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PROPOSED METHODOLOGY & INSTITUTIONAL MECHANISMS TO DETERMINE PASTURE USE FEES

Feasibility Study on Pasture Use Fee

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1. Rationale

Pastures in Mongolia are used free of any fees. The policy may seem favorable for herders at first, but in fact it encourages the misuse of pastures, thus contradicts the long term interest for securing herders' livelihoods by ensuring sustainable livestock sector development.

Natural causes such as global warming & dryness and human factors like unsustainable use lead to pasture degradation. Long-term adaptation programs are needed to minimize the impact of naturally caused pasture degradation. However, unsustainable use of pastureland has to be stopped immediately to contribute to improved effectiveness of the long-term adaptation programs.

The most common type of unsustainable pastureland use in Mongolia is overstocking or increasing animal numbers beyond pasture carrying capacities. This leads to pastureland degradation due to animal pressures beyond vegetation recovery and absence of seasonal rotations. In addition, overstocking eats up *otor* reserve areas leading to increased losses in emergencies.

Herders use pastures and the resources on them, such as water and salt licks, free of any charge and without any accountability mechanisms for overgrazing and degradation. In this system, herders rationally choose maximizing animal numbers as the dominant economic behavior. Herders do not bother themselves with alternative methods promoted by the government and donor programs. "I'll take anything if programs give it to me for free, and as everybody helps us, there's no need for demanding *dzud* preparedness" – this is the dominant herder's mentality. In other words, the current way of livestock herding is so cheap that it discourages herders from being interested in alternative ways of running livestock, and participating in government and donor programs aimed at animal health, pastureland and risk management, and animal and livestock product quality.

Figure 1.1 Current economic behavior of herders

The direct impact of pasture degradation is declined forage supply, increased malnutrition and exposure to risks, decreased quality and productivity of animals leading to increased income and asset

losses of herders. A study has shown that compared to fresh pastures, on degraded pastures spring live weight of ewes dropped by 8 kg, milk yield by 2.5 folds and cashmere yield by 8%. Income losses from only these three indicators account for MNT 2.6 m per household and 368 billion nationwide. As pastures make base biodiversity habitat, local attractiveness and tourism values decline due to pasture degradation.

Under the current common use regime a few wealthy herders, the city rich and companies expand their grazing rights at the expense of other herders' grazing rights, thus increasing social inequality. Moreover, it encourages improper practices of neglecting the interests of local herders in converting pastureland into other uses such as mining, infrastructure, tourism.

Thus, the key question is how to free herders from the vicious circle in which they strive hard to maximize animal numbers after a *dzud* but end up with no good returns as their strategy destroys pastures and swallows up otor reserve pastures making losses for the next *dzud* even more devastating.

There are two key incentive mechanisms to encourage the sustainable use of pastures - secure land tenure and user fees. The secure land tenure encourages the sustainable use by making sure that benefits from individuals' efforts in sustainable land use are reaped by themselves through land use agreements with clear and enforceable land use boundaries and associated rights and responsibilities. User fees are a mechanism is to assign certain values to the impact animals have on pastures and make them the responsibility of herders, as beneficiaries of using state-owned pastures through their privately-owned livestock. These basic incentive mechanisms are absent with the existing common use regime.

As a result herders choose the animal number maximization as the cheapest way of generating short-term incomes at the expense of state owned pastureland degradation as well as the long-term sustainability of livestock herding. Thus, animals and herders are not to be blamed for pasture degradation, but it is the government that fails to introduce right incentive mechanisms.

As discussed in the following sections the two incentive mechanisms are most effective if introduced as one package, in other words, if user fees are introduced as a part of land use agreements.

The introduction of a grazing fee system is expected to provide essential economic mechanisms for implementing the "Mongolia Livestock" program and enforcing key provisions of the land law and the draft pastureland protection law. If designed wisely, it is capable of performing the following functions:

1. Serving a mechanism to build herders' awareness and accountability of the value of pastures they are using and damages of the unsustainable use to pastures and to leverage them towards reaching optimum stocking densities (behavioral change from the livestock number maximization to adopting productivity oriented strategies)
2. Providing an independent funding source to finance pastureland, livestock risk and environmental management locally and facilitate herders participation in designing and implementing them through enhanced PPP with soum governments (a lack of finance is a key challenge obstructing the sustainable management of resources)

3. Changing the existing ineffective system of risk and disaster management where herders ask for assistance from the government and the latter for international donors and aid funds are used in inefficient ways into an effective system based on advance planning and sufficient funding raised locally

The key relevant policy documents have set the following objectives:

State Policy on Food and Agriculture, 2015:

2.1.11. Introduce economic mechanisms to regulate stocking densities and herd structure based on assessments of carrying capacity and conditions, ensure sustainable use, protection and recovery of pastures

Mongolian Livestock Program, 2010:

3.4.1.3 Introduce economic incentives to reconcile animal numbers with pasture carrying capacities and to enforce limits of animal numbers on degraded pastures
3.4.1.4. Create a legal framework to collect pasture use fees from herders and people with livestock, based on regional characteristics and type of herd and use a part of revenues on pastureland protection and improvement

2. Approach

Grazing fees need to be designed in consideration of the following principles in order to perform the desirable functions specified in the previous section:

1. Grazing fees are differentiated across pastureland users based on pasture quality, location, animal type and the degree of overstocking (Being easily estimated using the locally available & unambiguous data is key requirement for this factor)
2. Revenues are used back locally on financing pastureland, livestock risk and environmental management
3. Designed in such a way that does not make a financial burden on herders, especially the poor
4. Relied on the past experiences, best practices and lessons learnt to be feasible and easily acceptable

2.2 Differentiating grazing fees across pastureland users based on pasture quality, location, animal type and the degree of overstocking

Pasture quality. Livestock benefits are different from good and poor pastures. Therefore, the state, as owner of pastures, needs to collect higher fees from pastureland users utilizing good quality pastures. The pasture quality depends on grass yield, vegetation composition, water availability and micro-climate. All these factors are interrelated and their natural qualities change in response to animal pressures. When pastureland is overgrazed grass yield declines, vegetation composition changes in

favor of unpalatable plant species to increase and water becomes polluted and exhausted. In terms of data availability, the most available and more unambiguous data is grass yield. At present, pastureland grass yield is estimated annually for each soum by the National Agency for Meteorology, Hydrology and Environmental Monitoring (NAMHEM) and the Agency for Land Relations, Geodesy and Cartography (ALRGC) keeps 1:100,000 scale vegetation maps with grass yield and vegetation composition data for each soum and updates them every 5 years based on funding possibilities. Moreover, the grass yield can be easily measured for every household or khot ail -the lowest level of pastureland users. The vegetation composition in these 1:100,000 scale maps were first identified properly in 1960-1980s and updated since then have been carried out using a fewer than required samples due to budget constraint significantly eroding the quality of maps. Water availability of pastures is changed by digging wells much decreasing natural differences. There are no differentiated data available on micro-climate at the level of pastureland users. Moreover, differences in micro-climate can be captured to some degree through grass yield data the latter depends most on precipitation and temperature in any given area.

