Version 2015-06-12

FA1105 BioGreenhouse
(2012-04-19 – 2016-04-18

Towards a sustainable and productive EU organic greenhouse horticulture

FINAL ACHIEVEMENT REPORT
(2012-04-19 – 2016-04-18)

This report on the full lifetime of the Action is submitted by the MC Chair on behalf of the Management Committee and is validated by the Scientific Committee of the COST Association.

Confidentiality: the document will be made available to the public via the Action page on the COST website except for Section II.D.

Executive summary of the Achievement Report:
(max.500 words) (to be completed by Action Chair describing the outputs, impacts and success stories of the Action – see annex 1 definitions)

Organic greenhouse horticulture (OGH)(i.e the production in greenhouses or polytunnels)in the EU should improve its sustainability, production and productivity. Emissions of nutrients and its footprint should be reduced. Production and productivity are too low to meet the demand of the society. The scientific challenges are to design sustainable irrigation and fertilization strategies, to reveal the mechanisms of resilience, robustness and suppressiveness for the management of pests and diseases, to integrate crop management, energy saving, renewable energy sources and new techniques and combinations with other activities and business to realize climate neutral production. This COST Action coordinated, strengthened and focused the activities of the partners. It improved the communication, offered a common agenda, more and better knowledge for less money, sharing new techniques, an improved dissemination to OGH, basis for further collaboration in joint research proposals and support in the development of EU standards for OGH.

The main objective of COST Action FA1105 Biogreenhouse "Towards a sustainable and productive EU organic greenhouse horticulture" is to improve and disseminate knowledge for new and better production strategies, methods and technologies to support sustainable and productive organic greenhouse/protected horticulture in the EU.

Within the framework of this Action a network of institutions and experts from 27 COST Countries together with experts from Canada, Jordan and Egypt were realising 20 scientific reviews and publications about major issues in Organic Greenhouse Horticulture (OGH), and were publishing in total 6 books and booklets, 17 factsheets and gave in 12 workshops in the Technical program presentations at the final conference from 11-14th April 2016 in Izmir(TR), covering the following subjects of the organic production and experimentation of protected crops: nursery management, soil fertility, compost, water management, pest management, sensible use of energy, marketing and food safety and in addition to this guidelines for experimentation in organic horticulture and tools for assessing sustainabilily

Applied science, education and the sector of OGH have now access to the latest knowledge.

More than 70 young researchers used the opportunity to grow in knowledge and ability with respect to OGH by doing a Short Term Scientific Mission or following one of the four training Schools.
Members of the Action were invited to advise the EU with respect to the development of EU standards for Organic Greenhouse Production (EGTOP).
At several occasions, Brussels 2013 and 2014, Milan 2015 and the Final Conference in Izmir in 2016 the Action contributed to the agenda setting for innovation in organic protected cropping.

The goals of the Action have been achieved largely.
The most innovative part of the action is the networking of experts in the field of organic protected horticulture. This applies also to the integration of all disciplines in one platform so being able to produce many deliverables with integrated knowledge and solutions valuable for applied science in OGH and for the OGH industry or sector.
In all the books, booklets and factsheets of the Action the main bottlenecks and constraints are discussed with a particular reference to the regulatory framework in force. The most relevant issues that may influence the enforcement and future development of the sector, have been identified as specific knowledge gaps and needs for action. For each of them, the appropriate research needs were elaborated in a multidisciplinary perspective as forthcoming challenges for the whole sector.
By realising reviews, guidelines, books, booklets, common procedures, approaches and policy advise the network of BioGreenhouse COST Action shows to be a break-through which will be valuable also for the time to come. Without this network these contributions to applied science and industry would never have been realised.

Summary assessment of outcomes and impacts by Action Rapporteur:

The principal objective of the Action was to improve and disseminate knowledge for new and better production strategies, methods and technologies to support sustainable and productive organic greenhouse/protected horticulture in the EU. Therefore, experienced as well as early stage scientists and their research institutions were brought together in the horticulture field. The key scientific challenges were to design sustainable irrigation and fertilization strategies, to reveal the mechanisms for the management of pests and diseases, to integrate crop management, energy saving, renewable energy sources and new techniques to realize climate neutral production. It was planned to be achieved by bringing together European and non-European scientists that lead to the assembly of strong sub-teams devoted to particular problems. Moreover, the achieved results were planned to be transferred to an application level that involves stakeholders (companies and patients). Each individual objective was represented by one Working Group: WG1 (Robust Planting Material), WG2 (Soil fertility, Suppressiveness and Water Management) WG3 (Plant health), WG4 (Energy saving and climate neutral production) and WG5 (Sustainability and Standards). The Action gathered 27 European countries, attracted three more non-COST members from around the world and established a network of approximately 290 members or interested parties.

COST instruments were used extensively to fulfill the Action's objectives. namely the exchange of methodologies and techniques via 18 Short Term Scientific Missions (STSMs) and four Training Schools (TS) including 79 participants, particularly Early Stage Researchers (ESRs) as an important COST-target group and also by enabling smaller and less developed labs to benefit from state-of-the-art technologies in crop physiology, water management, vegetable diseases diagnostics and pest biological management. Supported STSMs resulted in publication or submission of moderate number of nine peer-reviewed papers (although quantitatively this result is not colossal, several papers were published in high-ranking journals, like PNAS), however, few other results are promised to be in the review process. As a consequence of the Action's networking activities, several ESRs were successful in the establishment of their own research projects and benefitted through support for their proposals.

