



Decree of the Rector n. 1202 of 21/11/2023
Competition for awarding 1 research grant at the University of Udine

DISCLAIMER:

The official and legally binding call for applications is in Italian only. This document cannot be used for legal purposes and is only meant to provide information in English on the call for applications (Decree of the Rector n. 1202 of 21/11/2023). Please refer to the official call published on: <https://www.uniud.it/it/albo-ufficiale>

Any change and integration will be made available on the above mentioned web page. Therefore, no personal written communication regarding the examination date and/or competition results shall be provided to applicants.

Annex 1

Competition announcement for the assignment of 1 research grant at the University of Udine, entitled "Set up of a continuous rumen fermenter equipped for the methane measure" SSD: AGR/18 (principal investigator, Mauro Spanghero)

Art. 1

A selection procedure is hereby launched for the award of 1 research grant at the University of Udine, as identified in Attachment A which constitutes an integral part of the present announcement.

The research grant is linked to the research project and is subject and conditioned upon the relative funding.

The fellowship may be renewed, in compliance with Art. 22, Law No. 240 of 30 December 2010 (as in the text in force before the implementation of the Conversion Law of the D.L. 36/2022, L. 79/2022), Law No. 11 of 27 February 2015, and the current regulations of the University of Udine for awarding research grants, issued with the Rector's Decree No. 182 of 31 March 2021. The renewal is subject to the scientific coordinator's positive assessment of the researcher's activities, an adequate scientific rationale, and a corresponding financial covering.

The research fellowship does not give rise to any right with regards to accessing University posts.

Any personal communication to candidates related to this selection will be sent exclusively to the email address indicated when registering for the selection, as mentioned in Art. 5.

Art. 2

The research grant described in this competition announcement and the required qualifications to apply for the position are identified in Attachment A. The lack of the admission requirements leads to the automatic exclusion from the competition procedure.

Possession of a PhD or equivalent degree obtained abroad or, only for the interested areas, of a medical specialization accompanied by an adequate scientific production, constitutes a preferential qualification for awarding the research fellowship of this selection, if it has not been provided as a mandatory requirement.

For the only purpose of the admission to the competition, the Examining Board (Art. 7) shall assess the equivalence of the qualification obtained abroad, except for the evaluation of the medical specialization



qualification to which Article 38 of the Legislative Decree 165/2001 and subsequent modifications and additions, and EU regulations on the matter, shall be applied.

The Examining Board will proceed to the evaluation of the qualification obtained abroad according to the documentation attached to the application form. The Examining Board may exclude the candidate if the submitted documentation does not provide sufficient information for the assessment.

Therefore, applicants must enclose all the documentation in their possession relating to their qualification in order to provide the Examining Board with sufficient information for assessment.

Candidates holding a qualification issued by a **European Research Area country**, if successful, must submit, if not already attached to the application form one of the following options:

- Supplement Diploma in English issued by the competent University.
- CIMEA Certificate of comparability of the foreign qualification, issued by CIMEA (Information Centre on Academic Mobility and Equivalence) via the "diplome" service at <https://cimea.diplome.eu/udine/#/auth/login>

Candidates holding a qualification issued by a **non-European Research Area country**, if successful, must submit, if not already attached to the application form one of the following options:

- Declaration of the on-site value of the qualification and the certificate relating to the degree with examinations and grades. A certificate in a language other than Italian or English must be accompanied by an official translation into one of these languages (certified by the competent diplomatic-consular authority or certified by a court in Italy).
- CIMEA Certificate of comparability of the foreign qualification, issued by CIMEA (Information Centre on Academic Mobility and Equivalence) via the "diplome" service at <https://cimea.diplome.eu/udine/#/auth/login>

If the Supplement Diploma or the statement/attestation of comparability are not available when signing the contract, the applicant must demonstrate that he/she has requested the documentation and submit it as soon as possible.

Any exclusion from the selection procedure due to lack of eligibility requirements, absence of required documents, failure to sign the selection application or submission of the selection application in a manner different from what is provided for in this call for applications will be communicated to applicants exclusively at the email address indicated in the application form.

