



**Verified Carbon
Standard**

QIANTAI ADJUSTED WATER MANAGEMENT IN RICE CULTIVATION



Document Prepared by Shanghai Libra Investment & Management Co., Ltd

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1 PROJECT DETAILS

1.1 Summary Description of the Project

The project changing from continuously flooded to intermittent flooded condition during rice cultivation is conducted in Qianshan City and Taihu County within the Anqing City, Anhui Province of China. Qianshan City and Taihu County are all prefecture-level cities of Anqing City, which are located in the southwest of Anhui with a total acreage of 12,997 ha for double-cropping rice. Without the implementation of this project, which provides ditches to conduct intermittently flooded method, the backward continuously flooded method would be continued, so the scenario that rice was cultivated by continuously flooded method is the baseline scenario. Since the organic matter in rice soil under flooded condition can emit a large amount of methane (CH₄) because of anaerobic decomposition, the intermittent flooded method is more beneficial to water conservation, production increase and methane emission removal than the continuously flooded.

Within the project boundary, every farmers' household owning the paddy fields is regarded as an isolate unit. With the project implementation, the cement ditches, reservoirs and relevant technical training are provided for these farmers to help them conduct the intermittent flooded water regime during rice cultivation, which replaces the traditional continuously flooded method. During rice cultivation, controllable irrigation and drainage according to rice growth requirements can not only save water resources, but also reduce methane emission from soil organic matter under anaerobic conditions (in the flooded state). In this case, the CH₄ emission can be declined by an average of 48%¹. Hence, with the proposed project activity, an estimated amount of GHG emission reduction 4.12 tCO₂e/ha for double-cropping rice is expected.

The implementation of the project is expected to reduce the GHG emissions amounting to 374,584 tCO₂e in the first seven-year period, with an average annual GHG emission removal of 53,512 tCO₂e.

This project aims to:

- Sequester greenhouse gas and mitigate climate changes;
- Increase the rice productivity resulting in higher living standard of local farmers;
- Provide more job opportunities, especially women workers;
- Invest a part of profit to improve the local medical care;
- Use a proportion of benefits to improve the local children's education.

¹ Dr. Reiner Wassmann (2016). Coordinator, Climate Change Research. International Rice Research Institute. Available from: r.wassmann@irri.org

1.2 Sectoral Scope and Project Type

The project is developed under VCS scope 14 “Agriculture, Forestry and Other Land Use (AFOLU)” with an activity category of Improved Cropland Management (ICM) under Agricultural Land Management (ALM). Although the AMS-III.AU methodology applied is approved under sectoral scope 15 (agriculture) of CDM, this project is categorized as sectoral scope 14 (AFOLU) under Verra. This is in accordance with the definitions of eligible AFOLU project categories set out in Appendix 1 of the VCS Standard, 4.1 and can be demonstrated from the following three points.

Requirements	Evidence
1. Eligible ALM activities are those that reduce net GHG emissions on croplands and grasslands by increasing carbon stocks and woody biomass and/or decreasing CO ₂ , N ₂ O and/or CH ₄ emissions from soils.	This project reduces CH ₄ emissions on croplands by replacing intermittent flooded method by continuously flooded method. So, this project can be categorized as eligible ALM activity.
2. The project area shall not be cleared of native ecosystems within the 10-year period prior to the project start date.	The project area has not been cleared of native ecosystems since 2005 ² .
3. Eligible ALM activities include: Improved Cropland Management (ICM): This category includes practices that demonstrably reduce net GHG emissions of cropland systems by increasing soil carbon stocks, reducing soil N ₂ O emissions, and/or reducing CH ₄ emissions.	This project practices intermittent flooded method on croplands, which is demonstrated that can reduce net GHG emissions by reducing CH ₄ emissions. So, this project is an eligible ICM activity.

The project is not a grouped project.

1.3 Project Eligibility

According to the Section 2.1.1 of VCS Standard version 4.1, this project activity meets two of the scopes of the VCS program: 1) The six Kyoto Protocol greenhouse gases; and 3) Project activities supported by a methodology approved under a VCS approved GHG

² Evidences on Proof of Land History from Anqing Agricultural Bureau, and Qianshan City and Taihu County are directly under the jurisdiction of Anqing City

program, unless explicitly excluded under the terms of Verra approval. Accordingly, this project produces methane (CH₄) emission reductions, which is one kind of the six Kyoto Protocol GHGs. Besides, this project activity is supported by the CDM small-scale methodology: *Methane emission reduction by adjusted water management practice in rice cultivation* which is approved under a VCS approved GHG program – United Nations Clean Development Mechanism and it is not explicitly excluded under the terms of Verra approval. Therefore, this project is eligible under the scope of VCS program.

1.4 Project Design

This project is a single project activity instance.

Eligibility Criteria

The project is not a grouped project.

1.5 Project Proponent

Organization name	Hefei Luyu Agricultural Technology Co., Ltd
Contact person	Yiliang Chen
Title	Manager
Address	Room 2212, Building C, Xinhua International Square, No.320 Qianshan Road, Hefei City, Anhui Province, China
Telephone	+86-1331686686
Email	mail@luyunongye.com

1.6 Other Entities Involved in the Project

Organization name	Shanghai Libra Investment & Management Co., Ltd
Role in the project	Consultant
Contact person	Shaohui Zhong
Title	Manager
Address	Room 302, No.2815 Longteng Avenue, Xuhui District, Shanghai, P.R. China
Telephone	+86-21-64693022

Emailkvz@libracarbon.com

1.7 Ownership

The ownership of the rice paddies of the agricultural land management project belongs to the farmers, which has been confirmed by the local government and agricultural bureau. Since these rice paddies are all legal agricultural fields, and the ownership is clear, there is no dispute over land ownership in the project site.

During the construction period, Qianshan and Taihu agricultural bureaus were the main manager, with the cooperation and participation of Hefei Luyu Agricultural Technology Co., Ltd. (hereafter referred to as Hefei Luyu), of the construction of ditches and reservoirs, while the local farmers were hired to build the ditches and reservoirs. During the operation period, Hefei Luyu is responsible for supervising technicians to patrol and maintain the ditches and reservoirs. Furthermore, these farmers also have right to authorize Hefei Luyu as a representative of the carbon project owner and Hefei Luyu only has the right to make decisions about the carbon reduction project³. However, Hefei Luyu has already sold the carbon project development right to Shanghai Libra⁴. Therefore, Libra has played two roles in developing carbon reduction project. Firstly, Libra is the consultant which is responsible for helping the project proponent with development and management of the carbon project, including compiling the monitoring plan, organizing the training, etc. Secondly, Libra is the purchaser, so it has right of speech during development process. Although Hefei Luyu has already sold the carbon emission reduction generated by this project to Libra, it does not violate Luyu's rights and obligations as the project proponent.

1.8 Project Start Date

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 (e.g., preparing land for seeding, planting, changing agricultural or forestry practices, rewetting, restoring hydrological functions, or implementing management or protection plans). For this project, according to the requirements of the AMS-III.AU methodology applied, an entire cropping season is started from land preparation and the emission reduction calculation is also started this day. So, the project start date is 24-February-2018⁵ when the land preparation was started.

³ Source: carbon reduction project cooperation agreement signed between the farmers and Hefei Luyu.

⁴ Source: The Sales Contract of Rice Carbon Emission Reduction Project in Qianshan and Taihu Area in Anqing City

⁵ The earliest start date of rice cropping season within the whole 3,713 households which are recorded in the Farmers' database

1.9 Project Crediting Period

The crediting period of this project will be using a 7-year, twice renewable crediting period, for a combined total project crediting period of 21 years from 24-February-2018 to 23-February-2039, and the first 7-year period is from 24-February-2018 to 23-February-2025. Also, the project lifetime⁶ is 30 years from 5-February-2018 to 4-February-2048.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	√
Large project	

Year	Estimated GHG emission reductions or removals (tCO ₂ e)
24-February -2018 to 23-February-2019	53,512
24-February -2019 to 23-February-2020	53,512
24-February -2020 to 23-February-2021	53,512
24-February -2021 to 23-February-2022	53,512
24-February -2022 to 23-February-2023	53,512
24-February -2023 to 23-February-2024	53,512
24-February -2024 to 23-February-2025	53,512
Total estimated ERs	374,584 tCO ₂ e
Total number of crediting years	7 years
Average annual ERs	53,512 tCO ₂ e

1.11 Description of the Project Activity

The project changing from continuously flooded to intermittent flooded condition during rice cultivation is conducted in Qianshan City and Taihu County within Anqing City, Anhui Province of China. Anhui Province, located in eastern China, is one of the major rice-producing provinces in China. At the same time, Qianshan City and Taihu County also have the strong

⁶ The Acceptance Report of Anqing National Comprehensive Agricultural Development High-standard Farmland Construction Project in 2017

rice productivity. However, the living standard of farmers in these two places is relatively low, where the annual household income of farmers are only 19,968 CNY and 17,679.5 CNY⁷, respectively, and most of it is used to maintain the survival. In this case, they lacked funds to build ditches for applying intermittently flooded method. So, continuously flooded method was used in rice paddies, which means fields have standing water throughout the rice growing season and may only dry out for harvest. However, the organic matter in rice soil under flooded condition can emit a large amount of methane (CH₄) because of anaerobic decomposition. In contrast, there are at least once aeration period of more than three days, except for end-season drainage, during the cropping season by conducting intermittently flooded method after the cement ditches is built in this project activity. Since the CH₄ in rice paddies is produced by the anaerobic decomposition of organic matter after the flooding, allowing the field to drain halts CH₄ production, which happens in anaerobic condition, reducing the total quantity of CH₄ released during the cropping season. Moreover, the intermittently flooded method is more beneficial to water conservation, production increase and methane emission removal than the continuously flooded. The project aims to replace the traditional cultivation method by intermittent flooded method for GHG removal whilst contributing to Sustainable Development Goals (SDGs) in the project zone. 12,997 ha (194,955 Mu⁸) of rice paddies are changed to apply intermittently flooded method in Qianshan City and Taihu County, where the rice used to be cultivated under continuously flooded condition.

The project is conducted in Qianshan City and Taihu County, with a total population of nearly 586,000 and 570,000 respectively. All the rice paddies belong to the farmers. During the construction period, Qianshan and Taihu Agricultural Bureau was the main manager, with the cooperation and participation of Hefei Luyu, of the construction of ditches and reservoirs, while the local farmers were hired to build the ditches and reservoirs. During the operation period, Hefei Luyu is responsible for supervising technicians to patrol and maintain the ditches and reservoirs. Besides, Hefei Luyu has been fully authorized by all the farmers to act as the carbon project proponent. Also, Hefei Luyu has already sold the project development right to Shanghai Libra Investment & Management Co.,Ltd. (hereafter referred to as Shanghai Libra). So, Shanghai Libra is leading the carbon project development and management, including compiling the Monitoring and Quality Control Manual⁹, organizing the training, etc. Moreover, the local agricultural bureau is responsible for technical training. Farmers are the main operators to practice intermittently flooded water regime and supposed to record the cultivation logbooks. The technicians should carry out monthly inspections

⁷ Source: The ex ante investigation report of Anqing City (Qianshan City and Taihu County) in 2017 from Anhui Academy of Social Sciences

⁸ A Chinese metric unit of area, 1ha = 15 Mu.

⁹ Source: Monitoring and Quality Control Manual is Compiled by Shanghai Libra Investment & Management Co.,Ltd

according to the requirements of Monitoring and Quality Control Manual. The profit from this carbon reduction project is shared with farmers. The implementation of the project activity generates 53,512 tCO₂e/year and contributes to 6 SDGs.

This project is not located within a jurisdiction covered by a jurisdictional REDD+ program.

The main objectives of the project are to improve the productivity of rice and contribute to the sustainable development and SDGs, including:

1. Goal 1-No Poverty

The project increases yield by applying intermittently flooded method during cultivation in rice paddies, so the farmers in impoverished counties can see a higher net return and get out of poverty.

2. Goal 2-Zero Hungry

The project provides canals, reservoirs and pumps for practicing intermittently flooded method, which helps in increase the rice production.

3. Goal 4-Quality Education

A part of the profit of this project would be used to buy more books for the local children, which provides them with quality education.

4. Goal 5-Gender Equality

The project provides training to women who wish to participate in and facilitate more ownership of resources and access to economic opportunities.

5. Goal 8-Decent Work and Economic Growth

Field staff personnel would be hired from the local villages to conduct intermittently flooded water regime in the project area.

6. Goal 13-Climate Action

The project generates 53,512 tCO₂e of emission reductions in rice paddies by practicing intermittently flooded water regime, which makes contribution to the climate problems.

The implementation schedule of this project is listed as follows:

Date	Milestone (s) in the project's development and implementation
29-May-2017	Hefei Luyu Agricultural Technology Co., Ltd held a general meeting of their stockholders and they decided to develop this project as a carbon trading project.

15-June-2017	The ex ante investigation report ¹⁰ of Anqing City (Qianshan City and Taihu County) in 2017 from Anhui Academy of Social Sciences was completed
11-September-2017	Implementation Plan of Qianshan National Agricultural Comprehensive Development High Standard Farmland Construction Project in 2017 was completed by Qianshan Agricultural Bureau
13-September-2017	Implementation Plan of Taihu National Agricultural Comprehensive Development High Standard Farmland Construction Project in 2017 was completed by Taihu Agricultural Bureau
22-October-2017	The Approval of High Standard Farmland Construction Task in 2017 was issued by Anqing Agricultural Bureau ¹¹
20-November-2017	Construction of high standard rice fields was started
24-February-2018	The project activity was started, which means the land preparation of the early season was started in Qianshan City.
23-June-2018	The harvest of early season was started in Qianshan City
30-June-2018	The land preparation of the second season was started in Qianshan City
17-October-2018	The harvest of the second season was started in Qianshan City
2-March-2018	The land preparation of the early season was started in Taihu County.
28-June-2018	The harvest of early season was started in Tiahu County
01-July-2018	The land preparation of the second season was started in Tiahu County
10-August-2018	Qianshan County was changed to Qianshan City ¹²
24-October-2018	The harvest of the second season was started in Tiahu County
02-December -2020	The draft PD was completed
11-January-2021 ~ 11-February-2021	VCS Public comment period

¹⁰ The main contents of the ex-ante investigation report are divided into three parts: 1. the geographical and human conditions in the project area; 2. Rice planting before the project started operation; and 3. The economic income of local farmers.

¹¹ Anqing Agricultural Bureau is the superior department in charge of Qianshan and Taihu Agricultural Bureau

¹² <http://xzqh.mca.gov.cn/ssdescription?dcps=34&dcpid=2018>

22-April-2021 ~ 24-April-2021	On-site visit by VVB.
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1.12 Project Location

The project is implemented in Qianshan city and Taihu County, which are prefecture level cities of Anqing City in Anhui Province, China. Now Qianshan city has jurisdiction over 1 village (Youba Village) and 6 Towns (Meicheng Town, Wanghe Town, Huangni Town, Huangpu Town, Yujing Town and Yuantan Town), while Taihu County has jurisdiction over 1 village (Dashi Village) and 3 Towns (Xiaochi Town, Xincang Town and Xuqiao Town). The geographical coordinates of the project are shown in the following Table 1-1.

Table 1-1 The geographical coordinates of Qianshan City and Taihu County

Name of City/County	Geographical Coordinates	
	Longitudes	Latitudes
Qianshan City	E 116°14'~116°46'	N 30°27'~31°04'
Taihu County	E 115°45'~116°30'	N 30°09'~30°46'

The locations of Anhui province and Anqing City are illustrated in the Figure 1-1 and Figure 1-2 separately, while the location of project activity, Qianshan City and Taihu County within the Anqing City is shown in Figure 1-3. According to VCS standard, Qianshan City and Taihu County is defined as the project zone, and the rice paddies applied intermittent flooded water regime in these two places are defined as the project area. Please refer to Section 3.3 for the boundaries of the project area and project zone are shown in Figure 1-3, and the KML file has also been submitted.



