



Millennium Challenge Account of Mongolia (MCA-M) Peri-Urban Land Leasing Activity

Baseline Report for Phase II Areas¹

Prepared by Innovations for Poverty Action

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¹ The data to accompany this report is publicly available on the MCC website:
<<http://data.mcc.gov/evaluations/index.php/catalog/84>>

I. Acknowledgements

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II. List of Acronyms

Acronym	Definition
CPR	Centre for Policy Research
DQM	Data Quality Monitors
ERR	Economic Rate of Return model
ESA	Environmental and Social Assessment
FHH	Female-headed Household
IPA	Innovations for Poverty Action
MCA-M	Millennium Challenge Account - Mongolia
MCC	Millennium Challenge Corporation
MCDS	Mongolian Center for Development Studies
MHH	Male-headed Household
MNT	Mongolian Tugrik
NSO	National Statistics Office
PIU	Project Implementation Unit
PURLS	Peri-Urban Rangeland Leasing Survey
PURP	Peri-Urban Rangeland Project
RCT	Randomized Control Trial
USD	United States Dollar

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VI. Executive Summary

The Millennium Challenge Corporation (MCC) funded the Millennium Challenge Account-Mongolia (MCA-M) Peri-Urban Land Leasing Activity, commonly known as the Peri-Urban Rangeland Project (PURP), to help the Government of Mongolia shift to more sustainable rangeland management. PURP in coordination with soum and bagh officials provided exclusive pastureland use rights to herder groups and promoted improved animal husbandry practices, including sustainable pastureland management and adoption of “intensive” dairy farm practices among the project participants. The shift in practices that are anticipated to result from this project is expected to increase herd productivity, decrease land degradation and ultimately raise herder income. This baseline report for Phase II of PURP has four primary objectives:

1. To describe the Peri-Urban Rangeland Leasing Survey (PURLS) and research design for Phase II of PURP;
2. To present the data that was collected via PURLS Phase II Baseline in order to make the data available for other research efforts and the planning of other programs;
3. To perform tests of balance between treatment and control herder groups; and
4. To perform tests of the basic assumptions underlying the PURP project logic

Since this is a report on the baseline survey, which was conducted prior to the bulk of project activities, it does not attempt to determine impact of the project. As such, comparisons between the treatment and control herder groups have been kept to a minimum.

A. Project Background and Description

The main goal of the MCA-M PURP is to improve the livelihoods of semi-nomadic herding households living in the areas surrounding Mongolia’s larger cities. Since the transition to a market economy in the 1990s, the number of livestock in Mongolia has more than doubled, putting a strain on the common use grasslands in peri-urban areas. Overgrazing has led to severe degradation of the rangeland, on which these herders depend. By giving herders long-term rights to the land, including the ability to exclude use by other herder groups, MCA-M expects that the herders holding rights to an individual plot will have greater incentives to reduce over-grazing and make long-term investments in the land and their herds. The MCA-M PURP includes the following five components, a timeline for which is provided in Table ES 1 below:

1. *Legal reform:* To draft new legislation regarding rangeland and pasture use.
2. *Rangeland mapping:* Mapping the rangeland surrounding the three peri-urban areas targeted by the study along with their associated resources and geographic, climatic and biological features. Maps were used to identify candidate lease areas.
3. *Lease Titles and Contracts:* Provided 15-year exclusive-use pastureland leases to groups of herder households.
4. *Installation of Infrastructure:* Provided herder groups with wells, materials for the construction of winter shelters and fences, and alfalfa seed. Part of the costs of these materials is to be paid back by the herder groups over a 15-year period.

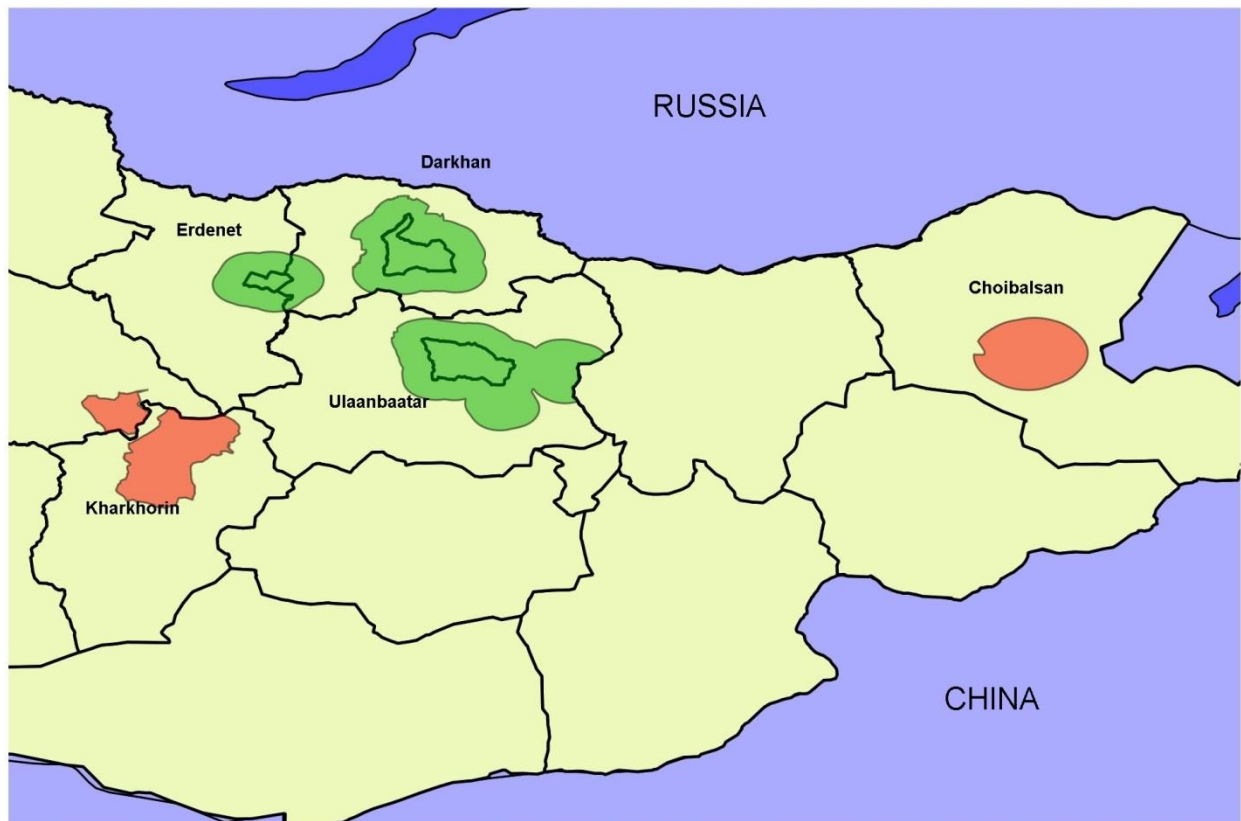
5. *Provision of Training*: Provided herder groups and local officials with extensive trainings in herd and pastureland management, animal husbandry and marketing.

Table ES 1. Phase II Project Activity Timeline

	Activities	Start	End
Selection Phase	Rangeland Tract Mapping	April 2011	September 2011
	Herder Group Application	August 2011	August 2011
	Review and Selection Process - soum committees	August 2011	August 2011
	ESA review and field verification	August 2011	September 2011
	Final selection	September 2011	October 2011
	Lease signed	October 2011	October 2011
Project Phase	Herder Group Training	November 2011	June 2013
	PURLS Survey – Baseline	January 2012	April 2012
	Supplying alfalfa seeds	Feb 2012	June 2012
	Well Installation	March 2012	June 2013
	Supplying materials for fence and shelter construction	June 2012	December 2012

The MCA-M PURP was implemented in two phases. Phase I of the project began awarding leases in October 2010 in areas around Mongolia’s three largest cities: Ulaanbaatar, Erdenet, and Darkhan. Phase II, which is the focus of this report, began one year later, and concentrates on areas surrounding two of Mongolia’s smaller regional cities, Choibalsan and Kharkhorin. The geographic scope of the project is shown in Figure 1. In this report, we will examine the characteristics of households and herder groups in the Phase II areas, focusing particularly on balance between treatment and control, differences between the two peri-urban areas, and validity of the assumptions underlying the PURP project logic.

Figure ES 1. Geographical Scope of the Peri-Urban Rangeland Project



Note: Phase I areas (Ulaanbaatar, Darkhan, Erdenet) are in Green. Phase II areas (Kharkhorin and Choibalsan) are in Red.

B. PURP Beneficiary Selection Process in Phase II Areas

The selection process was broken up into two stages. In the first stage all herder groups located in areas deemed fit for the project were allowed to submit applications for the available slots. Local selection committees scored these applications according to a set of predefined social criteria. Herder groups who passed the first stage of selection process were short-listed for the next stage of the selection process. In total, 329 herder groups passed the screening process. There were 165 leases to be allocated in the Phase II areas and it was decided that these would be assigned using a lottery.

In the second round of selection, the short-listed candidates were randomly assigned slots in the leasing program through a public lottery process. Some candidates (165 total) were randomly selected to receive a leasing slot (the treatment group) while the other 164 candidates were not (the control group).

Table ES 2. PURLS Survey Questionnaires – Types and Content

Household Survey	Herder Group Leader Survey	Soum Governor Survey
<ul style="list-style-type: none"> • Household expenditure and income • Loans, support and assistance received • Migration patterns • Infrastructure & pastureland quality at seasonal camps • Household livestock information • Livestock hay-making and forage production and purchases • Land disputes • Future investments • Opinion regarding the MCA-M Peri-Urban project • Political opinions • Behavioral Exercise 	<ul style="list-style-type: none"> • Basic herder group information • Information on herder group members • Plans for excess livestock • Existing assets and plans for new assets (wells, fences, equipment, etc.) • Plans for land usage • Herder group activities • Pastureland and forest management plans 	<ul style="list-style-type: none"> • Demography and migration in Soum • Services available • Soum-wide livestock and land information • Land disputes • Donor programs and development projects • Election information

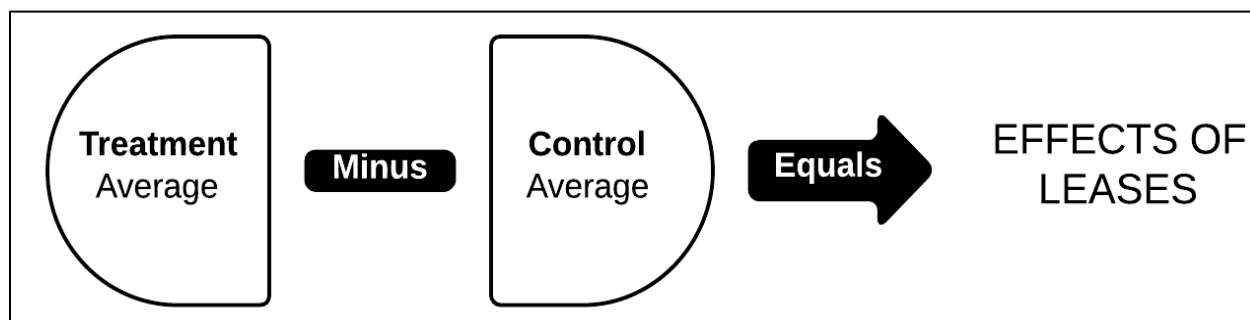
Data collection was undertaken by MEC and Mongolian Center for Development Studies (MCDS), local Mongolian firms contracted by MCA-M, starting in January of 2012 and was wrapped up in late April of 2012. Interviews were conducted in person. In total, 1027 herder households, or 91.1% of the original sample, completed a full household interview. Response rate for Herder Group Leader survey was 99 percent, while all 15 targeted soum governors were successfully interviewed.

C. Impact Evaluation Design—A Randomized Control Trial

The purpose of evaluating the impact of PURP is of course to assess whether the project made a difference to the outcomes of interest. That is, can we attribute change in these outcomes to the project itself? Did PURP *cause* changes in our outcome measures? These questions lead to a well known challenge: Observing that participation in the project is *correlated* with changes in outcomes is not equivalent to concluding that participation in the project *caused* these changes. It might be, for instance, that some unobserved factor predicts both project participation and changes in outcomes. In order to avoid drawing false inferences about the causal effect of the project, IPA designed a randomized controlled trial (RCT) in Phase II of the PURP.

The basic idea of the RCT is to randomly assign, via a lottery, eligible herder groups to either participate in the project (the “treatment” group) or not (the “control” group). Because receipt of the program is random, in expectation, the only differences between those household receiving the PURP program assistance and those that do not, is be the receipt of the assistance. In other words, on average, these two groups will be similar along other characteristics. Therefore, any differences in outcomes after the program has been implemented can be attributed to the program, and not some unobserved difference between the households receiving and not receiving the program. The random assignment of the project eliminates this “selection bias”, and ensures that the two groups are similar except that one group participated in PURP. A visual representation of this design can be seen in Figure ES 3 below.

Figure ES 2. Research Design—Identification Strategy



The evaluation is comprised of five steps. First, herder groups went through an application process to ensure that those selected were fit for the project. Second, a lottery was conducted that randomly assigned households to either a treatment group—receiving assistance—or a control group, that does not. Third, a baseline survey of all target households and their neighbors was conducted to provide an initial assessment of the sample and ensure that the randomization process was successful. Fourth, PURP provided assistance to the households in the project. Finally, one or two follow up surveys will be conducted after the PURP activities are completed to evaluate the impact of the project by assessing any differences between those households that received assistance and those that did not.

D. Presentation and Analysis of Data from Baseline Survey

The following section presents the main findings from the PURLS baseline data collection. There are several important aspects of the data that are examined:

- Balance between treatment and control households
- Comparison of “intensive” and “semi-intensive” project households
- Comparison of household, herder group, and soum characteristics by peri-urban area
- Comparison of project households with male and female heads
- Tests of assumptions underlying PURP project logic
- Examination of neighbor households

A handful of the key findings from the analysis are described in this Executive Summary; a more complete analysis is provided in Sections IV - IX of the report.

1. Balance between treatment and control households

A large number of variables covering each aspect of the PURP project logic were tested to see whether, despite the randomization beneficiary selection process, any substantial differences exist between the treatment and control households. Overall, the number of variables displaying a significant difference and the magnitude of the differences are too small to suggest that the two groups are meaningfully different from each other. Moreover, the number of statistically

significant results is consistent with what one would expect from such a random assignment procedure. Overall the evidence suggests that the randomization process functioned as expected.

2. Comparison of “intensive” and “semi-intensive” project households

The PURP beneficiaries can be split into two major types: intensive, which are focused on high-input dairy farming and received smaller lease areas, and semi-intensive, which are closer to traditional Mongolian nomadic herders. Although the two types of household received similar benefits from the project, they are different in many important ways. Approximately five percent of all project groups were intensive, so it is helpful for interpreting statistics about all project beneficiaries to know what this segment looks like. Intensive households are found to focus much more heavily on dairy farming, which is consistent with the expectations of the project. They migrate less, have smaller herds overall, and more improved-breed cows, more of their cattle are females of milk-production age, they use substantially more hay and other prepared fodders, and sell cow’s milk much more frequently and in larger quantities.

3. Comparison of household, herder group, and soum characteristics by peri-urban area

The two peri-urban areas in Phase II of PURP are quite geographically distant from each other and have completely different terrain. Choibalsan area is much more sparsely population and is primarily flat steppe. Kharkhorin area is densely populated and has a diverse landscape including many mountains. It was found that PURP beneficiary households in Kharkhorin areas tend to have larger herds than the average herders in their soum, while those in Choibalsan area had smaller herds than the average herder. The Herder Group Leader survey also confirmed that project beneficiaries in Kharkhorin area have more herder households living near or on their lease area, and generally more interaction with other herders (e.g. those who are passing through during a migration).

The Household survey produced a number of interesting results. The composition of herds was very different in the two areas, with households in Choibalsan owning 30 percent more animals, which were concentrated more in horses and cattle, and less in sheep and goats. Breakdown of income into various sources was very similar across both regions, with about 60 percent of income coming from animal husbandry. However, of the earnings from animal husbandry, a much larger portion came from cashmere in Kharkhorin area, while direct sales of animals, especially sheep, was the dominant source of income in Choibalsan area. Choibalsan area herders were much more active in dairy production, having more cows overall and more improved-breed cows, milking more days in the year, feeding more hay, producing larger yearly milk yields per cow and selling much more milk.

4. Comparison of project households with male and female heads

Project beneficiaries were also examined with respect to the gender of the household head. Female-headed household are usually headed by widows, and seen to be a vulnerable population. PURP emphasized inclusion of women in the project and applications to the project were given higher scores if there was a female-headed household in the group. Overall women headed 10 percent of project groups. Female-headed households were found to have larger expenditures per household member, but lower overall income. They were less likely to own possession certificates for their winter or spring camps, took half as many loans, had less than half the herd size of male-headed households, and had very different motivations for joining the project, with women particularly

interested in herding jointly with a group, while men were more interested in improving pasture quality, learning improved farming practices, and getting support to build a well.

5. Tests of assumptions underlying PURP project logic

Several aspects of the PURP logic were examined in detail to see if the basis of the project's expectations for improvement of livelihood and economic growth were reasonable. It was found that contrary to prior assumptions, there is little in the PURLS data to support the assertion that the land in the Phase II areas is being overgrazed or the quality being degraded, though no strong conclusions should be drawn from this fact since the survey data is not well suited to answering these questions. It was also found that herders were using less hay than the project recommended, which means there was room for improvement. Finally, we examined the productivity of foreign and crossbreed milking cows, which were heavily promoted by the project, and found that in fact they are much more productive than Mongolian cows, even controlling for the amount of hay and fodder they are fed.

6. Examination of neighbor households

The PURLS survey also collected data from households living within two kilometers of project lease areas, in an attempt to measure any spillover effects of the project. A short analysis of these neighbors was conducted. Neighbors of treatment and control areas were compared and found to be very well balanced. However, a large issue is that many groups did not have any neighbors who were interviewed, so any impact results in the future must be interpreted carefully.

E. Conclusion and Next Steps

Data collection for the evaluation of Phase II of the PURP will include a second, and possibly third, survey of all respondents in this baseline survey. The second wave of the PURLS in the Phase II areas was fielded in May – July 2014. A third wave of survey data collection will be carried out in February 2017. All households that participated in the original survey will be tracked and re-interviewed. These surveys will then form the basis for the evaluation.

The randomized control trial in the Phase II areas of the PURP provides a very strong impact evaluation design. Because receipt of the project has been randomly assigned, we are on much firmer ground to draw conclusions about the project and attribute any changes in project outcomes to the intervention. The initial analysis of project impacts in Phase II will focus mainly on changes in behavior such as herd management, rangeland use, and perceptions of land quality. We will also estimate project effects on changes in income and animal productivity (such as milk yields). However, we believe that effects on income and agricultural outcomes may take longer to materialize than the time allowed between baseline and midline data collections. Therefore, we are planning for an end line survey at least three years after project implementation. Changes in behavior are an important part of this causal model and as such, the midline Phase II evaluation will provide valuable information on the project and will inform the design and timing of the end line data collection.

I. Introduction

A steady stream of poor rural Mongolians are abandoning traditional nomadic herding practices and migrating to the cities in search of better lives. The bulk of these migrants are moving to Mongolia's three biggest cities – Ulaanbaatar, Erdenet, and Darkhan – where they either settle in underdeveloped urban areas, called ger districts, or peri-urban pastureland areas. In peri-urban pasture lands, Mongolia's tradition of open access pasture use, combined with an increase in migrants' herds, has led to significant overgrazing and land degradation. In response, there has been growing interest in new strategies to encourage investment, improve long-term land use, and boost agricultural productivity.

Mongolia's rangeland is currently only loosely regulated, emphasizing accessibility. Open access to rangeland has been a tradition in this region of the world for thousands of years. Even when the government emphasized the use of livestock collectives during the Soviet era, rangeland use still followed traditional open use practices. In the 1990s, Mongolia switched to a market based economy and the majority of the country's livestock was privatized.² However, rangeland remained state property that could not be privately owned, and the right of farmers to use these lands is stipulated in the constitution.

The combination of open pastureland usage and private livestock ownership has led to a situation akin to that described in ecologist Garrett Hardin's classic 1968 article, "The Tragedy of the Commons".³ The idea is that individuals acting in their own self-interest lack incentives to limit the grazing of their herds on the land, despite the fact that doing so is in the long-run common interest to prevent the resource in question – the rangeland – from being depleted. The problem arises because the benefits of grazing one's herd on the common land are private, while everyone shares the costs associated with overgrazing. Thus, individual herders have an incentive to increase their herd sizes to levels not sustainable by the land. As a result, the number of livestock in the country has more than doubled in the two decades since the fall of the Soviet Union. In many areas of the country, especially the peri-urban areas surrounding Mongolia's larger cities, the explosion in livestock numbers has exceeded the biological carrying capacity⁴ of the rangeland and has thus contributed further rangeland degradation and desertification.⁵

One of the goals of MCA-M was to directly address these challenges and increase household income and reduce poverty through changes in property rights. Through the Peri-Urban Land Leasing Activity, commonly known as the Peri-Urban Rangeland Project (PURP),⁶ MCA-M provided herder households with long term (15 year), exclusive use leases of rangeland plots;

² Fernandez-Gimenez, M.E. (1999). Sustaining the steppes: A geographical history of pastoral land use in Mongolia. *Geographical Review*, 89, 315–342.

³ Hardin, Garrett. 1968. The tragedy of the commons. *Science* 162: 1243–48.

⁴ "Carrying Capacity" is usually defined as the maximum number of livestock possible on a given piece of land, while still allowing for maintenance or improvement of the production of vegetation or related resources. It may vary from year to year on the same area due to climate and other factors.