Art. 3

The research grant referred to in this call for applications cannot be awarded:

- a. to employees of Universities and the entities referred to in Article 22, section 1, of Italian Law no. 240 of 30 December 2010 (in the text prior to the reform introduced by Law no. 79 of 29 June 2022);
- b. to those who have already been awarded research grants pursuant to Italian Law no. 240 of 30 December 2010 (prior to the reform introduced by Law no. 79 of 29 June 2022) for the maximum period provided by law, even if not continuously, excluding the period in which the grant was used in conjunction with the doctorate, up to the legal term of the relative course;
- c. to those who have already benefited from research grants and fixed-term researcher contracts provided for, respectively, in Articles 22 and 24 of Italian Law no. 240 of 30 December 2010 (in the text prior to the reform introduced by Law no. 79 of 29 June 2022), for a total of 12 years, even if not consecutive;
- d. to anyone who has a degree of kinship or affinity, up to and including the fourth degree, with:
 - the Rector, the Director General or a member of the Board of Directors of the University of Udine;



- the scientific supervisor or a professor/researcher belonging to the department or organisation hosting the research grant in question.

The research grant provided for in this call for applications cannot be combined:

- a) with scholarships of any kind, except for those granted by Italian or foreign institutions to supplement, by means of stays abroad, the fellow's training or research activities;
- b) with other research grants;
- c) with an employment relationship, even if part-time, without prejudice to the relevant provisions for employees of public administrations.

The grant awarded under this call for applications is also incompatible with simultaneous attendance at university degree courses, either Bachelor's degree or Master's degree courses, research Doctorates with scholarships and medical specializations, in Italy or abroad.

Art. 4

Applicants must enclose with their application, under penalty of exclusion, the following documents:

- a) their professional scientific CV, highlighting the candidate's aptitude for carrying out and implementing the research project (Attachment A);
- b) their identity card, their passport or any other identification document¹;
- c) (for candidates with a foreign qualification only) certification or self-certification of both the academic qualification required for the admission to the selection, and of the exams (with evaluation) took during the period of study abroad, and of any other document that can be useful to the evaluation of the degree by the Examining Board.

Applicants can attach to the application, publications and any other certification considered useful to demonstrate the qualification based on the research program (Attachment A) and to certify any research activity accomplished at public or private institutes (indicating the starting and ending date and the duration).

The documents and qualifications mentioned above must be submitted in Italian or English. Those that are not as requested will not be evaluated. Documents originally written in a language other than Italian or English must come with a translation in Italian or English, that the candidate will do on its own responsibility. The translation can be an abstract concerning the thesis.

Italian and Community candidates wishing to submit qualifications referring to conditions and facts attested by Public Administrations must proceed exclusively with self-certification.

Non-EU citizens legally residing in Italy may self-certify only data that can be verified or certified by Italian public bodies. They may also use declarations in lieu when provided for by an international convention between Italy and the declarant's country of origin.

Non-EU citizens not residing in Italy cannot self-certify.

Only the qualifications possessed by the candidate on the date the application form is submitted and submitted in accordance with the procedures set out in Article 5 will be assessed.

Failure to submit mandatory documents provided for in this article will constitute grounds for exclusion from the selection.

¹ Please be aware that the residence permit is not an identification document.



Art. 5

The submission of the applications for the present call starts on November 30, 2023 at 2:00 pm (Italian time) and ends on March 4, 2024 at 2:00 pm (Italian time).

The application to take part in the selection must be completed, under penalty of exclusion, using the appropriate online procedure, available at the link <https://pica.cineca.it/>. The procedure involves an applicant registration step, for those who do not already have an account, and then an application completion step.

Once completed, the online application must be signed in the manner described in the online procedure (manual signature with attached identity document or digital signature), under penalty of exclusion from selection. The application does not have to be signed if you access the above-mentioned online procedure using your SPID ID.

The qualifications referred to in Article 4 must be attached to the application in .pdf format. Individual .pdf files may not exceed 30MB.

The application for participation in the selection is automatically sent to the University of Udine with the definitive closing of the online procedure.

The University Administration:

- is not responsible if it is impossible to read the submitted documentation in electronic format due to damaged files;
- shall not accept or take into consideration qualifications or documents received in paper form or by any means other than what is specified in this article.

Reference to documents or publications already submitted in connection with other competitions is not allowed.

The Administration is not responsible for any missing document or communication because of inaccurate indication of residence and/or address submitted by the candidate during the application. Also, the Administration is not responsible if the candidate has not communicated changes in this information, or has communicated them too late. The Administration is also not responsible for any postal or telegraphic problems not attributable to the Administration itself.

Applicants are advised not to wait until the last few days before the closing date to submit their application. The University accepts no responsibility for any malfunctions due to technical problems and/or overloading of the communication line and/or application systems.