Figure 1-1 The map of China



Figure 1-2 The map of Anhui Province

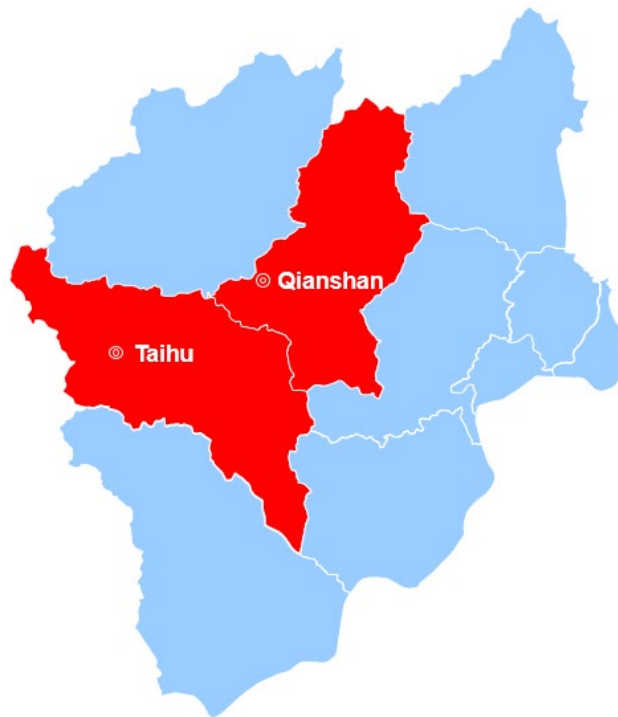


Figure 1-3 The map of project zone – Qianshan City and Taihu County

1.13 Conditions Prior to Project Initiation

Prior to the project initiation, economic conditions in the project area are backward and the level of education is relatively low⁷, so farmers lack advanced irrigation technologies like

intermittent flooded water regime. However, intermittent flooded water regime requires that irrigation and drainage can be controlled according to the growth needs of rice during its cultivation. Whereas, the low economic level leads to the low income of farmers⁷, which means that farmers have no additional economic capacity to afford the construction of cement ditches which are able to practice controllable irrigation and drainage. So, the project has not been implemented to generate GHG emissions for the purpose of their subsequent reduction, removal or destruction.

Since the conditions existing prior to the project initiation is the same as baseline scenario, please refer to Section 3.4 (Baseline Scenario) to see the detail information. Besides, this project does not affect the environmental conditions, including climate, hydrology, topography, soils, relevant historical conditions, type of vegetation, ecosystems, etc., so, the present and prior environmental conditions of this project are the same, which are listed as follows.

Conditions	Description	
City/County	Qiansan City	Taihu County
Climate	Qianshan City is located in the north subtropical monsoon agricultural climate zone. The general climate is characterized by four distinct seasons and mild climate. At the same time, there is plenty of light and rain and it has a long frost-free period. There is constant rain in spring. The weather is hot and rainy in summer and cool in autumn. It is dry and cold in winter ¹³ .	Taihu County has four distinct seasons with north subtropical monsoon climate. In winter, it is controlled by the northwest inland air current and the temperature is low. The summer is hot and humid under the influence of southeast ocean currents. The annual average temperature is 16.4°C. The average temperature in January is 3.7°C, and the average temperature in July is 28.4°C. The extreme maximum temperature was 40 ° C (28 August 1967) and the extreme minimum temperature was - 12.7 ° C (6 February 1969). The average annual sunshine 1937.7 hours, and frost-free

¹³ https://baike.baidu.com/item/%E6%BD%9C%E5%B1%B1/6623606?fr=aladdin#3_4

		period 249 days. The annual average rainfall is 1368.4 mm ¹⁴ .
Hydrology	The main rivers in Qianshan City are the Dasha River of Caizi Lake basin and the Qian River, Wan River and Chang River of Wan River basin. The average annual runoff is 1.2 billion cubic meters ¹⁵ .	The main river in the county is the Chang river, originating in Duozhi Mountain in Yuexi, flowing into the county in the south of Xinghua village. Chang river, through the county, has the total length of 81 kilometers. All the mountains in the county occupy 1242.41 square kilometers, accounting for 61.18% while the hills occupy 490.27 square kilometers, accounting for 24.14%. The plain covers 77.37 square kilometers, accounting for 3.83% and the water covers 222.25 square kilometers, accounting for 10.85% ¹⁶ .
Topography	The geomorphology in Qianshan City is controlled and affected by structure, lithology, climate, river and other internal and external forces. The terrain is high in the northwest and low in the southeast, extending from the northwest to the southeast is a ladder-shaped manner, which are low mountains, hills, sentry and plain. The mountainous account for 49.3% of the city's 1,686.03 square kilometers (of which the	Taihu County belongs to the low hilly area of Southwest Anhui. The terrain is high in the northwest and low in the southeast. The Dabie Mountains are in the northwest of the county, with 16 peaks above 800 meters above sea level, such as The General Mountain, Tong Mountain, Shanjian Zhai, Liusheng Slope, Tianhua Jian, Furong Zhai, etc. The highest of them

¹⁴ https://baike.baidu.com/item/%E5%A4%AA%E6%B9%96%E5%8E%BF/637991?fr=aladdin#3_3

¹⁵ https://baike.baidu.com/item/%E6%BD%9C%E5%B1%B1/6623606?fr=aladdin#3_5

¹⁶ <http://www.thx.gov.cn/zjth/dlzy/index.html>

	middle mountainous account for 4% and the low mountainous area accounts for 45.3%). The hilly area accounts for 9.9% and the sentry area accounts for 23.9%. Besides, the plain area accounts for 16.9% ¹⁷ .	is The General Mountain, which is 1,109 meters above sea level and is a natural barrier for Anhui Province and Hubei Province ¹⁶ .
Soils	The total soil area of the county is 2,055,513 mu. There were 8 soil types, 14 subtypes, 43 soil genera and 81 soil species. The cultivated soil type is mainly paddy soil ¹⁸ .	The county's soil is divided into 7 soil types, 13 subtypes, 43 soil genera and 70 soil species. The cultivated soil type is paddy soil ¹⁹ .
Relevant historical conditions	Qianshan was administered by Wan in the Zhou Dynasty. In the early republic of China, Anqing was abandoned and Qianshan county was directly under Anhui Province. On 14 September 1950, the Qianshan County government was renamed the Qianshan County People's Government. Since 17 August 1988, Qianshan County has been attributed to Anqing City of Anhui Province, until today ²⁰ . On 10-August-2018, Qianshan County is renamed Qianshan City ²¹ .	Taihu County is an ancient civilization with a long history. In the Western Han Dynasty, it was the city of Huling, belonging to Lujiang County. The Eastern Han Dynasty, it was divided into Wan County. In March 1949, Taihu was liberated. At first, it belonged to Anqing District of Northern Anhui Administrative Office, and now it belongs to Anqing City of Anhui Province ²² .
type of vegetation	Qianshan City is located in the north subtropical climate area.	The vegetation type is the mixed forest belt of deciduous

¹⁷ https://baike.baidu.com/item/%E6%BD%9C%E5%B1%B1/6623606?fr=aladdin#3_2

¹⁸ http://60.166.6.242:8080/was40/pdf/dshx/86/02_pdf_86_02_05.pdf

¹⁹ http://60.166.6.242:8080/was40/pdf/dshx/87/02_pdf_87_01.pdf

²⁰ <https://www.qss.gov.cn/zjqs/lsgy/index.html>

²¹ <https://www.qss.gov.cn/zwzx/jrqs/2008799081.html>

²² <http://www.thx.gov.cn/zjth/lswl/wmgx/index.html>

	The natural vegetation is mainly deciduous broad-leaved forest, followed by evergreen broad-leaved forest, coniferous forest, mountain meadow and grass. The artificial vegetation is economic forest, timber forest and firewood forest. Timber stands and oak broad-leaved forests are scattered. Forest coverage is 39%. Three different types of vegetation can be classified according to their altitude²³.	and evergreen broad-leaved in the north subtropics. It is clear that the different forest types are distributed vertically according to the altitude. Chinese fir and masson pine are mainly distributed in the area between 400 and 600 meters above the sea level, while the coniferous forests, like cork oak, acacia oak, coffin trees, etc., are distributed in the area of altitude between 600 and 1000 meters²⁴.
ecosystems	There are 12 species of rare tree species and 26 species of rare animals under state protection in Qianshan City. In addition, there are 280 kinds of Chinese medicinal materials such as magnolia officinalis, Poria cocos, sophora flavescens, etc²⁵.	The northwest of Taihu County are mountainous and the southeast is hilly. In the middle part of the county, there is an artificial lake, named Hualiang Ting reservoir (also known as Hua Ting Lake). There is a natural lake in the south - Po Lake. Whether in the mountains, hills, lakes, there are rich plant and animal resources. According to the statistics of forest resources survey, the forestry land area of the whole county is 1.5833 million mu, and the forest land area is 1.1894 million mu, among which the timber forest is 1.1501 million mu. Meanwhile, the total stock volume of living trees is

²³ https://baike.baidu.com/item/%E6%BD%9C%E5%B1%B1/6623606?fr=aladdin#3_2

²⁴ <https://www.ixueshu.com/document/6816c00f2f6dcf0b318947a18e7f9386.html>

²⁵ http://60.166.6.242:8080/was40/index_sz.jsp?rootid=34187&channelid=35864

		529,900 cubic meters, and that of forest trees is 430,800 cubic meters, including 437,900 cubic meters of timber forest ²⁶ .
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1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project conforms to all kinds of regulations, which are listed as below:

PRC Constitution, PRC Agricultural Law, Law of the PRC on Land Administration, Implementing Regulations of the Law of the PRC on Land Administration, Law of the PRC on Rural Land Contracting, PRC Production Safety Law, and PRC Labour Law.

- National Master Plan for High Standard Farmland Construction
- National Plan for the Construction of High Standard Farmland for Comprehensive Agricultural Development
- Guidance on the National Demonstration Project of High Standard Farmland Construction Comprehensive Agricultural Development
- Construction Standard of National Agricultural Comprehensive Development of High Standard Farmland Construction Demonstration Project (Trial) (National Agricultural Office [2009] No.163)
- Design Specification for Irrigation and Drainage Engineering (GB50288-1999)
- Technical Specification for Water-saving Irrigation Engineering (GB/T50363-2006)

According to the Inspection and Acceptance Report of the project, during the construction of cement ditches, the requirements of Design Specification for Irrigation and Drainage Engineering (GB50288-1999) and Technical Specification for Water-saving Irrigation Engineering (GB/T50363-2006) have been followed, which requires no harm to the surrounding soils. Besides, the construction of high standard farmland also followed the requirements of *PRC Agricultural Law*, National Master Plan for High Standard Farmland Construction, National Plan for the Construction of High Standard Farmland for Comprehensive Agricultural Development, and Guidance on the National Demonstration Project of High Standard Farmland Construction Comprehensive Agricultural Development, without causing negative impact on the local ecological environment. Besides, the project will be subject to regular inspection by local government during the implementation period to ensure continuous compliance.

²⁶ <http://www.thx.gov.cn/zjth/dlzy/index.html>

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

The project has not been registered or is seeking registration under any other GHG programs.

1.15.2 Projects Rejected by Other GHG Programs

The project has not been rejected by any other GHG programs.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

The project is not involved in an emission trading program or any other mechanism that includes GHG allowance trading and also has not been rejected by other GHG program. GHG emission reductions and removals generated by the project will not be used for compliance under any programs or mechanisms.

1.16.2 Other Forms of Environmental Credit

The project has not sought or received another form of GHG-related environmental credit.

1.17 Additional Information Relevant to the Project

Leakage Management

According to the applied methodology: *Methane Emission Reduction by Adjusted Water Management Practice in Rice Cultivation*, any effects of the project activity on GHG emissions outside the project boundary are deemed to be negligible and do not have to be considered under this methodology. So, leakage does not need to be considered.

Commercially Sensitive Information

None of the project documents will be considered commercially sensitive information, and all the documentation is available to any stakeholders.

Sustainable Development

The Project provides many benefits that will help achieve China's Sustainable Development Goals, a set of 17 universal goals covering the thematic areas of environmental, economic and social development.



The project contributes to achieving sustainable development as following:

- High yield brings extra income and improves the living standard of local farmers (Goal 1 mentioned as Section 1.11);
- Increase the rice productivity alleviates hunger problem (Goal 2 mentioned as Section 1.11);
- Use a proportion of benefits to improve the local children's education (Goal 4 mentioned as Section 1.11);
- Women are given priority for employment and their social status is raised (Goal 5 mentioned as Section 1.11);
- Provide more job opportunities for local farmers (Goal 8 mentioned as Section 1.11);
- Sequester greenhouse gas and mitigate climate changes (Goal 13 mentioned as Section 1.11).

Goal 1	Higher income
Type of Impact	The impact is a positive impact as increasing yield and new job opportunities created by the change of rice cultivation method.
Affected Stakeholder Group(s)	A total number of 3,713 households is 13,701 farmers who are involved in this project

Expected achievement	Agricultural farming is a major source of income for the farmers in the project zone. Therefore, the increase of yield is of great importance for them, which can increase their income. The construction of the project will provide new job opportunities for farmers involved in this project, as well as provision of technicians during the operation of the project, which could help them get out of poverty.
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Goal 2	Increase in rice yield
Type of Impact	The impact is a positive impact as the rice grown using the intermittently flooded method can increase its production.
Affected Stakeholder Group(s)	Farmers participated in the project
Expected achievement	Rice is an important staple for local farmers and even the whole country, so higher yields could solve the hunger problem to some extent.

Goal 4	Help in quality education
Type of Impact	The impact is a positive impact as the project will help to improve the local education.
Affected Stakeholder Group(s)	Farmers participated in the project
Expected achievement	A part of the profit of this project shall be used to buy about 500-2000 ²⁷ books for the local children, which provides them with quality education.

Goal 5	Help in gender equality
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²⁷ The exact figure depends on the number of school-age children in the local school

Type of Impact	The impact is a positive impact as the project provides training to women who wish to participate in and facilitates more ownership of resources and access to economic opportunities.
Affected Stakeholder Group(s)	Women workers within the project area
Expected achievement	24 new job occupations for technicians would be created by this project, and the women shall be given priority for employment which improves their social status.

Goal 8	More job opportunities and growth of local economy
Type of Impact	The impact is a positive impact as the project provides more job opportunities for practicing the intermittently flooded method. At the same time, higher rice production could bring growth in local economy.
Affected Stakeholder Group(s)	A total number of 3,713 households is 13,701 farmers who are involved in this project.
Expected achievement	In order to practice the intermittently flooded method, some better irrigation and drainage facilities should be provided, such as cement ditches and reservoirs. In this case, a large number of job occupations could be created for the farmers involved in this project, including building the ditches and reservoirs, working as technicians, etc. Therefore, the male adults working outside Qianshsan and Taihu counties would come back to make contribution to their hometown.

Goal 13	CH ₄ emission reduction
Type of Impact	The impact is a positive impact as CH ₄ emissions generated by soil organic matter under anaerobic conditions is reduced. The impact is an actual impact which is a direct consequence of the project activity.

Affected Stakeholder Group(s)	Farmers within the project area
Expected achievement	It is expected to reduce 53,512 tCO ₂ e every year by conducting this project, because the duration of anaerobic decomposition of soil organic matters in rice paddies is shortened by replacing continuously flooded with intermittently flooded.

Further Information

There is no any further information that may have a bearing on the eligibility of the project, the net GHG emission reductions or removals, or the quantification of the project's net GHG emission reductions or removals.

