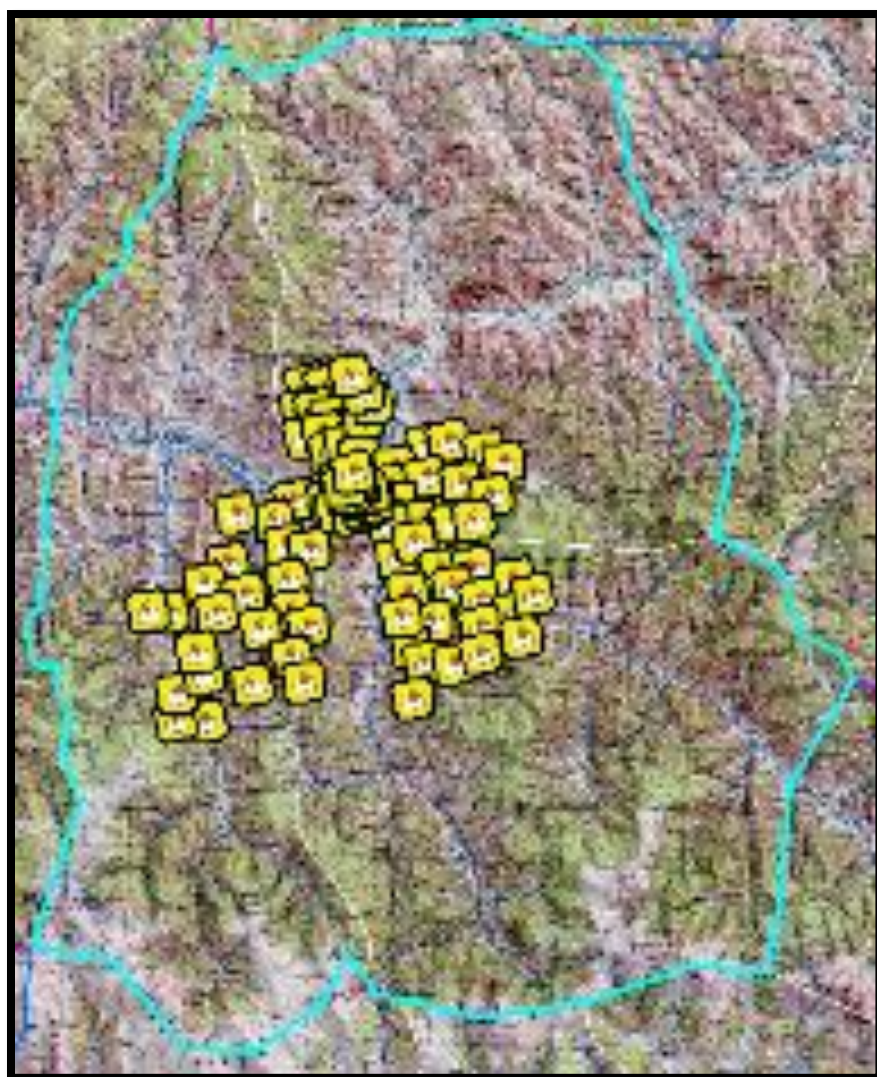
12. Zavhan, Tsagaanhairhan



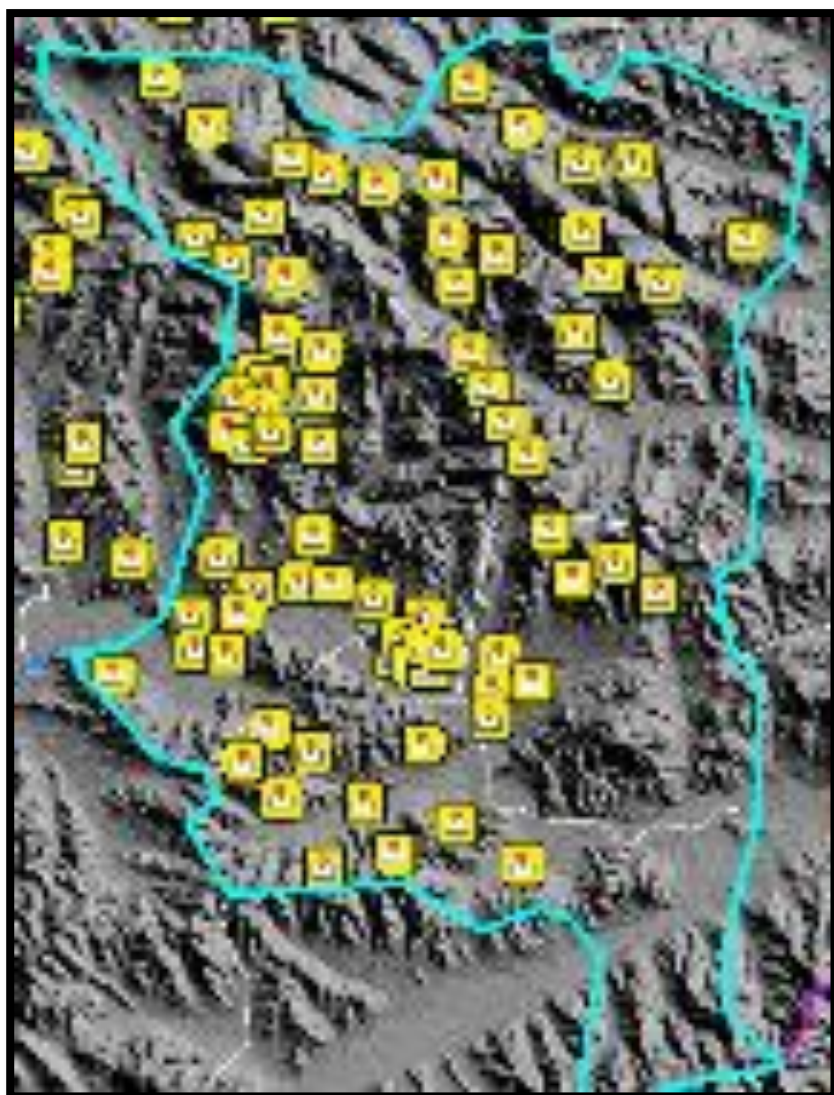
13. Huvsgul, Tumurbulag



14. Huvsgul, Jargalan



15. Huvsgul, lh-Uul



Annex 4: Detailed tables

A4: Table 1. Household members average age

	Treatment	Control	Female headed household		Vulnerable household		Sig.	t
			Treatment	Control	Treatment	Control		
Average age of household head	47.1	47.6	47.6	54.1	44.4	43.5	0.817	-0.940
Average age of household member	41.7	42.0	42.0	26.3	38.1	35.5	0.259	-0.433
Average age of household member	17.8	18.4	18.4	18.6	17.4	16.7	0.050	-1.331
Average age of household member	13.5	14.0	14.0	13.1	13.3	13.2	0.670	-1.005
Average age of household member	10.5	10.9	10.9	8.8	12.2	10.2	0.102	-0.747
Average age of household member	8.2	8.5	8.5	7.6	8.9	8.3	0.045	-0.349

A4: Table 2. Household heads' literacy level

	All household		Female headed household		Vulnerable household	
	Treatment	Control	Treatment	Control	Treatment	Control
Can read and write	95.4%	95.0%	95.0%	96.3%	89.7%	91.1%
Can read, can't write	2.7%	2.8%	2.0%	1.9%	7.4%	5.4%
Can't read and write	1.9%	2.2%	3.0%	1.9%	2.9%	3.6%

A4: Table 3. Households' assets by female-headed and vulnerable

	Female headed household				Vulnerable household			
	Treatment		Control		Treatment		Control	
	Count	%	Count	%	Count	%	Count	%
Refrigerator and Ice box	53	51.0%	51	49.0%	63	52.5%	57	47.5%
TV and satellite antenna	77	48.4%	82	51.6%	113	49.3%	116	50.7%
Solar panel	63	49.2%	65	50.8%	85	44.7%	105	55.3%
Wind-powered generator	2	66.7%	1	33.3%	3	75.0%	1	25.0%
Small-scale diesel generator	8	50.0%	8	50.0%	11	47.8%	12	52.2%
Cell phone	98	48.0%	106	52.0%	133	45.1%	162	54.9%
Carriage drawn by animals	6	60.0%	4	40.0%	15	50.0%	15	50.0%
Truck	11	47.8%	12	52.2%	14	38.9%	22	61.1%