Art. 6

The selection procedure is held in accordance with the modality indicated in Attachment A.

The test will aim to assess the general preparation, experience and aptitude for research of the candidate. It will consist in the evaluation of the professional scientific curriculum, of the publications and qualifications presented, and of the interview, where foreseen.



Art. 7

The Examining board for the competition is identified in Attachment A of the present competition announcement, of which it is an integral part.

At its first meeting, the Examining board shall appoint its President and Secretary, and establish the criteria and methods for evaluating the qualifications and the interview, where foreseen.

The results of the qualifications assessment must be disclosed to applicants during the interview, where foreseen.

The Examining board can award a maximum of 100 points (one hundred out of one hundred) to the selection.

At the end of the evaluation procedure, the Examining board shall formulate the general merit list based on the overall score of each candidate, and draw up the minutes of the whole competition procedure.

Based on the ranking list, the assignment is awarded to candidates who have obtained a minimum overall score of 70/100 (seventy out of one hundred).

The Examining board's judgement is final.

The ranking list will be made public exclusively through publication on the University's official website.

Applicants will not be notified of the outcome of the evaluation.

Those who do not declare their acceptance of the research grant and do not present themselves at the research centre within the deadline communicated by the latter, even if not formally, shall lose the right to receive it. Exceptions to this term will only be granted in cases of documented force majeure.

Art. 8

The research activity cannot be started before signing the contract defining the terms and conditions of the collaboration.

The activity covered by the research grant must have the following characteristics:

- a) it must be carried out as part of the research programme covered by the grant and not be a merely technical support to it;
- b) it must have a close connection with the realization of the research program for which the winner of the grant has been awarded the contract;
- c) it must be continuous and, in any case, temporally defined, not merely occasional, and in coordination with the overall activity of the University;
- d) it must be carried out autonomously, solely within the limits of the programme prepared by the programme supervisor, without predetermined working hours.

The researcher is required to submit a detailed written report on the work carried out and the results achieved, accompanied by the opinion of the scientific supervisor, to the reference organisation at the intervals set out in the contract. The researcher must also submit interim reports and timesheets, if requested by the reference organisation.

Either the fellow or the reference organisation may withdraw from the contract.



The reference organisation may terminate the contract not only in the cases referred to in Article 9, sections 2 and 3, of the "Internal rules for awarding research grants pursuant to law 240 of 30 December 2010" of the University of Udine, but also in the event the research project and therefore the financial coverage on which the research grant is based cease to exist.

Art. 9

The following legal dispositions shall apply to the grant referred to in this call for applications:

- for tax matters, the provisions of Article 4 of Italian Law no. 476 of 13 August 1984, as subsequently amended and supplemented;
- for social security matters, the provisions of Article 2(26) *et seq.* of Italian Law no. 335 of 8 August 1995, as subsequently amended and supplemented;
- for mandatory maternity leave, the provisions of the Italian Ministerial Decree of 12 July 2007;
- with regard to sick leave, the provisions of Article 1(788) of Italian Law no. 296 of 27 December 2006 and subsequent amendments.

During the period of mandatory maternity leave, the allowance paid by INPS according to Art. 5 of the Italian Ministerial Decree of 12 July 2007 is supplemented by the University up to the full amount of the research grant.

The grant will be paid in monthly instalments.

Art. 10

The data collected as part of the procedure referred to in Art. 5 are necessary to properly manage the selection procedure, for any subsequent management of the research grant and for purposes related to managing services provided by the University. The University of Udine is the Data Controller. At any time, the data subject may request access, rectification and, depending on the University's institutional purposes, cancellation and restriction of processing or oppose the processing of their data. The data subject can always lodge a complaint with the Italian Data Protection Authority. The complete disclosure is available on the University of Udine website in the "Privacy" section, accessible from the home page www.uniud.it Direct Link: <https://www.uniud.it/it/it/pagine-speciali/guida/privacy>

Art. 11

For all matters not expressly mentioned in this call for applications, refer to the regulations in force on the subject cited in the introduction and to the "Internal rules for awarding research grants pursuant to Italian Law no. 240 of 30 December 2010" of the University of Udine, issued by Rector's Decree no. 182 of 31 March 2021.

Art. 12

The procedure supervisor is Dr Sandra Salvador, Head of the Research Services Area of the University of Udine.

The Responsible office at the University of Udine is "Area Servizi per la Ricerca - Ufficio Formazione per la Ricerca", via Mantica n. 31 - 33100 Udine, Italia.