2 SAFEGUARDS

2.1 No Net Harm

The potential negative environmental and socio-economic impacts and steps to mitigate them have been summarized in the following table:

Environmental		Socio-Economic	
Potential Negative Impacts	Actions	Potential Negative Impacts	Actions
During the construction, a large amount of construction waste could be generated, which has a negative impact on water resources, air quality and soil quality.	During the construction process of the project, the construction waste should be uniformly classified and collected according to the requirements of Anqing Municipal Construction Waste Disposal Management Measure ²⁸ . The construction entity	The construction of the project needs to be jointly funded by local farmers and the government, so it would put economic pressure on them, especially farmers.	Project proponent provided a part of funds as subsidies to farmers involved in this project to ease their economic pressure ²⁹ .

²⁸ <http://aqxxgk.anqing.gov.cn/show.php?id=632773>

²⁹ Carbon reduction project cooperation agreement signed between the farmers and Hefei Luyu

	shall provide personnel in charge of the discharge of construction wastes at the construction site, supervise the standard shipment of construction wastes at the construction site, and ensure that the transport vehicles are washed clean before leaving.		
During the construction, the construction dust could be produced, which could form haze and harm the air quality.	During the construction, water should be sprayed frequently to reduce the negative impacts brought by the dust.	If the intermittently flooded method cannot be conducted strictly during rice cultivation within the project area, then the yield would not be great and the income will not be increased.	The relevant training should be conducted every year and the technician should also give timely guidance during every monthly inspection.

2.2 Local Stakeholder Consultation

Stakeholder consultations include an ex ante surveys and stakeholder meetings, requiring stakeholders to present their opinions on project design and their willingness to participate.

Before the project started, Anhui Academy of Social Sciences conducted stakeholder meetings to ask their willingness of participation and notice containing information, including date, location, etc., were also posted on the notice board in each village. Anhui Academy of Social Sciences organized a team of people to interview the village representatives, relevant governmental officials and distribute the questionnaires to gather local farmers' opinions. The stakeholder meeting was held on 07 June 2017 and the relevant details have been summarized as the table below.

The details of stakeholder meeting	
Date	07 June 2017

Location	Anqing Agricultural Bureau ³⁰
Attendance Rate	67% ³¹
Output	During the stakeholders meeting, Anhui Academy of Social Sciences investigated the original rice cultivation method, and asked farmers whether they knew about intermittent flooded irrigation and carbon reduction project. Secondly, the representatives of project proponent ,Qianshan Agricultural Bureau and Taihu Agricultural Bureau explained all the designs of the high standard farmland construction and carbon reduction development project to the farmers. Thirdly, after these farmers listened to the introduction to intermittent flooded method and carbon reduction, they expressed their willingness to support the development of this project and said that they knew it could be useful for their environment and community. Finally, they said that when they came back home after the meeting, they would pass the information on to the other farmers who did not attend, so that all the farmers would be informed.

Before the consultation started, the project proponent has inquired the Standard for Sampling Surveys for CDM Project Activities and Programme of Activities (V8.0) required to be complied with in the small-scale methodology AMS-III.AU. Then, the project proponent commissioned Anhui Academy of Social Sciences to design and organize an ex-ante survey, since they are the top academic institution for social studies in Anhui Province. The ex-ante survey is aimed at the farmers involved in the project. According to the Standard for Sampling Surveys for CDM Project Activities and Programme of Activities, the number of famers involved was too large and scattered to carry out a census. Moreover, famers are homogeneous which is suitable for simple random sampling. Thus, random sampling is used for the survey, and the calculation is shown as follows.

³⁰ Qianshan City and Taihu County are directly under the jurisdiction of Anqing City

³¹ According to the attendance table of stakeholders meeting in Anqing City, a total of 9,171 farmers attended the meeting, with the attendance rate of 67% (9,171/13,701).

$$n \geq \frac{1.645^2 \times N \times p(1-p)}{(N-1) \times 0.1^2 \times p^2 + 1.645^2 \times p \times (1-p)}$$

Where:

Parameters	Description
n	Sample size
N	Total number of farmers, which is 13,701 as stated in Section 2.5 below
p	Expected value, which is 0.75 based on the experience of Anhui Academy of Social Sciences combined with the local condition
1.645	Represents the 90% confidence as required in the Standard that 90/10 confidence/precision as the criteria for the reliability of sampling efforts for small-scale CDM project activities
0.1	Represents the 10% relative precision

Thus, substituting in the values gives:

$$n \geq \frac{1.645^2 \times 13,701 \times 0.75 \times (1-0.75)}{(13,701-1) \times 0.1^2 \times 0.75^2 + 1.645^2 \times 0.75 \times (1-0.75)} = 90$$

The final result is $n \geq 90$, which means the sample size at least is 90 in this ex-ante survey. In accordance with the conservative principle of the sample survey, project proponent selected 100 farmers for the survey.

In addition, the 100 sampling famers are only selected for the ex-ante survey. During the process of project implementation, 311 different samples with cultivation logbooks would be sampled and checked every year. So, a total of 100 questionnaires were distributed randomly by Anhui Academy of Social Sciences, and 100 were collected. Since they are the top academic institution for social studies in Anhui Province, it is authoritative that the sample size of 100 was calculated to be representative of the 13,701 farmers involved based on their experience. Moreover, they are a third party independent of Hefei Luyu and Shanghai Libra, therefore, it is credible that they selected these 100 farmers randomly for the questionnaire.

A total of 100 questionnaires were distributed, including 67 of them from Qianshan City, and 100 were collected. The background information of these 100 stakeholders is summarized as follows (see Table 2-1). The surveys took 1 week and completed on 9 June 2017. The feedback collected is summarized below:

- Most farmers are well aware of the benefits of adjusted water management during rice cultivation. They understand that the intermittently flooded method can reduce methane emissions, save water resource and increase the rice productivity.
- Prior to the meeting, most local farmers had never heard of carbon trading, VCS or carbon credits. After the introduction, they strongly agreed that the project should be registered as a carbon reduction project and participate in the carbon trading market.
- Local farmers believe that the project can 1) create jobs; 2) get more benefits from selling carbon credits; 3) reduce methane emissions, save water resource and increase the rice productivity; and 4) improve the social status of women by hiring them to be technicians.
- The local agricultural bureau is very clear about the benefits of the intermittently flooded cultivation method and understands that carbon trading can make projects more sustainable.

- Table 2-1 Background information of these 100 stakeholders

Categories	Proportion
Nationality	17% of them are Hui and the rest are Han.
Educational Level	25% and 13% are at the primary and high school levels, respectively, with the rest are all at the junior high school level.
Career	Mostly farmers, only 12% work for factories and 7% are village officials
Gender	62% are female and 38% are male.
Age-bracket	39~57 years old

Table 2-2 Survey Results Summary Sheet

Question	Survey Result	
	Qianshan City	Taihu County
How many people in your family? How much is the annual income? What are the main economic sources?	The average number of people is 3.95 in one family and the average annual income is 19,968 CNY. The main economic source is planting rice.	The average number of people is 3.15 in one family and the average annual income is 17,679.5 CNY. The main economic source is planting rice.

Do you think the intermittently flooded water regime is good for rice cultivation?	It is favourable.	It is favourable.
What do you know about the benefits of the intermittently flooded water regime?	Reduce methane emissions, save water resource and increase the rice productivity	Reduce methane emissions, save water resource and increase the rice productivity
What industries does your family member work in?	Labor and farming	Labor and farming
What kind of production activities does your family do?	Crop farming	Crop farming
What is your educational level?	62% are middle school level, 13% are high school level and the rest are primary school level.	57% are middle school level, 20% are high school level and the rest are primary school level.
Is the land ownership involved in the project clear?	Yes.	Yes.
Did you know carbon trading before?	Most people had never known.	Most people had never known.
Through the staff's introduction to carbon trading, do you support this project's application for development as a carbon reduction project?	Definitely support.	Definitely support.
If this project is successfully applied for development as a carbon reduction project, what benefits do you think can be brought?	Create more job opportunities for economic benefits, improve the local environment, reduce methane emissions, save water resource, and increase the rice productivity.	Create more job opportunities for economic benefits, improve the local environment, reduce methane emissions, save water resource, and increase the rice productivity.
Do you support hiring women to participate in rice cultivation	Yes.	Yes.

and management in this project?		
Do you think there is anything that needs to be improved in the design or implementation of this project? Please provide your valuable comments.	There are some comments came up from farmers: 1. They worried that they cannot afford the self-raised part of construction funds. 2. They worried that they cannot conduct the intermittent flooded water regime well. Firstly, during the stakeholders meeting, the representatives of Hefei Luyu and local Agricultural Bureau explained that the government and Hefei Luyu would jointly fund the construction of high standard farmland to reduce the economic burden on farmers. For the second problem, experts from Qianshan and Taihu Agricultural Bureau train the technicians every year, and the technicians also train farmers every February to master their skills of practicing intermittent flooded water regime. Lastly, the farmers represent that they have no comments.	

Therefore, the stakeholders have no opinions on the project implementation, and there is no need to change the project design.

The mechanism for on-going communication with local stakeholders

There is a Suggestion Book published with the phone number of contact person on the notice board in each of villages throughout the lifetime of the project. Stakeholders can write their comments or suggestions in the book anytime anonymously as they wish. The project proponent will check the book regularly and collect all the comments received.

Besides, the technicians as the project monitoring executor have surveyed the project area. The distance from one village to another is so short that the locals can talk directly to the technicians or even the local agricultural bureaus if they have any opinions. Meanwhile, technicians would also pay a regular visit to the villages and collect comments if any. So, the stakeholders have been and will be communicated on the followings.

- As mentioned above, during the stakeholders meeting before the implementation of this project, the project proponent and local Agricultural Bureau have explained all the designs of the high standard farmland construction and carbon development project. During the operation phase, all the stakeholders have been and will be communicated about the results of monitoring through villagers' meetings.

- During the stakeholders meeting, all the risks, costs and benefits the project may bring to local stakeholders have been discussed, and all the stakeholders have expressed the view that they were informed and accepted.
- Also, the representative of Hefei Luyu, under the supervision of the local agricultural bureau and government, has also informed farmers of all relevant laws and regulations covering workers' rights in the host country.
- The process of VCS Program validation and verification and the validation/verification body's site are required to inform the farmers by publishing it on the notice board also with the contact person's information. If there is any negative feedback, a meeting will be immediately held in the village

2.3 Environmental Impact

According to the Environmental Impact Assessment Law of the People's Republic of China, this project does not require any environmental impact assessments. The environmental impacts, both positive and negative, produced during construction and operation of this project activity and the mitigation of negative impact are summarized as follows.

Stages	Positive impact	Negative impact and its mitigation
Construction period	● In the process of construction, the soil has been turned from a deep level, which can improve the soil structure to a certain extent.	(1) ● Negative impact: During the construction, a large amount of construction waste could be generated. ● Its mitigation: During the construction process of the project, the construction waste should be uniformly classified and collected. (2) ● Negative impact: During the construction,

		the construction dust could be produced. ● Its mitigation: During the construction, water should be sprayed frequently to reduce the negative impacts brought by the dust.
Operation period	● Drainage and irrigation can be controlled, so water resources could be saved compared to the original continuously flooded method. ● Drainage and irrigation can be controlled, so methane emissions from soil organic matter under flooded conditions during rice cultivation can be reduced.	● Negative impact: In the course of drainage, if the ditches are damaged, the discharged water may not be discharged into the reservoir in accordance with the set route and contaminate other water resources ● Its mitigation: Since each technician is in charge of several villages, farmers would immediately call the technician if a ditch broke down in their fields. If it is a minor problem, including a blocked water outlet, the technician shall be on site within an hour to solve it. If the technician cannot solve the problem, they should immediately inform Shanghai Libra and contact the local agricultural bureau to activate the emergency mechanism and take

		corresponding measures. For example, if the ditch is broken or leaking, the repair shall be arranged within 24 hours.
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2.4 Public Comments

The public comments period is from 11- January-2021 to 11-February-2021 and there are not any public comments received.

2.5 AFOLU-Specific Safeguards

1. Stakeholder Identification

This stakeholder's identification starts by listing all the people or groups who might have an influence over or be impacted by a project. The local village committees and village officials were considered as the key informants and focus groups who know best about the local farmers. In June 2017, the project proponent and Anhui Academy of Social Sciences held a consultant meeting with local village committees before the project start, and the main purpose of the meeting was to identify the stakeholders in the project.

- 1) Village residents: (including 9,828 farmers within 2,488 households in Qianshan City and 3,859 farmers within 1,225 households in Taihu County with a total of 13,701 farmers, of which 8,084 are females, accounting for about 59 percent)

In Qianshan City and Taihu County, a total of 13,701 farmers have been directly affected by the activities of the project. In addition, the rice paddies in the project area belong to these farmers. Hence, the village committees collected the opinions and consent of the farmers in respective villages through face-to-face meetings before deciding to apply to the local governments' and agricultural bureaus for using intermittently flooded method through participation in the Plan of High Standard Farmland Construction³² (hereinafter referred to as HSFC). These farmers were also responsible for signing the cooperation agreements with the project proponents to ensure the proper development of the project.

Since June 2017, before the project started, the village committees conducted a survey of the local farmers' willingness to participating in the Plan of HSFC for applying the intermittently flooded method during rice cultivation. This was done through meetings and

³² This Plan is government-led, involving the construction of ditches and the leveling of rice paddies, and voluntary participation is applied for by farmers

interviews with farmers. All the farmers agreed to use this advanced cultivation method in the end.

The meeting held on June 2017 was attended by the representatives of agricultural bureaus of Qianshan City and Taihu County, the representatives of Hefei Luyu, the representatives of farmers, and the representatives of the village committee. The representatives of agricultural bureaus of Qianshan City and Taihu County also organized a meeting to solicit suggestions from farmers for the implementation of project activities and their willingness to participate in rice cultivation.

This project activity has greatly benefited the local farmers and could only carry out with the farmers' consent. Hence, all the farmers within the project area are recognized to be stakeholders in the project.

2) Agricultural Bureaus of Qianshan City and Taihu County

The techniques of intermittently flooded method are provided by the local agricultural bureau, which inspects successful rice cultivation. In this respect, the farmers, the committees, the local governments granting permission and local agricultural bureau providing advice and inspections, are all identifies as relevant stakeholders in this project.

3) Local governments of Qianshan City and Taihu County

The local administration is responsible for the local social and environmental management. They are responsible and accountable to all local farmers for any violation of their rights.

4) Village committees of Qianshan City and Taihu County

They are responsible for collecting opinions from the respective locals and villages with the project proponent or agricultural bureaus.

The results of identified stakeholders will be publicly announced on VCS website as part of the draft PD which can be accessed by everyone, in case there is any other person who may consider themselves as one of the project's stakeholders, they can directly contact the project owner for consultation.

2. Potential Risks and Measures

Potential risks to stakeholders	During the implementation of the project, since it is necessary to go to the field every day to observe the growth of rice and the change of water level, drainage and irrigation are carried out from time to time, which increases the chances of farmers encountering dangers, such as slipping while checking the rice in the field.
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Measures to mitigate it	All these potential risks should be told to the stakeholders in advance and some simple first aid measures also need to be communicated to farmers during training to reduce the injuries.
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Prior to the project implementation, these soil ditches cannot be controlled by irrigation and drainage, so rice has to be cultivated under the conditions of continuously flooded method, which leads to a lower productivity and the poor income of local farmers. After the construction of the cement ditches, farmers volunteered to conduct intermittent flooded water regime, because it allowed them to irrigate and drain the rice according to its growth needs, resulting in higher yields³³. Besides, the 12,997 ha of construction land within the project has been agricultural land since 2005, which has been proved by Qianshan and Taihu Agricultural Bureau³⁴. In addition, this project activity only adjusts the water regime during rice cultivation but not changes the type of land use, therefore, the project would not impact local stakeholder's property rights without the free, prior and informed consent.

