Version 21/04/2016

COST Action FA1302
(Action 10 Dec 2013 – Action 9 Dec 2017)

Large-scale methane measurements on individual ruminants for genetic evaluations

PROGRESS REPORT AT MONTH 30

This report is submitted by the MC Chair on behalf of the Management Committee.

Confidentiality: This report, other than section II.D, is non-confidential. Section II.D is confidential to the Management Committee and the COST Association (including the Committee of Senior Officials, Scientific Committee and Administration).

Executive summary of the Progress Report:

The METHAGENE COST Action has now been active for 30 months. A kick-off meeting was held in Brussels, Belgium, in December 2013, where the Management Committee (MC) and Working Groups (WG) were organized, and the general structure for COST Actions was accepted. This was followed by a start-up meeting in Amsterdam, the Netherlands, where the roadmaps for WG 1 and 2 were drafted.

The first Annual Workshop was held in Granada, Spain, and the second Annual Workshop in Wageningen, the Netherlands. Both meetings brought together ~60 researchers from different countries and different disciplines, including researchers from Australia and New Zealand who shared their knowledge. Interactive programme resulted in interesting discussions between nutritionists, physiologists, environmental engineers, breeders and micro-biologists on possible reasons for the difference between low- and high-emitting ruminants. The roadmaps for all working groups were jointly evaluated, updated and sharpened. The Annual Workshops were followed by the MC meeting, to discuss and decide on the planning and progress of METHAGENE. The next Annual Workshop and MC meeting is planned for October 2016 in Padova, Italy.

The core MC has regular Skype meetings every 6 weeks, where action minutes are made to ensure progress in the WGs and the project in general. Expert meetings were held for WG2, WG3 and WG4. At these meetings, core scientific questions are being discussed and future activities are being planned. Resources have been allocated to have more of these in near future.

The research done in methane emission has attracted young scientists. A successful Training School on "Methane physiology for geneticists" was held in Dummerstorf, Germany, with lectures from within the consortium. Another Training School on "Handling large scale methane data" was held in September 2015 in Poznan, Poland. The next Training School will be on Rumen Microbial Data and will be held in Porto, Portugal in September 2016. These young scientists have, so far, also been on 16 successful short-term scientific missions between member countries.

Soon after the startup of the project the official homepage and mailing groups were functioning. Information on all activities are made available on the project homepage and distributed through social media (i.e. Twitter). A flyer and factsheet has been created, explaining METHAGENE. They are translated in many different languages, see website. Members can use these flyers to reach out for local people. We also put researcher profiles on the website to get faces with names.

METHAGENE has also been active at other meetings and in other networks. The consortium was active at the WCGALP-conference in Vancouver, Canada, in August 2014, the EAAP-conference in Warsaw, Poland, in September 2015 and the GGAA-conference in Melbourne, Australia, in February 2016. Joint meetings with Animal Selection, Genetics and Genomics Network from the Global Research Alliance are held, and METHAGENE plays an important role in the "Feed & Gas"-working group of ICAR (http://www.icar.org/index.php/technical-bodies/working-groups/working-groupsfeed-and-gas/)

Several activities are currently ongoing and therefore many joint scientific publications are anticipated in near future. So far 10 joint publications have been achieved through the network together with 4 international grant applications.

The success of the METHAGENE network is that it unites researchers from across Europe to work on new solutions in breeding for low–emitting ruminants.

I. Progress Report

I.A. COST Action Profile

Objective/ Aim

The main objective of the Action is to reduce environmental footprints of animal-derived food using methane mitigation strategies through animal breeding. The Action aims at harmonising large-scale methane measurements using different techniques; agreeing on identified easy to record proxies for methane emissions for genetic evaluations; and on approaches for incorporating methane emissions in breeding strategies

Details

MoU:	016/13	Start of Action:	10 Dec 2013
CSO approval date:	16 May 2014	End of Action:	9 Dec 2017

COST Member Countries and Cooperating State having accepted the MoU

Country	Date	Country	Date	Country	Date	Country	Date
Austria	20/06/2013	Belgium	23/07/2013	Denmark	03/06/2013	Finland	18/06/2013
France	05/07/2013	Germany	17/06/2013	Greece	19/01/2016	Ireland	22/07/2013
Italy	29/08/2013	Lithuania	18/11/2013	Netherlands	20/06/2013	Norway	23/08/2013
Poland	24/06/2013	Portugal	17/09/2013	Slovakia	13/10/2014	Slovenia	25/08/2013
Spain	27/06/2013	Sweden	02/09/2013	Switzerland	03/07/2013	Turkey	13/05/2014
United Kingdom	30/05/2013	fYR Macedonia	11/12/2013				

Total: 22

Intentions to Accept the MoU
0

Other participants:

Institution Name	Country
FAO	Rome, Italy
ICAR	Rome, Italy

Contacts

Chair/ Vice Chair

Position	Name	Contact details	Country	Date of PhD:	Gender
Chair:	Yvette de Haas	Wageningen UR – Animal Breeding and Genomcs Centre; Building 107; 6700 AH Wageningen. + 31.317.480505 Yvette.deHaas@wur.nl	NL	Oct 2003	F
Vice Chair:	Jan Lassen	Aarhus University – Center for Quantitative Genetics and Genomics; Blichers Allé 20; 8830 Tjele. +45.87.157936 jan.lassen@mbg.au.dk	DK	May 2007	M