Within the scope of inter-disciplinary networking, the Action was closely linked to COST Actions FA1103 (Endophytes in Biotechnology and Agriculture) and FA1204 (Vegetable Grafting to Improve Yield and Fruit Quality under Biotic and Abiotic Stress Conditions) and organized joint meetings that not only brought together broader audience but also saved the allocated financial resources. The Action widely exploited the potential of metabolic engineering of plant natural products and actively seeked the opportunities of promoting and enhancing the networking within and outside COST platform.
The dissemination activities made relevant information available to involved scientists and to stakeholders. Several meetings addressing this issue brought together scientists from academia and industry as well as representatives of funding agencies and lobbying groups. In this respect, the activities of BioGreenhouse fully fell within the scope of the goals of HORIZON 2020.

Action Rapporteur	Name Institution Country

Validation by Scientific Committee
This report was validated by the Scientific Committee on: <COST insert date of SC validation>

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I. Achievement Report

I.A. COST Action Profile

Objective/ Aim

Organic greenhouse horticulture (OGH)(i.e the production in greenhouses or polytunnels)in the EU should improve its sustainability, production andproductivity. Emissions of nutrients and its footprint should be reduced. Production and productivity are too low to meet the demand of the society. The scientific challenges are to design sustainable irrigation and fertilization strategies, to reveal the mechanisms of resilience, robustness and suppressiveness for the management of pests and diseases, to integrate crop management, energy saving, renewable energy sources and new techniques and combinations with other activities and business to realize climate neutral production. This COST Action coordinates, strengthens and focuses the activities of the partners. It improves the communication, offers a common agenda, more and better knowledge for less money, sharing new techniques, an improved dissemination to OGH, basis for further collaboration in joint research proposals and support in the development of EU standards for OGH.

The main objective of the Action is to improve and disseminate knowledge for new and better production strategies, methods and technologies to support sustainable and productive organic greenhouse/protected horticulture in the EU.

Details

MoU:	4167/11	Start of Action:	2012-04-19
CSO approval date:	2011-12-01	End of Action:	2016-04-18

COST Member Countries and Cooperating State having accepted the MoU

Country	Date	Country	Date	Country	Date	Country	Date
Austria	09/03/2012	Belgium	13/04/2012	Bulgaria	02/07/2012	Cyprus	02/04/2012
Czech Republic	12/09/2012	Denmark	02/03/2012	Estonia	27/01/2012	Finland	11/04/2012
France	13/03/2012	Germany	13/01/2012	Greece	11/09/2012	Ireland	16/07/2012
Israel	27/12/2011	Italy	09/01/2012	Malta	09/01/2013	Netherlands	20/01/2012
Norway	08/03/2012	Poland	16/05/2012	Portugal	21/02/2014	Romania	05/04/2012
Serbia	22/04/2014	Slovenia	23/06/2012	Spain	03/01/2012	Sweden	16/01/2012
Switzerland	24/01/2012	Turkey	08/02/2012	United Kingdom	09/12/2011		

Intentions to Accept the MoU

"0"

Other participants:

Institution Name	Country
Al-Balqaa Applied University/ Faculty of Agricultural Technology	Jordan
Cairo University	Egypt

Contacts

Chair/ Vice Chair

Position	Name	Contact details	Country	Date of PhD:	Gender
Chair:	Mr Rob Meijer	Stichting DLO, Droevendaalsesteeg 4, 6708 PB Wageningen Netherlands Tel: +31 317485632 (office) **rob.meijer@wur.nl**	NL	n.a.	M
Vice	Prof Beatrix	Dept of Biosystems and TechnologyDept of Biosystems and TechnologySE23053 AlnarpSweden ; Tel: **+46-**	SE	24 Jan	F

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Chair:	Alsanius	40-415336 (office); beatrix.alsanius@slu.se		1991	

Working Group Leaders

WG#	WG Title	WG Leader	Country	Date of PhD:	Gender	Number of participants
1	Robust Planting Material	Martin Koller	CH	n.a.	M	40
2	Soil fertility, Suppresiveness and Water management	Fabio Tittarelli	IT	n.a.	M	80
3	Crop Health	Gerben Messelink	NL	5 June 2012	M	51
4	Energy saving and climate neutral production	Cecilia Stanghellini	NL	20 Jun 1987	F	30
5	Sustainability and Standards	Ulrich Schmutz	UK	16 Jul 1997	M	30

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

Position	Name	Country	Date of PhD:	Gender
STSM Coordinator	Davide Spadaro	IT	15 Feb 2004	M
Website Manager	Anja Vieweger	UK	n.a.	F

Action website:	www.biogreenhouse.org

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I.B. Achievement of MoU objectives and deliverables and additional outputs