Feedback and Grievance Redress Procedure

There is a Suggestion Book published with the phone number of contact person on the notice board in each of villages throughout the lifetime of the project. Stakeholders can write their comments or suggestions in the book anytime anonymously as they wish. The project proponent will check the book regularly and collect all the comments received. If there is a conflict of interest between the parties, the stakeholders can appeal to the local agricultural bureau through the village representative or directly, which is the most effective way to solve the problem. They appeal through the phone number of the relevant contact or file a complaint during the meeting.

The project proponent has appointed a staff member to record and collect conflicts and dissatisfaction between local communities and individual villagers. Technicians' monthly inspection play an important role in dealing with conflicts and dissatisfaction and report to the agricultural bureau. Upon receipt of the technicians' report, the relevant management unit should contact and discuss with the relevant community or other stakeholders within 3 days. Based on the information collected by the relevant parties, the specific staff member shall propose a solution and mediation plan within one week and solve the conflict within 30 days.

³³ Which is stated in Technical Guidelines for Intermittently Flooded Rice Cultivation Method in Anhui Province

³⁴ Evidences on Proof of Land History from Anqing Agricultural Bureau, and Qianshan City and Taihu County are directly under the jurisdiction of Anqing City

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

The small-scale methodology AMS-III.AU: *Methane Emission Reduction by Adjusted Water Management Practice in Rice Cultivation/version 4.0* is used. Also, the project proponent shall apply the “General guidelines for SSC CDM methodologies/version 23.0”.

In addition, since the reporting and verification shall be done on the basis of samples of the log-books from the farmers, the *Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities/version 8.0* and the *Guideline for Sampling and Surveys for CDM Project Activities and Programme of Activities/version 4.0* are used.

The TOOL 21 “Demonstration of Additionality of Small-scale Project Activities (version 13.1)” is used to demonstrate the additionality.

3.2 Applicability of Methodology

As mentioned in Section 3.1, the methodology applied in this project is AMS-III.AU (version 4.0) which is applicable under the following conditions:

Conditions required by methodology	Applicability of this project
2. The methodology comprises technology/measures that result in reduced anaerobic decomposition of organic matter in rice cropping soils and thus reduced generation of methane. The methodology includes projects such as: a) Rice farms that change the water regime during the cultivation period from continuously to intermittent flooded conditions and/or a shortened period of flooded conditions; b) Alternate wetting and drying method and aerobic rice cultivation methods; c) Rice farms that change their rice cultivation practice from transplanted to direct seeded rice.	This project activity realized the type (a), changing the water regime during the cultivation period from continuously to intermittent flooded conditions, through the construction of cement ditches for controllable irrigation and drainage.

3. This methodology is applicable under the following conditions: a) Rice cultivation in the project area is predominantly characterized by irrigated, flooded fields for an extended period during the growing season, i.e. farms whose water regimes can be classified as upland or rainfed and deep water are not eligible to apply this methodology. This shall be shown from a representative survey conducted in the geographical region of the proposed project or by using national data. This project area characterization shall also include information on pre-season water regime and applied organic amendments, so that all dynamic parameters as shown in Table 3-1 below are covered by the baseline study.	According to the result of The ex ante investigation report of Anqing City (Qianshan City and Taihu County) ³⁵, rice cultivation in the project area is predominantly characterized by irrigated, flooded fields for an extended period during the growing season. And the pre-season water regime is mainly continuously flooded with no any organic amendments.
b) The project rice fields are equipped with controlled irrigation and drainage facilities such that both during dry and wet season, appropriate dry/flooded conditions can be established on the fields;	With the project, the rice fields are equipped with controlled irrigation and drainage facilities such that intermittently flooded method can be conducted.
c) The project activity does not lead to a decrease in rice yield. Likewise, it does not require the farm to switch to a cultivar that does not been grown before;	The type of rice planted in this project is very common and the project activity is not subject to any local regulatory restrictions, so it will not lead to a decrease in rice yield.
d) Training and technical support during the cropping season that delivers appropriate knowledge in field preparation, irrigation, drainage and	By now since the project activity was started in 2018, experts from Anhui Academy of Agricultural Sciences will train technicians in intermittent irrigation,

³⁵ Source: The ex ante investigation report of Anqing City (Qianshan City and Taihu County) in 2017 from Anhui Academy of Social Sciences

use of fertilizer to the farmer is part of the project activity and is to be documented in a verifiable manner (e.g. protocol of trainings, documentation of on-site visits). In particular, the project proponent is able to ensure that the farmer by himself or through experienced assistance is able to determine the crop's supplemental N fertilization need. The applied method shall assess the fertilizer needs using for example a leaf colour chart or photo sensor or testing stripes. Alternatively, a procedure to ensure efficient fertilization considering the specific cultivation conditions in the project area backed by scientific literature or official recommendations shall be used;	requiring correct drainage and irrigation at the corresponding stages during rice planting. Every February from 2018 to 2020, farmers are also trained intensively. During the training, it will be emphasized that the application amount of fertilizer should not exceed the recommended amount for Qianshan and Taihu by Anhui Academy of Agricultural Sciences, which is 9.3-10.2kg/mu³⁶.
e) Project proponents shall assure that the introduced cultivation practice, including the specific cultivation elements, technologies and use of crop protection products, is not subject to any local regulatory restrictions;	The intermittent flooded water regime, the optimal amount of nitrogen utilization and the high standard farmland construction introduced in the project area are legal.
f) Except the case where the default value approach indicated as follows, "Emission reductions using IPCC tier 1 approach or default values" is chosen for emission reductions calculations, project proponents have access to infrastructure to measure CH₄ emissions from reference fields using	For the ex ante emission reduction calculation, since "Emission reductions using IPCC tier 1 approach or default values" is chosen for emission reductions calculations, project proponent made measurements by using the closed chamber to determine baseline emission factors for continuously flooded field³⁷.

³⁶ The Technical Guidelines for Intermittently Flooded Rice Cultivation Method in Anhui Province, later issued by the Institute of Agricultural Engineering of Anhui Academy of Agricultural Sciences, also emphasized that the optimal amount of nitrogen fertilizer used in Anhui rice paddy fields is 9-10.5kg/ Mu.

³⁷ The Report of Measuring Methane Emission Rate of Paddy Fields with Continuously Flooded Method by Closed Chamber in Qianshan and Taihu for early season was completed in August 2017, while that for second season was completed in November 2017

closed chamber method and laboratory analysis;	For the post-emission reduction calculation, project proponent has already set the closed chamber in baseline and project reference fields respectively, and made the plan of monitoring.
g) Aggregated annual emission reductions of all fields included under one project activity shall be less than or equal to 60 kt CO ₂ equivalent.	Those rice paddies belong to the local farmers, covering a total of 12,997 hectares, and 53,512 tCO ₂ e is expected to be generated every year, which is below 60 kt CO ₂ e. If the emission reductions monitored during the verification exceeds the threshold, the project proponent will only claim gap of 60,000 tons according to the Applicability of small-scale methodology.

Table 3-1 Parameters for the definition of cultivation patterns

Nr.	Parameter	Type	Values/categories	Source/method
1	Water regime – on-season	Dynamic	Continuously flooded	Baseline: Farmer's information
			Single drainage	
			Multiple drainage	
2	Water regime – pre-season		Flooded	
			Short drainage (<180d)	
			Multiple drainage (>180d)	
3	Organic amendment		Straw on-season	Project: Monitoring
			Green manure	
			Straw off-season	
			Farm yard manure	
			Compost	
			No organic amendment	
4	Soil pH	Static	<4.5	

			4.5-5.5	ISRIC-WISE soil property database or national data
			>5.5	
5	Soil organic carbon		<1%	
			1-3%	
			>3%	
6	Climate		[AEZ] ³⁸	Rice Almanac, HarvestChoice ^f

As described above, this small-scale methodology AMS-III.AU (version 4.0) is applicable to the proposed activity.

- 1) The Tool 21 “Demonstration of Additionality of Small-scale Project Activities (version 13.1)” applied in this project is applicable under the following conditions:

Conditions required by methodology	Applicability of this project
4. The use of the methodological tool “Demonstration of additionality of small-scale project activities” is not mandatory for project participants when proposing new methodologies. Project participants and coordinating/managing entities may propose alternative methods to demonstrate additionality for consideration by the Executive Board.	For this project activity, this methodological tool is decided to be used. Besides, Hefei Luyu (as the project participant) and Shanghai Libra (as the project managing entities) do not plan to propose alternative methods.
5. Project participants and coordinating/managing entities may also apply “TOOL 19: Demonstration of additionality of microscale project activities” as applicable.	This project activity is expected to generate 53,512 tCO ₂ e/ha emission reductions per year which is greatly more than 20 tCO ₂ e/ha defined under microscale project activities, so it is not applicable to “TOOL 19”.

3.3 Project Boundary

³⁸ Climate zone: use agroecological zone as shown in the Rice Almanac (Third Edition, 2002), or by HarvestChoice.

Source	Gas	Included?	Justification/Explanation
Baseline	CO ₂	No	Not included in this project
	CH ₄	Yes	Baseline emissions consist of the CH ₄ emissions.
	N ₂ O	No	Due to the optimized N fertilization practice regulated by the methodology, N ₂ O emissions do not significantly deviate from the baseline emissions and hence are not considered.
	Other	No	Not included in this project
Project	CO ₂	No	Not included in this project
	CH ₄	Yes	Project emissions consist of the CH ₄ emissions, which will still be emitted under the changed water regime.
	N ₂ O	No	Due to the optimized N fertilization practice regulated by the methodology, N ₂ O emissions do not significantly deviate from the baseline emissions and hence are not considered.
	Other	No	Not included in this project

The rice paddies applied intermittently flooded water regime in Qianshan and Taihu is defined as the project area, also the project boundary where the cultivation method and water regime are changed. The map of the project boundary is provided as the Figure 3-1, and the yellows sections show the specific project areas.

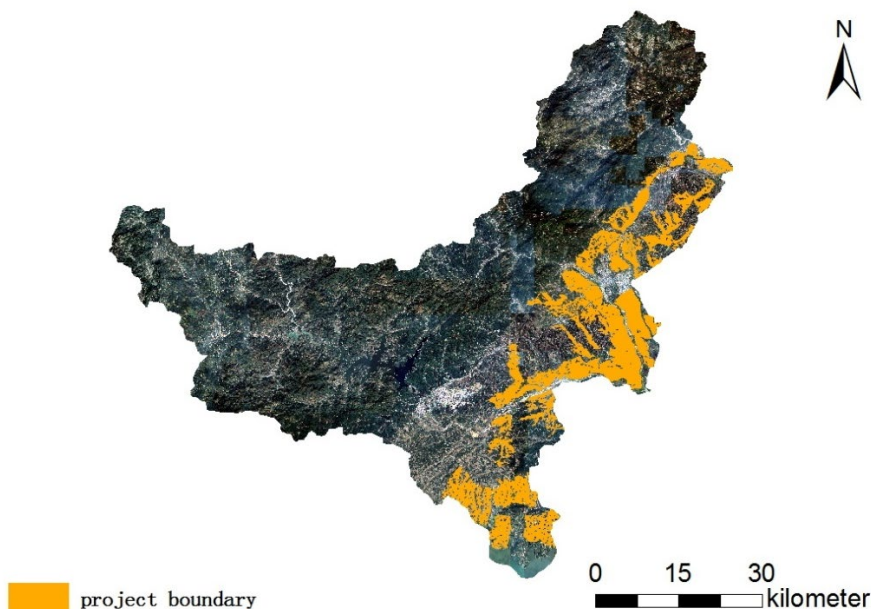


Figure 3-1 the map of the project boundary

3.4 Baseline Scenario

According to the small-scale methodology: *Methane Emission Reduction by Adjusted Water Management Practice in Rice Cultivation*, the baseline scenario is the continuation of the current practice which is continuously flooded water regime without any organic amendment during rice cultivation in the project fields (see further details in Section 3.5).

3.5 Additionality

According to TOOL 21 “Demonstration of Additionality of Small-scale Project Activities (version 13.1)”, project participant shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:

- a) Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;
- b) Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;
- c) Barrier due to the prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;
- d) Other barriers: without the project activity, for another specific reason identifies by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

Project activity would not have occurred due to investment barrier and technological barrier as analyzed below.

Investment barrier

In the absence of the project activity, the living standard of farmers in Qianshan and Taihu is poor and the economy is backward, so it is difficult for them to build the cement ditches for timely drainage and irrigation according to the growth need of rice. According to implementation plan³⁹, the government shall invest 3,500 CNY/ha of irrigation and drainage ditches for the construction of high standard farmland, while the farmers should raise no less than 20% of the government's investment, that is, nearly 700 CNY/ha. According to the

³⁹ Implementation Plans of Qianshan and Taihu National Agricultural Comprehensive Development High Standard Farmland Construction Project in 2017

results of investigation report⁴⁰, the living balance of local farmers is only 279 CNY/year and 364 CNY/year in Qianshan and Taihu, respectively. Therefore, without external investment, farmers cannot afford the economic pressure of self-financing part to build the cement ditches, which could result in continuation of continuously flooded water regime during rice cultivation. So, the baseline scenario is a financially more viable alternative to the project activity but would have led to higher emissions.

Technological barrier

The original water regime used during rice cultivation in baseline scenario, continuously flooded method, is less technologically advanced, because it only requires that the fields should be flooded throughout the whole season and there is no need to pay close attention to the growth status of rice for appropriate drainage and irrigation. Thus, simple soil ditches are enough in baseline scenario so that 97.4% famers in Qianshan City and 97.3% farmers in Taihu County practiced continuously flooded method during rice cultivation⁴⁰, which means the new technology, intermittent flooded water regime, has a low market share. .

In general, this project has both investment and technological barriers, so it is additional.

3.6 Methodology Deviations

No deviations from the procedures indicated by the methodology have been made.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

As described in methodology AMS-III.AU (version 4.0) mentioned above, the baseline scenario is the continuation of the current practice, e.g. continuously flooded rice cultivation in the project fields, the baseline emissions are estimated as follows:

$$BE_y = \sum_s BE_s \quad (1)$$

$$BE_s = \sum_{g=1}^G EF_{BL,s,g} \times A_{s,g} \times 10^{-3} \times GWP_{CH_4} \quad (2)$$

Where:

⁴⁰ The ex ante investigation report of Anqing City (Qianshan City and Taihu County) in 2017 from Anhui Academy of Social Sciences

Parameters	Description
BE_y	Baseline emissions in year y (tCO ₂ e)
BE_s	Baseline emissions from project fields in season s (tCO ₂ e)
$EF_{BL,s,g}$	Baseline emissions factor of group g in season s (kgCH ₄ /ha per season)
$A_{s,g}$	Area of project fields of group g in season s (ha)
GWP_{CH_4}	Global warming potential of CH ₄ (tCO ₂ e/tCH ₄)
g	Group g, covers all project fields with the same cultivation pattern (G = total number of groups)

However, according to the Section 5.3 and 5.4 stated in methodology AMS-III.AU (version 4.0), the equation (1) and (2) above are used to calculate the ex-post emission reduction. During the project operation period, three baseline reference fields shall be set up in a way that they are representative of baseline emissions to measure the baseline emissions factor of group g in season s ($EF_{BL,s,g}$) as follows, therefore, it is only available for ex-post emission reduction calculation. As for ex-ante estimation, as required in the Section 5.8.1 and 5.8.2, the project proponent shall estimate baseline and project emissions using the IPCC tier 1 approach but undertaking measurements to determine baseline emission factors for continuously flooded fields as described in Section 4.4 and relevant values used for calculation had been included.

Thus, at this stage in which the ex-ante calculation of emission reduction is performing, there is no relevant values available for calculation the baseline emissions in year y ($EF_{BL,s,g}$, tCO₂e).

