METHODOLOGY ASSESSMENT REPORT "REDUCTION OF ENTERIC METHANE EMISSIONS FROM RUMINANTS BY THE USE OF 100% NATURAL FEED SUPPLEMENT PROVIDED BY MOOTRAL SA.

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Document Prepared By RINA SERVICES SPA

Methodology Title	Reduction of enteric methane emissions from ruminants by the use of 100% natural feed supplement provided by "MOOTRAL SA".	
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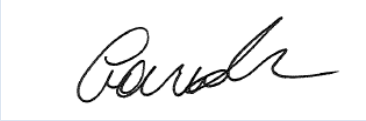
Approved By	Laura SEVERINO (Head of Certification Innovation & Sustainability) 
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Summary:

RINA Service Spa is retained to provide the first assessment in the VCS double-approval process for the proposed methodology element titled "Methodology for the reduction of enteric methane emissions from ruminants through the use of 100% natural feed supplement". The methodology element provides procedures for monitoring and calculating emission reductions generated form the inhibition of methanogenesis due the introduction of a natural feed supplement into ruminant's diet. The methodology considers only emission reductions from enteric fermentation.

Purpose and scope of the assessment. The purpose of the assessment is to determine whether and how the methodology adheres to VCS rules and requirements set out in the VCS Standards and its ancillary documents, and any other applicable requirements set out under the VCS program. The scope of assessment includes whether and how the methodology addresses the: (a) the relationship to approved or pending methodology; (b) stakeholder consultation; (c) structure and clarity of the methodology; (d) definitions; (e) applicability conditions; (f) project boundary; (g) baseline scenario; (h)

additionality; (i) baseline emissions, project emissions, leakage; (l) Net GHG emission reduction; (m) monitoring of data and parameters.

Method and criteria used for the assessment. The methodology assessment is conducted using RINA procedures in line with the requirements specified in the VCS Standard, VCS Methodology Approval Process, VCS Validation and Verification Manual and any other applicable requirements set out under the VCS program, latest version available, and ISO14064-3 requirements and applying auditing techniques. Methodology assessment is carried out through background research, document reviews and interviews with the methodology developer and stakeholders in order to determine whether the criteria described in the methodology conform to the principles and requirements set out in the VCS Standard and with scientific best practice used in the sectoral scope into which falls in. RINA meets the eligibility criteria set out in the VCS Methodology Approval Process and the team involves qualified team members to undertake methodology assessment. The methodology assessment report before to be submitted to client is submitted to independent technical review. The assessment is not meant to provide any consultancy towards the project developer; however stated request for clarification and/or corrective actions may have provided input for improvement of the methodology clarity.

During the assessment process RINA issued six clarification requests and sixteen corrective action requests for which the methodology developer is requested to provide responses, evidences and if necessary changes to the methodology element. All of hem were addressed sufficiently by MOOTRAL.

RINA is of the opinion that the “Reduction of enteric methane emissions from ruminants through the use of 100% natural feed supplement”, as described in Version 9 of the methodology element of 16/10/2019, meets all relevant VCS requirements.

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1 INTRODUCTION

MOOTRAL SA has commissioned RINA to carry out the first assessment of methodology ***Reduction of enteric methane emissions from ruminants by the use of 100% natural feed supplement provided by "MOOTRAL SA"***. This report provides a description of the steps involved in conducting the first methodology assessment as a part of the VCS double-approval process and summarizes the findings of the first methodology assessment. RINA was provided an initial version of the methodology dated 27/02/2019, updated versions dated 29/04/2019, and version of 16/10/2019 (after the second assessment). Based on this documentation, the audit team performed a document review and desktop audit, which resulted in corrective action and clarification requests (discussed later in this report) and revisions to the methodology.

1.1 Objective

The purpose of the assessment is to determine whether and how the methodology adheres to VCS rules and requirements set out in the VCS Standards and its ancillary documents, and any other applicable requirements set out under the VCS program. The scope of assessment includes whether and how the methodology addresses the: (a) the relationship to approved or pending methodology; (b) stakeholder consultation; (c) structure and clarity of the methodology; (d) definitions; (e) applicability conditions; (f) project boundary; (g) baseline scenario; (h) additionality; (i) baseline emissions, project emissions, leakage; (l) Net GHG emission reduction; (m) monitoring of data and parameters.

The methodology assessment report is prepared in accordance to the guidance in the VCS Validation and Verification Manual, and adhere to the instructional text set out in the Methodology Assessment Report template.

1.2 Summary Description of the Methodology

The methodology element applies to project activities resulting in emission reductions from enteric emissions by ruminants as result of their digestion process of feed supplement in the rumen. In the specific it applies in livestock operations where no similar enteric methane reduction activities were taken place, therefore leading to CH4 released into the atmosphere. The feed supplement is a blend of natural compounds with a combination of dried or extracted garlic, citrus fruit extract, and it reduces methane emissions when it is administered as a daily dose to the animal. The application of the feed supplement in the rumen diet improves fermentation and reduces methane emissions by direct inhibition of methanogens in the rumen. As the production of methane in the rumen can represent a loss of up to 12% of the digestible energy /12/, feed supplementation is currently being pursued with a view to improving energy utilization in ruminants and mitigating the production of methane /28/.

2 ASSESSMENT APPROACH

2.1 Method and Criteria

The methodology assessment is conducted using RINA procedures in line with the requirements specified in the VCS Standard, VCS Methodology Approval Process, VCS Validation and

Verification Manual and any other applicable requirements set out under the VCS program, latest version available, and ISO14064-3 requirements and applying auditing techniques. According to ISO14064-3, the criteria are the policy, procedures or requirements used as reference against which evidence is compared. Therefore, the methodology assessment is measured for compliance against the following criteria:

- VCS Standard version 3.7
- VCS Program Guide version 3.7
- VCS Program Definitions version 3.7
- VCS Validation and Verification Manual version 3.2
- VCS Methodology Approval Process version 3.7

The assessment process derived from all items in the assessment criteria stated above and it consists of background research, document reviews and interviews with the methodology developer, corrective actions and supplemental information, assessment reporting, in order to meet a reasonable level of assurance.

2.2 Document Review

A detailed review of all methodology documentation is conducted to ensure consistency with and identify any deviation from VCS program requirements. The following table lists the documentation that is reviewed during the methodology assessment:

/1/	VCS Methodology: Reduction of enteric methane emissions from ruminants by the use of 100% natural feed supplement provided by MOOTRAL SA. Version 8 of 27/02/2019, version 9 of 28/04/2019, version 9 of 16/10/2019 (after second assessment)
/2/	American Dairy Science Association: The influence of strain of Holstein-Friesian cow and feeding system on greenhouse gas emissions from pastoral dairy farms. (2010)
/3/	FAPRI-UK Project: Greenhouse Gas Emission Modelling System for England, Wales, Scotland and Northern Ireland. (December 2010)
/4/	MOOTRAL SA: Report Brades Farm Project 3.3–12.8.2018. (20/08/2018)
/5/	Frontiers in Microbiology: Application of Mootral™ reduces methane production by altering the Archaea community in the rumen simulation technique. (04/09/2018)
/6/	American Dairy Science Association: On-farm methane measurements during milking correlate with total methane production by individual dairy cows. (2012)
/7/	Food and Agriculture organization of the United Nations: Tackling climate change through

	livestock. (2013)
/8/	Animal Feed Science and Technology: Review of current in vivo measurement techniques for quantifying enteric methane emission from ruminants. (2016)
/9/	Journal of General Microbiology: Growth and rumen function of gnotobiotic lambs fed on starchy diets. (12/1980)
/10/	International Dairy Forum: The effect of a blend of natural compounds (NX-RH-201) on the quality of milk produces on a commercial farm under normal operational conditions.
/11/	Acta Agraria Kaposvàriensis: Carbon footprint from dairy farming system: comparison between Holstein and Jersey cattle in Italian circumstances. (2014)
/12/	Journal of Animal Science: Methane emissions from cattle. (1995)
/13/	Land: Effect of feeding system on enteric methane emissions from individual dairy cows on commercial farms. (2018)
/14/	Sean M. McGinn, Karen A. Beauchemin and Trevor W. Coates, Agriculture and Agri-Food Canada, Lethbridge: Measurement of methane emissions from cattle using chambers and micrometeorological techniques.
/15/	The Animal Consortium - D.P. Morgavi, E. Forano, C. Martin and C.J. Newbold: Microbial ecosystem and methanogenesis in ruminants. (2010)
/16/	HAL - Angela Moss, Jean-Pierre Jouany, John Newbold: Methane production by ruminants: its contribution to global warming. (2000)
/17/	Global Change Biology - Mutian Niu, Ermias Kebreab, Alexander N. Hristov, Joonpyo Oh, Claudia Arndt, Andre Bannink, Ali R. Bayat, Andre F. Brito, Tommy Boland, David Casper, Les A. Crompton, Jan Dijkstra, Maguy A. Eugene, Phil C. Garnsworthy, Md Najmul Haque, Anne L.F. Hellwing, Pekka Huhtanen, Michael Kreuzer, Bjoern Kuhla, Peter Lund, Jørgen Madsen, Cecile Martin, Shelby C. McClelland, Mark McGee, Peter J. Moate, Stefan Muetzel, Camila Munoz, Padraig O'Kiely, Nico Peiren, Christopher K. Reynolds, Angela Schwarm, Kevin J. Shingfield, Tonje M. Storlien, Martin R. Weisbjerg, David R. Yanez-Ruiz, Zhongtang Yu: Prediction of enteric methane production, yield, and intensity in dairy cattle using and intercontinental database. (2017).
/18/	The Animal Consortium - M.G.G. Chagunda: Opportunities and challenges in the use of the laser methane detector to monitor enteric methane emissions from ruminants. (2013)
/19/	Alexander N. Hristova, Joonpyo Oha, Fabio Giallongoa, Tyler W. Fredericka, Michael T. Harpera, Holley L. Weeksa, Antonio F. Brancob, Peter J. Moatec, Matthew H. Deightonc, S. Richard O. Williamsc, Maik Kindermannd, Stephane Duvale: An inhibitor persistently decreased enteric methane emission from dairy cows with no negative effect on milk production. (2015)

/20/	C. Alan Rotz: Modelling greenhouse gas emissions from dairy farms. (2018)
/21/	2006 IPCC Guidelines for National Greenhouse Gas Inventories: Emissions from livestock and manure management.
/22/	American Dairy Science Association - B. Vlaeminck, V. Fievez, S. Tamminga, R.J. Dewhurst, A. van Vuuren, D. De Brabander, D. Demeyer: Milk Odd- and Branched-Chain fatty acids in relation to the rumen fermentation pattern. (2006)
/23/	BMC Microbiology - Marc F Whitford, Ronald M Teather, Robert J Forster: Phylogenetic analysis of methanogens from the bovine rumen. (2001)
/24/	Zimmerman: Method and system for monitoring and reducing ruminant methane production. (2009)
/25/	The Green Optimistic: Swiss company develops new cow feed to cause fewer farts (10/2018). https://www.greenoptimistic.com/swiss-company-develops-new-cow-feed-fewer-farts-20181006/#.XF
/26/	FEEDINFO: France's Valorex Extracts value from overlooked grains (09/03/2010) http://www.pinallet.com/data/FEEEDINFO%20Interviews%20VALOREX%20CEO.pdf
/27/	J.Dairy Sci – Predicting manure volatile solid output of lactating dairy cows https://www.journalofdairyscience.org/article/S0022-0302(17)30988-8/pdf
/28/	Application of MootralTM reduces methane production by altering the archaea community in the rumen simulation technique. https://www.ncbi.nlm.nih.gov/pubmed/30233557
/29/	Boadi, D., Benchaar, C., Chiquette, J. and Massé, D. 2004. Mitigation strategies to reduce enteric methane emissions from dairy cows: Update review. Can. J. Anim. Sci. 84: 319–335
/30/	GHG Online – Methane Sources Ruminants http://www.ghgonline.org/methaneruminants.htm
/31/	Greenhouse gas emissions from ruminant supply chains – A global life cycle assessment http://www.fao.org/3/i3461e/i3461e02.pdf