Passenger car	16	66.7%	8	33.3%	28	71.8%	11	28.2%
Motorcycle	37	52.1%	34	47.9%	100	50.5%	98	49.5%
Animal sheds	64	48.5%	68	51.5%	81	41.8%	113	58.2%
Well	17	50.0%	17	50.0%	21	52.5%	19	47.5%
Wool combing machine	2	100.0%	0	0.0%	5	55.6%	4	44.4%
Haymaking machine	23	50.0%	23	50.0%	37	42.0%	51	58.0%
Planting equipment	20	80.0%	5	20.0%	15	83.3%	3	16.7%
Ploughs	12	80.0%	3	20.0%	7	87.5%	1	12.5%

	Female headed household				Vulnerable household			
	Treatment		Control		Treatment		Control	
	Count	%	Count	%	Count	%	Count	%
Milk cream separator	7	63.6%	4	36.4%	8	100.0%	0	0.0%
Land in urban areas	49	50.5%	48	49.5%	67	49.3%	69	50.7%
Land in rural areas	6	60.0%	4	40.0%	6	60.0%	4	40.0%

A4: Table 4. Household seasonal camps' location

		Treatment	Control	Female headed household		Vulnerable household		Sig.	t
				Treatment	Control	Treatment	Control		
Winter camp	In the current <i>soum</i>	99.1%	99.7%	100.0%	98.6%	97.7%	99.1%	0.003	1.492
	In the another <i>soum</i>	0.9%	0.3%	0.0%	1.4%	2.3%	0.9%		
	In the another <i>aimag</i>	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
Spring camp	In the current <i>soum</i>	99.4%	99.4%	100.0%	98.0%	98.4%	98.7%	1.000	0.000
	In the another <i>soum</i>	0.6%	0.6%	0.0%	2.0%	1.6%	1.3%		
	In the another <i>aimag</i>	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
Summer camp	In the current <i>soum</i>	98.9%	99.2%	100.0%	98.4%	97.7%	99.1%	0.659	0.224
	In the another <i>soum</i>	1.1%	0.6%	0.0%	1.6%	2.3%	0.9%		
	In the another <i>aimag</i>	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%		
Autumn camp	In the current <i>soum</i>	99.6%	99.3%	97.7%	97.6%	98.5%	97.4%	0.254	-0.571
	In the another <i>soum</i>	0.4%	0.7%	2.3%	2.4%	1.5%	2.6%		
	In the another <i>aimag</i>	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		