Thus, in consideration of unambiguous data availability at the lowest level of pastureland users we recommend to use grass yield as key environmental variable to capture the geographical differences in the pastureland quality.

Table 2.1 Grass Yield, Annual Value of Livestock Porduction and Pastureland by regions

Ecological Regions	Average Grass Yield, kg of dry mass 2010-2014	Annual Livestock Product Value per household, '000 MNT	Livestock Product Value per sheep unit, '000 MNT	Annual Livestock Product Value per ha of pastureland '000 MNT	Proxy for How much Pastureland prodcues per annum, '000 MNT
High Mountains	258	14163	26.6	32.6	26.0
Forest-steppe	454	16581	25.8	48.2	38.6
Steppe	380	18664	23.8	24.1	19.3
Gobi	109	14327	25.2	10.0	8.0
Depression of Great Lakes	142	16392	26.2	17.2	13.8
National Average	242	13535	25.4	22.5	18.0

Source: CPR herd turnover model, 2017 used the average national livestock product prices of 2016, National Statisitcs Office of Mongolia.

According to Enkh-Amgalan[1], the aggregate weather variables explain 70-80% of the animal growth rate in Mongolia (Adjusted R-squared of the aggregate weather and livestock growth model), implying that animal growth as a key livestock output depends on nature or pastures for this percentage and the remaining portion of around 20-30% depends on other factors such labor, supplementary feed and others. Using this indicator it can be said that around the same percentage of the total value of livestock products is created by pastures. The last column of **Table 2.1** shows how much pastureland

[1] *Enkh-Amgalan, Production Function Analysis of the Extensive Livestock Industry of Mongolia, ME Thesis, University of New England, Armidale, NSW, Australia, 1997*

produces per ha annually –MNT 8-38.6 thousand. It is common to estimate the value of asset as a product of the annual return and the asset lifespan in years. However, as pastureland produces this return in perpetuity some suggest to use 99 years as the present *value of* rents from a 99-year lease is nearly numerically equivalent to the present value of perpetuity. The value of pastureland can be estimated using this method simply multiplying the last column of **Table 2.1** by 99. However, the purpose of this assignment is not to estimate the land value, instead it focuses on estimating grazing fee as a tool for promoting the sustainable of pastureland.

Weather yield model animal growth depends on nature.

Location. Herders located closer to urban areas gain extra benefits from the low costs of accessing markets and services. Lower fees for remote pastures will also discourage herders from migrating to peri-urban areas that lead to severe land degradation. As detailed data on differences in transportation costs due to location of herders are not easily available and difficult to estimate due to a range of factors such as herders mobility, mode of transportation etc. a simple way to capture this difference is to estimate coefficients based on remoteness by pastureland users and modify the base fee using these coefficients. These coefficients need to be differentiated based on not only remoteness but also the significance of the attraction point as big cities are not comparable to soum centers.

Animal species. Despite being a major source of cash income, goat is claimed to be a worst user of pastures due to its preferences to eat grass roots and flowers. A higher fee for goat makes sense, also in terms of payment capacities of herders with more goats as cashmere is a major cash income source. It is worth noting that in the total increase of animal numbers since 1990s the goat number increase accounts for a predominant share. Likewise, horse is also considered to have worst impacts on pastures by tramping by hooves. Therefore, it is recommended that increased fee rate be established for goat and horse. A simple way for doing this is to increase coefficients of these species into sheep units. The most commonly used coefficients are 6.6 for horse and 0.9 for goat based on pasture forage intake of animals meaning the pasture forage volume goat eats is equivalent to 90% of the forage sheep eats. When grazing fees are based on sheep units then increasing these coefficients is identical to increasing fees for these animal species.

Degree of overstocking. As explained in section 1, overstocking or increasing animal numbers beyond pasture carrying capacities leads to pastureland degradation, eats up otor reserve areas leading to increased losses in emergencies and leads to animal productivity and herders' income declines. Therefore, grazing fees need to be able to discourage overgrazing and encourage herders towards reaching and keeping optimum stocking densities. This is ultimately about encouraging herders to shift from their current economic behavior – animal number maximization – to more productivity-oriented strategies. To do this, base grazing fees need to be increased at least proportionately to the degree of overstocking.

The methodology to estimate grass yield is relatively well established and not mentioned here. Instead, the issue of what kind of grass yield data should be used in estimating carrying capacities is not clearly understood by everyone therefore is explained here in a more detail.

Grass yield is measured in August when forage biomass reaches a maximum. In a dry country like Mongolia the precipitation is a key variable lying behind grass yield's strong year-to-year variability. In this situation the issue of what kind of grass yield data should be used in judging how herder groups/partnerships perform in fulfilling their obligations to reconcile the animal numbers with pasture carrying capacities is critical. **Table 2.2** demonstrates s sample year-to- year variability in the pasture yield.

Table 2.2 Yearly pasture yield, centner per hectare

Way pasture is used	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Sustainable use	3.5	4.5	3.3	3.9	3.6	3.3	3.9	4.2	3.5	4.4
5 year average	**2011-2015**				**3.76**	**2016-2020**				**3.84**
Unsustainable use	3.5	3.8	3.1	3.6	3.4	3.7	3.3	3.2	3.3	3.2
5 year average					**3.48**					**3.34**

As shown above, pasture yield fluctuates considerably year by year. However, the 5 year average figures clearly show the difference between the sustainable use & overuse. When used in a sustainable way, grass yield increases from 3.76 centner per hectare to 3.84 centner whereas the unsustainable use results in decreasing trend of multi-year average from 3.48 to 3.34 centner per hectare.