Working Group Leaders

WG#	WG Title	WG Leader	Country	Date of PhD:	Gender	Number of participants
1	Methane determining factors	Björn Kuhla	D	1999	M	66
2	Comparison and calibration of measurements	Phil Garnsworthy	UK	1980	M	85
3	Proxies for methane emission	Enyew Negussie	FI	1999	M	64
4	Benefit for producers	Eileen Wall	UK	2001	F	61
5	Knowledge and management exchange	Miriam van Straten	NL	-	F	10

Other positions if applicable (STSM Coordinator, WG Vice Leader, Task Force Leader…)

Position	Name	Country	Date of PhD:	Gender
STSM Coordinator	Marcin Pszczola	PL	2013	M
WG1 – Vice leader	David Yanez	ES	2003	M
WG2 – Vice leader	Eva Lewis	IRL	2004	F
WG3 – Vice leader	Filippo Biscarini	IT	2010	M
WG4 – Vice leader	Nicolas Gengler	BE	1996	M

Action website:	www.methagene.eu

COST is supported by the EU Framework Programme Horizon 2020

COST Association
Avenue Louise 149 I 1050 Brussels, Belgium
t: +32 (0)2 533 3800 I f: +32 (0)2 533 3890
office@cost.eu I www.cost.eu

I.B. Progress with MoU objectives and deliverables and additional outputs

MoU objectives

MoU objective	Achieved Yes/ Partially/ No	Evidence of (partial) achievement including hyperlink to enable assessment of the achievement[1]. Justification if full achievement is not foreseen
Animal- and herd-level factors contributing to variation among animals in methane production, distinguishing between true influences and those attributable to methodology; appropriate units of measurements (e.g., grams per unit output or per unit input) and the use of common units that allow data and interpretation of the data to be compatible within and between populations	Mostly	The roadmap for this objective was worked out with the full consortium at the start-up meeting in Amsterdam. http://www.methagene.eu/meetings/start_up_meeting.html (roadmap WG1) Password: amsterdam An inventory was sent out to the consortium by email and in the Forum on the website (Username + Password both: MGforum). The inventory is now listed as output of WG1 on the website http://www.methagene.eu/workinggroups.html A good discussion was held at the Workshop in Granada in November 2014 based on presentations of consortium members. http://www.methagene.eu/meetings/granada2014.html Password: granada A report was written on the most important animal- and herd-level factors determining the enteric methane emission of ruminants. (http://methagene.eu/workinggroups/WG1/output/Final_Report_METHAGENE_WG1.pdf) The next step is to elaborate on the rumen microbial population in more detail with an Expert Group. Another next step is to investigate whether the individual enteric methane emission can be explained better by combining information of several methane-determining factors.
Established protocols for calibration, comparison, harmonisation and merging large-scale methane measurement using from different techniques and measuring strategies for individual animal methane emissions	Partially	The roadmap for this objective was worked out with the full consortium at the start-up meeting in Amsterdam. http://www.methagene.eu/meetings/start_up_meeting.html (ppt Working group 2) A presentation was held at the Workshop in Granada in November 2014, followed by a discussion with the entire consortium. http://www.methagene.eu/meetings/granada2014.html (see photos of break-out sessions) Password: granada After the Workshop an email was sent to the full consortium asking for member that performed simultaneous measurements with 2 equipments. This list is as output of WG2 on the website http://www.methagene.eu/workinggroups.html The first Expert meeting was held in Nottingham (Jan. 2016) (http://methagene.eu/workinggroups/WG2/output/Expert_meeting_WG2_Comparison_of_Methods.pdf) and experiences were shared, as well as an action plan is written with 8 experts (http://methagene.eu/news/WG2_meeting_19_01_2016.html) Currently the experts are working on comparing and

[1] The links to the outputs and deliverables will be used by the Action Rapporteur in assessing the progress.

		combining data of individual methane emissions measured with different equipments. This dataset includes information of in total 240 animals with 7 different devices, and each animal is measured with at least 2 devices. This will lead to a protocol how to collect and collate data. The next Expert Meeting is planned for September 2016.
Identified easy to record and inexpensive indicator traits for methane emissions from ruminants (e.g., milk fatty acid profiles, mid-infrared spectra of milk samples, and others), without sacrificing accuracy, to be used for genetic evaluations	Partially	The roadmap for this objective was worked out with the full consortium at the workshop in Granada. http://www.methagene.eu/meetings/granada2014.html (see ppt on WG3) Password: granada An Expert meeting was held in Catania in April 2015. 9 experts were invited, and presented on Day 1 possible proxies based on their expertise. On Day 2 the way to proceed was discussed. Next step: writing a review on "The future of large-scale indirect measurement for methane emissions : added value from combining proxies" The minutes and presentations can be found at: http://www.methagene.eu/meetings/catania2015.html Password: catania A second Expert meeting was held in Jokioinen, Finland in January 2016. The same experts were invited and the progress of the review, as well as the direction of the discussion of the review was discussed. (http://methagene.eu/meetings/Jokioinen2016.html) Password: jokioinen It is aimed that the review will be submitted for peer-review in July 2016.
Approaches, necessary information and tools for EU countries for incorporating methane emissions in national breeding strategies while simultaneously taking cognisance of other animal performance characteristics	Partially	Some first thoughts have been presented by E. Wall at the Joint Animal Meeting, July 13, 2014 in Orlando, US (http://www.jtmtg.org/JAM/2015/abstracts/280.pdf) The first Expert meeting was held in Edinburgh in April 2016. 12 experts were invited to discuss breeding goals for lower emitting ruminants and on benefit for producers. (http://methagene.eu/meetings/edinburgh2016.html) Password: edinburgh