2.3 Interviews

The objective of the interview process was to solicit important information from personnel related to methodology development. The audit team held teleconferences with the following individuals during the course of the methodology assessment*:*

- Elisavet Zoupanidou, Project Manager, Carbon and Sustainability, Mootral SA.
- Dr. Maria Sünkel, Scientific Affairs Manager, Mootral SA
- *Sergi Cuadrat, Technical Director, Allcot AG*
- Mercedes García Madero, Technical Director, Allcot AG
- Isabelle Botticelli, VP Head of Operations, Mootral SA
- Dr. Hilde Vrancken, VP Head of Scientific Affairs, Mootral SA
- Michael Mathres, VP Head of Strategic Projects, Mootral SA

2.4 Assessment Team

Rita VALOROSO (Team Leader/GHG Validator-Verifier). She is a senior auditor with over ten years of experience in GHG validation and verification and GHG management (from 2005). Her competency is confirmed through the qualification process and related documentation in accordance with the UNFCCC CDM Accreditation Standard requirements*.*

Daria MASO (Technical Expert in SS 15). She is a senior technical expert with over ten years of experience activities concerning climate action, environment, forestry, agriculture. Her competency is confirmed through the qualification process and related documentation in accordance with the UNFCCC CDM Accreditation Standard requirements*.*

Rekha MEMON (Independent Technical Reviewer). She is a senior with over 14 years of experience in GHG validation and verification and GHG management. Her competency is confirmed through the qualification process and related documentation in accordance with the UNFCCC CDM Accreditation Standard requirements*.*

Filippo CAMERINI (Technical Expert in SS 15 supporting Independent Technical Reviewer). He is a senior technical expert with over twenty years of experience activities concerning forestry and agriculture. His competency is confirmed through the qualification process and related documentation in accordance with the UNFCCC CDM Accreditation Standard requirements*.*

Certificates of competence assessment team are available in APPENDIX B.

A VCS approved expert was not retained during the assessment of methodology element. An expert will be retained by the second assessor in the VCS double approval process.

2.5 Resolution of Findings

The objective of this phase of the validation is to resolve any outstanding issues, which need to be clarified for RINA's conclusion on the methodology assessment. Findings related to corrective actions, clarification requests are resolved during communication between the assessment team and the methodology developer. More specifically, where noted by the assessment team, methodology developer implemented corrective actions by amending and proving written clarification responses. Types of finding are characterized in the following manner*:*

- Corrective Action Request (CAR) is raised if one do the following occurs: (a) the methodology developer has made mistakes that influence the ability of the methodology to achieve real, measurable additional emission reductions; (b) the VCS requirements have not been met; (c) there is a risk that the methodology cannot ensure the monitoring and the calculation of emission reductions*.*

- Clarification Request (CR) is raised if information is insufficient or not clear enough to determine the applicable VCS requirements have been met.

The specific corrective action and clarification requests issued by the audit team, as well as the responses provided by MOOTRAL, are summarized in the attached Appendix C*.*

3 ASSESSMENT FINDINGS

3.1 Relationship to Approved or Pending Methodologies

According to para 6.2.1 of the Methodology approval process, the following methodologies falling into the sectoral scope 15 have been identified for being reviewed whether and existing methodology could be reasonably be revised to meet the objective of the proposed methodology. Potentially similar methodologies consist of approved, not approved, or pending methodologies within Sectoral Scope 15. The methodology has considered the following methodologies to assess the similarity with the proposed new methodology**:**

GHG Progam	Methology	Methodology scope	New methodology scope	Similarity
CDM	AMS-III.BK. Strategic feed supplementation in smallholder dairy sector to increase productivity. The methodology is within the list of approved small-scale methodologies.	This methodology is applicable to project activities that use strategic supplementation to improve the digestibility of feedstuff fed to large ruminants (i.e. dairy cows and/or buffalo) in the smallholder diary sector, for the purpose of increasing milk productivity and thus reducing methane emissions per unit of milk produced. The methodology is not intended for technologies/measures targeting suppression of methane emissions from the process of enteric fermentation	The methodology provides procedures to estimate enteric methane emission reductions generated from the inhibition of methanogenesis due to the introduction of a natural feed supplement into ruminant's diet. The methodology considers only reductions from enteric fermentation.	NO
CDM	NM260 Uganda Cattle Feed Project (UCFP). The methodology is within the list of finalized proposed new large scale methodologies, not approved.	The methology is applicable to dairy cows in Uganda and is not intended technologies/measures targeting suppression of methane emissions from the process of enteric fermentation		NO
CDM	SSC-MN085 Strategic supplementation of a large ruminant dairy sector for the reductions of methane. The methodology is within the list of finalized new small-scale methodologies, not approved.	The methodology is applicable to projects that develop and sell a nutritional feed supplement to productive dairy animals (cattle/buffle).		
VCS	VCS 02 Methodology to reduce enteric methane emissions in beef cattle using organic or natural feed supplements. The methodology is in the list under development.	The methodology is applicable to beef cattle release methane as a result of digestion of feed materials in rumen. The methology seeks to reduce GHG emissions from both enteric fermentation and manure handling by reducing the number of days on feed using a feed supplement. The methodologys is limited to catlle range fed or semi-confined.		NO

The methodology discussed above are not similar to the proposed new methodology because are not intended technologies/measures targeting suppression of methane emissions from the process of enteric fermentation, and in the case of VCS methodology even if it considers the GHG reductions form enteric fermentations it also consider the GHG reductions from the manure management.

3.2 Stakeholder Comments

Under the public stakeholder consultation period from 28/02/2019 until 30/03/2019 (https://verra.org/methodology/reduction-of-enteric-methane-emissions/), the methodology received comments from: Climate Focus and CIAT, Greenhouse Gas Management Institute, Native Energy, South Pole, TREES Consulting and Viresco Solutions. The list of comments are available in Appendix D of this report.

The methodology developer responded to each comment appropriately. Several of the comments caught mistakes of one kind or another, which were changes in later version of the methodology. The developer's responses to the comments are reasonable and sometimes resulting in change in the document. The list of the public comments are available in Appendix D while the responses

provided by the MD are attached to this report as Attachement A_Mootral Metthodology_Public Comments-Answers_28042019.xlsx.

3.3 Structure and Clarity of Methodology

The proposed new methodology uses the latest version of the VCS methodology template (Version 3) available at the VERRA website at the time the methodology is developed and made publicly available for the stakeholder comments. The terminology used is consistent with that of the VCS program and the language appropriately identifies the level of adherence to the methodology requirements. The criteria and procedures as described are readable applicable and consistent for auditing of the project activities. Based on that, the overall structure and clarity of the methodology meets the VCS requirements.

3.4 Definitions

The methodology introduces definitions of key terms relevant to the application of the procedures and requirement given elsewhere in the methodology. The definitions are given in alphabetical order and provide the necessary clarity to ensure the terms are used consistently throughout the methodology.

3.5 Applicability Conditions

The VCS standard requires that the methodology identify the project activities to which it applies and establish criteria that describe the conditions under which the methodology can be applied. The methodology conforms to this by providing detailed applicability conditions in § 4 of the methodology element. The methodology identifies criteria by which to assess the eligibility of project activities at the time of project validation. These include criteria related to the pre-project and post-project implementation and criteria are designed to ensure that the project complies wih the VCS crediting requirements. This assessment determined that the applicability conditions contained within the methodology are appropriate, adequate and in compliance with the VCS rules. In the specific, the methodology requires eligible projects to meet the following applicability conditions:

Methodology applicability conditions	**Assessment team findings**
1.Livestock producers must feed their animals (all ruminants managed under farm system) by a natural feed supplement which reduces enteric CH4 emissions by direct inhibition of methanogens in the rumen.	The applicability condition is sufficiently clear to determine the animal feed. The characteristics/conditions of the natural feed supplement are clearly defined in condition 3.

2.Livestock in the project boundaries only includes ruminant animals.	The applicability condition is written in a clear and precise manner to ensure clear boundaries and animal species to which is applicable. The mean of ruminant is clearly defined in §3 Definition of the methodology element.
3.The feed supplement must meet the following conditions as: (a) The active ingredients of the feed supplement must be 100% natural plant-based or macroalgae based and non-GMO. The feed manufacturer needs to provide a non-GMO certificate based on lab analysis; (b) The feed supplement must have been demonstrated to comply with all feed and food regulations in each national or subnational (including local) jurisdiction in which it is consumed. Where conflict arises between regulations, the most stringent standard will apply; (c) the feed supplement must have no significant negative health on performance impacts on the animal to which is fed. Where conflict arises between regulations he most stringent standard will apply; (d) The feed supplement must be used as per feeding instructions provided by the manufacturer. The instructions provide critical defining conditions to secure the default level of reduction of the enteric methane emissions, such as the feeding routine and dose of supplement per kg of DMI to the animal.	The applicability condition is written in a sufficiently precise manner to direct projects to use of the appropriate feed supplement and ensures projects are unable to fall out of line with the condition.
4.Emission reductions by the use of other feed supplements and/or activities (e.g. improving animal productivity or nutritional and management strategies) the objective of which does not lead the inhibition of methanogenesis in the rumen cannot be claimed through this methodology. This is to prevent overestimation of emission reduction achieved.	The applicability condition is written in a sufficiently precise manner to ensure projects are unable account emission reductions not generated by the feed supplement under methodology conditions.

5.The implementation of project activities must confirm that the herd of ruminants in a given operation is fed the project feed supplement. For this purpose, the project proponent must be able to trace the feed supplement from on-farm consumption.	The applicability condition is practical to account emission reductions due to feed supplement consumption.
6. The feed manufacturer need to provide proof of evidence for no increase in the manure emissions due to feed supplementation (e.g. evidence-based literature, peer reviewed publications, study reports).	The applicability condition is written in a precise manner to direct projects to use appropriate data for calculating project emissions. It allows for a demonstration of conformance at time of project validation and ensures project are unable to fall out of line with the condition.
7.Baseline emissions included in this methodology are CH_4 production from enteric fermentation and is determined as the average activity over at least three continuous years prior to project implementation. Therefore, the project activities are required to meet the following conditions: (a) Where project areas involve livestock farms that were operating prior to the start of project activities, reliable data (e.g., gross energy intake and dry matter intake) per animal group must be available for a minimum of three years if using baseline emissions option 2 and two years if using baseline emissions option 1; (b) Where project areas involve livestock farms where farm records and farming data are available , the project proponent must be able to provide evidence to substantiate the farm stratum to which each new project area is allocated according to the average stratum as described in national or regional statistical accounts (i.e., the baseline emissions will be considered as the average activity of where the project is located).	This applicability condition is written in a sufficiently precise manner to direct projects to use appropriate data for estimating baseline emissions; it allows for a demonstration of conformance at time of project validation and ensures projects are unable to fall out of line with the condition.