To request information about the call for applications, please complete the following form available on the University of Udine website:

https://helpdesk.uniud.it/SubmitSR.jsp?type=req&accountId=universityofudine&populateSR_id=42105



Attachment A

Responsabile scientifico della ricerca / Principal investigator:

Nome e cognome / Name and surname: Mauro Spanghero
Qualifica / Position: Professore Ordinario / Full Professor
Dipartimento / Department: Scienze agroalimentari, ambientali e animali / Agricultural, Food, Environmental and Animal Sciences
Area MUR / Research field: 07 – Scienze agrarie e veterinarie
Settore concorsuale e Settore scientifico disciplinare / Scientific sector: 07/G1; AGR/18 – Nutrizione e alimentazione animale

Titolo dell'assegno di ricerca / Topic of the research fellowship "assegno di ricerca":

I bandi sono consultabili dal sito dell'Ateneo, del MUR e di Euraxess / The calls are available on the University, MUR and Euraxess websites

Testo in italiano:

Allestimento di un fermentatore ruminale continuo con misura della produzione di metano.

Text in English:

Set up of a continuous rumen fermenter equipped for the methane measure.

Obiettivi previsti e risultati attesi del programma di ricerca in cui si colloca l'attività dell'assegnista di ricerca / Foreseen objectives and results of the research programme performed by the research fellow "assegnista di ricerca":

I bandi sono consultabili dal sito dell'Ateneo, del MUR e di Euraxess / The calls are available on the University, MUR and Euraxess websites

Testo in italiano:

Abstract del progetto	La diffusione in atmosfera di gas che intrappolano il calore irradiato dal globo, principalmente anidride carbonica e metano (CH ₄), provocano il riscaldamento globale con gravi danni all'ecosistema del pianeta (ad es. scioglimento dei ghiacciai, innalzamento del livello del mare, espansione degli incendi, ecc.). Tra le diverse fonti di emissioni di CH ₄ , quella relativa alle fermentazioni ruminali che avvengono durante il normale processo di digestione, contribuisce in modo rilevante alle emissioni zootecniche totali (circa 30-40%). L'opinione pubblica ha preso ormai coscienza delle problematiche del riscaldamento globale e la Unione Europea ha recentemente deciso di ridurre la diffusione in atmosfera di CH ₄ del 36% entro il 2030 rispetto ai livelli del 2005 (Commissione europea, 2020). Pertanto, nel prossimo futuro, si prevede una elevata pressione dei governi sulla ricerca su questi temi per adottare azioni concrete volte a mitigare le emissioni di CH ₄ anche nel comparto di allevamento dei ruminanti. Il progetto si propone di allestire un fermentatore ruminale di concezione avanzata ed idoneo alla conduzione di sperimentazioni sulla produzione di metano nei ruminanti senza l'utilizzo di animali da esperimento (tecniche in vitro, "cruelty free"). L'assegnista apporterà sostanziali modifiche innovative ad un fermentatore già in uso per svolgere studi di fermentazione ruminale in laboratorio ("rumine artificiale") di cui il gruppo di ricerca di Nutrizione Animale del Dipartimento DI4A si è recentemente dotato. L'attività di ricerca in cui l'assegnista sarà impegnato sarà quella di progettazione, allestimento e verifica della funzionalità del nuovo impianto di fermentazione ruminale. Il
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	<p>progetto presenta (i) un elevato impatto scientifico in quanto si colloca in una area di ricerca di elevato interesse internazionale, (ii) un elevato impatto ecologico, poiché il problema del riscaldamento globale è tra le priorità più urgenti per la salvaguardia dell'ambiente, ed ha anche (iii) un impatto economico in quanto ridurre le emissioni si traduce in un aumento della efficienza alimentare dei ruminanti d'allevamento.</p>
Obiettivi del progetto	<p>Il progetto si propone di attrezzare un sistema di fermentazione ruminale in vitro con misuratori continui della quantità di gas emesso e di misurare la concentrazione di metano del gas stesso. La finalità è quello di disporre di un fermentatore ruminale di concezione avanzata ed idoneo alla conduzione di sperimentazioni per testare additivi alimentari o combinazioni dietetiche appositamente studiate per mitigare la produzione di metano dei ruminanti. La strumentazione, unica al momento a livello nazionale, potrà consentire la conduzione di sperimentazioni di nutrizione dei ruminanti similmente a quanto svolto in alcuni centri avanzati internazionali di ricerca.</p>
Stato dell'arte	<p>I fermentatori ruminali continui sono delle attrezzature sperimentali di laboratorio per la conduzione di prove di nutrizione dei ruminanti senza impiegare animali da esperimento (tecniche <i>in vitro</i>, <i>cruelty free</i>). Questi impianti realizzano, entro un certo periodo, una rigenerazione continua del microbiota ruminale da un inoculo ruminale iniziale grazie alla rimozione continua dei prodotti finali della fermentazione, al continuo afflusso di una soluzione minerale di nutrienti, alla aggiunta giornaliera di un substrato di fermentazione e al mantenimento controllato della temperatura e della anaerobiosi. Sono molto utilizzati in centri specializzati di ricerca per testare nuovi additivi alimentari o combinazioni dietetiche o nuovi mangimi e misurare in tempi veloci e a costi ridotti la efficacia di nuove soluzioni alimentari. I fruitori di queste attività sono le industrie mangimistiche e i produttori di foraggi e tutto il sistema di allevamento dei ruminanti che può migliorare l'efficienza alimentare dei ruminanti e continuare a fornire alimenti di alta qualità (carni e latticini) alla collettività a costi contenuti.</p> <p>La problematica del contributo dei ruminanti alle emissioni di metano ha però reso le tradizionali misurazioni non sufficienti ad analizzare le diete alimentari anche sotto il profilo delle emissioni di gas climalteranti. Infatti per condurre sperimentazioni di questo tipo è necessario che gli impianti di fermentazione siano a tenuta dei gas e vengano attrezzati con apparecchiature di misurazione degli stessi. L'adattamento degli impianti a questa nuova esigenza sperimentale è quindi necessaria se si vuole indirizzare la ricerca della nutrizione dei ruminanti anche sulle queste nuove tematiche, di grande impatto per la attenzione che l'opinione pubblica riserva alle problematiche ambientali.</p>
Descrizione del progetto	<p>Il progetto si articolerà in tre fasi.</p> <p>In una prima fase del progetto (2 mesi) l'assegnista si dedicherà a compilare una rassegna bibliografica per aggiornare le conoscenze sugli impianti di fermentazione ruminale in vitro attualmente disponibili in centri di ricerca specializzati a livello internazionale. A conclusione di questa fase verrà progettato il nuovo fermentatore con le soluzioni costruttive più innovative e funzionali adottate a livello internazionale e si procederà all'acquisto dei materiali necessari alla costruzione dell'impianto.</p> <p>In una seconda fase (6 mesi circa) si procederà all'assemblaggio delle diverse componenti utilizzando il sistema di fermentazione già in dotazione al gruppo di ricerca di nutrizione animale del DI4A (impianto di</p>