MoU deliverables

MoU deliverable	Level of progress[1]	Evidence of (partial) delivery achievement including hyperlink to enable assessment of the delivery[1]. Justification if full achievement is not foreseen
Kick off meeting	Done	http://www.methagene.eu/meetings/kick-off-meeting.html (Dec 10, 2013 – Brussels) http://www.methagene.eu/meetings/start_up_meeting.html (May 8, 2014 – Amsterdam)
Official webpage operational	Done	www.methagene.eu
Project webpage operational	Done	See forum on www.methagene.eu Username and Password both: MGforum
Open mail group operational	Done	No hyperlink – a group in address book of Chair
Project mail group operational	Done	No hyperlink – a group in address book of Chair

COST is supported by the EU Framework Programme Horizon 2020

COST Association
Avenue Louise 149 I 1050 Brussels, Belgium
t: +32 (0)2 533 3800 I f: +32 (0)2 533 3890
office@cost.eu I www.cost.eu

Management Committee meeting 1 held	Done	- Physical meeting with full MC on November 7 2014 http://www.methagene.eu/meetings/granada2014.html Password: granada - Core MC meetings through Skype every 6 weeks (agenda + documents + minutes on DropBox)
Working Group meetings held	Done	http://www.methagene.eu/meetings/granada2014.html (November 5-7, 2014) Password: granada
Competitive call STSMs held	Done	Successfull calls have been set out. 10 STSMs are currently successfully finished, 2 are currently at their mission. Reports can be found at the website: http://www.methagene.eu/reports.html
Workshop 1 held	Done	http://www.methagene.eu/meetings/granada2014.html (November 5-7, 2014) Password: granada
Training school 1 held	Done	http://www.methagene.eu/meetings/dummerstorf2014.html (Sept 30 - Oct 2, 2014) Password: dummerstorf
Management Committee meeting 2 held	Done	- Physical meeting with full MC on October 9 2015 http://www.methagene.eu/meetings/wageningen2015.html - Core MC meetings through Skype every 6 weeks (agenda + documents + minutes on DropBox)
Working Group meetings held	Done for WG 2, 3, 4	http://www.methagene.eu/meetings/catania2015.html (April 23-24, 2015) Password: catania http://methagene.eu/meetings/Jokioinen2016.html (Jan 7-8, 2016) Password: jokioinen http://methagene.eu/news/WG2_meeting_19_01_2016.html (Jan 19-20, 2016) in Nottingham, UK http://methagene.eu/meetings/edinburgh2016.html (April 27-29, 2016) Password: edinburgh
Competitive call STSMs	Done	Successful calls have been set out. 16 STSMs are currently successfully finished, 1 is currently at his mission. Reports can be found at the website: http://www.methagene.eu/reports.html
Workshop 2 held	Done	http://methagene.eu/meetings/wageningen2015.html (October 7-9, 2015) Password: wageningen
Training school 2 held	Done	http://methagene.eu/meetings/poznan2015.html (September 23-25, 2015) Password: poznan
Management Committee meeting 3 held	Planned for Oct 2016	- Physical meeting with full MC is planned for October 2016 in Italy (http://methagene.eu/meetings/padova2016.html) - Core MC meetings through Skype every 6 weeks (agenda + documents + minutes on DropBox)
Working Group meetings held	Planned for WG2	A follow-up on the first expert meeting of WG2 is planned in Denmark for September 2016

Co-authored publications and FP7/ H2020 proposals

The co-authored publications and FP7/ H2020 proposals/ projects resulting from the Action are listed on the page following the "Additional outputs and achievements" section

Additional outputs and achievements

Please describe any other outputs and achievements that have resulted or are in progress, focusing in particular on those that contribute to the COST mission of "COST enables break-through scientific developments leading to new concepts and products and thereby contributes to strengthen Europe's research and innovation capacities."
- Co-organisor of session on "Climate smart cattle farming and breeding" at the 66th meeting of the European Association of Animal Production (EAAP) in Warsaw, Poland on August 31st, 2015 (http://eaap2015.syskonf.pl/programme) - A one-day satellite meeting on "Breeding for lower emitting animals" was organised together with the ASGGN attached to the 6th Greenhouse Gas and Animal Agriculture Conference in Melbourne,

Australia http://methagene.eu/meetings/melbourne2016.html

- Joint Networks Meeting with networks related to the Livestock Research Group of the Global Research Alliance on agricultural greenhouse gases (http://www.globalresearchalliance.org/research/livestock/activities/networks-and-databases/) in Melbourne, Australia on February 16th 2016. See also: http://methagene.eu/meetings/melbourne2016_2.html (Password: melbourne)

COST is supported by the EU Framework Programme Horizon 2020

COST Association
Avenue Louise 149 I 1050 Brussels, Belgium
t: +32 (0)2 533 3800 I f: +32 (0)2 533 3890
office@cost.eu I www.cost.eu

Version 21/04/2016

Co-authored publications and FP7/ H2020 proposals

Co-authored publications

Enter in the table below only publications on the topic of the Action, co-authored by at least two Action participants from two different countries participating in the Action and for which the Action networking added value. A maximum of ten publications may be entered. If the Action has more than ten such publications the Core Group should select the ten most significant ones to include in the table below.