A4: Table 5. Transportation between seasonal camps

		Treatment		Control		Female headed household				Vulnerable household	
		N	%	N	%	Treatment		Control		Treatment	
						N	%	N	%	N	%
Winter camp	By own vehicle	353	53.3%	293	42.0%	20	34.5%	20	28.6%	24	16.2%
	Rent vehicle	290	43.8%	382	54.8%	35	60.3%	48	68.6%	59	80.2%
	Carriage drawn by animal	9	1.4%	13	1.9%	0	0.0%	1	1.4%	3	0.9%
	Other	10	1.5%	9	1.3%	3	5.2%	1	1.4%	2	2.7%
Spring camp	By own vehicle	314	59.6%	249	47.2%	21	51.2%	16	32.0%	23	19.0%
	Rent vehicle	205	38.9%	268	50.9%	20	48.8%	31	62.0%	36	77.2%
	Carriage drawn by animal	4	0.8%	8	1.5%	0	0.0%	1	2.0%	2	1.3%
	Other	4	0.8%	2	0.4%	0	0.0%	2	4.0%	1	2.5%

Summer camp	By own vehicle	347	54.9%	264	42.6%	23	40.4%	17	27.0%	21	16.8%
	Rent vehicle	277	43.8%	340	54.9%	34	59.6%	45	71.4%	63	80.4%
	Carriage drawn by animal	6	0.9%	13	2.1%	0	0.0%	0	0.0%	3	1.9%
	Other	2	0.3%	2	0.3%	0	0.0%	1	1.6%	0	0.9%
Autumn camp	By own vehicle	284	56.3%	212	46.9%	20	45.5%	15	36.6%	20	19.7%
	Rent vehicle	213	42.3%	230	50.9%	24	54.5%	26	63.4%	42	78.9%
	Carriage drawn by animal	5	1.0%	8	1.8%	0	0.0%	0	0.0%	3	1.3%
	Other	2	0.4%	2	0.4%	0	0.0%	0	0.0%	0	0.0%

A4: Table 6. Household income in the baseline period, by MNT

		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	48,232	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 live 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	830,206	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	1,566,403	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 sample	Female HH head	Male HH head	Herd Size Q1	Herd Size Q2	Herd Size Q3	Herd Size Q4
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

A4: Table 7. Household expenditure in the baseline period, by MNT

		Total Sample	Female HH Head	Male HH Head	Herd Size Q1	Herd Size Q2	Herd Size Q3	Herd Size Q4
On livestock purchases	Mean	404,506	34,432	448,537	12,085	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
On animal breeding	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
On animal health	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
On animal nutrition	Mean	171,827	119,199	177,772	68,400	123,630	186,979	295,002.00
	SD	280,354	229,294	285,039	186,322	193,099	287,210	353,870.00
On migration	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
On paid labor	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	1,125,512	232,416
Transportation to output buyers	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
HH livestock operation	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
HH member's education	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
Housing amenities	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
Vehicles	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
Health care and medicine	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
Other agricultural items	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 Sample	Female HH Head	Male HH Head	Herd Size Q1	Herd Size Q2	Herd Size Q3	Herd Size Q4
Personal goods	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
Other items	Mean	1,961,173	1,126,367	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	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	4,394,636	4,795,666	4,652,587	6,538,981
Number of observations		867	88	779	212	206	209	235

A4: Table 8. Membership of cooperatives

		Households		Female headed household		Vulnerable household	
		Treatment	Control	Treatment	Control	Treatment	Control
		Count	Count	Count	Count	Count	Count
Member of an [ORGANIZATION]?	Yes	509	269	59	22	59	28
	No	391	631	42	85	77	140
Type of the organization	Cooperative	478	240	58	19	57	26
	Partnership	21	20	1	2	2	1
	Companionship	0	0	0	0	0	0
	LLC	10	5	0	1	0	0
	NGO	0	4	0	0	0	1

A4: Table 9. Attendance in cooperative meeting

	Treatment	Control	Female headed household		Vulnerable household		Sig.	t
			Treatment	Control	Treatment	Control		
Often	47.9%	34.9%	67.8%	40.9%	47.5%	50.0%	0.796	-4.304
Sometimes	41.7%	45.4%	25.4%	31.8%	37.3%	32.1%		
Not attend	10.4%	19.7%	6.8%	27.3%	15.3%	17.9%		

A4: Table 10. Household members who received project support

		Total households		Female headed household		Vulnerable household	
		Count	%	Count	%	Count	%
Grant for meat processing	Male member of the HH	11	57.9%	0	0.0%	2	100.0%
	Female member of the HH	0	0.0%	0	0.0%	0	0.0%
	Both	7	36.8%	0	0.0%	0	0.0%
	Child	1	5.3%	0	0.0%	0	0.0%
Grant for dairy processing	Male member of the HH	7	58.3%	0	0.0%	1	50.0%
	Female member of the HH	0	0.0%	0	0.0%	0	0.0%
	Both	4	33.3%	0	0.0%	1	50.0%