MoU objectives

MoU objective	Achieved Yes/ Partially / No	Evidence of (partial) achievement
Copy from eCOST or MoU		For each objective insert evidence of (partial) achievement including hyperlink to enable assessment (by the Action Rapporteur) of the achievement and access by end users
Standardized methods and protocols variety testing in Organic Greenhouse Crops	Yes	Guidelines for Experimental Practice in Organic Greenhouse Horticulture (http://biogreenhouse.org/public-documents/cat_view/18-publications/50-books-and-booklets/53-low-resolution *Document Biogreenhouse Research*)
Standardized methods and protocols for the evaluation of seed treatments	Yes	Review on seed treatment technologies for organic vegetable seeds *(will be published in 2016 in Plant Pathology))*
Availability of international variety trials through Organic e-prints	Partially /Greatly	With the Biogreenhoude Book "Guidelines for Experimental Practice in Organic Greenhouse Horticulture" the common basement for comparable trials has been laid. Efforts within WG 1 were concentrated to this first step. Within the network of the COST action personal contacts were established and knowledge about different platforms for distributing and archiving results from variety trials (and other experiments) were distributed. Orgprints proves to be the most suitable platform for it.
Fertility strategies in OGH	Yes	Soil fertility management in organic greenhouses in Europe (http://biogreenhouse.org/public-documents/cat_view/18-publications/50-books-and-booklets/53-low-resolution *Document Biogreenhouse Soil Fertility)*
Water management strategies OGH	Yes	Impact of water quality and irrigation management on organic greenhouse horticulture (http://biogreenhouse.org/public-documents/cat_view/18-publications/50-books-and-booklets/53-low-resolution *Document Biogreenhouse Watermanagement*)
Compost use in OGH	Yes	Handbook for Composting and Compost Use in Organic Horticulture (http://biogreenhouse.org/public-documents/cat_view/18-publications/50-books-and-booklets/53-low-resolution *Document Biogreenhouse Compost*)
Alternatives for peat as substrate in production of young plants	Yes	Review on alternatives of peat, their properties and use in the production of transplants in OGH (To be published in 2016 in Bioresource Technology)
Risks in drain water recycling	Yes	Factsheet (http://biogreenhouse.org/public-documents/cat_view/18-publications/59-factsheets/52-factsheets-food-safety) , in Document Biogreenhouse Watermanagement chapter 3 (http://biogreenhouse.org/public-documents/cat_view/18-publications/50-books-and-booklets/53-low-resolution) and review on food hazards in OGH (to be published in Scientia Horticulturae in 2016)
Resilient cropping systems to suppress greenhouse pests and diseases and to enhance biological control	Yes	16 Factsheets on Integrated Pest Management in OGH (http://biogreenhouse.org/public-documents/cat_view/18-publications/59-factsheets/51-factsheets-pest-management) and presentations in the technical program at the 3rd Symposium on Organic Greenhouse Horticulture in Izmir (http://biogreenhouse.org/public-documents/cat_view/18-publications/60-presentations-and-reports-3rd-ogh-symposium-izmir-2016/64-presentations-and-reports-technical-programme in the folder Foliar diseases and Pest Management) 5 scientific review papers, of which 3 published (see list further) and 2 still to

		be published in Pest Management Science and Applied Ecology)
Analyse energy economy and use of fossil energy in OGH systems	Yes	Sensible use of primary energy in organic greenhouse production (http://biogreenhouse.org/public-documents/cat_view/18-publications/50-books-and-booklets/53-low-resolution *Document Biogreenhouse Energy*)
Options and feasibility for climate neutral production for OGH in the EU	Yes	Sensible use of primary energy in organic greenhouse production (http://biogreenhouse.org/public-documents/cat_view/18-publications/50-books-and-booklets/53-low-resolution *Document Biogreenhouse Energy*)
Indicators for sustainability in OGH	Yes	Sustainability assessment tools for organic greenhouse horticulture (http://biogreenhouse.org/public-documents/cat_view/18-publications/50-books-and-booklets/53-low-resolution *Document Biogreenhouse Sustainability)*
Roadmaps how to improve sustainability	Partially	In: Sustainability assessment tools for organic greenhouse horticulture (http://biogreenhouse.org/public-documents/cat_view/18-publications/50-books-and-booklets/53-low-resolution *Document Biogreenhouse Sustainability*)
Policy advice for standards EU	Yes	Final Report On Greenhouse Production (Protected Cropping) by EGTOP (http://ec.europa.eu/agriculture/organic/eu-policy/expert-advice/documents/final-reports/final_report_egtop_on_greenhouse_production_en.pdf)
Dissemination of knowledge	Yes	●**Deliverables and publications** mentioned in the chapter below ; These are placed on the internet and also given to the EU, IFOAM and the national organisations for organic agriculture of the participating countries ●2nd Symposium on Organic Greenhouse Horticulture (https://www.amiando.com/OGH_Symposium2013.html) and proceedings in http://www.actahort.org/books/1041/ ; ● **Scientific program** of 3rd Symposium on Organic Greenhouse Horticulture (www.oghsymposium2016.org) and proceedings in Scientia Horticulturae in the course of 2016) Abstracts can be found at: http://biogreenhouse.org/public-documents/cat_view/18-publications/60-presentations-and-reports-3rd-ogh-symposium-izmir-2016/65-presentations-and-abstracts-scientific-prog . ●**Technical program** of 3rd Symposium on Organic Greenhouse Horticulture (www.oghsymposium2016.org) and presentations and reports (http://biogreenhouse.org/public-documents/cat_view/18-publications/60-presentations-and-reports-3rd-ogh-symposium-izmir-2016) ●Website www.biogreenhouse.org ● COST Website http://www.cost.eu/COST_Actions/fa/FA1105
Develop a common research and innovation agenda and support agenda setting	Yes	●In 2013 contribution to the TP Organics stakeholder forum on the 25th of June 2013 (http://www.organic-research.net/home/news-organic-research.html?L=2%2525252520onfocus%252525253DblurLink%2525252528this%2525252529%252525253B&tx_ttnews%5Btt_news%5D=1023&cHash=13a52cab57cb1e96ac4288105a40fc54)See also the documents on the BioGreenhouse website : http://biogreenhouse.org/public-documents/cat_view/2-background-info in the documents of 2013 ● In 2014:Contribution to strategic agenda of TP Organics (see http://tporganics.eu/wp-content/uploads/2016/01/tporganiceu-strategic-research-and-innovation-agenda-2014-brochure-20150129.pdf page 39); ●in 2015 In a EU Conference : "Conference on Organic production, Research and Innovation: setting the priorities for the future" Milan, 28-29 May 2015: (http://ec.europa.eu/agriculture/expo-milano-2015/cap-events/organic-farming/outcomes_en.pdf see page 8); ●in 2016 a presentation of the vision on future research (http://biogreenhouse.org/public-documents/cat_view/18-publications/60-presentations-and-reports-3rd-ogh-symposium-izmir-2016/61-presentations-