NO.	Bibliographic data (including: Title, Authors, Title of the periodical or the series, Issue number or volume, Publisher, Year of publication, Relevant pages)	Main author	Number of authors	Action participants listed among the authors (Name, country and role[2])	WGs involved in publication	Date of submission (must be after Action start date)	Expected date of publication (if not already published)	Persistent link to publicly available version of the paper (if available) or the abstract	Is/Will open access[3] provided to this publication?	Is/ will COST be cited/ acknowledged in the publication?	Are/ will COST funds (be) implicated in this publication	Relevance to H2020 Societal Challenges[4]?	Is it peer-reviewed?	Was the added value of the Action Networking necessary for the publication	Impact Factor (if applicable)
1	Pickering, Oddy, Basarab, Cammack, Hayes, Hegarty, Lassen, McEwan, Miller, Pinares-Patino, de Haas, 2015. Animal board invited review: genetic possibilities to reduce enteric methane emissions from ruminants. Animal 9: 1431-1440 doi: 10.1017/S1751731115000968	Pickering	11	Yvette de Haas, NL, Chair Jan Lassen, DK, Vice chair	WG2, WG3, WG4	July 2014	Sept 2015	http://dx.doi.org/10.1017/S1751731115000968	Yes	Yes	Yes	Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and Bioeconomy	Yes	Yes	1.508
2	Berry, Lassen, de Haas, 2015. Residual feed intake and breeding approaches for enteric methane mitigation. pp 273-291 In: Livestock production and climate change. Editors: Malik, Bhatta, Takahashi, Kohn, Prasad. ISBN: 978-1-78064-432-5	Berry	3	Donagh Berry, IE, WG member Jan Lassen, DK, Vice chair Yvette de Haas, NL, Chair	WG3 WG4	June 2014	Feb 2015	http://www.cabi.org/bookshop/book/9781780644325 (chapter 18)	No	No	No	Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and Bioeconomy	No	Yes	-
3	Vanlierde, Vanroybas, Dehareng, Froidmont, Soyeurt, Lewis, Deighton, Grandl, Kreuzer, Gredler, Dardenne, Gengler, 2015. Innovative Lactation-stage-dependent prediction of methane emissions from milk mid-infrared spectra. Journal of Dairy Science 98: 5740-5747	Gengler	13	Amélie Vanlierde, BE, WG member Marie-Laure Vanroybays, BE, ESR/Trainee Frédéric Dehareng, BE, MC substitute Eric Froidmont, BE, WG member Hélène Soyeurt, BE, WG member Eva Lewis, IE, Vice WG leader Michael Kreuzer, CH, MC Birgit Gredler, CH, MC/Trainee Nicolas Gengler, BE, Vice WG leader	WG3	June 2014	August 2015	http://www.sciencedirect.com/science/article/pii/S0022030215003537#	No	No	No	Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and Bioeconomy	Yes	Yes	1.508
4	Yáñez-Ruiz, Bannink, Dijkstra, Kebreab, Morgavi, O´Kiely Reynolds, Schwarm, Shingfield, Yu, Hristov, 2016. Design, implementation and interpretation of in vitro batch culture experiments to assess methane mitigation in ruminants – a review. Animal Feed Science and	Yanez-Ruiz	11	David Yanez-Ruiz, ES, Vice WG1 leader Jan Dijkstra, NL, MC member	WG1	Dec 2015	March 2016	http://ac.els-cdn.com/S0377840116301055/1-s2.0-S0377840116301055-main.pdf?_tid=07173720-2578-11e6-9372-00000aacb35e&acdnat=1464510992_513b	No	No	No	Food security, sustainable agriculture and forestry,	No	Yes	1.713

[2] MC Member/ MC Substitute/ MC Observer/ WG Member/ Training School Trainee/ STSM Recipient/ Other Action Participant

[3] Open Access is defined as free of charge access for anyone via Internet. Please answer "yes" if the open access to the publication is already established and also if the embargo period for open access is not yet over but you intend to establish open access afterwards.

[4] H2020 Societal Challenges are “Health, demographic change and wellbeing”; “Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and the Bioeconomy”; “Secure, clean and efficient energy”; “Smart, green and integrated transport”; “Climate action, environment, resource efficiency and raw materials”; “Europe in a changing world - inclusive, innovative and reflective societies”; “Secure societies - protecting freedom and security of Europe and its citizens”

COST is supported by the EU Framework Programme Horizon 2020

COST Association
Avenue Louise 149 I 1050 Brussels, Belgium
t: +32 (0)2 533 3800 I f: +32 (0)2 533 3890
office@cost.eu I www.cost.eu

