ZHANGYE IMPROVED GRASSLAND MANAGEMENT PROJECT

Document Prepared By Gansu Heihe Electric Power Sales Co. Ltd

Project Title	Zhangye Improved Grassland Management Project
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Project Location	Zhangye City, Gansu Province, China
Project Proponent(s)	Zhangye Academy of Forestry Sciences Quan Jinpeng Ten kilometers outside the east gate of Ganzhou District, Zhangye City, Gansu Province, China +86 0936-8671238, 1622371231@qq.com
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GHG Accounting/ Crediting Period	25-July-2017 to 24-July-2057; 40-year lifetime
Monitoring Period of this Report	25-July-2017 to 31-December-2021
History of CCB Status	N/A

Gold Level Criteria	N/A

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1 SUMMARY OF PROJECT BENEFITS

1.1 Unique Project Benefits

Outcome or Impact	Achievements during the Monitoring Period	Section Reference	Achievements during the Project Lifetime
1) Improve grassland productivity and forage quality in the project zone of Zhangye city, which could significantly improve the ecological aesthetics value of local touristic resources.	Restore 261,059.80 ha of degraded grassland system by seeding grass, fence building and sustainable grassland management.	2.1	Restore 261,059.80 ha of degraded grassland system by seeding grass, fence building and sustainable grassland management.
2) Improve the cultural collision within ethnic groups by full communication among stakeholders on a regular basis during the implementation of the project. Attracts tourists from all parties, which greatly promotes the diffusion of silk culture.	The project provided opportunities for local minorities to work together, and organize special community cultural activities during their traditional holidays, which improved interaction within the local minorities, and indirectly promoted the diffusion of traditional culture.	4.1	The project provided opportunities for local minorities to work together, and organize special community cultural activities during their traditional holidays, which improved interaction within the local minorities, and indirectly promoted the diffusion of traditional culture.
3) Increase biodiversity of the project zone, such as Qilian mountains which has been regarded as ecological security barrier.	The biodiversity in the project zone has increased	5.4	The biodiversity in the project zone has increased.

1.2 Standardized Benefit Metrics

Category	Metric	Achievements during Monitoring Period	Section Reference	Achievements during the Project Lifetime
GHG emission reductions & removals	Net estimated emission removals in the project area, measured against the without-project scenario	2,695,781 tCO_2e	3.2	2,695,781 tCO_2e
	Net estimated emission reductions in the project area, measured against the without-project scenario	Not applicable	/	Not applicable
Forest[1] cover	For REDD[2] projects: Number of hectares of reduced forest loss in the project area measured against the without-project scenario	Not applicable	/	Not applicable
	For ARR[3] projects: Number of hectares of forest cover increased in the project area measured against the without-project scenario	Not applicable	/	Not applicable
Improved land management	Number of hectares of existing production forest land in which IFM[4] practices have occurred as a result of the project's activities, measured against the without-project scenario	Not applicable	/	Not applicable
	Number of hectares of non-forest land in which improved land management has occurred as a result of the project's activities, measured against the without-project scenario	Not applicable	/	Not applicable
Training	Total number of community members who have improved skills and/or	11,727	2.3	11,727

[1] Land with woody vegetation that meets an internationally accepted definition (e.g., UNFCCC, FAO or IPCC) of what constitutes a forest, which includes threshold parameters, such as minimum forest area, tree height and level of crown cover, and may include mature, secondary, degraded and wetland forests (*VCS Program Definitions*)
[2] Reduced emissions from deforestation and forest degradation (REDD) - Activities that reduce GHG emissions by slowing or stopping conversion of forests to non-forest land and/or reduce the degradation of forest land where forest biomass is lost (*VCS Program Definitions*)
[3] Afforestation, reforestation and revegetation (ARR) - Activities that increase carbon stocks in woody biomass (and in some cases soils) by establishing, increasing and/or restoring vegetative cover through the planting, sowing and/or human-assisted natural regeneration of woody vegetation (*VCS Program Definitions*)
[4] Improved forest management (IFM) - Activities that change forest management practices and increase carbon stock on forest lands managed for wood products such as saw timber, pulpwood and fuelwood (*VCS Program Definitions*)

Category	Metric	Achievements during Monitoring Period	Section Reference	Achievements during the Project Lifetime
	knowledge resulting from training provided as part of project activities			
	Number of female community members who have improved skills and/or knowledge resulting from training provided as part of project activities of project activities	6,039	2.3	6,039
Employment	Total number of people employed in of project activities,[5] expressed as number of full-time employees[6]	952[7]	2.3	952
	Number of women employed in project activities, expressed as number of full-time employees	493	2.3	493
Livelihoods	Total number of people with improved livelihoods[8] or income generated as a result of project activities	11,727	2.3	11,727
	Number of women with improved livelihoods or income generated as a result of project activities	6,039	2.3	6,039
Health	Total number of people for whom health services were improved as a result of project activities, measured against the without-project scenario	Not applicable	/	Not applicable
	Number of women for whom health services were improved as a result of	Not applicable	/	Not applicable

[5] Employed in project activities means people directly working on project activities in return for compensation (financial or otherwise), including employees, contracted workers, sub-contracted workers and community members that are paid to carry out project-related work.

[6] Full time equivalency is calculated as the total number of hours worked (by full-time, part-time, temporary and/or seasonal staff) divided by the average number of hours worked in full-time jobs within the country, region or economic territory (adapted from UN System of National Accounts (1993) paragraphs 17.14[15.102];[17.28])

[7] During the implementation of the project, about 11,727 local herders will directly participate in grass seeding and rodent control, of which 51.5% were women. According to the payment records, the working hours was 1,904,000 hours per year during this monitoring period, and the legal working hours is 2,000 hours per year according to Labour Law of China. Therefore, total number of people employed in the project expressed as number of full-time employees is 952 (1,904,000/2,000 =952).

[8] Livelihoods are the capabilities, assets (including material and social resources) and activities required for a means of living (Krantz, Lasse, 2001. *The Sustainable Livelihood Approach to Poverty Reduction*. SIDA). Livelihood benefits may include benefits reported in the Employment metrics of this table.

Category	Metric	Achievements during Monitoring Period	Section Reference	Achievements during the Project Lifetime
	project activities, measured against the without-project scenario			
Education	Total number of people for whom access to, or quality of, education was improved as a result of project activities, measured against the without-project scenario	Not applicable	/	Not applicable
	Number of women and girls for whom access to, or quality of, education was improved as a result of project activities, measured against the without-project scenario	Not applicable	/	Not applicable
Water	Total number of people who experienced increased water quality and/or improved access to drinking water as a result of project activities, measured against the without-project scenario	Not applicable	/	Not applicable
	Number of women who experienced increased water quality and/or improved access to drinking water as a result of project activities, measured against the without-project scenario	Not applicable	/	Not applicable
Well-being	Total number of community members whose well-being[9] was improved as a result of project activities	11,727	2.3	11,727
	Number of women whose well-being was improved as a result of project activities	6,039	2.3	6,039

[9] Well-being is people's experience of the quality of their lives. Well-being benefits may include benefits reported in other metrics of this table (e.g. Training, Employment, Health, Education, Water, etc.), but could also include other benefits such as empowerment of community groups, strengthened legal rights to resources, conservation of access to areas of cultural significance, etc.

Category	Metric	Achievements during Monitoring Period	Section Reference	Achievements during the Project Lifetime
Biodiversity conservation	Change in the number of hectares significantly better managed by the project for biodiversity conservation,[10] measured against the without-project scenario	4,087,400[11]	2.1	4,087,400
	Number of globally Critically Endangered or Endangered species[12] benefiting from reduced threats as a result of project activities,[13] measured against the without-project scenario	7	5.1	7

[10] Biodiversity conservation in this context means areas where specific management measures are being implemented as a part of project activities with an objective of enhancing biodiversity conservation.
[11] According to PRA Report, the total area of Zhangye city is 4,087,400 ha. The project restored degraded grassland, guided herders to graze reasonably, prevented sustainable degradation of grassland, provided more habitats for wild animals and increased biodiversity in the project zone.
[12] Per IUCN's Red List of Threatened Species
[13] In the absence of direct population or occupancy measures, measurement of reduced threats may be used as evidence of benefit

2 GENERAL

2.1 Project Description

2.1.1 Implementation Description

Zhangye Improved Grassland Management Project (hereafter as "the project") is located in Zhangye City, Gansu Province of China. Zhangye City is located in the northwest of Gansu Province and in the middle of Hexi corridor where the Qinghai Tibet Plateau and Mongolia Plateau meet. The project's aim is to restore the local degraded grassland ecosystem by seeding grass and building fence on the degraded grassland, increase carbon sequestration and contribute to local development by introducing sustainable grazing and management of grassland. The project proponent is Zhangye Academy of Forestry Sciences.

The project area is located in Zhangye City, which covers Sunan Country, Gaotai County, Ganzhou district, Shandan County, Mingle County and Shandan Racecourse.

Totally, 261,059.80 ha of degraded grassland have been managed scientifically by fence building and reseeding of local high-quality forage. There are three main restoration measures as followed in the project during this monitoring period:

Rotational grazing requires that the grazing time shall be halved by dividing grasslands into seasonal grazing land according to the livestock carrying capacity of the grassland by fence building. Then based on specified grazing order, grazing cycle and zoning grazing time, the grassland is grazed area by area and used in turn. 76,608.83 ha of degraded grassland have been managed scientifically by the implementation of rotational grazing.

Rest grazing requires that grazing shall not be carried out within 90 days when the grass turns green every year by building the fence and sustainable management. 106,562.38 ha of degraded grassland have been managed scientifically by the implementation of rest grazing.

Reseeding grass is sowing grass seeds on the degraded grassland. According to the National standard documents of the people's Republic of China[14] and Project Design Report, the total grass yield decreased by 50% compared with that before degradation is regard as seriously degraded grasslands. In our project, 77,888.59 ha of degraded grassland have been managed scientifically by the implementation of rest grazing.

The implementation of the project will generate GHG emission removals by increasing soil organics, mitigate the impact of climate change on the local ecological environment, such as slow down the melting of snow-capped mountains, increase local biodiversity by protect and restore wildlife habitat, enhance the capabilities of local communities and improve their income by providing them with relevant technical skills training and employment opportunities.

The project proponent and the County Forestry and Grassland Bureau visited all project participants every year to investigate the management of the project, including whether grazing is carried out according to the planned frequency. Also, the grassland guardians conduct daily patrols

[14] GB19377-2003 Parameters for degradation, sandification and salification of rangelands

on the grassland, record and report the risks that affect the sustainable development of the grassland in the project area, such as overgrazing, rodent damage and fires, etc.

According to the PD, leakage from displacement of grazing activities to outside the project boundary should be calculated, and the relevant parameters were monitored on the basis of Leakage from Displacement of Grazing Activities (VMD0040, Version 1.0). For non-permanence risk factors, the project has been evaluated against the all the three categories of risk factors during this monitoring period by regular records of the relevant events and comprehensive analysis, the results of the monitoring and evaluation was summarized in the relevant non-permanence risk report.

From 16- September 2021 to 1- October -2021, the project proponent has conducted a field monitoring for the climate and community impacts of the project actually achieved during the first monitoring period (from 25-July-2017 to 31-December -2021[15]). According to the patrol records, during the monitoring period, there was no events that may impact the GHG emission reductions or removals and monitoring occurred.

To monitor the biodiversity impact, the project proponent has conducted two filed surveys in winter season (3-November-2020 to 7-December-2020) and summer season (25-May-2021 to 20-June-2021) respectively. Please refer to Section 5.3 and 5.4 for details.

In conclusion, during this monitoring period, the project has generated GHG emission removals of 2,653,955 tCO_2e and improved local environment through reseeding grass and fence building on the degraded grassland, increased income of local residents by offering job opportunities from the project and improve tourism income, enhanced the capabilities of local communities and residents by providing their relevant technical skills training, promote cultural communication by attracting tourists and increased local biodiversity due to the restoration of grassland ecosystem.

2.1.2 Project Category and Activity Type

According to Appendix of 1 Eligible AFOLU Project Categories of the VCS Standard (version 4.1), eligible Agricultural Land Management (ALM) activities are those that reduce net GHG emissions on croplands and grasslands by increasing carbon stocks in soils and woody biomass and/or decreasing CO_2, N_2O and/or CH_4 emissions from soils, which include Improved Cropland Management (ICM), Improved Grassland Management (IGM) and Cropland and Grassland Land-use Conversions (CGLC).

The project restores degraded grassland by planting grass and rotational grazing and rest grazing thus increasing soil carbon stocks. So, the project is developed under VCS scope 14 “Agriculture, Forestry and Other Land Use (AFOLU)” with a project category of Agricultural Land Management (ALM), and belongs to the category of Improved Grassland Management (IGM) that demonstrably reduce net GHG emissions of grassland ecosystems by increasing soil carbon stocks. The project is not a grouped project.

[15] According to the methodology, the monitoring of SOC stock should be at the end of growing season in the year measured, therefore the field monitoring activities for this monitoring period has been conducted in September and October of 2021, and the monitoring period end at the end of the year measured, i.e. 31-December-2021.

2.1.3 Project Proponent(s)

Organization name	Zhangye Academy of Forestry Sciences
Contact person	Quan Jinpeng
Title	President
Address	Ten kilometers outside the east gate of Ganzhou District, Zhangye City, Gansu Province, China
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2.1.4 Other Entities Involved in the Project

Organization name	Gansu Heihe Electric Power Sales Co. Ltd
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Gansu Heihe Electric Power Sales Co. Ltd is the project consultant, who is responsible for the development of the project.

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Climate Bridge (Shanghai) Ltd. is responsible for providing technical support for the entire project development cycle.

2.1.5 Project Start Date (G1.9)

According to VCS standard, the project start date is the date on which activities that lead to the generation of GHG emission reductions or removals are implemented, for this project, the project start date is 25-July-2017 when grass reseeding and fence building started.

2.1.6 Project Crediting Period (G1.9)

The project crediting period is from 25-June-2017 to 24-June-2057 with a lifetime of 40 years which is the same as the CCB benefits assessment period.

2.1.7 Project Location

The project is located in Zhangye City, Gansu Province of China. The geographical coordinates of the project are east longitude 97° 20′ ~ 102° 12′ and north latitude 37° 28′ ~39° 57′ .

According to CCB standard, Zhangye City is defined as the project zone, and the planting and fence building areas in a state-owned enterprise (Shandan Racecourse), four counties, and a district are defined as project area, and the project activities in the project area will generate net climate benefits. The boundaries of project area and project zone is shown in Figure 2-2, and the KML file has also been submitted.

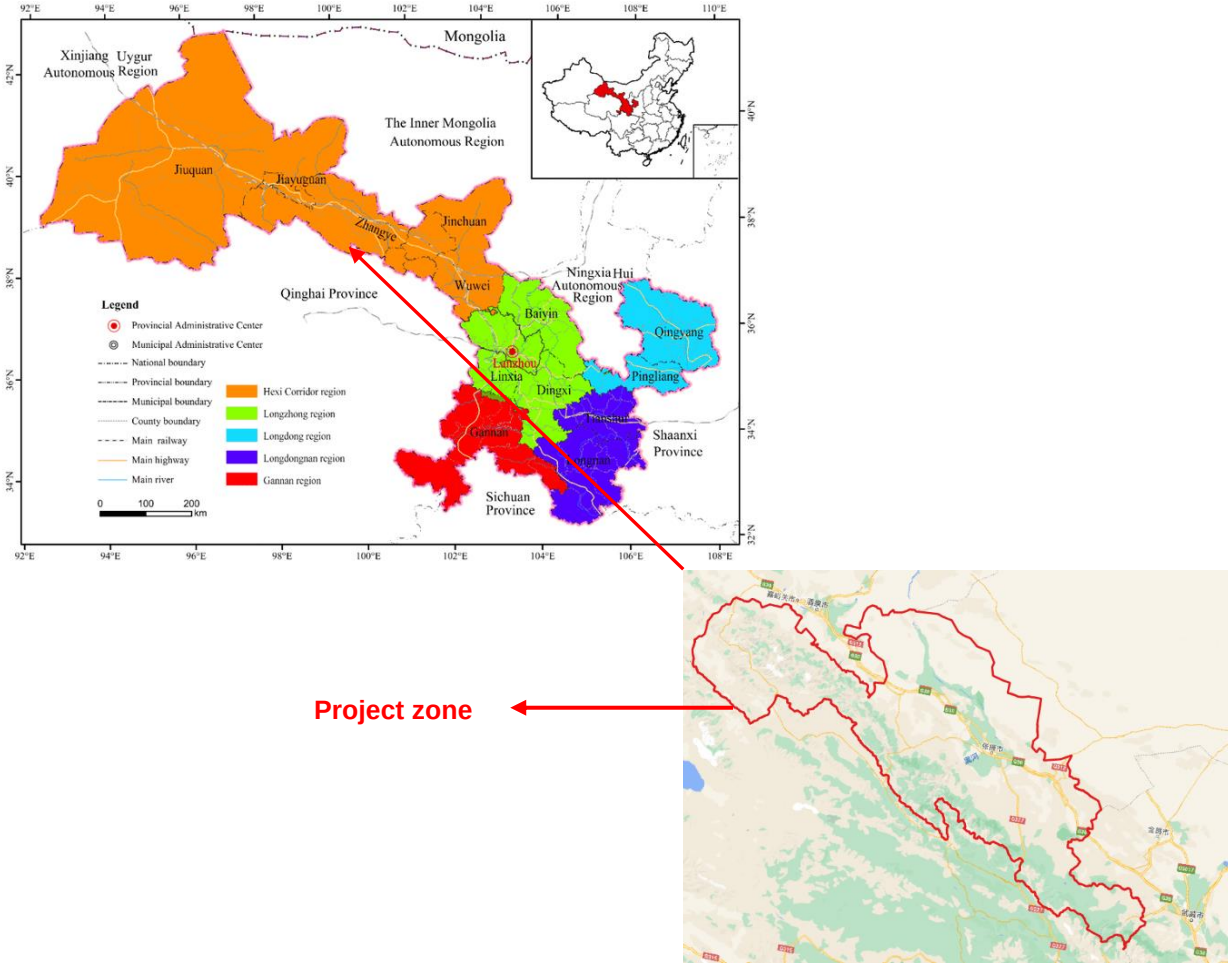

Figure 2-1 The project location

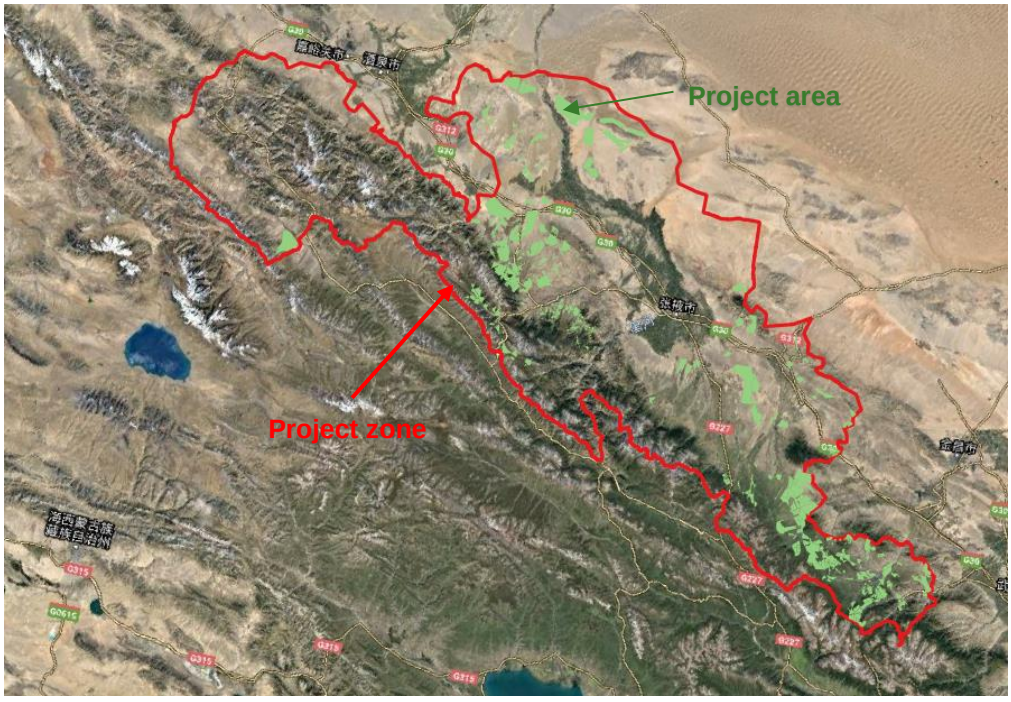

Figure 2-2 The project area

2.1.8 Title and Reference of Methodology

- VM0026 Sustainable Grassland Management, v1.1
- Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities, v3.0
- Tool for Identification of Degraded or Degrading Lands for Consideration in Implementing CDM AR Project Activities, v1.0
- Guidelines for sampling and surveys for CDM project activities and programmes of activities, v 4.0
- VMD0033 Estimation of emissions from Market leakage, v1.0
- VMD0040 Leakage from displacement of grazing activities, v1.0

2.1.9 Other Programs (G5.9)

The project does not reduce GHG emissions from activities that are included in an emissions trading program or any other mechanism that includes GHG allowance trading;

The project has not sought or received another form of GHG-related environmental credit, including renewable energy certificates, during this monitoring period;

The project is not seeking registration under any other GHG programs.

2.1.10 Sustainable Development

According to the United Nations Sustainable Development Goals, the project provided many benefits that will help to achieving the goals as following:

	All the employees that were involved in grass seeding, fence building were paid 150 RMB (23.13 USD) /day. Grassland guardians were paid around 24,000 RMB (3758.4 USD) / year. Women and vulnerable people who come from the poorest local households were not only provided with equal opportunities but also consciously ensured that they can be part of the project. These measures could improve the income and reduce poverty of local residents.
	The project proponent has referenced Labor Law of the People's Republic of China and adapted them to meet the local conditions to ensure workers' health and safety. The workers' health and safety policy, including items covering the health insurance scheme for workplace accidents and evacuation plans is made available for workers and implemented by county forestry and grassland bureau.

	During the project implementation, about 11,727 local herders participated in the project, of which 6,039 are women. By being trained with the sustainable grassland management skills and participating the community activities together with other employees, women may gain more happiness compares to doing housework only. This will contribute to empower women and build community capacity in gender and sustainable grassland management.
	The purpose of the project is to restore the degraded grassland ecosystem by seeding grass or managed grazing which will generate GHG emission removals by increasing soil organics or avoiding soil degradation, mitigate the impact of climate change on the local ecological environment.
	The project can improve the quality and quantity of the grassland vegetation and provide more habitat for wild animals to enhance biodiversity conservation by reseeding grass or scientific grazing.

For monitoring and reporting, all the achievements have been recorded with related evidence, and the certain contributions on climate, community and biodiversity have been calculated and evaluated as per the related standard and methodologies.

2.2 Project Implementation Status

2.2.1 Implementation Schedule (G1.9)

Table 2-1 Timeline of the project

Date	Milestone(s) in the project's development and implementation
September-2016	The Project Design Report was completed
15-November-2016	The Participatory Rural Appraisal (PRA) Report was completed
20-December-2016	The baseline biodiversity survey report was completed
27-December-2016	The Project Design was approved by Zhangye animal husbandry and Veterinary Bureau
25-July-2017	Started grass seeding and fence building (start date of project activity and crediting period)
September-2019	Completed reseeding and fence building

3-November-2020 to 7-December-2020 and 25-May-2021 to 20-June-2021	Biodiversity monitoring in winter and summer season respectively
16-September-2021 to1-October-2021	Filed monitoring and survey for climate and community impact
20-November -2021	Draft PD and PD summary finished
25-November-2021	Draft MR and MR summary finished

2.2.2 Methodology Deviations

Not applicable.

2.2.3 Minor Changes to Project Description (*Rules* 3.5.6)

Not applicable.

2.2.4 Project Description Deviations (*Rules* 3.5.7 – 3.5.10)

Not applicable.

2.2.5 Grouped Projects

Not applicable.