RINA can conclude that the applicability conditions given in the methodology are appropriate, adequate and consistent with the VCS Standard. All the criteria expected are clear basis for

determining the methodology's applicability to project activities delineating the eligible livestock, the eligible supplement feed, the eligible project boundary. All criteria identified provide a clear, unambiguous basis for determining the methodology's applicability to potential project activity delineating the eligible feed supplement and livestock. Additionally, the criteria help ensure that the stated assumptions related to project boundary, emissions quantifications, and monitoring and measurement are satisfied for any project applying the proposed methodology. The stated criteria ensures environmental integrity due to CH_4 methane reduction. Further, all are demonstrably verifiable at the time of validation because they relate known characteristics of the livestock and feed supplement.

3.6 Project Boundary

The VCS Standard requires that the methodology establish criteria and procedures for describing the project boundary and identifying and selecting the appropriate GHG sources. The methodology appropriately addresses the establishment of spatial, temporal and gaseous boundaries to meet the VCS requirements. Mandatory and optional GHG sources are confirmed suitable for a project specific methodology.

The project boundary is comprised as all geographic locations where the natural feed supplement is part of the livestock production operation. The spatial boundaries in the methodology were assessed for conformance to VCS rules and found to be sufficiently detailed and adequate for project scenarios.

The methodology establishes criteria to identify relevant sources of baseline and project emissions and indicates whether each is included or excluded from the project boundary. Both in the baseline and in the project the main activity considered is the enteric fermentation and the relevant gas includes is CH_4 which represent the major source of emissions. Project emissions also consider CO_2 from supplement production and transportation, and CH_4 from combustion fo fossil fuels during the supplement production processing. tCO_2 and N_2O are not considered both in the baseline and project emissions since the enteric fermentation results only CH4 production and it vary by the animal feed that is a crucial factor /30/.

The methodology it clearly define that the feed manufacturer must be transparent on the carbon footprint of the feed supplement production and for any change in the manure. At this purpose CO_2, CH_4 and N_2O are considered as project emissions.

The assessment team evaluated the appropriateness of mandatory or optional GHG sources for project scenarios under the methodology and determined the project developer's choices were justified. RINA concludes that the methodology provides sufficient criteria to establish the project boundary and adequate justification; it includes all relevant GHG sources that are affected, related, and/or controlled by the project activity.

3.7 Baseline Scenario

The methodology applies the project method. The baseline scenario is the continued of livestock operations following business as usual practices meaning a feeding regime without using a

natural feed supplement to reduce CH4 enteric fermentation. This is considered the appropriate and the most plausible baseline scenario because it is the method employed in the majority of livestock in the world. The baseline scenario specified by the methodology can be considered appropriate because the methodology is intended for project activity that reduce GHG emissions by using a supplement feed 100% natural plant-based or macroalgae based and non-GMO.

RINA concludes that the use of the baseline scenario specified is an acceptable approach and consistent with the VCS Standard requirements for determining the baseline scenario. The baseline scenario represents the most plausible scenario since: there is only one source of enteric CH_4 emission, there are no existing alternative that has the same mode of action as the methodology is suggesting.

3.8 Additionality

The methodology uses the activity method for the demonstration of additionality and it involves two steps:

1. Demonstrate regulatory surplus in accordance with the VCS Standard

2. Applicability conditions represent the positive list

The positive list is established using the activity penetration option (Option A in the VCS Standard). The activity penetration is given by the observed adoption of the project activity (OA) and the MAP (maximum adoption potential of the project activity) Acconding the VCS rules if the result of the equation is less than 5% the project activity can be considered additional.

Given the early stage of the technology is not easy to confirm if there are any constraints that would limit the adoption of the technology, therefore is considered the entire market of ruminant livestock operations as conservative approach; the global ruminant population in 2010 was estimated to be 3 612 million (FAOSTAT, 2012), with cattle making up nearly 40 percent, sheep and goat 55 percent, and buffalo the remaining 5 %/31/. The MAP is represented by the worldwide market and the data used for the analysis are data available from accessible sources since the specifications of the products are confidential data and often not publicly available. Therefore MAP is considered a 3.61 billion. The OA (observed adoption) is considered based on assumptions available in public sources /25/ /26/. A feeding regime containing extruded linseeds was recently tested by a team of French researchers. They discovered that a dietary supply of extruded linseeds decreased methane production without altering milk yield in dairy cows. Approximately 50,000 cows were fed by linseed and alfalfa /25/. Swiss farm Agolin developed a specialized feed to help the cattle industry adhere to the increasingly strict international regulation of the agricultural sector's methane production /26/. Both the above reports do not state that the emission reductions is by methanogenesis. The activity has reached 2.1 million ruminants, therefore OA is assumed to be 2.1 million.

Based on the above assumption the activity penetration is calculated to be 0.06% which is less than 5% expected by the VCS rules, therefore the project activity is deemed to be additional. This establishes that the positive list in the methodology is appropriate and the observed activity level is correctly assessed less than 5%. The methodology also includes a requirements for project activities to demonstrate regulatory surplus.

RINA concludes that the additionality approach is consistent with the requirements in the VCS Standard for activity methods.

3.9 Quantification of GHG Emission Reductions and Removals

The proposed methodology considers only emission reduction from enteric fermentation. As the methodology and the different options proposed to quantify the emissions reduction are using mostly parameters from other source (e.g. IPCC or national agencies) it is assumed that uncertainties have been already addressed.

3.9.1 Baseline Emissions

Procedure for quantifying the baseline emissions are determined by baseline type and selected GHG sources. The methodology provides complete procedures and equations for the calculation of baseline emissions.

Specifically, baseline emissions within the project boundary are quantified from the product of the sum of annual emissions from each and the enteric emission factor of each animal group and the GWP of methane. The enteric emission factor can be determined through different options depending on the availability of project data and measurements: Option 1 by direct enteric methane measurements and the technology used must be available at the project validation time; option 2 by applying the IPCC tier 2 method /21/ that requires detailed country-specific data on gross energy intake and methane conversion factor for specific livestock categories and should be used if enteric fermentation is a key source category for the animal category that represents a large portion of the country's total emissions; option 3 by using country or regional specific factors and it is only applicable when data for Option 2 are not available. The methodology expects that when the quality of the feed is good the lower bounds should be used (i.e., high digestibly and energy value). Higher bounds are more appropriate when poorer quality of feed is available. The specification is in line with the IPCC requirements; in addition, it establishes, where applicable, the requirements that the parameters from any source must include the uncertainty component itself. The relevant data/parameters to be taken into account are: (a) the number of days for each animal in the group during the monitoring period; (b) the average number of head in each animal grouping in the monitoring period; (c) the identification of the livestock farm; and (d) the animal grouping. Based on the option selected, it also taken into account: (a) the gross energy intake per animal grouping; (b) the energy content of methane; (c) the livestock CH4 conversion factor**.**

By reviewing the formulae and quantification methods, RINA concludes:-

- . The procedures for calculating baseline emissions in the methodology are appropriate and adequate for estimating emissions;

- The equations and formulas are appropriate and without error and parameters for quantification of baseline emissions are used appropriately in calculating all significant baseline emissions.

- Default factors used are appropriate and in conformance with VCS rules.

3.9.2 Project Emissions

The methodology provides procedures and equations for the calculation of project emissions. Specifically, project emissions within the project boundary are the sum of annual emissions from enteric fermentation, considering the enteric emissions reduction factor (supplement's percentage reduction of the enteric CH4), the emissions associated with manufacturing of the feed supplement and the emissions associated with the change on manure emissions due to feed supplement The methodology expect two option for calculating the enteric emission reductions: (1) apply default enteric emission reduction factor estimated by the manufacturer of the feed supplement; the information shall be supported by peer reviewed literature such as form scientific studies in order to be considered default values in accordance with the VCS requirements. It is considered sufficient to provide one/two peer reviewed data when provided in a scientific manner and representative to the livestock group project. There is no reason to establish not appropriate peer reviewed publications that are not appropriate for demonstration of default values if the conditions for default values are fulfilled. Models must apply conservative factors to discount for model uncertainty and must use conservative assumptions and parameters that are likely underestimate or overestimate the GHG emission reductions. (2) Determine the enteric emission factor for each animal group by performing direct enteric methane measurements to estimate the production per animal group per day during the monitoring period**.** the emissions associated with manufacturing of the feed supplement are calculated based on the amount of feed supplement purchased and the emission factors for production and transport of feed supplement which are provided by the feed manufacturer through the carbonfoot print. The emissions associated with the change on manure emissions due to feed supplement are calculated based on the increase of CH4 and N20 due to manure change. Project emissions also include the emissions from feed supplement manufacturing and transportation.
By reviewing the formulae and quantification methods, RINA concludes that the approach to calculate the project emissions is appropriate, adequate and consistent with the VCS Standard.

3.9.3 Leakage

The methodology does not expect sources of leakage**.** The scope of methodology is not considering the GHG emission reductions from manure management. Manure emissions are considered as a negative parameter and therefore subtracted by the project emissions if the feed supplement increase the CH_4 or N_20 in the manure due to change in the chemical composition of the manure itself and not from manure handling.
RINA conclude that the approach is appropriate, adequate and consistent with the VCS Standard.

3.9.4 Net GHG Emission Reductions and Removals

Emission reductions are calculated as the difference between baseline and project emissions as shown by the formula stated in the methodology. The assessment team determined that the equation and formulas are used without error an parameters for quantification of emissions are used appropriately in calculating all significant emissions. The procedures described adequately and appropriately combine the individual components of methodology to estimate the net GHG emission reductions and removals in compliance with VCS rules.

3.10 Monitoring

The monitoring of all data and parameters required to quantify emissions are described and appropriately defined in the methodology. The methodology identifies all data and parameters as either monitored or not monitored, the description include source of data, unit of measurement, measurement procedures and frequency, default values where appropriate, quality control and quality assurance procedures, and other comments necessary for project implementation or validation/verification. All parameters defined in sections 9.1 and 9.2 of the methodology can be mapped to equations in section 8. The data/parameters available at validation and data/parameters described in the methodology provide an exhaustive set of parameters needed to populate all equations used for quantification of baseline and project emissions**.** The monitoring guidelines are adequate to allow a project developer to develop a project-specific monitoring plan, which can be reviewed at project validation. The monitoring procedures are appropriate, adequate and in compliance with the VCS rules.

Data and Parameters available at validation. The data and parameters applied in the methodology are listed in § 9.1 and 9.2 of the methodology element. Each parameter is provided in a table with its units, description, the source of data to be used, and default where appropriate.