	Technology 216: 1-18 doi:10.1016/j.anifeedsci.2016.03.016			Diego Morgavi, FR, MC member Angela Schwarm, CH, MC Substitute				f4135a52655de012146984c03950				marine and maritime and inland water research, and Bioeconomy			
5	Vanlierde, Vanrobays, Gengler, Dardenne, Froidmont, Soyeurt, McParland, Lewis, Deighton, Mathot, Dehareng, 2016. Milk mid-infrared spectra enable prediction of lactation-stage-dependent methane emissions of dairy cattle within routine population-scale milk recording schemes. Animal Production Science, 56(3) 258-264 http://dx.doi.org/10.1071/AN15590	Dehareng	11	Amélie Vanlierde, BE, WG member Marie-Laure Vanroybays, BE, ESR/Trainee Frédéric Dehareng, BE, MC substitute Eric Froidmont, BE, WG member Hélène Soyeurt, BE, WG member Eva Lewis, IE, Vice WG leader Nicolas Gengler, BE, Vice WG leader McParland, IRL, WG member/Expert	WG3	Sept 2015	Feb 2016	http://www.publish.csiro.au/paper/AN15590.htm	Yes	No	No	Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and Bioeconomy	Yes	Yes	0.902
6	Olijhoek, Hellwing, Weisbjerg, Dijkstra, Højberg, Lund, 2016. Effect of short-term infusion of hydrogen on enteric gas production and rumen environment in dairy cows. Animal Production Science 56, 466-471.	Olijhoek	6	Diana Olijkhoek, DK, ESR/Trainee Jan Dijkstra, NL, MC member	WG1	Aug 2015	Feb 2016	http://www.publish.csiro.au/nid/72/paper/AN15521.htm	Yes	No	No	Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and Bioeconomy	Yes	Yes	0.902
7	Schwarm, Schweigel-Röntgen, Kreuzer, Ortmann, Gill, Kuhla, Meyer, Lohölter, Derno. 2015. Methane emission, digestive characteristics and faecal archaeol in heifers fed diets based on silage from brown midrib maize as compared to conventional maize. Arch Anim Nutr. 69:159-76.	Schwarm	9	Angela Schwarm, CH, action participant, Björn Kuhla, D, WG leader	WG1	Jan 2015	Apr 2015	http://www.tandfonline.com/doi/full/10.1080/1745039X.2015.1043211	no	no	no	Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and Bioeconomy	yes	yes	1.319
8	Difford, G. , J. Lassen and P. Løvendahl. 2016. Interchangeability between methane measurements in dairy cows assessed by comparing precision and agreement of two non-invasive infrared methods Comput. Electron. Agric 124, 220-226	Difford	3	Difford, DK/NL ESR/trainee Lassen, DK MC member	WG1	Dec 2015	March 2016	http://www.sciencedirect.com/science/article/pii/S0168169916301260	Yes	yes	no	Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and Bioeconomy	yes	yes	1.892
9	Hammond, Crompton, Bannink, Dijkstra, Yáñez-Ruiz, O'Kiely, Kebreab, Eugène, Yu, Shingfield, Schwarm, Hristov, Reynolds. 2016. Review of current in vivo measurement techniques for quantifying enteric methane emission from ruminants. Animal Feed Science and Technology 219:13-30. http://dx.doi.org/10.1016/j.anifeedsci.2016.05.018	Hammond	13	David Yanez-Ruiz, ES, Vice WG1 leader Jan Dijkstra, NL, MC member Diego Morgavi, FR, MC member Angela Schwarm, CH, MC Substitute	WG1, WG2, WG3	Dec 2015	May 2016	http://www.sciencedirect.com/science/article/pii/S0377840116302048	No	No	No	Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and	Yes	yes	1.713

COST is supported by the EU Framework Programme Horizon 2020

COST Association
Avenue Louise 149 I 1050 Brussels, Belgium
t: +32 (0)2 533 3800 I f: +32 (0)2 533 3890
office@cost.eu I www.cost.eu

				Hammond, NZ/UK, WG1 member and expert Shingfield, FI, MC member								Bioeconomy			
10	Olijhoek, Hellwing, Brask, Weisbjerg, Højberg, Larsen, Dijkstra, Erlandsen, Lund. Effect of dietary nitrate level on enteric methane production, hydrogen emission, rumen fermentation, and nutrient digestibility in dairy cows. Journal of Dairy Science (in press)	Olijhoek	9	Diana Olijkhoek, DK, ESR/Trainee Jan Dijkstra, NL, MC member	WG1	Nov 2015	May 2016	http://dx.doi.org/10.3168/jds.2015-10691	No	No	No	Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and Bioeconomy	Yes	Yes	2.408

FP7/ H2020 Proposals and projects

This table contains FP7/ H2020 proposals/ projects spinning off from Action activities and including in the proposing consortium at least three Action participants from at least three different countries participating in the Action.

NO.	Title	Name and country of main proposer	Number of proposers	Action participants listed among the proposers (Name, country, role[3] in the Action)	Funding agency submitted to	Date submitted	Date results expected	Result	Call identifier	Relevance to H2020 Societal Challenges[4]?	Was the added value of the Action Networking necessary for the proposal / project?
Projects											
	-										
Proposals											
	PREDICT - Precision Breeding for Enhanced Resilience and Efficiency in Diversity-rich Cattle	Johanna Vilkki (FIN)	22	Negussie, FIN, WG3 leader De Haas, NL, Chair Gengler, BE, Vice WG4 leader Meuwissen, NO, MC member Gonzalez, ES, MC substitute Gredler, CH, MC substitute Van Straten, NL, WG5 leader	EU – H2020	Feb 2016 (preproposal)	May 2016	Rejected	SFS-15	Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and Bioeconomy	It helped to form a strong consortium
	GenTore .- Genomic Management Tools to Optimise Resilience and Efficiency across the Bovine Sector	Nic Friggens (FR)	21	Lassen DK, Vice chair Wall, UK, WG4 leader	EU-H2020	Preproposal: Feb 2016 Full proposal: Sept 2016	Preproposal: May 2016 Full proposal: Dec 2016	Accepted awaiting	GenTore .- Genomic Management Tools to Optimise Resilience and Efficiency across the Bovine Sector	Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and Bioeconomy	It helped to form a strong consortium
	CEDERS- Capturing Effects of Diet on Emissions from Ruminant Systems	Andre Bannink (NL)	8	Pekka Huhtanen S, Action participant, Björn Kuhla, D, WG leader	FACCE ERA-NET	May 2016	Oct 2016	awaiting	ERA_GAS	Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and Bioeconomy	It helped to form a strong consortium
	DAISY	Helen Soyeurt (B)	5	Hélène Soyeurt, BE, WG member Jan Dijkstra, NL, MC member Bruno Stefanon, IT, MC substitute Sam de Campeneere, BE, WG member	ERA-NET SUSAN	Preproposal: march 2016	Oct 2016	Awaiting	ERA-NET SUSAN	Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and Bioeconomy	It helped to form a strong consortium

I.C. Networking

Added value of the Networking

Please describe here the added value of the networking, highlighting in particular anything that would not have happened without the Action networking.