2.2.6 Risks to the Project (G1.10)

Table 2-2 The Project Risks Table

Identify Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed and designed to mitigate the risk	The actual risk during this monitoring period
Fire	The planting area is degraded grassland with low coverage; thus, the risk of fire is quite low in the early phase of the project. With the increase of grassland coverage, the risk of fire may increase, and the project owner will adopt the necessary measures for fire preventing.	According to the Chinese Grassland Law and Regulations on grassland fire prevention, the local government should carry out the construction of grassland fire prevention facilities, strengthen grassland fire observation during dry grass period to strictly prevent grassland fire. Once a fire disaster occurs, the local government should be responsible for relevant rescuing immediately.	During this monitoring period, no fire disaster occurred.

Rodents and pests	There could be rodents and pests that may damage the grassland, but the rodents and pests will be prevented by routine overseeing.	The biological methods are used to control rodents, such as building eagle's nest. The chemical pesticides are allowed to be used only if there is a serious pest problem erupted in the project area, and the pesticides will be used in accordance with the National Pesticides Policy. The project proponent is also experienced in local natural risk control and has established a Grassland monitoring technical manual for the project which includes specific instruction in rodents and pest prevention and control.	During this monitoring period, no rodents and pests disaster occurred.
Overgrazing	Overgrazing is the main factor leading to grassland degradation. It is possible that a few herdsmen do not obey sustainable management and overgrazing occurs	The local government guide herders to carry out sustainable grazing, which can slow down the degradation of grassland. Also, local forestry and grassland bureau vigorously promotes grassland protection, provides relevant training for herders, and raises herders' awareness of grassland protection.	During this monitoring period, no overgrazing occurred in the project area.
Frost	The project area is located in the North foot of Qilian Mountains, where the Grassland and forest are adjacent, so the frost disaster has little impact on the grassland.	Grass species planted in the project are native species, which can adapt to the local climate. In case of frost disaster, grass can grow smoothly in the second year.	During this monitoring period, frost disaster has no significant impact on grassland.

2.2.7 Benefit Permanence (G1.11)

To maintain and enhance the climate, community and biodiversity benefits, the project build grassland fences to achieve rotational grazing and rest grazing and carrying out sustainable grassland management. Meanwhile, the forage suitable for alpine region (*Elymus nutans, Elymus sibiricus, Poa pratensis, Agropyron cristatum, Festuca rubra, and Artemisia sphaerocephala*) were selected to be planted in the project. After the completion of the project, strictly implement the

Grassland Law Regulations on Grassland Fire Prevention and Gansu Grassland Regulations to formulate the basic grassland protection system, grass and livestock balance system.

At the same time, strictly implement the Measures for the Management of Network Fence of Grazing Returning Project, further implement the management and protection responsibilities of the degraded grassland and its fence facilities to townships, villages and households, sign management and protection responsibility letters at all levels, and clarify responsibilities and obligations. The grassland supervision department shall strengthen grassland law enforcement, and timely stop, investigate and deal with illegal acts such as unauthorized grazing, destruction of grassland vegetation and its fence facilities during the rest period.

According to Grassland Law of People's Republic of China, the ownership of grassland belongs to the state and the collectives. After the implementation of the project, Grassland Station of local Zhangye animal husbandry and Veterinary Bureau (before 2019) and Forestry and Grassland Bureau (after 2019) help with the sustainable grassland management, see Section 2.5.1 for detail. To make sure the successful development of the relevant carbon credits of the project, with support of Zhangye animal husbandry and Veterinary Bureau in early stage, the landowners all agreed with Zhangye Academy of Forestry Sciences as the project proponent and authorize they the rights of land usage and to take care of the maintenance and overall management of the grassland during the whole crediting period, including conducting baseline survey, signing consultant agreement for development of carbon credits.. The carbon revenue will be used to pay the salaries of the grassland guardians, which is conducive to the sustainable development of the project.

The Grassland Station of County Forestry and Grassland Bureau will be responsible for the implementation and management of the project during the project lifetime. And Zhangye Forestry and Grassland Bureau will take over of the responsibility beyond the project lifetime. The technicians from local forestry and grassland bureau will measure the grass yield regularly in the project area and guide the herders to graze reasonably. In addition, approximately 952 local herders were employed as grassland guardians to manage and protect the grassland under the guidance of the project proponent and the local forestry and grassland bureau through and beyond the project lifetime.

All of these could guarantee the long-term climate, community, and biodiversity benefits.

2.3 Stakeholder Engagement

2.3.1 Stakeholder Access to Project Documents (G3.1)

The full project documentation will be published on VCS and CCB website for public comments, as well as the project summary in Chinese version, and the local communities and other stakeholders can easily download from the website. The project owner noticed local stakeholders through the routine villager assembly regarding every milestone of the project development, including monitoring and listing.

Before starting the monitoring of this monitoring period, the project owner published the monitoring plan and monitoring manual on the local bulletin boards for the villages around the project area from 1-September-2020 to 15-September-2020 and invited local stakeholders to discuss them and give their advises.

2.3.2 Dissemination of Summary Project Documents (G3.1)

After the monitoring activities finished, the project proponent prepared a draft monitoring report along with a short version of MR summary in Chinese. Also, After the stakeholder meeting, the summary of monitoring results was disseminated to local communities by local forestry and grassland bureau and stakeholder representatives and the contact information of monitoring staff from project proponent has also been provided in case the local communities have any questions regarding the monitoring procedures and results.

2.3.3 Informational Meetings with Stakeholders (G3.1)

To ensure the continued effectiveness of the participation mechanisms, investigation team conducted a Participatory Rural Appraisal (PRA) in the 4 counties, a district and Shandan Racecourse where project located prior to project initiation (from 01-November-2016 to 15-November-2016), in order to obtain basic information, data and information of socio-economic situation on the project area and the surrounding, understand the major socio-economic and environmental issues from the stakeholders, collect their willingness to participate and take advantage of the demands of the proposed project activity and analysis the potential socio-economic and environmental impacts of the proposed project activity.

During the PRA survey, the project owner also held a stakeholder meeting in Forest operations in Zhangye Academy of Forestry Sciences on 01-November-2016 to collect the direct feedback and suggestions. During the meeting, questionnaires were distributed to attendees to collect their feedback.

For this monitoring period, the project owner will distribute questionnaires to stakeholders in each local villages to collect their feedback. Please refer to Section 2.3.7 for the detailed information regarding the results of questionnaires.

The project owner also reported the accomplished monitoring activities and draft monitoring results during this monitoring period, some of the representatives thought it was too complicated to calculate the emission removals which was time consuming and costly. The project owner explained the general concept of VCS and CCB standard regarding the requirement for monitoring and calculation in a simple and straightforward way, so that the representatives finally understood the importance of all the necessary procedures to guarantee the real and measurable benefits of the project.

2.3.4 Community Costs, Risks, and Benefits (G3.2)

During the PRA survey and stakeholder meeting in November 2016, project owner explained the potential costs, risks and benefits to relevant communities and stakeholders by using the Theory of Change and invited them to give their feedback.

Local Forestry and Grassland Bureau and project proponent are responsible to explain the potential costs, risks and benefits to relevant communities and stakeholders, then asked them to give their feedback and collected their willingness to participate. The analysis based on results chain is quite clear and understandable using a form as followed. According to the analysis, the community benefits of the project include income improvement, job creation, training opportunities and

capability establishment, and all the relevant communities are aware of the design concept of the project and have willingness to participate in the project.

Benefits	Costs and Risks	Mitigations
income improvement, job creation, training opportunities, capability establishment, higher ecological aesthetic value	The grazing frequency will be reduced, from annual grazing to semi-annual grazing or rest grazing for 90 days after reseeding or building fences	The local government issued subsidies to the herders in the project area who implemented the rest grazing and rotational grazing. County Forestry and Grassland Bureau measures the grass yield of the surrounding grasslands in the project area, and guides herders to graze in a reasonable area. Also, the project provides job opportunities for local herders, which will increase their income in long term

During this monitoring period, to mitigate the impact of project implementation on local herders, the project proponent and local County Forestry and Grassland Bureau measured the grass yield of the surrounding grasslands in the project area and guide herders to graze within the acceptable area, so the project will not reduce their grazing productivity. And the project will not affect herdsmen's grazing time and reduce herdsmen's grazing income.

During the project implementation, about 11,727 local herders (6,039 are women) participated in grass seeding and fence building, of which 952 local herders (493 are women) were employed as guardians. Grassland Guardian were paid around 24,000 RMB (3758.4USD) /year, higher than the per capita disposable income of all residents in Zhangye city (11,646 RMB (1827.26 USD) /year).What's more, the project proponent and local Forestry and Grassland Bureau explained that the project could restore their degraded grassland, and if they agreed to restore the degraded grassland and implemented grazing prohibition of project activities, they would receive corresponding subsidies, and they did not need to participate in the implementation and management of the grassland. According to the Implementation Plan of the new round of grassland ecological protection subsidy and reward policy (2016-2020) in Zhangye City, due to the sustainable management of grazing, herders in the project area can receive corresponding subsidies. The subsidy standards for project activities vary from county to county, ranging from 2.17 RMB/mu to 3.35 RMB/mu. And the restored grassland ecological landscape will increase local tourism income.

The community impacts have been monitored through interviews and questionnaires from 16-September-2021 to 1- October-2021, and the monitoring results showed there were net community benefits achieved from the implementation of the project just as anticipated. As stated in Section 2.3.7, after fully communicating with the representatives of stakeholder, 95% of them think the impact of the project activities on them has been mitigated and improve their family income.

2.3.5 Information to Stakeholder on Verification Process (G3.3)

The villager assembly is held once a year, all community group leaders participate in the village assembly, and the contents of the assembly will be conveyed to all community

members by the leaders. Therefore, the villager assembly is considered as the most appropriate means for sharing information with local communities. A contact person with phone numbers was published through villager assembly in case any stakeholders wish to participate in any activities related to the project.

The status and process of the project for CCB and VCS validation and verification were published through routine villager assembly and posted on local bulletin boards, also the mobile phone number of contact person of the project was provided to all the stakeholders so they can directly make a call in case they have any problem about the project.

2.3.6 Site Visit Information and Opportunities to Communicate with Auditor (G3.3)

The local stakeholders have been informed timely regarding the project process, especially when the auditor would take the site visit. And a week prior to the visit, the project staff will be informed relevant stakeholders in advance about the details of the audit process and arranged a half day for the auditor's interview with stakeholders so that the stakeholders have sufficient time to communicate with the auditor.

2.3.7 Stakeholder Consultation (G3.4)

As mentioned above, the stakeholder consultation includes PRA and meetings. During the PRA survey and stakeholder meeting prior to start of the project, the local stakeholders were asked to raise their opinions of the project design and their willingness to participate the following implementation, and all the stakeholders agreed with the project design and willing to participate the implementation and follow-up management of the project activity.

During this monitoring period, the project owner collects the comments and feedback regarding the following implementation of the project. The project staff-maintained communications with the community groups and other stakeholders through in-person meetings and made a questionnaire survey from 16-September-2021 to 1-October-2020 to directly collect relevant feedback. A total of 80 questionnaires were distributed to the representatives of the local stakeholders from local government and surrounding villages, and all 80 copies were collected with valid answers. As described in the PD, the "community stakeholders" that was made within the project has been divided into six groups: "Local residents around project area", "Village collectives", "Zhangye Forestry and Grassland Bureau", "County Forestry and Grassland Bureau", "Local government" and "Other stakeholders". The representatives participated in the questionnaire include these six different community groups, at least 3 representatives in each community group and the representatives covered different ages, different occupations and different education levels. The results were summarized as follows.

Table 2-3 The representatives' information

	number	80
Gender	Male	45.00%
	female	55.00%
Age	20--30	12.50%
	30--50	40.00%

	above 50	47.50%
Education	Junior high school and below	68.75%
	senior middle school	15.00%
	junior college education and above	16.25%

Table 2-4 The survey results

1. Whether to participate in this project activity?	Yes	93.75%
	No	6.25%
2. How does the project affect family income?	Increase income	95.00%
	No effect	1.25%
3. Does the project have an impact on local women's living standards and skills?	Improve living standards and skills	87.50%
	No effect	12.50%
4. Does the project activity affect your lifestyle?	Improved the knowledge and skills of sustainable grazing	86.25%
	No	13.75%
5. Has the project improved your relevant skills?	Yes	85.00%
	No	15.00%
6. What are your suggestions for this project?	Expand the project area	72.50%
	No suggestion	27.50%

The questionnaire survey results show that:

- Most stakeholders understand the benefits of the project, which can restore degraded grassland ecosystems and increased the grassland biodiversity. They also feel strongly that the project has improved the level of social activities.

- Local stakeholders think the project can 1) create employment opportunities; 2) increase biodiversity; 3) improve local environment.

- Most of the stakeholders have participated the implementation and follow-up management of the project activity, and they felt they have benefit from the project economically.

Along with the questionnaire survey, the stakeholders were informed that they will be invited to attend the second round stakeholder meeting during the site visit of the VVB for the verification, and the confirmed meeting date will be notified to them about one week prior to the meeting.

2.3.8 Continued Consultation and Adaptive Management (G3.4)

The Project Design Report was completed by Dahua Engineering Management (Group) Co., Ltd, the stakeholders have been consulted before the implementation of the project and they all agreed and supported the project. Through the consultation, most of the stakeholder were willing to participate the project in rodent control, grass seeding, grassland sustainable management and fire prevention, therefore the project provided all the job opportunities to local communities, including

temporary job (rodent control, grass reseeding, fence and shed building) and permanent job (grassland guardian).

Throughout the lifetime of the project, the project owner will visit village collectives, local forestry and grassland bureau, local government regularly. This will establish a commitment to communication and consultation to keep stakeholders informed of project activities including restoration, maintenance, monitoring and the CCB validation and verification process. In addition, the project staff in the field will maintain communications with local residents around project area including local women, local herders and grassland guardians through in-person stalking. And the project will actively listen to recommendations made by any identified community members, or other stakeholder groups, and adapt and improve methods as necessary.

The project has an adaptive management plan to effectively evolve as the project progresses, and systematically develop existing practices through project monitoring and evaluation. The project will periodically review plans, methods, goals and objectives, to incorporate new lessons learned, available technology, and scientific knowledge. These strategies will be in accordance with project's Standard Operating Procedures (SOPs) and monitoring plans.

In addition, to maximize the involvement of local residents, besides the job opportunities offered during project implementation, the local residents are also invited to conduct the field work in collecting soil samples and the questionnaire among local communities, local involvement in monitoring can empower communities by helping instill a greater sense of ownership of and responsibility for the community and biodiversity objectives of the project.

2.3.9 Stakeholder Consultation Channels (G3.5)

Local villagers directly impacted by the project were invited through their most convenient way: the routine villager assembly, in addition, a contact person with phone numbers was published through villager assembly in case any stakeholders wish to participate in any activities related to the project. Local policy makers and grassland experts were also invited by phone calls.

As mentioned before, the project staff from local forestry and grassland bureau maintained communications with the community groups and other stakeholders through in-person meetings and made a questionnaire survey from 16-September-2021 to 1-October-2021 to directly collect relevant feedback during this monitoring period.

2.3.10 Stakeholder Participation in Decision-Making and Implementation (G3.6)

In the project planning phase, stakeholders were fully involved in the land selection, planting pattern selection, etc., through villagers meeting and PRA methods. As mentioned above in Section 2.3.7, during this monitoring period, questionnaires have been collected from the representatives of the local stakeholders of local government and surrounding villages. Stakeholders from different age, gender and culture background has been prudently taken into account during the distribution of the questionnaires, and the feedbacks reflected in the interview and questionnaire has been seriously addressed immediately. Based on stakeholder consultation, all of the representatives of the stakeholders support the implementation of the project.

In the project planning phase, stakeholders were fully involved in the land selection, grass species selection, etc., through meeting and PRA methods. As mentioned above in Section 2.3.7, during this monitoring period, questionnaires have been collected from the representatives of the local stakeholders of local government and surrounding villages. Stakeholders from different age, gender and culture background has been prudently taken into account during the distribution of the questionnaires, and the feedbacks reflected in the interview and questionnaire has been seriously addressed immediately. Based on stakeholder consultation, all of the representatives of the stakeholders support the implementation of the project.

To enable the effective participation of all communities in a culturally appropriate and gender sensitive manner, the project proponent particularly encouraged the participation of women by maintaining the regular communications with women's Federation of local towns. During the project implementation, about 11,727 local herders (6,039 are women) participated in grass seeding and rodent control, of which 952 local herders (493 are women) were employed as guardians. As described in PD, there are 2.15% population of minorities, including Yughur, Hui, Tibetan, Manchu, Mongolian and Monguor, Yi Nationality.

And the project proponent plays as coordinator who is in-charge of the overall management. All the critical information regarding decision-making should be published to local stakeholders, and the decision should be revised according to further discussion in case there is any feedback from stakeholders.

When started the first monitoring activities, the project proponent invited some of the local residents to help conduct the field work with payment, such as soil sample collection and questionnaire survey collection. And a contact person with phone numbers was published through villager assembly in case any stakeholders wish to participate in the following monitoring or other activities related to the project.

According to the feedback received during this monitoring period, all of the representatives of stakeholders represented their satisfaction regarding the implementation of the project.

2.3.11 Anti-Discrimination Assurance (G3.7)

According to Labor Law of the People's Republic of China, it is illegal to discriminate on grounds of race, nation, sex or religion. The project owner will obey the Labor Law of the People's Republic of China and have established the anti-discrimination rules in the implementation of the project, including providing equal job opportunities for any qualified workers regardless their gender, race, nation or religion, no extra requirement for women or minorities, and equal pay for equal work, etc. All the rules have been emphasized during staff training sessions. And there is a grievance and redress procedure which has been described in section 2.3.12 and 2.3.13 of the MR, in case of any discrimination occurred, anyone could report to the project proponent follow the relevant procedure.

During the project implementation, about 11,727 local herders (6,039 are women) participated in grass seeding and rodent control, of which 952 local herders (493 are women) were employed as guardians. Besides, most of them coming from the poorest households.

No discrimination complaint received during this monitoring period.

2.3.12 Grievances (G3.8)

The project proponent has nominated a specific staff in charge of recording and collecting conflicts and grievances of local communities and individual residents. Grassland guardians in each project site will play an important role dealing with conflicts and grievances. All of the grassland guardians are coming from local communities whose name and contact number were published through villager assembly. In case of any conflicts and grievances, the stakeholders will contact the grassland guardian in the certain project site, and the grassland guardian will collect all the necessary information and then report to the specific staff. Also, the contact number of local forestry and grassland bureau has been publicized at the village assembly, all other stakeholders can easily give their feedback in case of any grievance.

Once a grievance case reported to the specific staff, the staff will contact the relevant stakeholders directly and discuss with them for an acceptable solution within one week; if the stakeholder's demand cannot be satisfied in a short time, the specific staff will contact with the head of the village where the stakeholders come from, who will play as a mediation to discuss with both sides together and seek for a further solution, which should be no more than 30 days; for more complicated case which cannot be settled by mediation, the project proponent shall report to local government, and follow the relevant legal procedure of arbitration or courts.

All the feedback and grievance received and the relevant solution shall be recorded and summarized in the project monitoring report in the next verification, and all the project documents has been published on Verra website and the website address to download all the summary project documents has been provided to communities through the public notice boards in each village.

No grievances received during this monitoring period.

2.3.13 Worker Training (G3.9)

There is a working manual provided for each employee which includes technical advice for their work, and all the workers were offered the technical training immediately once they were hired. Such skills and knowledge include are useful for grassland management, such as fire prevention, rodent control and grassland scientific grazing and protection method. These technical manuals will be distributed to each household in the local villages, including the villagers who haven't participated in the planting project. The members of local communities will be trained equally as long as they lived around the project area and willing to participate the training process, so that the local capacity won't be lost through staff turnover.

Besides the training on technical skills of seeding grass and grassland management, local workers will also be trained on relevant skills for their future livelihood, such as reasonable grazing. These skills will benefit the long-term development of the local communities who participate in the project. There were routine training courses arranged in October 2016 and May 2020 respectively during the implementation of the project by providing rodent control and seeding grass skills and experience for workers.

In addition, prior to the monitoring activities for this monitoring period, technical staff from project proponent and local forestry and grassland bureau also took a special training from 28-July-2021 to 31-July-2021 for the project monitoring by explaining the monitoring plan and measurement

method to local herders in Zhangye Forestry and Grassland Bureau. Some of the local herders were invited to offer support during monitoring activities from 16-September -2021 to 1- October-2021.

Figure2-3 Grassland monitoring technology training

2.3.14 Community Employment Opportunities (G3.10)

The project mobilized the whole community, including women, minority groups and least privileged group. All people from the communities have been given an equal opportunity to fill in the work positions if they meet the job requirements. Women and vulnerable people who come from the poorest local households will not only be provided with equal opportunities but also consciously ensure that they can be part of the project.

During the project implementation, about 11,727 local herders (6,039 are women) participated in grass seeding, fence building, rodent control and fire prevention, of which 11,727 local herders (6,039 are women) were employed as guardians. Besides, most of them coming from the poorest households. All the employees will be provided related skill training periodically. Grassland guardians are paid around 24,000 RMB (3758.4 USD) / year.

2.3.15 Relevant Laws and Regulations Related to Worker's Rights (G3.11)

The local people were under the protection of Labor Law of the People's Republic of China[16] and no forced labor is allowed, and they are free to establish and join any labor organizations as they wish. There was regular training provided to workers before they start the job, which will clearly indicate their rights and mechanism for grievance appeal, and the worker's rights are guaranteed in the labor contracts for each worker. The new employee training was in accordance with the Labor

[16] http://www.mohrss.gov.cn/SYrlzyhshbzb/zcfg/flfg/fl/201605/t20160509_239643.html

Law of People's Republic of China which guarantees the protection of employee's rights and benefits.

2.3.16 Occupational Safety Assessment (G3.12)

The project owner has referenced Labor Law of the People's Republic of China and adapted them to meet the local conditions to ensure workers' health and safety. The workers' health and safety policy, including items covering the health insurance scheme for workplace accidents and evacuation plans is made available for workers and implemented by the village committee.

The potential risks of the project mainly include risks such as fire, driving, and unexpected situations in the wild.

To minimize the potential risk, all the workers have been provided new staff training before they start to work. The training includes all necessary risk control measures during the work, as well as the health and safety policy mentioned before.

In 2019-2021, Zhangye Forestry and Grassland Bureau provided skill training for local herders, including fire emergency drills, field emergency rescue, and safe driving training to further ensure the safety of workers.

Figure 2-4 Grassland fire emergency drills training

2.4 Management Capacity

2.4.1 Required Technical Skills (G4.2)

The project requires technical skills of community engagement, biodiversity assessment and carbon measurement and monitoring in order to implement the project activities. Table below outlines the skills required per project activity.

Table 2-5 Key skills required to implement the project activities

Project Activity	Specific measures	Key Skills Required

Reseeding grass and fence building	Project community division, grass seed and sowing method selection, fence design	Construction capacity, Supplementary sowing techniques, GIS for site selection
Carbon stock measurements and monitoring	Soil carbon monitoring, land cover mapping, grazing monitoring, climate monitoring, biodiversity monitoring, community monitoring, and fire monitoring	Soil organic carbon and bulk density test, GIS/ remote sensing, grazing record, diesel and gasoline consumption records, rodent control and fire management
Community engagement and development	Stakeholder consultation, livelihood development, and education program	Community organizing, conflict resolution, business management, adult education, livelihoods and social science surveys
Biodiversity assessment and monitoring	Sustainable grassland management, biodiversity monitoring, endangered animals monitoring	Fence building, reseeding grass, rotational grazing, biodiversity survey, field investigation, Infrared camera technology, global positioning system (GPS) tracking technology

2.4.2 Management Team Experience (G4.2)

The project proponent Zhangye Academy of Forestry Sciences is in rich experience in sustainable grassland management in Zhangye city, including rodent control, grassland protection and management, technical training, carbon measurement and monitoring and biodiversity assessment.

As mentioned above, Zhangye City Forest Bureau and Gansu Heihe Electric Power Sales Co. Ltd will play as the expert group and to provide technical support for project implementation and purchasing the carbon credit and as working group who is in charge of guiding and coordinating the project's overall implementation and decision-making.