Data/Parameter	Assessment
GE_j (Gross Energy Content of Diet)	A default value provided by the livestock operator, calculated by dividing dry matter intake by the energy density of the feedstuff and depending on the fat level of diet. The GE content of diet is assumed to be constant at 18.45 MJ/kg of dry matter, the fat content of diet must be in the range between 4 to 6% /27/. The data/parameter is included because it pertains to baseline emissions calculation.
DMI_j (Dry mass of feed consumed by an animal in a given day).	Methodology requires data provided by the livestock operator for each animal group. The data/parameter is included because it pertains to

	baseline emissions calculation.
Y_{mj} (Percentage of feed energy converted to methane for each animal group).	Methodology specifies default values available at country or regional level, as alternative default values provided in the IPCC guidelines may be used. Uncertainty is expected from any source. The data/parameter is included because it pertains to baseline emissions calculation.
NDF_j (Forage quality indices)	Methodology specifies that must be provided by the livestock operator and is used to determine the Y_m.
ED (Energy content of dry matter)	Methodology specifies default values from literature or in alternative farm specific data. The data/parameter is included because it pertains to baseline emissions calculation.
EC (Energy content of methane)	Methodology specifies default values taken from IPCC guideline. The data/parameter is included because it pertains to baseline emissions calculation.
$EF_{enteric,i,j}$ (Emission factor for each animal group)	The enteric emission factor is established as per the data availability and selecting the option described in section of the baseline emission calculation. The data/parameter is included because it pertains to baseline emissions calculation.
GWP of CH_4 (Global warming potential of methane)	Methodology identifies that the current IPCC value for the GWP is to be used. The data/parameter is included because it pertains to baseline emissions calculation.
PE_j (Project enteric CH_4 emissions calculated by direct measurements technology)	The data is determined with direct measurement, defining the sampling protocol, demonstrating experience in methane measurement technologies, and taking into account the accuracy of the measurement. Sampling protocol is expected to be provide at the project validation time as well the technology used during verification for direct measurement. The data/parameter is included because it pertains to project

	emissions calculation.
$ERF_{enteric,j}$ (Enteric emission reductions factor).	The emission factor must be provided by the feed supplement manufacturer for each animal group with direct measurement, defining the sampling protocol, demonstrating experience in methane measurement technologies, and taking into account the accuracy of the measurement. The data/parameter is included because it pertains to project emissions calculation.
$EF_{production,j}$ (Enteric emission production factor).	The emission factor must be measured by the selected technology by the project proponent/livestock operator, defining the sampling protocol and taking into account the accuracy of the measurement. The data/parameter is included because it pertains to baseline emissions calculation.
$EF_{i,j}$ (Enteric CH4 emission factor for each animal in the group during the monitoring period)	Data shall be provided by the project proponent and country or regional values would be used otherwise default values provided by IPCC. The data/parameter is included because it pertains to baseline emissions calculation.
DFEnteric,j (discount factor)	Methodology specifies default values available at country or regional level, as alternative default values provided in the IPCC guidelines may be used. Uncertainty is expected from any source. The data/parameter is included because it pertains to baseline emissions calculation.
EF_p (emission factor for production of feed supplement)	Provided by the feed manufacturer trough carbonfoot print. The data/parameter is included because it pertains to project emissions calculation.
EF_{ti} (emission factor for transportation of feed supplement)	Provided by the feed manufacturer trough carbonfoot print. The data/parameter is included because it pertains to project emissions calculation.

The resources provides adequate accuracy for quantifying baseline and project emissions, and parameters from any source must include the uncertainty component itself. The data available at validation must be updated each renewal of crediting period.

The assessment team concludes that monitoring procedures for the methodology as appropriate, adequate and in compliance with VCS rules

Data and Parameters to be monitored. The methodology provide detail for project proponents to identify the value.

Data/Parameter	Assessment
Ni,j (Number of animals)	Methodology provides adequate details for project proponents to establish procedures for determining data and parameters for emission reductions calculation. It further species QA/QC procedures for monitoring. The data/parameters were included because they pertain to both baseline and project emissions calculation.
Days (Number of days project activity implemented in the specific animal grouping)	
j (animal grouping)	
FM (amount of feed supplement purchased)	
EF_p (Emission factor for production of feed supplement)	
EF_{Ti} (Emission factor for transportation of feed supplement)	
Q_{elec} (quantity of electricity used by production facility)	
Q_{ff} (quantity of fossil fuel used by the production facility)	
EF_{elec} (emission factor for electricity)	
FC_a (energy content of fuel type)	
EF_{fuel} (emission factor for fuel combustion)	
TEF (emission factor values for	

each mode of transport)	
Di (total distance travelled by transport mode)	

Section 9.3 of the methodology provides details to allow the project proponent to develop the monitoring plan for calculating emission reductions. It also specifies that all data must be retained for at least two years after the end of the last crediting period.

Based on the above assumptions, the assessment team concludes that monitoring procedures for the methodology as appropriate, adequate and in compliance with VCS rules

4 ASSESSMENT CONCLUSION

RINA performed the methodology assessment of the methodology element as part of the VCS double-approval process. The assessment process is carried out in accordance with the VCS Standard and guided by the VCS Methodology Approval Process and the VCS Program Guide.

The review of the methodology and the satisfaction of corrective action and clarification requests have provided RINA with sufficient evidence to determine the fulfillment of stated criteria. The methodology is arranged in accordance with the relevant VCS requirements, and it falls under Sectoral Scope 15 – Livestock and Manure Management.

In summary, it is RINA's opinion that the methodology "Reduction of enteric methane emissions from ruminants by the use of 100% natural feed supplement provided by "MOOTRAL SA", version 9 of 28/04/2019 meets all relevant VCS requirements without limitation or qualification.

5 REPORT RECONCILIATION

Subsequent to completion of the second assessment, the assessment team received the updated version of the methodology element review. The assessment team found that most all of the revisions made during the second assessment were related to modifying and/or improving the appearance and readability of the methodology element.

The second assessment resulted in changes to the methodology element including:

- Improving the applicability conditions;
- Inclusion of additional language regarding how to address uncertainty
- Inclusion in the project emissions of the emissions from supplement production and transportation.

RINA reviewed these revisions in the final methodology element, version 9 of 16/10/2019. Based on this review, RINA concluded that none of the modifications affects the conformance of the methodology element to the VCS rules.

The methodology assessment report is updated accordingly taking into account the methodology element revision.

6 EVIDENCE OF FULFILMENT OF VVB ELIGIBILITY REQUIREMENTS

The methodology is classified under VCS Sectoral Scope 15 – Livestock and manure management, which falls within the Sectoral Scope Group 05 Livestock (GHG emission

reductions from methane collection and destruction, livestock and other anaerobic digester operations, agricultural methane emission reduction, agricultural carbon emission reduction), as defined by the American National Standard Institute (ANSI). RINA Services Spa holds accreditation to perform validation from UNFCCC on 2008 for projects under Sectoral Scopes 1-7, 9-11, 13-15, and approved by VCS Program. RINA has also completed more than 10 project validation in ANSI Group 05. RINA therefore is eligible under the VCS Program to perform assessment for the methodology element.

7 SIGNATURE

Signed for and on behalf of:

Name of entity: _____

Signature: _____

Name of signatory: _____

Date: _____

APPENDIX A: ABBREVIATIONS

ANSI	American National Standards Institute
BE	Baseline Emissions
CAR	Corrective Action Request
CH_4	Methane
CL	Clarification Request
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
DOE	Designated Operational Entity
ERs	Emission Reductions
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
PP	Project Participant
QA/QC	Quality Assurance / Quality Control
RINA	RINA Services SPA
SS	Sectoral Scope
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard

APPENDIX B: CERTIFICATES OF COMPETENCE ASSESSMENT TEAM

RINA SERVICES

classification, certification, inspection & testing

CERTIFICATO DI QUALIFICA PER GLI SCHEMI VOLONTARI*
QUALIFICATION CERTIFICATE FOR VOLUNTARY SCHEMES*

Si attesta che il sig./sig.ra: / *We declare that Mr/Mrs/Ms:* **Rita Valoroso**

è qualificato come: / *is qualified as:* **TEC, VAL, VER, TL, ITRP**

per le seguenti aree tecniche: / *for the following technical areas:*

AREE TECNICHE *TECHNICAL AREAS*	DESCRIZIONE DELL'AREA TECNICA *TECHNICAL AREA DESCRIPTION*	SCOPO SETTORIALE *SECTORAL SCOPE*
1.2	Renewables	1
3.1	Energy demand	3
13.1	Solid waste and wastewater	13

REVISIONE *REVISION*	DATA *DATE*	MOTIVAZIONI PER LA REVISIONE *REASON FOR THE REVISION*
0	19/07/2016	First issue with new template (this certificate is linked to CDM qualification)

Responsabile QPT
Head of QPT
Laura Severino

*SCHEMI VOLONTARI/ VOLUNTARY SCHEMES: ACR American Carbon Registry, CCB The Climate, Community & Biodiversity Alliance, GS Gold Standard, JI Joint Implementation, SCS Social Carbon Standard, VCS Verified Carbon Standard.

TEC: Technical expert; VAL: Validator; VER: Verifier; TL: Team leader; FIN EXP: Financial Expert; ITRP: Independent technical reviewer

RINA Services S.p.A. è accreditato/riconosciuto da
RINA Services S.p.A. is accredited /recognized by:

UNFCCC	quale Entità Operativa Designata (DOE), per condurre la Validazione e la Verifica di Progetti CDM *as Designated Operational Entity (DOE), to carry out Validation and Verification of CDM Projects*
VCSA	per condurre la Validazione e la Verifica di Progetti VCS *to carry out Validation and Verification of VCS Projects*
GS Foundation	per condurre la Validazione e la Verifica di Progetti GS *to carry out Validation and Verification of GS Projects*
Ecologica Institute	per condurre la Validazione e la Verifica di rapporti SCS *to carry out Validation and Verification of SCS Reports*
American Carbon Registry ACR	per condurre la Validazione e la Verifica di Progetti ACR *to carry out Validation and Verification of ACR projects*
The Climate, Community & Biodiversity Alliance CCB	per condurre la Validazione e la Verifica di Progetti co-benefit CCB *to carry out Validation and Verification of co-benefit CCB projects*

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QUALIFICATION CERTIFICATE FOR VOLUNTARY SCHEMES*

Si attesta che il sig./sig.ra: / *We declare that Mr/Mrs/Ms:* **Darla Maso**

è qualificato come: / *is qualified as:* **TEC, FIN-EXP**

AREE TECNICHE *TECHNICAL AREAS*	DESCRIZIONE DELL'AREA TECNICA *TECHNICAL AREA DESCRIPTION*	SCOPO SETTORIALE *SECTORAL SCOPE*
14.1	Afforestation and reforestation	14
15.1	Agriculture	15

REVISIONE *REVISION*	DATA *DATE*	MOTIVAZIONI PER LA REVISIONE *REASON FOR THE REVISION*
0	26/01/2017	First issue
1	03/05/2017	Update qualification as financial expert

Responsabile di schema
Scheme Leader

Laura Severino

*SCHEMI VOLONTARI/ VOLUNTARY SCHEMES: ACR American Carbon Registry, CCB The Climate, Community & Biodiversity Alliance, GS Gold Standard, JI Joint Implementation, SCS Social Carbon Standard, VCS Verified Carbon Standard.