The diverging trends of grass yield in sustainable & unsustainable uses can be seen more clearly in chart below:

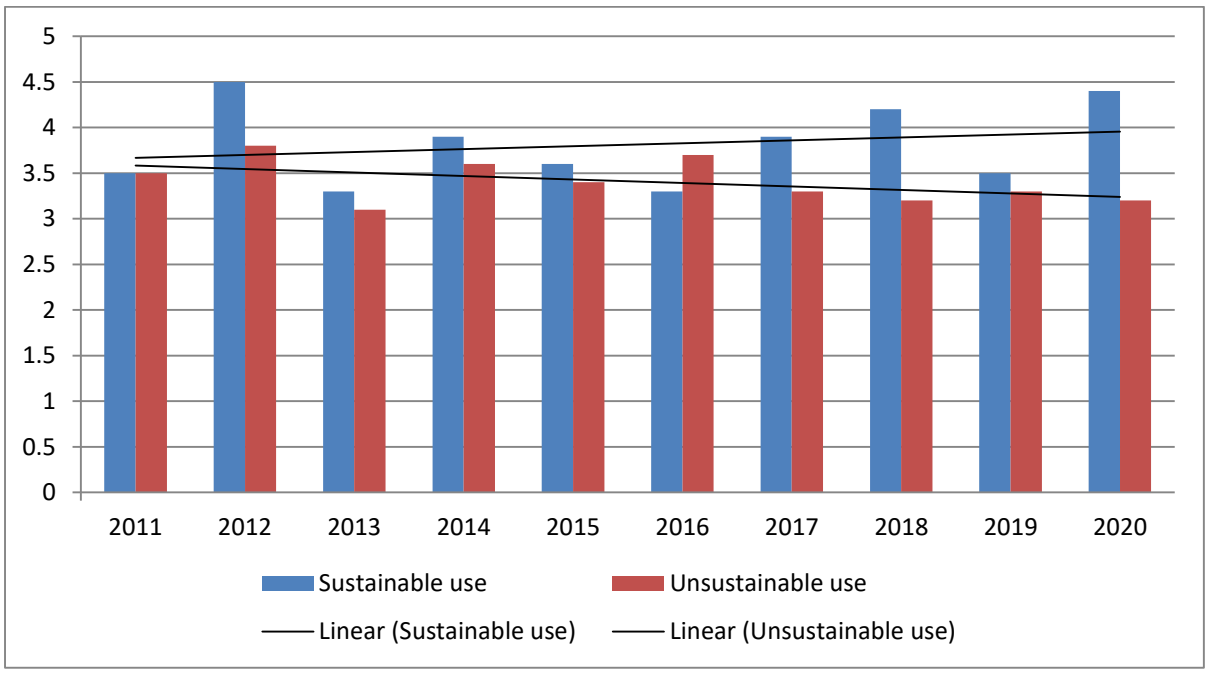

Figure 2.1 Trend chart of pasture yield, centner per hectare

As demonstrated in **Figure 2.1**, pasture yield has a tendency to decline under the unsustainable use but it has increasing tendency under the sustainable use. In other words, the sustainable use of pasturelands gradually improves the carrying capacity to feed more livestock. On the contrary, seeking

to increase the herd size leads to long-term decline in the pasture carrying capacity and animal productivity and herder incomes.

The key principle of the sustainable use is to fully utilize pasture resources without damaging regeneration capacity of biomass. This principle means that the selection of appropriate grass yield data to estimate pasture carrying capacity depends on whether the carrying capacity is exceeded or not.

Steps for using grass yield data for estimating pasture carrying capacity and their rationale

1. Reach a general conclusion as to whether the pasture carrying capacity was exceeded in the last 5 years, by average.
2. Based on step 1, **Table 2.3** below shows the use & rationale depending on whether the pasture is overused (carrying capacity exceeded) or underused (carrying capacity not reached).

2.2 Grazing fee as a source of funding the integrated management of natural resources and livestock risks

In 2005, under the WB-funded Sustainable Livelihoods Project (SLP), CPR, in cooperation soum officials, has estimated the need for operational costs (not including salaries of relevant staff) for undertaking bottom-up and participatory pastureland and livestock risk management activities per one soum at proper levels to be around MNT 7.5 million (Sample pastureland and livestock risk management activities that can be performed using this amount of operational costs are shown in **Appendix 1**). Using CPI between 2005 and 2016 which has increased around 3 folds it equals to around MNT 22.5 million. This could be seen as an approximation for the minimum amount of operational costs required for an average soum to perform its pastureland and livestock risk management activities at proper levels.

Table 2.3 Use of grass yield data and its rationale based on the current status of pasture carrying capacity

	Overused pastures	**Underused pastures**
Type of grass yield data	Average grass yield for the last 5 years	Current year grass yield
Used for what	Estimate carrying capacity ceilings in: 1. Pasture land use agreements (PUA) and monitor over their enforcement 2. Developing and implementing multi-year comprehensive action plans of PUGs, herder groups/partnership to gradually decrease animal numbers to reconcile with carrying capacities	1. Estimate carrying capacity ceilings in PUA and monitor over their enforcement 2. Make risk management decisions with regard to how many animas need to be slaughtered in each fall to keep optimum number of animals for winter-spring pastures in consideration of other factors such as weather conditions and availability of supplementary fodder
Rationale	As pastures are heavily overused even high grass yields in good years are not enough for sustaining animal numbers. Despite the good year's	Pastures can be used to their full extent but not damaging their regeneration capacities meaning carrying capacity estimates should

	weather conditions, grasses cannot regenerate because of high stocking densities. In other words, there is no way to use current year's grass yield.	be based on the current year's grass yield that varies from year to year.
Pastureland use strategy	As quickly as possible to reach optimum stocking densities but without compromising herders' incomes	Allow pasture yield & composition to improve by rotational use and minimize losses during emergencies by ensuring accesses to reserve pastures

As for herders' need for livestock risk management, a key issue is the amount of supplementary feeding in emergencies. The "National program to protect livestock against drought and dzud" and subsequent Government Resolution No 47 (2001) has estimated that herders need to prepare 10 kg of feed in the steppe region-an average ecological condition. CPR has estimated the amount of subsistence feeding required to keep animals alive is 0.26 kg of feed unit per day or around 6.5 kg of hay. As extreme emergencies such as severe drought and dzud do not happen every year herders do not need to prepare the required amount of subsistence feeding every year. It can be roughly estimated that extreme emergency conditions can happen every 6 year and herders need the amount of feed to keep animals alive at least 30 days without grazing in an emergency year implying that if herders have sufficient funding every year to stock subsistence feeding for 5 days then they will be able to meet 30 days requirements. Using the average of price for a hay pack of MNT 3000 and the weight of one pack of 22 kg, the amount of funding needed for an average soum was calculated in **Table 2.4**.