		Total households		Female headed household		Vulnerable household	
		Count	%	Count	%	Count	%
Grant for wool and cashmere processing	Child	1	8.3%	0	0.0%	0	0.0%
	Male member of the HH	14	63.6%	2	66.7%	1	50.0%
	Female member of the HH	2	9.1%	0	0.0%	0	0.0%
	Both	4	18.2%	0	0.0%	1	50.0%
	Child	2	9.1%	1	33.3%	0	0.0%
Grant for horticulture operation	Male member of the HH	41	45.1%	9	52.9%	5	38.5%
	Female member of the HH	13	14.3%	3	17.6%	2	15.4%
	Both	24	26.4%	4	23.5%	5	38.5%
	Child	13	14.3%	1	5.9%	1	7.7%
Grant for greenhouse operation	Male member of the HH	28	56.0%	8	88.9%	5	62.5%
	Female member of the HH	2	4.0%	1	11.1%	0	0.0%
	Both	18	36.0%	0	0.0%	3	37.5%
	Child	2	4.0%	0	0.0%	0	0.0%
Grant for animal feed and forage	Male member of the HH	80	79.2%	5	71.4%	13	86.7%
	Female member of the HH	6	5.9%	2	28.6%	2	13.3%
	Both	12	11.9%	0	0.0%	0	0.0%
	Child	3	3.0%	0	0.0%	0	0.0%
Nucleus flock	Male member of the HH	301	83.1%	22	88.0%	28	77.8%
	Female member of the HH	4	1.1%	0	0.0%	0	0.0%
	Both	37	10.2%	1	4.0%	2	5.6%
	Child	20	5.5%	2	8.0%	6	16.7%
Veterinary service equipment	Male member of the HH	231	64.9%	32	74.4%	36	60.0%
	Female member of the HH	14	3.9%	4	9.3%	2	3.3%
	Both	89	25.0%	3	7.0%	16	26.7%
	Child	22	6.2%	4	9.3%	6	10.0%
Agricultural equipment	Male member of the HH	50	59.5%	7	63.6%	4	40.0%
	Female member of the HH	8	9.5%	2	18.2%	2	20.0%
	Both	18	21.4%	2	18.2%	3	30.0%
	Child	8	9.5%	0	0.0%	1	10.0%
Support to livestock products market	Male member of the HH	10	50.0%	2	100.0%	2	50.0%
	Female member of the HH	2	10.0%	0	0.0%	1	25.0%
	Both	6	30.0%	0	0.0%	0	0.0%
	Child	2	10.0%	0	0.0%	1	25.0%
Support to horticulture products market	Male member of the HH	28	48.3%	6	60.0%	4	36.4%
	Female member of the HH	9	15.5%	1	10.0%	3	27.3%
	Both	16	27.6%	3	30.0%	4	36.4%

		Total households		Female headed household		Vulnerable household	
		Count	%	Count	%	Count	%
	Child	5	8.6%	0	0.0%	0	0.0%
Support for animal feed market	Male member of the HH	33	68.8%	2	100.0%	4	80.0%
	Female member of the HH	4	8.3%	0	0.0%	1	20.0%
	Both	9	18.8%	0	0.0%	0	0.0%
	Child	2	4.2%	0	0.0%	0	0.0%
Other (Write)	Male member of the HH	23	62.2%	3	75.0%	1	20.0%
	Female member of the HH	5	13.5%	1	25.0%	2	40.0%
	Both	6	16.2%	0	0.0%	2	40.0%
	Child	3	8.1%	0	0.0%	0	0.0%

A4: Table 11. Targeted population for next level

	treatment group		Female headed household		Vulnerable household	
	Count	%	Count	%	Count	%
Cooperatives	330	36.7%	38	37.6%	53	39.0%
Households	366	40.7%	39	38.6%	46	33.8%
Entrepreneurs	59	6.6%	5	5.0%	8	5.9%
Vulnerable	118	13.1%	19	18.8%	23	16.9%
Other (Write)	27	3.0%	0	0.0%	6	4.4%

A4: Table 12. Produced fibers and skins

	Treatment	Control	Female headed household		Vulnerable household		Sig.	t
			Treatment	Control	Treatment	Control		
Total produced cashmere, kg	46.3	44.9	29.7	30.2	20.4	17.3	0.376	0.515
Total produced sheep wool, kg	173.6	141.6	79.9	68.2	77.3	61.3	0.000	3.104
Total produced camel wool, kg	61.2	134.2	5.0			40.0	0.025	-1.283
Total produced cattle wool, kg	12.6	13.7	13.6	7.5	6.0	11.9	0.567	-0.580
Total produced horse skin, n	1.5	1.6	1.3	1.5	1.1	1.1	0.253	-0.840
Total produced cow hide, n	2.7	2.6	3.0	1.9	1.6	1.5	0.537	0.536
Total produced goat skin, n	11.3	14.7	8.6	11.1	7.2	7.3	0.000	-3.764
Total produced sheep skin, n	16.1	15.2	10.3	6.9	6.2	6.5	0.368	0.490
Total produced camel skin, n	7.0	2.3			6.0	4.3	0.000	2.068