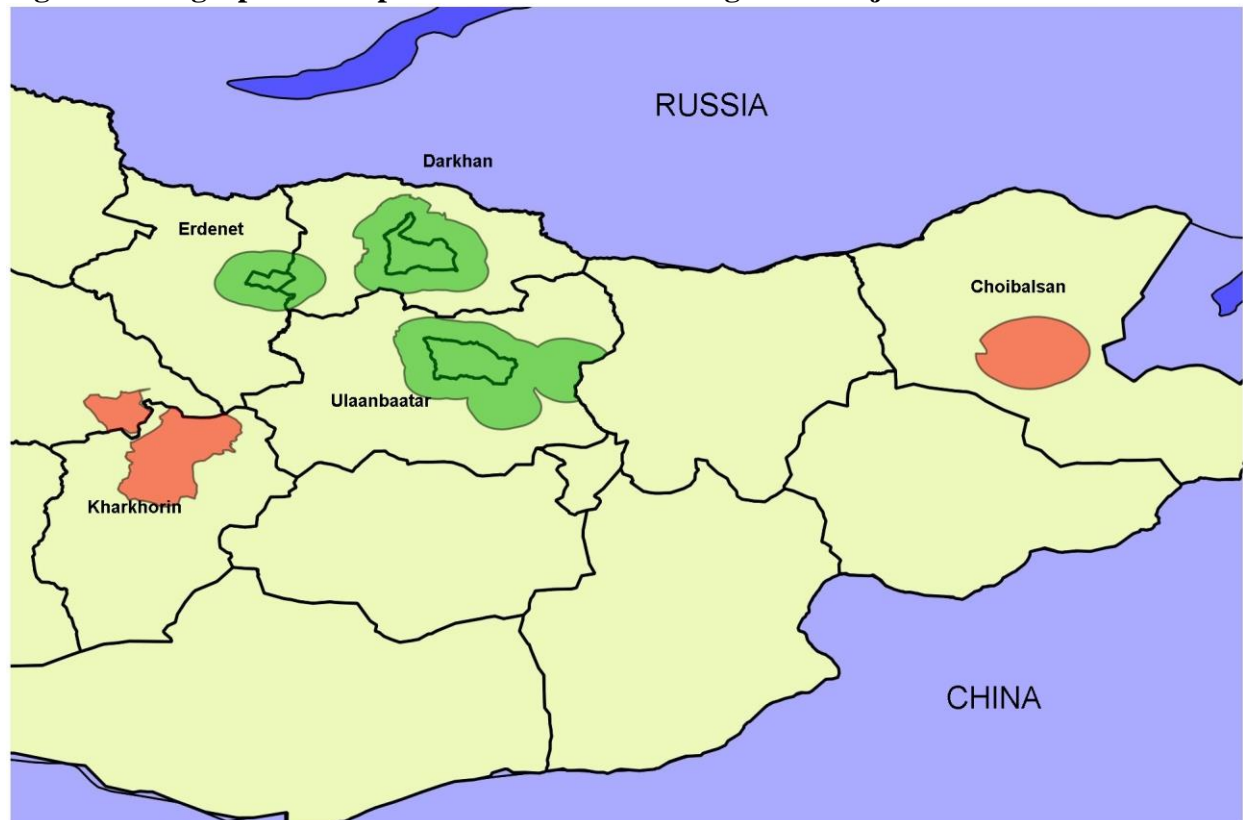
⁵ Cheng, Y., Tsubo, M., Ito, T., Nishihara, E., and Shinoda, M. (2011). Impact of rainfall variability and grazing pressure on plant diversity in Mongolian grasslands. *Journal of Arid Environments* 75, 471–476.

⁶ The Peri-Urban Land Leasing Activity, commonly known as the Peri-Urban Rangeland Project (PURP) is one of the three activities of the larger Property Rights Project, but has been implemented as a stand-alone project by MCA-M.

training in marketing, rangeland and herd management; and infrastructure in the form of wells and materials for fences and animal shelters. The project also provided support and training to herder groups operating or planning to switch to “intensive” livestock management, which is essentially western-style dairy farming based on heavy use of prepared fodder and indoor animal shelters. By giving herders long-term rights to the land, including the ability to exclude use by other herder groups, the expectation of MCA-M was that the herders holding rights to an individual plot would have greater incentives to reduce over-grazing and make long-term investments in the land and their herds. The expected outcome is that the project will cause improvements in land and herd quality and increase the productivity of herders awarded these rights.

The PURP was implemented in two phases. The project officially began in September of 2008, while the first leases in Phase I of the project were awarded in October 2010 in areas around Mongolia’s three largest cities: Ulaanbaatar, Erdenet, and Darkhan. Phase II, which is the focus of this report, began one year later, and concentrated on areas surrounding two of Mongolia’s smaller regional cities, Choibalsan and Kharkhorin. The geographical scope of the project is shown in Figure 1 below. Choibalsan area is within Dornod aimag, and Kharkhorin area spans Arkhangai and Uvurkhangai aimags. In this report, we provide a summary of the initial round of the data collection for Phase II, including a description of the characteristics of herder groups based on that data and the implications for the proposed research design. The data collected for this project provides a rich source of information on households in various types of herder groups. Since the information will be publicly available, an important component of this report is to describe these data so that they might be used in other research or planning activities. A separate baseline report was already produced for Phase I of the project.

Figure 1. Geographical Scope of the Peri-Urban Rangeland Project



Note: Phase II areas (Kharkhorin and Choibalsan) are in Red. Phase I areas (Ulaanbaatar, Darkhan, Erdenet) are in Green.

In the remainder of the report, we proceed as follows. First, a brief description of the project and its expected outcomes is provided. Section II provides an overview of the research design and selection process. Section III goes through the different stages of data collection. Section IV reports on balance tests to ensure that randomization was properly conducted. Section V compares herder groups that applied to the project as “intensive” or “semi-intensive.” Section VI presents results from the three survey instruments by peri-urban area. Section VII examines various aspects of the project households with respect to gender of the household head. Section VII presents several tests of underlying assumptions of the PURP project logic. Section IX presents some basic information about the PURP neighbors who were interviewed for the Household survey. Finally, conclusions and next steps are presented in Section X.

A. Overview of MCA-M Peri-Urban Rangeland Project

The MCA-M PURP was an innovative project designed to deal with the problems associated with overuse of rangelands that are currently being exacerbated by an increase in herd sizes and migration closer to urban areas in Mongolia. The project attempted to integrate the strengths of private, common use, and centrally regulated regimes through the following three elements:

- *Exclusive Rights to Range Land.* The project provided each group of individual households with exclusive, 15-year usage rights to a specific piece of rangeland. The contracts that govern these rights are designed to create strong incentives to invest in the land’s productive capacity and enable herders to adopt more sedentary agricultural practices associated with greater yields. Since these groups have a legal guarantee that they will reap

the long-term benefits of investments in the land, the project should increase investment, improve herd management, and increase productivity. Moreover, the project should lead to a reduction in land degradation because herder households should also have an incentive to prevent overgrazing on land they get to exclusively use.

- *Extend Rights to Collective Groups.* By extending the lease rights to collective groups of herders rather than to individual households and providing training on collective herding and marketing, the project built upon traditional norms of pasture management, encouraging cooperation and collaboration among close herder groups. Moreover, the tough physical environment of Mongolia makes it so that groups will be better able to respond to emergencies than individual herders, thus giving the group a greater chance of success.
- *National Laws.* One of the planned outcomes of the project is the creation of a new national rangeland law and the development of local enforcement mechanisms. If these are realized, it will standardize land use regimes across regions and allow for more consistent and transparent enforcement of the new approach to rangeland management.

The overall PURP program includes the following components. A timeline for Phase II is provided in Table 1.

- *Legal reform:* A panel of legal, technical, and social experts was convened to help draft a new rangeland and pasture use law. The law will modify the open-range land use regime of Mongolia and establish an improved, national legal vehicle through which long-term leasing right to pastureland can be extended to private herding organizations. Regulatory and enforcement mechanisms will also be created as a corollary to the law. Although work on this component began well before any of the other project activities, at the time of the baseline data collection the Mongolian parliament had not approved the passage of the draft law. The original rangeland law has been incorporated into a more general land law that has yet to be finalized and voted on in parliament.
- *Rangeland mapping:* The rangeland of the peri-urban areas was mapped along with their associated resources and geographic, climatic and biological features. These maps were used to determine which rangeland tracts were best suited for project activities. These maps were also used to determine where herding groups were living.
- *Lease Titles and Contracts:* In combination with local officials, the Ministry of Food, Agriculture and Light Industry, and a key implementation contractor, Center for Policy Research (CPR), MCA-M developed a 15-year lease for pastureland to be offered to herder households. These leases are contracts between the herder groups and the local soum governments. Leases cover an average of 1100 hectares for groups classified as “semi-intensive” and 450 hectares for groups classified as “intensive.” Intensive groups practiced or planned to practice western-style dairy farming, which is heavily reliant on prepared fodder and thus less dependent on large areas of pasture.
- *Installation of Infrastructure:* As part of the project, every selected herder group had a well installed if they chose to. The households were trained in the use and maintenance of the well. Herder groups were also provided with materials for the construction of winter shelters, feeding equipment, or fences. Herder groups will be required to pay back

approximately 50 percent of the value of the funds used to install the wells (up to a limit) and 100 percent of the value of the construction materials. The repayment terms are generous: no interest will be charged over a 15-year period. These will be paid to a “soum development fund” which will be used to continue support for the project post-compact and develop other local infrastructure.

- *Provision of Training:* Herder groups and local officials received an extensive series of trainings centered on five main topics:
 1. Leaseholder rights, commitments, and responsibilities
 2. Rangeland, environmental and water resource management
 3. Livestock management and productivity
 4. Livestock business management and marketing of animal products
 5. Collaborative management of herds, pasture, and forage

Table 1. Project Activities and Timeline for Phase II

	Activities	Start	End
Selection Phase	Rangeland Tract Mapping	April 2011	September 2011
	Herder Group Application	August 2011	August 2011
	Review and Selection Process - soum committees	August 2011	August 2011
	ESA review and field verification	August 2011	September 2011
	Final selection	September 2011	October 2011
	Lease signed	October 2011	October 2011
Project Phase	Herder Group Training	November 2011	June 2013
	PURLS Survey – Baseline	January 2012	April 2012
	Supplying alfalfa seeds	Feb 2012	June 2012
	Well Installation	March 2012	June 2013
	Supplying materials for fence and shelter construction	June 2012	December 2012

B. Project Logic and Expected Outcomes

The MCA-M PURP is to date one of the largest and best-funded efforts designed to address the issues of rangeland degradation and income loss due to overgrazing. Overall, 392 herder groups (representing approximately 1300 households) participated in the project. A total of 156 of these groups (representing approximately 480 households) are located in the Phase II areas. At the time of the PURLS Baseline, these groups had signed the leases for their peri-urban rangeland tracts and had begun participating in the training programs. The main outcomes that the evaluation will examine can be divided into those that we expect the project to have an impact on in the short-term and outcomes we expect the project to affect only in the longer term.

1. Expected Short-Term Outcomes

- Increase tenure security
- Change in stocking rates and improved grazing practices to maintain carrying capacity of land

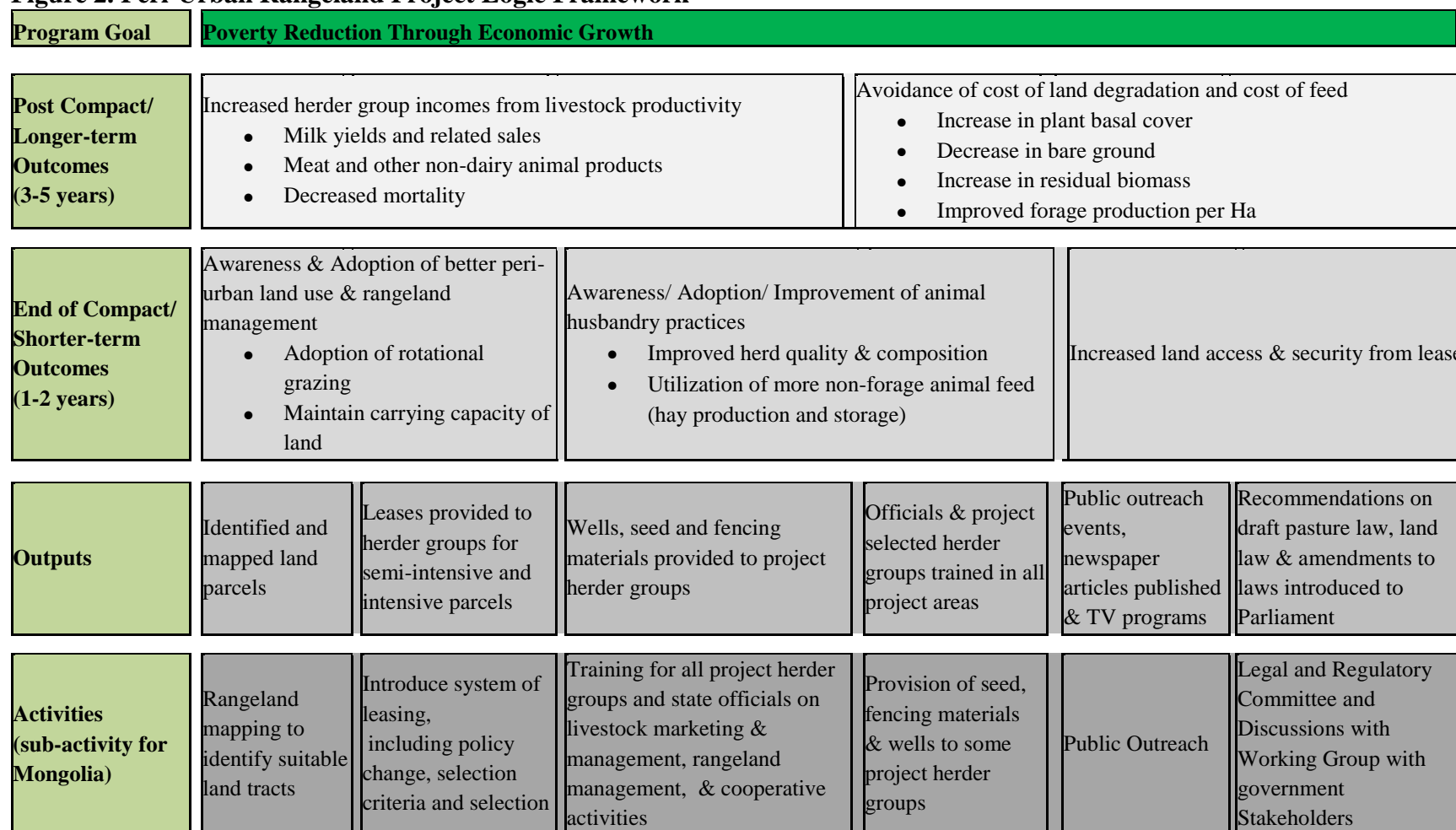
- Improved herd composition including increase in crossbred cows and other more productive cow breeds
- Increase in hay production, hay storage and use of hay and other prepared fodder

2. Expected Long-Term Outcomes

- Higher livestock productivity
- Decreased herd mortality
- Increased income from livestock
- Improved pasture quality due to reduction in overgrazing

Figure 2 presents a more complete overview of the PURP logic framework. In addition to this general framework, MCC developed an Economic Rate of Return (ERR) model to predict the overall effect on income from the entire project. The ERR model relies heavily on assumptions about usage of hay and prepared fodder, and milk yields from improved cattle. The full ERR model can be found on MCC's website <<http://www.mcc.gov/pages/countries/err/mongolia-compact>>.

Figure 2. Peri-Urban Rangeland Project Logic Framework



II. Evaluation Design

In this section we outline the design of the evaluation, including a discussion of our identification strategy—a randomized controlled trial—and a description of the selection process for project beneficiary households as well as our approach to measuring spillovers. A more detailed account of the research design can be found in the project evaluation design document.⁷

A. Identification Strategy—A Randomized Controlled Trial Design

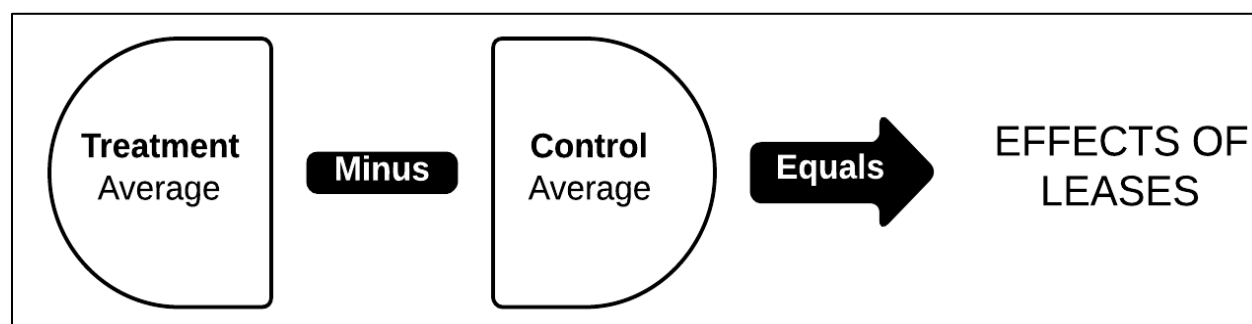
The purpose of evaluating the impact of PURP is of course to assess whether the project made a difference to the outcomes of interest. That is, can we attribute change in these outcomes to the project itself? Did PURP *cause* changes in our outcome measures? These questions lead to a well known challenge: Observing that participation in the project is *correlated* with changes in outcomes is not equivalent to concluding that participation in the project *caused* these changes. It might be, for instance, that some unobserved factor predicts both project participation and changes in outcomes. In order to avoid drawing false inferences about the causal effect of the project, we designed a randomized controlled trial (RCT) in Phase II of the PURP.⁸

The basic idea of the RCT is to randomly assign, via a lottery, eligible herder groups to either participate in the project (the “treatment” group) or not (the “control” group). Because receipt of the program is random, in expectation, the only differences between those household receiving the PURP program assistance and those that do not, is be the receipt of the assistance. In other words, on average, these two groups will be similar along other characteristics. Therefore, any differences in outcomes after the program has been implemented can be attributed to the program, and not some unobserved difference between the households receiving and not receiving the program. Without the randomization, for example, households that applied for assistance would be compared to households that did not. As a result, those receiving assistance would likely be much more motivated to obtain rangeland leases than those that did not. Later differences between those receiving assistance and those not receiving assistance could then be due either to the rangeland assistance or to the underlying motivation of the two groups. The random assignment of the project eliminates this “selection bias”, and ensures that the two groups are similar except that one group participated in PURP. A visual representation of this design can be seen in Figure 3 below.

⁷ Mongolia Peri-Urban Rangeland Project Impact Evaluation Strategy. Innovations for Poverty Action Report to the Millennium Challenge Corporation, January 2013.

⁸ A RCT was not possible in Phase I areas; instead we assess project impact using a matching framework.

Figure 3. Research Design—Identification Strategy



The evaluation is comprised of five steps. First, herder groups went through an application process to ensure that those selected were fit for the project. Second, a lottery was conducted that randomly assigned households to either a treatment group—receiving assistance—or a control group, that does not. Third, a baseline survey of all target households and their neighbors was conducted to provide an initial assessment of the sample and ensure that the randomization process was successful. Fourth, PURP provides assistance to the households in the project.⁹ Finally, two follow up surveys will be conducted after the PURP activities are completed to evaluate the impact of the project by assessing any differences between those households that received assistance and those that did not.

The baseline surveys and the randomization process, which have been completed, are described in this report. Section IV tests to see if the randomization was done successfully by comparing the information collected from the PURLS Phase II surveys between treatment and control groups. A PURLS Phase II follow up survey was conducted from May to July 2014, and a second follow up is planned to begin in February 2017. Each follow up survey will cover the same sample of households interviewed in the baseline survey and the data collected will be similar to the baseline survey described in this report. More details on the future steps of the project are provided in Section X.

B. Selection Process in Phase II Areas

The selection process was broken up into two stages. In the first stage all herder groups located in areas deemed fit for the project (see below) were allowed to submit applications for the available slots. Local selection committees scored these applications according to a set of predefined economic and social criteria. Herder groups who passed the first stage of selection process were short-listed for the next stage of the selection process.

In the second round of selection, the short-listed candidates were randomly assigned slots in the leasing program through a lottery process. Some candidates were randomly selected to receive a leasing slot (the treatment group) while other candidates were not (the control group). The PURLS

⁹ Due to procurement delays, the baseline survey was actually carried out after a small number of project activities commenced in Phase II areas. First, the groups signed their pasture lease contracts in October 2011. Second, a few training modules were started in November 2011, before the baseline survey, and other trainings were being conducted during the survey period, January-April 2012. None of the other project activities were implemented before the baseline survey.

was used to collect data on the behavior and characteristics of herder groups in both the treatment and control groups.

1. Application Process

The project first identified tracts of land that met the following criteria:

1. Access to well water within an average depth of 60 meters of the surface
2. Regular use and access by local herders

Then the project initiated outreach to government officials and herder families to explain the application process, encouraging families to submit applications, and provide guidance in the preparation of applications. The herder families were also encouraged to form herder groups. Herder groups then filled out applications that were scored using criteria based on socio-economic variables and animal husbandry experience and capacity. In addition there were eligibility criteria with regard to group size, permanent residence in the soum, herd size and proportion of earned income coming from animal husbandry.

Herder groups applying for project assistance were also categorized as either “intensive” or “semi-intensive” and the scoring of these applications differed, with applications from intensive groups having less emphasis on animal husbandry (in particular for non-dairy breed cattle) and socioeconomic criteria, and more emphasis on experience and success with foreign breed milking cattle, use of animal shelters, and fodder preparation. Intensive groups were able to apply for smaller areas of land under the presumption that these types of dairy operations were less reliant on pastureland to feed their animals. Full application scoring criteria are included in Appendix A.

Local soum governments formed selection committees that included both local officials and citizen representatives. These committees conducted the first screening of applications. The applicants that passed this first screen were then reviewed by the PURP, resulting in the disqualification of several herder groups due to non-compliance with project requirements, such as land tract size or water access. Based on the experience in Phase I where a majority of applications were rejected, many due to violations of the World Bank involuntary resettlement policy,¹⁰ PURP, MCA-ESA and PURP’s contractor CPR did extensive outreach and reconnaissance prior to the application process in Phase II. This allowed them to make potential applicants aware of possible issues and avoid these by choosing the area applied for more carefully. Because of this process all but 10 of the 339 applicants were shortlisted, passed the field verification process and participated in the lottery.

In total, 329 herder groups passed the screening process. There were 165 leases to be allocated in the Phase II areas and it was decided that these would be assigned using a lottery.

¹⁰ O.P.4.12 (“Ext Opmanual - OP 4.12 - Involuntary Resettlement, World Bank) stipulates that households and individuals cannot, as a result of a development aid project, be forced to relocate or involuntarily denied access to resources they previously enjoyed. A number of herder households residing on the land tracts in Phase I of the PURP claimed by short-listed herder groups complained that they had not been made aware of the project and/or its goals of granting exclusive use right to the land they normally resided upon.

2. Lottery

In each soum, a lottery drawing was organized. One hundred sixty-five leasing slots were distributed amongst soums, set proportional to the total number of applicants in each soum, with a random adjustment built in to account for rounding issues. This left 164 herder groups as “control” groups, which were rejected during the lottery.

Three separate public lottery ceremonies were organized—one in Dornod province’s capital, Choibalsan, another in Uvurkhangai province’s capital, Arvaikheer, and a third in the regional city, Kharkhorin. A separate lottery drawing was held for each soum administrative unit. Since only 18 intensive groups applied to the project, only two lotteries were held for intensive groups, one for all of Choibalsan area and the other for all of Kharkhorin area. In some of the central soum units surrounding the regional cities or capitals, there was not enough rangeland within the central soum to provide land for all applicant herders. In these cases, residents of the soum applied for leases to land tracts located in neighboring soums. When this occurred, a separate drawing was organized for all non-resident applicants in each adjacent soum. Quotas were established for each of the lottery drawings to determine how many lease winners were selected in each drawing. Quotas in each soum were set proportional to the number of applicant groups in that soum.

Lottery drawings were carried out using a clear plastic container filled with ping pong balls. Each short-listed group was assigned an ID number. Each group’s number was then inscribed on a ping pong ball. The container was equipped with a small hatch that would only allow one ball to be removed at a time. For each drawing, containers were turned over 5 times, then a single ball was removed and the number of the herder group listed on the ball was recorded. This process was repeated until the quota for the drawing was met. Then the next drawing began. The herder groups whose numbered balls were selected were then assigned project assistance. All the lottery drawings were conducted on stage, in public and recorded on video. The entire lottery protocol can be found in Appendix B.