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		and-reports-general-programme/62-opening *Document R&D Inn Vision Biogreenhouse 2016)* at the 3rd Symposium on Organic Greenhouse Horticulture Izmir 2016 in the general program. Paper in the proceedings in Scientia Horticulturae to be published in 2016 . (http://www.oghsymposium2016.org/files/downloads/OGH2016_SCIENTIFIC_PROGRAM.pdf)
Capacity building : Training and education: Short Term Scientific Missions	Yes	During the Action period in total 18 people went on a short term scientific mission; 4 in the 1st year of the Action; 7 in the 2nd and 7 in the 3rd year. The reports can be seen at http://www.biogreenhouse.org/stsm?limitstart=0 .
Capacity building : Training and education: Training Schools	Yes	During the Action period 4 Training Schools are being held: ● Applied methods in crop physiology; 4-9 May 2014; 9 participants; AarhusUniversity(DK) (http://biogreenhouse.org/public-documents/cat_view/47-training-schools/41-training-school-alnarp-2014-applied-plant-physiology-in-ogh) ● Soil fertility, Suppressiveness & Water management strategies towards sustainable and productive organic greenhouse agriculture; 15-19 September 2014; 25 participants; IAMB, Bari (IT) (http://biogreenhouse.org/public-documents/cat_view/47-training-schools/21-training-school-bari-2014-soil-fertility-in-ogh) ● Vegetable diseases diagnostic tools and control methods under greenhouse organic farming. Practical training; 12-15 May 2015; 22 participants; IFAPA La Mojonera Center (ES) (http://biogreenhouse.org/public-documents/cat_view/47-training-schools/35-training-school-almeria-2015-disease-diagnosis-and-management-in-ogh) ● Biological Management of Arthropod Pests in Greenhouse Crops: Principles and their Application; 7-11 October 2015; 23 participants; The Hebrew University of Jerusalem, Rehovot (IL) (http://www.biogreenhouse.org/public-documents/cat_view/47-training-schools/39-training-school-jerusalem-2015-pest-management-in-ogh)

MoU deliverables

MoU deliverable	Delivered Yes/ Partially/ No	Evidence of (partial) delivery
Copy from eCOST or MoU		For each deliverable insert evidence of (partial) achievement including hyperlink to enable assessment (by the Action Rapporteur) of the achievement and access by end users
International manual for seed treatment of OGH crops	Partially	Review on seed treatment technologies for organic vegetable seeds (To be published in 2016 in Plant Pathology)
International manual for Variety trials of OGH	Yes	Guidelines for Experimental Practice in Organic Greenhouse Horticulture (http://biogreenhouse.org/public-documents/cat_view/18-publications/50-books-and-booklets/53-low-resolution Document Biogreenhouse Research)
Guideline booklet on soil fertility	Yes	Soil fertility management in organic greenhouses in Europe (http://biogreenhouse.org/public-documents/cat_view/18-publications/50-books-and-

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		booklets/53-low-resolution *Document Biogreenhouse Soil Fertility)*
Document on organic substrate for protected crops	Yes	●Handbook for Composting and Compost Use in Organic Horticulture(http://biogreenhouse.org/public-documents/cat_view/18-publications/50-books-and-booklets/53-low-resolution *Document Biogreenhouse Compost*) ● Review on alternatives of peat, their properties and use in the production of transplants in OGH (To be published in 2016/2017 in Bioresource Technology)
Guideline for composting	Yes	Handbook for Composting and Compost Use in Organic Horticulture (http://biogreenhouse.org/public-documents/cat_view/18-publications/50-books-and-booklets/53-low-resolution *Document Biogreenhouse Compost*)
Document on monitoring and control tools of water management	Yes	Impact of water quality and irrigation management on organic greenhouse horticulture (http://biogreenhouse.org/public-documents/cat_view/18-publications/50-books-and-booklets/53-low-resolution *Document Biogreenhouse Watermanagement*)
Document on risks of OGH for human health	Yes	Factsheet (http://biogreenhouse.org/public-documents/cat_view/18-publications/59-factsheets/52-factsheets-food-safety), in chapter 3 of the document Biogreenhouse Watermanagement ((http://biogreenhouse.org/public-documents/cat_view/18-publications/50-books-and-booklets/53-low-resolution) and review on food hazards in OGH (to be published in Scientia Horticulturae in 2016)
Document on the management of greenhouse climate related diseases	Partially	Presentations and report of Workshop Foliar diseases in Technical Programme Izmir 2016 (http://biogreenhouse.org/public-documents/cat_view/18-publications/60-presentations-and-reports-3rd-ogh-symposium-izmir-2016/64-presentations-and-reports-technical-programme/70-foliar-diseases)
Document on the management of pests by non-chemical means	Yes	16 fact sheets of different aspects and tools for pest management in greenhouse horticulture (http://biogreenhouse.org/public-documents/cat_view/18-publications/59-factsheets/51-factsheets-pest-management)
Inventory of the present energy economy and use of fossil energy in OGH in Europe	Yes	***In***: Sensible use of primary energy in organic greenhouse production (http://biogreenhouse.org/public-documents/cat_view/18-publications/50-books-and-booklets/53-low-resolution *Document Biogreenhouse Energy*)
Guidelines for the reduction of primary use of primary energy	Yes	***In***: Sensible use of primary energy in organic greenhouse production (http://biogreenhouse.org/public-documents/cat_view/18-publications/50-books-and-booklets/53-low-resolution *Document Biogreenhouse Energy*)
Information package on energy use by climate control, carbon dioxide fertilisation and crop	Yes	***In***: Sensible use of primary energy in organic greenhouse production (http://biogreenhouse.org/public-