A4: Table 13. Meat market channel in *aimag* level

Sold animal still alive	Bayanhongor <i>aimag</i>				Arhangai <i>aimag</i>				Huvsgul <i>aimag</i>				Zavhan <i>aimag</i>				Govi-Altai <i>aimag</i>			
	Treatment		Control		Treatment		Control		Treatment		Control		Treatment		Control		Treatment		Control	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Changers (middleman)	47	56.6%	57	70.4%	38	52.1%	45	57.7%	97	85.8%	70	76.1%	52	77.6%	40	76.9%	30	46.9%	41	61.2%
A cooperative that I belong to	4	4.8%	0	0.0%	1	1.4%	1	1.3%	0	0.0%	1	1.1%	0	0.0%	0	0.0%	7	10.9%	5	7.5%
A cooperative that I do not belong to	1	1.2%	0	0.0%	0	0.0%	1	1.3%	0	0.0%	1	1.1%	0	0.0%	0	0.0%	1	1.6%	0	0.0%
A representative from a processor who came to me	2	2.4%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	2	3.0%	1	1.9%	1	1.6%	1	1.5%
Sell to direct customers	6	7.2%	5	6.2%	6	8.2%	22	28.2%	13	11.5%	12	13.0%	13	19.4%	8	15.4%	22	34.4%	11	16.4%
Didn't sell	23	27.7%	19	23.5%	28	38.4%	9	11.5%	3	2.7%	8	8.7%	0	0.0%	3	5.8%	3	4.7%	9	13.4%
Sold slaughtered																				
Changers (middleman)	32	68.1%	45	63.4%	64	69.6%	61	56.0%	96	86.5%	61	73.5%	18	78.3%	12	63.2%	11	44.0%	32	66.7%
A cooperative that I belong to	0	0.0%	1	1.4%	3	3.3%	0	0.0%	0	0.0%	6	7.2%	0	0.0%	0	0.0%	3	12.0%	5	10.4%
A cooperative that I do not belong to	0	0.0%	1	1.4%	0	0.0%	0	0.0%	1	0.9%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	2.1%
A representative from a processor who came to me	0	0.0%	1	1.4%	0	0.0%	1	0.9%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	4.0%	0	0.0%
Sell to direct customers	4	8.5%	4	5.6%	12	13.0%	33	30.3%	10	9.0%	15	18.1%	5	21.7%	7	36.8%	7	28.0%	6	12.5%
Didn't sell	11	23.4%	19	26.8%	13	14.1%	14	12.8%	4	3.6%	1	1.2%	0	0.0%	0	0.0%	3	12.0%	4	8.3%

A4: Table 14. Fiber market channel in *aimag* level

	Bayanhongor <i>aimag</i>				Arhangai <i>aimag</i>				Huvsgul <i>aimag</i>				Zavhan <i>aimag</i>				Govi-Altai <i>aimag</i>			
	Treatment		Control		Treatment		Control		Treatment		Control		Treatment		Control		Treatment		Control	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Cashmere																				
Changers (middleman)	102	76.7%	127	93.4%	136	83.4%	141	77.9%	173	93.0%	130	72.6%	87	87.0%	97	99.0%	111	74.5%	105	74.5%
A cooperative that I belong to	21	15.8%	4	2.9%	14	8.6%	27	14.9%	2	1.1%	26	14.5%	10	10.0%	0	0.0%	29	19.5%	24	17.0%
A cooperative that I do not belong to	7	5.3%	1	0.7%	8	4.9%	9	5.0%	3	1.6%	10	5.6%	3	3.0%	0	0.0%	3	2.0%	6	4.3%
A representative from a processor who came to me	1	0.8%	0	0.0%	0	0.0%	1	0.6%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	2	1.4%
Sell to direct customers	2	1.5%	2	1.5%	3	1.8%	1	0.6%	5	2.7%	10	5.6%	0	0.0%	0	0.0%	1	0.7%	2	1.4%
Didn't sell	0	0.0%	2	1.5%	2	1.2%	2	1.1%	3	1.6%	3	1.7%	0	0.0%	1	1.0%	5	3.4%	2	1.4%
Sheep wool																				
Changers (middleman)	66	50.4%	89	67.4%	129	78.7%	137	75.7%	152	84.9%	106	62.4%	48	49.0%	54	58.1%	57	43.8%	63	50.0%
A cooperative that I belong to	50	38.2%	9	6.8%	18	11.0%	28	15.5%	10	5.6%	38	22.4%	32	32.7%	23	24.7%	47	36.2%	43	34.1%
A cooperative that I do not belong to	6	4.6%	2	1.5%	14	8.5%	12	6.6%	3	1.7%	16	9.4%	16	16.3%	12	12.9%	15	11.5%	10	7.9%
A representative from a processor who came to me	1	0.8%	4	3.0%	0	0.0%	1	0.6%	3	1.7%	0	0.0%	0	0.0%	2	2.2%	0	0.0%	6	4.8%
Sell to direct customers	0	0.0%	1	0.8%	1	0.6%	2	1.1%	5	2.8%	8	4.7%	0	0.0%	0	0.0%	0	0.0%	1	0.8%
Didn't sell	8	6.1%	27	20.5%	2	1.2%	1	0.6%	6	3.4%	2	1.2%	2	2.0%	2	2.2%	11	8.5%	3	2.4%
Big animal wool																				
Changers (middleman)	13	40.6%	3	15.8%	27	71.1%	44	67.7%	0	0.0%	0	0.0%	9	47.4%	3	50.0%	1	16.7%	9	34.6%
A cooperative that I belong to	10	31.3%	0	0.0%	4	10.5%	11	16.9%	0	0.0%	0	0.0%	7	36.8%	1	16.7%	2	33.3%	6	23.1%
A cooperative that I do not belong to	2	6.3%	0	0.0%	4	10.5%	5	7.7%	0	0.0%	0	0.0%	2	10.5%	0	0.0%	1	16.7%	0	0.0%