C. Neighbor Sampling

In addition to collecting baseline data from the member households of all 329 herder groups (treatment and control) that applied for project assistance and passed the initial soum selection committee screening to participate in the lottery, data was also collected from a randomly selected sub-sample of neighboring herder households. These neighbors reside on rangeland plots adjacent to the 329 herder groups. Collecting data on the neighbors was carried out to measure whether and the extent to which project effects spill over to non-project households. In contrast to the Phase I areas, in the Phase II areas the research team wanted to collect data from neighbors of both treatment and control herder groups since, in this case, the purpose of interviewing neighbors was to measure spillovers rather than to provide potential matches for project beneficiaries.

The plan was to collect data from two of the neighbors associated with each herder group. During the reconnaissance for Phase II, CPR made an exhaustive list of all households with permanent camps within 2 km of the potential lease area boundaries. IPA used this list as a sampling frame for neighbor households. Experience with the baseline data collection in the Phase I areas had revealed that neighbors were difficult to locate and that they often refused to participate in the data collection. Therefore, rather than randomly selecting and ordering a specific number of neighbors per herder group to target for surveying, the full list of neighbors for each group was sorted and randomly ordered. Enumerators were instructed to approach neighbors according to the order in

which they appeared on the list until they obtained data from at least two separate households or until the list was exhausted. This random ordering approach was designed to maximize the number of neighbor interviews obtained. Unfortunately many of the groups, especially in the Choibalsan area where population density is very low, had none or only one neighbor household within 2 km of the lease area. Because of this, baseline statistics for the neighbors must be interpreted carefully. An augmented sampling plan that ensures representation of all groups among the neighbors was developed for the first follow up survey, as described in Section III below.

III. Data Collection

A. Contracting

To ensure that the PURLS Phase II surveys were conducted correctly, MCA-M hired the local Mongolian firms, MEC and the Mongolian Center for Development Studies (MCDS) to provide support in the collection of applications. MEC and MCDS were responsible for the finalizing the questionnaire, translation of the questionnaire into Mongolian and back-translation into English, interviewer training, data collection, filing and organization of collected surveys, documentation of the data set, data entry, data cleaning, and delivery of a cleaned, well organized data set. MEC and MCDS were ideal candidates because they had previous experience with extensive data collection operations and working with similar surveys, in particular the baseline survey for PURLS Phase I. The firms also possessed strong data management skills and were capable of entering and processing large amounts of data in a limited time period.

B. Questionnaire Design and Description

During the summer and fall of 2010, three data collection instruments were developed for the Phase I PURLS baseline survey – the Household questionnaire, the Herder Group questionnaire, and the Soum Governor questionnaire (Table 2 provides a description of the topics covered in each survey). The household questionnaire contained 22 sections and required approximately 120 minutes to complete, on average. The herder group questionnaire and the soum governor questionnaire required approximately 30 and 60 minutes to complete, respectively. The data collection instruments used for Phase I areas were updated and slightly modified for baseline data collection in the Phase II areas. A new section on political attitudes was added, bringing the total number of sub-sections in the questionnaire to 23. Some specific questions within these sub-sections were deleted or modified to keep the length of the interview within the 120 minute average previously established. In addition, a series of behavioral economics games was fielded as part of the PURLS Phase II data collection. The goal of the behavioral games was to measure pro-social attitudes generally, and behavior and beliefs having to do with fairness, altruism and trust, specifically. A detailed protocol of the behavioral games is described in a separate document.¹¹

Focus groups and piloting were conducted by the contractors in coordination with MCA-M to ensure the internal consistency of the instruments being used before implementation. These activities focused primarily on new sections and updated questions. The focus groups consisted of

¹¹ “Peri-Urban Rangeland Project (PURP) Impact Evaluation Design” Innovations for Poverty Action Report to the Millennium Challenge Corporation, (2012).

potential beneficiaries such as herder families, soum governors and officials. During these focus groups, different survey topics were discussed in order to catalogue possible responses to questions and anticipate any challenges that may arise when discussing these topics. Focus group responses were then used to inform the survey design. Once the initial first draft of the survey had been designed and approved by MCA-M, the contractor conducted a pilot of the survey in the field. The draft survey was administered to a small number of herder households (roughly 20) living outside the project areas in order to assess whether any of the questions were confusing, problematic, or inconsistent. Any problems that were encountered during this focus-group/pretesting phase were carefully recorded in a report. MCA-M, IPA, and the contractor then revised the survey in order to adjust for these problems. After these revisions, a second round of focus groups and pre-testing was conducted in the same manner. These focus groups and piloting exercises took place from December of 2011 to January of 2012.

The three questionnaires can be found in Appendices D, E, and F, and details on the content of each questionnaire are provided in Table 2 below.

The Soum Governor Survey was developed in order to supplement other data collection instruments by providing important soum level context. The PURP was implemented on a soum-by-soum basis and as such, the soum was the primary unit of selection for the project. Awareness of soum level differences may be important in the interpretation of later findings from the main household survey.

The complete survey is provided in Appendix F. In particular, it includes the following topics:

1. Demography, migration, and access to public resources/services
2. Livestock numbers, livestock related practices, and rangeland quality
3. Land disputes and conflict resolution
4. PURP land leases and their impacts
5. Other donor programs being implemented in the soum
6. Business activities being conducted in the soum

The questionnaire was administered to all soum governments participating in the PURP Phase II areas. Though referred to as the “Soum Governor Survey”, the questionnaire was in fact filled out by a number of different soum government representatives. Enumerators interviewed whichever government representative was most knowledgeable on a given topic. Researchers were careful to record the name of all officials who provided information on the survey and note their position in the government or civil service. Table 11 in Section VI.A below provides a list of the project aimags and the soums for which a representative completed the soum governor survey.

Table 2. PURLS Survey Questionnaires – Types and Content

Household Survey	Herder Group Leader Survey	Soum Governor Survey
<ul style="list-style-type: none"> • Household expenditure and income • Loans, support and assistance received • Migration patterns • Infrastructure & pastureland quality at seasonal camps • Household livestock information • Livestock hay-making and forage production and purchases • Land disputes • Future investments • Opinion regarding the MCA-M Peri-Urban project • Political opinions • Behavioral Exercise 	<ul style="list-style-type: none"> • Basic herder group information • Information on herder group members • Plans for excess livestock • Existing assets and plans for new assets (wells, fences, equipment, etc.) • Plans for land usage • Herder group activities • Pastureland and forest management plans 	<ul style="list-style-type: none"> • Demography and migration in Soum • Services available • Soum-wide livestock and land information • Land disputes • Donor programs and development projects • Election information

C. Questionnaire Administration

Data collection was undertaken by MEC and MCDS starting in January of 2012. Data collection activities were completed in April of 2012 and the data was entered and cleaned throughout May and June.

As with the baseline data collection in the Phase I areas, rough terrain and the high mobility of herder households conspired to prevent the data collection team from interviewing every single household targeted in the sample. However, drawing on lessons learned in the Phase I areas, MCA-M was able to collect much more precise and accurate contact information from Phase II area households. In addition, the contractors created an interview protocol to better improve their chances of finding the respondent. In the event that the respondent was not home, they would conduct two additional attempts at different times during the day (morning, afternoon, evening) and spread out over at least a two week period with a minimum of three days between visits. They also checked with soum authorities to confirm that a particular household was in fact residing in that soum. To encourage participation, households were also incentivized with 2,500 tugriks in mobile phone credits. All these activities made it possible for MEC and MCDS to locate and ultimately interview a much higher proportion of the targeted households than in the Phase I areas.

Table 3 shows the details of the response rate for treatment and control households. The “Number Sampled” column shows the number of plots that were originally sampled from the data. The “Number Complete” column shows the number of households who completed a full interview. The overall target for the Phase II PURLS was to interview the 1,015 treatment and control households, based on a list compiled from PURP applications. Of these, 923 households completed a full interview, while 18 refused to participate in the survey, and 74 were not interviewed for other reasons (most of these could not be located). The overall response rate, which is the number of completed interviews divided by the number of eligible reported units in the sample, was 90.9 percent.

Table 3. Targeted and Actual Sample, Lottery Households

		Number Sampled	Number Complete	Number Refused	Number Impossible/ Incomplete	Response Rate
Choibalsan	Treatment	162	151	0	11	93.2%
	Control	146	141	0	5	96.5%
	Total	308	292	0	16	94.8%
Kharkhorin	Treatment	357	330	4	23	92.4%
	Control	350	301	14	35	86.0%
	Total	707	631	18	58	89.2%
Overall	Treatment	519	481	4	34	92.6%
	Control	496	442	14	40	89.1%
	Total	1015	923	18	74	90.9%

Table 4 gives the response rate for neighbor households, separated by peri-urban area. This table presents the number of herder groups that were associated with zero, one or two complete neighbors. For analysis purposes, the most relevant response rate is the percent of groups with at least one neighbor interview, since these groups have at least some information on neighbors and if there is only one neighbor for a group, this can be accounted for with weighting. Overall neighbor interview rates were very low in Choibalsan area, with less than half (45.6 percent) of groups being matched with a complete neighbor interview. The situation was much better in Kharkhorin area, where 86.3 percent of groups with matched with a complete neighbor interview (and most with two). Neighbor sampling was complicated by the fact that many herder groups, especially in Choibalsan area, had only one or did not have any neighbors within two kilometers of the lease area boundary. The low neighbor interview rates were due partly due to the lack of neighbors on the sample list in Choibalsan area, and partly due to the difficulty of finding those who were on the sample list, which was compiled in summer while the survey was conducted in winter.¹² More analysis of the response rate of neighbor households is conducted in Section IX.

Table 4. Targeted and Actual Sample, Neighbor Households

		Number of Groups	Zero Neighbors Interviewed	One Neighbor Interviewed	Two Neighbors Interviewed	Percent with At Least One Neighbor
Choibalsan	Treatment	60	29	17	14	51.6%
	Control	56	34	11	11	39.2%
	Total	116	63	28	25	45.6%
Kharkhorin	Treatment	105	17	11	77	83.8%
	Control	107	12	19	76	88.7%
	Total	212	29	30	153	86.3%
Overall	Treatment	165	46	28	91	72.1%
	Control	163	46	30	87	71.7%
	Total	328	92	58	178	71.9%

¹² The list of neighbors that was used as a sample frame was compiled by CPR during summer of 2011 during their outreach activities to recruit groups for Phase II of PURP.

D. Data Quality Monitoring

There were two main purposes for data quality monitoring (DQM) activities. The first purpose was to check whether the data collection activities in the field properly took place. DQM staff conducted field monitoring to check whether MEC and MCDS properly administered the PURLS and that none of the data was falsified. They did this by going to a random sample of households that had already been surveyed but for whom the questionnaires had not yet been dispatched for data entry. The households revisited for this purpose were selected in such a way that the performance of all investigators was checked. The checks were performed using a subset of the questions in the questionnaires selected by MCA-M that were not vulnerable to significant problems in terms of recall. MCA-M then compared the two by checking the questionnaires with the full questionnaires and verifying any discrepancies.

The second purpose was to ensure that the dataset entry was accurate and corresponded to the hardcopies of the PURLS questionnaires collected. This was done through manual checks, or the process in which values in the entered data were checked to see if they matched those in the questionnaires. The manual check took a representative sample of all the variables in the PURLS dataset to ensure that the entire dataset was accurate. IPA followed a strict criterion to ensure that the error rate, or the number of mismatches between the hard copy questionnaires and entered values, did not exceed 0.5 percent. If any dataset's error rate exceeded this value, the data collection contractor had to re-enter the dataset for the given household and another round of manual checks were conducted. This process was repeated until every dataset had an error rate below 0.5 percent.

IV. Balance Tests for Treatment and Control Households

As described above in Section II, the purpose of the randomization strategy was to ensure that households benefiting from the PURP project (i.e. the treatment group) and those in the control group are very similar on average. If these two groups are similar in all respects, except that one group was a beneficiary of PURP, then we can conclude that any differences emerging between the two groups are the result of the project. In practice, however, random differences, although unlikely, can result from the randomization process. And while we cannot compare the treatment and control households along all dimensions, we can use the information from the PURLS to assess the similarities of the two groups using the answers provided by the respondents. If these two groups are similar along these dimensions, it suggests that the randomization worked as intended.

The PURLS baseline data provides an opportunity to assess the similarity of these two groups. Since the survey was taken shortly after herder groups were assigned to the treatment or control group, there should be little or no relationship between their answers on the survey and the outcome of the randomization. To assess the effectiveness of the randomization process at creating a control group with the same characteristics as the treatment group, a series of tests using linear regression were conducted on the key variables collected in the PURLS baseline survey. The results are shown in Tables 5 and 6 below. The first column of the tables gives the mean level of the variable for households in the control group. The second column gives the average difference of the variable between households in the treatment and control groups. All monetary figures are listed in Mongolian tugriks (MNT). The exchange rate between the tugrik and the US dollar was

approximately 1,300 MNT to the dollar during the period when the baseline PURLS Phase II data were collected.¹³

The results of the balance tests are broken down into two main sections. The first examines general demographic information on the households, and is presented in Table 5. The second examines key outcomes specifically related to the PURP project logic, and is presented in Table 6. This table is broken down into the key components of the project logic (see Figure 2), and presents outcomes related to each of these that were measured in the PURLS baseline survey. Some key outcomes from the project logic were not collected in the baseline survey and so cannot be presented here. See Section VIII for a summary of these outcomes and how they will be measured in the future.

There is no clear pattern of differences between treatment and control groups for demographic and household background variables aside from the frequency of prior training of family members. As noted above in Section II.A, PURP training began in Phase II areas in November 2011, so most of the groups had already received some training from the project at the time of the baseline survey (which began in January 2012). The treatment-control difference in prior training reflects this timeline. This can be further seen by looking at the area-level training differences, presented in Section VI.B below.

For project logic variables, no statistically significant differences (at 5% significance level) are present between the treatment and control groups at baseline. There are a few variables that show relatively large absolute differences between the groups (about 10% difference or more), but because of the large variance in these variables we cannot rule out the possibility that simple chance caused these differences. These include the total amount of hay produced, purchased, and stored from previous year (higher for treatment), number of days that cattle were fed with hay (higher for control), percent that own improved breed cows (higher for treatment),¹⁴ percent of households that sold milk in last 12 months, and income for those that did sell milk (both higher for treatment), income from animal sales, cashmere, and airag (all higher for control), and mortality rates of all four major animal types (all higher for treatment), and total investments in movable and immovable property in the previous 12 months (higher for treatment). Overall there is a slight but statistically insignificant trend of higher mortality rates and lower animal product sales (besides milk) for treatment households, somewhat offset by higher milk sales. Also treatment households had slightly higher investments in the previous year, which could possibly reflect an early project effect since baseline survey was conducted after project commencement (leases were awarded in October 2011 while the survey began in January 2012). The higher investments in land and immovable property were statistically insignificant, while movable property was marginally significant at the 10% level. None of the other larger differences show clear patterns.

Overall, the number of variables displaying a significant difference and the magnitude of the differences are too small to suggest that the two groups are meaningfully different from each other.¹⁵ Moreover, the number of statistically significant results is consistent with what one would expect from such a random assignment procedure. The one substantial difference we find between the treatment and control groups is in the proportion that received training in business operations

¹³ Exchange rate information was taken from <http://www.xe.com>

¹⁴ Improved breed cows included foreign breed milking cows, and foreign crossbreed cows.

¹⁵ The balance tests were also run separately for Choibalsan and Kharkhorin peri-urban areas. Results are displayed in Appendix C. Overall results are similar to the grouped analysis.

and animal husbandry, which is clearly attributable to the fact that the baseline survey was conducted after the project trainings began. Overall the evidence suggests that the randomization process functioned as expected.

Because of the successful results of these balance tests, which indicate that the randomization created well-balanced treatment and control groups which did not differ in any substantial ways at the time of the baseline survey save for one isolated difference in training due directly to the early stages of project activity, for the remainder of this report treatment and control households will be grouped together and analyzed as one category of “lottery” households. It should be understood that all of these households came from the same population of herder households that applied to the project, and it is this population that will be described in this report.

Table 5. Balance Test of Treatment and Control: Demographics and Household Background

	Mean: Control Group	Difference: Treatment – Control (std. error)
Number of household members	4.17	-0.16 (0.10)
Percent with male head of household	93.18	-0.8 (1.75)
Years of schooling of head of household	7.33	-0.41 (0.26)
Any Household Member Has Had Training in Animal Husbandry (%)	22.1	38.0*** (3.16)
Any Household Member Has Had Training in Business Operations (%)	6.8	13.8*** (2.05)
Lived in soum 5 years previously (%)	90	2.48 (1.76)
Percent with possession certificate for winter or spring camp	43.05	-0.22 (3.05)

Table 6. Balance Test of Treatment and Control: Outcomes from PURP Project Logic

	Mean: Control Group	Difference: Treatment – Control (std. error)
Short-term outcome 1: Awareness & Adoption of better peri-urban land use & rangeland management		
a. Adoption of rotational grazing		
Household is sedentary (did not migrate in past year) (%)	16.36	-0.8 (2.30)
Number of migrations in past year	2.64	-0.08 (0.07)
Average distance between camps (km)	9.86	0.45 (0.96)
b. Maintain carrying capacity of land		

Herd size (sheep units)	333.14	-6.62 (20.05)
Long-term outcome 1: Avoidance of cost of land degradation and cost of feed		
Perceived quality of pasture at winter camp	3.63	-0.01 (0.05)
Short-term outcome 2: Awareness/ Adoption/ Improvement of animal husbandry practices		
a. Improved herd quality & composition		
Percent that own improved breed cows	9.09	2.9 (2.11)
Percent of cattle herd that are productive females	38.64	1.67 (1.29)
b. Utilization of more non-forage animal feed		
Total hay produced, purchased, and stored from previous year	4.02	0.45 (0.44)
Days that cattle were fed with hay	62.69	-6 (5.05)
Days that cattle were fed with other prepared fodder	89.96	-5.15 (5.43)
Percent that purchased "concentrate"-type fodder	24.09	-1.53 (2.97)
Long-term outcome 2: Increased herder group incomes from livestock productivity		
a. Overall income		
Total income in last 12 months	6247028.14	-346782.18 (448288.63)
Net income from livestock	2742775.23	-376144.99 (325981.71)
b. Improved milk yields and related sales		
Percent with milking cows	78.86	1.36 (2.76)
Milk yield (liters per cow per year)	473.95	29.31 (25.94)
Percent that sold milk in last 12 months	14.77	2.35 (2.51)
Total earnings from milk sales (for households that sold milk)	1010749.23	739322.67 (500251.48)
c. Income from meat and other non-dairy animal products		
Total income from selling animals	1995453.18	-272836.01 (308253.72)
Total income from selling cashmere	1091129.77	-127735.6 (79613.08)
Total income from selling airag	157434.09	-53360.72 (39277.80)
d. Decreased mortality		
Mortality rate of horses	1.56	0.44

		(0.58)
Mortality rate of cattle	2.13	0.2
		(0.66)
Mortality rate of sheep	3.61	0.61
		(0.78)
Mortality rate of goats	3.11	1.04
		(0.74)
Short-term outcome 3: Increased land access & security from lease		
Percent with a pastureland-related conflict in past 5 years	3.89	0.05
		(1.29)
Long-term outcome 3: Increased investment in improvements and repairs on the land		
Total value of planned investments in next 5 years	16838454.55	1349656.37
		(2140709.40)
Total investment in immovable property in past year	346214.89	213285.76
		(173827.81)
Total investment in movable property in past year (besides vehicles)	260235.45	55004.14*
		(30356.27)

Note: * Significant at 10% level, ** Significant at 5% level, *** Significant at 1% level

V. Comparison of Intensive and Semi-intensive Herder Groups

We now turn to a comparison of herders that applied to the project as intensive groups versus those that are semi-intensive herder groups. The major differences between the types were described in Section I, and was primarily based on different application scoring criteria, which places more emphasis on experience and capacity with high-input dairy farming, lower reliance on pastureland to feed animals and thus smaller lease areas. The differences between the types of groups are quite distinct as will be described below. However the very small number of intensive groups means that a separate impact analysis is not possible. Rather the two types are simply described here in order to give an understanding as to the types and frequency of herder groups in the project, as a context for interpreting statistics about project households overall. For the remainder of the report after this section, intensive and semi-intensive groups will all be grouped together for presentation of statistics.

Tables 7 and 8 show the number of intensive and semi-intensive herder groups, and member households, for both treatment and control groups. Overall in PURP Phase II areas, there were 10 treatment and 8 control groups classified as intensive, for a grand total of 30 treatment and 21 control households. These numbers are too small to perform a meaningful impact analysis within the intensive groups, and certainly too small to also separate the analysis by peri-urban area.

Table 7. Number of Herder Groups in Lottery

	Choibalsan			Kharkhorin		
	Control	Treatment	Overall	Control	Treatment	Overall
Semi-intensive	54	57	111	101	98	199
Intensive	2	3	5	6	7	13
Overall	56	60	116	107	105	212

Table 8. Number of Households Interviewed for PURLS (Excluding Neighbors)

	Choibalsan			Kharkhorin		
	Control	Treatment	Overall	Control	Treatment	Overall
Semi-intensive	136	144	280	283	308	592
Intensive	5	8	13	16	22	38
Overall	141	152	293	299	330	630

At the level of the herder group, we can look at the composition of the group members, and the characteristics of the lease area. In particular, we see in Table 9 that intensive and semi-intensive groups have the same number of households, on average. Thus household-level differences such as herd size can be extrapolated to herder groups as well. In contrast, the size of the lease area is starkly different, with semi-intensive groups having more than twice as large areas of land (1,100 ha.) as intensive groups (450 ha.) on average.