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management		documents/cat_view/18-publications/50-books-and-booklets/53-low-resolution *Document Biogreenhouse Energy*)
Document on the feasibility of substitutes of fossil energy	Yes	***In***: Sensible use of primary energy in organic greenhouse production (http://biogreenhouse.org/public-documents/cat_view/18-publications/50-books-and-booklets/53-low-resolution *Document Biogreenhouse Energy*)
Meeting to assess available sustainability indicators	Yes	September 2015 Maribor Slovenia See: (http://biogreenhouse.org/public-documents/cat_view/18-publications/50-books-and-booklets/53-low-resolution *Document Biogreenhouse Sustainability)*
Indicator toolkit for sustainability in OGH	Yes	Sustainability assessment tools for organic greenhouse horticulture (http://biogreenhouse.org/public-documents/cat_view/18-publications/50-books-and-booklets/53-low-resolution *Document Biogreenhouse Sustainability)*
Roadmaps to improve sustainability for key aspects	Yes	Meeting in Barcelona 2014 on roadmap to phase-out fossil fuels in OGH This has fed into the "Document on the feasibility of substitutes of fossil energy" (http://biogreenhouse.org/public-documents/cat_view/18-publications/50-books-and-booklets/53-low-resolution *Document Biogreenhouse Energy*) and into Sustainability assessment tools for organic greenhouse horticulture (http://biogreenhouse.org/public-documents/cat_view/18-publications/50-books-and-booklets/53-low-resolution *Document Biogreenhouse Sustainability)* Meeting in Vienna 2014 to phase-out peat, this however only on the agenda in some EU member states (link http://biogreenhouse.org/public-documents/cat_view/18-publications/20-scientific-papers-and-reviews : documents Schmutz and Raviv)
Publication on the scientific background for standards and good practices in OGH	Partially	Two peer-reviewed scientific papers on OGH standards and urban agriculture and on vegan organic standards for OGH, Avignon 2013, Izmir 2016. Discussion papers on scientific evidence to phase out peat and growing in growing media without connection to the subsoil, Vienna 2014 (http://biogreenhouse.org/public-documents/cat_view/18-publications/20-scientific-papers-and-reviews Documents Raviv and Schmutz).These have to remain scientific discussion papers as no absolute consensus on certain inputs and practices is possible. It remains a political process were different values and viewpoints co-exist. To be pubished in Acta Horiculturae in 2016. See also the Abstracts: http://biogreenhouse.org/public-documents/cat_view/18-publications/60-presentations-and-reports-3rd-ogh-symposium-izmir-2016/65-presentations-and-abstracts-scientific-prog
Open stakeholder seminar to present results and findings	Yes	Workshop Resilience and Sustainability in the Technical program of the 3rd Symposium on Organic Greenhouse Horticulture (http://biogreenhouse.org/public-

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		documents/cat_view/18-publications/60-presentations-and-reports-3rd-ogh-symposium-izmir-2016/64-presentations-and-reports-technical-programme/68-resilience-and-sustainability)

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, 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."

There is a lot of research being done in Europe and Northern America about protected cultivation. There is much less R&D done on organic protected cropping specifically. There is also a need to provide guidelines and information wherever factors acutely relevant to organic horticulture are affected, such as the management of climate and crop, for the prevention/early detection of pests and diseases.
Therefore there was much to be gained by joining together with other institutions and experts to discuss experiences and perspectives in order to compare scientific approaches, and to develop common theoretical concepts and references. Experts with experience of various climates, socio-economic environments and national regulations were able to learn from each other and find viable solutions more quickly than separately.

The most innovative part of the action is the networking of experts in the field of organic protected horticulture. This applies also to the integration of all disciplines in one platform so being able to produce many deliverables with integrated knowledge and solutions valuable for applied science in OGH and for the OGH industry or sector. By realising reviews, guidelines, books, booklets, common procedures, approaches and policy advise the network of BioGreenhouse COST Action shows to be a break-through which will be valuable also for the time to come. Without this network these contributions to applied science and industry would never have been realised.

BioGreenhouse 2.0
Including near neighbouring countries into the BioGreenhouse network worked especially well as many of them are in an earlier phase of the development of organic agriculture. Learning from each other has largely benefited the spread of more sustainable greenhouse production techniques. As these processes are slow and on-going OGH is still only in it's early stages.
Therefore, a second phase of the BioGreenhouse (COST BioGreenhouse 2.0) network would make a lot of sense from an economic and environmental point of view. A project like this should include further near neighbouring countries.In the European core it could also study and integrate novel developments in organic agriculture, like the emergence of urban organic agriculture, vegan organic agriculture, over-winter cropping in northern climates in unheated greenhouses, territorial food systems and short food supply chains.
In short, although BioGreenhouse was very successful to kick-start and promote the sector, it is still in it's infancy and much more growth potential both in the core and in near neighbouring countries is possible.

Please describe any additional outputs and achievements from the Action

- Articles in the industry press in different member countries

Koller M. 2013. Woran wird zum Bioanbau in Gewächshäusern geforscht? ÖKOmensicher Gärtnerrundbrief 5/2013 p.11-13 (in German). [Content: Highlights of the II OGH Symposium in Avignon, Readers: Organic Growers in Germany, Austria and Switzerland]

Koller M. and Große Lengerich T. 2015. Internationale Tagung zum Biogewächshausanbau. ÖKOmensicher Gärtnerrundbrief 4/2015 p.17 (in German).

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Version 2015-06-12

Co-authored publications and FP7/ H2020 proposals

Co-authored publications

This table contains the (up to) ten most significant co-authored publications resulting from the Action. All publications are on the topic of the Action, co-authored by at least two Action participants from two different countries participating in the Action.