	Bayanhongor aimag				Arhangai aimag				Huvsgul aimag				Zavhan aimag				Govi-Altai aimag			
A representative from a processor who came to me	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	3.8%
Sell to direct customers	0	0.0%	0	0.0%	0	0.0%	1	1.5%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	3.8%
Didn't sell	7	21.9%	16	84.2%	3	7.9%	4	6.2%	1	####	0	0.0%	1	5.3%	2	33.3%	2	33.3%	9	34.6%
Animal hide and skin																				
Changers (middleman)	83	63.4%	104	77.0%	116	77.3%	137	75.7%	175	92.6%	141	75.0%	73	73.0%	90	94.7%	90	62.1%	96	72.7%
A cooperative that I belong to	34	26.0%	4	3.0%	12	8.0%	28	15.5%	5	2.6%	27	14.4%	18	18.0%	1	1.1%	34	23.4%	28	21.2%
A cooperative that I do not belong to	3	2.3%	1	0.7%	14	9.3%	9	5.0%	0	0.0%	8	4.3%	9	9.0%	2	2.1%	6	4.1%	6	4.5%
A representative from a processor who came to me	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	0.5%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	0.8%
Sell to direct customers	0	0.0%	1	0.7%	1	0.7%	3	1.7%	8	4.2%	9	4.8%	0	0.0%	0	0.0%	1	0.7%	0	0.0%
Didn't sell	11	8.4%	25	18.5%	7	4.7%	4	2.2%	0	0.0%	3	1.6%	0	0.0%	2	2.1%	14	9.7%	1	0.8%

A4: Table 15. Milk and dairy product sales channel

		Bayanhongor aimag				Arhangai aimag				Huvsgul aimag				Zavhan aimag				Govi-Altai aimag			
		Treatment		Control		Treatment		Control		Treatment		Control		Treatment		Control		Treatment		Control	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Milk	Changers (middleman)	4	3.1%	10	7.5%	52	29.9%	32	16.4%	18	10.0%	3	1.7%	10	12.0%	5	7.7%	6	4.2%	8	5.9%
	Cooperative that I belong to	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	2	2.4%	0	0.0%	1	0.7%	2	1.5%
	Cooperative that I do not belong to	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	1.2%	1	1.5%	0	0.0%	0	0.0%
	Representative from a processor who came to me	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	1.5%	0	0.0%	0	0.0%

		Bayanhongor <i>aimag</i>				Arhangai <i>aimag</i>				Huvsgul <i>aimag</i>				Zavhan <i>aimag</i>				Govi-Altai <i>aimag</i>			
		Treatment		Control		Treatment		Control		Treatment		Control		Treatment		Control		Treatment		Control	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
	Sell to direct customers	7	5.5%	7	5.2%	9	5.2%	11	5.6%	17	9.4%	12	6.9%	10	12.0%	10	15.4%	10	7.0%	16	11.9%
	Didn't sell	117	91.4%	117	87.3%	113	64.9%	152	77.9%	145	80.6%	158	91.3%	60	72.3%	48	73.8%	125	88.0%	109	80.7%
Dairy product	Changers (middleman)	24	19.4%	20	15.0%	105	60.0%	53	27.3%	32	18.0%	10	5.8%	17	20.2%	4	6.3%	6	4.3%	12	8.8%
	Cooperative that I belong to	2	1.6%	0	0.0%	0	0.0%	2	1.0%	0	0.0%	0	0.0%	1	1.2%	0	0.0%	2	1.4%	3	2.2%
	A cooperative that I do not belong to	0	0.0%	1	0.8%	1	0.6%	0	0.0%	0	0.0%	0	0.0%	2	2.4%	0	0.0%	0	0.0%	0	0.0%
	Representative from a processor who came to me	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	Sell to direct customers	11	8.9%	18	13.5%	17	9.7%	40	20.6%	12	6.7%	23	13.4%	9	10.7%	7	10.9%	16	11.5%	22	16.1%
	Didn't sell	87	70.2%	94	70.7%	52	29.7%	99	51.0%	134	75.3%	139	80.8%	55	65.5%	53	82.8%	115	82.7%	100	73.0%
Milk	In the <i>soum</i> centre	5	45.5%	7	41.2%	40	65.6%	29	67.4%	8	22.9%	15	####	19	82.6%	2	11.8%	16	94.1%	22	84.6%
	In the <i>aimag</i> centre	5	45.5%	10	58.8%	2	3.3%	2	4.7%	27	77.1%	0	0.0%	4	17.4%	15	88.2%	1	5.9%	4	15.4%
	In the Ulaanbaatar	0	0.0%	0	0.0%	18	29.5%	11	25.6%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	In the other <i>aimag</i> and <i>soum</i>	1	9.1%	0	0.0%	1	1.6%	1	2.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Dairy product	In the <i>soum</i> centre	17	45.9%	14	35.9%	78	63.4%	41	43.2%	4	9.1%	29	87.9%	21	72.4%	3	27.3%	20	83.3%	30	81.1%
	In the <i>aimag</i> centre	17	45.9%	24	61.5%	4	3.3%	13	13.7%	40	90.9%	4	12.1%	5	17.2%	8	72.7%	3	12.5%	6	16.2%
	In the Ulaanbaatar	1	2.7%	1	2.6%	39	31.7%	38	40.0%	0	0.0%	0	0.0%	1	3.4%	0	0.0%	0	0.0%	0	0.0%

		Bayanhongor aimag				Arhangai aimag				Huvsgul aimag				Zavhan aimag				Govi-Altai aimag			
		Treatment		Control		Treatment		Control		Treatment		Control		Treatment		Control		Treatment		Control	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
	In the other aimag and soum	2	5.4%	0	0.0%	2	1.6%	3	3.2%	0	0.0%	0	0.0%	2	6.9%	0	0.0%	1	4.2%	1	2.7%

A4: Table 16. Veterinary service unit needs

	Treatment	Control	Female headed household		Vulnerable household	
			Treatment	Control	Treatment	Control
Need to train veterinarian	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Need to supply veterinary medicine	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Need to supply animal breeding technique	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Need to improve veterinary vaccine quality	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