Table 9. Comparison of Group-level Characteristics, by Intensive and Semi-intensive

	Intensive	Semi-intensive	Overall
Number of households in group	2.8	2.8	2.8
Size of lease area (hectares)	449	1,121	1,083

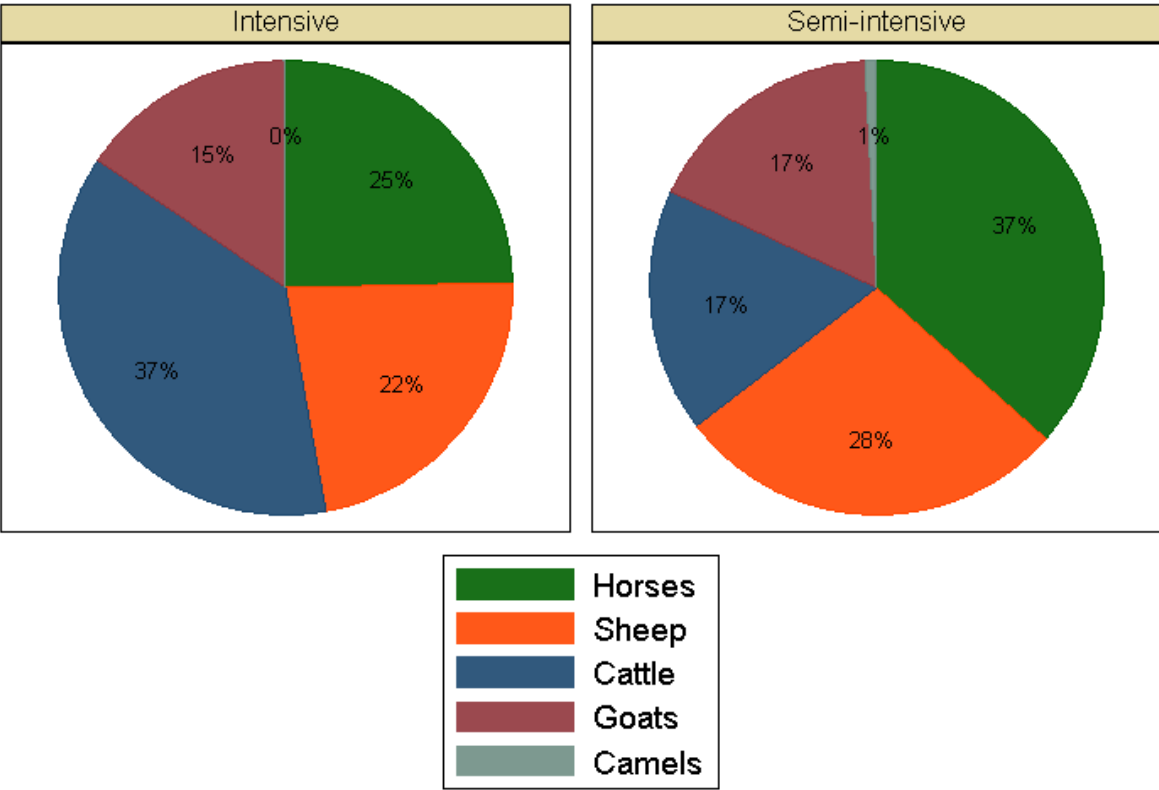
When we look at outcomes from the Household Survey (presented in Table 10), we see major differences in the types of household that make up the groups. Twenty-seven percent of intensive households are sedentary, compared with only 15 percent of semi-intensive, and among households that are semi-nomadic, those in intensive groups are less mobile, having both lower number of moves and average distance between camps. Semi-intensive households have almost twice as large herd sizes, while intensive households are three times as likely to own an improved breed milking cow. Figure 4 shows the breakdown of animal types owned between the two types of group. Intensive herders have relatively more cattle (37% of their herd compared with only 17% for semi-intensive), and fewer sheep and horses. Both intensive and semi-intensive groups have the same proportion of households with milking cows (80%), which reflects the high emphasis on milking cows in the application scoring for both types of group. Intensive groups have a higher proportion of their total cattle herd that are productive females, which is a key input in MCC's ERR model for PURP. Intensive households also made much greater use of hay and prepared fodder (including concentrate) than semi-intensive households. The emphasis on improved breed cows and high inputs is also reflected in a 50 percent higher yearly milk yield per cow for intensive households. Moreover, intensive households were much more likely to sell milk (41 percent versus 15 percent), and had higher proportion of total revenue coming from milk sales. Despite this, net incomes from all sources were fairly similar for both types of household.

Table 10. Comparison of Household-level Characteristics, by Intensive and Semi-intensive

	Intensive	Semi-intensive	Overall
Percent that did not migrate at all	27	15	16

Number of migrations in last year (for those that migrated)	2.4	2.6	2.6
Average distance between camps (km) (for those that migrated)	6.8	10.2	10.0
Size of herd (sheep units)	175	337	328
Percent that own at least one milking cow	80	80	80
Percent that own at least one improved breed milking cow	31	10	11
Percent of cattle that are productive females	47	39	40
Total hay produced, purchased, and stored (tonnes)	6.2	4.2	4.4
Number of days cattle were fed with hay in last year	117	59	62
Number of days cattle were fed with prepared fodder (besides hay) in last year	118	87	88
Percent that purchased "concentrate"-type animal fodder	39	23	24
Milk yield (liters per cow per year)	713	480	494
Percent that sold milk in last year	41	15	16
Total earnings from milk sales, for those that sold milk (MNT)	3,644,021	891,040	1,273,905
Net income (revenue – cost) from all sources (MNT)	7,459,820	6,011,373	6,091,310
Percent of revenue from milk sales (for all households)	10	1	2

Figure 4. Breakdown of Animal Types in Herd, for Intensive and Semi-intensive Households



Graphs by intensive

VI. Survey Results by Peri-Urban Area

A. Comparison of Peri-Urban Areas Using Soum Governor Survey

The Soum Governor Survey collected soum-level information from local officials in each of the project soums. The research design of the PURP assigned herder groups to the project by soum—that is, the soum was the primary level at which beneficiaries were selected. However, the selection of project soums was not itself randomized. Because the PURP did not use randomization in its selection of participating soums, the governor survey will not allow researchers to accurately estimate any causal impacts the project may have on soum level dynamics. The Soum Governor survey was developed to complement the other data collection instruments by adding to the richness of contextual information available. The expectation is that this information may prove useful in interpreting results from the household survey and exploring the mechanisms behind project effects. This section presents information from this survey, reporting on the extent of the PURP project in the participating soums as well as on other key measures at the soum level.

Table 11 provides a list of all the soums participating in PURP in the Phase II areas.

Table 11. List of Soums Participating in PURP in Phase II Areas

Peri-Urban Area	Aimag	Project Soums
Choibalsan	Dornod	Bayantumen
		Bulgan
		Choibalsan
		Sergelen
Kharkhorin	Arkhangai	Khotont
		Tuvshruulekh
	Uvurkhangai	Burd
		Kharkhorin
		Khujirt
		Taragt
		Ulziit
		Yusunzuil
		Zuunbayan-Ulaan

Table 12 lists the natural zones occurring in the PURP Phase II areas. These natural zones are correlated with climate and land productivity and can have substantial implications for herder lifestyles in the area. These natural zones will be used to stratify future impact analyses.

Table 12. Types of Natural Zone in Phase II Areas

Kharkhorin	Choibalsan
Forest Steppe	Steppe
Meadow Steppe	Dry Steppe
Steppe	

Table 13 presents the PURP in relation to the whole soum, including the percent of all herder households in the soum that are participating in the project, and the percent of all soum pastureland that is covered by PURP leases. With the exception of Ulziit soum in Uvurkhangai, which is barely touched by the project boundaries, the project covers between two and 12 percent of all herder households in the project soums, and between one and 18 percent of all pastureland. Generally, the percentage of households in the project is larger in Choibalsan area, while the percentage of pastureland under PURP leases is much smaller in that area. Although the project is relatively small in extent, it has directly affected a significant proportion of herders in both areas, and the leases have become a salient feature covering a substantial portion of pastureland in several soums. Future analyses will examine the relationship between lease area density and household and group outcomes.

Table 13. PURP Herder Groups and Households, and Lease Areas in Soum Context¹

Aimag	Soum	Number of PURP Herder Groups	Number of PURP Households	Total herder households in soum	Percent of herder households in PURP	Total land area of soum (hectares)	Percent of soum land that is pastureland	Percent of soum pastureland in PURP lease areas	Percent of soum pastureland in PURP control areas
Choibalsan Area									
Dornod	Bayantumen	24	52	405	12.8	832080	77.3	5.7	4.9
Dornod	Bulgan	14	19	310	6.1	711000	94.5	2.1	1.8
Dornod	Choibalsan	10	20	225	8.9	1015215	81.5	1.1	1.7
Dornod	Sergelen	4	9	292	3.1	290894.8	82.9	1.5	0.6
Kharkhorin Area									
Uvurkhangai	Taragt	21	36	740	4.9	395500			
Uvurkhangai	Kharkhorin	18	61			224116	59.7	13.6	15.6
Arkhangai	Tuvshruulekh	16	69	570	12.1	122283	69.8	18.1	13.8
Uvurkhangai	Zuunbayan-Ulaan	13	37	1098	3.4	270098	91.6	5	5.1
Arkhangai	Khotont	11	40			247170	79.4	6.7	6.1
Uvurkhangai	Khujirt	10	25	1088	2.3	171782	77.9	5.4	8.5
Uvurkhangai	Yusunzuil	8	15	749	2	222100	96.9	3.1	4.4
Uvurkhangai	Burd	5	17	596	2.9	257861	86.9	3.4	3
Uvurkhangai	Ulziit	1	1	644	0.2	196800	90.0	0.36	0.95

¹ Blank cells indicate missing data

A key indicator of wealth among herders is the number of livestock owned. The government of Mongolia keeps very complete and detailed records on animal numbers collected during the biannual animal census. Because of the availability of these numbers,¹⁶ we can compare PURP herders with average herder households in each soum using numbers of each type of animal and the total number of herder households in the soum. Table 14 presents this comparison. There is a noticeable pattern based on geographic location. For all soums in the Choibalsan area, PURP households have smaller herd sizes than the average household in the soum. In contrast, for the Kharkhorin area, PURP households in all soums have larger herd sizes than average. At this point it is unclear what are the causes or implications of these differences, but they will be important to keep in mind for future analyses.

Table 14. PURP Households Compared to Soum Households: Number of Animals^{1,2}

Aimag	Soum	Livestock per herder household in soum (sheep units)	Livestock per household in treatment and control households (sheep units)
Choibalsan Area			
Dornod	Choibalsan	649	454
Dornod	Sergelen	609	360
Dornod	Bulgan	494	397
Dornod	Bayantumen	408	378
Kharkhorin Area			
Uvurkhangai	Burd	504	541
Uvurkhangai	Ulziit	253	397
Uvurkhangai	Yusunzuil	227	391
Uvurkhangai	Khujirt	200	314
Arkhangai	Tuvshruulekh	180	222
Uvurkhangai	Taragt	152	202
Uvurkhangai	Zuunbayan-Ulaan	121	229
Uvurkhangai	Kharkhorin		410
Arkhangai	Khotont		324

¹ A “sheep unit” is a generic way of measuring “number of livestock” that takes account of the differing size of animals. Goat = 0.9, Sheep = 1, Camel = 5.7, Cattle = 6, Horse = 6.6

² Blank cells indicate missing data

Table 15 displays a list of other economic development projects that were ongoing in project soums at the time of the survey. Notable projects include a project for “Water Point and Extension Station Establishment for Poor Herding Families” funded by the Asian Development Bank that was active in three soums in the Kharkhorin area, and the World Bank’s “Sustainable Livelihood-2” project, which was active in all project soums.

¹⁶ Animal numbers were collected from local officials during the Soum Governor Survey.

Table 15. Other Economic Development Projects in PURP Souns

Organization	Project Name	Number of souns in Kharkhorin area ¹	Number of souns in Choibalsan area
Asian Development Bank	Water Point and Extension Station Establishment for Poor Herding Families	3	0
Government of Mongolia	Soum development project	2	0
Government of Mongolia	Improving the Mongolian livestock breeding	1	0
Government of Mongolia	Supporting herders' employment project	0	1
Government of Mongolia	Project to protect from disaster	0	1
IED	Yak providing project	1	0
Japan International Cooperation Agency	Improving teacher skill project	0	1
United Nations	Project to improve income of poor population	0	1
World Bank	Sustainable Livelihood - 2	9	4
World Vision	Education	1	0
World Vision	Economic	1	0
World Vision	Food security of poor population	1	0
World Vision	Child protection project	1	0

¹This refers to the number of souns that participated in PURP that also were affected by a different project.

B. Herder Group Characteristics by Area

This section uses the herder group leader survey to examine the PURP herder groups on a number of dimensions including characteristics of the group members, characteristics of the lease area, and herd size relative to the carrying capacity of the lease area.¹⁷ Table 16 gives information on herder group members broken down by peri-urban area. On most measures the group composition is very similar between the two areas. Group members in Choibalsan area are slightly smaller, and are slightly more likely to have a female head of household than those in Kharkhorin area. In addition, members in Kharkhorin are more likely (by seven percentage points—84% vs. 91%) to live within the lease area. Overall the standardized PURP application process ensured that groups in both areas are similar on average.

Table 16. Group Composition & Demographics of Members

	Choibalsan	Kharkhorin	Overall
Number of households in group	2.8	3.3	3.1
Percent of members that are relatives	75.0	72.3	73.3
Percent of member households with female head	11.1	9.8	10.3

¹⁷ This section only includes treatment groups, since control groups did not take the Herder Group Leader survey. But Section IV showed that treatment and control groups are well-balanced, so this information will be very similar for control groups.

Percent of member households with small herd (less than 100 sheep units)	42.7	43.8	43.4
Percent of member households that live within lease area	84.1	91.4	88.8

Table 17 gives the percentage of groups whose leader said the members received training since the formation of the group, broken down by type of training. A large majority of groups in Choibalsan received training of all types; while in Kharkhorin the groups received much less training. This is easily attributed to the fact that the baseline survey was occurring at the same time as some of the early trainings of the project, and the Kharkhorin surveys were conducted earlier in the year than the Choibalsan surveys. This is another confirmation that the finding of significantly different rates of receiving training between treatment and control groups, which was seen in the balance test section, is due to participation in PURP training prior to the baseline survey.

Table 17. Previous Training of Group Members

	Choibalsan	Kharkhorin	Overall
Pasture management	100.0	76.7	84.7
Intensive livestock farming	98.1	82.5	87.9
Fodder preparation and storage	81.5	49.5	60.5
Business and marketing	85.2	48.5	61.1
Well maintenance	77.8	58.3	65.0

Table 18 presents different carrying capacity estimates for the PURP lease areas, as well as two measures of pasture load.¹⁸ Carrying capacity was measured using biomass clippings by PURP in the mid-2012. Prior to this, group leaders who responded to the PURLS Herder Group Leader Survey gave estimates of the carrying capacity of their lease area. In Choibalsan area, group leaders tended to underestimate the carrying capacity, while the opposite was true in Kharkhorin area. In Choibalsan, the actual number of animals (in sheep units) owned by the group members (as measured by the household survey) slightly exceeded the actual carrying capacity, and greatly exceeded (by 300 sheep units) the estimated carrying capacity of the group leader. In contrast, the planned animal number was lower than the actual carrying capacity measured by PURP, but still higher than the capacity estimated by group leaders. Interestingly, in Kharkhorin the number of animals that the group planned to graze on the lease area was significantly higher than the number currently owned by the group, while the planned number was slightly lower than the actual number in Choibalsan. In both areas, the actual number of animals owned by the group was very similar to (though slightly larger than) the carrying capacity directly calculated by PURP, suggesting that the groups might have already been limiting their herd size based on the land's capacity, even without the precise measurements of the carrying capacity provided by PURP. However, no strong conclusions regarding overgrazing are possible using only data from the PURLS baseline survey. It is important to note that the number of animals owned by group members is not a perfect measure

¹⁸ Carrying capacity is the maximum number of livestock that an area of pastureland can sustainably support without becoming degraded over time. Pasture load is the number of livestock that are actually being grazed on an area of pastureland. These quantities are typically measured at the soum level, but PURP promoted the use of more fine-grained carrying capacity measurements based on individual lease areas. Carrying capacity varies from year to year based on weather.

of the pasture load of the lease area, since many group members herd some of their livestock outside the lease area for at least part of the year. Moreover, there was a dzud (severe winter) which caused extensive animal mortality two years prior to the baseline survey, which would reduce grazing intensity in the short term but likely not in the long term. Additionally, estimates of pasture load and comparisons to carrying capacity depend not just on the number of animals, but which seasons and for how long the animals used the pasture. This information is not available in the baseline survey, which further limits our ability to draw any conclusions. Much more detailed information on the intensity of use of the lease area pasture will be collected in the follow up survey, and additional information on carrying capacity will be made available through the parallel USDA study on land quality.

Table 18. Pasture Carrying Capacity and Pasture Load (Sheep Units)

	Choibalsan	Kharkhorin	Overall
Carrying capacity, Herder Group Leader Survey	846.7	968.9	923.1
Carrying capacity, PURP 2012	1,109.5	875.5	953.0
Number of sheep units group plans to graze on lease area	1,094.6	1,416.6	1,305.8
Number of sheep units currently owned by group	1,132.6	934.4	1,003.0

Table 19 gives a picture of the natural and social environment surrounding the lease areas in each peri-urban area. Almost 80% of lease areas in Choibalsan contained some type of well, compared with only 53% in Kharkhorin.¹⁹ This may be attributable to the easier access to streams and rivers, which are present in 36 percent of lease areas in Kharkhorin and only 15 percent in Choibalsan. None of the leasing areas in Choibalsan and 17 percent in Kharkhorin contain a hay or cropping area of a non-member, perhaps reflecting the greater population density in the Kharkhorin area. Kharkhorin area leases were also much more likely to contain grazing or passage areas of non-members, or a camp of a non-member household. Additionally, on average the number of winter and spring camps of neighbors within 2 km of the lease area boundary were higher in Kharkhorin than Choibalsan. However, given that the PURLS design called for selection of two neighbor households within 2 km of the lease boundary, the number of neighbors is small in both areas. This led to the problem of insufficient neighbor interviews, which will be explored in Section IX below.

Table 19. Features and People in Proximity of Lease Area

	Choibalsan	Kharkhorin	Overall
Lease area contains Well (%)	79.6	52.9	62.2
Lease area contains River or stream (%)	14.8	36.3	28.8
Lease area contains Hay-making or cropping area of non-member (%)	0.0	16.7	10.9

¹⁹ Note that overall 15% of lease areas contained an electric well before the project began. This type of well was later drilled at a subsidized price by PURP. The other lease areas contained either traditional wells with a bucket, or wells with a hand-powered pump.

Lease area contains Grazing area of non-member (%)	16.7	37.3	30.1
Lease area contains Passage area of non-member (%)	20.4	31.4	27.6
Lease area contains camp of non-member (%)	5.6	25.7	18.7
Number of winter camps with 2 km of lease area boundary	2.2	3.7	3.1
Number of spring camps with 2 km of lease area boundary	1.3	1.5	1.4

C. Household Characteristics by Area

This section takes a closer look at the characteristics of those households that entered the lottery—i.e. the combined treatment and control groups—by peri-urban area. Table 20 presents information on demographics of households. Both areas had similar household size of four members (including children). Across both areas, 92% of household heads were male. Household heads in Choibalsan area are more educated by an average of 1.4 years than those in Kharkhorin area. Both areas have a similar number of households that have lived in their current soum for at least five years. Households in Choibalsan have a much higher rate of winter and spring camp possession certificate ownership, with over half of households owning at least one certificate, compared to 38 percent for Kharkhorin area. Households in Choibalsan area were twice as likely as those in Kharkhorin to be sedentary, perhaps because the flat geography of eastern Mongolia limits opportunities for sheltering from winter weather in mountains and hills. Of those that did migrate, however, Choibalsan-area households moved further on average between their camps, again a reflection of the lower population density of the area.

Table 20. Household Demographics and Migration

	Choibalsan	Kharkhorin	Overall
Number of household members	4.0	4.1	4.1
Percent of households with male head	92	93	92
Number of years of schooling of household head	8.1	6.7	7.1
Percent that lived in current soum 5 years ago	91	92	91
Percent with winter or spring camp possession certificate	52	38	43
Percent that are sedentary (one year-round camp)	25	12	16
Average distance between camps (for those that moved) (km)	11.5	9.4	10.0

Figure 5 presents the total number of seasonal camps occupied by households in both areas. As mentioned above, Choibalsan area households are twice as likely to be sedentary. In contrast, Kharkhorin-area residents are much more likely to use two seasonal camps, primarily a winter-spring camp and a summer-autumn camp. Both areas have similar numbers of households using three or four seasonal camps (20% and 15%, respectively).

Figure 5. Number of seasonal camps that household uses

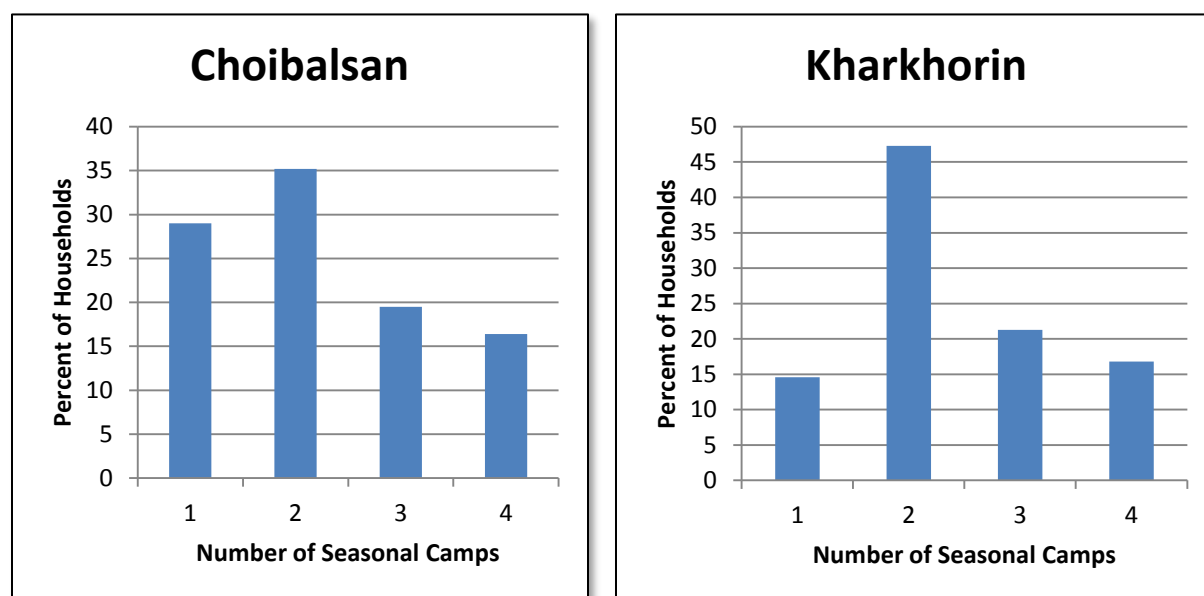


Table 21 reports overall herd size and a breakdown of herd by type of animal, by area. Herds in Choibalsan area were substantially larger (about 30 percent larger in sheep units) than those in Kharkhorin area. This is attributable primarily to larger numbers of cattle and horses in Choibalsan, whereas the numbers of sheep and goats were very similar between the areas.