Determination of baseline emission factor on reference fields

Baseline reference fields shall be set up in a way that they are representative of baseline emission in the project rice fields. For each group of fields with the same cultivation pattern, as defined with the help of Table 3-1 above, at least three reference fields with the same pattern shall be determined in the project area. On these fields, measurements using the closed chamber method shall be carried out, each resulting in an emission factor expressed as kgCH₄/ha per season. The seasonally integrated baseline emission factor $EF_{BL,s,g}$ shall be derived as average value from the three measurements for each group.

In this project, all the dynamic and statistic parameters of rice paddies within the project area are the same, according to the ex ante investigation report⁴¹, which can be summarized as follows:

Table 4-1 The dynamic and static parameters of rice paddies within the project area

No.	Parameter	Type	Conditions within the project area
1	Water regime – on-season	Dynamic	Continuously flooded
2	Water regime – pre-season		Flooded
3	Organic amendment		No organic amendment
4	Soil pH	Static	The soil pH within project area is 5.5~7.4, which is in the range of larger than 5.5.
5	Soil organic carbon		The soil organic carbon is 2.53% which is in the range between 1% and 3%.
6	Climate		According to the Rice Almanac (Third Edition, 2002), the project zone, Qianshan City and Taihu County, lies in agroecological zones 7 (AEZs), which is warm/cool humid subtropics with summer rainfall.

Therefore, all fields within project area have the same cultivation pattern and there is only one group in this project.

4.2 Project Emissions

According to the applied methodology AMS-III.AU (version 4.0), the project emissions within the project boundary are calculated as follows:

$$PE_y = \sum_s PE_s \quad (3)$$

$$PE_s = \sum_{g=1}^G EF_{P,s,g} \times A_{s,g} \times 10^{-3} \times GWP_{CH_4} \quad (4)$$

Where:

⁴¹ The ex ante investigation report of Anqing City (Qianshan City and Taihu County) in 2017 from Anhui Academy of Social Sciences

Parameters	Description
PE_y	Project emissions in year y (tCO ₂ e)
PE_s	Project emissions from project fields in season s (tCO ₂ e)
$EF_{p,s,g}$	Project emission factor of group g in season s (kgCH ₄ /ha per season)

Similarly, according to the Section 5.6 and 5.7 stated in methodology AMS-III.AU (version 4.0), the equation (3) and (4) above are used to calculate the ex-post emission reduction. During the project operation period, three project reference fields shall be set up in a way that they are representative of project emissions to measure the project emissions factor of group g in season s ($EF_{p,s,g}$), therefore, it is only available for ex-post emission reduction calculation. As for ex-ante estimation, as required in the Section 5.8.1 and 5.8.2, the project proponent shall estimate baseline and project emissions using the IPCC tier 1 approach but undertaking measurements to determine baseline emission factors for continuously flooded fields as described in Section 4.4 and relevant values used for calculation had been included.

Thus, at this stage in which the ex-ante calculation of emission reduction is performing, there is no relevant values available for calculation the project emissions in year y (PE_y , tCO₂e).

Determination of project emission factor on reference fields

The seasonally integrated project emission factor $EF_{p,s,g}$ shall be determined using measurements on at least three project reference fields that fulfil the same conditions as the baseline reference fields, with the difference that they are cultivated according to the defined project cultivation practice. Project reference fields shall be established close to the baseline reference fields and begin with the growing season at the same time. $EF_{p,s,g}$ is the average of the measurement results from the three reference fields.

There is only one group for all rice paddies in this project, so a total of three project reference fields were established about 2km away from the baseline reference fields and began with the growing season at the same time.

4.3 Leakage

According to the applied methodology AMS-III.AU (version 4.0), any effects of the project activity on GHG emissions outside the project boundary are deemed to be negligible and do not considered under this methodology. So, leakage does not need to be considered in this project.

4.4 Net GHG Emission Reductions and Removals

The emission reductions achieved by the project activity shall be calculated as the difference between the baseline and the project emissions, which is also used as post-emission reduction:

$$ER_s = BE_s - PE_s \quad (5)$$

Where:

Parameters	Description
ER_s	Emission reductions in season s (tCO ₂ e)

Ex ante estimation of emission reductions

According to the applied methodology AMS-III.AU (version 4.0), for the ex ante estimation of emission reductions within the project design document prior to the project implementation, project proponent shall refer to own field experiments or estimate baseline and project emissions with the help of national data or IPCC tier 1 default values for emission and scaling factors.

In this project, using the IPCC tier 1 approach but undertaking measurements to determine baseline emission factors for continuously flooded fields, as per the following formula:

$$ER_y = EF_{ER} \times A_y \times L_y \times 10^{-3} \times GWP_{CH_4} \quad (6)$$

$$EF_{ER} = EF_{BL} - EF_P \quad (7)$$

$$EF_{BL} = EF_{BL,c} \times SF_{BL,w} \times SF_{BL,p} \times SF_{BL,o} \quad (8)$$

$$EF_P = EF_{BL,c} \times SF_{P,w} \times SF_{P,p} \times SF_{P,o} \quad (9)$$

Where:

Parameters	Description
ER_y	Emission reductions in year y (t CO ₂ e)
EF_{ER}	Adjusted daily emission factor (kgCH ₄ /ha/day). Alternatively, seasonal emission factor (kg CH ₄ /ha/season ⁴²) may be determined
A_y	Area of project fields in year y (ha)

⁴²For all scaling factor used in this methodology, the average values in 2006 IPCC Guidelines for National Greenhouse Gas Inventories are chosen.

L_y	Cultivation period of rice in year y (days/year). This is not applicable when seasonal emission factor is determined.
GWP_{CH_4}	Global warming potential of CH ₄ (t CO ₂ e/t CH ₄)
EF_{BL}	Baseline emission factor (kg CH ₄ /ha/day) or (kg CH ₄ /ha/season)
EF_p	Project emission factor (kg CH ₄ /ha/day) or (kg CH ₄ /ha/season)
$EF_{BL,c}$	Baseline emission factor for continuously flooded fields without organic amendments (kg CH ₄ /ha/day) or (kg CH ₄ /ha/season)
$SF_{BL,w}$ or $SF_{p,w}$	Baseline or project scaling factors ⁴³ to account for the differences in water regime during the cultivation period
$SF_{BL,p}$ or $SF_{p,p}$	Baseline or project scaling factors to account for the differences in water regime during the pre-season before the cultivation period
$SF_{BL,o}$ or $SF_{p,o}$	Baseline or project scaling factors should vary for both type and amount of organic amendment applied

Determination of $EF_{BL,c}$

However, the baseline emission factor for continuously flooded fields without organic amendments ($EF_{BL,c}$) can be determined ex ante prior to the start of the project activity, in this case, the ex ante value should be used to calculate emission reduction during the crediting period. It should be measured by using closed chamber in three reference fields which are chosen in the project area.

According to the guidance on methane measurement in the appendix of AMS-III.AU Methodology, the following requirements should be met.

1. The implementation of methane measurement in rice fields requires the involvement of experts in this field or at least experienced staff trained by experts (i.e. from research institutions). These guidelines cannot replace expertise in setting up chamber measurements. They rather set minimum requirements that serve for standardizing the conditions under which methane emissions are measured for projects under this methodology.

The closed chamber measurement requires the involvement of technicians trained by experts from Anhui Academy of Agricultural Sciences under the jurisdiction of the Anhui Agricultural

⁴³ For all scaling factor used in this methodology, the average values in 2006 IPCC Guidelines for National Greenhouse Gas Inventories are chosen.

Bureau. Anhui Academy of Agricultural Sciences is a comprehensive agricultural research institution directly under the provincial government. The expert who is the leader of the experiment has a doctoral degree and her field of study is rice cultivation and GHG monitoring⁴⁴.

According to the *The Report of Measuring Methane Emission Rate of Paddy Fields with Continuously Flooded Method by Closed Chamber in Qianshan and Taihu*, those two areas are located in the central area of Anqing city, and their dynamic and statistic parameters of rice paddies are the same as those listed in Table 4-1 above. In addition, the area of rice paddies in the Qianshan is slightly larger than that in Taihu. Therefore, the methane emission rate measured in the reference fields selected for the chamber measurement in Qianshan is representative. The expert set up the chamber for measurement on 5 March 2017 for the early season and 12 July 2017 for the second season, respectively⁴⁵. The base is embedded just before transplanting, and the first gas sampling began on the second day after transplanting, followed by sampling every 7 days. After sampling, the gas is stored in the evacuated vial, and the samples collected after three times should be taken together for laboratory analysis.

2. Project proponents shall prepare a detailed plan for the seasonal methane measurements before the start of the season. The plan shall include the schedule for the field and laboratory measurements, the logistics that are necessary to get the gas samples to the laboratory and a cropping calendar. The plan shall also include all reference field specific information regarding location and climate, soil, water management, plant characteristics, fertilizer treatment and organic amendments.

Project proponent prepared a detailed plan⁴⁶ for measuring the $EF_{BL,c}$ before the start of the season, which is provided in Table 4-2 、 Table 4-3 and Table 4-4 below.

Table 4-2 The details of reference fields for measuring $EF_{BL,c}$

Specific Information	Plot 1	Plot 2	Plot 3
Area	0.28 ha	0.32 ha	0.30 ha

⁴⁴ Which can be proven by the CV of the expert

⁴⁵ The Report of Measuring Methane Emission Rate of Paddy Fields with Continuously Flooded Method by Closed Chamber in Qianshan and Taihu for early season was completed in August 2017, while that for second season was completed in December 2017

⁴⁶ Pilot plan of methane emission rate in rice paddies with continuously flooded water regime has been provided as evidence

Geological coordinates	116.6283395° E, 30.7686480° N	116.6280267° E, 30.7679452° N	116.6277846° E, 30.7671540° N
Location	Huangling Village, Yujing County, Qianshan City		
The type of rice	Hybrid rice		
Climate	North subtropical monsoon climate		
Soil	pH5.5-7.4 and the soil organic carbon is 2.53%		
Water management	Continuously flooded ⁴⁷		
Fertilizer treatment	No any organic amendments, the amount of nitrogen fertilizer applied is at the range between 9.3 to 10.2 kg/mu		

Table 4-3 The plan for the seasonal methane measurements of the early season

DATE	Activity	Date of Laboratory Analysis
3 March 2017	Land preparation	-----
5 March 2017	Base was buried and transplantation	-----
6 March 2017	The first sampling	21 March 2017
13 March 2017	The second sampling	
20 March 2017	The third sampling	
27 March 2017	The fourth sampling	11 April 2017
3 April 2017	The fifth sampling	
10 April 2017	The sixth sampling	
17 April 2017	The seventh sampling	2 May 2017
24 April 2017	The eighth sampling	
1 May 2017	The ninth sampling	
8 May 2017	The tenth sampling	23 May 2017

⁴⁷ Continuously flooded: fields have standing water throughout the rice growing season and may only dry out for harvest (end-season drainage)

15 May 2017	The eleventh sampling	
22 May 2017	The twelfth sampling	
29 May 2017	The thirteenth sampling	
5 June 2017	The fourth sampling	13 June 2017
12 June 2017	The fifth sampling	
19 June 2017	The sixth sampling	
26 June 2017	The seventh sampling	2 July 2017
1 July 2017	The last on-site sampling and then harvest	

Table 4-4 The plan for the seasonal methane measurements of the second season

DATE	Activity	Date of Laboratory Analysis
10 July 2017	Land preparation	-----
12 July 2017	Base was buried and transplantation	-----
13 July 2017	The first sampling	28 July 2017
20 July 2017	The second sampling	
27 July 2017	The third sampling	
3 August 2017	The fourth sampling	18 August 2017
10 August 2017	The fifth sampling	
17 August 2017	The sixth sampling	
24 August 2017	The seventh sampling	8 September 2017
31 August 2017	The eighth sampling	
7 September 2017	The ninth sampling	
14 September 2017	The tenth sampling	29 September 2017
21 September 2017	The eleventh sampling	

28 September 2017	The twelfth sampling	
5 October 2017	The thirteenth sampling	26 October 2017
12 October 2017	The fourth sampling	
19 October 2017	The fifth sampling	
25 October 2017	The last on-site sampling and then harvest	

In addition, according to the guidance on methane measurement in the appendix of AMS-III.AU Methodology, the steps from field measurement to $EF_{BL,c}$ should be taken as follows.

Table 4-5 On the field – technical options for the chamber design

Feature	Requirements	Conditions in the project
Chamber material	Option 1: Non-transparent ● Commercially available PVC containers or manufactured chambers (e.g. using galvanized iron); ● Painted white or covered with reflective material (to prevent increasing inside temperature); ● Only suitable for short-term exposure (typically 30 min) followed by immediate removal from the field	The chamber used in this project is made of PVC materials covered with reflective material to prevent the increasing inside temperature. And it is only put just before the sampling and then is removed after 30 mins of sampling.
Placement in soil	Option 1: Fixed base ● Base made of non-corrosive material and remains in the field for the whole season; ● Base should allow tight sealing of the chamber;	The base used in this project is made of non-corrosive PVC material and was embedded before transplantation, remaining in the field for the whole season. Base allows tight sealing of the chamber and

	● Base should have bores in the submerged section to allow water exchange between inside and outside; ● Base should be installed at least 24 hours before the first sampling	has bores in the submerged section to allow water exchange. The first sampling was taken 24 hours after the base installation (see details in Table 4-3 and Table 4-4 above).
Auxiliaries of chamber	● Thermometer for measuring the temperature inside the chamber; ● Fan (battery operated) inside the chamber for mix the inside air during sampling; ● Sampling port (rubber stopper placed in a bore of the chamber)	There are a thermometer and a fan inside the chamber and the sampling port is set on the top of the chamber.
Basal area	Rectangular or rounded, but has to cover minimum of four rice hills (ca. 0.1m ² minimum)	The base is rectangular and installed covering four rice hills.
Height	Option 1: Fixed height Total height (protruding base + chamber) should exceed plant height	The total height of chamber and base is 1.5 meters which is higher than 1.2 meters, the largest height of the plant.

Table 4-6 On the field – air sampling

Feature	Requirements	Conditions in the project
Replicate chambers per plot	Minimum requirement: Three replicate chambers per plot	Three replicate chambers were placed in every plot.

Number of air samples per exposure/data points per measurement	Minimum requirement: Three samples per exposure	Three samples for every exposure.
Exposure time	30 minutes	30 minutes
Daytime of measurement	Morning	9.30 – 10.00 a.m.
Measurement interval	Minimum requirement: once per week	Once a week
Syringe	Suitability test (leak proof) before measurement Preferably equipped with a lock for ease of handling	The syringe with a lock was used in this project and it is checked for leak proof before every measurement.
Sample storage until analysis	- Storage < 24h: air samples can remain in syringe; - Storage > 24h: transfer air samples into evacuated vial, store with slight overpressure	Three samples were taken before a laboratory analysis was performed, so the samples were stored in the evacuated vials.

Table 4-7 Laboratory analysis⁴⁵

Feature	Requirements	Conditions in the project
Method	Gas Chromatography with flame ionization detector (FID)	FID
Injection	Direct injection or with multi-port valve and sample loop	Direct injection
Column	Packed (e.g. molecular sieve) or capillary column	Packed
Calibration	With certified standard gas each day of analysis before and after the analyses are done	With certified standard gas each day of analysis before and after the analyses are done

It is demonstrated by *The Report of Measuring Methane Emission Rate of Double-cropping Rice Paddies with Continuously Flooded Method by Closed Chamber in Qianshan and Taihu in 2017* from Anhui Academy of Agricultural Sciences (see further details in Section 5.1 below) that the baseline emission factor for continuously flooded fields without organic amendments ($EF_{BL,c}$) is 177.87 kg CH₄/ha/season for early season and 165.24 kg CH₄/ha/season for second season. The process of calculation is shown as follow.