Local Forestry and Grassland Bureau is a local government agency who is in rich experience in community engagement and sustainable grassland management, including grass planting, sustainable grazing, rodent control and technical training.

Local government agency Zhangye Finance Bureau is in rich experience in project fund management.

2.4.3 Project Management Partnerships/Team Development (G4.2)

As mentioned above, the management team of the project is experience in grassland management and carbon project development.

The project proponent, Zhangye Academy of Forestry Sciences is experienced in sustainable grassland management, carbon measurement and monitoring and biodiversity assessment. The

management team of the project includes experts from Zhangye Forestry and Grassland Bureau and Gansu Heihe Electric Power Sales Co. Ltd who is experienced in development of carbon projects at the similar scale of this project and sustainable grassland management, community engagement.

Therefore, the project management team has sufficient experience and skills required by the project.

2.4.4 Financial Health of Implementing Organization(s) (G4.3)

Zhangye Forestry and Grassland Bureau and Zhangye City Finance Bureau are government agencies, financially supported by local government, which could guarantee the financial health over the project lifetime. In addition, Zhangye Academy of Forestry Sciences and Heihe Electric Power Sales Co. Ltd. are legally registered government-affiliated institutions and company in China. According to the public information listed in National Enterprise Credit Information Publicity System[17], the project participants don't involve in nor complicit in any form of corruption such as bribery, embezzlement, fraud, favouritism, cronyism, nepotism, extortion, and collusion.

2.4.5 Avoidance of Corruption and Other Unethical Behavior (G4.3)

As legally registered companies, the project proponent and other involved entities have the obligation to comply with relevant regulations, including anti-corruption law. The annual audit by the government makes sure that it operates with full compliance with China law and regulations. According to the "National enterprise credit information publicity system", none of them were involved in nor complicit in any form of corruption such as bribery, embezzlement, fraud, favoritism, cronyism, nepotism, extortion, and collusion.

2.4.6 Commercially Sensitive Information (*Rules* 3.5.13 – 3.5.14)

None of the project documents will be considered as commercially sensitive information, and all of the documentations are available to any stakeholders.

2.5 Legal Status and Property Rights

2.5.1 Recognition of Property Rights (G5.1)

As described in Section 2.2.7, according to the grassland use certificate, the land of each county (district) of our project is collectively owned by each village, and the grassland of Shandan Racecourse is owned by the state.. Considering the widely dispersed distribution of the project land, it is difficult for any of the landowner to raise enough right and fund and effectively maintain the implementation of the project during such a long period. Therefore, after seriously considered the carbon revenue and thought the revenue could help to mitigate the investment barrier, Zhangye animal husbandry and Veterinary Bureau has organized and managed the project implementation during the early phase and raise initial fund from Zhangye Finance Department for reseeding, fence building and maintenance expenses for the three years. At the same time, in order to develop carbon credits of the project, with support of Zhangye animal husbandry and Veterinary Bureau, the landowners all agreed with Zhangye Academy of Forestry Sciences as the project proponent

[17] http://www.gsxt.gov.cn/index.html

and authorize they the rights of land usage and to take care of the maintenance and overall management of the grassland during the whole crediting period, including conducting baseline survey, signing consultant agreement for development of carbon credits. Since the Zhangye animal husbandry and Veterinary Bureau Department has been dismissed in 2019 due to the reform of government function, and some functional departments related to grassland management have been transferred to Zhangye Forestry and Grassland Bureau.

Following which, in order to continue to get the support from Zhangye Forestry and Grass Bureau to ensure the implementation and management of the project, the project proponent Zhangye Academy of Forestry Sciences also got the approval of Zhangye Forestry and Grass Bureau and confirm the rights of land usage to take care of the maintenance and overall management of the grassland and get carbon credits of the project during the whole crediting period. The project proponent Zhangye Academy of Forestry Sciences is responsible for the research and development, introduction, test demonstration and promotion of new technologies, varieties and products for grassland and artificial grass planting in the city; Responsible for grassland resources investigation, technical training and grassland dynamic monitoring in the city, including rodent control, grassland protection and management, technical training, carbon measurement and monitoring and biodiversity assessment. In addition, the Project Proponent will also be responsible for development of the carbon credits and the carbon revenue will be used for sustainable development and management of the project activities.

Therefore, all property rights involved in the project are recognized, respected, and supported.

2.5.2 Free, Prior and Informed Consent (G5.2)

As described above, the Zhangye Academy of Forestry Sciences has been authorized the rights of lands and grassland management within the project boundary during the project crediting period, so the project will not encroach uninvited on private property, community property or government property.

To make sure all the stakeholders to be aware of the potential impact of the project on their life, an investigation team of the Grassland Station has conducted a Participatory Rural Appraisal (PRA) in the counties where project located in November 2016, in order to obtain basic information, data and information of socio-economic situation on the surrounding area, understand the major socioeconomic and environmental issues from the stakeholders, collect their willingness to participate and take advantage of the demands of the proposed project activity and analysis the potential socio-economic and environmental impacts of the proposed project activity.

Also, a stakeholder meeting was held during the PRA survey and questionnaires were distributed to attendees to collect their feedback. During the meeting, the project owner publicized the Project Design Report and informed stakeholders of the project's impact.

Some herders may be affected by the project, due to sustainable grazing patterns like the rotational and rest grazing. Rotational grazing requires that the grazing time shall be halved, and rest grazing requires that grazing shall not be carried out within 90 days in every year. To mitigate the impact of project implementation, the project proponent and the County Forestry and Grassland Bureau measures the grass yield of the surrounding grasslands in the project area in July and August every year, calculates the reasonable grazing quantity according to the carrying capacity standard of Gansu Province, and guides herders to graze within the acceptable area to make sure their grazing

productivity could be maintained. So, the project will not reduce the grazing productivity, instead of which, the sustainable grazing could improve the grazing productivity in a long term and the leakage emissions due to grazing displacement are calculated in section 3.2.3.

Through meeting interviews and questionnaire surveys, all stakeholders know the impact of the project and they though that the implementation of the project can restore degraded grasslands and increase grazing areas in long term, and the project provides job opportunities for local herders, which will increase their income. In addition, according to the Implementation Plan of the new round of grassland ecological protection subsidy and reward policy (2016-2020) in Zhangye City[18], due to the sustainable management of grazing like rotational grazing and rest grazing, herders in the project area can receive corresponding subsidies. The subsidy standards for project activities vary from county to county, ranging from 2.17 RMB/mu to 3.35 RMB/mu.

In conclusion, the project has received free, prior, and informed consent from relevant property rights holders prior to commencing with project activities.

2.5.3 Property Right Protection (G5.3)

Prior to the project implementation, the project area is mostly degraded grassland with no residents, and Zhangye Forestry and Grassland Bureau has confirmed the right of grassland management to the project proponent during the project crediting period. The County Forestry and Grassland Bureau measures the grass yield of the surrounding grasslands in the project area, and guides herders to graze in a reasonable area. In addition, due to the sustainable management like rest grazing and rotational grazing, herders in the project area can receive corresponding subsidies. Also, the project provides job opportunities for local herders, which will increase their income in long term.

Therefore, the project will not change the ownership of the project land, lead to involuntary removal or relocation of property rights holders from their lands or territories, and does no force rights holder to relocate activities important to their culture or livelihood.

2.5.4 Identification of Illegal Activity (G5.4)

Currently all project lands are defined as grassland by local government. According to Chinese grassland law, grassland vegetation should be strictly protected, mining and construction are prohibited. The project aims to restore degraded grassland, all the benefits are gained from legal activities. Therefore, the project's climate, community and biodiversity impacts will not be affected by the illegal activities. Therefore, the project's climate, community and biodiversity impacts will not be affected by the illegal activities.

2.5.5 Ongoing Disputes (G5.5)

The local residents lived by grazing, and there were not much other job opportunities offered, and most of the local women has no income. Zhangye City Forest Bureau confirmed Zhangye Academy of Forestry Sciences the rights of lands and grassland management within the project boundary during the project crediting period, thus there is neither ongoing or unresolved conflicts or disputes

[18] Official gazette of Zhangye Municipal People's Government

over rights to lands, territories and resources nor any disputes that were resolved and recorded during the last twenty years.

At the project start, some of the project lands are state-owned, rest of them are collective-owned, there is no unresolved conflicts or disputes over rights to lands, territories and resources and also any disputes that were resolved during the last twenty years. Before the project start, the local residents lived by grazing, and there were not much other job opportunities offered, and most of the local women has no income. As described above, the implementation of the project will improve grassland landscape, attract tourism resources and increase employment and income in long term. In addition, due to the control grazing like rotational grazing and rest grazing, herders in the project area can receive corresponding subsidies from government.

The healthy grassland ecosystem is an attractive landscape which could attract more tourists and promote the local economy. After the implementation of the project, local residents have more opportunities to work together or communicate with outsides, which is conducive to carrying forward traditional culture.

So, there is no ongoing or unresolved conflicts or disputes over rights to lands, territories and resources exist.

2.5.6 National and Local Laws (G5.6)

The project conforms to all kinds of regulations in the grassland field, as listed below:

PRC Constitution, PRC Grassland Law, PRC Wildlife Protection Law, Grassland Fire Prevention Regulations, Insect Control Regulation, PRC Production Safety Law, PRC Labour Law;

Parameters for degradation, sandification and salification of rangelands;

Technical regulation of reseeding on sandy grassland;

Technical Specification for Natural Grassland Improvement;

Technical Specification for Artificial Grassland Construction;

Technical Rule for Fences Construction of Rangeland;

According to the Inspection and Acceptance Report of the project, the project has complied with the above regulations and laws during construction period and will be under regular inspection by local government during the implementation period to ensure the continuous compliance.

3 CLIMATE

3.1 Monitoring GHG Emission Reductions and Removals

3.1.1 Data and Parameters Available at Validation

Data / Parameter	GWP_{N_20}

Data unit	t CO2e/t N2O
Description	Global-warming potential for N_2O
Source of data	VCS Standard (Version 4.1)
Value applied	265
Justification of choice of data or description of measurement methods and procedures applied	Default value
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Comments	N/A

Data / Parameter	EF_{Nfert}
Data unit	kg N_2O-N/kg N applied
Description	N_2O emission factor for synthetic N fertilizer use
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	0.01
Justification of choice of data or description of measurement methods and procedures applied	Default value
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Comments	N/A

Data / Parameter	$Frac_{Gas,F}$
Data unit	kg N volatilized/kg N applied
Description	Fraction of synthetic N fertilizer that volatilizes as NH_3 and NO_x
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	0.1

Justification of choice of data or description of measurement methods and procedures applied	Default value
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Comments	N/A

Data / Parameter	$EF_{4,SN}$
Data unit	kg N_2O-N/(kg NH_3-N + NO_x-N volatilized)
Description	N_2O emission factor for atmospheric deposition of synthetic N on soils and water surfaces
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	0.01
Justification of choice of data or description of measurement methods and procedures applied	Default value
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Comments	N/A

Data / Parameter	$EF_{4,MD}$
Data unit	kg N_2O-N/(kg NH_3-N + NO_x-N volatilized)
Description	N_2O emission factor for atmospheric deposition of urine and manure N on soils and water surfaces
Source of data	IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	0.01
Justification of choice of data or description of measurement methods and procedures applied	Default value
Purpose of data	Calculation of baseline emissions Calculation of project emissions

Comments	N/A

Data / Parameter	GWP_{CH_4}
Data unit	t CO2e/t N2O
Description	Global-warming potential for CH_4
Source of data	VCS Standard (Version 4.1)
Value applied	28
Justification of choice of data or description of measurement methods and procedures applied	Default value
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Comments	N/A

Data / Parameter	EF_t
Data unit	kg CH_4/ (head * year)
Description	Enteric CH_4 emission factor per head of livestock type l per year
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	Dairy cattle: 68 Cattle: 47 Sheep: 5
Justification of choice of data or description of measurement methods and procedures applied	Default value
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Comments	N/A

Data / Parameter	$EF_{3,PRP,CPP}$
Data unit	kg N_2O-N/kg N input

Description	N_2O emission factor for cattle (dairy, non-dairy and buffalo), poultry and pigs manure and urine deposited on of applied to grassland
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	0.02
Justification of choice of data or description of measurement methods and procedures applied	Default value
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Comments	N/A

Data / Parameter	$EF_{3,PRP,SD}$
Data unit	kg N_2O-N/kg N input
Description	N_2O emission factor for sheep and other animals' manure and urine deposited on of applied to grassland
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	0.01
Justification of choice of data or description of measurement methods and procedures applied	Default value
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Comments	N/A

Data / Parameter	Nex_t
Data unit	kg N deposited/(t livestock mass * day)
Description	Nitrogen excretion of livestock type l
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	Dairy Cattle: 0.47 Cattle: 0.34 Sheep: 1.17

Justification of choice of data or description of measurement methods and procedures applied	Default value
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Comments	N/A

Data / Parameter	$W_{l,b}$
Data unit	kg
Description	Average weight of livestock l, in baseline year b
Source of data	Local expert judgment.
Value applied	Cattle: 300 Sheep: 45
Justification of choice of data or description of measurement methods and procedures applied	PRA Report, data from local expert judgement that are specific to the project area.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Comments	N/A

Data / Parameter	$Days_{l,b}$
Data unit	Days
Description	Grazing days for livestock type l in baseline year b
Source of data	Survey of Grazing Displacement and Relocation Plans
Value applied	Baseline scenario:138 Project scenario:69
Justification of choice of data or description of measurement methods and procedures applied	According to the Survey of Grazing Displacement, the average grazing days of herdsmen under the baseline scenario are counted. According to the rotational grazing management mode, under the project scenario, the grazing days of herders are expected to be reduced by half. From 1-May-2016 to 19-June-2017, the survey was conducted by

	the project proponent and the Zhangye animal husbandry and Veterinary Bureau completed the Grazing Displacement Management Plan.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Comments	N/A

Data / Parameter	$H_{l,b}$
Data unit	Hours
Description	Average grazing hours for livestock type l per day during the grazing season in baseline year b
Source of data	Survey of Grazing Displacement and Relocation Plans
Value applied	8
Justification of choice of data or description of measurement methods and procedures applied	According to the Survey of Grazing Displacement, the average grazing hours of herdsmen under the baseline scenario are counted.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Comments	N/A

Data / Parameter	$Frac_{GAS,MD}$
Data unit	kg N volatilized/kg of N deposited
Description	Fraction of volatilization from manure and urine deposited by grazing animals as NH_3 and NO_x
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	Dairy Cow: 30% Cattle: 45% Sheep/goats: 12%
Justification of choice of data or description of measurement methods and procedures applied	Default value
Purpose of data	Calculation of baseline emissions Calculation of project emissions

Comments	N/A

Data / Parameter	$EF_{l,M}$
Data unit	kg CH_4/ (head * year)
Description	CH_4 emission factor from manure of livestock type l
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	Dairy Cows: 9 Other cattle: 1 Sheep:0.10 Goats: 0.11
Justification of choice of data or description of measurement methods and procedures applied	Default value
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Comments	N/A

Data / Parameter	$EF_{CO_2,k}$
Data unit	t CO_2/GJ
Description	CO_2 emission factor by fuel type k
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	Gasoline: 0.0693 Diesel: 0.0741
Justification of choice of data or description of measurement methods and procedures applied	Default value
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Comments	N/A

Data / Parameter	NCV_K
Data unit	GJ/t fuel
Description	Thermal value of fuel type k
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	Gasoline: 44.3

	Diesel: 43.0
Justification of choice of data or description of measurement methods and procedures applied	Default value
Purpose of data	Calculation of project emissions
Comments	N/A

Data / Parameter	$SOC_{S,Baseline}$
Data unit	t C/ha l
Description	Baseline SOC stock in the top 30 cm of soil layer (or greater depth if required) in stratum s
Source of data	Laboratory test data
Value applied	Please refer ER calculation sheets for details.
Justification of choice of data or description of measurement methods and procedures applied	Option 2 was applied to estimate project removals due to changes in SOC, and the procedures of Section 8.2.8 in VM0026 were follow. The $SOC_{S,Baseline}$ was tested in 2016, which less than two years prior to the project start time. From September 16 to October 28, 2016, the organic carbon, bulk density and sand-gravel ratio (percentage of rocks larger than 2mm, roots, and other dead residues with a diameter in the top 30 cm of soil) of 117 soil samples were measured by Shandong Huasheng Tiantong Standard Technical Service Co., Ltd., which was registered in Jinan City, Shandong Province in 27-August-2015. Soil sampling followed General Guidelines for Sampling and Surveys for Small-Scale CDM Project Activities. The nationally approved standard Method for Determination of Soil Organic Matter (NY/T 1121.6-2006) was used to measure SOC of the soil samples.
Purpose of data	Calculation of baseline emissions
Comments	N/A

Data / Parameter	$DMI_{day,l}$
Data unit	kg dm/(head*day)
Description	Daily dry matter intake requirement of each type of livestock l
Source of data	National standards

	The notice on standardizing and unifying the statistics of grassland carrying capacity data, which was issued by the Qinghai Provincial Department of Agriculture and Animal Husbandry
Value applied	Sheep: 1.38 Cattle: 5.52
Justification of choice of data or description of measurement methods and procedures applied	Default value
Purpose of data	Calculation of leakage emissions
Comments	N/A

Data / Parameter	$ANPP_{GUI,REF}$
Data unit	t dm/ha
Description	Aboveground net primary productivity in the reference region that is the likely location of unidentified grasslands to which livestock are relocated
Source of data	Peer-reviewed studies Wang jie.(2017) The Relationship between Biodiversity and Aboveground Biomass with Soil Properties in North Slope of Qilian Mountains Meadow Steppe. (Master's thesis, Northwest Normal University) https://kns.cnki.net/KCMS/detail/detail.aspx?dbname=CMFD201901&filename=1017199627.nh
Value applied	1.38
Justification of choice of data or description of measurement methods and procedures applied	Values come from published studies in the project region.
Purpose of data	Calculation of leakage emissions
Comments	N/A

Data / Parameter	$H_{GUI,l,t}$
Data unit	Hours
Description	Average grazing hours per day during grazing season for livestock of each type l displaced to unidentified grassland in year t
Source of data	A full census survey conducted by the project proponent and county forestry and grassland bureau.

Value applied	8
Justification of choice of data or description of measurement methods and procedures applied	Average value come from a full census survey.
Purpose of data	Calculation of leakage emissions
Comments	N/A

3.1.2 Data and Parameters Monitored

Data / Parameter	$P_{l,t}$
Data unit	Head
Description	Population of livestock type l under project in year t
Source of data	Project records
Description of measurement methods and procedures to be applied	The project proponent and the County Forestry and Grassland Bureau visit all the project participants every year to investigate the situation of the project.
Frequency of monitoring/recording	Annually
Value applied	The ex-ante value comes from Grazing Displacement Management Plan. Please refer ER calculation sheets for details.
Monitoring equipment	N/A
QA/QC procedures to be applied	Guidance provided in IPCC, 2003 chapter 5 or IPCC, 2000 chapter 8 is applied
Purpose of data	Calculation of project emissions
Calculation method	N/A
Comments	N/A

Data / Parameter	$H_{l,t}$
Data unit	Hours
Description	Average grazing hours per day of livestock type l during grazing season in year t
Source of data	Project records
Description of measurement methods and procedures to be applied	The project proponent and the County Forestry and Grassland Bureau visit all the project participants every year to investigate the situation of the project.
Frequency of monitoring/recording	Annually
Value applied	The ex-ante value comes from Grazing Displacement Management Plan. Please refer ER calculation sheets for details.
Monitoring equipment	N/A
QA/QC procedures to be applied	Guidance provided in IPCC, 2003 chapter 5 or IPCC, 2000 chapter 8 is applied
Purpose of data	Calculation of project emissions
Calculation method	N/A
Comments	N/A

Data / Parameter	$Days_{l,t}$
Data unit	Days
Description	Grazing days of lives tock l in year t under project
Source of data	Project records

Description of measurement methods and procedures to be applied	The project proponent and the County Forestry and Grassland Bureau visit all the project participants every year to investigate the situation of the project.
Frequency of monitoring/recording	Annually
Value applied	The ex-ante value comes from Grazing Displacement Management Plan. Please refer ER calculation sheets for details.
Monitoring equipment	N/A
QA/QC procedures to be applied	Crosscheck with previous records and reconduct the survey if there is a significant change observed
Purpose of data	Calculation of project emissions
Calculation method	N/A
Comments	N/A

Data / Parameter	$FC_{p,j,k,t}$
Data unit	Kg fuel
Description	Fuel consumption by type k, machine type j, parcel grassland p, in year t under project
Source of data	Project records
Description of measurement methods and procedures to be applied	The project proponent recorded the fuel consumption.
Frequency of monitoring/recording	Record fuel consumption just after the application of machine.
Value applied	The ex-ante value comes from Project Design Report. According to Project Design Report, each 10,000 mu fence will consume 0.008 tons of diesel oil and each shed will consume 0.058 million kwh of electricity. Combined with the standard conversion coefficient at that time, it will be uniformly converted

	into tons of diesel oil for the calculation of energy consumption and emission of the project. Please refer ER calculation sheets for details.
Monitoring equipment	N/A
QA/QC procedures to be applied	Guidance provided in IPCC, 2003 chapter 5 or IPCC, 2000 chapter 8 is applied
Purpose of data	Calculation of project emissions
Calculation method	N/A
Comments	N/A

Data / Parameter	$PA_{mG,s,i,t}$
Data unit	ha
Description	Project areas of grassland with management practice mG in stratum s in year t
Source of data	Project records
Description of measurement methods and procedures to be applied	Record the area of grassland with management practice mG in stratum s.
Frequency of monitoring/recording	Record the area and management practice just after the management practice has taken place and report annually
Value applied	The ex-ante value comes from Project Design Report. Please refer ER calculation sheets for details.
Monitoring equipment	N/A
QA/QC procedures to be applied	Crosscheck with previous records and satellite images
Purpose of data	Calculation of project emissions

Calculation method	N/A
Comments	N/A

Data / Parameter	$SOC_{mG,s,i,t}$
Data unit	g C/kg soil
Description	SOC stock in the top 30 cm of soil (or greater depth if required) for management practice mG, stratum s (or greater depth if desired), sampling site i
Source of data	Project records
Description of measurement methods and procedures to be applied	Handling, storage, processing, measurement, and quality control of soil samples must follow scientifically established procedures such as the procedures described in Carter and Gregoroch, 2006, OECD, 1998, or nationally approved standards. Soil sampling based on the nationally-approved standard Soil Quality Guidelines for Soil Sampling Techniques (GB/T 361972018). The SOC measurement based on the nationally-approved standard Method for Determination of Soil Organic Matter (NY/T 1121.6-2006) was used to.
Frequency of monitoring/recording	At least once every five years, at the end of growing season in the year measured, until the end of the project crediting period.
Value applied	For ex-ante calculation, the $SOC_{mG,s,i,t}$ were measured by Shandong Huasheng Tiantong Standard Technical Service Co., Ltd., which was registered in Jinan City, Shandong Province in 27-August 2015. And the growth rate of SOC is 1.02%, which comes from previous study. Zhou Xiaoyan. (2019). Impacts of different restoration years of returning grazing land to grassland on community characteristics and soil nutrients of alpine grassland in Maqu County (Master's thesis, Northwest Normal University). Please refer ER calculation sheets for details.
Monitoring equipment	Soil sample, electric furnace, test tube, oil bath pot, wire cage and dropper.
QA/QC procedures to be applied	The collection of soil samples for measuring SOC will be carried by suitably trained staff. The measurement of SOC will be carried out by a laboratory that can demonstrate adherence to the principles of good laboratory practices, outlined in OECD (1998).