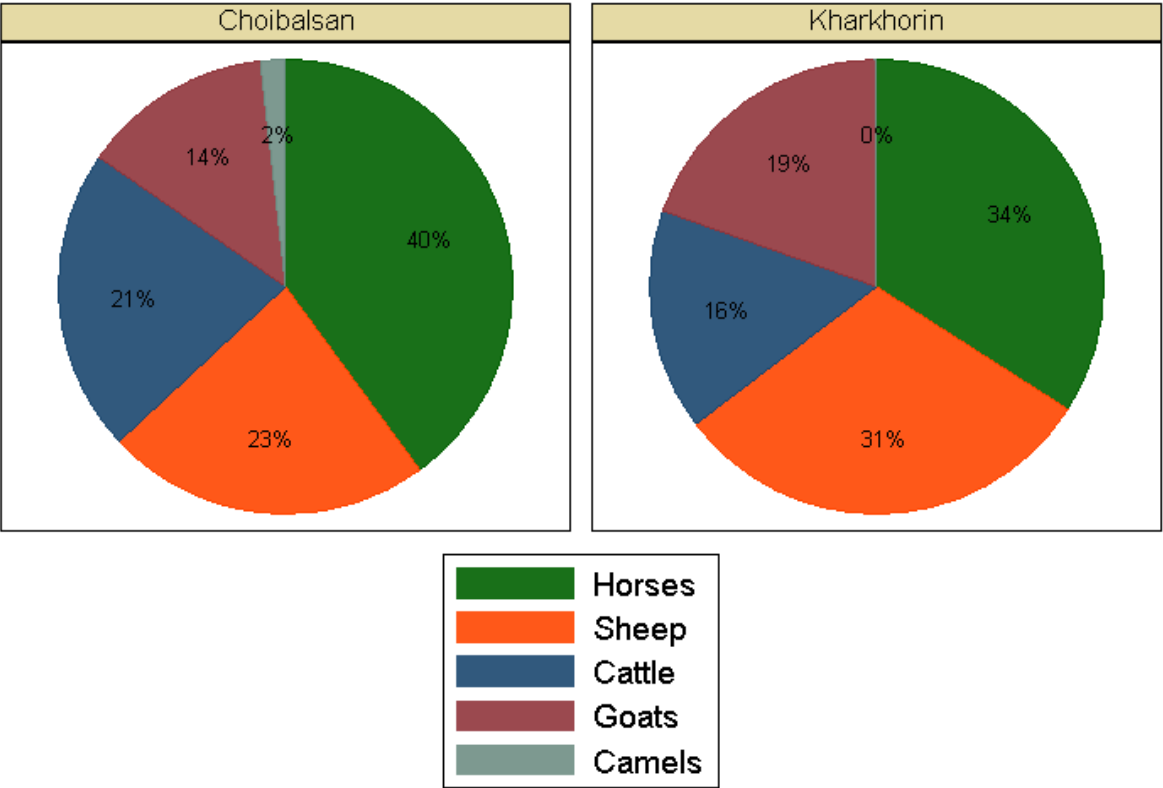
Table 21. Animal Numbers

	Choibalsan	Kharkhorin	Overall
Total sheep units	390	299	328
Camels	1	0	0
Horses	25	16	19
Cattle	15	8	10
Sheep	97	95	96
Goats	63	67	66

Figure 6 presents the herd composition of households in a different way. When we compare the composition of the herd after converting all animal numbers into sheep units, we see that horses dominate the herds in Choibalsan area, with sheep and cattle also being prominent, and generally few goats, and a small number of camels. Kharkhorin area herds, in contrast, are more balanced

between different animals, with horses and sheep being most prominent, followed by goats, and finally cattle. No households in Kharkhorin area owned camels.

Figure 6. Breakdown of Herd by Animal Type (% of Sheep Units)



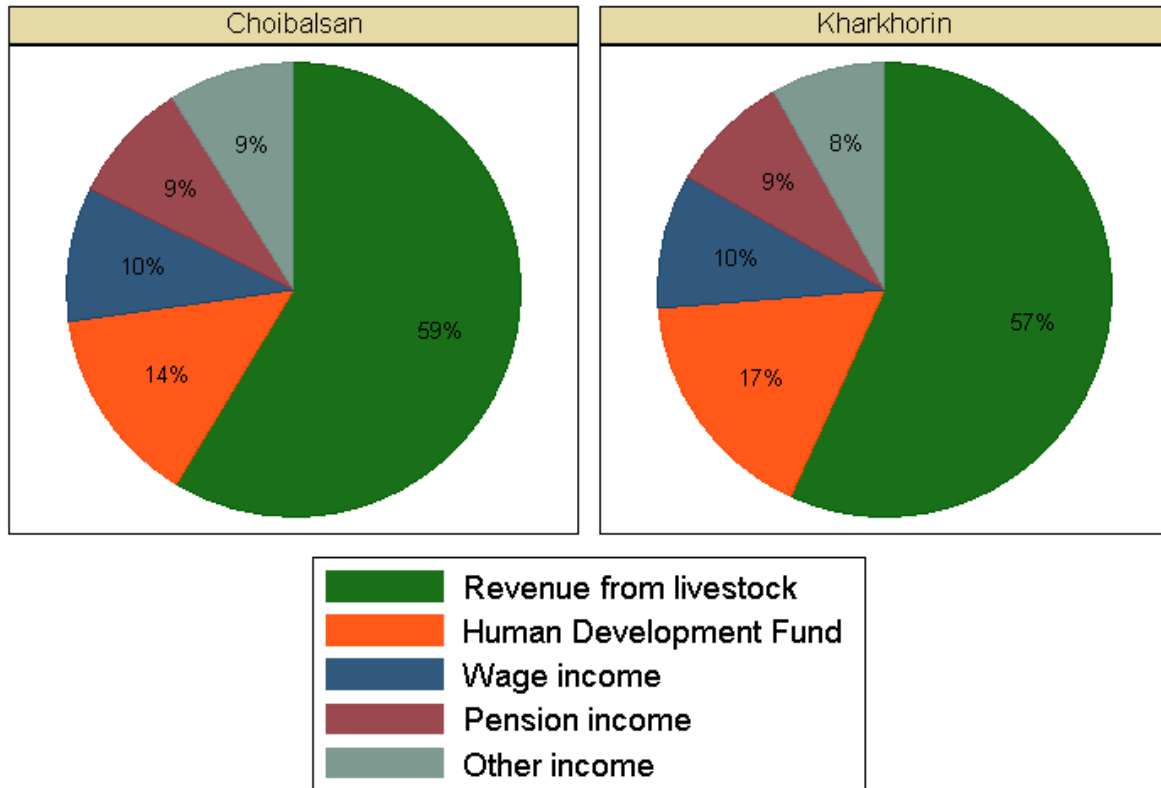
Graphs by Peri-Urban Area

Table 22 presents overall household income from all sources, and this number is broken down into its sources in Figure 7.²⁰ Overall household income was 6.9 million MNT in Choibalsan, higher by almost 1.2 million compared to households in Kharkhorin. The breakdown of income into sources was surprisingly very similar across the two areas, given all of the other differences observed. Almost 60% of income came from livestock husbandry, while the next largest source (about 15%) was the Human Development Fund, which was a cash transfer program that was implemented by the Mongolian government during the period of the survey. Following this were wages, pensions, and other income.

Table 22. Total Income from All Sources (MNT)

	Choibalsan	Kharkhorin	Overall

²⁰ Revenue from livestock is gross earnings, not net earnings. Thus these income numbers overstate the net income by the cost of engaging in animal husbandry.

Figure 7. Breakdown of Total Income by Source

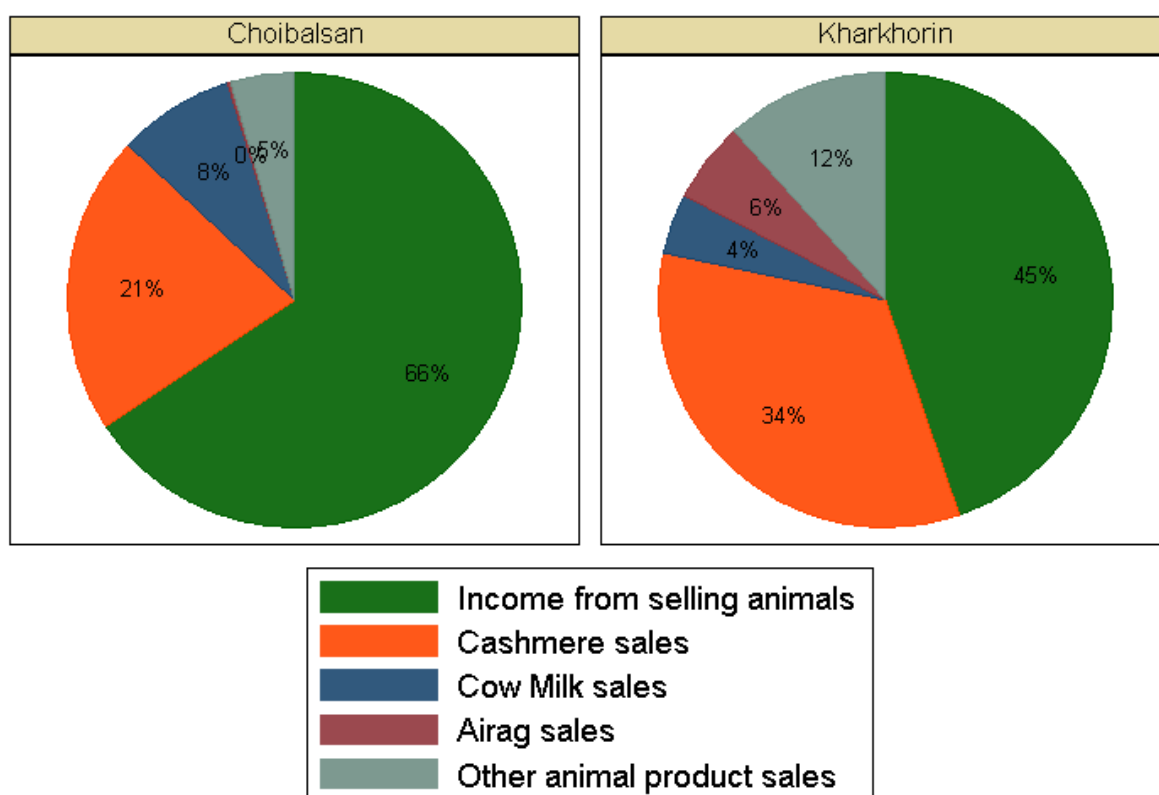
Graphs by Peri-Urban Area

Table 23 and Figure 8 present the breakdown of livestock-related revenue and costs. Table 23 presents total revenue from animal husbandry, as well as total costs and implied net income or profit. For both areas, costs ran at about 27% of revenue, but it is difficult to compare this to profits from a traditional business because animal husbandry for Mongolian herders is an entire livestock and requires extensive “inputs” of times and effort that are not captured in the costs displayed in Table 23. Figure 8 breaks down the revenue figure further by presenting the percent coming from the sale of animals (alive or for meat), cashmere, cow milk, airag, and other animal products. In Choibalsan area, animal sales (primarily sheep) constituted over two thirds of agricultural income, while cashmere accounted for 21% of income and other products less than 10%. In Kharkhorin the situation was quite different. While still the largest share, animal sales produced less than half of agricultural income (44%), while cashmere brought in a much larger share of income, accounting for fully one third of income.

Table 23. Revenue and Cost from Livestock Husbandry

	Choibalsan	Kharkhorin	Overall
Revenue from animal husbandry	4,120,382	3,258,385	3,528,592
Cost of animal husbandry	1,193,711	902,192	994,733
Net income from animal husbandry	2,901,454	2,349,884	2,522,783

Figure 8. Breakdown of Livestock Revenue by Product



Graphs by Peri-Urban Area

Table 24 reports on hay and fodder usage, milk production, and milk sales. These measures are presented together because prepared hay and fodder are primarily used for feeding cattle during winter and spring months, particularly for those with foreign breed milking cows that are milked in winter. Thus it is expected that hay usage should lead to higher milk production, an assumption that will be discussed further in Section VIII below. Households in Choibalsan area were much more focused on milk production than those in Kharkhorin area. They purchased, produced, and stored more hay, and they fed hay to their cows more days in the year, and fed other prepared fodder to their cows much more than in Karkhorin area. Choibalsan-area households were more likely to own milking cows, and more than three times as likely to own improved-breed milking cows. This is all reflected in the higher milk yields of the average cow in Choibalsan area, which is nearly 50 percent higher than in Kharkhorin. Despite the much lower average milk production,

Kharkhorin households were equally likely to sell their milk, though they earned substantially less money from selling.

Table 24. Hay and Fodder Usage, Milk Production and Sales

	Choibalsan	Kharkhorin	Overall
Total hay produced, purchased, and stored (tonnes)	5.8	3.7	4.4
Number of days cattle were fed with hay	66	60	62
Number of days cattle were fed with fodder	110	78	88
Percent with milking cows	87	77	80
Percent with improved breed milking cows	21	6	11
Yearly milk yield per cow (L)	623	423	494
Percent that sold milk	17	16	16
Total earnings from milk sales, for those that sold milk (MNT)	1,966,700	920,580	1,273,905

Table 25 examines the links between production, price, and income for a variety of animal products. The method of calculation requires some explanation. Prices, quantities, and total earnings were calculated as averages across all households. This method of calculation does not produce the average price *per unit sold*, only the price that *an average household* received. Thus multiplying average price and quantity does not exactly give average earnings. If there is relatively little price and quantity variation among households, however, the number calculated should be close. This is the case with all animals and animal products in Table 25 except for cow's milk, where the average earnings are substantially lower than the average price times average quantity sold. This could be because a small number of households sold a large amount of milk at lower prices, while most households sold a smaller amount of milk at higher prices. In fact, we do see a substantial negative correlation between herd size and price received. This may be because small-scale herders are only willing to sell when the price is high, whereas larger business-focused dairy operations need to sell their product continuously at the going rate. Besides the milk price, other notable features of Table 25 are that almost all households sold cashmere, while other animal products were much less common. Between one quarter and one half of households sold each of the four main types of animals (live or slaughtered), but less than one fifth sold airag or cow's milk, and airag was almost all sold in Kharkhorin area, despite the relative abundance of horses in Choibalsan area, as reported in Figure 6.

Table 25. Average Price and Quantity Sold of Animals and Major Animal Products

Animal or Product	Choibalsan				Kharkhorin			
	Quantity Sold	Price per unit	Total earnings	Percent of households who sold	Quantity Sold	Price per unit	Total earnings	Percent of households who sold
Horse	4.3	372,772	1,620,657	37	3.3	359,716	1,092,548	25
Cattle	3.4	466,281	1,475,975	41	2.6	483,083	1,165,238	23
Sheep	34.4	68,600	2,355,609	47	20.8	86,130	1,654,221	46
Goat	14.7	52,659	747,639	38	10.7	61,447	587,071	24
Airag (liters)	406.7	1,833	646,667	1	1,136.4	800	889,779	21
Cow Milk (liters)	3,822.7	718	1,966,700	17	1,187.5	919	920,580	16
Cashmere (kg)	15.0	67,288	1,031,356	85	18.8	61,194	1,154,351	95

Table 26 gives additional information on the determinants of income.²¹ This table presents coefficients from a linear regression of total income on a number of different characteristics of the household. We see that having an additional Mongolian cow is associated with about 206,000 MNT greater income per year, while a foreign breed cow is associated with a much greater additional income of 734,000 MNT per year. Sheep and goats are also associated with higher income, though much less (15,000 for a goat and 19,000 for a sheep). Owning horses also appears to be significantly related to higher income (by 11,700 MNT). Further, having access to electric wells in summer is linked to about 660,000 MNT of additional income. Other important characteristics are the level of schooling of the household head and the number of household members, both of which are associated with higher income. On the other hand, having migrated over the last 12 months is linked with earning 740,000 MNT less in total income compared with households that stayed put.

There is also a significant association between distance to a milk processing or sales facility and income – those who are further away earned slightly more. But this final finding is likely a statistical artifact.

²¹ Note that this table presents results from a simple cross-sectional regression analysis and should not be viewed as causal. The relationships presented simply give descriptive correlations of variables, which indicate factors that are closely related. For example, we see that owning a car is associated with higher income (though not significantly). But owning a car may allow a herder to earn more income, or may simply be more affordable for those with higher income. Both of these seem likely to be true, but this type of analysis cannot tell us to which extent either of those is true.

Table 26. Determinants of Household Income

	Coefficient	Standard Error
Number of foreign breed cows	734,042**	(66,904)
Number of Mongolian cows	206,113**	(37,364)
Number of horses	11,697*	(5,846)
Number of sheep	18,948**	(1,531)
Number of goats	15,082**	(3,281)
Household owns a car or truck	341,504	(270,417)
Household owns a piece of land	624,612*	(265,607)
Household has winter or spring camp possession certificate	-27,731	(266,680)
Household head is female	145,121	(494,907)
Years of schooling of household head	95,743**	(34,090)
Household member has received training in animal husbandry	523,292	(277,318)
Household member has received training in business	574,593	(406,641)
Number of household members	355,785**	(77,947)
Total hay produced and purchased	9,570	(18,853)
Quality of land at winter camp	205,600	(182,685)
Distance to milk sales or processing facility	3,529*	(1,684)
Household has migrated over the last 12 months	-738,474*	(357,310)
Size of household's lease	-235	(237)
Household has access to electric (deep) summer well	659,616*	(266,767)
Household has access to electric (deep) winter well	471,399	(287,475)

* $p < 0.05$; ** $p < 0.01$; $R^2 = 0.51$

Table 27 explores the motivations of households for joining PURP and how they differ by peri-urban area. In general herders in Kharkhorin area listed more reasons for joining the project, and in particular were much more likely to list “improve pasture quality,” “support to build a well,” and “develop better farming practices,” than those in Choibalsan area. Choibalsan area herders in contrast were more interested in support for fencing and animal shelters than those in Kharkhorin area. The most common reasons for joining the project were Support to build well, Desire to herd jointly with a group, Develop better farming practices, and Improve pasture quality.

Table 27. Motivations for joining PURP

	Choibalsan	Kharkhorin	Overall
Desire to Herd Jointly with a Group	40	42	41
Improve Pasture Quality	26	38	34
Protect Environment	8	11	10
Support to Build Fencing	25	16	19
Support to Build Well	38	46	44
Learn From/Share with Others	8	10	9
Develop Better Farming Practices	33	42	39
Other	25	20	21

Note: The options “improve tenure security” or “gain access to land” were not included on the questionnaire. Primary answer for “Other” was “to improve livelihood”.

VII. Gender Analysis of Project Groups and Households

The preceding analysis has focused on overall levels of variables in PURLS Phase II. In this section we turn to a description of gender differences. Specifically, we look at differences between households with female and male heads of household, across a range of variables. These statistics are reported only for households that were members of the 156 herder groups that participated in the PURP project.²²

Table 28 below reports the percentage of female and male heads of households and herder group leaders. The household heads were self-reported by the respondent or respondents surveyed from each household. As is evident, men led the vast majority (about 90%) of households and herder groups.

Table 28. Gender of Head of Household and Herder Group Leader

Gender by Head of Household	Percent
Male (%)	91.7
Female (%)	8.3
Gender of Herder group Leader	Percent
Male (%)	89.5
Female (%)	10.5

Table 29 illustrates the gender of survey respondents. Though less than 10 percent of all household heads were female, this did not translate into males dominating the interviews. Overall 43 percent of main respondents were female, while 68 percent of secondary respondents were female. This suggests that women who are not considered household heads still have extensive knowledge of the household's livestock and economic activities.

Table 29. Gender of Interview Participants (%)

	Percent Male	Percent Female
Main respondent	56.7	43.3
Secondary respondent ¹	31.6	68.4

¹ Secondary respondent is any household member who actively participated in the interview, but was not considered to be the primary respondent.

While men lead the majority of households, it does not appear that the gender of the head of household had a substantial effect on the likelihood of household members having previous training. Figure 9 breaks down our two training variables by gender. FHHs have lower numbers of members with training in livestock husbandry and business operations. FHHs had a slightly lower percentage of household members with livestock husbandry training (42%) compared those headed by men (62%), but while 21% of MHHs had business training compared with 16% of FHHs. If we look within these households at the family members who are receiving training, a different picture emerges.²³ For those households that received any business training, 46% of those trained were women, while for livestock husbandry training, 41% of those trained were women. Thus, while FHHs were almost as likely to receive any type of training for the family members, overall slightly more men than women engaged in the training activity.

²² A total of 165 groups were selected by lottery to participate in the project. However some groups failed to sign contracts or dropped out of the project at a later date, leaving 156 groups that fully participated in the project.

²³ This information is not presented in any of the tables.

Figure 9. Previous Household Member Training, by Gender of Household Head (%)

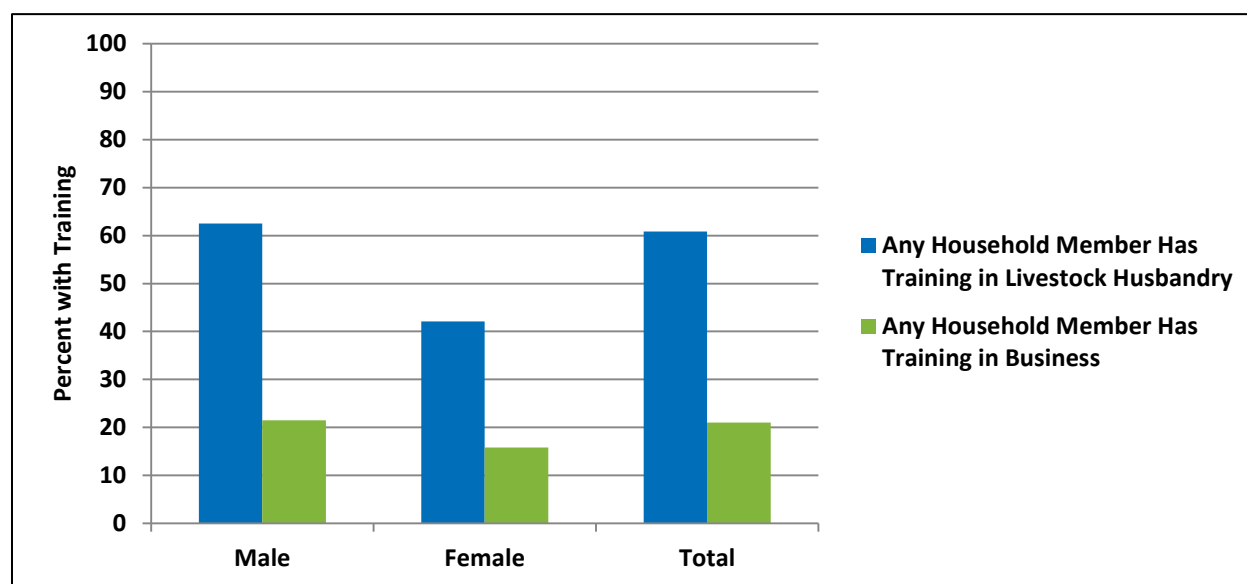


Table 30 reports figures for expenditures per household member, looking at regular food and overall expenditure. When it comes to food expenditures, the yearly household mean was considerably higher for households with female heads. FHHs spent, on average 200,000 MNT more per household member when compared to households with male heads. This may have been caused by the fact that MHHs tended to have more livestock so could have been more self-sufficient and depended less on purchasing food items from the market place.

Total expenditures per household member did not seem to be appreciably different, on average, in male versus FHHs. Mean total expenditures per household member were somewhat higher (by about 250,000 MNT or 10%) in households with women as heads of household.