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[1])	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[2] 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[3]?	Is it peer - revi ewe d?	Was the value of Action Network necessa the publ
1	*The Challenge of Peat Substitution in Organic Seedling Production: Optimization of Growing Media Formulation through Mixture Design and Response Surface Analysis*	*Francesco Giovanni Ceglie*	*4*	*Francesco Giovanni Ceglie (MC Substitute), Maria Angeles Bustamante(WG Member and STSMrecipient), Fabio Tittarelli(MC)*	*WG Robust Planting Material and WG Soil Fertility, Suppressiveness and Water Management*	*June 12, 2015*		*http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0128600*	*yes*	*yes*	*no*	*Food security, sustainable agriculture and forestry*	*yes*	*yes*
2	*New opportunities for the integration of microorganisms into biological pest control systems in greenhouse crops*	*Francisco Gonzalez*	*7*	*Francisco Gonzalez (WG Member) Cezary Tkaczuk(WG Member) Mihaela Monica Dinu(STSM/WG Member) Zaneta Fiedler(WG member) Stefan Vidal (WG member) Einat Zchori-Fein (WG Member) Gerben J. Messelink(WG leader)*	*WG 3 Plant Health*	*7 March 2016*		*http://paperity.org/p/75932914/new-opportunities-for-the-integration-of-microorganisms-into-biological-pest-control*	*yes*	*yes*	*no*	*Food security, sustainable agriculture and forestry*	*yes*	*yes*
3	*Organic seed treatments of vegetables to prevent seedborne diseases*	*Davide Spadaro*	*3*	*Davide Spadaro(WG1), Joelle Herforth-Rahmé(WG1), and Jan van der Wolf(WG1)*	*WG1Robust Planting Material*		*Aug 2016*		*no*	*yes*	*yes*	*Food security, sustainable agriculture and forestry*	*yes*	*yes*
4	*Growing media for transplant production and potted herbs in organic nurseries: review on their characteristics, formulations and functionality*	*Jose Antonio Pascual*	*6*	*Pascual JA(MC) Ceglie(WG) Tuzel Yuksel(MC), Koller Martin(MC) Koren Amnon(WG), Tittarelli(MC)*	*WG Robust Planting Material and WG 2 Soil Fertility, Suppressiveness and Water Management*		*Oct 2016*		*yes*	*yes*	*yes*	*Food security, sustainable agriculture and forestry*	*yes*	*yes*
5	*Approaches to conserving natural enemy populations in greenhouse crops: current methods and future prospects*	*Gerben Messelink*	*8*	*Gerben J. Messelink(MC) Oscar Alomar (WG) Barbara L. Ingegno (WG) Luciana Tavella*	*WG 3 Plant Health*		*8 May 2014*	*http://link.springer.com/article/10.1007%2Fs10526-014-9579-6#/page-1*	*yes*	*yes*	*yes*	*Food security, sustainable agriculture and forestry*	*yes*	*yes*

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

[2] 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.

[3] 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”

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				(WG) Eric Palevsky(WG) Felix L. Wäckers(WG)											
6	Bio-based resistance inducers for sustainable plant protection against pathogens	Lenka Burketová	4	Olga Valentová (MC)	WG3 Plant Health and COST action FA1203 (EUBIS)	2015 Jan 22		An increasing demand for environmentally acceptable alternative for traditional pesticides provides an impetus to conceive new bio-based strategies in crop protection. Employing induced resistance is one such strategy, consisting of boosting the natural plant immunity. Upon infections, plants defend themselves by activating their immune mechanisms. These are initiated after the recognition of an invading pathogen via the microbe-associated molecular patterns (MAMPs) or other microbe-derived molecules. Triggered responses inhibit pathogen spread from the infected site. Systemic signal transport even enables to prepare, i.e. prime, distal uninfected tissues for more rapid and enhanced response upon the consequent pathogen attack. Similar defense mechanisms can be triggered by purified MAMPs, pathogen-derived molecules, signal molecules involved in plant resistance to pathogens, such as salicylic and jasmonic acid, or a wide range of other chemical compounds. Induced resistance can be also conferred by plant-associated microorganisms, including beneficial bacteria or fungi. Treatment with resistance inducers or beneficial microorganisms provides long-lasting resistance for plants to a wide range of pathogens. This study surveys current knowledge on resistance and its mechanisms provided by microbe-, algae- and plant-derived elicitors in different crops. The main scope deals with bacterial substances and fungus-derived molecules chitin and chitosan and algae elicitors, including naturally sulphated polysaccharides such as ulvans, fucans or carageenans. Recent advances in the utilization of this strategy in practical crop protection are also discussed.	no	yes	no	Food security, sustainable agriculture and forestry	yes	partially
7	Potential food hazards from organic greenhouse horticulture	Beatrix Alsanius	5		WG2 WG 2 Soil Fertility, Suppressiveness and Water Management		November 2016		no	yes	yes	Food security, sustainable agriculture and forestry	yes	yes
8	Minerals and botanicals as biopesticides in greenhouse crops	Ellen Richter			WG 3 Plant Health	Sep 2016			yes	yes	yes	Food security, sustainable agriculture and forestry	yes	yes
9	Induced plant responses and their role in pest management in greenhouse horticulture	Maria Pappas			WG 3 Plant Health	Sep2016			no	yes	yes	Food security, sustainable agriculture and forestry	yes	yes

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											
1	List FP7/ H2020 projects resulting from the Action in this section of the table										
2											

Proposals											
	List FP7/ H2020 proposals submitted as a result of the Action in this section of the table										
	Pest and disease control through functional biodiversity in organic greenhouses	Luciana Tavella (IT)	12	DISAFA(IT), EGE (TR), GRAB(FR), LUH-IPP(DE), RDIPP(RO), AUA(GR), FiBL(CH), IRTA(ES), SLU(SE), PCG(BE), PKK Pamel(BE), LLU (LV)	CORE Organic PLUS	30-06-2014	01-10-2014	Not approved		Food security, sustainable agriculture and forestry	Yes
	Local Alpine low-carbon vegetable production	A. Himpens GERES (FR)	7	AGROINNOVA (IT), FIBL (CH), HBLFA (AT), GRAB (F)	Interreg Alpine Space	8-4-2016	07-06-2016	Pending		Food security, sustainable agriculture and forestry	Yes
	SFS-08-2017 Organic inputs – contentious inputs in organic farming	Ulrich Schmutz (UK)	4 or more	Spain, Greece, Denmark, Switzerland, UK	EU Horizon 2020	14 February 2017		In preparation	SFS-08-2017	Food security, sustainable agriculture and forestry	Yes

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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.