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The Climate, Community & Biodiversity Alliance CCB	per condurre la Validazione e la Verifica di Progetti co-benefit CCB *to carry out Validation and Verification of co-benefit CCB projects*

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Si attesta che il sig./sig.ra: / *We declare that Mr/Mrs/Ms:* **Rekha Menon**

è qualificato come: / *is qualified as:* **TEC, VAL, VER, TL, ITRP**

per le seguenti aree tecniche:
for the following technical areas:

AREE TECNICHE *TECHNICAL AREAS*	DESCRIZIONE DELL'AREA TECNICA *TECHNICAL AREA DESCRIPTION*	SCOPO SETTORIALE *SECTORAL SCOPE*
1.2	Renewables	1
2.1	Electricity distribution	2
13.1	Solid waste and wastewater	13
13.2	Manure	13
14.1	Afforestation and reforestation	14

REVISIONE *REVISION*	DATA *DATE*	MOTIVAZIONI PER LA REVISIONE *REASON FOR THE REVISION*
0	19/07/2016	First issue with new template (this certificate is linked to CDM qualification)

Responsabile di schema
Scheme Leader
Rita Valoroso

*SCHEMI VOLONTARI/ VOLUNTARY SCHEMES: ACR American Carbon Registry, CCB The Climate, Community & Biodiversity Alliance, GS Gold Standard, JI Joint Implementation, SCS Social Carbon Standard, VCS Verified Carbon Standard.

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VCSA	per condurre la Validazione e la Verifica di Progetti VCS *to carry out Validation and Verification of VCS Projects*
GS Foundation	per condurre la Validazione e la Verifica di Progetti GS *to carry out Validation and Verification of GS Projects*
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RINA SERVICES
classification, certification, inspection & testing

CERTIFICATO DI QUALIFICA PER GLI SCHEMI VOLONTARI*
QUALIFICATION CERTIFICATE FOR VOLUNTARY SCHEMES*

Si attesta che il sig./sig.ra:
We declare that Mr/Mrs/Ms: **Filippo Camerini**

è qualificato come:
Is qualified as: **TEC**

per le seguenti aree tecniche:
for the following technical areas:

AREE TECNICHE *TECHNICAL AREAS*	DESCRIZIONE DELL'AREA TECNICA *TECHNICAL AREA DESCRIPTION*	SCOPO SETTORIALE *SECTORAL SCOPE*
15.1	Agriculture	15

REVISIONE *REVISION*	DATA *DATE*	MOTIVAZIONI PER LA REVISIONE *REASON FOR THE REVISION*
0	19/07/2016	First issue with new template (this certificate is linked to CDM qualification)

Responsabile di schema
Scheme Leader
Rita Valoroso

*SCHEMI VOLONTARI/ VOLUNTARY SCHEMES: ACR American Carbon Registry, CCB The Climate, Community & Biodiversity Alliance, GS Gold Standard, JI Joint Implementation, SCS Social Carbon Standard, VCS Verified Carbon Standard.

TDC: Technical expert; VAL: Validator; VER: Verifier; TL: Team leader; FIN EXP: Financial Expert; ITRP: Independent technical reviewer

RINA Services S.p.A. è accreditato/riconosciuto da
RINA Services S.p.A. is accredited /recognized by

UNFCCC	quale Entità Operativa Designata (DOE), per condurre la Validazione e la Verifica di Progetti CDM *as Designated Operational Entity (DOE), to carry out Validation and Verification of CDM Projects*
VCSA	per condurre la Validazione e la Verifica di Progetti VCS *to carry out Validation and Verification of VCS Projects*
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American Carbon Registry ACR	per condurre la Validazione e la Verifica di Progetti ACR *to carry out Validation and Verification of ACR projects*
The Climate, Community & Biodiversity Alliance CCB	per condurre la Validazione e la Verifica di Progetti co-benefit CCB *to carry out Validation and Verification of co-benefit CCB projects*

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APPENDIX C: RESOLUTION OF FINDINGS

ID	Section of the Report	Corrective Action Request
1	3.1 Relationship to approved or pending methodologies.	The following methodologies are not considered for the similarity assessment: VCS VMD0028, ACR methodology Reduced carbon intensity of fed cattle, Gold Standard methodology Smallholder dairy methodology. The methodology SSC-NM094 is considered in the similarity assessment but it is the base of the approved methodology ASM-III.BK. It is not clear the no-similarity with the proposed methodology with methodology SSC-MN0085.
Methodology Developer Response		29/04/2019. The oldest version of the methodology included a detailed table with the several methodologies(please see CAR1 sheet for the detailed table). However, VERRA requested to remove them. Here is the comment by VERRAt: "It was decided that only the methodologies that are from approved VCS GHG programs. Should be included here. All others were removed."
DOE Assessment Conclusion		09/05/2019: Being there VERRA opinion, the methodology developer response is accepted. The CAR is closed.
ID	**Section of the Report**	**Corrective Action Request**
2	3.2 Stakeholder comments	Under the public stakeholder consultation period, comments are received. The PP must provide appropriate responses and if necessary provide changes to the proposed methodology.
Methodology Developer Response		29/04/2019. Please see the excel document attached
DOE Assessment Conclusion		09/05/2019. The methodology developer provided exhaustive responses to all the comments received during the public stakeholder consultation period. Where necessary has also updated the methodology. The list of the public comments are available in Appendix D while the responses provided by the MD are attached to this report as Attachement A_Mootral Metthodology_Public Comments-Answers_28042019.xlsx. The CAR is closed.
ID	**Section of the Report**	**Corrective Action Request**
3	3.3 Structure and Clarity of Methodology	The methodology contains the term shall, which is reserved for VCS program documents and is generally not appropriate for methodologies.
Methodology Developer		29/04/2019. Please see changes to the updated methodology document

Response		
DOE Assessment Conclusion		09/05/2019. The methodology version 9 of 28/04/2019 is updated accordingly. The CAR is closed.
ID	**Section of the Report**	**Corrective Action Request**
4	3.5 Applicability conditions	The methodology element does not clarify if is applicable to all ruminants defined in the term of definition. Livestock species must be defined as well as group of them based on a homogenous ruminant population characterization (this is considered by the methodology element at the quantification of GHG emission reductions).
Methodology Developer Response		29/04/2019.Please see new applicability condition 4.2
DOE Assessment Conclusion		09/05/2019. Applicability conditions in version 9 of methodology have been updated accordingly, taking also into account some of the stakeholder public comments received. The CAR is closed.
ID	**Section of the Report**	**Corrective Action Request**
5	3.5 Applicability conditions	It is not demonstrated that the feed supplement 100% natural and plant based is not a limiting conditions that restrict its used to a single proprietary technology (VCS VVM 5.2.1).
Methodology Developer Response		29/04/2019. This methodology provides procedures for a plant based technology and we cannot foresee the applicability conditions for different technologies, such as a chemical product, that may have the same mode of action. Therefore, a project developer could always request an amendment of the methodology to avoid having two similar methodologies. This methodology does not specify what this plant based ingredients should be in order to be applicable for all plant based technologies In addition, in order not to exclude technologies based on plant-like organisms we modified the definition in the following “The active ingredients of the feed supplement must be 100% natural plant or macroalgae based and non-GMO.”
DOE Assessment Conclusion		09/05/2019. The applicability conditions in version 9 of the methodology are updated specifying that the feed supplement can be not only plant based but also macroalgae based. According to what is stated by the methodology developer, it is demonstrated that the technology expected by the methodology is not a limiting conditions that restrict its used to a single proprietary technology. The CAR is closed.

ID	Section of the Report	Corrective Action Request
6	3.5 Applicability conditions	It is not clear the mean of “different mode of action” if the improved feeding practices or improved animal health practices are not allowed for the emission reductions calculation.
Methodology Developer Response		29/04/2019. Please see changes to the updated methodology document.
DOE Assessment Conclusion		09/05/2019. The applicability conditions in version 9 of the methodology are updated, clarifying how other feed supplements and/or activities are eligible under the methodology. The CAR is closed.
ID	**Section of the Report**	**Corrective Action Request**
7	3.5 Applicability conditions	It is not clear: (a) how the time “one year prior the project implementation” can be considered an appropriate time for comparing the emission reductions; (b) the mean of project areas; (c) the condition established in point b (please refer to §3.7.1 of VCS Standard).
Methodology Developer Response		29/04/2019. We agree that one year might not be representative to determine the baseline scenario. Therefore as a rule of thumb, we suggest records from 3 years. Please see applicability condition 6a and 6b.
DOE Assessment Conclusion		09/05/2019. The applicability conditions in version 9 of the methodology are updated, in particular establishing three years as time for comparing the emission reductions that is more representative. The CAR is closed.
ID	**Section of the Report**	**Corrective Action Request**
8	3.5 Applicability conditions	The methodology does not include in the scope of validity the geographic scope according the VCS Standard §4.3.9.
Methodology Developer Response		29/04/2019. In previous versions of the methodology document, we had the following applicability condition: "The applicable geographical area of the project should be the entire host country. This methodology applies to livestock project activities in all countries. The geographical area may be defined to be consistent with a specific geographical area (e.g., province, region or district). If the project participants opt to limit the applicable geographical area to a specific geographical area within the host country, then they shall describe the essential distinction between the identified specific geographical area and the rest of the host country. The project participant must provide the exact location of the project facility. " VERRA requested to remove it. VERRA Comment: "It is not clear as to what the purpose of this applicability condition is. As the methodology is globally applicable, it is not necessary for projects to demonstrate they are in a specific area covered by the methodology. If you wish to state,

		"This methodology is globally applicable" you may do so here but it is not necessary. " Mootral Answer: "The rational of this is to state that the methodology applies to livestock project activities in all countries. Also since baseline scenario gives priority to national or even regional available data is important for project participants do define he geographical area. Also same applies for the efficacy of emissions reductions. must be recalculated in the case of significant differences in project parameters, (e.g., feed regime, geographic region, and management practices). If you believe that this is not necessary and can be covered by the PDD, please delete it"
DOE Assessment Conclusion		09/05/2019: Being there VERRA opinion, the methodology developer response is accepted. The CAR is closed.
ID	**Section of the Report**	**Corrective Action Request**
9	3.7 Baseline Scenario	It is not specified the method applied by the methodology (project method or standardized method) in accordance with the VCS requirements §4.5. Based on the selected method the PP must include criteria and procedures for identifying alternative baseline scenarios and determining the most plausible scenario.
Methodology Developer Response		29/04/2019. It's standardized method.
DOE Assessment Conclusion		09/05/2019. The developer clarified that the standardized method (activity method) is applied therefore there are no specific requirements for activity methods. The CAR is closed.
ID	**Section of the Report**	**Corrective Action Request**
10	3.8 Additionality	The methodology does not refer or require the use of an appropriate additionality tool that has been approved under VCS or an approved GHG program (VCS Standard §4.6.2)
Methodology Developer Response		29/04/2019. The methodology is using the activity method to demonstrate additionality. The positive list was established using the activity penetration option (Option A in the VCS Standard). Justification for the activity method is provided in Appendix I.
DOE Assessment Conclusion		09/05/2019. The developer clarified that the methodology used the activity method and therefore a positive list is established according the Option A (activity penetration). The CAR is closed.
ID	**Section of the Report**	**Corrective Action Request**
11	3.8 Additionality	Determining MAP shall be taken into account factors that can imposing their own limitations in accordance with VCS Standard §4.6.9.