Purpose of data	Calculation of project emissions
Calculation method	N/A
Comments	N/A

Data / Parameter	$BD_{mG,s,i,t}$
Data unit	g soil/cm^3
Description	Soil bulk density in the top 30 cm of soil (or greater depth if required) for management practice mG , stratum s (or greater depth if desired), sampling site i
Source of data	Project records
Description of measurement methods and procedures to be applied	Handling, storage, processing, measurement, and quality control of soil samples must follow scientifically established procedures such as the procedures described in Carter and Gregoroch, 2006, OECD, 1998, or nationally approved standards. Soil sampling based on the nationally-approved standard Soil Quality Guidelines for Soil Sampling Techniques (GB/T 361972018). The $BD_{mG,s,i,t}$ measurement based on the nationally approved standard Method for Determination of soil bulk density (NY/T 1121.4-2006).
Frequency of monitoring/recording	At least once every five years, at the end of growing season in the year measured, until the end of the project crediting period.
Value applied	For ex ante calculation, the $BD_{mG,s,i,t}$ were measured by Shandong Huasheng Tiantong Standard Technical Service Co., Ltd., which was registered in Jinan City, Shandong Province in 27-August 2015. Please refer ER calculation sheets for details.
Monitoring equipment	Ring knife, electronic scale, rubber hammer, oven and dryer.
QA/QC procedures to be applied	The collection of soil samples for measuring soil bulk density will be carried by suitably trained staff. The measurement of soil bulk density will be carried out by a laboratory that can demonstrate adherence to the principles of good laboratory practices, outlined in OECD (1998).

Purpose of data	Calculation of project emissions
Calculation method	N/A
Comments	N/A

Data / Parameter	$FC_{mG,s,i,t}$
Data unit	percent
Description	Percentage of rocks with a diameter larger than 2mm, roots, and other dead residues in the top 30 cm of soil (or greater depth if desired), for management practice mG, stratum s, sampling site i
Source of data	Project records
Description of measurement methods and procedures to be applied	Handling, storage, processing, measurement, and quality control of soil samples must follow scientifically established procedures such as the procedures described in Carter and Gregoroch, 2006, OECD, 1998, or nationally approved standards. Soil sampling based on the nationally-approved standard Soil Quality Guidelines for Soil Sampling Techniques (GB/T 361972018). There is no nationally recognized standard for measuring soil $FC_{mG,s,i,t}$, so previous research standard are used. Xie yingge, Li xia. Research progress on determination methods of gravel content in soil[J]. Soils, 2012,44(1):17-22.
Frequency of monitoring/recording	At least once every five years, at the end of growing season in the year measured, until the end of the project crediting period.
Value applied	For ex ante calculation, the $FC_{mG,s,i,t}$ were measured by Shandong Huasheng Tiantong Standard Technical Service Co., Ltd., which was registered in Jinan City, Shandong Province in 27-August 2015. Please refer ER calculation sheets for details.
Monitoring equipment	Ring knife, electronic scale and sieve.
QA/QC procedures to be applied	The collection of soil samples for measuring $FC_{mG,s,i,t}$ will be carried by suitably trained staff. The measurement of soil bulk density will be carried out by a laboratory that can demonstrate

	adherence to the principles of good laboratory practices, outlined in OECD (1998).
Purpose of data	Calculation of project emissions
Calculation method	N/A
Comments	N/A

Data / Parameter	$FC_{mG,s,i,t}$
Data unit	percent
Description	Percentage of rocks with a diameter larger than 2mm, roots, and other dead residues in the top 30 cm of soil (or greater depth if desired), for management practice mG, stratum s, sampling site i
Source of data	Project records
Description of measurement methods and procedures to be applied	Handling, storage, processing, measurement, and quality control of soil samples must follow scientifically established procedures such as the procedures described in Carter and Gregoroch, 2006, OECD, 1998, or nationally approved standards. Soil sampling based on the nationally-approved standard Soil Quality Guidelines for Soil Sampling Techniques (GB/T 361972018). There is no nationally recognized standard for measuring soil $FC_{mG,s,i,t}$, so previous research standard are used. Xie yingge, Li xia. Research progress on determination methods of gravel content in soil[J]. Soils, 2012,44(1):17-22.
Frequency of monitoring/recording	At least once every five years, at the end of growing season in the year measured, until the end of the project crediting period.
Value applied	For ex ante calculation, the $FC_{mG,s,i,t}$ were measured by Shandong Huasheng Tiantong Standard Technical Service Co., Ltd., which was registered in Jinan City, Shandong Province in 27-August 2015. Please refer ER calculation sheets for details.
Monitoring equipment	Ring knife, electronic scale and sieve.

QA/QC procedures to be applied	The collection of soil samples for measuring $FC_{mG,s,i,t}$ will be carried by suitably trained staff. The measurement of soil bulk density will be carried out by a laboratory that can demonstrate adherence to the principles of good laboratory practices, outlined in OECD (1998).
Purpose of data	Calculation of project emissions
Calculation method	N/A
Comments	N/A

Data / Parameter	$Depth$
Data unit	cm
Description	Total soil depth, for calculating grassland SOC stock in the top 30 cm of soil (or greater depth if required)
Source of data	Project records
Description of measurement methods and procedures to be applied	Collect soil samples with soil drill with 30cm scale.
Frequency of monitoring/recording	Recorded with each measurement taken
Value applied	Due to full depth of affected soil layers is not known, a minimum depth of 30 cm was applied.
Monitoring equipment	Soil drill with scale.
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of project emissions
Calculation method	N/A
Comments	N/A

Data / Parameter	$P_{GUI,l,t}$
Data unit	Head
Description	Total population of livestock of each type relocated to unidentified grasslands in year t
Source of data	Full census survey
Description of measurement methods and procedures to be applied	A full census survey conducted by the project proponent and county forestry and grassland bureau.
Frequency of monitoring/recording	Annually
Value applied	Please refer ER calculation sheets for details.
Monitoring equipment	N/A
QA/QC procedures to be applied	Guidance provided in IPCC, 2003 chapter 5 or IPCC, 2000 chapter 8 is applied
Purpose of data	Calculation of project leakage
Calculation method	N/A
Comments	N/A

Data / Parameter	$Days_{GUI,l,t}$
Data unit	days
Description	Days that the population of each type of relocated livestock of type l graze in unidentified grassland in year t
Source of data	Full census survey
Description of measurement methods and procedures to be applied	A full census survey conducted by the project proponent and county forestry and grassland bureau.
Frequency of monitoring/recording	Annually

Value applied	10
Monitoring equipment	N/A
QA/QC procedures to be applied	Guidance provided in IPCC, 2003 chapter 5 or IPCC, 2000 chapter 8 is applied
Purpose of data	Calculation of project leakage
Calculation method	N/A
Comments	N/A

3.1.3 Monitoring Plan

1. Operation and management structure

The project proponent hired local herders and communities (monitoring group and auditing group) for daily supervision and data management during the project implementation while office manager oversee the whole working group. A monitoring group has been established by Zhangye Academy of Forestry Sciences to carry out the monitoring work. The structure of the monitoring group is as follows:

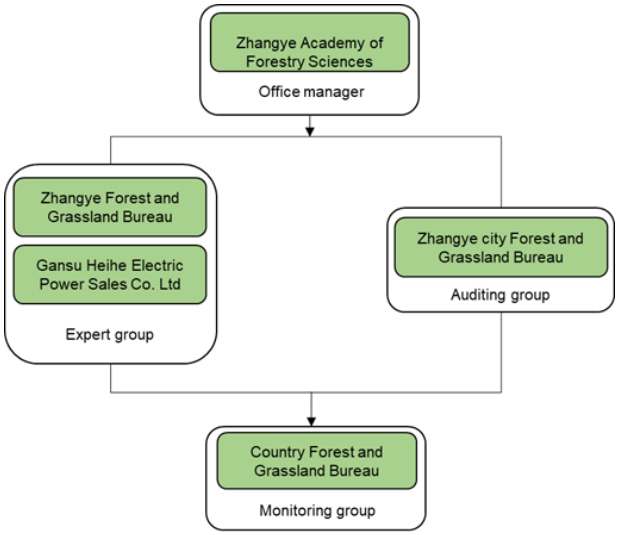

Figure 3-1 Organization structure of the monitoring team

The responsibilities of each role in the team structure are:

- Office manager has the overall management responsibility, especially supervising the implementation of the monitoring plan, and assigning each member of the monitoring team their individual responsibility during the monitoring.

- Expert group provides professional technique related to monitoring activities to make sure all the monitoring activities meet the requirement of VCS and CCB standards.

- Monitoring group conducts the following monitoring process, measures the required parameters of the project as listed in the above Section 3.3.2 particularly, and collects all the original evidence and data and make relevant records.

- Auditing staff performs internal verification of the measurement, reviews all the monitoring records and documents, crosschecks evidence and calculates emission removals during each verification period.

A Monitoring Manual was provided to each member of the monitoring team with a specific explanation to make sure they fully understand all the monitoring process and issues concerned.

For this monitoring period, the monitoring task was assigned on 25-June-2021, and the monitoring team started the field work from 16-September-2021 to 1-October-2021.

2. Monitoring process

1) Monitor the applicability conditions listed in methodology

The methodology VM0026/Version 1.1 “Sustainable Grassland Management” is applicable under the following conditions:

- The project area is grassland at the start of the project. The project area is land that is degraded at the start of the project and degradation will continue in the baseline scenario on the basis that degradation drivers or pressures are still present in the baseline scenario. The procedures outlined the latest version of the CDM Tool for Identification of Degraded or Degrading Lands for Consideration in Implementing CDM A/R Project Activities must be used to determine both that the land is degraded at the start of the project and that in the baseline scenario the land will continue to degrade.

- The project area is grassland at the start of the project. The project area is land that is degraded at the start of the project and degradation will continue in the baseline scenario on the basis that degradation drivers or pressures are still present in the baseline scenario. The procedures outlined the latest version of the CDM Tool for Identification of Degraded or Degrading Lands for Consideration in Implementing CDM A/R Project Activities must be used to determine both that the land is degraded at the start of the project and that in the baseline scenario the land will continue to degrade.

- The project area is subject to livestock grazing, burning, and/or nitrogen fertilization in the baseline scenario.

- In the baseline scenario, more than 95 percent of animal dung from grazing animals deposited on grassland is allowed to lie as is, and is not managed, and in the project scenario no more than 5 percent of the animal dung from grazing animals within the project area is managed with alternative manure management systems.

According to the Project Description, all the conditions are applicable at the start of the project activity due to the baseline survey. During the following verification, the project proponent should monitor the possible change of the project boundary, if there is a change to the project boundary, the applicability conditions should be re-assessed for the changed project area.

Step 1: Monitoring of boundary

The coordinate of the project boundary should be measured and managed strictly in accordance with regulations and saved in GIS files. Boundary information such as original records, needs to store in both electronic and printed archive in the project owner, and participants should keep a backup. Files need to be saved at least two years after the end of the crediting period.

In order to obtain valid and reliable boundary information, monitoring team need to use the GPS or other verifiable methods to verify the project boundary. Determine the actual boundaries of afforestation. If the actual boundary is larger than the boundary in the project design, the excess section is not included in project boundary; instead, if the actual border boundary is smaller than the boundary in the project design, project boundary should be based on the actual boundary. Any change in the boundary must be located by GPS or appropriate spatial data (eg satellite imagery).

Step 2: Monitor the applicability conditions

- Collect documented evidence to prove that the project area is grassland at the start of the project, which has been classified as “degraded”, such as local, regional, national or international land classification system or peer-review study, participatory rural appraisal, satellite imagery and/or photographic evidence in the last 10 years.

- Through documented evidence collection, questionnaire surveys and interviews proved that the project area is subject to livestock grazing, burning, and/or nitrogen fertilization in the baseline scenario.

- Through questionnaire surveys and interviews confirmed that animal manure treatment both in baseline scenario and project scenario.

Step 3: Go through applicability checklist

If there is any change in the boundary happened, the monitoring team will go through a specific checklist of the applicability conditions, records all relevant results for each monitoring period.

In case any non-conformance of the applicability conditions, the expert group should evaluate the situation and submit the deviation or change to the methodology to Verra for approval.

During this monitoring period, there is no change of the project boundary, nor any non-conformance of the applicability conditions occurred.

2) Monitoring of Project Implementation

A record of the grazing agents (eg, herder households) involved the project.

- The project proponent and County Forestry and Grassland Bureau recorded each household involved in the sustainable grassland management project. Including the current situation of Grassland: area, type, grassland degradation area and degree, existing livestock species and quantity.

- Each household was given a unique ID. Their name, location of their land, and date of entering into the agreement and leaving the agreement was recorded.

A record of the geographic location of the project area for all areas of grassland.

- The geodetic coordinates of the project area (and any stratification inside the area) were established, recorded and archived. This was achieved by field survey (eg, using GPS) and by using geo-referenced spatial data (eg, maps, GIS datasets).

A record of grassland management

- The grassland management plan, together with a record of the plan as actually implemented during the project crediting period were available for validation and verification.

- Subsidies received by each household in the project area due to sustainable management measures.

During this monitoring period 183171.21 ha of degraded grassland in Zhangye were managed by rotational and rest grazing, 77888.59 ha of degraded grassland in Zhangye were planted with *Elymus nutans, Elymus sibiricus, Poa pratensis, Agropyron cristatum, Festuca rubra, Artemisia sphaerocephala*, and grazing is control like rotational grazing and rest grazing, and then controlled grazing will be allowed in alternative grazing area depending on the growth situation of the forage. In addition, 11,727 local herders (6,039 are women) were employed as guardians to patrol the project area to prevent fires, rodents and insects.

3) Recording of Data and Parameters Monitored

According to PD, for the estimate of annual emissions from the use of synthetic fertilizers, the following parameters were recorded at each application during the monitoring period:

• Mass and type of synthetic N fertilizer applied;

• Nitrogen content of synthetic N fertilizer applied.

For the estimate of annual CH_4 emissions from enteric fermentation, population of livestock type l and grazing days of livestock type l were recorded annually during the monitoring period.

For the estimate of annual CH_4 and N_2O emissions from manure deposition during grazing, grazing days of livestock of type l, and average grazing hours per day of livestock type l during the grazing season were recorded in every grazing season, in each year during the monitoring period.

For the estimate of annual CO_2 emissions due to the use of fossil fuels for SGM, the following parameters must be recorded at each time a management practice using machines is adopted and reported annually during the monitoring period:

• Quantity of fuel consumption;

• Fuel type;

• Machine type.

According to the project design report, no fertilizer will be applied in the subsequent management of the project. During the first monitoring period, no fertilizer was applied in the project area

Table 3-1 Parameters fossil fuel

Parameters	Measurement method	Value	Unit
Quantity of fuel consumption (diesel)	The project proponent and County Forestry and Grassland Bureau recorded the fuel consumption.	Truck:2925 Tractor: 57,548 See ER calculation sheets for detail.	kg

To estimate project removals due to changes in SOC, the following parameters were monitored during the monitoring period. The soil sampling, handling and storage, processing and measurement, and quality control procedures implemented in soil organic carbon analysis that follow a scientific peer-reviewed approved standard.

• SOC content;

• Soil bulk density;

• Percentage of rocks with a diameter larger than 2mm, roots and other dead residues;

• Carbonate content.

As mentioned in Section 3.2.2, the project uses direct measurement approach (Option 2) to determine the project removals due to changes in SOC, and the sampling procedures were designed such that the statistical significance of soil carbon stock changes between the baseline carbon stock and the carbon stock in time t can be determined with a 95 percent confidence interval. The Guidelines for sampling and surveys for CDM project activities and programmes of activities was followed to determine the sampling procedure and sample size.

For the estimate of leakage emissions, the monitoring parameters required in the VCS modules VMD0040 Estimation of Leakage Emissions from Displacement of Grazing Activity due to Implementation of Sustainable Grassland Management Activities must be recorded annually during the project crediting period.

4) Sampling Design and Stratification

According to PD, the project removals due to changes in SOC will be determined by direct measurement approach (Option 2) by using soil sampling procedures according to nationally approved standard (HJ/T 166-2004).

Due to the heterogeneity of soil carbon, stratification of the project area into relatively homogeneous units can either increase the measuring precision without increasing the cost unduly or reduce the cost without reducing measuring precision because of the lower variance within each homogeneous unit.

According to the methodology (VM0026/Version 1.1), four main requirements was met before the stratified sampling is chosen:

- Population must be stratified in advance of the sampling.

The project area was stratified before sampling.

- Classes must be exhaustive and mutually exclusive (ie, all elements of the population must fall into exactly one class).

For the project, classes were determined by each county within project boundary and the two different soil texture (see Table 3-4 for details), which are exhaustive and mutually exclusive, and all elements of the population fell into exactly one class.

- Classes must differ in the attribute or property under study, otherwise there is no gain in precision over simple random sampling.

Firstly, because our project has different management practice, such as reseeding grass, rest grazing and rotational grazing. In area of rotational grazing, the grasslands are divided into seasonal grazing land, and then the seasonal grazing land is divided into several small areas by the livestock carrying capacity of the grassland. Then based on specified grazing order, grazing cycle and zoning grazing time, the grassland is grazed area by area and used in turn. Rest grazing means seasonal grazing banning. During the spring rejuvenation period, the plot is required rest grazing for 45-90 days according to the average growth rate of plants (>10kg/ha) and aboveground dry matter accumulation(100kg/ha). In area of reseeding grass, *Elymus nutans*, *Elymus sibiricus*, *Poa pratensis*, *Agropyron cristatum*, *Festuca rubra*, *Artemisia sphaerocephala* were reseeded on the degraded grassland in project area. Therefore, different measures will benefit grassland in different aspect.

Secondly, the grazing situation in the project area of each county is basically the same, but the climate of each county is different, which has a certain impact on the accumulation of soil carbon. Thirdly, different soil textures have a significant impact on soil carbon accumulation, such as, sandy soil has poor water and fertility retention, clay soil has strong water and fertility retention, and loam has moderate water and fertility retention. For the project, based on the county and soil texture, the project ex ante strata are listed in the following table.

- Selection of items to represent each class (ie, the sample drawn from each class) must be random.

The locations of sample sites were set by systematic sampling with a random start. For each strata, using GIS to set a random start plots, and then set the constraint boundary for the rest plots (within the range of the certain strata and the horizontal and vertical distances from the boundary should be no less than 30m).

The ex-post stratification must be updated due to the following reasons:

- Unexpected disturbances occurring during the project crediting period (eg, due to fire, pests or disease outbreaks), affecting differently various parts of an originally homogeneous stratum;

- Grassland management activities (planting) may be implemented in a way that affects the existing stratification.

During this monitoring period, grassland management activities (planting) may be implemented in a way that affects the existing stratification. So, the carbon stratification of the project has be updated by the special measures of grassland management activities.

Table 3-2 Post-stratification during this monitoring period

Strata	Area(ha)	Grassland type	Management practice	Soil texture
Strata-1	52009.90	Desertification Grassland	Rest grazing	Sandy
Strata-2	26892.34	Desertification Grassland	Rest grazing	Sandy loam
Strata-3	7443.17	Desertification Grassland	Reseeding grass	Sandy
Strata-4	7803.22	Desertification Grassland	Reseeding grass	Sandy loam
Strata-5	3374.91	Desertification Grassland	Rotational grazing	Sandy
Strata-6	4383.18	Desertification Grassland	Rotational grazing	Sandy loam
Strata-7	11692.04	Temperate grassland	Rest grazing	Sandy loam
Strata-8	12576.56	Temperate grassland	Rest grazing	Loam
Strata-9	14805.05	Temperate grassland	Reseeding grass	Sandy loam
Strata-10	21153.68	Temperate grassland	Reseeding grass	Loam
Strata-11	21374.62	Temperate grassland	Rotational grazing	Sandy loam
Strata-12	26652.60	Temperate grassland	Rotational grazing	Loam
Strata-13	2083.39	Meadow grassland	Rest grazing	Sandy loam
Strata-14	2194.31	Meadow grassland	Rest grazing	Loam
Strata-15	3034.93	Meadow grassland	Reseeding grass	Sandy loam
Strata-16	22762.37	Meadow grassland	Reseeding grass	Loam
Strata-17	3118.59	Meadow grassland	Rotational grazing	Sandy loam
Strata-18	17704.94	Meadow grassland	Rotational grazing	Loam
Total	261059.80			

Sampling framework

According to the methodology, Guidelines for sampling and surveys for CDM project activities and programmes of activities (version 4.0) should be followed to determine the sampling procedure and sample size.

According to the Guidelines for sampling and surveys for CDM project activities and programmes of activities (version 4.0), the project proponents may use the sample size calculator available in the CDM website[19]. See Sample Size Calculator Table for detail.

The mean SOC with the project boundary and the standard deviation of SOC in each strata were estimated from a preliminary sample, the project monitoring team has selected 3 preliminary sample sites for each strata and calculated the mean value and standard deviation of the biomass stock in each strata which were used to calculate the final number of sample sites based on the Sample Size Calculator Table as mentioned above.

The calculated sample size was 54 originally by using a precision of 15 percent at the 95 percent confidence level, considering the large area of the project boundary, the actual sample size has been increased into 117, by tripling the individual sample size of each strata with a minimum number of 6. Please refer to Sample Size Calculator Table for details.