Calculation of the emission rate for a plot (reference field)

- (1) For each gas analysis, calculate the mass of CH₄ emissions with the help of the following formula:

$$m_{CH_4,t} = c_{CH_4,t} \times V_{chamber} \times M_{CH_4} \times \frac{1atm}{R \times T_t \times 1000} \quad (10)$$

Where:

Parameters	Description
m_{CH_4}	Mass of CH ₄ in chamber at time t (mg)
t	Point of time of sample (e.g. 0,15,30 in case of three samples within 30 minutes)
$c_{CH_4,t}$	CH ₄ concentration in chamber at time t, from gas analysis (ppm)
$V_{chamber}$	Chamber volume (L)
M_{CH_4}	Molar mass of CH ₄ : 16g/mol
$1atm$	Assume constant pressure of 1atm, unless pressure measurement is installed
R	Universal gas constant: 0.08206 L atm/K ⁻¹ × mol ⁻¹
T_t	Temperature at time t (K)

- (2) Determine the slope of the line of best fit for the values of over time with the help of Excel:

$$s = \frac{\Delta m_{CH_4}}{\Delta t} \quad (11)$$

Where:

Parameters	Description
------------	-------------

s	Slope of line of best fit (mg/min)
-----	------------------------------------

(3) Calculate the emission rate per hour for one chamber measurement:

$$RE_{ch} = s \times \frac{60min}{A_{chamber}} \quad (12)$$

Where:

Parameters	Description
RE_{ch}	Emission rate of chamber ch (mg/h $\times$ m ²)
ch	Index for replicate chamber on a plot
$A_{chamber}$	Chamber area (m ²)

(4) Calculate the average emission rate of a chamber measurement per plot:

$$RE_{plot} = \frac{\sum_{ch=1}^{Ch} RE_{ch}}{Ch} \quad (13)$$

Where:

Parameters	Description
RE_{plot}	Average emission rate of a plot (mg/h $\times$ m ²)
Ch	Number of replicate chambers per plot

(5) Further procedure: from the average emission rates per plot of each chamber measurement, derive the seasonally integrated emission factor by integration of the measurement results over the season length. The simplest way of integration is multiplying the emission rate with the number of hours of the measurement interval (e.g. one week) and accumulating the results of every measurement interval over the season. Convert from mg/m² to kg/ha by multiplying with 0.01.

According to *The Report of Measuring Methane Emission Rate of Double-cropping Rice Paddies with Continuously Flooded Method by Closed Chamber in Qianshan and Taihu in 2017* for both early season and second season from Anhui Academy of Agricultural Sciences, there were 162 gas samples gained from on-field gas sampling in each reference field for early season and 144 gas samples for second season, totalling 486 gas samples from the three reference fields for early season and 432 for second season, separately, which means 918 values of $c_{CH_4,t}$ can be outputted by the FID in laboratory, combining with the equations (10)~(13), and then RE_{plot} for each reference field (plot) monitored can be summarized in the table below.

RE_{plot} (mg/h × m ²)							
Early Season				Second Season			
Date	Plot 1	Plot 2	Plot 3	Date	Plot 1	Plot 2	Plot 3
06 March 2017	2.933	2.024	2.71	13 July 2017	3.160	3.425	4.523
13 March 2017	10.330	6.066	7.308	20 July 2017	12.343	12.319	10.132
20 March 2017	12.646	12.099	14.428	27 July 2017	14.753	13.216	13.185
27 March 2017	12.782	15.106	13.534	03 August 2017	15.033	15.428	13.928
03 April 2017	14.191	13.056	15.38	10 August 2017	15.471	17.237	16.439
10 April 2017	14.857	17.367	15.218	17 August 2017	16.352	16.797	14.781
17 April 2017	11.063	11.164	14.93	24 August 2017	11.373	10.689	11.980
24 April 2017	10.026	8.731	7.456	31 August 2017	5.012	4.530	4.346
01 May 2017	5.175	6.020	3.169	07 September 2017	2.809	3.321	2.912
08 May 2017	4.776	2.561	5.902	14 September 2017	0.469	1.131	3.162
15 May 2017	2.340	3.822	5.507	21 September 2017	0.956	1.371	0.946
22 May 2017	1.039	2.481	0.968	28 September 2017	0.861	1.883	1.004
29 May 2017	0.618	1.920	1.775	05 October 2017	1.107	1.016	0.532
05 June 2017	0.330	0.861	1.879	12 October 2017	0.442	1.008	0.314
12 June 2017	1.085	0.800	1.498	19 October 2017	0.425	0.701	0.519
19 June 2017	0.771	1.172	1.143	25 October 2017	0.847	0.968	0.839
26 June 2017	0.725	0.911	1.964	Average	6.34	6.57	6.22
01 July 2017	0.636	0.872	2.626	—	—	—	—
Average	5.91	5.95	6.52	—	—	—	—

RE_{plot} (mg/h × m²) was converted from mg/m² to kg/ha by multiplying with 0.01. So, the final integrated results of RE_{plot} with the unit of (kg/season/ha) in the three reference fields is equal to $EF_{BL,c}$ (kgCH₄/season/ha) which are summarized in Table 4-8 below.

Table 4-8 RE_{plot} (kg/season/ha) in reference fields

	Early Season			Second Season		
	RE_{plot} (mg/h × m ²)	Hours over the season	RE_{plot} (kg/season/ha)	RE_{plot} (mg/h × m ²)	Hours over the season	RE_{plot} (kg/season/ha)
Plot 1	5.91	2,904 hours (121 days)	171.53	6.34	2,592 hours (108 days)	164.29
Plot 2	5.95		172.68	6.57		170.17
Plot 3	6.52		189.40	6.22		161.26
Average	6.12		177.87	6.37		165.24

the baseline emission factor for continuously flooded fields without organic amendments ($EF_{BL,c}$) is 177.87 kg CH₄/ha/season for early season and 165.24 kg CH₄/ha/season for second season

Determination of $SF_{BL,w}$ or $SF_{P,w}$

According to the methodology, the IPCC default for $SF_{BL,w}$ or $SF_{P,w}$ is as follows:

Water regime during the cultivation period		$SF_{BL,w}$ or $SF_{P,w}$
Irrigated	Continuously flooded ⁴⁸	1
	Intermittently flooded-single aeration ⁴⁹	0.60
	Intermittently flooded-multiple aeration ⁵⁰	0.52

For the baseline scenario, the water regime is continuously flooded, so the $SF_{BL,w}$ is 1. As described in Section 1.11, the water regime of this project activity is intermittently flooded with multiple aeration, so the $SF_{P,w}$ is 0.52.

Determination of $SF_{BL,p}$ or $SF_{P,p}$

In addition, IPCC default for $SF_{BL,p}$ or $SF_{P,p}$ is provided in the following table.

⁴⁸ Continuously flooded: fields have standing water throughout the rice growing season and may only dry out for harvest (end-season drainage)

⁴⁹ Single aeration: fields have a single aeration during the cropping season at any growth stage (except for end-season drainage)

⁵⁰ Multiple aeration: fields have more than one aeration period during the cropping season (except for end-season drainage)

Water regime prior to cultivation period	$SF_{BL,p}$ or $SF_{P,p}$
Non-flooded pre-season<180 days (indicating double cropping)	1
Non-flooded pre-season>180 days (indicating double cropping)	0.68

In the project area, all the rice cultivation is double cropping, so both $SF_{BL,p}$ and $SF_{P,p}$ are 1.

Determination of $SF_{BL,o}$ or $SF_{P,o}$

Accordingly, since no amendments are applied under both baseline and project scenario, $SF_{BL,o}$ and $SF_{P,o}$ are calculated as follows according to the Methodology.

$$SF_o = \left(1 + \sum_i ROA_i \times CFOA_i \right)^{0.59} \quad (14)$$

Where:

Parameters	Description
ROA_i	Application rate of organic amendment type i, in dry weight for straw and fresh weight for others, tonne ha ⁻¹
$CFOA_i$	Conversion factor for organic amendment type i (in terms of its relative effect with respect of straw applied shortly before cultivation)

There are no organic amendments applied under both baseline and project scenario, so $ROA_i=0$ and both $SF_{BL,o}$ and $SF_{P,o}$ are 1.

Taking all the information above, the table below can be reached.

Parameters	Early Season	Second Season
$EF_{BL,c}$ (kg CH ₄ /ha/season)	177.87	165.24
$SF_{BL,w}$	1	
$SF_{P,w}$	0.52	
$SF_{BL,p} / SF_{P,p}$	1	
$SF_{BL,o} / SF_{P,o}$	1	

GWP_{CH_4} (t CO ₂ e/t CH ₄)	25
A_y (ha)	12,997
L_y	Since the $EF_{BL,c}$ with unit of kg CH ₄ /ha/season was used, it is not applicable.
P.S. The GWP_{CH_4} is taken from the IPCC's Fourth Assessment report, GHG Protocol	

Under this methodology, any effects of the project activity on GHG emissions outside the project boundary are deemed to be negligible and do not have to be considered, so the leakage of this project activity is zero.

Thus, for early season, the emission reduction should be calculated as follows:

$$\begin{aligned}
 EF_{BL} &= EF_{BL,c} \times SF_{BL,w} \times SF_{BL,p} \\
 &= 177.87 \text{ kg CH}_4 * \text{ ha}^{-1} * \text{ season}^{-1} \times 1 \times 1 \\
 &= 177.87 \text{ kg CH}_4 * \text{ ha}^{-1} * \text{ season}^{-1} \\
 EF_P &= EF_{BL,c} \times SF_{P,w} \times SF_{P,p} \\
 &= 177.87 \text{ kg CH}_4 * \text{ ha}^{-1} * \text{ season}^{-1} \times 0.52 \times 1 \\
 &= 92.49 \text{ kg CH}_4 * \text{ ha}^{-1} * \text{ season}^{-1} \\
 EF_{ER} &= EF_{BL} - EF_P \\
 &= 177.87 \text{ kg CH}_4 * \text{ ha}^{-1} * \text{ season}^{-1} - 92.49 \text{ kg CH}_4 * \text{ ha}^{-1} * \text{ season}^{-1} \\
 &= 85.38 \text{ kg CH}_4 * \text{ ha}^{-1} * \text{ season}^{-1} \\
 ER_y &= EF_{ER} \times A_y \times 10^{-3} \times GWP_{CH_4} \\
 &= 85.38 \text{ kg CH}_4 * \text{ ha}^{-1} * \text{ season}^{-1} \times 12,997 \text{ ha} \times 10^{-3} \times 25 \text{ t CO}_2\text{e/t CH}_4 \\
 &= 27,741 \text{ t CO}_2\text{e}
 \end{aligned}$$

Likely, for the later season, the emission reduction should be calculated as follows:

$$\begin{aligned}
 EF_{BL} &= EF_{BL,c} \times SF_{BL,w} \times SF_{BL,p} \\
 &= 165.24 \text{ kg CH}_4 * \text{ ha}^{-1} * \text{ season}^{-1} \times 1 \times 1 \\
 &= 165.24 \text{ kg CH}_4 * \text{ ha}^{-1} * \text{ season}^{-1} \\
 EF_P &= EF_{BL,c} \times SF_{P,w} \times SF_{P,p}
 \end{aligned}$$

$$= 165.24kgCH_4 * ha^{-1} * season^{-1} \times 0.52 \times 1$$

$$= 85.92kgCH_4 * ha^{-1} * season^{-1}$$

$$EF_{ER} = EF_{BL} - EF_P$$

$$= 165.24kgCH_4 * ha^{-1} * season^{-1} - 85.92kgCH_4 * ha^{-1} * season^{-1}$$

$$= 79.32kgCH_4 * ha^{-1} * season^{-1}$$

$$ER_y = EF_{ER} \times A_y \times 10^{-3} \times GWP_{CH_4}$$

$$= 79.32kgCH_4 * ha^{-1} * season^{-1} \times 12,997 ha \times 10^{-3} \times 25 t CO_2e/t CH_4$$

$$= 25,771 tCO_2e$$

Therefore, for a whole year, the emission reduction is $27,741 tCO_2e + 25,771 tCO_2e = 53,512 tCO_2e$.

The ex ante calculations of baseline and project emissions are shown in excel and the results are summarized in the Table following.

Year	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated net GHG emission reductions or removals (tCO ₂ e)
24-February -2018 to 23-February -2019	N/A ⁵¹	N/A	0	53,512
24-February -2019 to 23-February -2020	N/A	N/A	0	53,512
24-February -2020 to 23-February-2021	N/A	N/A	0	53,512
24-February -2021 to 23-February -2022	N/A	N/A	0	53,512

⁵¹ According to the CDM small-scale methodology: **Methane emission reduction by adjusted water management practice in rice cultivation (v4.0)**, Para 5.8.1 Ex ante estimation of emission reductions, PP has chosen option 1 for the calculation of Ex ante ER, while the according to the Equation (6) $ER_y = EF_{ER} \times A_y \times L_y \times 10^{-3} \times GWP_{CH_4}$ in the methodology, the ex ante of ER value is calculated directly but not calculated by Baseline emissions minus project emissions. So PP provided N/A in the table in section 4.4.

24-February -2022 to 23-February -2023	N/A	N/A	0	53,512
24-February -2023 to 23-February -2024	N/A	N/A	0	53,512
24-February -2024 to 23-February -2025	N/A	N/A	0	53,512
Total	N/A	N/A	0	374, 584

5 MONITORING

5.1 Data and Parameters Available at Validation

According to the methodology, there is no pre-determined data, as long as the monitoring data, but the ex ante calculation method was used in determining $EF_{BL,c}$, and the A_y used to calculate the ex ante emission reduction is only used in the ex ante calculation formula, so the relevant ex ante calculation data are listed in this section.

Data / Parameter	A_y
Data unit	ha
Description	Area of project fields in year y
Source of data	Determined by collecting the project field sizes in a project database. The size of project fields is determined by GPS or satellite data.
Value applied	The total area is 12,997ha
Justification of choice of data or description of measurement methods and procedures applied	The size of project field is determined through GPS by agricultural bureaus in Qianshan and Taihu ⁵²
Purpose of Data	The parameter is used to calculate the ex ante estimated net GHG removals.
Comments	N/A

⁵² Certificates of Land Ownership proved by Qianshan and Taihu Land and Resources Bureau

Data / Parameter	GWP_{CH_4}
Data unit	t CO ₂ e/t CH ₄
Description	Global warming potential of CH ₄
Source of data	The number of GWP_{CH_4} is taken from the IPCC's <i>Fourth Assessment report, GHG Protocol</i>
Value applied	25
Justification of choice of data or description of measurement methods and procedures applied	Any future revision of the IPCC's assessment report should be taken account.
Purpose of Data	The parameter is used to calculate the estimated net GHG removals.
Comments	N/A

Data / Parameter	$EF_{BL,c}$
Data unit	kg CH ₄ /ha/day or kg CH ₄ /ha/season
Description	Seasonal baseline emission factor for continuously flooded fields without organic amendments
Source of data	The Report of Measuring Methane Emission Rate of Double-cropping Rice Paddies with Continuously Flooded Method by Closed Chamber in Qianshan and Taihu in 2017.
Value applied	(1) 177.87kg CH ₄ /ha/season for early season rice; (2) 165.24 kg CH ₄ /ha/season for later season rice;
Justification of choice of data or description of measurement methods and procedures applied	The methodology provides two kinds of methods, which are ex ante calculation and monitoring. The project proponent chose the ex ante calculation method, and then conducted methane measurement according to the requirements in the Appendix according to the requirements of the ex ante calculation method, and finally obtained the above value according to the calculation method in the Appendix of methodology.