		Explanation of each factors is required. Moreover evidences about: (a) geographical definition of the entire market to support the ruminant livestock operations considered for the MAP; (b) specification of the products observed in the market, must be provided.
Methodology Developer Response		29/04/2019. Currently we propose the following: This project activity in particular, and CH4 enteric fermentation reduction in general, is a relatively recent field with few if any fully commercial technologies. As "the total adoption of a project activity that could currently be achieved given current resource availability, technological capability, level of service, implementation potential, total demand, market access and other relevant factors within the methodology's applicable geographically defined market." In this case, given the early stage of feed supplements for reducing enteric methane emissions, it is difficult to say that there are any resource (or other) constraints that would limit the adoption of this technology. Thus, for the purposes of this methodology, the MAP can be considered the entire market of ruminant livestock operations worldwide. a) The geographical scope considered for the MAP is the ruminant livestock operations worldwide. b) The specifications of the products are not publicly available. To the best of our knowledge and give that this is private information, we used for the analysis available data from different accessible sources.
DOE Assessment Conclusion		09/05/2019. The developer, at this stage, is not able to demonstrate any constraints that would limit the adoption of the technology expected by the methodology. The MAP is represented by the worldwide market and the data used for the analysis are data available from accessible sources since the specifications of the products are confidential data and often not publicly available. Therefore, the response provided is accepted. The CAR is closed.
ID	**Section of the Report**	**Corrective Action Request**
12	3.8 Additionality	The data sources used for developing the level of activity penetration must meet the requirements data set out for performance benchmarks (VCS Standard § 4.5.6). In particular, the sources used are not primary or secondary sources and the data could not reflect current practices and trends (data of 2010 and 2014).
Methodology Developer Response		29/04/2019. The data sources in Appendix I only been used for the demonstration of the additionality. As described in CAR11 to the best of our knowledge and give that this is private information, we used the data available at the time of the analysis.
DOE Assessment Conclusion		09/05/2019. The developer stated that the only data available for doing the activity penetration analysis are those available from accessible sources since the specifications of the products are confidential data and often not publicly available. Therefore, the response provided is

		accepted. The CAR is closed.
ID	**Section of the Report**	**Corrective Action Request**
13	3.8 Additionality	The methodology does not expect that in case the project activity has been commercially available in any area of the applicable geographic scope for less than three years it must be demonstrated that it faces barriers to its uptake.
Methodology Developer Response		29/04/2019. The methodology requires the project proponent to demonstrate additionality. In previous versions, we had a step 3 but VERRA requested to delete it. VERRA's comment: "We ask that this be removed. While this does provide a safeguard in the event that an individual country breaches the 5% penetration rate we would prefer an alternative be developed before this happens. Given that the first reassessment of the penetration rate will not take place for five years this should provide adequate time for an appropriate alternative to be developed."
DOE Assessment Conclusion		09/05/2019: Being there VERRA opinion, the methodology developer response is accepted. The CAR is closed.
ID	**Section of the Report**	**Corrective Action Request**
14	3.9.1.Baseline emissions	According the IPCC Ch. 10 Livestock, the methane correction factor depends on several interacting feed and animal factors. So that the methodology does not take into account the different feed characteristic and production practices (developed and developing countries): specifically when good feed is available, the lower bound should be used, while when poorer feed is available the higher bounds are more appropriate. Conversion factor of zero must be assumed for all juveniles consuming only milk.
Methodology Developer Response		29/04/2019. Please see footnote 4 page 12
DOE Assessment Conclusion		09/05/2019. The methodology expects that when the quality of the feed is good the lower bounds should be used (i.e., high digestibly and energy value). Higher bounds are more appropriate when poorer quality of feed is available. The specification is in line with the IPCC requirements. The CAR is closed.
ID	**Section of the Report**	**Corrective Action Request**
15	3.9.1.Baseline emissions	The uncertainty associated to the emission factor and activity data must be defined. Moreover, for option 3 the country specific factors should be compared with the IPCC default value and require justification and proof for significant differences between them.

Methodology Developer Response		29/04/2019. Given that all data sources suggested in this methodologies must be peer reviewed and internationally recognized. it is therefore expected that data include an uncertainty component itself. For avoidance of doubt we added the following text when applicable: "Parameters from any source (e.g., IPCC or national agencies) must include an uncertainty component itself. Parameters to be updated each crediting period if new data exists. "
DOE Assessment Conclusion		09/05/2019. The methodology version 9 is updated including, where applicable, the requirements that the parameters form any source must be include the uncertainty component itself. The CAR is closed.
ID	**Section of the Report**	**Corrective Action Request**
16	3.9.3 Leakage	The methodology does not to clarify if the seasonal variations in feeding can affect the emission reductions and thus be considered as leakage (i.e. animals grazed during the summer and in stable for the rest of the year).
Methodology Developer Response		29/04/2019. Please see section 9.2 table parameter j:"Description of measurement methods and procedures to be applied: Ruminant Population Characterization: Methane emissions from ruminants vary by animal type, weight, production phase (e.g., pregnant or lactating cow), feed type and seasonal conditions. "
DOE Assessment Conclusion		09/05/2019. The methodology version 9 is updated accordingly. The CAR is closed.

ID	Section of the Report	Clarification Request
1	3.4 Definitions	Definition of edible oils and feeding regime are not considered in the list of definitions.
Methodology Developer Response		29/04/2019. VERRA deleted the definitions for the last version
DOE Assessment Conclusion		09/05/2019: Being there VERRA opinion, the methodology developer response is accepted. The CL is closed.
ID	**Section of the Report**	**Clarification Request**
2	3.5 Applicability conditions	The methodology element does not clarify how must be demonstrated: (a) that GMO are not in the natural plant based feed supplements; (b) the minimum enteric CH4 reduction factor considering the different conditions (climate, regional, etc.) in which the livestock is operating.
Methodology Developer Response		29/04/2019. Please see applicability condition 3a. The active ingredients of the feed supplement must be 100% natural plant-based or macroalgae based and non-GMO. The feed manufacturer needs to provide a non-GMO certificate based on lab analysis.
DOE Assessment Conclusion		09/05/2019. The methodology version 9 is updated accordingly. The CL is closed.
ID	**Section of the Report**	**Clarification Request**
3	3.5 Applicability conditions	The methodology element does not clarify if taking into account the manufacturer specification is included the daily dose of the feed supplement, and how the daily dose can affect the emission reductions.
Methodology Developer Response		29/04/2019. Please see applicability condition 3.c. The feed supplement must be used as per feeding instructions provided by the manufacturer. The instructions provide critical defining conditions to secure the default level of reduction of the enteric methane emissions, such as the feeding routine and dose of supplement per kg of DMI to the animal.
DOE Assessment Conclusion		09/05/2019. The methodology version 9 is updated accordingly. The CL is closed.
ID	**Section of the Report**	**Clarification Request**
4	3.6 Project boundary	The mean of livestock production operation (i.e. single farm, breeding company, etc.) must be clarified.
Methodology Developer		29/04/2019. Please see footnote 2.

Response		
DOE Assessment Conclusion		09/05/2019. The methodology version 9 is updated accordingly including definition of livestock production operation. The CL is closed.
ID	**Section of the Report**	**Clarification Request**
5	3.9.1 Baseline emissions	The methodology refer for Option 3 to table 6, but the table is not available in the methodology therein
Methodology Developer Response		29/04/2019. Option 3 refers to table 5, we have corrected it.
DOE Assessment Conclusion		09/05/2019. The methodology version 9 is updated accordingly. The CL is closed.
ID	**Section of the Report**	**Clarification Request**
6	3.9.2 Project emissions	The equation (5) mentioned for option 1 is not consistent with the formula in the methodology. Moreover, it is not clear the mean of “technology A in farm” defined for option 2.
Methodology Developer Response		29/04/2019. ERFEnteric Option 1: In this case, the feed manufacturer must provide the factor that is the Enteric emissions reduction factor (default percentage value). Supplement’s percentage reduction of the enteric CH4 per animal in an animal group j during the monitoring period. We understand that the factor is different for each group therefore the equation needs to calculate the project emissions for every group. For the case the feed manufacture must provide the For technology A please see footnote 7.
DOE Assessment Conclusion		09/05/2019. The methodology version 9 is updated accordingly. The CL is closed.

APPENDIX D: STAKEHOLDER COMMENTS

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Comments received on Methodology for the Reduction of Enteric Methane Emissions from Ruminants through the Use of 100% Natural Feed Supplement

This comment was received via email by the VCS.

Submitted by: Simon König

Organization: Climate Focus and The Tropical Forages Program of the International Center for Tropical Agriculture (CIAT)

Country: United States

1. Page 7, Footnote #1: Please provide full reference, this publication is not listed in Section 10 (References)
2. Page 7, Footnote #1: Please provide an explanation as to why such emission reductions cannot be quantified with this methodology. If peer-reviewed, empirical studies confirm such emission reductions, have derived reliable emission factors, and a project can reliably demonstrate the use of corresponding feeding practices per this methodology, should such emission reductions not be included?
3. Page 7, 2.c.: Please correct spelling to "as per" rather than "as pre"
4. Page 7, 2.d.: What is the justification for the 17% threshold?
5. Page 8, 5.a.: Please explain the choice of the recommended baseline period of "at least one year prior to project implementation". A longer period may be chosen to determine business-as-usual practices if the farm was engaged in livestock production for a longer period. It should be demonstrated that operations over the baseline period are representative of expected future operations in the absence of the project and that baseline operations have not been significantly altered for the purpose of influencing baseline emissions.
6. Page 8, 5.b.:
   - The meaning of "stratum" and "situation" in this context should be clarified. It is unclear whether it is supposed to refer to typical livestock operations in the country or region in which the operation is to be established and if so, procedures should be outline for the project to reliably demonstrate that the chose "situation" serves as a conservative baseline.
   - If new livestock operations are to be established, it should be demonstrated by the farm that plans for establishing such operations have existed and would have been realized in the baseline scenario. Otherwise, it could be argued that new livestock operations may result in net emission increases relative to the prior land use activity.

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7. Page 12, Table 4: Given possible revisions of the IPCC Guidelines, it may be preferable to reference the "latest version" of the IPCC Guidance to reduce the need for making continuous updates to the methodology document. It might be 2006 or a future iteration.
8. Page 14, $ERF_{Enteric}$ Option 2: We assume that emission reductions from any improved feeding practice (e.g. provision of supplemental legume feed) could be accounted for using this method as long as baseline and project EFs can be reliable quantified and feeding practices demonstrated.
9. Page 15, Parameter GE_j:
    - Additional guidance should be provided regarding the data sources and the period over which an average should be derived. Examples of documentation may be given, including feed production or purchase records as well as record of feedstuff provision to animals.
    - Conservativeness of default value 18.45 MJ kg should be demonstrated.
10. Page 19, Parameter $EF_{Production,j}$:
    - Purpose of the data indicates calculation of the *baseline* scenario, however *project* emission procedures are described in "Justification of choice of data [...]" box. Please clarify.
    - "Justification of choice of data [...]" box further refers to a "sufficient number and sampling times" which requires further definition. Sufficient by which standard?
11. Page 22, Monitoring Plan: The same standard should hold for the determination of the baseline scenario, i.e. "project proponents must provide detailed feeding records for each farm"
12. Uncertainty does not seem to be addressed in the methodology. Procedures for calculating (and making deductions from ERs for) uncertainties should be provided.