Table 30. Expenditure in a Year per Household Member by Gender of Head of Household (MNT)

	Male	Female	Overall
Expenditure on Regular Food in a Year per HH Member	322,291	523,886	339,127
Total Expenditure per HH Member	2,097,901	2,349,174	2,118,795

FHHs reported higher annual incomes per household member than those with male heads of household (Table 31). Households with female heads reported an annual income per household member of 1.7 million MNT, while their male counterparts reported 1.6 million MNT. This means that total average yearly income per household member was about 135,000 MNT higher in FHHs. The primary reason for this is that FHHs received significantly more annual income for both pension benefits (520,000 MNT vs. 180,000 MNT per household member) and welfare support (130,000 MNT vs. 56,000 MNT per household member).

Table 31. Total Yearly Income per Household Members by Gender of Head of Household (MNT)

Male	Female	Overall
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Income per Household Member	1,715,981	1,584,677	1,705,477
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There appeared to be a difference in the number of land certificates owned by households when broken down by the gender of the head of the household. Table 32 breaks down land certificate ownership by gender of household head. These figures suggest that households headed by men were slightly more likely to own both winter land certificates (43% vs. 31%) and spring land certificates (31% vs. 27%) than households with a woman as head.

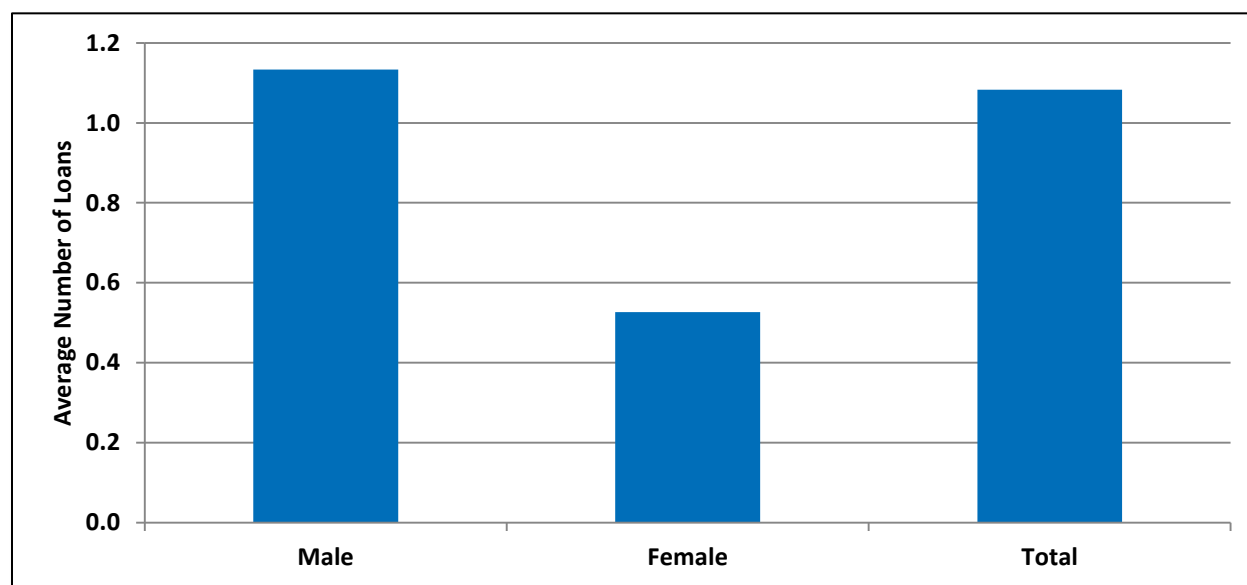
Table 32. Percentage of Land Certificates Owned by HH, by Gender of Head of Household¹

	Male	Female	Overall
Winter Land Certificate Owned by HH	42.5	31.6	41.6
Spring Land Certificate Owned by HH	30.9	27.3	30.7

¹Percentages are reported only for those that have separate winter camps, spring camps, or haymaking areas, respectively.

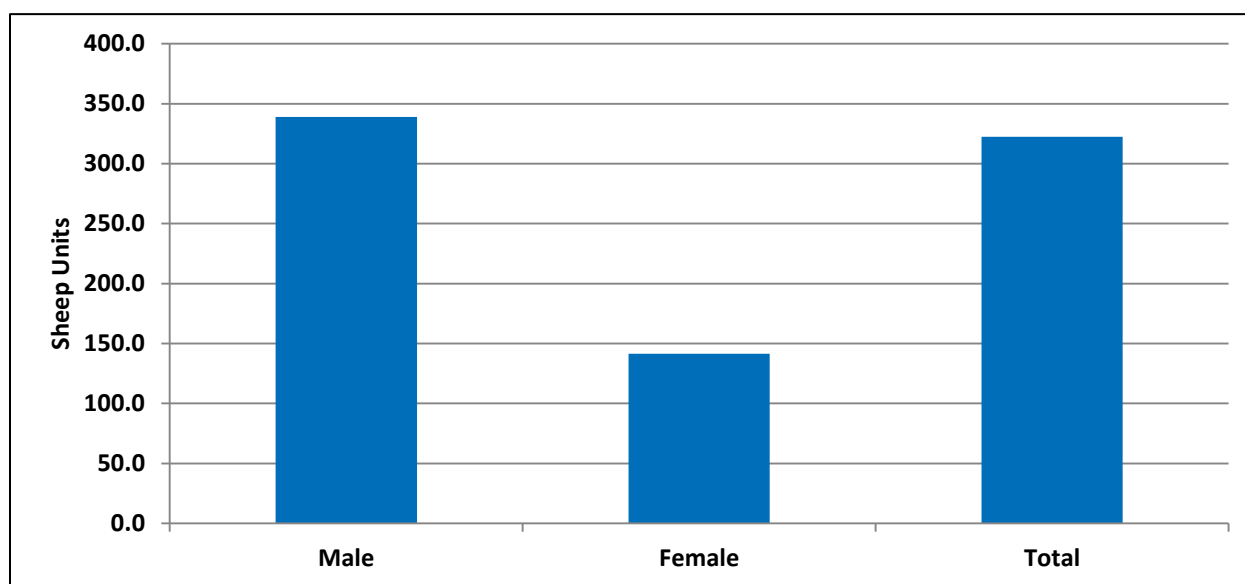
When it comes to access to credit, the differences between households with female versus male heads of household were quite pronounced. Figure 10 below shows the number of loans greater than 500,000 MNT received by households, by gender of head of household, in the past five years. MHHs had received on average 1.1 loans of this size in the last five years compared to only 0.6 loans received by households with female heads.

Figure 10. Number of Loans Greater than 500,000 MNT in the Last 5 Years by Gender of Head of Household



When examining differences in terms of herd sizes between female-headed (FHH) and male-headed (MHH) households (Figure 11), we note two things. First, the average herd size was considerably larger amongst households with men as heads. FHHs had, on average, 130 sheep units compared to 340 sheep units for MHHs. In other words, herd sizes were more than twice as large, on average, in MHHs. However, when we look at the average number of livestock per household member, the difference between male and FHHs was much smaller, due to the smaller sizes of FHHs.

Figure 11. Average Total Herd Size (sheep units) by Gender of Head of Household



The PURLS for Phase II areas also included questions about future investments. Here we found some differences between male and FHHs, but most of these differences were not particularly large nor were they systematic in any obvious way. Table 33 reports the percentage of households planning to invest in the next five years across a range of areas, should they have the resources. The only thing that does stand out was that on average FHHs planned to invest less in almost all categories than their male counterparts. This most likely was the result of FHHs having lower investment needs to maintain their current herd levels than their male counterparts due to their having significantly smaller herd sizes. Some interesting exceptions to this pattern are that FHHs are more likely than MHHs to invest in buying Mongolian cows (a behavior that the project intended to reduce) and much less likely to invest in buying a tractor.

Table 33. Future Investment by Gender of Head of Household (% Planning to Invest in Next Five years)

	Male	Female	Overall
Purchasing Pure and Crossbred cows	81	76	80
Well	75	70	75
Animal Shelter	74	62	73
Fencing	57	54	57
Forage crops	54	46	54
Purchasing Tractor	53	35	51
Purchasing Hay Making Equipment	45	46	45
Purchasing Other Livestock	35	32	35
Purchasing Other Equipment	27	24	27
Purchasing Mongolian Cows	25	32	26
Other	5	0	4

When looking at gender differences in land disputes (Figure 12), a marked difference appears. On average, almost 5 percent of MHHs had disputes, while no FHHs had any land disputes, though this is not entirely surprising given the small number of FHH's in the sample.

Figure 12. Percent of Households with Pastureland Disputes by Gender of Household Head

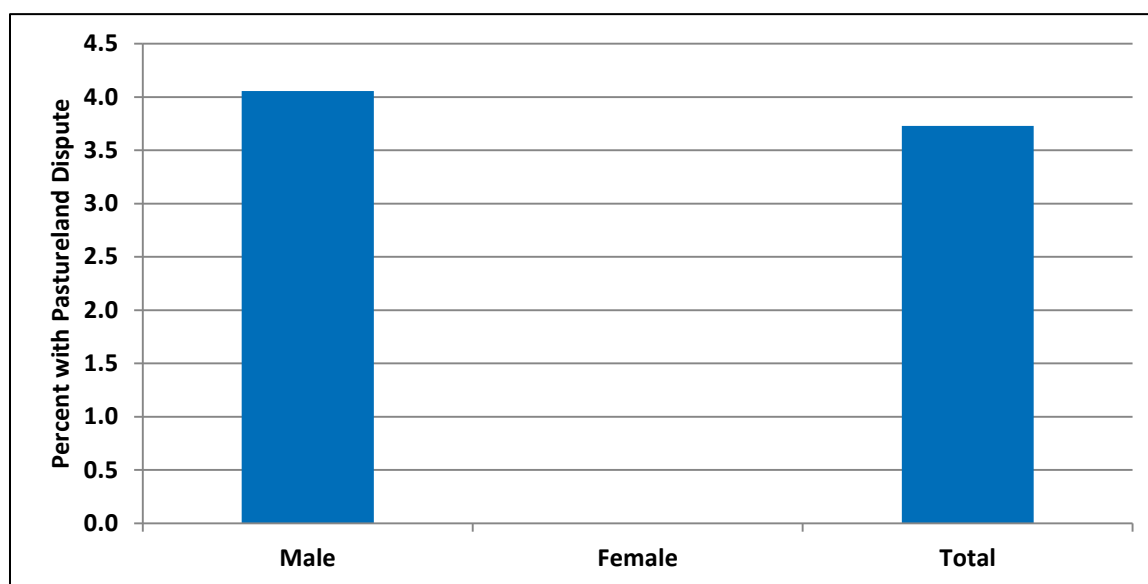


Figure 13 shows the educational attainment of heads of households, broken down by gender. Educational levels were slightly different between men and women. It was found that male heads, on average, had one more year of formal schooling than their female counterparts. Table 34 shows the breakdown of the amount of school fees and school supplies households pay per child in the household, broken down by gender of the household head. MHHs on average spend more on school fees per child than FHHs (95,000 MNT and 65,000 MNT respectively). However, FHHs spent slightly more on school supplies per child than MHHs (44,000 MNT and 31,000 MNT, respectively).

Figure 13. Years of Education of Household Head by Gender

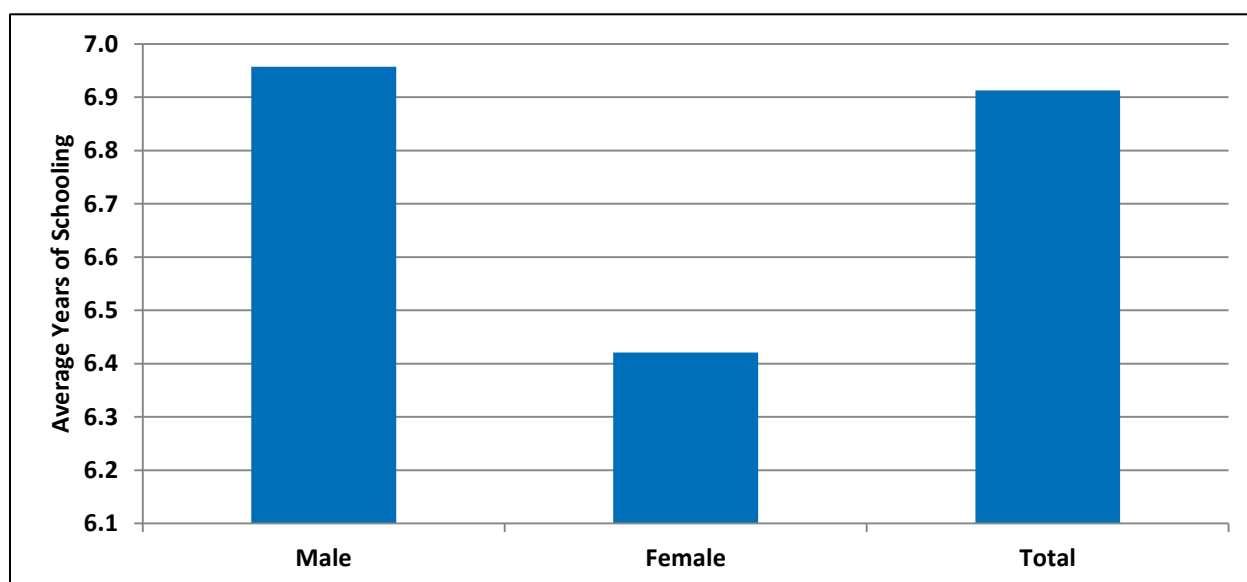


Table 34. Annual School Fees and School Supplies Expenditure per Child by Gender of Head of Household (MNT)

	Male	Female	Overall
Annual School Fees per Child	95,335	65,588	93,740
Annual Expenditure on School Supplies per Child	31,151	43,563	32,190

Table 35 presents the different motivations for joining PURP, by gender of the household head. Some very large differences arise here. Females were over 50% more likely to say they desired to herd jointly with a group. This may reflect a general difficulty of FHHs in finding other households with which to herd together, or it might simply reflect the PURP's application scoring procedure, which gave points for having FHHs in the group. In this case, among the households wanting to jointly herd in a group, those that were female headed were more likely to be selected for PURP. On the other hand, MHHs were more motivated to protect the environment, to develop better farming practices, and to gain support for building fencing and wells.

Table 35. Motivations for Joining PURP by Gender of Head of Household (%)

	Male	Female	Overall
Support to Build Well	44	32	43
Desire to Herd Jointly with a Group	39	61	41
Develop Better Farming Practices	41	26	40
Improve Pasture Quality	37	11	35
Other	21	21	21
Support to Build Fencing	20	5	19
Protect Environment	11	8	11
Learn From/Share with Others	10	11	10

Note: The options "improve tenure security" or "gain access to land" were not included on the questionnaire. Primary answer for "Other" was "to improve livelihood".

Table 36 presents a comparison of MHHs and FHHs on a number of additional outcomes that were important in the PURP project logic. It is clear from this table that male- and FHHs were quite different at baseline on many key outcomes of the project. This finding is not surprising given that having a FHH was heavily encouraged in the PURP application scoring process (see Appendix A), so groups likely put in extra effort to reach out to FHHs, so the selection of FHH into the project followed a different process than that of MHHs. Key differences are that FHHs use substantially less hay, had substantially lower income from all sources, had lower mortality rate for their horses and goats, and had lower past investment in movable and immovable property. These differences should be taken into account when analyzing project impact on FHHs using future follow-up surveys.

Table 36. Comparison of Male- and Female-headed Households on Outcomes from PURP Logic

Variable	Mean: MHHs	Difference: Female – Male (std. error)
Household is sedentary (did not migrate in past year) (%)	14.56	11.03

		(7.03)
Number of migrations in past year	2.59	-0.15 (0.15)
Average distance between camps (km)	10.22	0.57 (2.06)
Perceived quality of pasture at winter camp	3.61	-0.04 (0.13)
Percent that own improved breed cows	12.65	-0.85 (5.16)
Percent of cattle herd that are productive females	39.95	2.21 (3.56)
Total hay produced, purchased, and stored from previous year	4.98	-3.82*** (0.97)
Days that cattle were fed with hay	59.04	13.24 (12.87)
Days that cattle were fed with other prepared fodder	85.16	10.56 (14.58)
Percent that purchased "concentrate"-type fodder	23.87	-3.85 (6.89)
Total income in last 12 months	6086191.26	-2544287.37*** (958345.51)
Net income from livestock	2452980.31	-1349980.54** (530327.24)
Percent with milking cows	80.67	-7.50 (6.97)
Milk yield (liters per cow per year)	506.87	70.57 (87.92)
Percent that sold milk in last 12 months	17.66	-0.20 (7.30)
Total earnings from milk sales (for households that sold milk)	1579173.65	-1507830.77 (2446208.35)
Total income from selling animals	1774401.43	-689906.69** (341853.61)
Total income from selling cashmere	1010362.41	-426417.40*** (131579.05)
Total income from selling airag	115179.00	-107988.44*** (33881.85)
Mortality rate of horses	2.23	-2.84** (1.10)
Mortality rate of cattle	2.34	3.99 (3.92)
Mortality rate of sheep	4.20	0.12 (1.75)
Mortality rate of goats	4.12	-2.70*** (0.84)
Total value of planned investments in next 5 years	19571763.72	-6522256.64 (5085086.30)
Total investment in immovable property in past year	560396.18	-315524.55* (169560.87)
	321908.35	-152416.17***

Total investment in movable property in past year (besides vehicles)

(46899.70)

The PURLS Phase II baseline data points to several important differences along gender lines. In the analysis of the first follow up survey fielded in spring/summer 2014, we will be able speak to the question of whether these gender differences also play out in terms of project effects.

VIII. Tests of PURP Project Logic and Assumptions

This section is a direct examination of several assumptions (explicit or implicit) of the PURP project logic. Many of the statistics discussed were presented earlier, but here they are used to test how the foundations on which the project and its expected benefits were based, measure up to the reality of the lives of the project beneficiaries. First, in Table 37, we present a list of the general outcomes specified in the PURP logic framework (in the first column), and the specific outcomes from PURLS survey that were used to measure them (in the second column). This is the same framework that was used to organize the balance tests in Section IV. Specific outcomes that were not measured in the baseline, but will be added in the follow up survey, are listed in parentheses. Following this, several assumptions that are required to realize these outcomes are examined in detail in the subsequent sub-sections.

Table 37. PURP Logic Framework and Outcomes Measured in PURLS¹

Outcome in project logic framework	Measured outcomes in PURLS
Adoption of rotational grazing²	<ul style="list-style-type: none"> • Percent that moved at all • Number of moves in past year • Average distance between camps • (More detail on grazing patterns will be collected in the follow-up survey, including which seasons the lease area was utilized)
Maintain carrying capacity of land	<ul style="list-style-type: none"> • Stocking rate of lease area • (Percent of groups maintaining their herd at or below carrying capacity. Measured in follow-up; accurate numbers not available in baseline because only total animal numbers were collected and group members often do not herd all of their animals within the lease area)
Avoidance of cost of land degradation and cost of feed	<ul style="list-style-type: none"> • Perceived land quality • Hay and fodder production • (Pastureland productivity measured directly in USDA's Land Productivity Study)
Improved herd quality & composition	<ul style="list-style-type: none"> • Percent of herd that is foreign breed and crossbreed cows • Percent of herd that is productive female
Utilization of more non-forage animal feed	<ul style="list-style-type: none"> • Hay production, purchase, and storage (tonnes) • Number of days cows were fed with hay in past year • Number of days cows were fed with other fodder in past year • Percent using concentrate • (Percent using silage)
Increased herder group incomes from livestock productivity	<ul style="list-style-type: none"> • Total household income • Net income from livestock
Milk yields and related sales	<ul style="list-style-type: none"> • Percent with milking cows • Yearly milk per year per milking cow • Percent that sold milk • Total income from milk sales, for those that sold milk
Meat and other non-dairy animal products	<ul style="list-style-type: none"> • Livestock sales • Sales of cashmere • Sales of airag • (Sales of meat is separated out from livestock sales in follow-up)
Decreased mortality	<ul style="list-style-type: none"> • Mortality rate of cattle • Mortality rate of horses • Mortality rate of sheep • Mortality rate of goats

(Table continued on next page)

Increased land access & security from lease	<ul style="list-style-type: none"> • Number of land conflicts regarding sharing pastureland in past 5 years • Planned livestock-related investments (total amount) • Purchase and maintenance of land & immovable assets • Purchase and maintenance of movable assets • Purchase and maintenance of vehicles • (Ability to restrict others from using the land) • (Feeling of tenure security on their pastureland) • (More detail on pastureland conflicts will be collected in the follow up)
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¹ Parentheses indicate that an item was not measured in the PURLS Phase 2 Baseline Survey

² Rotational grazing can refer to both seasonal migration, where animals are moved to new pasture for an entire season, or to within-season movement of animals to new pasture, while staying at the same camp. Typically Mongolian herders use all of the pastureland near their camps—there is no fencing of certain areas to restrict grazing, and so the animals graze widely. Nonetheless, more detail on both inter- and intra-seasonal animal movements will be collected in the follow-up survey.

A. Migration

One might predict that PURP would reduce the number of migrations among project participants and enable herders to stop seasonal migration by supporting intensive farming practices. However, as we reported in Section V, 27 percent of intensive and 15 percent of semi-intensive herder households were already sedentary at the baseline study. Although the project did facilitate the ability to stay sedentary by building wells in winter pastureland, and encouraging expanded usage of hay and fodder to supplement grazing particularly among intensive herding groups, it did not push herders to stay sedentary. In fact, the project encouraged rotational grazing of animals (which was both seasonal and within-season aspects, as explained in footnote 22). Thus the predicted net effect on migration patterns is ambiguous. Moreover, the ERR model for PURP did not depend in any way on reduced migration.

B. Pasture Load, Carrying Capacity, and Land Degradation

One underlying assumption of the entire PURP was that rangelands in Mongolia, particularly in the peri-urban areas, had been subject to overgrazing in recent years and had become degraded as a result. The baseline PURLS survey can shed at least some light on whether these two assumptions (overgrazing, and land degradation) were true in the areas around Choibalsan, Kharkhorin, and Arvaikheer cities. One way of examining this is to look at the carrying capacity of the lease areas, compared with the actual number of animals (in sheep units) being grazed on those same areas. Table 18, in Section VI.B above, shows several patterns. First, herder group leaders were fairly accurate in their estimate of their lease area's carrying capacity. This could possibly reflect an early training effect, since the training aspect of the project had started prior to the baseline survey. Second, the average number of animals owned by the groups only slightly exceeded the carrying capacity as estimated by PURP in summer of 2012. Additionally we can look at herders' perception of the quality of the land they use. Only two percent of herders considered the pasture they used in the previous winter to be "low" or "very low" quality. And only six percent considered their summer pasture to be low quality. Thus there is little evidence—as measured in our survey—that the pasture in Phase II areas was perceived to be seriously degraded prior to the start of PURP.