Table 3-3 Number of the sample plots

Stratum number	Expected mean, m	Expected standard deviation, s	Population area, g (project area)	Calculation sample size	Actual sample size
1	52.39	12.65	52009.90	3	6
2	67.76	11.42	26892.34	3	6
3	39.55	15.20	7443.17	3	6
4	50.54	24.81	7803.22	3	6
5	36.56	19.46	3374.91	3	6
6	58.89	22.84	4383.18	3	6
7	42.90	20.33	11692.04	3	6
8	71.04	49.77	12576.56	3	9
9	67.26	19.82	14805.05	3	6
10	83.45	35.57	21153.68	3	9
11	76.77	13.29	21374.62	3	6
12	71.30	33.60	26652.60	3	9
13	61.28	23.27	2083.39	3	6
14	74.69	21.83	2194.31	3	6
15	71.36	25.46	3034.93	3	6
16	75.18	20.01	22762.37	3	6
17	58.52	16.29	3118.59	3	6
18	70.01	13.88	17704.94	3	6
Total	/	/	261059.80	54	117

Table 3-4 Location of the sample sites

NO.	Sample site	Longitude	Latitude	Soil texture	Grassland type
GTB-19	S-1	99.51381667	39.29737778	sandy	Desertification Grassland
GTB-21	S-2	99.60247278	39.70758611	sandy	Desertification Grassland

[19] https://cdm.unfccc.int/Reference/Guidclarif/index.html

GTB-22	S-3	99.61783944	39.71794667	sandy	Desertification Grassland
GTB-23	S-4	99.63092917	39.69296889	sandy	Desertification Grassland
GTB-24	S-5	99.63608694	39.69289694	sandy	Desertification Grassland
GTB-25	S-6	99.77443694	39.67504556	sandy	Desertification Grassland
GTB-11	S-1	99.46308056	39.16722778	sandy loam	Desertification Grassland
GTB-12	S-2	99.45103056	39.13139167	sandy loam	Desertification Grassland
GTB-15	S-3	99.46223333	39.17971111	sandy loam	Desertification Grassland
GZB-01	S-4	100.7782244	39.10341833	sandy loam	Desertification Grassland
GZB-02	S-5	100.7537525	39.09053444	sandy loam	Desertification Grassland
GZB-03	S-6	100.8035153	39.092215	sandy loam	Desertification Grassland
GTB-02	S-1	99.19229981	39.16214441	sandy	Desertification Grassland
GTB-09	S-2	99.3944204	39.23739778	sandy	Desertification Grassland
GTB-10	S-3	99.27930635	39.28301713	sandy	Desertification Grassland
GTB-20	S-4	99.74848889	39.50160833	sandy	Desertification Grassland
SNB-13	S-5	99.42327943	39.05858148	sandy	Desertification Grassland
SNB-14	S-6	99.37521376	39.04664749	sandy	Desertification Grassland
GTB-01	S-1	99.19167524	39.16240072	sandy loam	Desertification Grassland
GTB-07	S-2	99.33451171	39.08077567	sandy loam	Desertification Grassland
MLB-01	S-3	100.6231333	38.73726472	sandy loam	Desertification Grassland
MLB-03	S-4	100.5265944	38.68363378	sandy loam	Desertification Grassland
SDB-05	S-5	101.3375056	38.70332778	sandy loam	Desertification Grassland
SDB-06	S-6	101.3328917	38.67540833	sandy loam	Desertification Grassland
GTB-17	S-1	99.41422778	39.09978611	sandy	Desertification Grassland
MLB-02	S-2	100.5815766	38.68047317	sandy	Desertification Grassland
SDMCB-06	S-3	101.358866	38.17372692	sandy	Desertification Grassland
SNB-07	S-4	102.1291619	37.88070117	sandy	Desertification Grassland
SNB-08	S-5	102.1381766	37.88418968	sandy	Desertification Grassland
SNB-11	S-6	101.9389006	37.87680949	sandy	Desertification Grassland
GTB-08	S-1	99.41522886	39.2332414	sandy loam	Desertification Grassland
GTB-13	S-2	99.51699167	39.19394722	sandy loam	Desertification Grassland
GTB-14	S-3	99.50268056	39.25005278	sandy loam	Desertification Grassland
GTB-16	S-4	99.49815278	39.16973056	sandy loam	Desertification Grassland
SNB-09	S-5	102.0021541	37.8135039	sandy loam	Desertification Grassland
SNB-10	S-6	102.0023363	37.83911537	sandy loam	Desertification Grassland
GTB-03	S-1	99.32310422	39.13867113	sandy loam	Temperate grassland
GTB-04	S-2	99.33549636	39.14069724	sandy loam	Temperate grassland
GTB-06	S-3	99.35793777	39.09576119	sandy loam	Temperate grassland
SDMCB-07	S-4	101.3809122	38.21915486	sandy loam	Temperate grassland
SDMCB-17	S-5	101.3195222	38.14247222	sandy loam	Temperate grassland
SDMCB-24	S-6	101.3594105	38.2813197	sandy loam	Temperate grassland
GTB-05	S-1	99.33979359	39.11913085	loam	Temperate grassland
GTB-18	S-2	99.39987778	39.12473333	loam	Temperate grassland
MLB-08	S-3	100.9182722	38.55944722	loam	Temperate grassland
MLB-09	S-4	100.9755667	38.46915	loam	Temperate grassland
SDMCB-04	S-5	101.3071208	38.14579807	loam	Temperate grassland
SDMCB-05	S-6	101.319427	38.15414016	loam	Temperate grassland
SDB-01	S-7	100.9687972	38.70536667	loam	Temperate grassland

SDB-04	S-8	101.5023639	38.43268056	loam	Temperate grassland
SDB-07	S-9	101.1343944	38.79932778	loam	Temperate grassland
SDMCB-01	S-1	100.9739489	38.23008051	sandy loam	Temperate grassland
SDMCB-20	S-2	101.2661619	38.22779609	sandy loam	Temperate grassland
SDMCB-22	S-3	101.2893409	38.29107661	sandy loam	Temperate grassland
SDMCB-23	S-4	101.3182052	38.28630504	sandy loam	Temperate grassland
SNB-32	S-5	99.41890343	38.95760514	sandy loam	Temperate grassland
SNB-35	S-6	99.88692222	38.89697778	sandy loam	Temperate grassland
MLB-07	S-1	100.9198944	38.65052778	loam	Temperate grassland
MLB-10	S-2	100.8324472	38.72727222	loam	Temperate grassland
SDMCB-10	S-3	101.0488667	38.26205	loam	Temperate grassland
SDMCB-11	S-4	101.0461972	38.27394444	loam	Temperate grassland
SDMCB-12	S-5	101.0574806	38.24219167	loam	Temperate grassland
SDMCB-19	S-6	101.2712401	38.20364793	loam	Temperate grassland
SDMCB-21	S-7	101.2600053	38.28070031	loam	Temperate grassland
SDB-08	S-8	101.2232917	38.82918611	loam	Temperate grassland
SNB-15	S-9	99.41261233	38.99072182	loam	Temperate grassland
SDMCB-26	S-1	101.3935129	38.04654659	sandy loam	Temperate grassland
SDB-02	S-2	101.4824944	38.44043056	sandy loam	Temperate grassland
SDB-09	S-3	101.1609944	38.90486111	sandy loam	Temperate grassland
SNB-01	S-4	99.49455164	39.002593	sandy loam	Temperate grassland
SNB-31	S-5	101.5610278	38.05689444	sandy loam	Temperate grassland
SNB-33	S-6	99.470785	38.98082514	sandy loam	Temperate grassland
MLB-05	S-1	100.7358476	38.43092368	loam	Temperate grassland
SDMCB-02	S-2	101.0515998	38.22489346	loam	Temperate grassland
SDMCB-09	S-3	101.3473361	38.09553091	loam	Temperate grassland
SDMCB-13	S-4	101.0561889	38.23929167	loam	Temperate grassland
SDMCB-16	S-5	101.3978861	38.19313333	loam	Temperate grassland
SDMCB-25	S-6	101.3784927	38.05850653	loam	Temperate grassland
SDMCB-27	S-7	101.3521554	38.04266286	loam	Temperate grassland
SNB-02	S-8	99.47997437	39.061551	loam	Temperate grassland
SNB-36	S-9	99.86615278	38.88538889	loam	Temperate grassland
SDMCB-03	S-1	101.0452011	38.18235146	sandy loam	Meadow grassland
SDMCB-14	S-2	101.4199444	38.16449167	sandy loam	Meadow grassland
SNB-04	S-3	99.75760316	38.81606597	sandy loam	Meadow grassland
SNB-34	S-4	99.70965752	38.78944638	sandy loam	Meadow grassland
SNB-41	S-5	99.95751944	38.78777778	sandy loam	Meadow grassland
SNB-43	S-6	99.93166111	38.79036111	sandy loam	Meadow grassland
SNB-12	S-1	101.6041144	38.05116283	loam	Meadow grassland
SNB-16	S-2	99.32069833	38.82743139	loam	Meadow grassland
SNB-17	S-3	99.29838417	38.85348861	loam	Meadow grassland
SNB-29	S-4	101.8173417	37.85716944	loam	Meadow grassland
SNB-39	S-5	99.89256667	38.81249167	loam	Meadow grassland
SNB-42	S-6	99.98378333	38.758625	loam	Meadow grassland
MLB-06	S-1	100.9361955	38.22074371	sandy loam	Meadow grassland
SDMCB-15	S-2	101.3766083	38.156475	sandy loam	Meadow grassland
SDB-03	S-3	101.4985861	38.44691667	sandy loam	Meadow grassland

SNB-06	S-4	101.4846779	37.95843563	sandy loam	Meadow grassland
SNB-23	S-5	101.8984833	37.86360556	sandy loam	Meadow grassland
SNB-25	S-6	101.8868194	37.82015833	sandy loam	Meadow grassland
MLB-04	S-1	100.6183124	38.43218947	loam	Meadow grassland
SDMCB-08	S-2	101.3403027	38.07660465	loam	Meadow grassland
SNB-05	S-3	101.4814478	37.96444874	loam	Meadow grassland
SNB-21	S-4	101.5347	37.97769444	loam	Meadow grassland
SNB-22	S-5	101.6726306	37.98882222	loam	Meadow grassland
SNB-27	S-6	101.8291	37.78699722	loam	Meadow grassland
SNB-03	S-1	99.75890556	38.85296111	sandy loam	Meadow grassland
SNB-24	S-2	101.9036444	37.85901389	sandy loam	Meadow grassland
SNB-26	S-3	101.8664361	37.80693611	sandy loam	Meadow grassland
SNB-28	S-4	101.8346778	37.81534444	sandy loam	Meadow grassland
SNB-30	S-5	101.8058389	37.87443056	sandy loam	Meadow grassland
SNB-40	S-6	99.94303333	38.81354722	sandy loam	Meadow grassland
SDMCB-18	S-1	101.3966	38.14735	loam	Meadow grassland
SNB-18	S-2	99.4271275	38.76811611	loam	Meadow grassland
SNB-19	S-3	99.52335028	38.63858917	loam	Meadow grassland
SNB-20	S-4	101.5477778	37.99391667	loam	Meadow grassland
SNB-37	S-5	99.88709444	38.86316944	loam	Meadow grassland
SNB-38	S-6	99.90464722	38.81724167	loam	Meadow grassland

From 16-September-2021 to 1- October-2021, two monitoring teams collected soil samples in the project area.

Collected 3-4 soil samples in S shape at each sampling point with a soil drill, mixed them into one soil sample, and put them into a ziplock bag for measuring soil organic carbon mining.

Also, collected a soil sample at each sampling point with a ring knife to measure the bulk density and percentage of rocks larger than 2mm, roots, and other dead residues.

And all the soil samples were Shandong Huasheng Tiantong Standard Technical Service Co., Ltd. for measuring, which was registered in Jinan City, Shandong Province.

As mentioned in section 3.1.2, the nationally-approved standard Method for Determination of Soil Organic Matter (NY/T 1121.6-2006) was used to measure SOC of the soil samples.

The nationally-approved standard Method for determination of soil bulk density (NY/T 1121.4-2006) was used to measure bulk density of the soil samples.

Due to there is no nationally recognized standard for measuring the percentage of rocks larger than 2mm, roots, and other dead residues, so previous research standard are used[20].

[20] Xie yingge, Li xia. Research progress on determination methods of gravel content in soil[J]. Soils, 2012,44(1):17-22.

See SOC table and laboratory test report for measuring results.

Figure 3-3 Soil sampling

5) Monitoring for leakage emission

For the estimate of leakage emissions, the monitoring parameters required in the VCS modules VMD040 Estimation of Leakage Emissions from Displacement of Grazing Activity due to Implementation of Sustainable Grassland Management Activities were recorded annually during the monitoring period.

The County Forestry and Grassland Bureau has conducted the full census survey from September to October each year to monitor the grazing activities from 2017-2021 outside the project area, the related monitoring results of the parameters are summarized as below:

Table 3-5 Parameters of leakage

Parameters	Measurement method	Value			Unit
$P_{GUI,l,t}$	During this monitoring period, the project proponent and the County Forestry and Grassland Bureau visited all the project participants every year to investigate the situation of the project.	2017	Cattle	2,613	Head
			Sheep	56,215	
		2018	Cattle	66,722	
			Sheep	464,279	
		2019	Cattle	88,189	
			Sheep	564,324	
		2020	Cattle	88,189	
			Sheep	564,324	
		2021	Cattle	88,189	
			Sheep	564,324	

$Days_{GUI,l,t}$	During this monitoring period, the project proponent and the County Forestry and Grassland Bureau visited all the project participants every year to investigate the situation of the project.	2016: 138 2017: 138 2018: 138 2019: 138 2020: 138	Days

3. Monitoring frequency

The monitoring of the project implementation will take place at least every five years after the project registration in order to ensure the continuity of the benefits. Periodic verification and quantitative monitoring of the project will take place at least every five years.

4. Data management

All data collected as part of monitoring is archived electronically. All information should be stored by the technology department of the project owner and all the material has a physical copy for backup. And all data collected shall be archived for a period of at least two years after the end of the last crediting period of the project activity.

5. QA/QC procedures

The following QA/QC procedures will be adopted:

1) Training will be provided to the staff to guarantee the implementation of the monitoring plan, all the relevant staff is obliged to take the training course before the operation starts;

2) The monitoring team will check the monitoring equipment regularly to make sure their normal operation before each monitoring activities;

3) If the validated monitoring plan cannot be conducted during the following monitoring process due to some reason, an updated monitoring plan should be submitted to VVB during the corresponding verification by indicating the relevant deviation of the original plan and the reason for the deviation.

4) All soil samples need to be backed up. If there is a problem with the testing equipment or the data is abnormal, retest the corresponding soil sample.

3.1.4 Dissemination of Monitoring Plan and Results (CL4.2)

Before the beginning of this monitoring period, the project owner published the monitoring plan and monitoring manual on the local bulletin boards for the villages around the project area from 16-September-2021 to 1- October -2021 and invited local stakeholders to discuss them and give their advises.

Besides, as part of the draft PD, the monitoring plan has been published on VCS and CCB website which can be easily download by stakeholders, and after the monitoring activity completed, the monitoring results were also published on the website as part of the draft monitoring report. Hard copies of the monitoring plan and monitoring manual have been distributed among local stakeholders by project proponent and the grassland guardians. At the same time, public notice boards in each village were used to publicize information regarding how to access to the monitoring plan and results through internet. Technical staff from project proponent also explained the monitoring plan to local herders. In addition, a contact person with phone numbers was published in case any stakeholders want to directly contact the project proponent and raise opinions.

For each verification, the monitoring team will summarize all the comments received from stakeholders and corresponding responses regarding the monitoring plan and results and published on VCS and CCB website along with the monitoring report for each monitoring period.

During this monitoring period, no comments on the monitoring plan and results received.

3.2 Quantification of GHG Emission Reductions and Removals

3.2.1 Baseline Emissions

According to PD, baseline emissions including CH_4 emissions due to enteric fermentation and N_2O and CH_4 emissions due to manure management.

$$BE_b = BE_{CH_{4EF,}b} + BE_{GHG_{MD,}b} \quad (1)$$

1. Baseline CH_4 emissions due to enteric fermentation

Baseline CH_4 emissions from enteric fermentation are calculated using the following:

$$BE_{CH_{4EF,}t} = \frac{GWP_{CH_4} \times \sum_{l=1}^{L} P_{l,b} \times EF_l \times Days_{l,b}}{1000 \times 365} \quad (2)$$

Where*:*

$BE_{CH_{4EF,}b}$	=	Baseline CH_4 emissions from enteric fermentation
GWP_{CH_4}	=	Global-warming potential for CH_4 (t CO_2e/t CH_4)
$P_{l,b}$	=	Population of grazing livestock type l, in baseline year b (head)
l	=	Index of livestock type
EF_l	=	Enteric CH_4 emission factor per head of livestock type l per year (kg CH_4 head*year)
$Days_{l,b}$	=	Grazing days inside the project area for each livestock type l in baseline year b (days)

1000	=	Conversion factor for t CH_4 to kg CH_4
365	=	Conversion factor for years to days

2. Baseline N_2O and CH_4 emissions due to manure management

Baseline emissions from manure management include N_2O and CH_4 emissions from manure and urine deposited on grassland soil during the grazing season.

$$BE_{GHG_{MD,b}} = BE_{N_2O_{MD,b}} + BE_{CH_{4MD,b}} \quad (3)$$

Where:

$BE_{GHG_{MD,b}}$	=	Baseline N_2O and CH_4 emissions due to manure management
$BE_{N_2O_{MD,t}}$	=	Baseline N_2O emissions from manure and urine deposited on grassland soil in baseline year b (t CO_2e)
$BE_{CH_{4MD,t}}$	=	Baseline CH_4 emissions from manure and urine deposited on grassland soil in baseline year b (t CO_2e)

1) Baseline N_2O emissions from manure management are calculated using the following:

$$BE_{N_2O_{MD,b}} = GWP_{N_2O} \times (BE_{D,N_2O_{MD,b}} + BE_{ID,N_2O_{MD,b}}) \quad (4)$$

Where:

GWP_{N_2O}	=	Global warming potential for N_2O (t CO_2e/t N_2O)
$BE_{D,N_2O_{MD,t}}$	=	Direct N_2O emissions from manure and urine deposited on grassland soil during the grazing season in baseline year b (t N_2O)
$BE_{ID,N_2O_{MD,t}}$	=	Indirect N_2O emissions from manure and urine deposited on grassland soil during the grazing season in baseline year b (t N_2O)

2) Baseline direct N_2O emissions from manure and urine deposited on grassland soil are calculated using the following:

$$BE_{D,N_2O_{MD,b}} = \sum_{l1=1}^{L1} F_{MD,l1,b} \times EF_{3,PRP,CPP} \times 44/28 \quad (5)$$

And/or

$$BE_{D,N_2O_{MD,b}} = \sum_{l2=1}^{L2} F_{MD,l2,b} \times EF_{3,PRP,SO} \times 44/28 \quad (6)$$

$F_{MD,l1,b}$ and $F_{MD,l2,b}$ must be calculated using the following equation for livestock type l.

$$F_{MD,l1,b} = \frac{P_{l,b} \times W_{l,b} \times Nex_l \times H_{l,b} \times Days_{l,b} \times (1 - Frac_{GAS,MD})}{1000_a \times 24 \times 1000_b} \quad (7)$$

Where:

$F_{MD,l1,b}$	=	Annual amount of nitrogen in cattle, poultry and pigs manure and urine deposited on grassland soil during the grazing season in baseline year b, adjusted for volatilization as NH_3 and NO_x (t N)
$F_{MD,l2,b}$	=	Annual amount of nitrogen in sheep and other animals manure and urine deposited on grassland soil during the grazing season in baseline year b, adjusted for volatilization as NH_3 and NO_x (t N)
$EF_{3,PRP,CPP}$	=	N_2O emission factor for cattle, poultry and pigs manure and urine deposited on grassland soil during the grazing season (kg N_2O-N/kg N input)
$EF_{3,PRP,SO}$	=	N_2O emission factor for sheep and other animals manure and urine deposited on grassland soil during the grazing season (kg N_2O-N/kg N input)
$l1$	=	Index of livestock cattle, poultry and pigs
$l2$	=	Index of livestock sheep and other animals
$P_{l,b}$	=	Population of livestock type l in baseline year b (head)
$W_{l,b}$	=	Average weight of livestock type l in baseline year b (kg livestock mass/head)
Nex_l	=	Nitrogen excretion of livestock type l (kg N deposited /(t livestock mass*day))
1000_a	=	Conversion factor for t livestock mass to kg livestock mass
$H_{l,b}$	=	Average grazing hours per day for livestock type l in baseline year b (hour)
24	=	Conversion factor for days to hours
$Days_{l,b}$	=	Grazing days for livestock type l inside the project area in baseline year b (days)
1000_b	=	Conversion factor for t N to kg N
$Frac_{GAS,MD}$	=	Fraction of volatilization from manure and urine deposited by grazing animals as NH_3 and NO_x (kg N volatilized/kg of N deposited)
l	=	Index of grazing livestock types

3) Baseline indirect N_2O emissions from urine and manure N deposited on grassland soils

According to the methodology (VM0026/Version 1.1) and baseline survey report, the annual precipitation of the project area is less than annual potential evapotranspiration, so, indirect N_2O emissions from leaching and runoff can be excluded.

The indirect N_2O emissions from the atmospheric deposition of N volatilized as NH_3 and NO_x after urine and manure N is deposited on grassland soils in baseline year b, are calculated using the following:

$$BE_{ID,N_2O_{MD},b} = \sum_{l=1}^{L} F_{MD,l,b} \times Frac_{GAS,MD} \times EF_{4,MD} \times 44/28 \quad (8)$$

Where:

$BE_{ID,N_2O_{MD},b}$	=	Indirect N_2O emissions from manure and urine deposited on grassland soil during the grazing season in baseline year b (t N_2O)
$F_{MD,l,b}$	=	Annual amount of manure and urine deposited on grassland soil from livestock type l during the grazing season in baseline year b, adjusted for volatilization as NH_3 and NO_x (t N)
$Frac_{GAS,MD}$	=	Fraction of volatilization from manure and urine deposited by grazing animals as NH_3 and NO_x (kg N volatilized/kg of N deposited)
$EF_{4,MD}$	=	N_2O emission factor for atmospheric deposition of urine and manure N on soils and water surfaces, (kg N_2O-N/(kg NH_3-N + NO_x-N volatilized))
L	=	Index of grazing livestock types

4) Baseline CH_4 emissions from manure management are calculated using the following:

$$BE_{CH_4MD,b} = \frac{GWP_{CH_4} \times \sum_{l=1}^{L} EF_{lM} \times P_{l,b} \times H_{l,b} \times Days_{l,b}}{1000 \times 365 \times 24} \quad (9)$$

Where:

$P_{l,b}$	=	Population of grazing livestock type l, in baseline year b, head
EF_{lM}	=	CH_4 emission factor from manure of livestock type l (kg CH_4/(head*year))
$H_{l,b}$	=	Average grazing hours per day for livestock type l in baseline year b (hour)
$Days_{l,b}$	=	Grazing days for livestock type l inside the project area in baseline year b (days)
1000	=	Conversion factor for t CH_4 to kg CH_4
365	=	Conversion factor for years to days
24	=	Conversion factor for days to hours

Baseline emissions and removals

The emissions and removals in baseline year b are calculated as follows:

$$BE_b = BE_{N_2O_{SN},b} + BE_{BBb} + BE_{CH_{4EF},b} + BE_{GHG_{MD},b} + BE_{FC,b} - BRWP_b \quad (9)$$

Where:

BE_b = Baseline emissions and removals in year b (t CO_2e)

$BE_{N_2O_{SN},b}$ = Baseline N_2O emissions due to fertilizer use in baseline year b (t CO_2e)

BE_{BBb} = Baseline GHG emissions from biomass burning in baseline year b (t CO_2e)

$BE_{CH_{4EF},b}$ = Baseline CH_4 emissions from enteric fermentation in baseline year b (t CO_2e)

$BE_{GHG_{MD},b}$ = Baseline GHG emissions from manure management in baseline year b (t CO_2e)

$BE_{FC,b}$ = Baseline CO_2 emissions from farming machine fossil fuel consumption in baseline year b, (t CO_2)

$BRWP_b$ = Baseline removals from existing woody perennials in baseline year b (t CO_2)

According to PD, for the project:

$$BE_b = BE_{CH_{4EF},b} + BE_{GHG_{MD},b}$$

$$= BE_{CH_{4EF},b} + BE_{N_2O_{MD},b} + BE_{CH_{4MD},b}$$

$$= \frac{GWP_{CH_4} \times \sum_{l=1}^{L} P_{l,b} \times EF_l \times Days_{l,b}}{1000 \times 365} + GWP_{N_2O} \times \left(\sum_{l1=1}^{L1} \frac{P_{l,b} \times W_{l,b} \times Nex_l \times H_{l,b} \times Days_{l,b} \times (1 - Frac_{GAS,MD})}{1000a \times 24 \times 1000b} \times EF_{3,PRP,CPP} \times \frac{44}{28} + \sum_{l2=1}^{L2} \frac{P_{l,b} \times W_{l,b} \times Nex_l \times H_{l,b} \times Days_{l,b} \times (1 - Frac_{GAS,MD})}{1000a \times 24 \times 1000b} \times EF_{3,PRP,SO} \times \frac{44}{28} + \frac{GWP_{CH_4} \times \sum_{l=1}^{L} EF_{lM} \times P_{l,b} \times H_{l,b} \times Days_{l,b}}{1000 \times 24 \times 365}\right)$$

(10)

According to PD, the annual baseline emission is calculated as 137,378 tCO_2e, for this monitoring period from 25-July-2017 to 1-September-2021 (1,500 days), the total baseline emissions is 567,909 tCO_2e. Please refer to ER calculation sheets for details.