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Comments received on Methodology for the Reduction of Enteric Methane Emissions from Ruminants through the Use of 100% Natural Feed Supplement

This comment was received via email by the VCS.

Submitted by: Patrick Cage

Organization: Greenhouse Gas Management Institute

Country: United States

1) "a. The active ingredients of the feed supplement must be 100% natural plant-based and non-GMO."

   In recent years, studies have shown that particular species of seaweed (macroalgae) have the ability to reduce emissions from enteric fermentation. To clarify that such macroalgae can be used under this methodology, we recommend the text changing the text to state "100% natural plant-based (terrestrial or aquatic) and non-GMO" or "100% natural plant-based (including macroalgae) and non-GMO."

2) "c. The feed supplement must be used as pre product specification provided by the manufacturer. The Specifications provide critical defining conditions to secure the default level of reduction of the enteric methane emissions, such as the feeding routine and dose of supplement per kg of DMI to the animal."

   This should read "must be used as per" product specification.

3) "ERFEnteric Option 1: Apply the default enteric emission reduction factor estimated by the manufacturer of the feed supplement and calculate the emissions using equation 5.5 This option may only be used where the enteric emission reduction factor provided by the manufacturer of the feed supplement is supported by peer reviewed literature or farm-specific emissions data. This information must be provided for review at validation and verification. Additionally, there must be no significant differences in project parameters (e.g., feed regime, geographic region, and management practices) from the manufacturer's supporting documents."

   We believe that the standard used for ERFEnteric Option 1 is relatively weak and should be specified to ensure environmental integrity in the project activities.

   Although there are examples provided, there are no criteria described for what constitutes "significant differences" between project parameters and the manufacturer's supporting documents. This cedes the determination of significance to the project developer and verifier, which creates a risk of ignoring substantial differences. Given the huge variation in enteric fermentation emission factors for ruminants based on breed, feed, climate, management, and other factors, it is necessary to set out the suite of criteria, the indicators to compare the manufacturer's specifications with the project circumstances, and the acceptable range of variation (including adjustments if required).

   While the text quoted above requires that "Specifications provide critical defining conditions to secure the default level of reduction of the enteric methane emissions, such as feeding routine and dose of supplement per kg of DMI to the animal," it does not specifically name other aspects of husbandry and management that will determine the baseline ruminant emissions, potentially the efficacy of emissions reductions, and ultimately the reduction in emissions as a result of the project activity.

   In addition, the language in the following phrase is in the right direction, but insufficient: "the enteric emission reduction factor provided by the manufacturer of the feed supplement is supported by peer

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reviewed literature or farm-specific emissions data." Here, "supported" is ambiguous and overly flexible. The criteria suggested above will help set a higher standard of proof. We suggest replacing "supported" with "established." In particular, this text can be made much stronger by requiring compliance with relevant ISO/ANSI standards.

4) "There would be some small additional upstream emissions in feed supplement manufacture and transport, which are considered negligible in this methodology."

These feed supplements are rare on the market now and used in relatively small quantities. This is, after all, the justification for using the activity penetration option of the positive list to justify additionality for the project methodology. Because of the few products available, there may be significant transportation miles between the point of feed supplement production and its site of use. The feed supplement per head may also be a significant part of the animal's intake and therefore significant mass. As such, there may be significant associated transportation emissions from the feed supplement compared against baseline feed, which can be sourced more locally. As such, we recommend that the transportation emissions associated with the feed supplement be estimated, or that project developers credibly demonstrate that the transportation emissions are likely to be insignificant using a simplified estimation method.

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Comments received on Methodology for the Reduction of Enteric Methane Emissions from Ruminants through the Use of 100% Natural Feed Supplement

This comment was received via email by the VCS.

Submitted by: Laura Wilkinson

Organization: Native Energy

Country: United States

The eligibility requirement that the feed additive be 100% plant based and non-GMO seems to unnecessarily exclude other feed additive types from utilizing this methodology. If there are other eligibility requirements to demonstrate the effectiveness of the feed additive, and a threshold for performance, that should be sufficient, as long as the product is approved by any applicable regulatory body.

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Comments received on Methodology for the Reduction of Enteric Methane Emissions from Ruminants through the Use of 100% Natural Feed Supplement

This comment was received via email by the VCS.

Submitted by: Tanushree Bagh

Organization: South Pole

Country: Switzerland

Chapter	Text Passage	Comment
Title	The reduction of enteric methane emissions from ruminants through the use of 100% natural feed supplement	Not all of the animals in *Table 5* are ruminants. This is confusing and in addition the fermentation process is different for each group of animals. Therefore, the *enteric emission reduction factor* might be different and should be measured for each group of animals.
2	This methodology focuses on application of natural plant-based feed supplements, which along with inhibiting methanogenesis, may also have advantageous effects on rumen bacteria, thereby improving fermentation in the rumen.	The chemical process of the methanogenesis requires energy. With a reduced methanogenesis, the animals have more energy at their disposal, which in many cases leads to an increase in milk yield or meat production. Therefore, not only the direct inhibition shall be accountable but also these side-effects if the change can be traced back (shall be part of an in-vivo study) to the application of the feed supplement.
4	1. Livestock producers must feed their animals a natural feed supplement which reduces enteric CH4 emissions by direct inhibition of methanogens in the rumen.	
4	2a. The active ingredients of the feed supplement must be 100% natural plant-based and non-GMO.	The exclusion of non-GMO makes sense. But we suggest to add *nature-identical* ingredients (they are the chemical equivalent of natural ingredients, but chemically synthesized rather than being extracted from source materials) to the list. Otherwise, we will have two identical Methodologies for the same cause in the near future.
4	2d. The application of the feed supplement must demonstrate a minimum enteric CH4 reduction factor of 17% to ensure substantial impact.	There is no scientific reason to have such an arbitrary default value and a substantial impact can be achieved with a 5% reduction as well. It is more important that in addition to the VCS Standard guidelines (4.1.7 and 4.5.6), the effect or the reduction factor has been proven not only by an in-vitro but also by an in-vivo study according to *EFSA Guidelines* (or similar) for animal trials and that the results are published in a peer-reviewed paper.

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5	Feed supplements that inhibit rumen methanogenesis cannot influence the ratio of enteric methane emissions in exhaled air compared to methane emissions in extracted feces due to the ruminants' physiology.	Reference? The substrate, which has not been converted into methane during digestion, can theoretically lead to increased methane emissions during subsequent manure storage (especially when stored in liquid form) (e.g. Külling et al., 2002). Møller et al. (2014) were able to show that the addition of certain supplements reduces methane emissions from digestion, but at the same time increases the potential for methane emissions from manure management.
8	Emission Reduction Calculation	A scientific measured (in-vivo, according to e.g. EFSA Guidelines and Peer-Reviewed) default *enteric emission reduction factor* needs to be available. Otherwise, the scientific evidence is not given. Based on that, we suggest to simplify the decision tree: Option 1: Performing direct enteric methane measurements to estimate the production per animal group per day. Option 2: Calculation of Baseline Emission according to the newest applicable National Greenhouse Gas Inventory (Tier 1 to 3) for all animal groups. If accurate on-site data for *GE (Gross Energy Intake)* and / or *Ym (Conversion factor)* is available, they can be used instead of the default values used in the *National Greenhouse Gas Inventory (Option 1)*.
8	Option 1 calculates the enteric emission factor for each animal group by performing direct enteric methane measurements to estimate the production per animal group per day (enteric emissions production factor). The enteric emissions production factor for each animal group measured by the chosen technology must be available at each validation and verification.	There is some additional information in the Annex, but more specifications on the level of detail is needed. Such as: - time duration of the measurements (to avoid e.g. diurnal, postprandial or seasonal fluctuations) - sample size (how many animals of each group) - 3rd party verification or even a publication should be considered
8	Option 3 is only suitable for animal species listed in Table 6	Wrong Reference. It is *Table 5*.
8	Enteric CH4 emissions factor for each animal in the group i during the monitoring period (country or regional specific factors or Table 6), (kg CH4 head-1 day-1)	
8	Table 5	According to *Equation 4*, the data in *Table 5* has to be converted into values per day. How is this conversion done? If divided by constant (365 days), then seasonal fluctuation is neglected. This is problematic if not a complete year is monitored.
	Table 5	Not all of the animals in *Table 5* are ruminants. The idea of the Methodology is to reduce CH4 emissions from ruminants. *Table 5* should be adapted.

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Comments received on Methodology for the Reduction of Enteric Methane Emissions from Ruminants through the Use of 100% Natural Feed Supplement

This comment was received via email by the VCS.

Submitted by: Dr. Jacqueline Gehrig-Fasel

Organization: TREES Consulting

Country: Switzerland

Methodology Section	Paragraph	Page	Topic	Question / Comment
Summary		5	"…applying empirically-derived regional emission reduction factor provided by the supplement manufacturer…"	What scientific evidence is required for accuracy / applicability of the emission factors provided by the manufacturer? Are other sources also applicable (e.g. scientific research results not provided by the supplement manufacturer?
4. Applicability Conditions	2a	7	"…100% natural plant-based and non-GMO."	What is the reason for this requirement? There does not appear to be a content-based rationale behind this in the methodology. Consequently, more detailed specification and rationale is needed for "100% natural planted-based". E.g. does this include chemically extracted components of plants? What about nature identical substances?
4. Applicability Conditions	2b	7	.."must have no negative health impacts on the animal to which it is fed."	What proof is required that the supplement does not lead to any negative health impact to animals? What about to impact on humans when using the animal products (e.g. milk, meat)?
4. Applicability Conditions	2c	7	"…pre product specification…"	typo? "per" instead of "pre"
4. Applicability Conditions	2c	7	"…such as the feeding routine and dose of supplement per kg of DMI to the animal."	Are these just examples? Some substances will vary in effect depending on feed composition (e.g. NDF) and thus require tracking of more information on feed composition.