A4: Table 17. Received veterinary service in 2017

						Female headed household				Vulnerable household			
		Treatment		Control		Treatment		Control		Treatment		Control	
		N	%	N	%	N	%	N	%	N	%	N	%
Did the livestock of your household receive vaccination service in 2017?	Yes	718	96.4%	683	91.4%	71	94.7%	77	89.5%	102	93.6%	120	87.6%
	No	27	3.6%	64	8.6%	4	5.3%	9	10.5%	7	6.4%	17	12.4%
Against brucellosis	Yes	489	100.0%	413	100.0%	50	100.0%	45	100.0%	71	100.0%	66	100.0%
Against ecthyma	Yes	230	100.0%	239	100.0%	17	100.0%	21	100.0%	29	100.0%	40	100.0%
Against contagious agalactia	Yes	396	100.0%	396	100.0%	29	100.0%	37	100.0%	49	100.0%	70	100.0%
Other (specify)	Yes	338	100.0%	292	100.0%	42	100.0%	30	100.0%	39	100.0%	38	100.0%
Did the livestock of your household receiving medicine service in 2017?	Yes	667	89.5%	686	91.8%	69	92.0%	77	89.5%	99	90.8%	128	93.4%
	No	78	10.5%	61	8.2%	6	8.0%	9	10.5%	10	9.2%	9	6.6%
Ivomec	Yes	639	100.0%	654	100.0%	67	100.0%	74	100.0%	96	100.0%	124	100.0%
Alamicin	Yes	207	100.0%	203	100.0%	22	100.0%	25	100.0%	27	100.0%	27	100.0%
Other (specify)	Yes	139	100.0%	180	100.0%	10	100.0%	14	100.0%	16	100.0%	36	100.0%
Did the livestock of your household receive dipping or de-worming in 2017?	Dipping	55	7.4%	46	6.2%	5	6.7%	9	10.5%	6	5.5%	7	5.1%
	De-worming	221	29.7%	251	33.6%	18	24.0%	24	27.9%	38	34.9%	41	29.9%
	Both	376	50.5%	358	47.9%	43	57.3%	42	48.8%	50	45.9%	62	45.3%
	Neither	93	12.5%	92	12.3%	9	12.0%	11	12.8%	15	13.8%	27	19.7%

A4: Table 18. Number lost animal due to illness

	Treatment	Control	Female headed household		Vulnerable household	
			Treatment	Control	Treatment	Control
Camels						
Horses	26	76		1		19
Cattle and Yak	57	107		3	9	4
Sheep	441	844	28	45	41	35
Goats	302	366	18	33	44	18

A4: Table 19. Breeding sires, by herd size

	Breeding sires	Up to 100 livestock				101-200 livestock				201-500 livestock				501 or above			
		Treatment		Control		Treatment		Control		Treatment		Control		Treatment		Control	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Camels	own flock	1	50.0%	1	25.0%	1	50.0%	4	30.8%	4	28.6%	10	28.6%	7	36.8%	9	27.3%
	others flock	1	50.0%	3	75.0%	1	50.0%	9	69.2%	8	57.1%	24	68.6%	12	63.2%	24	72.7%
	LAMP nucleus flock	0	0.0%	0	0.0%	0	0.0%	0	0.0%	2	14.3%	1	2.9%	0	0.0%	0	0.0%
Horses	own flock	19	29.2%	23	31.1%	56	47.5%	61	50.4%	116	46.0%	110	45.5%	56	44.1%	64	48.9%
	others flock	46	70.8%	51	68.9%	62	52.5%	60	49.6%	135	53.6%	130	53.7%	71	55.9%	65	49.6%
	LAMP nucleus flock	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	0.4%	2	0.8%	0	0.0%	2	1.5%
Cattle and Yak	own flock	21	20.0%	20	18.5%	50	37.9%	41	30.1%	99	40.1%	90	41.7%	39	33.6%	46	39.0%
	others flock	84	80.0%	88	81.5%	81	61.4%	95	69.9%	145	58.7%	124	57.4%	76	65.5%	69	58.5%
	LAMP nucleus flock	0	0.0%	0	0.0%	1	0.8%	0	0.0%	3	1.2%	2	0.9%	1	0.9%	3	2.5%
Sheep	own flock	20	15.9%	36	25.9%	52	31.0%	80	45.2%	70	23.6%	136	49.6%	21	15.8%	58	42.0%
	others flock	64	50.8%	101	72.7%	58	34.5%	94	53.1%	97	32.8%	138	50.4%	47	35.3%	80	58.0%
	LAMP nucleus flock	42	33.3%	2	1.4%	58	34.5%	3	1.7%	129	43.6%	0	0.0%	65	48.9%	0	0.0%
Goats	own flock	32	23.9%	45	30.2%	62	36.3%	86	48.0%	103	34.7%	132	48.2%	30	22.7%	59	42.8%
	others flock	70	52.2%	103	69.1%	76	44.4%	91	50.8%	116	39.1%	139	50.7%	62	47.0%	79	57.2%
	LAMP nucleus flock	32	23.9%	1	0.7%	33	19.3%	2	1.1%	78	26.3%	3	1.1%	40	30.3%	0	0.0%

A4: Table 20. Planted size and feed

		1-9 Ha				10-49 Ha				50 +Ha			
		Treatment		Control		Treatment		Control		Treatment		Control	
		N	%	N	%	N	%	N	%	N	%	N	%
Natural hay	On my own	21	44.7%	8	53.3%	2	66.7%	0	0.0%	8	88.9%	0	0.0%
	Cooperation	2	4.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	100.0%
	Market	1	2.1%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