Table 2.4 Estimate of funding per year for stocking the amount of subsistence feeding sufficient to keep animals alive in emergencies, per average soum

Number of animals, sheep units, SU	Number of days to feed animals in an emergency year	Assumed frequency of emergency conditions	Number of days to feed animals converted into annual basis	Daily amount of hay needed per SU, kg	Total amount of hay needed for soum, kg	Total amount of hay in packs, 1 pack 22 kg	Price of hay pack, MNT	Total price of hay per soum, MNT million
1	2	3	4 (2:3)	5	6 (1x4x5)	7 (6:22)	8	9 (7x8)
308813	30	Every 6 year	5	0.65	1003642	45620	3000	136.8

The total amount of subsistence feeding per average soum amounts to MNT 136.8 million. It is worth noting this amount is based on assumption that herders will be using the entire amount of funding on supplementary feeding only. However, as evidenced from experiences of piloting a proxy grazing fees system by CPR under different projects herders prefer to use funds for variety of purposes in addition to supplementary feeding. The purpose of estimating MNT 136.8 million was just to show an approximation for the herders' annual financial need for pastureland and livestock risk management in case of an item herders spend most.

Thus, the total amount of funding for pastureland risk management need per an average soum accounts for around MNT 160 million. It is worth noting that revenues collected from grazing fees are

not only source of funding for soum pastureland risk management. In contrary, the Budget Law specifies that pastureland, livestock risk and environmental management should be funded from the soum budget (Article 58.4). As evidenced by CPR experiences of promoting a proxy grazing fee system since 2011 herders are best encouraged to fulfill pastureland and risk management activities if fees they pay are augmented by a matching fund from other sources such as project and soum budget support. This means that innovative mechanism is needed to design grazing fee system to encourage herders best towards improved pastureland, livestock and environmental management instead of introducing it as an ordinary tax or payment without encouraging by additional budget support.

2.3. Grazing fee being affordable, easily estimated and understood by local people, especially herders

The issue whether paying grazing fee poses financial burden on herders especially, the poor is critical. At present, the political situation with introducing grazing fee is that the collection of grazing fees as a tax to increase budget revenues is not acceptable. There is increasing common agreement that the introduction of grazing fees is acceptable only if the revenues collected are used back locally on sustainable use, protection and improving pastures and related activities in participation of herders. In this sense, the level of grazing fee acceptable for herders is different from 'pure tax' that goes to general budget revenues. If spending of revenues from grazing fees are is designed in a way that most of revenues comes to back herders so that they could decide on where to spend, then herders, even the poor, are willing to accept relatively higher levels of fees. As evidenced from CPR experiences for promoting a proxy grazing fee system, poor herders have even borrowed to pay fees as they knew that the money paid would come back in an augmented size for them to spend in areas they want to choose from an eligible list of activities. Under CPR-promoted pilots the latest level of fees in 2015-2017 was MNT 500 per sheep units and there were suggestions from herders to increase this level further. This means that this level of fee was not a financial burden as herders get back the money paid within a few months (herders paid fees in April and those who paid were entitled to access the soum Livestock Risk Management Fund /LRMF/ to fund own pastureland and risk management activities from August to December). Another mechanism to ease a burden of proxy grazing fees on the poor was to use informal social networks within herder groups to allow group members to negotiate the amount of fees for each household to meet the overall fee requirement set on the group, which often ended up with the poor paying less and the rich paying the balance. Also as noted by participating herders in the previous pilots, making sure that herder pay grazing fees upon receiving major cash incomes from cashmere in April-May is important to avoid difficulties associated with a shortage of cash in other months.

2.4 Relying on the past experiences, best practices and lessons learnt to be feasible and easily acceptable

In 2011, under the World Bank supported Sustainable Livelihoods Project (SLP)-II CPR has piloted a proxy-grazing fee system to answer questions how herders would respond to grazing fees, is it possible to design a grazing fee system in a way that is acceptable to herders. The pilot was undertaken in four soums representing main ecological regions of Mongolia - Mankhan soum of Khovd aimag for the high mountain region, Undur-Ulaan soum of Arkhangai aimag for the forest-steppe region, Tumentsogt

soum of Sukhbaatar aimag for the steppe region, and Khuvsgul soum of Dornogobi aimag for the Gobi region for the period from February to August 2011.

The pilot was based on the following principles:

1. Given the absence of legal environment for grazing fee, design a proxy fee system that is similar to a desirable grazing fee system in Mongolia in terms of economic impacts on herders, ways to estimate fees and collect revenues, and disburse revenues
2. Be affordable, easily estimated and understood by local people, especially herders
3. Spend most revenues back on pastureland and risk management with both herders and local governments being beneficiaries
4. In addition to herders as users, local governments as owners of pastures should contribute and their contributions should be funded from the project during the pilot period
5. Herders should pay grazing fee on a voluntary basis
6. Ensure the herders' and local governments' participation in the pilot design and implementation by building well awareness among them
7. Involve key ecological regions of Mongolia
8. Ensure transparency and openness

The principle No 1 was applied through establishing a soum "Livestock Risk Management Fund" (LRMF) where herders pay contributions to (grazing fee proxy). The fund rules were discussed and approved by soum Hurals of Citizens' Representatives.

The principle No 2 was applied using the livestock numbers for each khot ail and herders' group based on the official animal census for 2010 and introducing grazing fee at the level of MNT 100 per sheep unit. Animal numbers were converted into sheep units using the coefficients based on grazing consumption but modified in consideration of damages animal species bring to pastures. The coefficients were 1 for sheep, 2 for goat, 3 for camel, 4 for cattle, and 8 for horse. Herders were entitled to pay their contributions to LRMF for absentee herds either getting contributions from owners or paying them on behalf of owners.

The principles No 3 and 4 were applied through **first**, LRMF is composed of herders contributions for 40% and project funding for 60% which is hoped to be eventually replaced by local budget, **second**, by paying contributions herders are entitled to get funding from LRMF in the amount the contributions paid augmented by 75% for the purposes of financing annual pastureland and risk management activities specified in a list, **third,** local governments are entitled to spend the remaining 30% of LRMF on common soum and bag level pastureland and risk management activities using bottom-up and participatory planning approach supported by SLP-II. For example, assuming that herders' contributions make up MNT 10 m (40% of LRMF), the project pays MNT 15 m (60% of LRMF) with the fund totaling MNT 25 m. Herders will get back MNT 17 m - MNT 10 m as their initial contributions plus MNT 7.5 m as 75% augmentation of their contributions. The remaining 30% or MNT 7.5 m is disbursed by soum governments.