Table 3-6 The estimation of baseline emission during the monitoring period

Crediting period	$BE_{CH_{4EF},b}$	$BE_{N_2O_{MD},b}$	$BE_{CH_{4MD},b}$	BE_b
	tCO_2e	tCO_2e	tCO_2e	tCO_2e
	A	B	C	D=A+B+C
25/7/2017-31/12/2017	54,923	4,915	383	60,221
1/1/2018-2018/12/31	125,292	11,212	874	137,378
1/1/2019-2019/12/31	125,292	11,212	874	137,378
1/1/2020-2020/12/30	125,292	11,212	874	137,378
1/1/2021-31/12/2021	125,292	11,212	874	137,378
Total	**556,092**	**49,762**	**3,880**	**609,734**

3.2.2 Project Emissions

1. Project CH_4 emissions due to enteric fermentation

Project CH_4 emissions from enteric fermentation are calculated using the following:

$$PE_{CH_{4EF},t} = \frac{GWP_{CH_4} \times \sum_{l=1}^{L} P_{l,t} \times EF_l \times Days_{l,t}}{1000 \times 365} \quad (11)$$

Where:

GWP_{CH_4}	=	Global-warming potential for CH_4 (t CO_2e/t CH_4)
$P_{l,t}$	=	Population of grazing livestock type l in year t under project (head)
L	=	Index of livestock type
EF_l	=	Enteric CH_4 emission factor per head of livestock type l per year (kg CH_4 head*year)
$Days_{l,t}$	=	Grazing days inside the project area for each livestock type l in the project year t (days)
1000	=	Conversion factor for t CH_4 to kg CH_4
365	=	Conversion factor for years to days

2. Project N_2O and CH_4 emissions due to manure management

The project emissions from manure management include N_2O and CH_4 emissions from manure and urine deposited on grassland soil during the grazing season.

$$PE_{GHG_{MD,t}} = PE_{N_2O_{MD,t}} + PE_{CH_{4MD,t}} \quad (12)$$

Where:

$PE_{GHG_{MD,t}}$	=	Project GHG emissions from manure management in year t (t CO_2e)
$PE_{N_2O_{MD,t}}$	=	Project N_2O emissions from manure and urine deposited on grassland soil in year t (t CO_2e)
$PE_{CH_{4MD,t}}$	=	Project CH_4 emissions from manure and urine deposited on grassland soil in year t (t CO_2e)

1) Project N_2O emissions from manure management

$$PE_{N_2O_{MD,t}} = GWP_{N_2O} \times (PE_{D,N_2O_{MD,t}} + PE_{ID,N_2O_{MD,t}}) \quad (13)$$

Where:

GWP_{N_2O}	=	Global warming potential for N_2O (t CO_2e/t N_2O)
$PE_{D,N_2O_{MD,t}}$	=	Project direct N_2O emissions from manure and urine deposited on grassland soil during the grazing season in year t (t N_2O)

$PE_{ID,N_2O_{MD},t}$ = Project indirect N_2O emissions from manure and urine deposited on grassland soil during the grazing season in year t (t N_2O)

2) Project direct N_2O emissions from manure and urine deposited on grassland soil

$$PE_{D,N_2O_{MD},t} = \sum_{l1=1}^{L1} F_{MD,l1,t} \times EF_{3,PRP,CPP} \times 44/28 \quad (14)$$

And/or

$$PE_{D,N_2O_{MD},t} = \sum_{l2=1}^{L2} F_{MD,l2,t} \times EF_{3,PRP,SO} \times 44/28 \quad (15)$$

$F_{MD,l1,t}$ and $F_{MD,l2,t}$ must be calculated using the following equation for livestock type l.

$$F_{MD,l1,t} = \frac{P_{l,t} \times W_{l,p} \times Nex_l \times H_{l,t} \times Days_{l,t} \times (1 - Frac_{GAS,MD})}{1000_a \times 24 \times 1000_b} \quad (16)$$

Where:

$F_{MD,l1,t}$ = Annual amount of nitrogen in cattle, poultry and pigs manure and urine deposited on grassland soil during the grazing season in year t, adjusted for volatilization as NH_3 and NO_x (t N)

$F_{MD,l2,t}$ = Annual amount of nitrogen in sheep and other animals manure and urine deposited on grassland soil during the grazing season in year t, adjusted for volatilization as NH_3 and NO_x (t N)

$EF_{3,PRP,CPP}$ = N_2O emission factor for cattle, poultry and pigs manure and urine deposited on grassland soil during the grazing season (kg N_2O-N/kg N input)

$EF_{3,PRP,SO}$ = N_2O emission factor for sheep and other animals manure and urine deposited on grassland soil during the grazing season (kg N_2O-N/kg N input)

$l1$ = Index of livestock cattle, poultry and pigs

$l2$ = Index of livestock sheep and other animals

$P_{l,t}$ = Population of grazing livestock type l in year t (head)

$W_{l,p}$ = Average weight of livestock l under project (kg livestock mass/head)

Nex_l = Nitrogen excretion of livestock type l (kg N deposited /(t livestock mass*day))

1000_a = Conversion factor for t livestock mass to kg livestock mass

$H_{l,t}$ = Average grazing hours per day during grazing season in year t (hours)

24 = Conversion factor for days to hours

$Days_{l,t}$ = Grazing days for livestock type l inside the project area in year t (days)

1000_b = Conversion factor for t N to kg N

$Frac_{GAS,MD}$ = Fraction of volatilization from manure and urine deposited by grazing animals as NH_3 and NO_x (kg N volatilized/kg of N deposited)

l = Index of grazing livestock types

3) Project indirect N_2O emissions from urine and manure N deposited on grassland soils

According to the methodology (VM0026/Version 1.1) and Project Design Report, the annual evapotranspiration is greater than annual precipitation in Zhangye generally. What's more, the annual evaporation is 10 times of the annual precipitation in Gao tai country. The annual precipitation of the project area is less than annual potential evapotranspiration, so, indirect N_2O emissions from leaching and runoff can be excluded.

Indirect N_2O emissions from the atmospheric deposition of N volatilized as NH_3 and NO_x after urine and manure N is deposited on grassland soils under the project, are calculated using the following:

$$PE_{ID,N_2O_{MD},t} = \sum_{l=1}^{L} F_{MD,l,t} \times Frac_{GAS,MD} \times EF_{4,MD} \times 44/28 \quad (17)$$

Where:

$PE_{ID,N_2O_{MD},t}$ = Project indirect N_2O emissions from manure and urine deposited on grassland soil during the grazing season in year t (t N_2O)

$F_{MD,l,t}$ = Annual amount of manure and urine deposited on grassland soil from livestock type l during the grazing season in year t, adjusted for volatilization as NH_3 and NO_x (t N)

$Frac_{GAS,MD}$ = Fraction of volatilization from manure and urine deposited by grazing animals as NH_3 and NO_x (kg N volatilized/kg of N deposited)

$EF_{4,MD}$ = N_2O emission factor for atmospheric deposition of urine and manure N on soils and water surfaces, (kg N_2O-N/(kg NH_3-N + NO_x-N volatilized))

CH_4 emissions from manure management are calculated using the following:

$$PE_{CH_4MD,t} = \frac{GWP_{CH_4} \times \sum_{l=1}^{L} EF_{lM} \times P_{l,t} \times H_{l,t} \times Days_{l,t}}{1000 \times 365 \times 24} \quad (18)$$

Where:

$P_{l,t}$ = Population of livestock type l in year t (head)

EF_{lM} = CH_4 emission factor from manure of livestock type l (kg CH_4/(head*year))

$H_{l,t}$	=	Average grazing hours per day during grazing season in year t (hours)
$Days_{l,t}$	=	Grazing days for livestock type l inside the project area in year t (days)
1000	=	Conversion factor for t CH_4 to kg CH_4
365	=	Conversion factor for years to days
24	=	Conversion factor for days to hours

3. Project CO_2 emissions due to the use of fossil fuels

Project CO_2 emissions due to the use of fossil fuels are calculated using the following:

$$PE_{FC,t} = \frac{\sum_{p=1}^{P}\sum_{j=1}^{J}\sum_{k=1}^{K} FC_{p,j,k,t} \times EF_{CO_2,k} \times NCV_k}{1000} \quad (19)$$

Where:

$FC_{p,j,k,t}$	=	Fuel consumption by fuel type k, by machine type j, on grassland parcel p, in year t (kg fuel/year)
$EF_{CO_2,k}$	=	CO_2 emission factor by fuel type k (t CO_2/GJ).
NCV_k	=	Thermal value of fuel type k (GJ/t fuel)
1000	=	Conversion factor for tonnes fuel to kg fuel
K	=	Index of fuel type
J	=	Index of machine type
P	=	Index of grassland parcel

4. Project removals due to changes in soil organic carbon

Estimate of project removals due to changes in SOC using a measurement approach.

The SOC stock in stratum s, sampling site i, under project in year t are calculated using the following:

$$P_{SOC_{mG,s,i,t}} = SOC_{mG,s,i,t} \times BD_{mG,s,i,t} \times Depth \times (1 - FC_{mG,s,i,t}) \times 0.1 \quad (20)$$

Where:

$P_{SOC_{mG,s,i,t}}$	=	SOC stock in the top 30 cm (or greater depth if required) of soil for management practice mG, stratum s, sampling site i under project in year t (t C/ha)

$SOC_{mG,s,i,t}$ = SOC content in the top 30 cm of soil (or greater depth if required) for management practice mG, stratum s, sampling site i, under project in year t (g C/kg soil)

$BD_{mG,s,i,t}$ = Soil bulk density in the top 30 cm of soil (or greater depth if required) for management practice mG, stratum s, sampling site i, under project in year t (g soil/cm^3)

$Depth$ = Top soil depth, for calculating grassland SOC stock in the top 30 cm of soil (or greater depth if required) (cm)

$FC_{mG,s,i,t}$ = Percentage of rocks larger than 2mm, roots, and other dead residues with a diameter in the top 30 cm of soil (or greater depth if required), for management practice mG, stratum s, sampling site i under project in year t (percent)

0.1 = Conversion factor for SOC to t C/ha

mG = Index of management practice

S = Index of stratum

i = Index of sampling site

Calculate average carbon stock of all monitored sites in management practice mG, stratum s, under project using the following:

$$P_{SOC_{mG,s,t}} = \frac{\sum_{i=1}^{I} P_{SOC_{mG,s,i,t}}}{I} \quad (21)$$

Where:

$P_{SOC_{mG,s,t}}$ = Average carbon stock in stratum s under project (t C/ha)

I = Monitored sites in stratum s, under project

The following is used to calculate the difference between the carbon stock for management practice mG under project in year t, and the carbon stock under the baseline scenario, for all strata.

$$P_{mG,t} = \sum_{s=1}^{S} (P_{SOC_{mG,s,t}} - SOC_{s,Baseline}) \times PA_{mG,s,t} \quad (22)$$

Where:

$P_{mG,t}$ = Difference in the carbon stock between the project in year t and the baseline scenario (t C)

$PA_{mG,s,t}$ = Project areas with management practice mG in stratum s in year t (ha)

$P_{SOC_{mG,s,t}}$	=	Average carbon stock in stratum s under project in year t (t C / ha)
$SOC_{s,Baseline}$	=	Baseline SOC stock of stratum s, in the top 30 cm soil layer (or greater depth if required) (t C / ha)
S	=	Strata under project
s	=	Index of stratum

The following is applied to calculate average carbon stock of all management practice, under project in year t.

$$P_t = \sum_{mG=1}^{M} P_{mG,t} \quad (23)$$

Where:

P_t	=	Carbon stock under project in year t (t C)
M	=	Number of management practice

For the first monitoring of SOC stock, the annual project removals due to changes in SOC stock in year t must be calculated using the following:

$$PR_t = \frac{(P_t)}{n} \times \frac{44}{12} \quad (24)$$

Where:

PR_t	=	Project removals due to changes in SOC in year t (t CO_2e)
n	=	Number of years from the project start date to year t (years)

All parameters are selected according to section 9.1 and 9.2 of the methodology (VM0026, Version 1.1), and soil organic matter data are obtained by laboratory tests. So the parameters are conservative, and the uncertainty is considered to be 0.

5. Uncertainty analysis

All parameters are selected according to section 9.1 and 9.2 of the methodology (VM0026, Version 1.1), and soil organic carbon data are obtained by laboratory tests. For the project, the project proponent conducted a survey of all grazing agents whose livestock grazed in the project area prior to the project start date. This survey covered a full census of project participants and project non-participants whose livestock graze in the project area during the baseline period (covering the one year prior to the project start date) covered by the survey, and collected grazing data in the project area under the baseline scenario, such as the number and days of grazing, etc. Also, the project proponent and the county forestry and grassland bureau recorded all the diesel oil consumed by the project. So, the parameters about grazing and diesel oil consumption are conservative, and the uncertainty is considered to be 0.

As mentioned before, the project use Option 2 (measurement approach) to estimate project removals due to changes in SOC. For the ex-post calculation during this monitoring period, the SOC changes in project scenario is based on the sample measurement undertaken within the project area, and the sample size is 117, larger than 30, therefore a conservative estimate of carbon sequestration by carbon pools in the project scenario should be given by adopting a value that represents the lower bound of the 95 percent confidence interval (sample mean - 1.96 × standard error). Please refer to ER spreadsheet for detailed calculation.

Project net GHG emissions by sources and removals by sinks

According to the PD, project net GHG emissions by sources and removals by sinks are calculated as follows:

$$PE_t = PE_{CH_{4EF},t} + PE_{GHG_{MD},t} + PE_{FC,t} - PR_t \quad (25)$$

$$=PE_{CH_{4EF},t} + PE_{N_2O_{MD},t} + PE_{CH_{4MD},t} + PE_{FC,t} - PR_t$$

Where:

PE_t	=	Project net GHG emissions by sources and removals by sinks in year t (t CO_2e)
$PE_{CH_{4EF},t}$	=	Project CH_4 emissions from enteric fermentation in year t (t CO_2e)
$PE_{GHG_{MD},t}$	=	Project GHG emissions from manure management in year t (t CO_2e)
$PE_{FC,t}$	=	Project CO_2 emissions from farming machine fossil fuel consumption in year t (t CO_2)
PR_t	=	Project removals due to changes in SOC in year t (t CO_2e)

During this monitoring period, 261,059.80 ha of *degraded grassland* in Zhangye were planted with *Elymus nutans, Elymus sibiricus, Poa pratensis, Agropyron cristatum, Festuca rubra, Artemisia sphaerocephala in project area*, which could increase the soil carbon stocks. Also, tractors and trucks were used in the project to transport seeds and build fences which consumes diesel oil. So, project CO_2 emissions due to the use of fossil fuels and project removals due to changes in soil organic carbon should be calculated.

And grazing is control after the implementation of the project like rotational grazing and rest grazing. Therefore, in the project area, although the grazing days are strictly managed, reasonable grazing is still allowed. So, project CH_4 emissions from enteric fermentation and project GHG emissions from manure management ($PE_{CH_{4EF},t}$ and $PE_{GHG_{MD},t}$) should be calculated during this monitoring period.

Therefore, $PE_t = PE_{CH_{4EF},t} + PE_{GHG_{MD},t} + PE_{FC,t} - PR_t$ (26)

Project net GHG emissions during the crediting period is summarized in the following table, please refer to ER spreadsheet for detailed calculation.

Table 3-7 The estimation of project net GHG emissions during the monitoring period

Crediting period	$PE_{FC,t}$	$PE_{CH_4MD,t}$	$PE_{N_2O_{MD,t}}$	$PE_{CH_4MD,t}$	PR_t	PE_t
Year	t CO_2e	t CO_2e	t CO_2e	t CO_2e	tCO_2e	tCO_2e
	A	B	C	D	E	A+B+C+D-E
25/7/2017-31/12/2017	1,925	2,138	314	15	263,969	1,925
1/1/2018-2018/12/31	1,701	28,886	3,186	200	602,179	1,701
1/1/2019-2019/12/31	1,175	36,875	3,966	255	602,179	1,175
1/1/2020-2020/12/30	0	36,875	3,966	255	603,828	0
1/1/2021-31/12/2021	0	36,875	3,966	255	602,179	0
Total	**4,801**	**141,649**	**15,397**	**980**	**2,674,334**	**4,801**

3.2.3 Leakage

According the Tool of Estimation of emissions from market leakage (VMD0033, Version 1.0), the main production in the project area is cattle and sheep for the project. Though grazing frequency was strictly managed during the implementation of the project, and the controlled grazing will be allowed depending on the growth situation of the forage, but the County Forestry and Grassland Bureau measures the grass yield of the surrounding grasslands in the project area, and guides herders to graze in a reasonable area. According to the annual statistical yearbook of Zhangye City, the annual output of cattle and sheep in Zhangye City has not decreased. The project would not lead to reductions in the production of cattle and sheep; therefore, the market leakage is considered to be 0 tCO_2e.

According to the PD, leakage from displacement of grazing activities to outside the project boundary should be calculated.

During this monitoring period, grazing is control like rotational grazing and rest grazing through building grassland fences, to achieve fixed-point grazing and grazing by hurdles. According to the Project Design Report, the grasslands is divided into seasonal grazing land, and then the seasonal grazing land is divided into several small areas by the livestock. carrying capacity of the grassland, and then controlled grazing will be allowed depending on the growth situation of the forage, and the County Forestry and Grassland Bureau measured the grass yield of the surrounding grasslands in the project area, and guides herders to graze in a reasonable area.

So, leakage from displacement of grazing activities should be calculated.

Leakage from Displacement of Grazing Activities (VMD0040, Version 1.0) is used to calculate the leakage emissions due to grazing displacement, and is applicable under the following conditions:

- The project area is subject to livestock grazing in the baseline scenario.

According to the PRA Report and Project Design Report, local herders graze in the project area under the baseline scenario. Therefore, Leakage from Displacement of Grazing Activities (VMD0040, Version 1.0) is applicable for the proposed project.

1) Assess whether Grazing Displacement Takes Place

According to the Baseline Survey Report and Project Design Report, local herders graze in the project area under the baseline scenario, but grazing frequency will be controlled during project implementation. Since the grazing demand of herdsmen will not decline in a short time, there is likely to be displacement of grazing activity, then proceed to the next step.

2) Survey of Grazing Displacement and Relocation Plans

According to (VMD0040, Version 1.0), a survey must be conducted of all grazing agents whose livestock graze in the project area prior to the project start date. The project proponent conducted a survey before the project implementation (ie, covering the five years period prior to the project start date, or if management records for this period are unavailable, at a minimum covering the one year prior to the project start date) according to the requirements of the module for the survey.

- For the project, the survey of all grazing agents whose livestock grazed in the project area prior to the project start date conducted by project proponent (1-May-2015 to 19-June-2016). This survey covered a full census of project participants and project non-participants whose livestock graze in the project area during the baseline period (covering the one year prior to the project start date) covered by the survey. In addition, the survey collected data on the number and type of livestock, and duration, that livestock under the control of project participants graze outside the project area during the period covered by the survey.

- According to the average value of the survey, under the baseline scenario, the project participants stocked 183,540 cattle and 641,788 sheep in the project area, grazing for about 138 days every year and 8 hours every day. And project non-participants would not graze in the project area under the project scenario.

- In 2016, the County Forestry and Grassland Bureau measured the grass yield of the grassland around the project area, and calculated the reasonable grazing quantity, designated a grazing area of 1,102,293.33 hectares. And the project participants grazed in the designated area under the guidance of the County Forestry and Grassland Bureau and grassland guardians. But the specific land parcels available for use by project participants may change from year to year, based on the actual situation of grassland, such as grass yield.

3) Prepare a Grazing Displacement Management Plan

A grazing displacement management plan was prepared on the basis of the survey of grazing displacement and relocation plans. The grazing displacement management plan recorded planned grazing activities for all livestock that are to be relocated to lands outside the project area and that are under the control of project participants. According to the survey, project non-participants would

not graze in the project area both under the baseline scenario and the project scenario. The grazing displacement management plan recorded for the years after the project start date, the following data:

- The identity of each grazing agent;
- The number and type of livestock to be relocated;
- The number of days each year which they will graze outside the project area (measured in days, or the whole year if appropriate);
- The location and area in hectares of each land parcel to which grazing will be relocated;
- A unique identifier code (where applicable) for each land parcel to which grazing will be relocated;
- The type of land (grassland, forest land, cropland) of each parcel to which grazing will be relocated, and where appropriate note the status (eg, degradation level) of the lands to which grazing will be relocated; and
- Any planned actions to avoid loss of above- or belowground carbon pools on the land parcels to which grazing will be relocated.

In July and August each year, the County Forestry and Grassland Bureau measured the grass yield of the grassland around the project area and calculated the reasonable grazing quantity. And the project participants grazed in the designated area under the guidance of the County Forestry and Grassland Bureau and grassland guardians. But the specific land parcels available for use by project participants may change from year to year, based on the actual situation of grassland. And the grazing displacement management plan record the number and type of livestock to be relocated and the type of land (grassland, forest land, cropland) to which grazing is planned to be displaced. In this case, the type of land to which grazing may be displaced must be categorized as unidentified grassland.

According to the grazing displacement survey conducted in 2016, all grazing agents were interviewed, and collected the information of the number and type of livestock to be relocated. As mentioned in Section 2.5, due to the prohibition of grazing, project participants would receive subsidies. Therefore, the project proponent and the County Forestry and Grassland Bureau will visit all project participants to investigate the project situation and issue subsidies based on this.

4) Determine whether Lands to which Livestock are Displaced are Identified or Unidentified

The grazing displacement management plan did not record the geographic location to which livestock under the control of project participants were relocated. Besides, the process of identifying the specific land areas to which livestock was relocated would be not feasible at reasonable cost (because project non-participants are scattered over wide distances and not contactable at reasonable cost). So, the land to which livestock grazing activity is displaced should be categorized as unidentified.

For unidentified land, assessment procedures mandate the use of conservative assumptions that do not underestimate the effects of grazing displacement on carbon stocks in unidentified lands, and in the case of land that remains unidentified after monitoring begins, conservative assumptions that do not underestimate leakage emissions caused by grazing displacement must also be used.

5) Define the Type of Land to which Grazing will be Relocated

Zhangye city covers an area of 4,087,400 square kilometers, and the available grassland area is 2,150,046 ha, accounting for 52.6% of the total area, and the area of forest land and cropland are small. In 2016, the County Forestry and Grassland Bureau designated a grazing area of 1,102,293 hectares, all of the specific land parcels are grassland. And the project participants grazed in the designated area under the guidance of the County Forestry and Grassland Bureau and grassland guardians. But the specific land parcels available for use by project participants may change from year to year, based on the actual situation of grassland, such as grass yield. So, the unidentified lands should be categorized as unidentified grassland.

Step 1: Estimate the area of grassland needed to sustain the population of livestock relocated to unidentified grasslands

The total area of unidentified grassland required to sustain the population of livestock relocated to unidentified grassland is to be calculated as:

$$Area_{GUI,t} = \frac{DMI_{GUI,t}}{ANPP_{GUI,REF}} \quad (27)$$

$$DMI_{GUI,t} = \sum_{l=1}^{L}\left(\frac{DMI_{day,l} \times P_{GUI,l,t}}{1000}\right) \times Days_{GUI,l,t} \quad (28)$$

Where:

$Area_{GUI,t}$	=	Area required to sustain the population of livestock displaced to unidentified grasslands in year t (ha)
$DMI_{GUI,t}$	=	Dry matter intake required to sustain the total number of livestock of all types l relocated to unidentified grasslands in year t (t dm)
$ANPP_{GUI,REF}$	=	Aboveground net primary productivity in the reference region that is the likely location of unidentified grasslands to which livestock are relocated (t dm/ha)
$DMI_{day,l}$	=	Daily dry matter intake requirement of each type of livestock l (kg dm/(head*day))
$P_{GUI,l,t}$	=	Population of livestock of each type relocated to unidentified grasslands in year t (head)
$Days_{GUI,l,t}$	=	Days that the population of each type of relocated livestock of type l graze in unidentified grassland in year t (days)

Step 2: Assess the risk of soil carbon loss due to overgrazing in unidentified grasslands

The calculation result of step 1 shows that, the area of unidentified grassland required to sustain the population of livestock relocated to unidentified grassland from 2017 to 2021 is 4,600, 50,451, 63,279, 63,279 and 63,279 ha respectively (See ER sheet for detail). So, the total area of unidentified grassland required to sustain the population of livestock relocated to unidentified grassland is at least 244,886 ha. And according to the PRA Report, the available grassland area is 2.15 million ha in Zhangye city, which is much higher than the displacement area.

According to the grassland livestock balance management measures of Zhangye City and the Agricultural standards of the people's Republic of China: Calculation of ranged carring capacity, the grassland utilization rate of the grassland type in our project is no more than 50%. So, the grazing displacement will not lead to consumption exceeding 50 percent of available biomass, and leakage due to soil carbon loss does not need to be accounted for.