There are several caveats to this conclusion, however. First, the method used to measure carrying capacity is sensitive to several factors. Moreover, there seems to be little consensus on what are

the best measures of carrying capacity. A single measure of “carrying capacity” for an area oversimplifies the reality of the situation, where the ability of a parcel of land to sustain livestock varies greatly from season-to-season and year-to-year based on weather. Consequently, although animal numbers were close to the measured carrying capacity of the land, in the long run over-grazing is still possible. The second caveat is that the animal numbers that group members reported owning may not accurately reflect the actual number grazing on the lease area—some of their animals may be grazed elsewhere, while other herders outside the group might graze some animals within the lease boundaries. More detailed data on grazing patterns will be collected in the follow-up survey. The third caveat is that herders’ perception of land quality may not accurately reflect the true state of the land if difficult-to-observe long-term trends are occurring. Finally, it must be taken into account that Phase II areas of PURP are “peri-urban” only in the sense that there is a small city within their boundaries. Choibalsan has a population of approximately 38,000, Arvaikheer a population of 25,000, and Kharkhorin a population of 9,000. Phase I covered areas (particularly the area surrounding Ulaanbaatar) than have seen much greater in-migration than the areas in Phase II.

A parallel study being conducted by USDA on the effect of PURP on pastureland productivity and quality will more directly address the issue of overgrazing in peri-urban areas.

C. Hay Feeding

The project was also designed to promote the use of hay and other prepared fodder to supplement grazing as a source of animal nutrition. In particular PURP set a goal that herder groups would put aside enough hay for the winter to feed their cows for 30 days (semi-intensive) or 180 days (intensive). This would only have an effect if the herders were not already storing sufficient quantities of hay. Although it is difficult to know exactly whether a particular quantity of hay was sufficient for a given herd (due to differences in breed, whether the cows were being milked, and whether the cows were also grazing on pastureland), herders were asked how many days in the past year their cows were fed with hay. It was found that 24 percent of intensive and 49 percent of semi-intensive herder households had fed their cows. Thus, using the project’s benchmarks of sufficient hay storage, it appears there is room for improvement in the amount of hay stored by the project households. It must be noted, though that it is certainly possible that some households stored sufficient hay but simply did not need to use it. Questions attempting to better capture the storage of hay will be added to the follow-up survey.

D. Improved Breed Milking Cows

A critical component of the project is to improve the productivity of milking cows by switching from traditional Mongolian cattle to foreign-breed milking cattle, which give much higher milk yields at the expense of being less hardy and requiring more prepared fodder. However, it is not certain how much more yield the foreign breed cattle will give under the same conditions as Mongolian cattle. To examine these questions, we carried out two tests. First, a multiple linear regression was run with yearly milk yield per cow in liters as the dependent variable and the number of days cattle were fed with hay or fodder, and the percent of the cows that are foreign breed or crossbreed on the right hand side of the equation. Results are presented in Table 38. It can be seen from this table that foreign breed cattle give much higher milk yields even after controlling for hay feeding. Increasing the proportion of foreign breed cattle by 10 percent is associated with an average milk yield increase of 51 liters per year.

Table 38. Regression of Milk Yield on Proportion of Improved Breed Cows

Variable	Coefficient (Std. Err.)
Number of days cows were fed with hay	0.4* (0.2)
Number of days cows were fed with other fodder	0.6** (0.2)
Percent of herd that is “improved breed” cows	5.1** (0.6)
Constant	352.6** (23.3)

* $p < 0.05$; ** $p < 0.01$; $R^2 = 0.18$

Second, the PURLS survey collected detailed information on a “high producing” and a “low producing” cows from each household’s herd. The “high producing” cows can be compared between Mongolian cows and foreign or crossbreed cows to see if the improved breed cattle are in fact getting higher milk yields per day or per year. This comparison is shown in Table 39. It is clear that the improved breed cows are producing much more milk than the Mongolian cows, both because they produce more per day and because they are milked more days in the year. Caution should be used in interpreting these numbers however, since the survey was not designed to make this type of comparison. Simply comparing the highest-producing cow across herds is not representative of the overall population of Mongolian or improved cows. Nonetheless, the numbers do clearly show that foreign cows are out-producing Mongolian cows.

Table 39. Comparison of Mongolian and Improved Breed Cows

	Improved Breed	Mongolian	Overall
Daily Milk Yield (liters) in milking season	7.0	3.8	4.1
Number of Days Milked	216	185	189
Yearly Milk Yield (liters)	1,232	563	645

E. Further Correlations

This section presents additional correlations that were assumed by the PURP logic. It must be noted that these are simple correlations and do not represent any causal relationship. Figure 14 examines the correlation of land conflict with investment in immovable property, milk yield, and revenue from livestock. Those with a land conflict in the past five years had higher investment in immovable property, and higher livestock revenues. There was no observed association with milk yield.

Figure 14. Correlations with Land Conflict

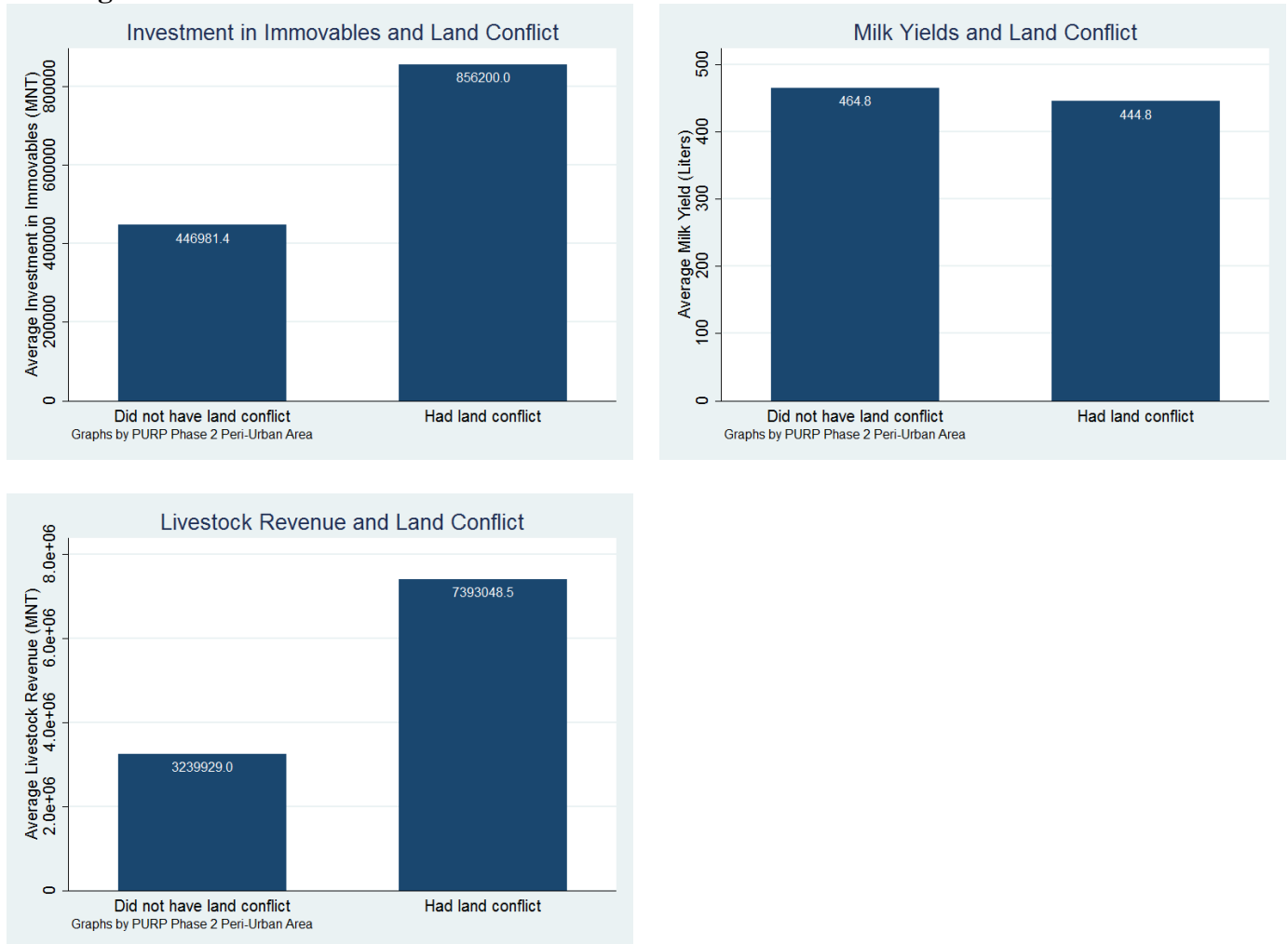


Figure 15 presents the correlations between having a land possession certificate for a winter or spring camp, and investment in immovable property, revenue from livestock and milk yield. Only livestock revenue displays any associated with certificate ownership – those with land certificates had higher livestock revenue on average.

Figure 15. Correlations with Possession Certificate of Winter or Spring Camp

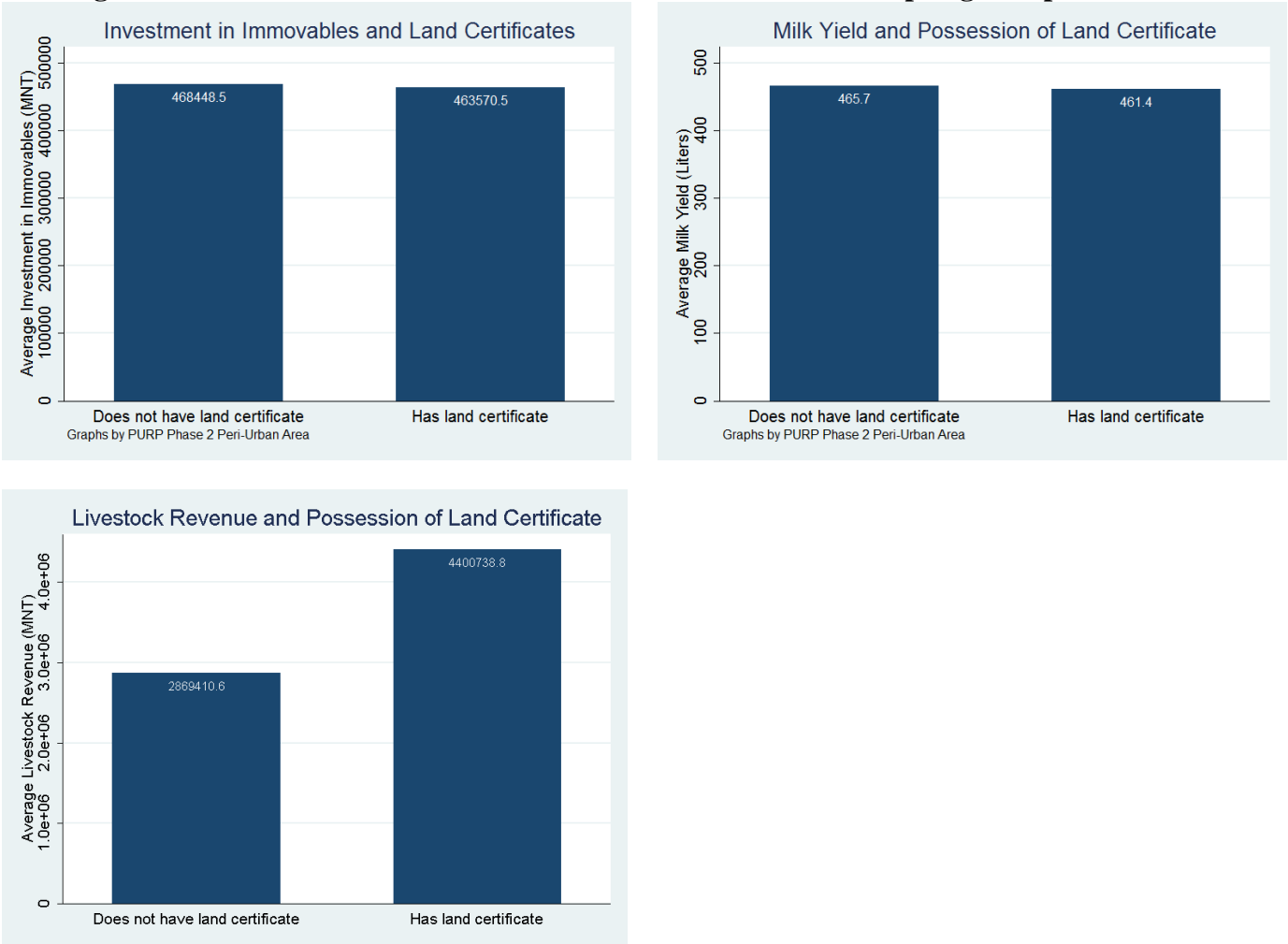


Figure 16 presents correlations between households having prior training in animal husbandry with livestock revenue and milk yield, and between prior business training and livestock revenue. Households with prior training had higher outcomes in all three cases.

Figure 16. Correlations with Prior Training

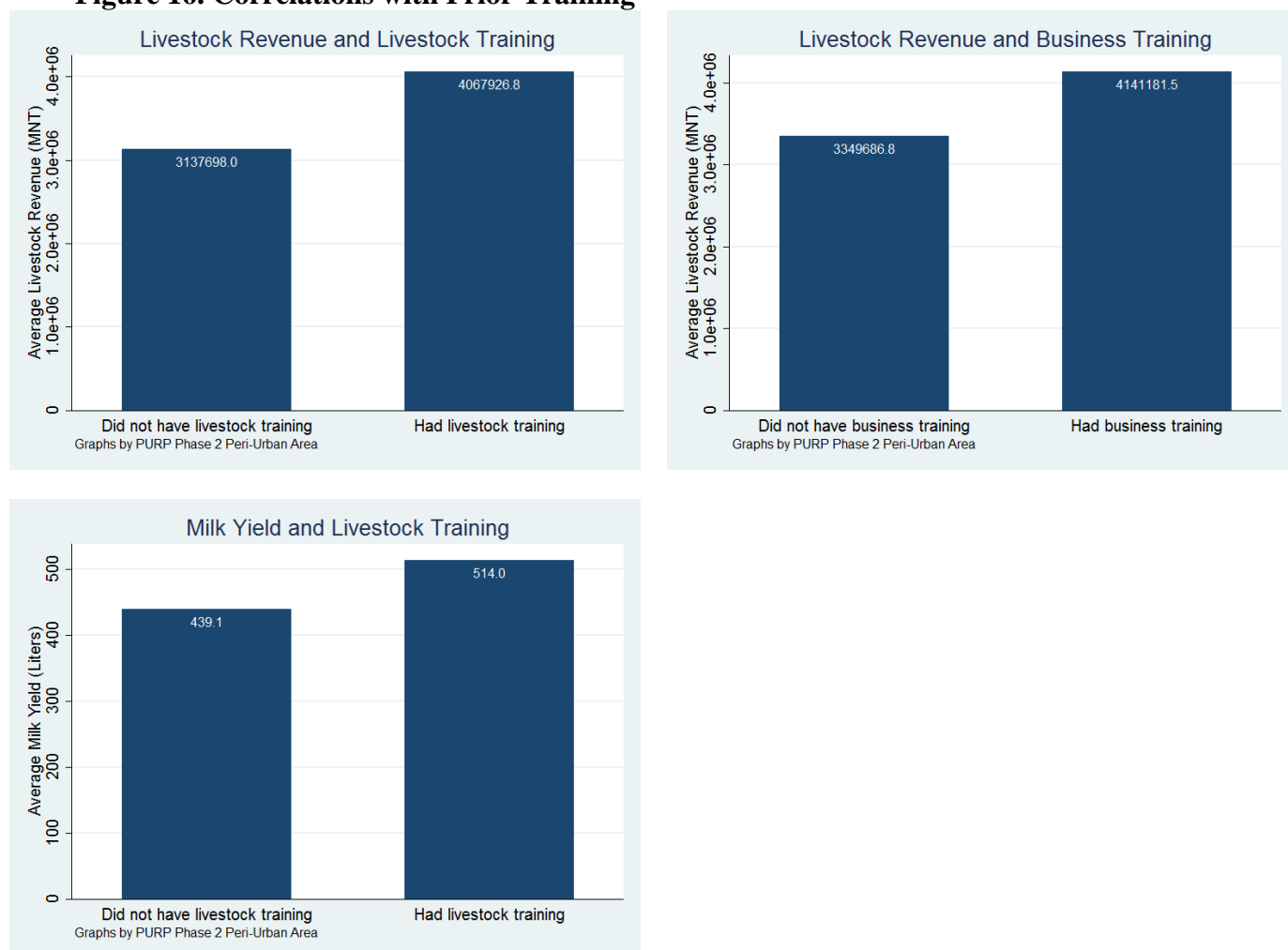
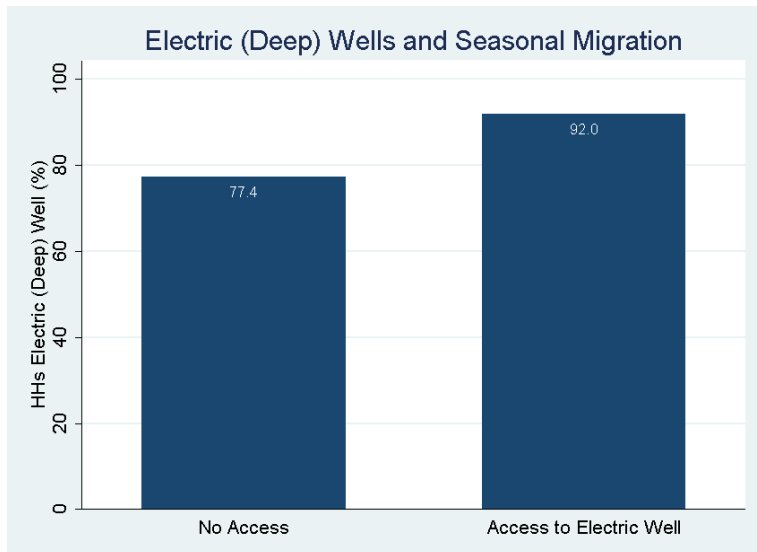


Figure 17 displays the correlation between having access to an electric well at winter or summer camps, and whether the household migrated at all. Those with access to electric wells were more likely to migrate (90 percent) than those without access (80 percent).

Figure 17. Correlation between Well Access and Migration



IX. Household Survey Results for Neighbor Households

As mentioned above in Section II, data was also collected from households neighboring both treatment and control households. That is, these are households that live close to those who applied for the project and participated in the lottery, but who themselves did not apply. Neighbors all have a permanent camp within two kilometers of a PURP Treatment or Control lease area; sampling of neighbors was described in detail in Section II.C. Neighbor sampling was not designed to allow

for direct comparison with lottery households for purposes of external validity, since neighbors are not sampled from a population that has close comparisons outside of its original context. Rather, the neighbor survey results will be used to measure any spillover effects that the project has on neighbors. This is a particularly important effect to track in a project based around property rights, because granting new property rights to one group by its very nature excludes others from access to a potential resource, and so the impacts of the project are not restricted to only direct project beneficiaries.

The exact nature of spillovers is unknown but likely to include effects on land conflicts and access to pastureland, and resulting animal productivity and mortality. If PURP groups exclude neighbors from pastureland, the effects may be negative. On the other hand if PURP leases cause the groups to graze with less intensity outside their boundary, effects may be positive on neighbors because of reduced overgrazing.

Table 40 presents balance tests for neighbor households. These balance tests contain a subset of variables tested for treatment and control households. None of the variables tested show significant difference between treatment and control group neighbors.

Table 40. Balance Test of Neighbor Households

Variables	Mean: Control Group Neighbors	Difference: Treatment – Control (std. error)
Number of household members	4.12	-0.16 (0.14)
Percent with male head of household	94.17	1.34 (2.07)
Years of schooling of head of household	6.83	-0.2 (0.38)
Lived in soum 5 years previously (%)	94.17	0.08 (2.31)
Percent with possession certificate for winter or spring camp	49.51	-7.18 (4.48)
Household is sedentary (did not migrate in past year) (%)	16.02	-2.56 (3.54)
Number of migrations in past year	2.55	-0.16* (0.08)
Average distance between camps (km)	9.8	0.16 (1.21)
Herd size (sheep units)	307.46	30.03 (27.90)
Perceived quality of pasture at winter camp	3.65	-0.03 (0.07)
Total income in last 12 months	5649801.32	-73338.30 (468245.24)
Net income from livestock	2305977	127872.71 (355476.95)
Total income from selling animals	1691480.58	38972.86

		(310343.23)
Total income from selling cashmere	1026804.85	-61013.19
		(88212.38)
Total income from selling airag	98199.03	25535.62
		(40753.74)
Mortality rate of horses	1.87	0.14
		(0.84)
Mortality rate of cattle	2.49	-1.24
		(0.99)
Mortality rate of sheep	4.79	-0.9
		(1.07)
Mortality rate of goats	4.16	-1.06
		(0.97)
Percent with a pastureland-related conflict in past 5 years	3.88	3.15
		(2.24)

Note: * Significant at 10% level, ** Significant at 5% level, *** Significant at 1% level

Table 41 tests whether the number of groups with any neighbors interviewed differs by treatment/control status. For both areas, the Chi Square test fails to reject the null hypothesis that having a neighbor is independent of treatment status of the group. However, it is also the case that over half of groups in Choibalsan area, and 14 percent of groups in Kharkhorin do not have any neighbor households interviewed. Thus there is a large portion of the sample of project groups not represented by any neighbor households, and any statistics regarding project impact on neighbors will likely be biased when attempting to extrapolate to the full population of PURP neighbors. This discrepancy will be taken into account in future impact analyses of neighbor households, and additionally for the follow up survey there will be an effort to sample additional neighbors so that there is at least one neighbor for each treatment and control group.

Table 41. Number of Groups with and without Neighbors

	Choibalsan			Kharkhorin		
	Control	Treatment	Total	Control	Treatment	Total
No Neighbor	34	28	62	12	17	29
Has neighbor	22	31	53	95	88	183
Total	56	59	115	107	105	212

p-value of chi-square test = 0.154

p-value of chi-square test = 0.292

X. Conclusion and Next Steps

Data collection for the evaluation of Phase II of the PURP will include a second and third wave of surveys of all respondents in this baseline survey. The second wave of the PURLS in the Phase II areas was fielded in May through July, 2014. A third wave of survey data collection will be carried out beginning February 2017. All households that participated in the original survey will be tracked and re-interviewed. These surveys will then form the basis for the evaluation.

A number of limitations of the baseline data were discovered during the production of this report. We will summarize the major limitations and actions taken to correct them here:

1. Hay questions were inconsistently asked and recorded in baseline, and skip patterns were not clear. Instructions and skip patterns were made more explicit in the follow-up survey.
2. No questions regarding perceptions of tenure security were included in the baseline survey. These were added to the follow-up survey.
3. Questions on seasonal migration were limited in baseline, and in particular the location of the camps relative to the lease area was not asked. This section was expanded and questions added which will allow us to determine which seasons the household was residing on the lease area.
4. Details on pasture load were insufficiently explored in the baseline survey. An extensive section asking about the location (on or off the lease area) and number of animals herded, by season, was added to the follow-up survey. This will provide much greater clarity on the extent of overgrazing that is occurring among these households.