See paragraph I. B. Additional outputs and achievements

The table below shows the extent to which it would have been possible to achieve each of the Action's objectives without the Action networking.

MoU objective	Possibility of achievement without Action networking		
Copy from eCOST or Action MoU	Fully	Partially	Impossible
The main objective of the Action is to improve and disseminate knowledge for new and better production strategies, methods and technologies to support sustainable and productive organic greenhouse/protected horticulture in the EU.			X
To develop standardized methods and protocols for the variety testing of organic greenhouse crops and for the evaluation of seed treatments. The drivers are the demand for resilient planting material and for effective and chemical free techniques for seed treatment.			X
To make available the results of international variety trials through Organic e-prints or other means of open communication.		X	
To develop efficient, sustainable and safe fertility and water management strategies using standardized guidelines in a systems approach for different pedo-climatic conditions.			X
To design strategies for the use of composts and other amendments in soil fertility and disease suppression			X
To develop alternatives for peat as a substrate in the production of young plants			X
To develop sustainable and safe technologies and strategies for reducing risks in drain water recycling			X
To design resilient cropping systems with a maximum use of ecological support functions to suppress greenhouse pests and diseases and enhance biological control. These functions can include functional diversity of natural enemies, food sprays, banker plants, habitat and climate management, and induced plant resistance			X
To analyse the energy economy and the use of fossil energy in existing organic greenhouse systems in relation to region, growing system and cropping schedule			X
To develop options and evaluate their feasibility for climate neutral production in different regions in the EU, by specifically considering the reduction of energy demand, energyefficient process management, the use of renewable sources of energy and the climate neutral CO2 enrichment of the greenhouse air.			X
To assess indicators for the ecological, social and economic sustainability of organic greenhouse systems, and to specifically assess total factor productivity. This contrasts reliance on non-renewable inputs, like fossil fuel or peat, with multiple outputs like yield quantity and quality, and environmental and social services			X
To produce roadmaps on how to improve sustainability in OGH across EU			X
To inform and give policy advice to stakeholders, especially for the development of EU standards for OGH			X
Establish and extend a network among European and other scientists, experts and advisors to design and develop new knowledge and strategies for OGH.			X

Extent of the networking

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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? ●***Extent of networking:*** Not all participants were equally integrated in the networking equally. The most active were the people who contributed actively in the making of the deliverables, to the organisation and participation of the exchange meetings, of STSMs and of Training Schools. About 180 people from the 290 registered people were actively involved ●***Inclusiveness:*** 27 countries from all over Europe participated in this Action. The participation from each COST country seems to reflect mainly the presence and importance of OGH in the country. In general: The more important OGH in a country, the highte the participation and activity. ●***ITCs/ESRs:*** The training schools and STSM facility invited especially young people to participate. In total 79 participants took part in the Traing Schools of which 55 were reimbursed; 18 people did a STSM. ●***Gender Balance:*** The gender balance of the participants in the Training Schools and STSMs were 75% female: 25% male; the gender balance in the making of the deliverables: 40% female: 60% male

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[4]	Timing of impact[5]
Enter one impact per line, and specify the type and timing of the impact.		
"the short- to long-term scientific, technological, and / or socioeconomic changes produced by a COST Action, directly or indirectly, intended or unintended."		
Use of deliverables in applied science	science & technology	2 years
Agenda setting on national and EU level	science & technology	2-5 years
Execution of joint R&D projects	science & technology	2-5 years
Use of deliverables in industry/organic sector	economic	2 years and 2-5 years
Use of deliverables in education	societal	2 years and 2-5 years
Use of deliverables in standard development	societal	2 years
Invitation of experts in the network for advise in EU standard development	societal	2-5 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.
The Action intends to disseminate the deliverables very widely so that a great audience – being growers, consultants, suppliers, researchers, teachers, students and policy makers- could be reached. The deliverables will be freely available via the website www.biogreenhouse.org and further on the internet. The deliverables are also handed over to the EU DG Research and DG Agriculture and Rural Development and to IFOAM EU. In addition all members of the Action have been invited to spread the information to the relevant Ministry and growers, consultant and vocational organisations in their country and further in their network. Also the participants of the final conference in Izmir(TR) have been asked to

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

disseminate in their network.
Finally: All deliverables are written in English; this means that for most of the audience it should be translated; within the framework of COST there are no opportunities for it and therefor the exploitation will be retarded.
.