	<p>8 fermentatori da 2 L ciascuno con sistema millicounters per la misura del gas prodotto e rilevatori infrarosso per il dosaggio del metano, Ritter Apparatebau GmbH & Co. KG). Il lavoro di adattamento del sistema già esistente sarà sostanziale e complesso in quanto la misura in continuo dei gas di fermentazione prevede di disporre di sistemi a tenuta continua che nell'attuale impianto non sono disponibili. Si dovrà procedere con prototipi che saranno progressivamente migliorati sulla base della esecuzione di test preliminari di funzionamento.</p> <p>Nella ultima fase del progetto (4 mesi circa) il fermentatore continuo verrà testato definitivamente con l'esecuzione di prove di fermentazione in cui si utilizzeranno diete addizionate con dosaggi diversi di additivi (ad es. NeOH oppure NaNO₃) in grado di inibire la metanogenesi ruminale e quindi si potrà valutare l'accuratezza di misura dell'impianto e gli indici di ripetibilità e riproducibilità delle misure.</p>
Possibili potenzialità applicative	<p>Impatto scientifico. L'interesse scientifico su queste tematiche è molto elevato poiché la problematica del riscaldamento globale è molto sentita dal mondo politico e dalle comunità. Inoltre il progetto sviluppa metodi e tecniche di indagine sperimentale senza l'utilizzo degli animali da esperimento ("cruelty free") e quindi si pone in linea con le direttive del Parlamento Europeo indirizzate a ridurre gli animali da esperimento (Directive 2010/63/EU).</p> <p>Impatto ecologico. Il riscaldamento globale è una problematica ecologica di grande attualità e la riduzione delle emissioni di CH₄ dal settore dell'allevamento dei ruminanti è molto sentito dalle comunità ed è un obiettivo prioritario della comunità scientifica internazionale. Le recenti decisioni dell'UE (Commissione europea, 2020) di adottare una strategia per limitare le emissioni richiedono azioni concrete anche nel settore degli allevamenti di ruminanti. Il progetto può fornire un ausilio importante alle discipline della nutrizione animale per individuare nuove azioni dietetiche di mitigazione delle emissioni di gas senza dover ricorrere a costose lunghe prove in vivo con gli animali.</p> <p>Impatto socio-economico. Le emissioni di metano sono una perdita alimentare rilevante (fino al 12% della energia alimentare totale) e mitigare le emissioni significa anche aumentare l'efficienza nutrizionale complessiva dei ruminanti e quindi la redditività d'allevamento.</p>
Bibliografia	<p>Beauchemin, K. A., Ungerfeld, E. M., Eckard, R. J., Wang, M., 2020. Review: Fifty years of research on rumen methanogenesis: lessons learned and future challenges for mitigation. <i>Animal</i>, 14:S1, pp s2–s1.</p> <p>European Commission, 2020. Communication from the commission to the European Parliament, the Council, the European economic and social Committee and the Committee of the regions: on an EU strategy to reduce methane emissions. 14-10-2020, Brussels, B?</p> <p>Fabro C, Sarnataro C, Spanghero M (2020) Impacts of rumen fluid, refrigerated or reconstituted from a refrigerated pellet, on gas production measured at 24h of fermentation. <i>Anim Feed Sci Technol.</i>, 268:114585.</p> <p>Mason F, Zanfi C, Spanghero M. Testing a stratified continuous rumen fermenter system. <i>Anim Feed Sci Technol</i> 2015;201:104-9.</p> <p>Yáñez-Ruiz DR, Bannink A, Dijkstra J, Kebreab E, Morgavi DP, O'Kiely P et al. (2016) Design, implementation and interpretation of in vitro batch culture experiments to assess enteric methane mitigation in ruminants—A review. <i>Anim Feed Sci Technol.</i> 216:1-18.</p> <p>Spanghero M, Chiaravalli M, Colombini S, Fabro C, Froidi F, Mason F</p>