The consortium of METHAGENE consists of experts in many disciplines: animal breeders, animal nutritionists, animal physiologists, rumen microbiologists, bio-informaticians, system biologists, statisticians, gas analysis experts and environmental engineers. Learning from each other, approaching the topic from different angles, interdisciplinarity, speaking each other's language – none of this would have happened without the Action

The connection between the North-Western European countries and the South and Eastern European countries within the consortium is of great benefit for all participants in the Action. This enlarges the possibilities for general guidelines and protocols that are applicable for many production systems

The added value of networking is most visible in Expert meetings, STSMs, Training Schools and spin offs of this network with joint publications or research proposals. A lot of knowledge is shared during the STSM, Training Schools, Expert meetings and the Annual Workshop – people go home with more ideas than they had before, and are able to do their research better than without the Network

The review in progress on "The future of large-scale indirect measurement for methane emissions: added value from combining proxies" would not have been there without the Network

A collaboration agreement on the "prediction of methane emission measured in respiration chambers from milk infrared spectra" has been signed between two members of METHAGENE (BE and DE) in July 2015. A clear spin off of the Action

The ideas on comparing measurements with different equipments, would not have been there without the Network

The programmes and teachers for the Training Schools would not have been there without the Network, but were highly appreciated by the trainees

The open network meetings with other networks (e.g. in Reading UK, at WCGALP, Vancouver, Canada and at GGAA, Melbourne, Australia) would not have happened without the Action. There is a lot of need for these open meetings. This is also shown by the participation on own expenses of an expert from Australia (Phil Vercoe) and one from New Zealand (Suzanne Rowe) in our Workshop in Granada, Spain in November 2014. At the annual workshop in Wageningen, the Netherlands, in October 2015, an expert from Australia (Hutton Oddy) and from New Zealand (Kirsty Hammond) made the effort to share their knowledge with the consortium.

Extent of the networking

Describe the extent of the networking among the participants in the Action. Were all participants integrated into the networking equally? Were those targeted by COST policies on Inclusiveness Target Countries (ITCs), Early Career Investigators (ECIs)/ Young Researchers, and gender balance fully integrated into the Action networking?

5 ITCs have signed the MoU of METHAGENE (LT, PO, PT, SK, SL). People from all these countries have all participated in the Annual Workshops that were held in Granada, Spain and in Wageningen, the Netherlands. ECIs from 2 of these countries participated in the first Training School that was held in Dummerstorf, Germany, and ECIs from 4 out of the 5 countries participated in the second Training School that was held in Poznan, Poland. The next training school will be organised in/by Portugal.

The gender balance in general is 2:1; i.e., about 1/3 of the participants is female. Especially the young researchers are female, so the balance is slightly moving.

Young researchers are becoming more and more aware of this network. We have successful Training Schools and STSMs. On the website we introduced 'Researcher Profiles' where we encourage the ECIs to introduce themselves. At the Annual Workshop we invite ECIs to present their work and experiences and give them an active contribution to the programme. We also invite young researchers to pitch their work in 2 minutes to give faces to names.

COST is supported by the EU Framework Programme Horizon 2020

COST Association
Avenue Louise 149 I 1050 Brussels, Belgium
t: +32 (0)2 533 3800 I f: +32 (0)2 533 3890
office@cost.eu I www.cost.eu

I.D. Impacts

The impacts that have resulted, or might result from the Action are described in the following table.

Description of the impact	Type of impact[5]	Timing of impact[6]
Common units and descriptors for large-scale methane emissions and other traits in individual methane measurements in ruminants	Scientific/ Techn.	Foreseen within 2 years
Established protocols for calibration, comparison and merging data from different techniques and measurement strategies which can be used beyond this project in optimally designing future experiments	Scientific/ Techn.	Foreseen within 2 years
Identified indicator traits for methane emissions from ruminants to facilitate cost-effective inclusion of environmental traits in national and EU breeding strategies	Scientific/ Techn.	Foreseen within 2 years
The necessary information and tools for EU countries to include methane emissions in their national breeding strategies	Scientific/ Techn.	Foreseen within 2-5 years
Critical contribution to the objective of the Kyoto protocol to reduce GHG emissions in the long term, with specific targets set for 2020, in order to reduce predicted global warming and reduce environmental footprints of animal-derived food	Societal	Foreseen within 5-10 years

I.E Dissemination and exploitation of Action results

Describe the Action's dissemination and exploitation approach as well as all activities undertaken to ensure dissemination and exploitation of Action results and the effectiveness of these activities.

Add description here

Item/ activity	Target audience	Result	Hyperlink
Active website	Open for everyone	- Blogs from people at STSM - Researcher profiles - Recent publications in field - Other news items (e.g. meetings)	www.methagene.eu
Twitter	Open for everyone; active followers	- Links with other networks - Links with universities & research organisations - Links with NGOs (e.g. FAO) - Links with industry	www.twitter.com/methagene
Contributions to Newsletter of ASGGN and LRG	Open for everyone; sent to mail group	- Broader exposure - interconnection with related networks	http://www.asggn.org/publications.html http://globalresearchalliance.org/research/livestock/
Symposium at EAAP	People registered for EAAP	- Linking disciplines - Scientific podium	https://eaap2015.syskonf.pl/conf-data/eaap2015/files/Warsaw_outline_programme_march_2015_after_abstract_sort.pdf

[5] Scientific/ technological, Economic, Societal
[6] Achieved/ Foreseen within 2 years/ Foreseen 2-5 years/ Foreseen 5-10 years/ Foreseen 10+ years

COST is supported by the EU Framework Programme Horizon 2020

COST Association
Avenue Louise 149 I 1050 Brussels, Belgium
t: +32 (0)2 533 3800 I f: +32 (0)2 533 3890
office@cost.eu I www.cost.eu

I.F. Action success(es)

COST regularly communicates the successes of Actions. At this point in time what aspect(s) (outcomes and/ or impacts, rather than activities) of this Action is/ are the most suitable for communication?