The analysis of neighbor households in this report was minimal, for three main reasons. First, the sampling strategy for neighbors was designed to measure spillover effects of the project. As such, the neighbors' characteristics at baseline are not of particular interest except in the context of the impact evaluation, which requires follow-up data to perform. Second, because of this sampling strategy, the neighbors interviewed are not a representative sample of herders in these areas. Thus comparisons of Treatment and Control households with neighbors sheds little light on external validity in the sense of how similar or different the applicants to PURP project were to other households in the region. Third, there were a large number of groups with no neighbors identified for the baseline survey. Because of this, a broader sampling plan including neighbors from up to 10 km from the lease areas was adopted for the follow-up survey. Thus, the sample of neighbors interviewed for baseline does not even represent the full group of neighbors that will be used in the future impact analysis of project spillover effects on neighbors.

The RCT in the Phase II areas of the PURP provides a very strong impact evaluation design. Because receipt of the project has been randomly assigned, we are on much firmer ground to draw conclusions about the project and attribute any changes in project outcomes to the intervention. The initial analysis of project impacts in Phase II will focus mainly on changes in behavior such as herd management, rangeland use, and perceptions of land quality. We will also estimate project effects on changes in income and animal productivity (such as milk yields). However, we believe that effects on income and agricultural outcomes may take longer to materialize than the time allowed between baseline and midline data collections. Therefore, we are planning for an end line survey at least three years after project implementation, most likely in winter/ spring of 2017.

Changes in behavior are an important part of this causal model and as such, the midline Phase II evaluation will provide valuable information on the project and will inform the design and timing of the end line data collection.

XI. Bibliography

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XII. Appendix

A. Selection Criteria for Candidates

Table A. 1. Selection Criteria for Semi-Intensive Herder Groups

Criteria for Semi-intensive herder groups				
	Criteria	Documentation	Score	Relevant documents for scoring
A	Minimum criteria:			
1	Consist of average of 3-6 herder households/farm	Application form	√	
2	Herder members are officially registered at the soum and used pastureland over 180 days permanently in that local area for animal husbandry purpose	Citizen ID and the Bagh governor reference	√	
3	Herder members are agreed not to exceed the carrying capacity of the pastureland. (contract clause)		√	
4	Herder member has animals not over 1000 in sheep units(contract clause)		√	
5	Member of herder group/farm has to be a citizen of Mongolia	Citizen ID and application form	√	
6	At least 60 percent of the member household income has to be from the animal husbandry	Application form	√	
7	All the animals of herder groups/farms have to be healthy	Examination document	√	
B	Scoring criteria			
I	Social-economic criteria (maximum score: 65)			
1	Collaboration experience and skill (maximum score: 17)			

1.1	Experience of selling animal products (milk, meat, animal skin, cashmere etc) to the market	Application form, knowledge about the local market	3 times in an year = 5 points; Twice in a year= 3 points	Application form, Table 1.3.
1.2	More than half of the herder group members use the pastureland collaboratively	Application form, knowledge about the local market	For whole year = 6 points; 9 months in last year = 4 points; 6 months in last year = 2 points	Application form, Table 1.3.
1.3	Herder group has to have a leader who is been accepted as leader for last 1 year	Application form, knowledge about the local market	2 points	Application form, "Бүлгийн танилцуулга" Table, 9-10-р мөр
1.4	The leader manages the animal husbandry and lives on the potential lease area	Application form, knowledge about the local market	2 points	Application form, Table 1.1, 1.2, 1.5.
1.5	2/3 of the member households are being members in that group for last 3 years	Application form, knowledge about the local market	2 points	Application form, Table 1.1
2	Animal husbandry managing skill (maximum score: 25)			
2.1	Percentage of the herder member household income from animal husbandry	Application form, knowledge about the local area	80 or more % = 8 points; 60-80% = 5 points; less than 60 % = 0 points	Application form, Table 1.4.1
2.2	More than half of the herder groups members should have experience of herding milk or meat breeding cow for more than last 3 years	Application form, knowledge about the local area	3 or more years experience = 6 points; 1-3 жилийн туршлага = 4 points	Application form, Table 1.2
2.3	All the member households have traditional animal husbandry experience of herding milk and meat breeding cows	Application form, knowledge about the local area	3 or more years experience = 11 points; 1-3 years of	Application form, Table 1.2,

			experience= 7 points	
3	Involvement of female headed member households in the group (maximum score: 15)			
3.1	Percentage of the female headed and low income member households in the group	The income level will be estimated by the method that soum or district uses	More than half of the member households = 15 points; 30-50% = 12 points; 1 household= 8 points	Application form, Table 1.1, 1.4.1, 1.5
4	Official registration at the local area (maximum score: 8)			
4.1	Official registration of the herder group members who are over 18 years over at the soum or district	Application form, Citizen ID	All the adult members = 8 points; 70 % of the adult members = 5 points	Application form, Table 1.1, 1.5
II	Current situation of the animal husbandry (maximum score: 35)			
5	Animal productivity (maximum score: 12)			
5.1	Member households should have pure or cross milk and meat breed cow	Application form, animal census, will be verified at field physically	4 or more = 8 points 2-3 = 6 points; 1 = 4 points	Application form, Table 2.1-ын хагас эрчимжсэн аж ахуйд хамааралтай хэсэг
5.2	average milk yield of the pure and cross breed milking cows	Application form, will be verified at field physically	1000 or more liter = 4 points; 700 or more = 3 points	Application form, Table 2.2.
6	Experience of supplying milk and meat to the market (maximum score: 8)			

6.1	Experience of the member households to sell the milked to the market in winter and spring season for last 3 years consistently	Application form, knowledge about the local market, and other related documents	All member households have experience for last 3 years = 4 points; More than 50 % of the member households have experience for last 3 years = 2 points; More than 30 % of the member households have experience for last 3 years = 1 points;	Application form, Table 2.4
6.2	Experience of the member households to sell the meat to the market in winter and spring season for last 3 years consistently	Application form, knowledge about the local market, and other related documents	All member households have experience for last 3 years = 4 points; More than 50 % of the member households have experience for last 3 years = 2 points; More than 30 % of the member households have experience for last 3 years = 1 points;	Application form, Table 2.5
7	Fodder preparation (maximum score: 4)			
7.1	More than half of the member households have experience of feeding milking cows and meat breeding cows by fodder for last 3 years	Application form, knowledge about the local market	1 or more month = 4 points; 10 or more days = 2 points; 3 or more days = 1 points	Application form, Table 2.6, 2.7.
8	Animal shelter /maximum score: 3/			
8.1	Herder group should have at least one animal shelter for cows	Application form, will be verified at field physically	3 points	Application form, Table 2.8.
9	Equipment of hay and fodder preparation /maximum score: 2/			

9.1	Herder group should have machines and equipment to prepare hay and fodder	Application form, will be verified at field physically	2 points	Application form, Table 2.9.
10	Milk processing equipment /maximum score: 2/			
10.1	Herder group should have milk processing equipment	Application form, will be verified at field physically	2 points	Application form, Table 2.9.
11	Winter and spring camp possession /maximum score: 4/			
11.1	More than half of the members households should have the possession certificate for the winter or spring camp	Certificate	4 points	Application form, Table 2.10.

Table A. 2. Selection Criteria for Intensive Herder Groups

Criteria for Intensive herder groups				
	Criteria	Documentation	Score	Relevant documents for scoring
A	Minimum criteria			
1	Consist of average of 3-6 herder households/farm	Application form	√	
2	Herder members are officially registered at the soum and used pastureland over 180 days permanently in that local area for animal husbandry purpose	Citizen ID and the Bagh governor reference	√	
3	Herder members are agreed not to exceed the carrying capacity of the pastureland. (contract clause)		√	
4	Herder member has animals not over 1000 in sheep units(contract clause)		√	
5	Member of herder group/farm has to be a citizen of Mongolia	Citizen ID and application form	√	

6	At least 60 percent of the member household income has to be from the animal husbandry	Application form	√	
7	All the animals of herder groups/farms have to be healthy	Examination document	√	
B	Scoring criteria			
I	Social-economic criteria (maximum score: 40)			
1	Collaboration experience and skill (maximum score: 13)			
1.1	Experience of selling milk to the market	Application form, knowledge about the local market	3 or more times per year = 4 points; Twice per year = 2 points	Application form, Table 1.3.
1.2	More than half of the herder group members use the pastureland collaboratively	Application form, knowledge about the local market	For whole year = 3 points; 9 months in last year = 2 points; 6 months in last year = 1 points	Application form, Table 1.3.
1.3	Herder group has to have a leader who is been accepted as leader for last 1 year	Application form, knowledge about the local market	2 points	Application form, "Herder group introduction" Table, 9-row10
1.4	The leader manages the animal husbandry and lives on the potential lease area	Application form, knowledge about the local market	2 points	Application form, Table 1.1, 1.2, 1.5.
1.5	2/3 of the member households are being members in that group for last 3 years	Application form, knowledge about the local market	2 points	Application form, Table 1.1
2	Animal husbandry managing skill (maximum score: 15)			
2.1	Percentage of the herder member household income from animal husbandry	Application form, knowledge about the local area	80 or more % = 5 points; 60-80% = 3 points; 60-aac доош хувь = 0 points	Application form, Table 1.4.1

2.2	More than half of the herder groups members should have experience of herding milk breeding cow	Application form, knowledge about the local area	5 or more years= 10 points; 3-5 years experience = 7 points; 1-2 years experience = 5 points	Application form, Table 1.2
3	Involvement of female headed member households in the group (maximum score: 7)			
3.1	Percentage of the female headed and low income member households in the group	The income level will be estimated by the method that soum or district uses	More than half of the member households = 7 points; 30-50% = 5 points; 1 opx = 3 points	Application form, Table 1.1, 1.4.1, 1.5
4	Official registration at the local area (maximum score: 5)			
4.1	Official registration of the herder group members who are over 18 years over at the soum or district	Application form, Citizen ID	All the adult members = 5 points; 70 % of the adult members = 3 points	Application form, Table 1.1, 1.5
II	Current situation of the animal husbandry (maximum score: 60)			
5	Animal productivity (maximum score: 20)			
5.1	Member households should have pure or cross (1st or 2nd generation cross) milk breed cow	Application form, animal census, and will be verified at field physically	25 or more numbers of milking cows = 10 points; 20 or more numbers of milking cows = 8 points; 10 or more numbers of milking cows = 6 points; 5 or more numbers of milking cows = 4 points	Application form, Table 2.1
5.2	average milk yield of the pure and cross breed milking cows	Application form, and will be verified at field physically	2000 or more = 5 points; 1000 or more = 3 points	Application form, Table 2.2.

5.3	Member households should have experience of insemination by high productive pure or cross breed bull (or bull which meets the standard requirements) in the last 3 years	Application form, knowledge about the local market	For all the milking cows = 5 points; For 50 % of the milking cows = 3 points	Application form, Table 2.3.
6	Experience of supplying milk to the market (maximum score: 10)			
6.1	Experience of the member households to sell the milk to the market in winter and spring season for last 3 years consistently	Application form, knowledge about the local market, and other related documents	All member households have experience for last 3 years = 10 points; More than 50 % of the member households have experience for last 3 years = 8 points; More than 30 % of the member households have experience for last 3 years = 6 points; All member households have experience for last 2 years = 4 points	Application form, Table 2.4
7	Fodder preparation (maximum score: 8)			
7.1	More than half of the member households have experience of feeding milking cows by fodder	Application form, knowledge about the local market	5 or more months = 8 points; 3-4 months = 6 points; 1-2 months = 4 points	Application form, Table 2.6, 2.7.
8	Animal shelter (maximum score: 10)			
8.1	Herder group should have at least one four walls and roof shelter for cows	Application form, and will be verified at field physically	All households have = 10 points; More than 50% of the households have = 8 points; 30-50% of the households have = 6 points	Application form, Table 2.8.

9	Equipment of hay and fodder preparation /maximum score: 4/			
9.1	Herder group should have machines and equipment to prepare hay and fodder	Application form, and will be verified at field physically	4 points	Application form, Table 2.9.
10	Milk processing equipment /maximum score: 4/			
10.1	Herder group should have milk processing equipment	Application form, and will be verified at field physically	4 points	Application form, Table 2.9.
11	Winter and spring camp possession /maximum score: 4/			
11.1	More than half of the members households should have the possession certificate for the winter or spring camp	Certificate	4 points	Application form, Table 2.10.

B. Lottery Protocol

Protocol for PURP Lotteries in Phase II Areas

Prepared by IPA

July 19th, 2011

Updated: September 28th, 2011

IPA and the MCA-M M&E unit would like to propose the following approach to conducting lotteries for herder group selection in the Phase II areas:

1. A final list of eligible herder groups whose applications were approved by the selection panel and who passed the field verification exercise will be developed and delivered, along with supporting documentation, to M&E.
2. After the selection panels have finished, the number of lease slots to allocate to each soum will be determined.
 - a. In general, the quota shall be set proportionally to the number of eligible herder groups in each soum. For example, if 329 eligible herder groups end up passing the field verification and the number of leases to be allocated by the project is 165, then the Soum level quota will be set equal to 329 divided by 165 (approximately 50% depending on final numbers). However, in some soums with small numbers of herder groups and/or odd numbers of herder groups it may not be possible to set the quota precisely equal to the correct ratio. For example, if the percentage ends up being 50%, in a Soum with 9 eligible herder groups it would not be possible to set the quota equal to 4.5 herder groups because herder groups are holistic units that cannot be subdivided. The quota will need to be set equal to either 4 or 5.
 - b. A randomized computer program will be used to set the quota for soums with small numbers of herder groups and/or odd numbers of herder groups. The computer program code will be shared with the PIU and other members of MCA-M. If it is approved, the program will be run and the quota officially set as part of a small ceremony held at MCA-M headquarters with all relevant parties in attendance. The results will be certified and announced to all project stakeholders.
3. Preparations will be made for a series of public lotteries. The lottery will be a traditional physical drawing using balls and glass boxes. Venues have been reserved and public announcements made. There will be a press conference on September 26th, 2011. The first lottery will happen in Choibalsan on September 29th, 2011. The second lottery will happen in Arvaikheer on October 5th and the third lottery will occur in Kharkhorin on October 7th.

- a. Intensive herder groups will have separate lotteries from semi-intensive herder groups. Semi-Intensive herder groups will have Soum level lotteries. Intensive herder groups will have lotteries at the aimag level due to the fact that there are only 18 intensive herder groups, which makes Soum level lotteries not possible. That means that there will be one intensive lottery at Kharkhorin, one at Arvaikheer, and one at Dornod.
- b. Given the facts above, the lotteries will be broken down in the following manner:
 - i. The Kharkhorin lottery event will have 6 lotteries, one for each participating Soum (Khotont, Tovshruulekh, Burd, Khujirt, Kharkhorin) and then one intensive herder group lottery with 11 intensive herder groups. 6 of the 11 intensive herder groups will be selected to receive the lease.
 - ii. The lottery event at Arvaikheer will also have 6 lotteries, one for each participating Soum (Zuil, Ulziit, Taragt, Zuunbayan-Ulaan, Arvaikheer) and one intensive herder group lottery with 2 intensive herder groups. 1 of the 2 intensive herder groups will be selected to receive the lease.
 1. Arvaikheer herder groups all applied for pastureland in Taragt and therefore the Arvaikheer lottery will be grouped with the Taragt Soum lottery and will occur right after the Taragt Soum lottery.
 - iii. Dornod will have a total of 8 lotteries even though there are only 5 Soums. This is because Kherlen will be broken up into 3 lotteries. All herder groups in Kherlen selected pastureland locations in Bayantumen, Bulgan, or Choibalsan. The Kherlen herder groups will therefore be split into a Kherlen – Bulgan lottery, a Kherlen – Bayantumen lottery, and a Kherlen – Choibalsan lottery. Thus there will be a total of 8 lotteries: 7 soum lotteries (Sergelen, Bayantumen, Bulgan, Choibalsan, Kherlen – Bulgan, Kherlen – Bayantumen, and Kherlen – Choibalsan) and one intensive herder group lottery with 5 intensive herder groups. 3 of the 5 intensive herder groups will be selected to receive the lease.
4. The exact procedures for the lotteries have been developed and are as follows:
 - a. Guests will enter the venue and first stop at the information desk. There they will be given a brochure explaining the procedure and their lottery number. Their lottery number will be the last 2 digits of their pre-assigned herder group ID. After receiving these two documents, guests will be seated in the venue.
 - b. The PIU and M&E will open the lottery with a speech and presentation about the Lottery. After these occur, three guests will be randomly selected out of the crowd to be official observers for the lotteries. These three observers will be seated at the front of the room at their own table. They will be given lists of herder groups for each lottery for them to monitor the lottery process.
 - c. Once these observers are seated the first lottery will be announced. The number of herder groups participating in the lottery as well as how many herder groups that will be selected during the lottery will be announced. Each herder group will have

a ball with their ID written on it (this ID number will be given to them upon entry to the lottery as well as posted on the wall). These balls (one for every herder group participating in the lottery) will be presented to the audience and observers one at a time. As each ball is presented, the observers will circle the corresponding herder group lottery ID on their lottery sheet. After it has been presented it will be placed into the glass container. After all of the balls for each herder group involved in the lottery have been presented to the audience and the observers and placed in the box, the box will be sealed.

- d. The box will then be rotated 5 times. The sliding door will be opened and one ball will roll out of the box. If the ball does not roll out automatically, the sliding door will be shut and the box will be flipped one more time. The sliding door will be opened again and the ball will roll out. If a ball fails to roll out again, the door will be closed and the box will be flipped one more time and the procedure will be repeated as many times as necessary until a ball rolls out of its own accord. This ball's number and the name of the corresponding, winning herder group will be presented to the audience and the observers. The observers will mark that herder group name on their list of all herder groups in that lottery (previously mentioned) and the PIU will mark the winner on a large poster on one side of the room (one poster for every lottery). After this, the box will be closed and rotated 5 times. After rotating it 5 times another ball will be selected and the whole procedure will be repeated. This will happen as many times as needed to select the right number of herder groups for a Soum. After the lottery has finished, the observers will all sign two sheets with the winning herder groups listed to verify the results. One sheet will be retained by the PIU while the other will be kept by M&E/IPA. After the papers have been signed, the next lottery will begin. The same process will happen all over again with the new lottery.
 - e. The moderator will announce all of these events.
 - f. After all the lotteries have been completed, there will be closing statements.
5. The results of the lottery will be carefully recorded and approved by the official observers that were selected by the audience. Winners will be given an invitation to the relevant lease signing ceremony that will happen on October 11th in Dornod and on the 18th, 20th, and 21st in different areas of Arvakhangai and Uvurkhangai.

C. Balance Tests for Lottery Participants by Peri-Urban Area

When running balance tests separately by peri-urban area, overall results were very similar to the grouped balance tests, with the following exceptions where differences were found that are significant at a 5% level: In Choibalsan area, Treatment households had significantly lower death rate of their cattle (0.99% compared with 2.89%). In Kharkhorin area, Treatment households had significantly higher percentage of their cows that were productive females (41% compared with 37%), and also the Treatment household heads had an average of 0.61 fewer years of schooling than Control household heads.

Table A. 3. Balance Tests for Lottery Participants by Peri-Urban Area

	Choibalsan		Kharkhorin	
	Mean: Control Group	Difference: Treatment – Control (std. error)	Mean: Control Group	Difference: Treatment – Control (std. error)
Number of household members	4	-0.06 (0.19)	4.24	-0.21* (0.12)
Percent with male head of household	92.2	0.41 (3.36)	93.65	-1.33 (2.05)
Years of schooling of head of household	8.04	0.04 (0.54)	7	-0.61** (0.29)
Any Household Member Has Had Training in Animal Husbandry (%)	22.7	56.63*** (5.53)	21.74	29.61*** (3.64)
Any Household Member Has Had Training in Business Operations (%)	7.8	16.06*** (3.92)	6.35	12.73*** (2.39)
Lived in soum 5 years previously (%)	88.65	3.54 (3.39)	90.64	2 (2.06)
Percent with possession certificate for winter or spring camp	49.65	2.1 (5.43)	39.93	-1.25 (3.70)
Household is sedentary (did not migrate in past year) (%)	26.95	-5.84 (5.31)	11.37	1.45 (2.32)
Number of migrations in past year	2.62	-0.08 (0.13)	2.64	-0.08 (0.09)
Average distance between camps (km)	12.57	-2.38 (2.03)	8.79	1.53 (1.05)
Herd size (sheep units)	371.11	54.93 (40.84)	315.38	-33.89 (22.40)
Perceived quality of pasture at winter camp	3.57	-0.07 (0.10)	3.66	0.02 (0.06)
Percent that own improved breed cows	18.44	3.2 (5.03)	4.68	2.77 (2.08)
Percent of cattle herd that are productive females	41.74	-2.87 (1.97)	37.04	3.96** (1.65)
Total hay produced, purchased, and stored from previous year	5.33	0.64 (1.31)	3.4	0.36 (0.26)
Days that cattle were fed with hay	64.33	1.49 (9.25)	61.91	-9.36 (6.02)

Days that cattle were fed with other prepared fodder	109.38	0.41 (8.62)	80.81	-7.64 (6.83)
Percent that purchased "concentrate"-type fodder	11.35	-2.18 (3.72)	30.1	-1.23 (3.96)
Total income in last 12 months	7413259.78	-1197503.94 (1050947.81)	5709375.59	24352.22 (456136.05)
Net income from livestock	3216128.64	-473678.22 (611528.15)	2524551.29	-333595.31 (387008.99)
Percent with milking cows	87.23	1.84 (3.95)	74.92	1.14 (3.58)
Milk yield (liters per cow per year)	581.99	71.34 (49.43)	411.43	5.91 (29.63)
Percent that sold milk in last 12 months	16.31	1.79 (5.18)	14.05	2.61 (2.80)
Total earnings from milk sales (for households that sold milk)	1407486.96	1103448.05 (1278028.32)	793488.1	563997.41 (422542.52)
Total income from selling animals	3030761.7	-610855.09 (801218.37)	1507230.77	-121476.26 (269336.12)
Total income from selling cashmere	891881.56	-39120.9 (129999.93)	1185089.63	-167415.90* (99590.09)
Total income from selling airag	10921.99	-9747.74 (12390.86)	226525.08	-72889.95 (56537.09)
Mortality rate of horses	1.35	-0.89 (0.62)	1.65	1.06 (0.80)
Mortality rate of cattle	2.89	-1.90** (0.86)	1.73	1.26 (0.88)
Mortality rate of sheep	4.26	-0.66 (1.49)	3.34	1.1 (0.92)
Mortality rate of goats	5	0.57 (1.85)	2.34	1.22* (0.73)
Percent with a pastureland-related conflict in past 5 years	5.07	-0.89 (2.44)	3.34	0.47 (1.52)
Total value of planned investments in next 5 years	14719645.39	2393351.16 (2529588.11)	17837625.42	882305.9 (2884165.46)
Total investment in immovable property in past year	499092.2	550274.73 (467778.15)	274122.24	62387.28 (138973.76)
Total investment in movable property in past year (besides vehicles)	208717.02	41842.1 (38304.48)	284530.1	60897.91 (40491.26)

D. Household Questionnaire

Household Questionnaire is attached as a separate document.

E. Herder Group Leader Questionnaire

Herder Group Leader Questionnaire is attached as a separate document.

F. Soum Governor Questionnaire

Soum Governor Questionnaire is attached as a separate document.