	<p>et al. (2019) Rumen inoculum collected from cows at slaughter or from a continuous fermenter and preserved in warm, refrigerated, chilled or freeze-dried environments for in vitro tests. <i>Animals</i>, 9(10).</p> <p>Sarnataro, C., Spanghero, M., 2020. In vitro rumen fermentation of feed substrates added with chestnut tannins or an extract from <i>Stevia rebaudiana</i> Bertoni. <i>Animal Nutrition</i>, 6 (1), pp. 54-60.</p> <p>Tricarico, J.M., de Haas, Y., Hristov, A. N., Kebreab, E., Kurt, T. Mitloehner, F., Pitta, D. 2022. Symposium review: Development of a funding program to support research on enteric methane mitigation from ruminants. <i>J. Dairy Sci.</i> 105.</p>
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Text in English:

<p>Abstract</p>	<p>Emissions in the atmosphere of gases trapping the heat radiated from the globe (greenhouse gases, GHG), mainly carbon dioxide and methane (CH₄), cause global warming (GW) with serious damages to the planet ecosystem (e.g., melting of glaciers, rising sea levels, clouding forests, etc.). Among different sources of CH₄ emissions, the one relating to rumen fermentations that occur during the normal process of feed digestion, contributes relevantly to total anthropogenic emissions (about 30-40%). Public opinion has become aware of the GW problems and EU has recently resolved to reduce 36% CH₄ emission by 2030 compared to 2005 levels (European Commission, 2020). Therefore, in the near future, an increased pressing of the governments on the research on these topics is expected due to need to adopt concrete actions to mitigate CH₄ emissions in the livestock systems. The project aims to set up an advanced ruminal fermenter suitable for conducting experiments on methane production in ruminants without the use of experimental animals (in vitro, 'cruelty free' techniques). The assignee will make substantial innovative modifications to a fermenter already in use for carrying out ruminal fermentation studies in the laboratory ('artificial rumen'), which the Animal Nutrition research group of the DI4A Department has recently equipped itself with. The research activity in which the assignee will be engaged will be that of designing, setting up and verifying the functionality of the new ruminal fermentation plant. The project has (i) a high scientific impact since it is located in a research area of high international interest, (ii) a high ecological impact since the problem of global warming is among the most urgent priorities for environmental protection, and it also has (iii) an economic impact since reducing emissions results in an increase in the feed efficiency of farmed ruminants</p>
<p>Objectives of the project</p>	<p>The project aims to equip an in-vitro ruminal fermentation system with continuous meters for the amount of gas emitted and to measure the methane concentration of the gas itself. The aim is to have a ruminal fermenter of advanced design and suitable for conducting experiments to test feed additives or dietary combinations specifically designed to mitigate the methane production of ruminants. The instrumentation, unique at the moment at a national level, will be able to conduct ruminant nutrition experiments similar to those conducted in some advanced international research centres.</p>