Description of the success story	Dimension of the success ■ Breakthrough: scientific, technological or socioeconomic ■ Policy implementation (specify which policy) ■ Capacity building
No breakthrough successes of this Action have yet been achieved	

II. Management Report

II.A. Overview of expenditure

Insert below in the yellow cells the summary of figures from the Yearly Financial Reports (YFRs) of completed Grant Periods and an IFR of any incomplete Grant Period – the Totals (non-yellow cells) will automatically sum.

Grant Period 1	Grant Period 2	Grant Period 3	Grant Period 4	TOTAL
(01/02/2014-01/12/2014)	(01/12/2014-30/09/2015)	(01/10/2015-30/04/2016)	(01/05/2016-30/04/2017)	
Wageningen UR (NL)	Wageningen UR (NL)	Wageningen UR (NL)	Wageningen UR (NL)	Wageningen UR (NL)
EUR 53,925.92	EUR 13,479.20	EUR 59,528.60	EUR 75,800.00	EUR 202,733.72
EUR 17,588.68	EUR 21,033.53	EUR -	EUR 19,980.00	EUR 58,602.21
EUR 5,290.00	EUR 11,400.00	EUR 5,560.00	EUR 15,000.00	EUR 37,250.00
EUR 4,500.00	EUR 2,262.20	EUR 1,995.00	EUR 3,000.00	EUR 11,757.20
EUR 8.61	EUR 500.00	EUR -	EUR -	EUR 508.61
EUR 81,313.21	EUR 48,674.93	EUR 67,083.60	EUR 113,780.00	EUR 310,851.74
EUR 11,882.45	EUR 6,590.59	EUR 10,062.54	EUR 17,067.00	EUR 45,602.58
EUR 93,195.66	EUR 55,265.52	EUR 77,146.14	EUR 130,847.00	EUR 356,454.32

[1] OERSA = Other Expenses Related to Scientific Expenditure (e.g. bank charges)
[2] FSAC = Amount received by Grant Holder for Financial Scientific and Administrative Coordination

COST is supported by the EU Framework Programme Horizon 2020

COST Association
Avenue Louise 149 I 1050 Brussels, Belgium
t: +32 (0)2 533 3800 I f: +32 (0)2 533 3890
office@cost.eu I www.cost.eu

II.B. Budget and Participation management

II.B.1 Budget spent in relation to individuals/ institutions outside participating COST countries					
STSMs from or to institutions from countries other than Participating COST countries					
The table below describes the added value STSMs to approved institutions in IPC or NNC or Specific Organisations and any STSMs from an approved institution in an NNC to a participating COST country.					
Grantee		Host		Date	Topic and value added to the Action
Institution	Country	Institution	Country		
-		-		-	-

Invited Speakers				
The table below highlights the added value of Invited Speakers from COST countries that have not accepted the MoU and/ or non-participating NNC, IPC or Specific Organisations whose participation at a meeting or Training School was reimbursed by the Action.				
Participant name	Institution	Country	Event date	Topic and added value to the Action
Hutton Oddy	DPI-NSW	Australia	Oct 7-9, 2015	Hutton is an expert on measuring methane emission for genetic improvement. He clearly showed the consortium the protocols and pitfalls
Kirsty Hammond	AgResearch	New Zealand	Oct 7-9, 2015	Kirsten has great experience with measuring methane with different equipments and could show the consortium the pro's and con's

Dissemination meetings					
The table below highlights the added value of Dissemination Meetings financed from Action funds.					
Participant name	Role	Country	Date	Location	Topic and added value to the Action
Jan Lassen	Vice Chair	Denmark	Aug 31, 2015	Warsaw Poland	Jan presented the genetic strategies to mitigate methane, and clearly created exposure for the network
Filippo Biscarini	Vice WG3 leader	Italy	Aug 31, 2015	Warsaw Poland	Filippo presented the WG3 work on proxies for methane and clearly created exposure for the network

II.C. Participants

Management Committee		
Name	Country	Email address
Dr. Leonhard Gruber	AT	Leonhard.Gruber@raumberg-gumpenstein.at
Dr. Birgit Fürst-Waltl	AT	birgit.fuerst-waltl@boku.ac.at
Dr. Nico Peiren	BE	Nico.Peiren@ilvo.vlaanderen.be
Prof. Nicolas Gengler	BE	nicolas.gengler@ulg.ac.be
Dr. Jan Lassen	DK	jan.lassen@mbg.au.dk
Dr. Enyew Negussie	FI	enyew.negussie@luke.fi
Dr. Gilles Renand	FR	Gilles.Renand@jouy.inra.fr
Dr. Diego Morgavi	FR	diego.morgavi@clermont.inra.fr
Mr. Miroslav Radeski	MK	miro@fvm.ukim.edu.mk
Dr. Björn Kuhla	DE	b.kuhla@fbn-dummerstorf.de
Prof. Hermann Swalve	DE	hermann.swalve@landw.uni-halle.de
Dr. Gus Rose	GR	gus@gusrose.com
Dr. Eva Lewis	IE	eva.lewis@teagasc.ie

COST is supported by the EU Framework Programme Horizon 2020

COST Association
Avenue Louise 149 I 1050 Brussels, Belgium
t: +32 (0)2 533 3800 I f: +32 (0)2 533 3890
office@cost.eu I www.cost.eu