Since 2015, CPR has been promoting LRMF by further improving its design under the SDC's Green Gold project, international environmental organizations WWF and TNC to launch its pilots in 3-8 *soums* each. The contribution from herders increased to 62.5% (MNT 500 per sheep unit) and the total contribution from other sources including projects and soum budget decreased to 37.5% (MNT 300

per sheep unit). Herders are entitled to access the fund in the amount of the fees increased by 30% (650 per sheep unit or 81.25% of the total spending) to fund activities chosen from an eligible list. The remaining 18.75% of the fund stays at the disposal of the soum government to decide which soum-wide and bagh-wide pastureland and risk management activities to finance. LRMF was promoted as a part of the integrated program called previously 'Soum Livestock Sustainable Development Policy' changed later to 'Smart Herder' program that consists of 3 other components in addition to LRMF to gain synergy effects: Land use agreements between herder groups and the soum Governor; 'Green Herd' sub-program aimed at addressing animal health, animal and product origin and certification challenges; and Support to value chains.

3. Methodology

As discussed in the previous section, the grazing fee level of MNT 500 per sheep unit can be considered a good indicator meeting bottom 3 out 4 requirements set at the beginning of the section:

1. Grazing fees are differentiated across pastureland users based on pasture quality, location, animal type and the degree of overstocking
2. Revenues are used back locally on financing pastureland, livestock risk and environmental management
3. Designed in such a way that does not make a financial burden on herders, especially the poor
4. Relied on the past experiences, best practices and lessons learnt to be feasible and easily acceptable

As of the end 2016, the livestock number in sheep units of an average soums is 381707. If MNT 500 fee is introduced then the average soum will collect MNT 191 million which is capable of meeting the soum's need of MNT 160 million for funding the pastureland, livestock and environmental management activities.

As discussed earlier, MNT 500 per sheep unit was not considered a financial burden on even poorer herders if they get back the money paid within the same year to finance their own pastureland and risk management activities.

Experiences of the CPR-piloted proxy grazing system have proved that it is feasible to introduce the grazing fee system that meets herders' needs and expectations.

What is not answered now is the question of how to link the base rate of MNT 500 per sheep unit to the pastureland quality variables discussed in section 2.1, namely animal species, grass yield, overgrazing rate and location of pastureland users.

3.1 Accounting for animal species

The most commonly used coefficients for converting animal species into sheep units are 5.7 for camel, 6.6 for horse, 6 for cattle and 0.9 for goat based on intake of pasture forage. Despite claims by many that goat and horse impact pastures worse than other species, there are no readily available

quantitative data comparing impacts of different animal species on pastures. Therefore, in 2011, under the World Bank funded Sustainable Livelihoods Project CPR has used increased coefficients for goat and horse as a part of the proxy grazing fee pilot and they were accepted by herders and local governments that participated in the pilot. The modified coefficients were sheep 1, goat 2, camel 3, cattle 4, and horse 8. Therefore, we propose to use these coefficients as a first choice for the time being until other alternatives come in the future. This means that the base fee rate is MNT 500 for sheep, MNT 1000 for goat, MNT 2000 for cattle, MNT 1500 for camel and MNT 4000 for horse.

3.2 Accounting for grass yield and overgrazing

As disused in section 2, the grass yield is a major variable to differentiate a grazing fee across users and to estimate pasture carrying capacity and the degree overstocking. As grazing fee level varies in response to stocking densities the explanation needs to be illustrated separately for scenarios of optimum stocking density and overstocked cases. **Table 3.1** shows 3 areas with different grass yield under the optimum stocking density scenario.

Table 3.1 Grazing fee per ha and sheep unit (SU), optimum stocking density

Area, ha	Grass Yield, kg	Forage Supply, kg	Forage demand per SU, kg	Carrying capacity, SU	Animal Number SU	Fee Per SU MNT	Total Fee MNT	Fee per ha MNT
1	2	3 (1x2)	4	5 (3:4)	6	7	8 (6*7)	9 (8:1)
1000	150	150000	560	268	268	500	134000	134
1000	280	280000	560	500	500	500	250000	250
1000	450	450000	560	804	804	500	402000	402

In the above scenario, pasture carrying capacity equals to the number of animals and animals eat what is required (560 kg per SU) and pays MNT 500 per SU for it. The difference in per ha fee reflects the difference in the grass yield as й key pastureland quality indicator.

The situation changes when overgrazing occurs. **Table 3.2** shows the same areas under the scenario where pasture carrying capacity is exceeded by 50%.

Table 3.2 Grazing fee per ha and sheep unit (SU), 50% overgrazing

Area, ha	Grass Yield, kg	Forage Supply, kg	Forage demand per SU, kg	Carrying capacity, SU	Animal Number SU (50% over-grazing)	Fee Per SU MNT	Total Fee MNT	Fee per ha MNT
1	2	3 (1x2)	4	5 (3:4)	6	7	8 (6*7)	9 (8:1)
1000	150	150000	560	268	402	500	201000	201
1000	280	280000	560	500	750	500	375000	375
1000	450	450000	560	804	1206	500	603000	603

In the above scenario, the animal numbers exceed the pasture carrying capacity by 50% and the per ha fee increased to the overgrazing rate of 50%, however, fee per SU remains the same as optimum stocking density scenario – MNT 500 per SU. Although the amount forage animals eat decrease closer to the rate of overgrazing rate (50%), the scenario has no clear message to herders about the overgrazing problem as the per SU fee stays the same as the optimum stocking density scenario. More importantly it has no financial incentive for herders to discourage their behavior for increasing animal numbers beyond the pasture carrying capacity as they pay the same amount of fee per animal as with the optimum stocking density scenario.

Table 3.3 shows the scenario with the fee rate per ha increased to twice the overgrazing rate. In this case the fee per sheep unit increases to MNT 667 per SU giving a clear message to herders about the overgrazing problem compared to the optimum stocking density scenario and increased financial burden they have to bear for each SU for causing the problem.