State of the art	<p>Continuous ruminal fermenters are experimental laboratory equipment for conducting ruminant nutrition trials without using experimental animals (in vitro, cruelty-free techniques). These facilities achieve, within a certain period, a continuous regeneration of the ruminal microbiota from an initial ruminal inoculum through the continuous removal of fermentation end-products, the continuous influx of a mineral nutrient solution, the daily addition of a fermentation substrate and the controlled maintenance of temperature and anaerobiosis. They are widely used in specialised research centres to test new food additives or dietary combinations or new feeds and to measure the efficacy of new food solutions quickly and at low cost. The beneficiaries of these activities are the feed and fodder industries and the entire ruminant husbandry system that can improve the feeding efficiency of ruminants and continue to provide high quality food (meat and milk) to the community at low cost.</p> <p>The problem of the contribution of ruminants to methane emissions, however, has made traditional measurements insufficient for analysing food diets in terms of climate-changing gas emissions as well. Indeed, in order to conduct experiments of this kind, it is necessary for fermentation plants to be gas-tight and equipped with gas measurement equipment. Adaptation of the plants to this new experimental requirement is therefore necessary if research into ruminant nutrition is also to be directed towards these new topics, which are of great impact due to the public's attention to environmental issues.</p>
Project description	<p>The project will consist of three phases.</p> <p>In the first phase of the project (2 months), the researcher will compile a literature review to update the knowledge on in-vitro ruminal fermentation plants currently available in specialised international research centres. At the end of this phase, the new fermenter will be designed using the most innovative and functional construction solutions adopted at international level and the materials required to build the plant will be purchased.</p> <p>In a second phase (approx. 6 months), the various components will be assembled using the fermentation system already used by the animal nutrition research group at DI4A (system of 8 fermenters of 2 L each with a millicounters system for measuring the gas produced and infrared detectors for methane dosing, Ritter Apparatebau GmbH & Co. KG). The work of adapting the existing system will be substantial and complex, as the continuous measurement of fermentation gas requires continuous sealing systems that are not available in the current plant. This will have to be done with prototypes that will be progressively improved on the basis of preliminary function tests.</p> <p>In the last phase of the project (approx. 4 months), the continuous fermenter will be definitively tested by carrying out fermentation tests in which diets with different dosages of additives (e.g., NeOH or NaNO₃) capable of inhibiting ruminal methanogenesis will be used, and then the measurement accuracy of the plant and the repeatability and reproducibility indices of the measurements can be assessed.</p>
Possible application potentialities	<p>Scientific impact. The scientific interest in these issues is very high as the issue of global warming is very much on the political and community agenda. In addition, the project develops methods and techniques for experimental investigation without the use of experimental animals ("cruelty free") and is therefore in line with the European Parliament's directives aimed at reducing the number of experimental animals</p>