Purpose of Data	The parameter is used to calculate the baseline emission factor EF_{BL} and ex ante emission reduction calculation.
Comments	N/A

Data / Parameter	$SF_{BL,w}$
Data unit	N/A
Description	Baseline scaling factors to account for the differences in water regime during the cultivation period
Source of data	It is chosen from 2006 IPCC Guidelines for National Greenhouse Gas Inventories.
Value applied	1
Justification of choice of data or description of measurement methods and procedures applied	Since the rice is cultivated under continuously flooded condition in baseline scenario, the 1 of value is used.
Purpose of Data	The parameter is used to calculate the baseline emission factor EF_{BL} and ex ante emission reduction calculation.
Comments	N/A

Data / Parameter	$SF_{P,w}$
Data unit	N/A
Description	Project scaling factors to account for the differences in water regime during the cultivation period
Source of data	It is chosen from 2006 IPCC Guidelines for National Greenhouse Gas Inventories.
Value applied	0.52
Justification of choice of data or description of measurement methods and procedures applied	Since the rice is cultivated under intermittently flooded condition in project scenario, the 0.52 of value is used.

Purpose of Data	The parameter is used to calculate the project emission factor EF_P and ex ante emission reduction calculation.
Comments	N/A

Data / Parameter	$SF_{BL,p}$
Data unit	N/A
Description	Baseline scaling factors to account for the differences in water regime in the pre-season before the cultivation period.
Source of data	It is chosen from 2006 IPCC Guidelines for National Greenhouse Gas Inventories.
Value applied	1
Justification of choice of data or description of measurement methods and procedures applied	Since the cultivation mechanism in rice field is double cropping in baseline scenario, the 1 of value is used.
Purpose of Data	The parameter is used to calculate the baseline emission factor EF_{BL} and ex ante emission reduction calculation.
Comments	N/A

Data / Parameter	$SF_{P,p}$
Data unit	N/A
Description	Project scaling factors to account for the differences in water regime in the pre-season before the cultivation period.
Source of data	It is chosen from 2006 IPCC Guidelines for National Greenhouse Gas Inventories.
Value applied	1
Justification of choice of data or description of measurement	Since the cultivation mechanism in rice field is double cropping in project scenario, the 1 of value is used.

methods and procedures applied	
Purpose of Data	The parameter is used to calculate the baseline emission factor EF_P and ex ante emission reduction calculation.
Comments	N/A

Data / Parameter	$SF_{BL,o}$
Data unit	N/A
Description	Baseline scaling factors should vary for both type and amount of organic amendment applied
Source of data	It is calculated using equation (14) above.
Value applied	1
Justification of choice of data or description of measurement methods and procedures applied	Since no organic amendment was used in baseline scenario, which means the $ROA_i=0$, so $SF_{BL,o}$ is 1.
Purpose of Data	The parameter is used to calculate the baseline emission factor EF_{BL} and ex ante emission reduction calculation.
Comments	N/A

Data / Parameter	$SF_{P,o}$
Data unit	N/A
Description	Project scaling factors should vary for both type and amount of organic amendment applied
Source of data	It is calculated using equation (14) above.
Value applied	1
Justification of choice of data or description of measurement	Since no organic amendment was used in project scenario, which means the $ROA_i=0$, so $SF_{P,o}$ is 1.

methods and procedures applied	
Purpose of Data	The parameter is used to calculate the baseline emission factor EF_P and ex ante emission reduction calculation.
Comments	N/A

5.2 Data and Parameters Monitored

Data / Parameter	$A_{s,g}$
Data unit	ha
Description	Aggregated project area in a given season s
Source of data	To determine by collecting the project field sizes in a project database. Project proponent shall set up a database which holds data and information that allow an unambiguous identification of participating rice farms, including the size of field. The technicians should submit the report of the monitoring results every season.
Description of measurement methods and procedures to be applied	The size of project fields shall be determined by GPS or satellite data. Should such technologies not be available, established field size measurement approaches shall be used provided that uncertainties are taken into account in a conservative manner.
Frequency of monitoring/recording	Every season
Value applied	N/A
Monitoring equipment	GPS or satellite data
QA/QC procedures to be applied	General guidelines for SSC CDM methodologies
Purpose of data	The parameter is used to calculate the baseline emissions from project fields in season s (BE_s).
Calculation method	N/A
Comments	Only compliant farms are considered

Data / Parameter	$EF_{BL,s,g}$
Data unit	kg CH ₄ /ha per season
Description	Baseline emission factor of group g in a given season s
Source of data	Field measurements in baseline reference fields
Description of measurement methods and procedures to be applied	As per instructions in the appendix (Guidelines for measuring methane emissions from rice fields) and IPCC 2006, volume 4, chapter 5.5.
Frequency of monitoring/recording	It is obtained from the calculation of the emission rate for baseline reference fields according to the requirements in the Appendix of methodology, and the $C_{CH_4,t}$ (CH ₄ concentration in chamber at time t) of weekly gas samplings is derived from the laboratory analysis. Regular measurements as per closed chamber method guidance, seasonally integrated
Value applied	N/A
Monitoring equipment	Closed chamber and also devices in laboratory
QA/QC procedures to be applied	The implementation of methane measurement in rice fields shall be conducted by technicians trained by experts from Anhui Academy of Agricultural Sciences. Besides, the laboratory analysis is also conducted in this institution which owned an ISO/IEC 17025 certificate. All the data should be cross-checked by technicians and experts.
Purpose of data	The parameter is used to calculate the baseline emissions from project fields in season s (BE_s).
Calculation method	N/A
Comments	N/A

Data / Parameter	$EF_{P,s,g}$
Data unit	kg CH ₄ /ha per season
Description	Project emission factor of group g in a given season s
Source of data	Field measurements in project reference fields

Description of measurement methods and procedures to be applied	As per instructions in the appendix (Guidelines for measuring methane emissions from rice fields) and IPCC 2006, volume 4, chapter 5.5.
Frequency of monitoring/recording	It is obtained from the calculation of the emission rate for project reference fields according to the requirements in the Appendix of methodology, and the $C_{CH_4,t}$ (CH_4 concentration in chamber at time t) of weekly gas samplings is derived from the laboratory analysis. Regular measurements as per closed chamber method guidance, seasonally integrated
Value applied	N/A
Monitoring equipment	Closed chamber and also devices in laboratory
QA/QC procedures to be applied	The implementation of methane measurement in rice fields shall be conducted by technicians trained by experts from Anhui Academy of Agricultural Sciences. Besides, the laboratory analysis is also conducted in this institution which owned an ISO/IEC 17025 certificate. All the data should be cross-checked by technicians and experts.
Purpose of data	The parameter is used to calculate the project emissions from project fields in season s (PE_s).
Calculation method	N/A
Comments	N/A

5.3 Monitoring Plan

Monitoring process

(1) Monitoring of farmers' compliance with project cultivation practice (determination of $A_{s,g}$)

In order to determine whether the project fields are cultivated according to intermittently flooded cultivation practice, and thus assure that measurements on the reference fields are representative for the emissions from the project fields, a cultivation logbook shall be maintained for all project fields. With the help of the logbook, all parameters, as following, that are part of the project cultivation practice shall be documented by the farmers:

- (a) Sowing date;
- (b) Fertilizer, organic amendments, and crop protection application (date and amount);
- (c) Water regime on the field (e.g. "dry/moist/flooded") and dates where the water regime is changed from one status to another;

(d) Yield.

In addition, farmers shall state whether they have followed fertilization recommendations⁵³ provided with the introduction of the adjusted water management practice.

In this project, every farmers' household owning the paddy fields is regarded as an isolate unit. Project proponent has established a database which holds data and information of these 3,713 households involved in this project activity, which contains the name, ID number, address of the head of the household, size of the field, completion date of construction, the starting date of rice season. Therefore, the sampling below is based on the database.

Since the reporting and verification shall be done on the basis of samples of the logbooks from the households, according to the latest version of the "*Standard for sampling and surveys for CDM project activities and programme of activities (version 8.0)*", the process of sampling is shown as follows:

● Objectives and Reliability Requirements

This sampling plan is for 3,713 households involved in this project. The project had applied intermittently flooded water regime with the same type, same category and same technology. After the implementation, this new water regime displaced the traditional continuously flooded method during rice cultivation in the project area. The households' logbooks should be sampled for assuring the project activity. In this case, the project proponent shall use 90/10 confidence/precision according to the sampling standard mentioned above.

● Target Population

From the description, the target population is the related 3,713 households planting the rice.

Table 5-1 the number of households in each town/village of Qianshan City and Taihu County

City/County	Name of Town/Village	The number of households
Qianshan City	Meicheng Town	339
	Youba Village	308
	Wanghe Town	562
	Huangni Town	231

⁵³ The Technical Guidelines for Intermittently Flooded Rice Cultivation Method in Anhui Province, later issued by the Institute of Agricultural Engineering of Anhui Academy of Agricultural Sciences, also emphasized that the optimal amount of nitrogen fertilizer used in Anhui rice paddy fields is 9-10.5kg/ Mu.

	Huangpu Town	231
	Yujing Town	505
	Yuantan Town	312
Taihu County	Xiaochi Town	76
	Xincang Town	381
	Dashi Village	290
	Xuqiao Town	478
Total		3,713

● Sample Method

Since the households are numerous and scattered, the water regime used during rice cultivation is identical, stratified random sampling is adopted in order that each one can be selected with equal probability. The strata should be mutually exclusive: every element in the population must be assigned to only one stratum. The stratification requires that information on the stratification variable, e.g. survey sample household will be changed once per year. Simple random sampling method will be taken in each stratum by using Microsoft Excel.

● Sample Size

According to the “*Standard for sampling and surveys for CDM project activities and programme of activities (version 8.0)*”, the desired confidence level is 90% and the desired precision is 10%. Based on the statistical principles and sampling survey method, 311 samples should be sufficient to satisfy the desired confidence and precision. For mean value sampling, the required sampling quantity is calculated by the following steps:

$$n_1 = \frac{Z^2 \sigma^2}{d^2} \quad (15)$$

Step1:

Where:

Parameters	Description
Z	The symbol used in general formula for confidence intervals. The validation team confirms it is to be 1.645 when confidence interval is 90%
σ	The population standard deviation, which is not available to PP

d	The maximum error of estimate
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Step 2: Deformation of basic formula

$$n_1 = \frac{Z^2 \sigma^2}{d^2} = \frac{Z^2 (\frac{\sigma^2}{X^2})}{d^2/X^2} = Z^2 V^2 / e^2 \quad (16)$$

Where:

Parameters	Description
V	the coefficient of variation, and $V = \sigma/X$. As population standard deviation σ shall be smaller than the sample mean value X , hence from conservative consideration point of view, making $V=1$ can get the biggest sample size. It is conservative
e	the relative sampling error, and $e = d/X$, which is the precision. In this case, $e=10\%$ as discussed above

Consequently, $n_1 = \frac{Z^2 V^2}{e^2} = \frac{1.645^2}{0.01} = 270.6$, and round up to 271.

Step 3: Correction based on population size

$$n_2 = \frac{n_1 N}{n_1 + N} \quad (17)$$

Where:

Parameters	Description
N	The population size, it is 3,713 under project context

Therefore,

$$n_2 = \frac{n_1 N}{n_1 + N} = \frac{271 \times 3713}{271 + 3713} = 252.57, \text{ and round up to be } 253, \text{ it takes } n_2 = 253 \text{ is preferable.}$$

Step 4: Correction based on sampling approach

$$n_3 = B n_2 \quad (18)$$

Where:

Parameters	Description
B	The survey design effect

As discussed in *Procedures for Administering Data Collection and Minimizing Non-Sampling Errors*. The project adopts multi-stage sampling approach. In this case, $B \leq 1$ as per Sampling Design and Methodology. It's conservative consideration.

Thus, $n_3 = Bn_2 = 1 \times n_2 = 253$

Step 5: Correction based on responding rate

$$n_4 = \frac{n_3}{r} \quad (19)$$

Where:

The responding rate is adopted to be less 90% according to investigation report.

Thus, $n_4 = \frac{n_3}{r} = \frac{253}{90\%} = 281.11$, round up to be 282.

Step 6: Correction based on contingency consideration

$$n = 110\% \times n_4 \quad (20)$$

Where:

Consequently, the sample size $n = 110\% \times n_4 = 110\% \times 282 = 310.2$, round up to be 311.

The calculation result for n is 311. Therefore, although all the households are required to complete the logbooks, only 311 sample logbooks from households will be selected from the sampling frame according to stratified sampling method at the beginning of each year during the crediting period. The template of logbook was compiled by Shanghai Libra in accordance with the requirements of methodology. An inclusion of 311 samples in total, the sample size of each township was decided on the method of proportional distribution.

● Sampling Frame

In the investigation, sampling frame is worked out independently by taking town as sampling unit. Sampled group will be changed in each monitoring period. Firstly, calculate the ratio of households in every administrative town to the total population of Qianshan City and Taihu County. According to the ratio of every town, calculate the sampling size of every town, and then set the amount of sampling 314 households, the actual sampling size is the ratio of every town multiply by 311. Finally, according to the number of samples needed for each town, the random sampling function of Excel is used to extract from the database mentioned above.

Table 5-2. The sampling size of logbooks from households in each town/village of Qianshan City and Taihu County

Town/Village	Name of Town/Village	The number of households
Qianshan City	Meicheng Town	28
	Youba Village	26
	Wanghe Town	47
	Huangni Town	20
	Huangpu Town	20
	Yujing Town	42
	Yuantan Town	26
Taihu County	Xiaochi Town	6
	Xincang Town	32
	Dashi Village	24
	Xuqiao Town	40
Total		311

After the sampling logbooks are collected by the technicians, the expert will check the contents in the logbooks first to confirm whether the nitrogen application amount and drainage and irrigation frequency recorded by the farmers meet the requirements of the project activity, and then hand it to Shanghai Libra for final check, and then complete the monitoring report.

(2) Monitoring of baseline and project emissions (determination of $EF_{BL,s,g}$ and $EF_{P,s,g}$)

According to the applied methodology AMS-III.AU (version 4.0), post-emission reduction shall be calculated by the formulas (1) – (5) shown in Section 5.1 and Section 5.2 above. So, $EF_{BL,s,g}$ and $EF_{P,s,g}$ shall be measured by technicians based on the requirements in the appendix (shown as follows) and IPCC 2006, volume 4, chapter 5.5.

1. The implementation of methane measurement in rice fields requires the involvement of experts in this field or at least experienced staff trained by experts (i.e. from research institutions). These guidelines cannot replace expertise in setting up chamber measurements. They rather set minimum requirements that serve for standardizing the conditions under which methane emissions are measured for projects under this methodology.

2. Project proponents shall prepare a detailed plan for the seasonal methane measurements before the start of the season. The plan shall include the schedule for the field and laboratory measurements, the logistics that are necessary to get the gas samples to the laboratory and a cropping calendar. The plan shall also include all reference field specific information regarding location and climate, soil, water management, plant characteristics, fertilizer treatment and organic amendments.

3. The following guidance is structured according to the steps from field measurement to emission factor calculation. Project proponents shall make sure that the measurements on project and baseline reference fields are carried out in an equal manner and simultaneously.