Step 3: Estimate emissions from livestock displacement to unidentified grasslands

Step 3a: Estimate methane emissions from enteric fermentation by livestock displaced to unidentified grasslands

Calculate the leakage emissions due to enteric fermentation by livestock displaced to all unidentified grasslands outside the project area using:

$$LE_{GUI,CH_{4EF},t} = \frac{\sum_{l=1}^{L} P_{GUI,l,t} \times EF_l \times Days_{GUI,l,t} \times GWP_{CH_4}}{1000 \times 365} \quad (29)$$

Where:

$LE_{GUI,CH_{4EF},t}$	=	Leakage emissions in year t from enteric fermentation by livestock displaced to unidentified grasslands (t CO_2e)
$P_{GUI,l,t}$	=	Population of grazing livestock type l in year t displaced outside the project area to unidentified grasslands (head)
$Days_{GUI,l,t}$	=	Days in year t that livestock of each type l grazes on unidentified grassland (days)
GWP_{CH_4}	=	Global-warming potential of CH_4 (t CO_2e/t CH_4)
EF_l	=	Enteric CH_4 emission factor per head of livestock type l per year (kg CH_4/(ha*year))
l	=	Index of grazing livestock types

Step 3b: Estimate GHG emissions from manure management

Calculate the N_2O and CH_4 leakage emissions due to manure deposition on grassland caused by relocating the livestock to unidentified grasslands outside the project area using:

$$LE_{GUI_{MD,t}} = LE_{GUI,N2O_{MD,t}} + LE_{GUI,CH4_{MD,t}} \quad (30)$$

Where:

$LE_{GUI_{MD,t}}$	=	Leakage emissions from manure and urine deposited on unidentified grassland in year t (t CO_2e)
$LE_{GUI,N2O_{MD,t}}$	=	Leakage N_2O emissions from manure and urine deposited on unidentified grasslands in year t (t CO_2e)
$LE_{GUI,CH4_{MD,t}}$	=	Leakage CH_4 emissions from manure and urine deposited on unidentified grasslands in year t (t CO_2e)

$LE_{GUI,N2O_{MD,t}}$ is calculated as the sum of direct N2O emissions and indirect N2O emissions using:

$$LE_{GUI,N2O_{MD,t}} = GWP_{N2O} \times (LE_{GUI_D,N2O_{MD,t}} + LE_{GUI_{ID},N2O_{MD,t}}) \quad (31)$$

Where:

$LE_{GUI,N2O_{MD,t}}$	=	Leakage N_2O emission from manure and urine deposited on unidentified grasslands in year t (t CO_2e)
GWP_{N2O}	=	Global-warming potential of N_2O (t CO_2e/t N_2O)
$LE_{GUI_D,N2O_{MD,t}}$	=	Leakage direct N_2O emissions from manure and urine deposited on unidentified grasslands in year t (t N_2O)
$LE_{GUI_{ID},N2O_{MD,t}}$	=	Leakage indirect N_2O emissions from manure and urine deposited on unidentified grasslands in year t (t N_2O)

Leakage direct N_2O emission from manure and urine deposited on unidentified grasslands ($LE_{GUI_D,N2O_{MD,t}}$) is calculated using:

$$LE_{GUI_D,N2O_{MD,t}} = \sum_{l1=1}^{L1} F_{MD,GUI,t,l1} \times EF_{3,PRP,CPP} \times \frac{44}{28} \quad (32)$$

And/or

$$LE_{GUI_D,N2O_{MD,t}} = \sum_{l2=1}^{L2} F_{MD,GUI,t,l2} \times EF_{3,PRP,SO} \times \frac{44}{28} \quad (33)$$

Where:

$LE_{GUI_D,N2O_{MD,t}}$	=	Leakage direct N_2O emissions from manure and urine deposited on unidentified grasslands in year t (t N_2O)
$F_{MD,GUI,t,l1}$	=	Annual amount of nitrogen in cattle, poultry and pig manure and urine deposited on unidentified grasslands in year t, adjusted for volatilization as NH_3 and NO_x (t N)

$F_{MD,GUI,t,l2}$ = Annual amount of nitrogen in sheep and other animal manure and urine deposited on unidentified grasslands in year t, adjusted for volatilization as NH_3 and NO_x (t N)

$EF_{3,PRP,CPP}$ = N_2O emission factor for cattle (dairy, non-dairy and buffalo), poultry and pigs manure and urine deposited on grasslands (kg N_2O-N/kg N input)

$EF_{3,PRP,SO}$ = N_2O emission factor for sheep and other animals manure and urine deposited on grasslands (kg N_2O-N/kg N input)

$$F_{MD,GUI,t,l} = \frac{P_{GUI,l,t} \times W_l \times Nex_l \times H_{GUI,l,t} \times Days_{GUI,l,t} \times (1 - Frac_{GAS,MD,l})}{1000_a \times 24 \times 1000_b} \quad (34)$$

Where:

$F_{MD,GUI,t,l}$ = Annual amount of nitrogen in manure and urine deposited on unidentified grasslands by livestock type l, adjusted for volatilization as NH_3 and NO_x (t N)

$P_{GUI,l,t}$ = Population of grazing livestock type l in year t displaced outside the project area to unidentified grasslands (head)

W_l = Average weight of livestock l displaced to unidentified grasslands (kg/head)

Nex_l = Nitrogen excretion from livestock type l (kg N/(t animal mass*day))

1000_a = Conversion factor for nitrogen excretion (kg/t livestock mass) to nitrogen excretion (kg/kg livestock mass)

$H_{GUI,l,t}$ = Average grazing hours per day during grazing season for livestock of each type l displaced to unidentified grassland in year t (hours)

24 = Conversion day to hour

$Days_{GUI,l,t}$ = Grazing days in year t for livestock type l displaced to unidentified grasslands (days)

1000_b = Conversion factor for kg to t

$Frac_{GAS,MD,l}$ = Fraction of volatilization from manure and urine deposited by grazing animals as NH_3 and NO_x (kg N volatilized/kg of N deposited)

t = Year

l = Index of grazing livestock types

CH_4 emission from manure management due to displacement of livestock to unidentified grasslands is calculated using:

$$LE_{GUI,CH4_{MD,t}} = \frac{GWP_{CH4} \times \sum_{l=1}^{L} EF_{l,m} \times P_{GUI,l,t} \times H_{GUI,l,t} \times Days_{GUI,l,t}}{24 \times 365 \times 1000} \quad (35)$$

Where:

$LE_{GUI,CH4_{MD,t}}$	=	Leakage CH_4 emissions from manure and urine deposited on unidentified grasslands in year t (t CO_2e)
GWP_{CH4}	=	Global-warming potential of CH_4 (t CO_2e/t CH_4)
$EF_{l,m}$	=	CH_4 emission factor per head of livestock type l in manure management system m (kg CH_4/(head*yr)
$P_{GUI,l,t}$	=	Population of livestock type l in year t displaced to unidentified grasslands (head)
$H_{GUI,l,t}$	=	Average grazing hours per day during grazing season for livestock of each type l displaced to unidentified grassland in year t (hours)
$Days_{GUI,l,t}$	=	Grazing days in year t for livestock type l displaced to unidentified grasslands (days)
1000	=	Conversion factor for kg to t

Step 4: Calculate total leakage emissions from relocation of grazing to unidentified grasslands

Total leakage emissions from relocation of grazing to unidentified grasslands must be calculated as:

$$LE_{GUI,t} = LE_{OG,GUI,t} + LE_{GUI,CH4_{EF,t}} + LE_{GUI_{MD,t}} \quad (36)$$

Where:

$LE_{GUI,t}$	=	Leakage due to displacement of livestock to unidentified grasslands in year t (t CO_2e)
$LE_{OG,GUI,t}$	=	Leakage due to soil carbon loss resulting from overgrazing due to displacement of livestock to unidentified grasslands in year t (t CO_2e)
$LE_{GUI,CH4_{EF,t}}$	=	Leakage due to enteric fermentation by livestock displaced to unidentified grasslands in year t (t CO_2e)
$LE_{GUI_{MD,t}}$	=	Leakage due to N_2O and CH_4 emissions in manure and urine deposited on grasslands by livestock displaced to unidentified grasslands in year t (t CO_2e)

As described above, the grazing displacement will not lead to consumption exceeding 50 percent of available biomass, and leakage due to soil carbon loss does not need to be accounted for.

$$LE_t = LE_{GD,t} = LE_{GUI,t} = LE_{GUI,CH_{4EF},t} + LE_{GUI_{MD,t}}$$

$$= LE_{GUI,CH_{4EF},t} + LE_{GUI,N_20_{MD},t} + LE_{GUI,CH_{4MD},t}$$

$$= \frac{\sum_{l=1}^{L} P_{GUI,l,t} \times Days_{GUI,l,t} \times GWP_{CH_4} \times EF_l}{1000 \times 365} + GWP_{N_20} \times \left(\sum_{l1=1}^{L1} \frac{P_{GUI,l,t} \times W_l \times Nex_l \times H_{GUI,t} \times Days_{GUI,l,t} \times (1 - Frac_{GAS,MD})}{1000a \times 24 \times 1000b} \times EF_{3,PRP,CPP} \times \frac{44}{28} + \sum_{l2=1}^{L2} \frac{P_{GUI,l,t} \times W_l \times Nex_l \times H_{GUI,t} \times Days_{GUI,l,t} \times (1 - Frac_{GAS,MD})}{1000a \times 24 \times 1000b} \times EF_{3,PRP,SO} \times \frac{44}{28} + \sum_{l=1}^{L} F_{MD,GUI,t,l} \times Frac_{Gas,MD} \times EF_4 \times \frac{44}{28} \right) + \frac{GWP_{CH_4} \times \sum_{l=1}^{L} EF_{lm} \times P_{GUI,l,t} \times H_{GUI,l,t} \times Days_{GUI,l,t}}{1000 \times 24 \times 365} \quad (37)$$

=42,065 tCO_2e

During this monitoring period, the investigate parameters are summarized in the following table:

Table 3-8 The results of investigation

Parameter	2017	2018	2019	2020	2021	Unit
$P_{GUI,cattle,t}$	2,613	66,722	88,189	88,189	88,189	Head
$P_{GUI,sheep,t}$	56,215	464,279	564,324	564,324	564,324	Head
$Days_{GUI,cattle,t}$	138	138	138	138	138	Days
$Days_{GUI,sheep,t}$	138	138	138	138	138	Days
$H_{GUI,cattle,t}$	8	8	8	8	8	Hours
$H_{GUI,sheep,t}$	8	8	8	8	8	Hours
W_{cattle}	300	300	300	300	300	kg
W_{sheep}	45	45	45	45	45	kg

The total leakage emissions during the monitoring period is summarized in the following table, please refer to ER spreadsheet for detailed calculation.

Table 3-9 The Estimation of leakage emissions from relocation of grazing

Crediting period	$LE_{GUI,CH_{4EF},t}$	$LE_{GUI_{MD,t}}$	$LE_{GUI,t}$
Year	tCO_2e	tCO_2e	tCO_2e
	A	B	C=A+B
25/7/2017-31/12/2017	2,138	328	2,466
1/1/2018-2018/12/31	28,886	3,386	32,272
1/1/2019-2019/12/31	36,875	4,221	41,096
1/1/2020-2020/12/30	36,875	4,221	41,096
1/1/2021-31/12/2021	36,875	4,221	41,096
Total	**141,649**	**16,377**	**158,026**

3.2.4 Net GHG Emission Reductions and Removals

According to the methodology (VM0026/Version 1.1), the amount of emission reductions that can be issued as credits during the monitoring period should calculated using the follow equations:

$$ER_t = BE_b - PE_t - LE_t$$
(38)

$$VCU_t = ER_t - BC_t$$
(39)

$$BC_t = RR_t * (PRWP_t + PR_t - PRWP_b)$$
(40)

Where:

ER_t	=	Emission reductions in year t (t CO_2e)
BE_b	=	Baseline emissions and removals in year b (t CO_2e)
PE_t	=	Project emissions and removals in year t (t CO_2e)
LE_t	=	Leakage emissions in year t (t CO_2e)
VCU_t	=	Emission reductions eligible to be issued as VCUs in year t (t CO_2e)
BC_t	=	AFOLU buffer credits in year tm (t CO_2e)
RR_t	=	Non-permanence risk rating in year t (percent)
$PRWP_t$	=	Project average net change in carbon stocks of existing woody biomass for species j, in year t (t CO_2e)
PR_t	=	Project removals due to changes in SOC in year t (t CO_2e)
$PRWP_b$	=	Baseline removals from existing woody perennials in baseline year b (t CO_2e)

According to the Non-permanence Risk Report of the project, the non-permanence risk rating is determined as 10%. There is no woody biomass in this project, so the Project average net change in carbon stocks of existing woody biomass $PRWP_t$ and Baseline removals from existing woody perennials $PRWP_b$ are considered to be 0 tCO_2e.

So, during this monitoring period, BC_t is 296,099 tCO_2e, ER_t is 3,208,040 tCO_2e, and VCU_t is 2,911,941 tCO_2e. please refer to ER spreadsheet for detailed calculation.

Year	Baseline emissions (tCO_2e)	Project emissions (tCO_2e)	Leakage emissions (tCO_2e)	Project removals (t CO_2e)	Net GHG emission	Buffer (tCO_2e)	Net VCUs (tCO_2e)

					removals (tCO_2e)		
	A	B	C	D	E=A-B-C+D	F=D*10%	G=E-F
25/7/2017-31/12/2017	60,221	4,391	2,466	263,969	317,333	26,397	290,936
1/1/2018-2018/12/31	137,378	33,973	32,272	602,179	673,312	60,218	613,094
1/1/2019-2019/12/31	137,378	42,271	41,096	602,179	656,190	60,218	595,972
1/1/2020-2020/12/30	137,378	41,096	41,096	603,828	659,014	60,383	598,631
1/1/2021-31/12/2021	137,378	41,096	41,096	602,179	657,365	60,218	597,147
Total	**609,733**	**162,826**	**158,026**	**2,674,334**	**2,963,215**	**267,434**	**2,695,781**

3.3 Optional Criterion: Climate Change Adaptation Benefits

Not applicable.

3.3.1 Activities and/or processes implemented for Adaptation (GL1.3)

Not applicable.

4 COMMUNITY

4.1 Net Positive Community Impacts

4.1.1 Community Impacts (CM2.1)

To assess the actual changes in well-being resulting from the project activities for community groups during this monitoring period, the project owner established a monitoring team to conduct interviews for local communities affected by the project, all the affected groups as identified in the PD have been distributed with the questionnaires accordingly. Please refer to Section 4.3.1 for detailed results of the questionnaires.

The Community impacts for each group are summarized as follow:

Community Group	Local residents around project area
Impact(s)	Create 11,727 job opportunities (952 permanent jobs and 10,775 temporary jobs); Enhance capabilities of local residents and improve their household income and living level. Provide work training.
Type of Benefit/Cost/Risk	Predicted direct benefits

Change in Well-being	During the project implementation, about 11,727 local villagers participated in grass seeding and rodent control, and about 952 local herders were employed as guardians with an salary of 24,000 RMB. Over 54% of the employed local residents are minorities and 51.2% are women. The job opportunities provided by the project have increased local household income. The local Forestry and Grassland Bureau regularly provides local residents with training on rodent control, grassland fire prevention and sustainable management of grassland. 11,727 local residents participated in the training, and their abilities were also improved. Furthermore, the local government issued subsidies to the herders in the project area who implemented the prohibition of grazing. The project restored the degraded grassland and is beneficial to rebuild local pleasant and beautiful ecological system which has higher ecological aesthetic value of tour and sightseeing which improve their living environment.

Community Group	Local women
Impact(s)	Create 11,727 job opportunities, which is equally offered to local women and men; Empower women and build community capacity in gender equity.
Type of Benefit/Cost/Risk	Predicted direct benefits
Change in Well-being	Before the implementation of the project, women are more involved in subsistence activities like planting, protecting, or caring for seedlings and small trees, as well as in home orchards and public land. There is also evidence that when women receive income, positive welfare outcomes are more likely. In project, more than half of the local residents directly involved in the project are women. The project provided them with skills training in fence building and sustainable grassland management, which is conducive to keep gender equity.

Community Group	Local herders
Impact(s)	Provide graze skill training and enhance capabilities of local herders.

	Get extra allowance (2.17RMB/mu-3.35RMB/mu) and increase their household income.
Type of Benefit/Cost/Risk	Predicted direct benefits
Change in Well-being	Local herders live by grazing, so the grassland ecosystem will have a great impact on their traditional livelihood. Also overgrazing is the main factor leading to the continued degradation of the grassland ecosystem. The project restored the degraded grassland and guided them to graze reasonably. The project will not change the ownership of the project land, but some herders are affected by the project, due to grazing was managed scientifically after the implementation of the project. However, herders in the project area can receive corresponding subsidies according to the stakeholder consultation. In addition, after the reseeding, controlled grazing will be expected to be increased the productivity significantly due to the restoration of the grassland.

Community Group	Zhangye Forestry and Grassland Bureau County Forestry and Grassland Bureau
Impact(s)	Create local job opportunities, and improve the local ecological environment.
Type of Benefit/Cost/Risk	Predicted indirect benefits
Change in Well-being	Improve local economic and environmental situations.

4.1.2 Negative Community Impact Mitigation (CM2.2)

Zhangye City is located on the Hexi corridor. It is the Silk Road of China, the main road leading to the western regions and the main road and the first stop for the eastward spread of Buddhism. It has rich historical and cultural heritage since ancient times. In Zhangye City, there are beautiful colorful Danxia and MATI Temple grottoes, which attract a large number of tourists every year and greatly promote the spread of silk culture.

The project restored degraded grassland around Eastern Qilian Mountain by reseeding grass, rodent controlling and grazing management, which can maintain water and soil, promote grassland productivity and sustainable development of grasslands. In addition, due to the restoration of the grassland landscape, the higher ecological aesthetic value promoted the development of local tourism with an increase of 46.94%[21] of tourists in project zone, which greatly promote the spread of silk culture.

[21] According the data of Zhangye Municipal Bureau of culture, radio, television and Tourism from 2017-2020

According to the Chinese Grassland Law, the local government should carry out the construction of grassland fire prevention facilities, and once a fire disaster occurs, the local government should be responsible for relevant rescuing immediately. And the project proponent is experienced in local natural risk control and has established a Grassland Management Manual for the project which includes specific instruction in fire prevention.

As described in section 2.3.16, negative well-being impacts on community groups including fires, emergencies, and dangerous driving. During this monitoring period, the project proponent and County Forestry and Grassland Bureau provided relevant skill training for local herders, to strengthen the safety awareness of herders. Also, local herders the local forestry and grassland bureau was equipped with fire protection facilities, such as fire protection clothing, fire trucks, and fire water guns, etc., in addition, the local herders conducted daily patrols on the grasslands, which could prevent grassland fires. Furthermore, there is a first aid kit on the grassland patrol vehicle to prevent emergencies.

This can be alleviated through technical and awareness training to local herders/communities, strengthening patrolling and monitoring.

Therefore, all the negative well-being impacts have been mitigated.

4.1.3 Net Positive Community Well-Being (CM2.3, GL1.4)

As summarized in Section 4.1.1, the expected community impacts are all benefit, no potential cost or risk, therefore the net well-being impacts of the project are positive for all identified community groups compared with their anticipated well-being conditions under the without-project land use scenario.

Restored degraded grassland and improve living environment of local residents

The implementation of the project will restore 261,059.80 ha of degraded grassland of Zhangye city, and prevented continued degradation of grassland, which is beneficial to rebuild local pleasant and beautiful ecological system which has higher ecological aesthetic value of tour and sightseeing which improve their living environment.

Promote local employment and improve the living standards of local residents

As described in section 4.1.1, at the project start, grazing was the traditional livelihood for local residents, and there were not much other job opportunities offered. The project provided short-term work such as fence building and grass seeding but also the long-term work such as the grassland guardians for local residents around project area. Approximately 11,727 local herders were employed as grassland guardians, with an annual salary of 24,000 RMB (3758.4 USD)/year per person, which will increase their household income. In addition, the development of local tourism due to the higher ecological aesthetic value and the government's additional subsidies to residents in the project area can increase their income.

Provide equal employment opportunities for local women, maintain gender equality.

There is evidence that when women receive income, positive welfare outcomes are more likely: gender equity can thus be key to wider poverty and equity impacts. Generally, women are more involved in subsistence activities like planting, protecting, or caring for seedlings and small trees, as well as in home orchards and public land. The project provided them job opportunities, which is equally offered to local women and men. In fact, more than half of the local residents directly involved in the project are women. which makes women gain more professional identity and higher happiness.

Accelerate the exchange and collision of ethnic and carry forward traditional culture.

The local residents employed by the project are mostly belong to ethnic minorities. The implementation of the project requires full communication among stakeholders on a regular basis. At the same time, it also attracts tourists from all parties, which greatly promotes the cultural collision of all ethnic groups and is conducive to the dissemination of ethnic minorities and grassland culture.

Figure 4-1 Grassland Tourism Culture Festival

Promote technical capability of local herders.

There is a Grassland monitoring technical manual provided for each employee which includes technical advice for their work, and all the workers were offered the technical training immediately once they were hired. Such skills and knowledge include are useful for grassland management, such as fire prevention and forage supplementary sowing technology. These technical manuals were distributed to each household in the local villages, including the villagers who haven't participated in the project.

Besides the training on technical skills of grass planting, local workers were trained on relevant skills for their future livelihood, such as sustainable grassland management. These skills will benefit the long-term development of the local communities who participate in the project.

4.1.4 Protection of High Conservation Values (CM2.4)

No HCVs was identified related to community well-being in the project zone thus none of the HCVs related to community well-being will be negatively affected by the project.

4.2 Other Stakeholder Impacts

4.2.1 Mitigation of Negative Impacts on Other Stakeholders (CM3.2)

There are no negative well-being impacts on other stakeholders during this monitoring period.

4.2.2 Net Impacts on Other Stakeholders (CM3.3)

The project provides valued experience of sustainable grassland management and carbon trading to other stakeholder, which in some way could encourage more followers to engage in similar projects for sustainable development. So, the project activities are not anticipated to result in net negative impacts on the well-being of other stakeholders.

4.3 Community Impact Monitoring

4.3.1 Community Monitoring Plan (CM4.1, CM4.2, GL1.4, GL2.2, GL2.3, GL2.5)

To in-depth track the social-economic changes resulted from the project activities in local communities and households, and understand issues raised and difficulties encountered during the project implementation, as well as their opinions and comments on the project activities, so as to adjust and improve the project activities in a timely manner, a PRA process has been conducted after initial monitoring, as described below.

Procedures:

a) Establishing PRA team: The team sets up to conduct the PRA process, which consists of social experts, project officers, local government officials and technical staff with various background (grassland, sociology and ecology) from county forest bureau;

b) Developing SOPs for the field PRA process;

c) Training: A training workshop has been held for discussing and training of PRA teams in order to ensure all PRA members fully understand the purposes, contents, procedures and specific methods of the PRA field survey;

d) Preparation: Developing detail PRA field survey plan including responsibility of each member of PRA team; and contacting with relevant project village collectives, towns/townships and local NGOs and informing them PRA plan.

e) PRA survey: conducting PRA survey following SOPs.

Figure 4-2 Training of PRA teams

Methods:

a) Stakeholder meeting: A meeting of stakeholder representatives has held in Forestry and Grass Bureau of Zhangye city on 29-March-2021. The general agenda are:

(i) Introducing PRA team members and the purpose, procedures, methods and time schedules of the PRA process;

(ii) Explaining the way of villagers' participation;

(iii) Collecting information regarding the project progress, social-economic and environmental benefits shared from the projects, existing problems/difficulties encountered by local communities during the project implementation, as well as comments and suggestions on improvement of the project.

Figure 4-3 Stakeholder meeting

b) Semi-structured interviews: This includes representatives' interview, famers/herders' interview and group interview

(i) Interviewing of representatives: including villager leaders, distinguished villagers, elder villagers and head of ethnic minority.

(ii) Interviewing of household: Some farmer households have been selected for the interview. The interviewed households shall cover rich household, poor household, new inhabitant household, etc.

(iii) Group interview: Villagers are grouped based on gender, age classes or land use types. The group interviews were conducted together with village meeting.

c) Questionnaire: Questionnaire forms have been developed and distributed among different stakeholders, including farmer households, village committees, herders, township governments and forestry and grassland bureau.

d) Evidence document collection: Collect evidence document from local forestry and grassland bureaus, herders and other stakeholders, such as contracts, payment certificates and training records, etc.

Figure 4-4 Household questionnaire survey

To assess the actual changes in well-being resulting from the project activities for community groups during this monitoring period, the project owner established a monitoring team to conduct interviews and questionnaires for local communities affected by the project.