	<p>(Directive 2010/63/EU).</p> <p>Ecological impact. Global warming is a highly topical ecological issue and the reduction of CH4 emissions from the ruminant livestock sector is highly felt by communities and is a priority objective of the international scientific community. The recent decisions of the EU (European Commission, 2020) to adopt a strategy to limit emissions also require concrete actions in the ruminant livestock sector. The project can provide an important aid to animal nutrition disciplines to identify new dietary actions to mitigate gas emissions without the need for costly and time-consuming in vivo tests with animals.</p> <p>Socio-economic impact. Methane emissions are a major dietary loss (up to 12% of total food energy) and mitigating emissions also means increasing the overall nutritional efficiency of ruminants and thus farm profitability</p>
References	<p>Beauchemin, K. A., Ungerfeld, E. M., Eckard, R. J., Wang, M., 2020. Review: Fifty years of research on rumen methanogenesis: lessons learned and future challenges for mitigation. <i>Animal</i>, 14:S1, pp s2–s1.</p> <p>European Commission, 2020. Communication from the commission to the European Parliament, the Council, the European economic and social Committee and the Committee of the regions: on an EU strategy to reduce methane emissions. 14-10-2020, Brussels, B?</p> <p>Fabro C, Sarnataro C, Spanghero M (2020) Impacts of rumen fluid, refrigerated or reconstituted from a refrigerated pellet, on gas production measured at 24h of fermentation. <i>Anim Feed Sci Technol.</i>, 268:114585.</p> <p>Mason F, Zanfi C, Spanghero M. Testing a stratified continuous rumen fermenter system. <i>Anim Feed Sci Technol</i> 2015;201:104-9.</p> <p>Yáñez-Ruiz DR, Bannink A, Dijkstra J, Kebreab E, Morgavi DP, O’Kiely P et al. (2016) Design, implementation and interpretation of in vitro batch culture experiments to assess enteric methane mitigation in ruminants—A review. <i>Anim Feed Sci Technol.</i> 216:1-18.</p> <p>Spanghero M, Chiaravalli M, Colombini S, Fabro C, Frolidi F, Mason F et al. (2019) Rumen inoculum collected from cows at slaughter or from a continuous fermenter and preserved in warm, refrigerated, chilled or freeze-dried environments for in vitro tests. <i>Animals</i>, 9(10).</p> <p>Sarnataro, C., Spanghero, M., 2020. In vitro rumen fermentation of feed substrates added with chestnut tannins or an extract from <i>Stevia rebaudiana</i> Bertoni. <i>Animal Nutrition</i>, 6 (1), pp. 54-60.</p> <p>Tricarico, J.M., de Haas, Y., Hristov, A. N., Kebreab, E., Kurt, T. Mitloehner, F., Pitta, D. 2022. Symposium review: Development of a funding program to support research on enteric methane mitigation from ruminants. <i>J. Dairy Sci.</i> 105.</p>

Struttura dell’Università di Udine presso la quale verrà sviluppata l’attività di ricerca / Department or other structure of the University of Udine where research activities will be carried out:

Dipartimento di Scienze Agroalimentari, Ambientali e Animali (DI4A) / Department of Agricultural, Food, Environmental and Animal Sciences



Importo dell'assegno di ricerca (al lordo oneri carico assegnista) / Total grant gross for the research fellowship:

€ 19.367,00

Durata dell'assegno di ricerca / Duration of the research fellowship "assegno di ricerca":

12 mesi / months

Finanziamento / Financed by:

La copertura finanziaria graverà sui fondi/progetto:

- Risorse d'Ateneo: bando interno finanziamento assegni 2023 (D.R. n. 406/2023);
- Fondo di ricerca libera del proponente, prof. Mauro Spanghero – codice U-GOV: RICLIB_SPANGHERO.

Requisiti di ammissione / Minimum qualifications necessary:

- Possesso del titolo di Dottore di ricerca o titolo equivalente conseguito all'estero;
- possesso di un curriculum scientifico professionale idoneo allo svolgimento dell'attività di ricerca contemplata.
- Research doctorate or equivalent qualification obtained abroad;
- professional scientific curriculum suitable for the research activity above mentioned.

Procedura selettiva / Competition procedure:

Valutazione per titoli e colloquio / Evaluation of titles and oral exam

I risultati della valutazione dei titoli saranno resi noti agli interessati nel corso del colloquio / The evaluation of the qualifications will be disclosed to candidates during the interview

Calendario del colloquio / Calendar of the oral exam	Modalità / Modality	In presenza / On site
	Data / Date	12 marzo / March 2024
	Ora / Time	15:30 / 3:30 pm (Italian time)
	Luogo / Place	Sala riunioni del Dipartimento di Scienze Agroalimentari, Ambientali e Animali presso via Sondrio, 2/a – Udine / Meeting room of the Department of Agricultural, Food, Environmental and Animal Sciences, via Sondrio, 2/a – Udine

Per sostenere il colloquio i candidati devono esibire un valido documento di riconoscimento. / Candidates must come to the interview with a valid identity document.

Eventuali variazioni saranno rese note esclusivamente mediante pubblicazione all'albo ufficiale on line dell'Ateneo / Any change will be made public solely through publication on the University web site http://web.uniud.it/ateneo/normativa/albo_ufficiale



Commissione giudicatrice / Examining Board:

Nome e Cognome	Qualifica	SSD	Università
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