Table 3.3 Grazing fee per ha and sheep unit (SU), 50% overgrazing

Area, ha	Grass Yield, kg	Forage Supply, kg	Forage demand per SU, kg	Carrying capacity, SU	Animal Number SU (50% over-grazing)	Fee Per SU MNT	Total Fee MNT	Fee per ha MNT
1	2	3 (1x2)	4	5 (3:4)	6	7	8 (6*7)	9 (8:1)
1000	150	150000	560	268	402	667	268000	268
1000	280	280000	560	500	750	667	500000	500
1000	450	450000	560	804	1206	667	804000	804

The rationale in Table 3.3 needs to be translated into formula so that the principle can be applied for any pasture area in Mongolia. The formula is:

SU'opt=S*Yha/Gsu
OG%= (SU/SU'opt-1)*100
Fha'opt=500/Gsu*Yha
Fha=Fha'opt*(1+OG%*2)
Ftotal=Fha*S
Fsu=Ftotal/SU
Where:
SU'opt-pasture carrying capacity in sheep units
S-area of pasture, ha
Yha-grass yield of pasture, kg
Gsu-Forage demand per sheep unit per annum, kg (560 kg in the High Mountain region, Steppe 620 in the Steppe region, 600 kg in the Forest Steppe region, 470 kg in Gobi and the Depression of Great Lakes)
OG%-overgrazing rate in percentage
SU-number of animals on pastures in sheep units
Fha- fee per ha

Fsu-fee per sheep unit

MS Excel sheet to apply the above formulas and the sample results by key ecological zones are shown is attached in **Appendix 3.1**.

Table 3.4 Grazing fee at the current level (2016) of overgrazing and grass yield

Regions	Pasture carrying capacity in sheep units (SU'opt)	Over-grazing rate based on animal intake, %	Over-grazing rate for grazing fee, % (OG%)	Fee per ha under optimum stocking density MNT (Fha'opt)	Fee per ha MNT (Fha)	Fee total million MNT (Ftotal)	Fee per sheep unit MNT (Fsu)	Fee per sheep - month MNT
High Mountain	7417883.4	166	210	230.3	1195.7	19,252,329	838.5	66
Forest Steppe	10,784,396	147	180	378.3	1737.9	24,769,847	821.2	72
Steppe	16,712,550	65	104	306.5	942.1	25,690,292	754.6	68
Gobi	8,750,972	72	142	116.0	446.2	16,837,910	793.7	64
Depression of Great Lakes	5,915,710	118	197	151.1	746.8	14,622,344	831.8	65
National	51,989,244	96	142	226.2	869.8	99,968,848	793.6	67

It is worth noting that when overgrazing rate becomes 0 or optimum stocking density reached then the base rate should applied and the application of the formula needs to be stopped. This is because negative overgrazing will decrease the base rate, which is not desirable as pastureland users should be paying the base rate. Also, the sum of regions does not exactly match with the national figures because of rounding errors of Excel sheet.

As grass availability significantly decreases in the winter-spring season, the annual base grazing fee needs to be also modified according to this change. Based on data in **Appendix 3.1, Table 3.5** shows grazing fees per sheep unit and per ha by seasons and for one sheep-month or 30 sheep-days.

Table 3.5 Grazing fees per sheep unit and per ha by seasons and for sheep-month

Ecological regions	Fee per ha Winter-Spring, MNT	Fee per ha Summer-Autumn, MNT	Fee per Sheep Unit Winter-Spring, MNT	Fee per Sheep Unit Summer-Autumn, MNT	Fee per Sheep-month Winter-Spring, MNT	Fee per Sheep-month Summer-Autumn, MNT

High Mountains	1075	1549	527	326	72	67
Forest steppe	1380	2671	456	379	68	69
Steppe	212	437	415	361	64	64
Gobi	320	771	398	411	65	69
Depression of Great Lakes	530	1277	413	427	67	71
National	668	1399	426	383	66	67

We are also planning that the methodology should be flexible enough to estimate grazing fees for not only per annum basis but also for shorter time frames such as quarterly, monthly, weekly and daily bases as the duration of the use of any particular area of pasture is much diverse and shorter-term fee rates are needed especially in cases of reciprocal grazing uses between aimags, soums, baghs and herder groups.

It is worth noting that figures in **Table 3.4** and **Table 3.5** are only indicative of the regional and national level scenarios and when it comes to estimating grazing fees in reality, grazing fees for individual soums and pastureland users need to be estimated specifically for specific cases involved using the formula or Excel sheet in **Appendix 3.1**.

2.3 Accounting for location

There are a plenty of studies and statistics evidencing that herders' migration form remote areas to urban settlements to have a closer access to markets and services has been increasingly in place for the past years. As an average for 2011-2016, every year 30 thousand new comers settle in the Ulaanbaatar city only with out-migration of around 10 thousand people and net in-migration of 20 thousand people. There have been clear migration patterns from remote aimags to the Erdenet and Darkhan city areas, as well as to aimag centers and soum centers. Many of in-migrators come with livestock, thus make a major role in overgrazing of pastures near urban settlements causing serious environmental problems and eroding the sustainability of livestock herding in peri-urban areas. As rural-to urban migration occurs, remote areas are getting unoccupied resulting in serious imbalances in the distribution of livestock across territories. Therefore, it is highly recommended to differentiate the base grazing fee based on the remoteness to encourage more even distribution of livestock and to prevent excessive rural-to-urban migration. **Table 3.4** recommends coefficients to modify the base grazing fee based on the location of pastureland users.

Table 3.4 Coefficients to modify the base grazing fee based on the location of pastureland users

Location of grassland used by HG	**Percent of change**
Within livestock region of UB	+50
Within 30 km radius from UB border	+35
Within Darkhan and Erdenet city border	+30

Within 30 km radius from Darkhan and Erdenet city border	+25
Within the border or 20 km radius of aimag centers and equivalent large settlements as well as within 10 km from hard paved and rail roads	+20
Within the border or 10 km radius of soum centers and equivalent small settlements	+10
Percentage of reducing the base fee in case of utilization of remote or unused pastures	-30
Percentage of reducing the base fee for herders reside along the state border outside the 30 km from the settlements such as border point and infrastructure point	-50

3.4 Practical steps to estimate grazing fees

Based on the approach described in section 2 and the methodology in section 3, the following practical steps are recommended to estimate and collect grazing fees:

1. **Estimating annual grazing fee**

1.1 Determine the area size of land users in ha- data source: for soums - pastureland area reflected in the annual report of unified land funds administered by the ALRGC; for land users within soum- pastureland area used by individual users as reflected in the pastureland use agreements if these agreements available, if these agreements are not available, soum land officer is responsible for estimating roughly land areas by individual users or herder groups in consultation with them.