The operation and management structure of the monitoring team has been shown in Figure 3-1 in Section 3.1.3 above, and the responsibilities of each role in the team structure are:

- Monitoring manager has the overall management responsibility, especially supervising the implementation of the monitoring plan, and assigning each member of the monitoring team their individual responsibility during the monitoring;

- Monitoring group conducts the interview and questionnaires for communities particularly, and collects all the original evidences and data and make relevant records;

- Auditing group performs internal verification of the measurement, reviews all the monitoring records and documents, crosschecks evidence and make summary statistics during each verification period.

- Expert group provide advises to monitoring manager to make sure the monitoring activities are in line with relevant requirement, and the expert group also review the monitoring results before each verification, in case any non-conformances founded, expert group will ask the monitoring team to take necessary compensation measures (redo some of the monitoring activities or statistics) until all the non-conformances been corrected.

A Monitoring Manual has been provided to each member of the monitoring team with a specific explanation to make sure they fully understand all the monitoring process and issues concerned.

From 16-September-2021 to 1-October-2021, the monitoring team has distributed 80 questionnaires for the representatives of local residents which is within the project zone and collect all the relevant information by simple interview with the representatives in person when distributing the questionnaires. Totally 75 of the questionnaires were collected with valid answers. The representatives covered different villages and different community groups, such as local herders, rural cooperatives, and especially rural women.

The following key variables has been monitored during each verification of the project:

Variable	Total number of community members who are expected to have improved skills and/or knowledge resulting from training provided as part of project activities
Monitoring methods to be applied	Training records Questionnaire and interview
Frequency of monitoring/recording	Before every verification event
Affected community groups	Local residents, local herders, local minorities, grassland guardians

Purpose of monitoring	Evaluate the technical improvement resulting from the project
Results of monitoring	During this monitoring period, the project proponent and the Zhangye city Forestry and Grassland Bureau provided training on rodent control, fire prevention and sustainable grassland management for 11,727 local herders in 2017, 2019 and 2020. 90% of the representatives thought there was an improvement of their capability and technical skills
Change in well-being	Improve technical skills of grassland sustainable management

Variable	Number of female community members who are expected to have improved skills and/or knowledge resulting from training as part of project activities
Monitoring methods to be applied	Training records Questionnaire and interview
Frequency of monitoring/recording	Before every verification event
Affected community groups	Local residents, local herders, local minorities, grassland guardians
Purpose of monitoring	Evaluate the technical improvement resulting from the project
Results of monitoring	During this monitoring period, the project proponent and the Zangye city Forestry and Grassland Bureau provided training on rodent control, fire prevention and sustainable grassland management for 6,039 local women in 2017, 2019 and 2020. 90% of the representatives thought there was an improvement of their capability and technical skills
Change in well-being	Improve technical skills of grassland sustainable management

Variable	Total number of people expected to be employed in project activities, expressed as number of full-time employees
Monitoring methods to be applied	Working contracts and payment records
Frequency of monitoring/recording	Before every verification event
Affected community groups	Local women, local herders, local minorities, grassland guardians

Purpose of monitoring	Evaluate the community benefit resulting from the project
Results of monitoring	According to the payment records, the working hours of local resident was1,904,000 hours per year during this monitoring period, and the legal working hours is 2,000 hours per year according to Labour Law of China. Therefore, total number of people employed in the project expressed as number of full-time employees is 952 (1,904,000/2,000 = 952).
Change in well-being	Increase living level

Variable	Number of women expected to be employed as a result of project activities, expressed as number of full-time employees
Monitoring methods to be applied	Working contracts and payment records
Frequency of monitoring/recording	Before every verification event
Affected community groups	Local women, local herders, local minorities, grassland guardians
Purpose of monitoring	Evaluate the community benefit resulting from the project
Results of monitoring	According to the payment records, the working hours of local women was 986,000 hours per year during this monitoring period, and the legal working hours is 2,000 hours per year according to Labour Law of China. Therefore, total number of people employed in the project expressed as number of full-time employees is 493 (986,000/2,000 = 493).
Change in well-being	Increase living level

Variable	Total number of people expected to have improved livelihoods or income generated as a result of project activities
Monitoring methods to be applied	Working contracts and payment records Questionnaire and interview Training records
Frequency of monitoring/recording	Before every verification event
Affected community groups	Local women, local herders, local minorities, grassland guardians

Purpose of monitoring	Evaluate the change of livelihoods due to the implementation of the project
Results of monitoring	The project provided 11,727 local residents with training and job opportunities, improved their abilities, also the project guided herders to graze reasonably, which improved grazing productivity and increased their household incomes, and improved their livelihoods.
Change in well-being	Improved their abilities and household income

Variable	Number of women expected to have improved livelihoods or income generated as a result of project activities
Monitoring methods to be applied	Working contracts and payment records Questionnaire and interview Training records
Frequency of monitoring/recording	Before every verification event
Affected community groups	Local women, local herders, local minorities, grassland guardians
Purpose of monitoring	Evaluate the change of livelihoods due to the implementation of the project
Results of monitoring	The project provided 6,035 local women with training and job opportunities, improved their abilities, also the project guided herders to graze reasonably, which improved grazing productivity and increased their household incomes, and improved their livelihoods.
Change in well-being	Improved their abilities and household income

Variable	Total number of community members whose well-being is expected to improve as a result of project activities
Monitoring methods to be applied	Working contracts and payment records Questionnaire and interview Training records
Frequency of monitoring/recording	Before every verification event
Affected community groups	Local women, local herders, local minorities, grassland guardians

Purpose of monitoring	Evaluate the change of well-being due to the implementation of the project
Results of monitoring	The project provided 11,727 local residents with training and job opportunities, and improve local ecological environment.
Change in well-being	Increase job and training opportunities and improve local ecological environment

Variable	Number of women whose well-being is expected to improve as a result of project activities
Monitoring methods to be applied	Working contracts and payment records Questionnaire and interview Training records
Frequency of monitoring/recording	Before every verification event
Affected community groups	Local women, local herders, local minorities, grassland guardians
Purpose of monitoring	Evaluate the change of well-being due to the implementation of the project
Results of monitoring	The project provided 6,039 local women with training and job opportunities, and improve local ecological environment.
Change in well-being	Increase job and train opportunities and improve local ecological environment

Variable	The number of herdsmen subsidized by the government due to the implementation of the project and the amount of subsidy.
Monitoring methods to be applied	Questionnaire and interview Government subsidy records
Frequency of monitoring/recording	Before every verification event
Affected community groups	Local herders, local minority
Purpose of monitoring	Evaluate the change of income due to the implementation of the project

Results of monitoring	the local government issued subsidies (2.17RMB/mu-3.35RMB/mu) in accord to the grassland type for the herdsman (both men and women) who implemented the sustainable management of the grasslands.
Change in well-being	Improved household income

Variable	Number of tourists received in the project area each year
Monitoring methods to be applied	Announcement of Zhangye Municipal Bureau of culture, radio, television and Tourism
Frequency of monitoring/recording	Annually
Affected community groups	Local resident, local minority, collectives
Purpose of monitoring	Evaluate the change of landscape value due to the implementation of the project
Results of monitoring	According to data of Zhangye Municipal Bureau of culture, radio, television and Tourism, from 2017 to 2019, the number of tourists increased significantly, nearly doubled from 20.30 million to 42. 40 million. In 2020, affected by the COVID-19, the number of tourists began to decline significantly. Totally from 2017 to 2020, there an increase of 46.94% of tourists in project zone.
Change in well-being	Improved household income[22]

Variable	Area of grassland restored from degraded grasslands
Monitoring methods to be applied	Project records
Frequency of monitoring/recording	Before every verification event
Affected community groups	Zhangye Forestry and Grassland Bureau County Forestry and Grassland Burea
Purpose of monitoring	Evaluate the environmental improvement resulting from the project

[22] http://www.zhangye.gov.cn/dzdt/xqdt/snx_2548/201908/t20190823_312724.html

Results of monitoring	During this monitoring period, totally 261,059.80 ha of degraded grassands in Zhangye city were planted with native grass species, the local ecological environment was improved.
Change in well-being	Improve local ecological environment of grassland by restoring the degraded grassland.

Variable	Number of minorities benefiting from project activities
Monitoring methods to be applied	Working contracts and payment records Questionnaire and interview
Frequency of monitoring/recording	Before every verification event
Affected community groups	Local minority
Purpose of monitoring	Evaluate the conservation of minority cultural resulting from the project
Results of monitoring	The project provided 11,727 local residents with training and job opportunities, and over 54% of the employed local residents are minorities. The community groups were barely active before the project started, and the project provided opportunities for local minorities especially the Yugurs (About 9,717 people) in different communities to work together and organize special community cultural activities during their traditional holidays, while the other members of the community are also invited. According to the questionnaire, all local minorities thought the project increased community interaction, and their social connection with other community members could indirectly promoted the conservation of traditional and silk culture.
Change in well-being	Benefit to conservation of local traditional and silk culture

4.3.2 Monitoring Plan Dissemination (CM4.3)

The monitoring plan and results have been published on VCS and CCB website which can be easily download by stakeholders. Hard copies of the monitoring plan have been distributed among local stakeholders by project proponent and grassland guardians. At the same time, public notice boards have been used to publicize information regarding how to access to the monitoring plan through internet. Technical staff from project proponent have also explained the monitoring plan to local herders. Also, a contact person with phone number was published in case any stakeholders want to directly contact the project proponent and raise opinions.

For each verification, the monitoring team will summarize all the comments received from stakeholders and corresponding responses regarding the monitoring plan and results, which will be published on VCS and CCB website along with the monitoring report for each monitoring period.

During this monitoring period, no comments on the monitoring plan and results received yet.

4.4 Optional Criterion: Exceptional Community Benefits

Not applicable.

4.4.1 Short-term and Long-term Community Benefits (GL2.2)

Not applicable.

4.4.2 Marginalized and/or Vulnerable Community Groups (GL2.4)

Not applicable.

4.4.3 Net Impacts on Women (GL2.5)

Not applicable.

4.4.4 Benefit Sharing Mechanisms (GL2.6)

Not applicable.

4.4.5 Governance and Implementation Structures (GL2.8)

Not applicable.

4.4.6 Smallholders/Community Members Capacity Development (GL2.9)

Not applicable.

5 BIODIVERSITY

5.1 Net Positive Biodiversity Impacts

5.1.1 Biodiversity Changes (B2.1)

Change in Biodiversity	Grassland productivity of the project area
Monitored Change	Actual direct increase
Justification of Change	he behaviour of reseeding grass could restore vegetation of the degraded grassland. The restored grassland is more suitable for the survival of animals and will increase the biodiversity of the project area.

Change in Biodiversity	Number of grass species in the project area
Monitored Change	Actual direct increase
Justification of Change	Six native grass species (see Project Design Report) have been planted in project area which will be maintained under long-term management.

Change in Biodiversity	Threats to endangered animals
Monitored Change	Predicted indirect positive impact
Justification of Change	The project prevented the continued degradation of the local grassland ecosystem and increased the natural habitats for the endangered animals, so the threats to endangered animals will be reduced as a result of the project activities.

5.1.2 Mitigation Actions (B2.3)

The main measure of the project is rotational grazing and rest grazing through building grassland fences and planted grass seeds on the degraded grassland. Through scientific and sustainable management of grazing, relevant training about technical skills, scientific and effective management plan, alleviate soil desertification and restore grassland vegetation to improve soil carbon storage and local biodiversity. The management team are experienced with sustainable grassland management as mentioned in Section 2.4.2 and has established an integrated management system for implementation of the project, including rodent control, fire prevention and technical training of employees, which will minimize the intensity and periodicity of required interventions. Also, the implementation of the project has improved the ecological environment of the Eastern Qilian Mountain, increased the biodiversity and provided more habitats for threatened species. In addition, all grass species are native species, and no invasive species will be introduced.

During this monitoring period, implementation of this project will not decrease biodiversity of project sites, thus no mitigation measures are required.

5.1.3 Net Positive Biodiversity Impacts (B2.2, GL1.4)

Without the project, the project area will continue degraded with much threat to local climate and biodiversity condition. And the main object of the project is to restore the degraded grassland ecosystem, by planting with mix species of native grass, therefore the net with-project change of biodiversity is positive.

First, there are 6 native species of grass planted in this project and the mix planting of the species will have more positive impacts on biodiversity according to relevant research. In addition, the management measures of rotational grazing and rest grazing will alleviate the grazing pressure, which is conducive to the restoration of grassland vegetation.

Second, through sustainable grassland management, including rodent control, grassland fire prevention and reasonable grazing guidance, the degraded grassland ecosystem is gradually

restored. This will make sure the project can bring net biodiversity benefit compared to the with-out project scenario.

Third, the implementation of the project can improve grassland productivity and increase the coverage which is beneficial of water conservation, reduce drought and flood risk, promote soil nutrient cycle, improve local micro-climate and other ecological environment. Therefore, the population of animals will increase due to the restoration of the habitat.

There are 21 national protected species identified in the project zone, including 2 of first level and 19 of secondary level. Seven of them are globally endangered species according to IUCN, who would benefit from reduced threats as a result of the project activities.

Table 5-1 List of rare and endangered animals

No.	Species	national protected level	CITES appendix	IUCN level
1	Tibetan Snowcock	II	I	LC
2	Himalayan Snowcock	II		LC
3	White-eyed Pochard			NT
4	Red-crested Pochard			LC
5	Great Crested Grebe			LC
6	Black-winged Stilt			LC
7	Kentish Plover			LC
8	Pacific Golden Plover			LC
9	Northern Lapwing			NT
10	Green Sandpiper			LC
11	Spotted Redshank			LC
12	Common Sandpiper			LC
13	Common Greenshank			LC
14	Eurasian Curlew			NT
15	Ruddy Turnstone			LC
16	Temminck's Stint			LC
17	Black-tailed Godwit			NT
18	Common Black-headed Gull			LC
19	Pallas's Gull			LC
20	Common Tern			LC
21	Black Stork	I	II	LC
22	Northern Harrier	II	II	LC
23	Steppe Eagle	II	II	LC
24	Golden Eagle	I	II	LC
25	Upland Buzzard	II	II	LC
26	Common Buzzard	II	II	LC
27	Long-legged Buzzard	II	II	LC
28	Himalayan Griffon	II	II	NT
29	Black-eared Kite	II	II	LC
30	Lesser Kestrel	II	II	LC
31	Saker	II	II	EN

32	Saker Falcon	II	II	LC
33	Eurasian Hobby	II	II	LC
34	Chinese Grey Shrike			LC
35	Large-billed Crow			LC
36	Red-billed Chough			LC
37	White-throated Dipper			LC
38	Kessler's Thrush			LC
39	White-capped Water-Redstart			LC
40	Desert Wheatear			LC
41	Black Redstart			LC
42	Daurian Redstart			LC
43	Rufous-breasted Accentor			LC
44	Eurasian Tree Sparrow			LC
45	White-rumped Snowfinch			LC
46	White Wagtail			LC
47	Yellow Wagtail			LC
48	Meadow Pipit			NT
49	Water Pipit			LC
50	Tawny Pipit			LC
51	White-browed Rosefinch			LC
52	Streaked Rosefinch			LC
53	Pallas's Bunting			LC

5.1.4 High Conservation Values Protected (B2.4)

No HCVs was identified related to biodiversity in the project zone thus no HCVs related to biodiversity are negatively affected by the project.

5.1.5 Invasive Species (B2.5)

All the grass are native species and no invasive species were introduced into any area affected by the project.

5.1.6 Impacts of Non-native Species (B2.6)

No non-native species were used in the project zone.

5.1.7 GMO Exclusion (B2.7)

No GMOs were used to generate GHG emissions reductions or removals.

5.1.8 Inputs Justification (B2.8)

Name	Chemical pesticides

Justification of Use	The chemical pesticides are allowed to be used only if there is a serious disease problem erupted in the project area, and the pesticides will be used in accordance with the National Pesticides Policy.
Adverse Effect	During this monitoring period, no serious disease disaster occurred, thus no chemical pesticides were used.

Name	Biological control agents
Justification of Use	Upon routine overseeing, the pest would be treated by biological control (building eagle's nest to Prevent Rodent) according to local Pest Control and Prevention Policy.
Adverse Effect	The biological control agents are natural enemy of pest which are native species and have no adverse effect on local environment and communities. During this monitoring period, eagle's nests were built in the project area for rodent control.

5.2 Offsite Biodiversity Impacts

5.2.1 Negative Offsite Biodiversity Impacts (B3.1) and Mitigation Actions (B3.2)

The project activities increased the area of the habitat, and improve the habitats' quality, only positive biodiversity impacts can be identified. Therefore, there are no potential negative offsite impacts on biodiversity.

5.2.2 Net Offsite Biodiversity Benefits (B3.3)

As described above, there are no potential negative offsite impacts on biodiversity, the net effect of the project on biodiversity is positive.

5.3 Biodiversity Impact Monitoring

5.3.1 Biodiversity Monitoring Plan (B4.1, B4.2, GL1.4, GL3.4)

As shown in Figure 3-1, the project owner established a monitoring team to conduct biodiversity monitoring. The responsibilities of each role in the team structure are:

- Office manager has the overall management responsibility, especially supervising the implementation of the monitoring plan, and assigning each member of the monitoring team their individual responsibility during the monitoring.

- Expert group provides professional technique related to monitoring activities to make sure all the monitoring activities meet the requirement of VCS and CCB standards.

- Monitoring group conducts the following monitoring process, measures the required parameters of the project as listed in the above Section 3.3.2 particularly, and collects all the original evidence and data and make relevant records.

- Auditing group performs internal verification of the measurement, reviews all the monitoring records and documents, crosschecks evidence and calculates emission removals during each verification period.

A Monitoring Manual has been provided to each member of the monitoring team with a specific explanation to make sure they fully understand all the monitoring process and issues concerned.

As mentioned in Section 2.1.11 of PD, the main measure of the project is rotational grazing and rest grazing through building grassland fences, and reseeding the grass the grassland is grazed area by area and used in turn. The other measures are reseeding *Elymus nutans, Elymus sibiricus, Poa pratensis, Agropyron cristatum, Festuca rubra, Artemisia sphaerocephala* on the degraded grassland. And based on the analysis in Section 2.1.18 of PD, the risks of fire, rodents, pests, overgrazing and frost might threat the aim of the project and need to be intervened.

According to SBIA Manual-Part 3, the traditional monitoring protocols often require significant inputs of time, money, and scientific expertise, which are hard to sustain over long periods, while providing few benefits to local communities[23]. So-called "community-based monitoring" would appear to be a good fit for many carbon projects, its focus on practical issues of sustainability, such monitoring also has the potential to interact in a positive way with the social component of carbon projects. The involvement of local residents in monitoring programs can improve methods and results by incorporating their knowledge of the region's biodiversity into protocols and can improve data quality by allowing programs to collect data year-round rather than during occasional expert visits. Likewise, local involvement in monitoring can empower communities by helping instil a greater sense of ownership of and responsibility for the biodiversity objectives of a project. Following the guidelines of SBIA Manual, the project chose multiple indicators and Pressure, State, and Response (PSR) indicators for the monitoring of biodiversity, while productivity and animals were both involved to be monitored and the threaten and risk factors such as fire and disease are included, therefore the monitoring indicators should be considered as reasonable, considering the balance of high-quality data, low costs, regular measurements, and community participation.

According to SBIA-Part 3, three types of monitoring indicators were chosen, including Pressure, State, and Response (PSR). Since natural systems are extremely complex, and even variables that are carefully chosen to reflect the health of a system will sometimes fluctuate for reasons unrelated to the project. In the absence of direct population or occupancy measures, measurement of reduced threats may be used as evidence of benefit. Usually, the abundance of endangered animals can accurately reflect the status of the local ecosystem. The greater the number of endangered animals, indicating the better the ecological environment in the region. And considering the cost efficiency, the indicators that can be monitored with relative ease and reflect local conditions should be chosen. Therefore, the project chooses "threats to endangered animals" and as indicator to monitor the project's impact on animals which should be appropriate for an sustainable grassland management project. Also, the indicator "threats to endangered animals" are

[23] Gardner, T. 2010. Monitoring forest biodiversity: Improving conservation through ecologically responsible management. Earthscan Ltd., London. 360 pages.

used to monitor the quantity and quality of grassland in the project area (a state indicator), together with other indicators ("grassland productivity" and "species of vegetation"), therefore the general population of local biodiversity could be reflected by the overall monitoring results of the multiple indicators.

During this monitoring period, the State Variables of the biodiversity have been monitored in both winter (3-November-2020 to 7-December-2020) and summer (25-May-2021 to 20-June-2021) season, and the Pressure Variables and Response Variables of the biodiversity have been monitored annually.

The detailed monitoring results for biodiversity are listed in the following table:

Table 5-2 Monitoring results for biodiversity during this monitoring period

Indicator type	Description	Monitoring indicator	Indicator unit	Monitoring method	Monitoring frequency	Monitoring results
State variables	The quantity and quality of grassland in the project area	Grassland productivity	Kg	Sample plots of the same size are installed in different strata to monitor the coverage. Plot size is set to be a rectangle land with 1m×1m ($1m^2$). Calculate grassland productivity by estimating aboveground biomass in quadrat	Before every verification	Through fence construction, the grassland vegetation coverage will be increased by 5 percentage points, and the grassland productivity will be increased by 10 kg per mu; Grassland productivity increased by 20 kg / mu per mu through supplementary sowing of forage
		Grass species in the project area	/	Sample plots have been set to monitor the species of vegetation which adopt the common quadrat size. Plot size is set to be a rectangle land with 1m*1m ($1m^2$).	Before every verification	*Elymus nutans, Elymus sibiricus, Poa pratensis, Agropyron cristatum, Festuca rubra, Artemisia sphaerocephala*
		Protected area for endangered animals;	ha	Check the Project Design Report, construction record and acceptance report, and visit the project land. Monitor the restored area of degraded grasslands in the project zone.	Once every year	261,059.80 ha of degraded grasslands were reseeding with 6 grass species, and the grassland productivity increased about 10-20Kg/mu.
Pressure variables	The frequency or intensity of	Number of fires occurred	/	Recorded by grassland guardians and confirmed by local Forest and Grass Bureau	Once every year	0

	anthropogenic impacts that are directly harmful to biodiversity in the project zone	Effected grassland area suffered rodents and pests	ha	Recorded by grassland guardians and confirmed by local Forest and Grass Bureau	Once every year	0
		Overgrazing	ha	Recorded by grassland guardians and confirmed by local Forest and Grass Bureau	Once every year	0
		Fertilizer and Chemical pesticides	t	Recorded by grassland guardians and confirmed by local Forest and Grass Bureau	Once every year	0
Response variables	The frequency or intensity of project interventions relevant to biodiversity	Grassland area under prevention control from fires	ha	Recorded by grassland guardians and confirmed by local Forest and Grass Bureau	Once every year	261,059.80
		Grassland area under prevention control from rodents and pests	ha	Recorded by grassland guardians and confirmed by local Forest and Grass Bureau	Once every year	261,059.80
		Project area of sustainable grassland management	ha	Recorded by grassland guardians and confirmed by local Forest and Grass Bureau	Once every year	261,059.80
		Project area for restoration of degraded grassland	ha	Recorded by grassland guardians and confirmed by local Forest and Grass Bureau	Once every year	261,059.80

5.3.2 Biodiversity Monitoring Plan Dissemination (B4.3)

The monitoring plan of biodiversity has been published on VCS and CCB website which can be easily download by stakeholders. Hard copies of the monitoring plan have been distributed among local stakeholders by project proponent and the grassland guarders. At the same time, public notice boards have been used to publicize information regarding how to access to the monitoring plan through internet. Technical staff from project proponent have also explained the monitoring plan to local herders. Also, a contact person with phone number was published in case any stakeholders want to directly contact the project proponent and raise opinions.

For each verification, the monitoring team will summarize all the comments received from stakeholders and corresponding responses regarding the monitoring plan and results, which will be published on VCS and CCB website along with the monitoring report for each monitoring period.

During this monitoring period, no comments on the monitoring plan and results received yet.

5.4 Optional Criterion: Exceptional Biodiversity Benefits

Not applicable.

5.4.1 Trigger Species Population Trends (GL3.3)

Not applicable.

6 ADDITIONAL PROJECT IMPLEMENTATION INFORMATION

Not applicable.

7 ADDITONAL PROJECT IMPACT INFORMATION

Not applicable.