Table 5-3 On the field – technical options for the chamber design

Feature	Conditions	
Chamber material	Option 1: Non-transparent ● Commercially available PVC containers or manufactured chambers (e.g. using galvanized iron); ● Painted white or covered with reflective material (to prevent increasing inside temperature); ● Only suitable for short-term exposure (typically 30 min) followed by immediate removal from the field	Option 2: Transparent ● Manufactured chambers using acrylic glass; ● Advantage of transparent chambers: could be placed for longer time spans on the field if equipped with a lid that remains open between measurements and is only closed during measurements
Placement in soil	Option 1: Fixed base ● Base made of non-corrosive material and remains in the field for the whole season; ● Base should allow tight sealing of the chamber; ● Base should have bores in the submerged	Option 2: Without base ● Chamber have to be placed on the soil with open lid to allow escape of eventual ebullition

	section to allow water exchange between inside and outside; ● Base should be installed at least 24 hours before the first sampling	
Auxiliaries of chamber	● Thermometer for measuring the temperature inside the chamber; ● Fan (battery operated) inside the chamber for mix the inside air during sampling; Sampling port (rubber stopper placed in a bore of the chamber)	
Basal area	Rectangular or rounded, but has to cover minimum of four rice hills (ca. 0.1m ² minimum)	
Height	Option 1: Fixed height Total height (protruding base + chamber) should exceed plant height	Option 2: Flexible height ● Adjustable to plant height; ● Chambers with different heights or modular design

Table 5-4 On the field – air sampling

Feature	Conditions
Replicate chambers per plot	Minimum requirement: Three replicate chambers per plot
Number of air samples per exposure/data points per measurement	Minimum requirement: Three samples per exposure
Exposure time	30 minutes
Daytime of measurement	Morning
Measurement interval	Minimum requirement: once per week
Syringe	Suitability test (leak proof) before measurement

	Preferably equipped with a lock for ease of handling
Sample storage until analysis	- Storage < 24h: air samples can remain in syringe; - Storage > 24h: transfer air samples into evacuated vial, store with slight overpressure

Table 5-5 Laboratory analysis

Feature	Conditions
Method	Gas Chromatography with flame ionization detector (FID)
Injection	Direct injection or with multi-port valve and sample loop
Column	Packed (e.g. molecular sieve) or capillary column
Calibration	With certified standard gas each day of analysis before and after the analyses are done

In this project, there is only one field group, thus, three baseline reference fields and project reference fields should be selected respectively for methane emission measurement. Besides, project reference fields shall be established close to the baseline reference fields and begin with the growing season at the same time as required by the methodology that the measurements on project and baseline reference fields are carried out in an equal manner and simultaneously. The emission is the average of the measurement results from the three reference fields.

The seasonally integrated emission factor $EF_{BL,s,g}$ (baseline) and $EF_{P,s,g}$ (project) shall be derived as average value from the three measurements for each group.

Hefei Luyu, as the project proponent, prepares a detailed plan for the seasonal methane measurements before the start of the season. The plan for field measurement and laboratory analysis is shown as follows. The implementation of methane measurement in both baseline and project reference fields is involved by the experts from Anhui Academy of Agricultural Sciences which is an institution owned the certificate to do the laboratory analysis. The expert who is the leader of the experiment has a doctoral degree and her field of study is rice cultivation and GHG monitoring.

Table 5-6 On the field – technical options for the chamber design

Feature	Requirements	Conditions in the baseline reference fields	Conditions in the project reference fields
Chamber material	Option 1: Non-transparent ● Commercially available PVC containers or manufactured chambers (e.g. using galvanized iron); ● Painted white or covered with reflective material (to prevent increasing inside temperature); ● Only suitable for short-term exposure (typically 30 min) followed by immediate removal from the field	The chamber used in this project is made of PVC materials covered with reflective material to prevent the increasing inside temperature. And it is only put just before the sampling and then is removed after 30 mins of sampling.	The chamber used in this project is made of PVC materials covered with reflective material to prevent the increasing inside temperature. And it is only put just before the sampling and then is removed after 30 mins of sampling.
Placement in soil	Option 1: Fixed base ● Base made of non-corrosive material and remains in the field for the whole season; ● Base should allow tight sealing of the chamber; ● Base should have bores in the submerged section	The base used in this project is made of non-corrosive PVC material and was embedded before transplantation, remaining in the field for the whole season. Base allows tight sealing of the chamber and has bores in the submerged section to allow water exchange. The first sampling was	The base used in this project is made of non-corrosive PVC material and was embedded before transplantation, remaining in the field for the whole season. Base allows tight sealing of the chamber

	to allow water exchange between inside and outside; ● Base should be installed at least 24 hours before the first sampling	taken 24 hours after the base installation (see details in Table 4-2 above).	and has bores in the submerged section to allow water exchange. The first sampling was taken 24 hours after the base installation (see details in Table 4-2 above).
Auxiliaries of chamber	● Thermometer for measuring the temperature inside the chamber; ● Fan (battery operated) inside the chamber for mix the inside air during sampling; ● Sampling port (rubber stopper placed in a bore of the chamber)	There are a thermometer and a fan inside the chamber and the sampling port is set on the top of the chamber.	There are a thermometer and a fan inside the chamber and the sampling port is set on the top of the chamber.
Basal area	Rectangular or rounded, but has to cover minimum of four rice hills (ca. 0.1m² minimum)	The base is rectangular and installed covering four rice hills.	The base is rectangular and installed covering four rice hills.
Height	Option 1: Fixed height Total height (protruding base + chamber) should exceed plant height	The total height of chamber and base is 1.5 meters which is higher than 1.2 meters, the largest height of the plant.	The total height of chamber and base is 1.5 meters which is higher than 1.2 meters, the

			largest height of the plant.
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Table 5-7 On the field – air sampling

Feature	Requirements	Conditions in the baseline reference fields	Conditions in the project reference fields
Replicate chambers per plot	Minimum requirement: Three replicate chambers per plot	Three replicate chambers were placed in every plot.	Three replicate chambers were placed in every plot.
Number of air samples per exposure/data points per measurement	Minimum requirement: Three samples per exposure	Three samples for every exposure.	Three samples for every exposure.
Exposure time	30 minutes	30 minutes	30 minutes
Daytime of measurement	Morning	9.30 – 10.00 a.m.	9.30 – 10.00 a.m.
Measurement interval	Minimum requirement: once per week	Once a week	Once a week
Syringe	Suitability test (leak proof) before measurement Preferably equipped with a lock for ease of handling	The syringe with a lock was used in this project and it is checked for leak proof before every measurement.	The syringe with a lock was used in this project and it is checked for leak proof before every measurement.
Sample storage until analysis	- Storage < 24h: air samples can remain in syringe; - Storage > 24h: transfer air samples into evacuated vial,	Three samples were taken before a laboratory analysis was performed, so the samples were stored in the evacuated vials.	Three samples were taken before a laboratory analysis was performed, so the samples

	store with slight overpressure		were stored in the evacuated vials.
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Table 5-8 Laboratory analysis

Feature	Requirements	Conditions in the baseline reference fields	Conditions in the project reference fields
Method	Gas Chromatography with flame ionization detector (FID)	FID	FID
Injection	Direct injection or with multi-port valve and sample loop	Direct injection	Direct injection
Column	Packed (e.g. molecular sieve) or capillary column	Packed	Packed
Calibration	With certified standard gas each day of analysis before and after the analyses are done	With certified standard gas each day of analysis before and after the analyses are done	With certified standard gas each day of analysis before and after the analyses are done

Calculation of the emission rate for a plot (reference field)

- (1) For each gas analysis, calculate the mass of CH₄ emissions with the help of the following formula:

$$m_{CH_4} = c_{CH_4,t} \times V_{chamber} \times M_{CH_4} \times \frac{1atm}{R \times T_t \times 1000} \quad (21)$$

Where:

Parameters	Description
m_{CH_4}	Mass of CH ₄ in chamber at time t (mg)

t	Point of time of sample (e.g. 0,15,30 in case of three samples within 30 minutes)
$c_{CH_4,t}$	CH ₄ concentration in chamber at time t, from gas analysis (ppm)
$V_{chamber}$	Chamber volume (L)
M_{CH_4}	Molar mass of CH ₄ : 16g/mol
$1atm$	Assume constant pressure of 1atm, unless pressure measurement is installed
R	Universal gas constant: 0.08206 L atm/K ⁻¹ *mol ⁻¹
T_t	Temperature at time t (K)

- (2) Determine the slope of the line of best fit for the values of over time with the help of software (e.g. Excel):

$$s = \frac{\Delta m_{CH_4}}{\Delta t} \quad (22)$$

Where:

Parameters	Description
s	Slope of line of best fit (mg/min)

- (3) Calculate the emission rate per hour for one chamber measurement:

$$RE_{ch} = s \times \frac{60min}{A_{chamber}} \quad (23)$$

Where:

Parameters	Description
RE_{ch}	Emission rate of chamber ch (mg/h*m ²)
ch	Index for replicate chamber on a plot
$A_{chamber}$	Chamber area (m ²)

- (4) Calculate the average emission rate of a chamber measurement per plot:

$$RE_{plot} = \frac{\sum_{ch=1}^{Ch} RE_{ch}}{Ch} \quad (24)$$

Where:

Parameters	Description
RE_{plot}	Average emission rate of a plot (mg/h*m ²)
Ch	Number of replicate chambers per plot

- (5) Further procedure: from the average emission rates per plot of each chamber measurement, derive the seasonally integrated emission factor by integration of the measurement results over the season length. The simplest way of integration is multiplying the emission rate with the number of hours of the measurement interval (e.g. one week) and accumulating the results of every measurement interval over the season. Convert from mg/m² to kg/ha by multiplying with 0.01.

Monitoring team

The monitoring team consists of the project proponent, Shanghai Libra Investment Management Co., Ltd, technicians and experts from the agricultural bureau. Firstly, Shanghai Libra sets the number of reference fields, and drafts cultivation logbooks template, tables, etc. Secondly, project proponent and Shang Libra confirm the monitoring frequency and notify the technicians and the agricultural bureau. The technicians also need to instruct the farmers and check the famers' logbooks every month. Finally, according to the requirements in the Appendix of methodology, the gas sampling on field should be conducted once a week in baseline and project reference fields, respectively. Then, the $EF_{BL,s,g}$ and $EF_{P,s,g}$ can be obtained from the calculation of the emission rate for baseline reference fields according to the requirements in the Appendix of methodology, and the $C_{CH_4,t}$ (CH₄ concentration in chamber at time t) of weekly gas samplings is derived from the laboratory analysis. The implementation of methane measurement in both baseline and project reference fields is involved by the experts from Anhui Academy of Agricultural Sciences which is an institution owned the certificate to do the laboratory analysis. The expert who is the leader of the experiment has a doctoral degree and her field of study is rice cultivation and GHG monitoring. Therefore, the accuracy of monitoring results is guaranteed.

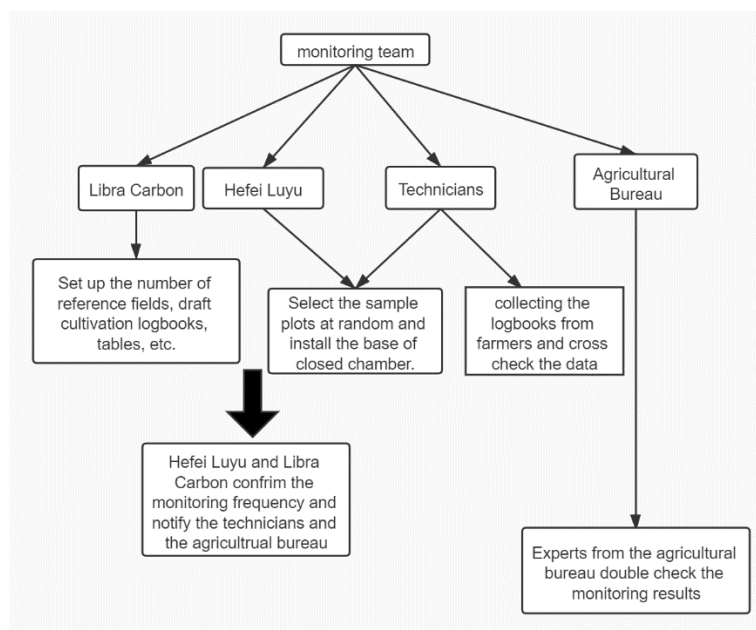


Figure 5-1 The figure of the monitoring team

Determine the reference fields

The reference fields are fixed rice paddies with area of around 0.35 ha⁵⁴. The measurements on project and baseline reference fields are carried out in an equal manner and simultaneously. The baseline reference fields should be selected that they are representative of baseline scenario where double-cropping rice is planted by continuously flooded method without any organic amendments, while the project reference fields should be selected that they are representative of project scenario where double-cropping rice is planted by intermittent flooded method without any organic amendments.

Monitoring frequency

The monitoring frequency should be determined according to the methodology requirements for each parameter in the project after the project registration in order to ensure the continuity of the benefits. Firstly, the aggregated project area in a given season s ($A_{s,g}$) is required to be monitored by technicians for every season. Should farmers relevantly deviate from the defined project cultivation practice, so that their fields cannot be deemed to be represented by the reference fields any more, those fields shall not be taken into account for the determination of the aggregated project area $A_{s,g}$ of that season.

Secondly, baseline and project emission factor of group g in a given season s ($EF_{BL,s,g}$ and $EF_{P,s,g}$) are obtained from the calculation of the emission rate for baseline reference fields

⁵⁴ According to the opinions of experts who is leading the on-site sampling and laboratory analysis and the general size of high-standard farmland, the experimental data is reliable and reasonable to select about 0.35 hectares of farmland as the reference fields.

according to the requirements in the Appendix of methodology, and the $C_{CH_4,t}$ (CH_4 concentration in chamber at time t) of weekly gas samplings is derived from the laboratory analysis. So, technicians should do the on-field sampling once a week, while the laboratory analysis is conducted by experts from Anhui Academy of Agricultural Sciences every three times of samplings. It is an institution owned the certificate to do the laboratory analysis and the expert who is the leader of the experiment has a doctoral degree and her field of study is rice cultivation and GHG monitoring. Therefore, the accuracy of monitoring results can be guaranteed.

The installation and calibration of the closed chamber and laboratory analysis shall be in accordance with the requirements in the Appendix of methodology (shown in Table 5-6~5-8 of Section 5.2 above). The equipment used in this project has been qualified by China National Accreditation Service for Conformity Assessment⁵⁵. Among them, FID has been judged to be qualified by the Regulations of Calibrate Metrological Verification (JJG 700-2016). And the syringe, evacuated vial and the closed chamber used in this project have been judged to be qualified by the application requirement of CNAS-CL01 Accreditation Criteria for Testing and Calibrating Laboratory Competencies (CNAS-CL52_2014).

Data management

All data collected as part of monitoring is archived electronically. All information should be stored by the technology department of the project proponent and all the materials have physical copies for backup. All data collected shall be archived at least two years after the end of the last crediting period of the project activity.

QA/QC

A systematic internal review and correction process will be used to assure/control the quality. The technicians are required to collect the logbooks from farmers once a month and cross check the data with experts. Similarly, the process of monitoring is also supervised by experts. When they find some unusual data, they will feed back to technicians and then correct the data before share it with Shanghai Libra. Shanghai Libra will draft the monitoring report based on the raw data and cross-check with the agricultural bureau experts. If there are not any further comments from the experts, Shanghai Libra will finalise the report. All parties are required to reply any questions raised within 30 days.

Emergency procedure

In this project, it is possible to cause equipment damage or missing data due to negligence and improper operation.

First of all, before the start of each growing season, Shanghai Libra should train technicians on how to check whether the equipment is working properly. After that, the technicians should

⁵⁵ See more details in the Attachment of Laboratory Accreditation Certificate

check whether the equipment in the field is in good condition. Secondly, if there is any damage, the replacement should be completed before the land preparation, and the replacement should be recorded by Hefei Luyu and Shanghai Libra to ensure that the replaced equipment meets the requirements of this project. All the equipment should be in place before the start of growing season (land preparation). Thirdly, the technician should pay close attention to weather forecasts during rice planting. If extreme weather, such as heavy rain, is imminent, on-field gas sampling should be carried out before and after the extreme weather to ensure the monitoring frequency, at least once a week, required in the Appendix of methodology. Finally, if data loss or equipment damage occurs during the monitoring process, the corresponding emission reduction will be deducted in the most conservative way.