1.2 Prepare grass yield data for pastureland users, kg or centner (100 kg) per ha: for soums - annual grass yield data by NAMHEM and 1:100,000 scale vegetation maps by ALRGC are key sources; for pastureland users soum Governor is responsible for organizing grass yield estimates for each pastureland user in participation of soum land officer, soum Animal Health & Breeding Unit (AHBU) staff, soum meteorological post staff and pastureland users/herders preferably arranging on site field estimates of vegetation samples and comparing them with available secondary data sources such as ALRGC's 1:100,000 scale vegetation maps and NAMHEM's annual grass yield estimates (as discussed in previous sections the introduction of grazing fees shall generate enough revenues to finance these kinds of pastureland management activities). Use the coefficient of 0.61 to convert the grass yield measured using vegetation samples in August into the annual average grass yield

1.3 Estimate the number of animals from the animal census data at the end of the previous year for pastureland users. The number of animals owned by absentee herders shall be included in the total number of animals of a herder who is looking after these animals. Estimate the total sheep units (SU) using the coefficients camel 3, horse 8, cattle 4, sheep 1, goat 2.

1.4 Estimate pasture carrying capacity:

SU'opt=S*Yha/Gsu

Where:

SU'opt-pasture carrying capacity in sheep units

S-area of pasture, ha

Yha-grass yield of pasture, kg

Gsu-Forage demand per sheep unit per annum, kg (560 kg in the High Mountain region, Steppe 620 in the Steppe region, 600 kg in the Forest Steppe region, 470 kg in Gobi and the Depression of Great Lakes)

1.5 Estimate overgrazing rate:

OG%= (SU/SU'opt-1)*100

Where:

OG%-overgrazing rate in percentage. If pastureland is overgrazed then use the average grass yield for previous 5 years instead of the grass yield in the year of measurement (See section 2.1 for details)

1.6 Estimate grazing fee under optimum stocking density:

Fha'opt=500/Gsu*Yha

Where:

500 – Annual base grazing rate per sheep unit, MNT

Fha'opt - Grazing fee under optimum stocking density

1.7 Estimate grazing fee per ha

Fha=Fha'opt*(1+OG%*2)

Where:

Fha- fee per ha

1.8 Estimate: Total grazing fee for the area of land user

Ftotal=Fha*S

Where:

Ftotal- Total grazing fee for the area of land user

1.9 Estimate grazing fee per sheep unit

Fsu=Ftotal/SU

Where:

Fsu- Grazing fee per sheep unit

2. Estimating grazing fee by seasons and months

2.1 Repeat steps in 1.1 for estimating the area size of pastures

2.2 Estimate grass yield of the area using the following coefficients to convert the annual grass yield in 1.2 into seasonal averages

Coefficients to convert the annual grass yield to seasonal averages

Regions	Winter-spring season	Summer-autumn season
High mountains	0.65	1.52
Forest steppe	0.67	1.52
Steppe	0.65	1.52
Gobi	0.64	1.55
Depression of Great Lakes	0.67	1.53

2.3 Repeat 1.3 and 1.4 to estimate the number of animals, sheep units and pasture carrying capacity for the season under consideration. Use the following base indicators:

Base grazing rate per sheep unit and forage demand per sheep unit by seasons

Regions	Base grazing rate per sheep unit, MNT	Total forage demand per sheep unit in season, kg

	Winter-spring	Summer-autumn	Winter-spring	Summer-autumn
High mountains	301	199	330	230
Forest steppe	274	226	300	300
Steppe	267	233	312	308
Gobi	253	247	200	270
Depression of Great Lakes	253	247	200	270

2.4 Repeat 1.5-1.9 to estimate relevant indicators

2.5 Estimate grazing fee for sheep-month by seasons using the following formula:

Fsu/month=Fsu*Sm

Where:

Fsu/month - Grazing fee for sheep-month

Sm-share of month (30 days) in the total duration of the season

Share of month (30 days) in the total duration of the season (Sm):

High mountains	0.136	0.207
Forest steppe	0.150	0.182
Steppe	0.154	0.176
Gobi	0.162	0.167
Depression of Great Lakes	0.162	0.167

3. Adjusting the grazing fees based on the location of pastureland users

3.1 Identify the location pastureland users based on the location of permanent seasonal camp sites located on the area under consideration

3.2 Estimate the distance from the camp site to relevant places specified in table below:

Location of pastureland users	**Percent of change**
Within livestock region of UB	+50
Within 30 km radius from UB border	+35
Within Darkhan and Erdenet city border	+30
Within 30 km radius from Darkhan and Erdenet city border	+25
Within the border or 20 km radius of aimag centers and equivalent large settlements as well as within 10 km from hard paved and rail roads	+20
Within the border or 10 km radius of soum centers and equivalent small settlements	+10
Percentage of reducing the base fee in case of utilization of remote or unused pastures	-30
Percentage of reducing the base fee for herders reside along the state border outside the 30 km from the settlements such as border point and infrastructure point	-50

3.3 Adjust the grazing fees estimated in 1-2 using the percentages in table above to account for the location of pastureland users

4. Adjusting grazing fees based on price changes

Herders' income and ability to pay grazing fees depends to a certain degree on prices of livestock products they sell and prices of production inputs and consumer goods they buy. Therefore, it is important to look at these variables at certain time intervals to make sure that herders have sufficient incomes and profitability to pay grazing fees. For this purpose analyses of herders incomes and expenditures have been carried out codmparing two time periods 2011 and 2016. Herders' income was estimated using a herd turnover model and the average national productivity indicators for 2016 and prices of 2011 and 2016.

Table 4.1 Average Household Livestock Income, '000 MNT

Indicators	2011	2016	Change
Livestock number in sheep units	634	634	1.00
Value of total production	9490	11200	1.18
Value of home consumed products	1633	2313	1.42
Potential cash income	7857	8887	1.13
Value livestock number growth	3892	4859	1.25
Total value of production including livestock growth	13382	16059	1.20

Source: CPR herd turnover model, 2017 and 2011 & 2016 average national prices, National Statistics Office, 2017

As shown in **Table 4.1**, the value of live4stock production has increased by 18% from 2011 to 2016 and this increase accounts for 20% if the value of livestock number growth included.

Table 4.2 Livestock production costs

Production costs	2011		2016		Change
	Cost	Share, %	Cost	Share, %	
Animal feed	212,569	49.59	525,264	56.97	2.47
Veterinary costs	39,433	9.20	79,350	8.61	2.01
Petrol	99,219	23.14	190,350	20.65	1.92
Others	77,467	18.07	126,967	13.77	1.64
Total	428,688	100	921,931	100	2.15

Source: National Statistics Office, Household socio-economic study, 2016

As shown in Table 4.2 production costs have increased by 2.15 folds between 2011 and 2016 and the major cost items are feeding and petrol accounting for more than 70% of the total costs. The percentage of the total production costs, however, account for only tiny percentages compared to the total value of production or income - 3.2% and 5.7% respectively in 2011 and 2016 meaning that livestock herding is extremely profitable if herders livelihood costs not included.