Dr. Tommy Boland	IE	tommy.boland@ucd.ie
Dr. Filippo Biscarini	IT	filippo.biscarini@ptp.it
Dr. Paolo Bani	IT	paolo.bani@unicatt.it
Dr. Violeta Juskiene	LT	violeta@lgi.lt
Ms. Miriam van Straten	NL	miriam.vanstraten@effab.info
Dr. Jan Dijkstra	NL	jan.dijkstra@wur.nl
Dr. Egil Prestlokken	NO	egil.prestlokken@umb.no
Prof. Theodorus Meuwissen	NO	theo.meuwissen@umb.no
Dr. Marcin Pszczola	PO	marcin.pszczola@gmail.com
Prof. Adam Cieslak	PO	adamck@up.poznan.pl
Dr. José Pereira	PT	jlpereira@esav.ipv.pt
Dr. Svetlana Kisidayova	SK	kisiday@saske.sk
Dr. Zora Varadyova	SK	varadyz@saske.sk
Dr. Joze Verbic	SL	joze.verbic@kis.si
Dr. Blaz Stres	SL	Blaz.Stres@bf.uni-lj.si
Dr. Eva Ugarte Sagastizabal	ES	eugarte@neiker.net
Dr. David Yanez-Ruiz	ES	david.yanez@eez.csic.es
Prof. Pekka Huhtanen	SE	Pekka.Huhtanen@slu.se
Prof. Jan Bertilsson	SE	jan.bertilsson@slu.se
Dr. Frigga Dohme-Meier	CH	frigga.dohme-meier@agroscope.admin.ch
Prof. Michael Kreuzer	CH	michael.kreuzer@inw.agrl.ethz.ch
Prof. Ilker Kilic	TR	ikilic@uludag.edu.tr
Prof. Bahar Ince	TR	bahar.ince@boun.edu.tr
Dr. Eileen Wall	UK	Eileen.Wall@sruc.ac.uk
Prof. Phil Garnsworthy	UK	Phil.Garnsworthy@nottingham.ac.uk

II.D. Specific matters

This section is confidential to the Management Committee, and the COST Association (Administration, Scientific Committee and Committee of Senior Officials); and is not included in the version of the report that is made publicly available.

The Action encountered the following particular difficulties in the implementation of the Action (e.g. imbalances of participation across the Working Groups, inactive country representatives).
No particular difficulties were encountered
The MC did not accept the pending intentions to accept the MoU shown in Section I.A for the following reason.
All intentions to accept the MoU were accepted

COST is supported by the EU Framework Programme Horizon 2020

COST Association
Avenue Louise 149 I 1050 Brussels, Belgium
t: +32 (0)2 533 3800 I f: +32 (0)2 533 3890
office@cost.eu I www.cost.eu

Annex 1

Definitions:

COST Action Challenge (main aim)	"The research question addressed by the COST Action targeting scientific, technological, and / or socioeconomic problems"
COST Action Innovation	"The creation and / or development of new or improved concepts, products, processes, services, and / or technologies that are made available to markets, governments and society"
COST Action objectives	"COST Action objectives are the results that an Action needs to achieve in order to respond to meet its challenge. These are SMART (Specific, Measurable, Achievable, Relevant, Timely) and twofold: research coordination objectives and capacity building objectives."
COST Action research coordination objectives	"Achieving these objectives turns COST Actions from initially scattered teams into one transnational team and leverages the existing funded research. These objectives entail the distribution of tasks, sharing of knowledge and know-how, and the creation of synergies among Action participants to achieve specific outputs."
COST Action capacity building objectives	"Achieving these objectives entail building critical mass to drive scientific progress, thereby strengthening the European Research Area. They can be achieved by the delivery of specific outputs and / or through network features or types and levels of participation."
COST Action networking activities	"any activities organised by the COST Action (whether or not directly funded by COST) in order to achieve research coordination and capacity building objectives."
COST Action networking tools	"instruments through which eligible activities can be funded"
COST Action outputs	"direct results from the COST Action activities. These can be codified knowledge, tacit knowledge, technology, and societal applications."
COST Action impact	"the short- to long-term scientific, technological, and / or socioeconomic changes produced by a COST Action, directly or indirectly, intended or unintended."
COST Action deliverable	"a distinct, expected and tangible output of the Action, meaningful in terms of the Action's overall objectives such as a report, a document, a technical diagram, a software etc. Action deliverables are used to measure its progress and success."
COST Action milestones	"Control points in the Action that help to chart progress. They are also needed at intermediary points so that, if problems have arisen, corrective measures can be taken. A milestone may be a critical decision point in the Action where, for example, the MC must decide which of several technologies to adopt for further development (e.g. core group and MC meetings, mid-term reviews)"
Inclusiveness Target Country (ITC):	Current COST Member Countries targeted by the COST inclusiveness Policy ("Inclusiveness Target Countries" (ITC)): EU 13 (Bulgaria, Cyprus, Czech Republic, Estonia, Croatia, Hungary, Lithuania, Latvia, Malta, Poland, Romania, Slovenia, Slovakia), EU candidate countries (the former Yugoslav Republic of Macedonia, Montenegro, Republic of Serbia, Turkey) and potential EU candidate countries (Bosnia and Herzegovina). In addition, to comply with the EC criteria for 'Spreading Excellence and Widening Participation', Portugal and Luxemburg are included.

COST is supported by the EU Framework Programme Horizon 2020

COST Association
Avenue Louise 149 I 1050 Brussels, Belgium
t: +32 (0)2 533 3800 I f: +32 (0)2 533 3890
office@cost.eu I www.cost.eu