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4. Applicability Conditions	2d	7	"…factor of 17%..."	What is the rationale for this threshold? No background (scientific or other) is provided for this very specific number. Also, maintaining this requirement would prevent project activities with lower reduction factors - which for example could be low-cost options which could be applied when funds are limited.
4. Applicability Conditions	5a	8	"…for a minimum of one year."	Animal feeding practices are known to vary significantly between years (e.g. changes in feed availability due to weather events or market changes). What are the conditions / reasoning for limiting the baseline to one year? What safeguards are in place to ensure that baseline does consider variations, respectively does not represent a biased event?
4. Applicability Conditions	4	8	.."project proponent must be able to trace the feed supplement from on-farm consumption"	More specific information may be needed here. E.g. how would one ensure that each animal receives the necessary amount of supplement in less controlled (non-TMR/PMR) dairy systems such as are common in developing countries? Are there options for management systems where animals roam and graze over a large area and do not receive dietary supplements? Consumption of feed supplement per animal should be listed in the monitoring plan.
5. Project Boudary	first paragraph	8	"…there is no change in such activities due to the project."	How is this ensured (e.g. no change in feed composition and sources to increase impact of feed supplement)?
5. Project Boudary	first paragraph	8	"…emissions in feed supplement manufacture and transport, which are considered negligible in this methodology."	What evidence is required to prove negligibility? In some cases, growing and harvesting, processing and transport of the natural components for the supplement production could be considerable. Transparency on emissions from production and transport should be provided.
5. Project Boudary	Table 3	8 and 9	N2O emissions	Certain supplements may have an impact on manure composition and thus N2O emissions. Methodology developer needs to provide an approach to account for N2O emissions which could be omitted if it can be proven that there is no effect for a specific supplement.

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7. Additionality	Step 2	9	Positive list / activity penetration	1) According to VCS Standard, new products which have not yet been available on the commercial market in the project region cannot directly apply positive list approach A but must instead perform a barrier analysis. Also applying the positive list to the entire world without further restrictions seams unjustified. 2) MAP is likely less than 3.6bn ruminants as no product will be available for all cattle owners worldwide. Some key factors likely reducing MAP are a) animal access for supplement provision (e.g. range fed animals will not be accessible to feed supplements in a controlled fashion), b) maximum production, storage and transport capacity, c) distribution to rural environments will likely be limited.
8. Quantification…	Figure 1	10	Decision tree	Options should be described for easier comprehension of the decision tree.
8. Quantification…	Figure 1	10	Decision tree	If different options are used for baseline and project assessment, it must be ensured that emission reduction are calculated conservatively (due to the high uncertainty for Option 2/3 values). This is especially true if default values (Option 2/3) are applied in the project scenario while referencing a measured baseline. How is conservativeness ensured in the methodology?
8.1 Baseline Emissions	Eq. 2ff	11	Number of animals	Number of days for each animal in group j is unclear, as this would have to be either an average, if formula 2 is applied, or a total of days (sum over days per cow) in a formula without $N_{i,j}$ number of animals.
8.1 Baseline Emissions	Eq.3	11f	Option 2: Conversion factor (Ym)	Default IPCC conversion factors are applied per animal category. These factors have been shown to be imprecise and not suitable for project-level application due to dependencies on various factors (e.g. feed composition, climate,…) and errors up to 30% (IPCC 2006 Vol 4 Ch 10, Table 10.12 and 10.13). Methodology indicates dependency on "quality of feed" ("high digestibility and energy value") but does not further specify classification.

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8.1 Baseline Emissions	Eq.4	12f	Default emission factors	High-level default IPCC conversion factors are applied per animal category. These are per-head EFs not not suitable for conservative project-level application due to high errors (+- 30-50%, according to IPCC 2006 Vol 4 Ch 10, Table 10.10).
8.2 Project Emissions	Eq. 5	13	Number of animals	The proposed equation does not take into account differences in animal count between Baseline and Project (or at least does not explicitly state that "BEEntericl" would have to be calculated with project herd structure and animal counts). If unchanged number of animals is presumed, a respective applicability condition should be added. However, as such herd fluctuations are very common, an approach to account for change in animal numbers should be added.
8.1 Baseline Emissions	Table 5	13	Horse, mule/ass, swine, poultry	Horse, donkey (mule, ass), swine, and poultry are not ruminants: remove from table as the methodology is limited to ruminants only.
8.2 Project emissions	Eq.6	14	emission factors (defaults)	Defaults per group (EFEntericl,j) need to be calculated with correct number of animals (project scenario) in each group. This is not specified explicitly (just that the baseline equations should be used).
8.2 Project emissions		15	Supplement production and transport	Emissions from production and transportation of the supplement are missing. The project level assessment of transportation of feed supplement, where applicable, shall be included in project boundary. Also, depending on the ingredients used for the supplement, significant emissions might arise from growth and harvest. Instead of general exclusion of these emission sources, they should be generally included (unless otherwise shown).
8.3 Leakage		15	Activity shift due to potential change in milk production	No consideration of decreasing emissions due to decreasing production (i.e. leakage), as supplements may have impacts on (milk) production, thus making it necessary to consider leakage from activity shift.
9.1 Data and Parameters Available at Validation	First Table	15	Parameter GEj	Equation error: Should be GEj = DMj*Energy Density

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General				Current loose approaches (e.g. no proof of effects of feed supplement trough in-vivo trials) require very deep knowledge of VVB / auditor to assess applicability and conservativeness of parameters applied. This could become a liability for VCS as VVBs may not have specialists with animal nutrition and calculations and experience.
General			GHG scope	No emission accounting from manure is provided. Inclusion of manure in feed-related methodologies is common practice, e.g. in the Alberta protocol, or the Gold Standard feed additive methodology "Reducing Methane Emissions from Enteric Fermentation in Dairy Cows through Application of Feed Supplements". Manure emissions are tracked in these methodologies to assess potential changes due to the project activity (increase or decrease), i.e. as a consequence of feeding a supplement or changing feed. How can the methodology developer be sure that any supplement feed by anyone does not have an effect on manure?
General				Default IPCC values cited refer to IPCC 2006 specifically. It is known that many IPCC 2006 default values have high errors (see comments above) and should thus not be applied. New IPCC values are expected this spring. It should thus be recommended to apply the newest IPCC values available (but only if errors of default values are in an acceptable range as required by the VCS standard).

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Comments received on Methodology for the Reduction of Enteric Methane Emissions from Ruminants through the Use of 100% Natural Feed Supplement

This comment was received via email by the VCS.

Submitted by: Karen Haugen-Kozyra

Organization: Viresco Solutions

Country: Canada

- **Clause No 1** – the methodology cites an Alberta protocol: "Quantification Protocol" approved by the Alberta Offset System: *Quantification protocol for reducing days on feed for beef cattle*". That is not the correct title and version of the current Alberta Protocol. It should read: **"Quantification protocol for reducing greenhouse gas emissions from fed cattle" (version 3.0), February 2016.**
- **Clause 4.2d** – For a public review, it would be advisable to have some substantiation of why there is a cut-off at 17% emission reductions. Citing a manufacturer's claims on enteric methane emissions reduction as acceptable seems questionable as to the validity of the claim. The validity of the additive needs to be based on peer reviewed science proving the performance of the additive with live animals over a sufficient time period (dosaging, predictability under certain conditions, proof of intake, species, durability of effect over time).
- **Clause 4.3** - This clause eliminates the use of feed supplements that have a similar mode of action and uses the general definition of 'those that do not inhibit methanogensis'. This statement needs to be more detailed in what exactly the mode of action of the supplement is. In other words, the scientific basis of the mode of action (enzyme destabilization; surface area activation (eg. Biochar addition to feed; protozoan immobilization) needs to be firmly described in order to be considered 'complementary' and allowed to be also used under this protocol. Otherwise, remove it and if there is a synergistic effect on enteric methane emissions, then why be concerned about it?
- **General Comment** - As far as I know, Verra bases their methodologies on project-based accounting (WRI GHG Project-Based Protocol or ISO 14064:2. This methodology does not give the reviewer the logic behind the emissions intensity of the feed additive product to ensure the production of this product does not constitute a 'relevant' source of emissions (ISO 14064:2 streamlined life cycle assessment approach) or has significant 'out of project boundary' emissions that need to be taken into account (WRI GHG Project-Based Protocol – so called secondary effects). Natural, plant-based feed additives will need to be grown/processed in significant quantities and it is uncertain what the GHG emissions associated with the growing/processing of these products are. This work needs to be demonstrated.
- **General Comment** – related to the above, focusing only on methane emissions from enteric fermentation, and not potential effects of other gases such as N2O or CO2 isn't sufficient. The protocol should at least demonstrate that they are not affected. To be credible, the process of reviewing controlled, related and affected sources and sinks (ISO 14064:2) for their 'relevance' to the accounting process, or demonstrating that secondary effects outside the project boundary (WRI GHG Project-based Protocol) are minimal or need to have a discount applied is important; even in the production of the feed additive. This needs to be demonstrated to the reviewer.
- **Table 5 – IPCC Tier 1** - The methodology speaks of ruminants only. The listing of animals in Table 5 includes non-ruminants (horses for example). Since the protocol doesn't speak to having a scientific basis for the testing of the feed additive across other species, I think this is an unjustified

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extension to say it can be applied to these species when it has not been through a peer-review publication stage.

- **Clause 9.1, Page 15** – re-check the GEI equation. I think GE is multiplied by DMI not divided by. Also, As per the Alberta Protocol, if added lipids are fed, the fat content of the diet is altered to suppress enteric methane, a higher energy density figure can be used (refer to the Alberta protocol for the value of a 'safe' lipid content of the diet (19.10 MJ kg-1).

APPENDIX E: EVIDENCE OF FULFILMENT OF VVB ELIGIBILITY REQUIREMENTS

GROUP 5 : GHG emission reductions from methane collection and destruction, livestock and other anaerobic digester operations, agricultural methane emission reduction, agricultural carbon emission reduction

Methodology AMS-III.D. - Methane recovery in animal manure management systems (SS15)

- CDM Project 8935 : GHG emission reductions through methane avoidance in North Bengal
- CDM Project 6411 : BRASCARBON Methane Recovery Project BCA-BRA-15.
- CDM PoA8027: Thailand Small Scale Livestock Waste Management Program
- GS 1197: Zengen Biogas Plant

Methodology AMS-III.AO. - Methane recovery through controlled anaerobic digestion (SS13)

- CDM Project 9478 : Alibunar Biogas Plant Construction Project

Methodology AMS-III.G. ver. 6 - Landfill methane recovery (SS13)

- CDM Project 5620 : Pine Ridge Landfill Gas to Energy Project

Methodology AMS-III.H. ver. 9 - Methane recovery in wastewater treatment (SS13)

- CDM Project 2341 : Introduction of the recovery and combustion of methane in the existing sludge treatment system of the Cañaveralejo Wastewater Treatment Plant of EMCALI in Cali, Colombia
- CDM Project 4184 : Methane Recovery Project of Meihekou City Fukang Alcohol Co., Ltd.
- CDM Project 5354 : Biogas y Energía - Methane recovery & power generation from oil mill plant effluents
- CDM Project 4188 : Methane Recovery Project of Tiancheng Corn Development Co., Ltd.
- CDM Project 8712 : Maesod Wastewater Treatment and Biogas Utilisation Project
- CDM Project 9349 : MCC Meili Pulp and Paper Co., Ltd Methane Utilization and Power Generation Project
- CDM Project 9130 : Methane recovery in wastewater treatment system at Yurimaguas industrial plant, Peru.
- CDM Project 9081 : Wastewater Treatment Project at Thaindo Palm Oil Factory, Lam Thap, Krabi Province,Thailand.
- CDM Project 8869 : Henan Taikang Longyuan Methane Recovery Project in new paper-production line
- CDM Project 8658 : Henan Suixian Longyuan Methane Recovery Project
- CDMProject 5568 : Rhodia Nuoc Trong Biogas Capture & Utilization Project, Vietnam