Table 4.3 provides herders livelihood costs in 2011 and 2016.

Table 4.3 Herders livelihood costs per year, '000 MNT

Cost items	2011	2016	Change
Food costs	2,487,055.85	3,242,227.48	1.30
Non-food costs	4,133,704.59	8,736,645.82	2.11
Total	6,620,760.45	11,978,873.30	1.81

Source: National Statistics Office, Household socio-economic study, 2016

As shown in **Table 4.3** herders livelihood costs have increased 1.8 folds between 2011 and 2016 mostly due to non-food costs. If these costs included as labor costs then the profitability of livestock herding changes. Table 4.4 summarizes the incomes, costs and profitability of livestock herding.

Table 4.4 Incomes, costs and profitability of livestock herding, average household case

	2011		2016	
	Amount	Share of items in total income %	Amount	Share of items in total income %
Total Income	13,381,889	100.00	16,059,420	100.00
Production costs	428,688	3.20	921,931	5.74
Food livelihood costs	2,487,055.85	18.59	3,242,227	20.19
Non-food livelihood costs	4,133,704.59	30.89	8,736,646	54.40
Total costs	7,049,448.65	52.68	12,900,804	80.33
Profit	6,332,440.31	47.32	3,158,616	19.67
Profitability or return per costs, %	89.8		24.4	

As shown in **Table 4.4**, although the profitability (profit per MNT 100 of costs) is decreasing from 89.8% in 2011 to 24.4% in 2015, livestock herding is still profitable business if compared to the international average of less than 15%. Especially, material costs such as feeding and petrol have almost no impact on profitability.

Based on this picture we recommend that grazing fees be adjusted for the time being based only on an income part until costs have increased to the level to make them sensitive to grazing fees. At present, grazing fees will make around MNT 503 thousand per household (MNT 794 of fee per sheep unit multiplied by 634 sheep units per household) and it will decrease the profitability from 24.4 to around 20%. Review of grazing fees based on prices is recommended be undertaken in every 5 years, so the situation can be reviewed again in 5 years' time.

Recommended adjustment method of grazing fee based on livestock incomes:
I= (Y'хм*73%+Y'н*27%)
Where:
I-Index to change grazing fee
Y'хм – Mutton price index as proxy for meat price changes
73%- Share of meat income in the total livestock income
Y'н – Cashmere price index
27% - Share of cashmere income in the total livestock income

Table 4.5 Prices of major livestock products

Products	2011	2016	Change
Camel meat	1.9	2.5	1.35
Horse meat	2.0	2.9	1.46
Beef	2.5	3.7	1.48
Mutton	2.3	3.2	1.41
Goat	1.9	2.7	1.39
Cashmere	52.0	48.0	0.92

As shown in **Table 4.5**, there is very high correlation between meat prices suggesting that mutton price can be a good proxy for meat price changes. It has increased by 1.41 folds between 2011 and 2016 and cashmere has decreased by 8%. Using these data the grazing fee adjustment index can be estimated as follows between 2011 and 2016:

I= (1.41*73%+0.92*27%) = 1.28

5. Recommendations on ways to spend grazing fee revenues

As discussed in section 2, the introduction of grazing fees is acceptable for herders and local governments if the revenues collected are used back locally on sustainable use, protection and improving pastures and related activities in participation of herders.

Therefore it is strongly recommended that local governments spend not less than 70% of the total revenues from grazing fees in way that maximizes pastureland users/herders participation, in other words, designing and implementing bottom-up proposals from herders. For this purpose, the CPR-undertaken pilots of establishing livestock risk management fund to receive and finance herder proposals can be used as a model. The pilot has recommended the following list of eligible activities to be financed from the fund:

1. Manure hay making areas
2. Protect springs, fence its origins
3. Fight against pasture rodents and insects
4. Improve pastures and hay making areas by planting perennials
5. Protect wildlife on pastures under agreement
6. Repair deep well facilities (pump, generator, trough)
7. Build and repair water catchment facilities
8. Plant trees and shrubs for environmental protection purposes
9. Estimate pasture grass yield, carrying capacities
10. Monitoring by group/partnership leaders over the implementation of the pastureland use agreements and sub-projects funded by LRMF
11. Prepare animal feed and establish its reserve fund
12. Repair and upgrade animal shelters
13. Repair hay and fodder storage facilities
14. Make small scale snow breaker
15. Dig and drain hand wells, repair hand well facilities
16. Purchase small-scale hay, fodder making equipment

17. Undertake horticulture activities for income diversification purposes
18. Repair and maintain fencing of hay making areas
19. Purchase breeding animals
20. Measures for animal health improvement
21. Measure for livestock product processing, improving its quality and market linkages

Procedures and forms used for implementing the soum livestock risk management fund are attached in **Appendix 5.1**.

6. Note on TOR task for estimating grazing fees at geographical indexes/regions

There are plenty of studies on zoning of Mongolia's territory into different geographical regions based on natural conditions such as climate, soils, vegetation, topography as well as land use such as livestock zoning and economic zoning etc. For example, agricultural regions based largely on key differences in physical geography have been widely used by economists and planners[2]. The Government resolution #152 "Measures to enforce the Law on Land Use Payment" in 1997 has split the country into 4 regions in terms of land valuation: Khangai-Khentii mountainous, Altai Mountain, Gobi mountainous and Steppe and 21 sub-regions. The SDC Green Gold project has used 6 major ecological regions – Meadow Steppe, Forest Steppe, Steppe, Semi-Desert Steppe, Desert Steppe and Steppe - in applying the ecological site description (ESD) approach in estimating pastureland degradation and recovery states. Despite differences in boundaries, regions under the above mentioned zoning show differences in the pastureland quality from one and other perspective in big-scale maps, one region covering at least a number of entire soums implying that the pastureland quality is the same across soums included in one region.

Although these kinds of zoning provide useful general information on pastureland quality differences, they are not much relevant for estimating grazing fees for pastureland users or herders as the quality of pastures they use are unique and differ significantly across users. If grazing fees established flat for a large area covering territories of several soums then grazing fees cannot play it's a role to incentivize the sustainable use of pastures. There is readily available database - 1:100,000 scale vegetation maps showing differences in the pastureland quality within soums. Therefore, in order to make grazing fees an effective tool for encouraging sustainable use of pastures, the proposed methodology should be able to establish grazing fees based on differences in the pastureland quality across land users or herder groups.

[2] Agricultural zoning map, National Atlas of Mongolia, Ulaanbaatar 1990