		1-9 Ha				10-49 Ha				50 +Ha			
		Treatment		Control		Treatment		Control		Treatment		Control	
		N	%	N	%	N	%	N	%	N	%	N	%
Green fodder	Other	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	No	23	48.9%	7	46.7%	1	33.3%	1	100.0%	1	11.1%	0	0.0%
	On my own	28	59.6%	8	53.3%	2	66.7%	1	100.0%	2	22.2%	0	0.0%
	Cooperation	8	17.0%	0	0.0%	1	33.3%	0	0.0%	4	44.4%	0	0.0%
	Market	3	6.4%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	Other	0	0.0%	1	6.7%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	No	8	17.0%	6	40.0%	0	0.0%	0	0.0%	3	33.3%	1	100.0%
Saltlick	On my own	13	27.7%	6	40.0%	2	66.7%	1	100.0%	4	44.4%	0	0.0%
	Cooperation	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	Market	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	Other	4	8.5%	1	6.7%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	No	30	63.8%	8	53.3%	1	33.3%	0	0.0%	5	55.6%	1	100.0%
Oat	On my own	3	6.4%	0	0.0%	0	0.0%	0	0.0%	1	11.1%	0	0.0%
	Cooperation	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	Market	1	2.1%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	Other	4	8.5%	1	6.7%	1	33.3%	0	0.0%	1	11.1%	0	0.0%
	No	39	83.0%	14	93.3%	2	66.7%	1	100.0%	7	77.8%	1	100.0%
Bran	On my own	2	4.3%	0	0.0%	0	0.0%	1	100.0%	0	0.0%	0	0.0%
	Cooperation	0	0.0%	1	6.7%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	Market	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	Other	8	17.0%	1	6.7%	1	33.3%	0	0.0%	2	22.2%	0	0.0%
	No	37	78.7%	13	86.7%	2	66.7%	0	0.0%	7	77.8%	1	100.0%
Other	On my own	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	Cooperation	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	Market	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	Other	1	2.1%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	No	46	97.9%	15	100.0%	3	100.0%	1	100.0%	9	100.0%	1	100.0%

A4: Table 21. Resource consumption of planting process

		1-9 Ha				10-49 Ha				50 +Ha			
		Treatment		Control		Treatment		Control		Treatment		Control	
		N	%	N	%	N	%	N	%	N	%	N	%
Soil processing	Human labour	8	17.0%	10	66.7%	0	0.0%	1	100.0%	0	0.0%	0	0.0%
	Animal power	4	8.5%	0	0.0%	1	33.3%	0	0.0%	0	0.0%	0	0.0%
	Mechanization	9	19.1%	1	6.7%	1	33.3%	0	0.0%	1	11.1%	0	0.0%
	Agricultural technique	21	44.7%	3	20.0%	1	33.3%	0	0.0%	7	77.8%	1	100.0%
	Didn't use fertilizer	5	10.6%	1	6.7%	0	0.0%	0	0.0%	1	11.1%	0	0.0%

		1-9 Ha				10-49 Ha				50 +Ha			
		Treatment		Control		Treatment		Control		Treatment		Control	
Plow and planting	Human labour	6	12.8%	8	53.3%	0	0.0%	1	100.0%	2	22.2%	0	0.0%
	Animal power	7	14.9%	0	0.0%	1	33.3%	0	0.0%	0	0.0%	0	0.0%
	Mechanization	6	12.8%	1	6.7%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	Agricultural technique	21	44.7%	6	40.0%	2	66.7%	0	0.0%	7	77.8%	1	100.0%
	Didn't use fertilizer	7	14.9%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Soil fertilizing, Code	Human labour	26	55.3%	11	73.3%	3	100.0%	1	100.0%	5	55.6%	0	0.0%
	Animal power	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	Mechanization	3	6.4%	2	13.3%	0	0.0%	0	0.0%	0	0.0%	1	100.0%
	Agricultural technique	4	8.5%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	Didn't use fertilizer	14	29.8%	2	13.3%	0	0.0%	0	0.0%	4	44.4%	0	0.0%
Soil enriching, Code	Human labour	22	46.8%	14	93.3%	1	33.3%	1	100.0%	5	55.6%	0	0.0%
	Animal power	1	2.1%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	Mechanization	4	8.5%	1	6.7%	1	33.3%	0	0.0%	0	0.0%	0	0.0%
	Agricultural technique	7	14.9%	0	0.0%	1	33.3%	0	0.0%	0	0.0%	0	0.0%
	Didn't use fertilizer	13	27.7%	0	0.0%	0	0.0%	0	0.0%	4	44.4%	1	100.0%
Pesticide, Code	Human labour	27	57.4%	13	86.7%	2	66.7%	1	100.0%	5	55.6%	1	100.0%
	Animal power	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	Mechanization	3	6.4%	0	0.0%	1	33.3%	0	0.0%	0	0.0%	0	0.0%
	Agricultural technique	1	2.1%	0	0.0%	0	0.0%	0	0.0%	1	11.1%	0	0.0%
	Didn't use fertilizer	16	34.0%	2	13.3%	0	0.0%	0	0.0%	3	33.3%	0	0.0%
Harvesting , Code	Human labour	12	25.5%	7	46.7%	1	33.3%	1	100.0%	0	0.0%	0	0.0%
	Animal power	0	0.0%	1	6.7%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	Mechanization	10	21.3%	4	26.7%	1	33.3%	0	0.0%	0	0.0%	0	0.0%
	Agricultural technique	20	42.6%	3	20.0%	1	33.3%	0	0.0%	9	100.0%	1	100.0%
	Didn't use fertilizer	5	10.6%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%



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