Item/ activity	Target audience	Result	Hyperlink
Press release	Growers, consultants, researchers, business people, teachers and students and policy makers via Agricultural journals/trade magazines	Audience knows about the existence of the deliverables	http://biogreenhouse.org/public-documents/cat_view/18-publications/60-presentations-and-reports-3rd-ogh-symposium-izmir-2016/61-presentations-and-reports-general-programme/62-opening
Website	Growers, consultants, researchers, business people, teachers and students and policy makers	www.biogreenhouse.org . The deliverables of Action will be freely available via this website	
Books, booklets and factsheets in the E-depot of Wageningen UR Library	Consultants, researchers, business people, teachers, students and policy makers and advanced growers	Continuous availability of these deliverables	http://edepot.wur.nl/ search on subject possible
Handing over to IFOAM EU and IFOAM International at the final conference in Izmir	Dissemination of existence of the deliverables via their communication to partner organisations	Network knows about the availability of the deliverables	http://biogreenhouse.org/public-documents/cat_view/18-publications/60-presentations-and-reports-3rd-ogh-symposium-izmir-2016/61-presentations-and-reports-general-programme/62-opening
Handing over to TP Organics and asking to publish the existance of the deliverables in their newsletter	TP Organics is a umbrella organisation of all EU organisations active in the production, trade and innovation in organic agriculture	Audience knows about the availability of the deliverables	Sent to TP Organics by email and post
Technical program at the final conference/3rd Symposium on Organic Greenhuse Horticulture, 11-14 April 2016, Izmir (TR)	Growers, consultants, researchers, business people, teachers and students and policy makers	Audience knows about the availability of the deliverables and will discuss the results	http://biogreenhouse.org/public-documents/cat_view/18-publications/60-presentations-and-reports-3rd-ogh-symposium-izmir-2016/64-presentations-and-reports-technical-programme
Request to all Action members	Policy makers, growers,	Audience knows about the availability of the	Report MC Meeting Izmir 2016 http://biogreenhouse.org/public-

to spread the existence of the deliverables to the relevant Ministry and the organisations of growers, consultants and education and to the agricultural magazines in their country and in their network	consultants, researchers, business people, suppliers, teachers, students and agricultural magazines	deliverables	documents/cat_view/8-management-committee-and-meetings and email message to all members of the Action
Request to all participants of the Final Conference in Izmir to spread the existence of the deliverables in their network. The participants of the Action received all deliverables on a USB stick	Growers, consultants, researchers, business people, suppliers, teachers and students.	Audience	n.a.

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I.F Action success(es)

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

	Dimension of the success ■ Breakthrough: scientific, technological or socioeconomic ■ Policy implementation (specify which policy) ■ Capacity building
Within the framework of the COST Action FA1105 Biogreenhouse a network of institutions and experts from 27 COST Countries together with experts from Canada, Jordan and Egypt were realising a great number of scientific reviews about major issues in Organic Greenhouse Horticulture (OGH), and were publishing books, booklets and gave presentations covering all subjects of the organic production of protected crops. Subjects covered are nursery management, soil fertility, compost, water management, pest management, sensible use of energy and marketing and food safety. Applied science and the sector of OGH have access to the latest knowledge. More than 70 young researchers used the opportunity to grow in knowledge and ability with respect to OGH by doing a Short Term Scientific Mission or following one of the four training Schools. Members of the Action were invited to advise the EU with respect to the development of EU standards for Organic Greenhouse Production (EGTOP). At several occasions the Action contributed to the agenda setting for innovation in organic protected cropping.	

II. Management Report

II.A. Overview of expenditure

The table below summarises the Action's expenditure throughout its four year life.

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Dissemination	EUR 4,500.00	EUR 10,700.00	EUR 8,391.83	EUR 9,597.50	EUR 33,189.33
OERSA[1]	EUR -	EUR -	EUR -	EUR -	EUR -
Total Scientific Expenditure	EUR 93,596.99	EUR 122,613.15	EUR 146,442.68	EUR 104,494.41	EUR 467,147.23
FSAC[2]	EUR 14,039.11	EUR 18,388.70	EUR 21,965.52	EUR 15,674.16	EUR 70,067.49
TOTAL	EUR 107,636.10	EUR 141,001.85	EUR 168,408.20	EUR 120,168.57	EUR 537,214.72

[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

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		
none		none		Date	none
Add home institution and country		Add host institution and country		Date	Describe topic of the STSM and the added value to the Action

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
Martine Dorais	Université Laval	Canada	15-17/10/2012	OGH systems in Northern America. Exchange of views and different approaches of OGH
Eliot Coleman	Coleman Farm	USA	28-31/10/2013	OGH farming in the USA. The way it started. . Confrontation and exchange of views.
Steeve Pepin	Université Laval	Canada	5-6/06/2014	Contribution to the deliverable of Watermanagement in OGH
Roula Fares	Lebanese Organic Consultancy	LB	15-19/09/2014	Organic protected farming in the Mediterranean area. Experiences from practice in Training School Soil fertility

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Add	Add	Add	Add	Describe the speaker's topic and the added value to the Action

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
2nd Symposium in Organic Greenhouse Horticulture	Dissemination	FR	28-31/10/2013	Avignon	Strengthening the network, disseminate, exchange views and contribution to agenda setting
3rd Symposium/Final Conference	Dissemination	TR	11-14/04/2014	Izmir	Dissemination of the knowledge of the Action to science and OGH industry.

II.C. Participants

Management Committee		
Name	Country	Email address
Copy MC Member name, country and email address from eCOST into the relevant columns		
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II.D. Specific issues

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 published on the COST website.

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).
Constant integration of participants into the working groups, some were lost after the first group meeting. This was caused mainly by the fact that the people could not find time to contribute, because their institutes/employers had different obligations, which were funded . Finding funds is a major responsibility for most of the knowledge workers; in this respect the reimbursement scheme of COST is a drawback for its functioning. The participation of people depends too much on the personal motivation only. The management incl. the administration of this Action is a great responsibility and demands a lot of effort and energy. The financial compensation for it should be better. The administrative procedures are largely documented, but for newcomers in the COST system it is a jungle and lead to many mistakes and shortcomings in the reimbursement claims; This causes a lot of work for COST Office and for the management /administration of the Action The support of both the Scientific and Administrative Officer were very good, stimulating and supportive.
The MC did not accept the pending intentions to accept the MoU shown in Section I.A for the following reason.
Not applicable

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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.

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