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NEW TRENDS IN PUBLISHING RESEARCH AND TRANSFERRING THE KNOWLEDGE ON ANIMAL PRODUCTION – presenting Animal Open Space and EUREKA project

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Invited paper

Abstract: Open science is not only about making research results freely available, but also about making them understandable to and reproducible for a wider public (audience) and not only to specialised scientists. It is thus influencing strongly the research environment, especially the way research results are disseminated and communicated. Many research results remain unpublished due to lack of novelty or insufficient strength of the experimental design, which is a loss to the particular knowledge community. If the research is reproducible and the associated data are available, publication can open up new opportunities and ideas for data reuse, contributing significantly to knowledge gain. Thus, the classical way of publishing research results needs alternative approaches. This paper presents two initiatives to disseminate results from animal production research and agriculture in general. The first one is the e-platform *animal open space* (ANOPES), intended for research results. It opens the possibility to publish research, methodological and data papers with faster review and is already operational. The second initiative is a proof-of-concept study of the EUREKA project to create an agricultural knowledge e-platform to strengthen the agricultural knowledge and innovation system of the European Union. For ANOPES, the scope and opportunities for publication are presented. For EUREKA, the analysis of data and knowledge objects created in a multi-actor projects and their relevance to the knowledge repository are presented.

Key words: animal production; open science; knowledge objects; e-repository

Introduction

Open science has for the objective to make scientific research results (e.g. publications, data, software) freely available to all stakeholders, amateur or professional (*Woefle et al, 2011*). Open science denotes a transparent and accessible knowledge shared and developed through the collaborative networks and generally making it easier to publish and communicate scientific knowledge (*Vicente-Saez et al., 2018*). According to *Eve (2014)*, for a piece of academic research to be called open access (OA), it must be available digitally for anybody to read at no financial cost beyond those intrinsic to using the internet; it means implementing a new system that allows free access to peer-reviewed scholarly research on the world wide web. The term also means that people should be able to reuse this material beyond the provisions of fair use enshrined in copyright law, as long as the author is credited. This policy has been rapidly spreading and has strongly affected the scientific environment, in particular the publishing. For example, the policy of open science has been implemented in European Union research programmes, and unless the results need to be protected, there is a contractual obligation for open access dissemination. Thus science becomes more transparent and accessible to society at large and can contribute to boosting the innovation potential, as suggested by *Woefle et al. (2011)* in a paper Open science is a research accelerator. OA also contributes to more efficient research and increases its impact.

It should be mentioned that open access (OA) of research results demands that FAIR data principles are respected (FAIR stands for Findable, Accessible, Interoperable and Reusable). The acronym and principles were defined in a paper that was published in 2016 the journal Scientific Data (*Wilkinson et al., 2016*) and emphasise the ability of machine-based operation i.e. the capacity of computational systems with none or minimal human intervention (FAIR principles). OA does not only refer to research papers being freely accessible, but covers the whole spectrum of research outputs like primary data produced or tools and methodologies developed in the research. The re-use of primary data is of particular interest as it contributes to avoiding additional experiments on animals, allows new ideas/analyses to be tested and used in larger context e.g. big data analysis. There is also a lot of research that has not been published due to shortcomings related to scientific soundness, insignificance of tested hypothesis or insufficient power of methodological approach which is a pity to be completely lost for the knowledge community. Knowledge community is strongly aware, that there is an urgent need to improve the infrastructure supporting the reuse of scholarly data (*Wilkinson et al., 2016*).

Besides creation of new knowledge, another issue to be considered in the context of knowledge availability is the innovation uptake, i.e. the transfer and implementation of knowledge into practice. The knowledge objects that emerge in the research community are diverse (see Fig. 1) and not always easy for various public to understand. Therefore, research papers are not and should not be the only outputs of a given research effort. While research papers are mostly produced for and intended for the scientific community, other types of knowledge objects developed by researchers are of interest and importance to practitioners. In particular those that convey a concise, condensed and practical message. When preparing or disseminating to farmers or practitioners, it is important to consider what and how to present the information - the content, the form and the communication channel.

Thus, the aim of this article is to present new trends and developments in the dissemination and communication of research results or knowledge transfer in animal production science. First, the platform for dissemination of research results related to animal production that has recently been established and put into operation is Animal Open Space. Second, the Horizon 2020 feasibility study of EUREKA project for the development of an e-platform for agricultural knowledge to facilitate knowledge transfer to end users. Both platforms respond to societal needs related to open science, FAIR principles and better research impact, and represent an innovative approach to the provision and/or transfer of knowledge (know-how) for enhanced innovation uptake in the field of animal production.

Animal Open Space – concept and scope

On June 28 2021, the animal consortium, which is a collaboration between the British Society of Animal Science (BSAS), the Institut National de la Recherche pour l'Agriculture, l'Alimentation et l'Environnement (INRAe) and the European Federation for Animal Science (EAAP) launched with the journal animal – open space a new publishing initiative. This new journal is part of a family of journals including the flagship journal animal and animal – science proceedings.

Compared to other known journal in animal science, animal - open space fully embraces Open Science. Its philosophy is that all reproducible research, the data linked to that research and the associated points of views of the authors contribute to knowledge gain. Therefore, this knowledge deserves to be rapidly published and open for comments once published. Thus, we would like to open the possibility of a discussion between author and reader using the platform PubPeer. The journal publishes articles that relate to farmed or other managed animals, leisure and companion animals and the use of insects for animal feed and human food. In animal – open space, articles can be accepted from all species if they are

in, or contribute knowledge to, the aforementioned categories (e.g. cattle, sheep, pigs, poultry, horses, rabbits, fish, cats, dogs). One key element is also that lack of novelty, negative results or lack of significant treatment differences are not a barrier for publication in this journal.

The objective of the animal consortium is that animal - open space will become an essential reading for all animal scientists, stakeholders and policy makers interested in agricultural, veterinary and environmental sciences with expected impacts on animal performance and productivity, animal welfare, animal health, food security, environment, climate change, product quality, human health and nutrition, sustainability of animal agriculture, livestock systems and methodology. The impacts of the articles can be either of local or international relevance.

In the spirit of the Opens Science, animal – open space aims to publish open and reproducible research as data papers, method articles and research articles. The following characteristics are the key elements for the journal for all article types, it is mandatory 1) to deposit the complete raw dataset and the metadata describing them in an official data repository and 2) to provide a detailed description of critical methodologies, including mathematical equations and statistical models including the programming codes, that ensures that the research process and products are transparent and can be reproduced. As aforementioned there will be 3 types of articles published in animal – open space:

Data paper: What is a data paper? A data paper is a searchable metadata document, describing a dataset or a group of datasets and the circumstances of their collection, but without further analyses and interpretation of the data. Data paper provides a way for researchers to share and reuse each other's datasets by publishing datasets. Almost any piece of information can be defined as data. However, to merit publication in animal – open space data should be a set of information that are acquired/collected with a scientific method and be accurate, reusable, reproducible, replicable, and of value to the research community. What are the benefits of data papers for the research community? For instance, data sets can be used for another purpose (e.g. meta-analysis) than their original purpose. Data sets published as a data paper are accessible for a long period of time and by everyone and are easily to find. What are the advantages for the author(s)? The data is citable. If the associated research article is published in another journal (e.g. animal), a data paper might increase the traffic towards the research article and lead to more citations. Data papers may help to open doors for new research collaborations.

Method article: We know that reproducible experimental and laboratory methodologies are essential to science and animal - open space welcomes method

article dedicated only to these aspects. This includes new research protocols and methods or changes to existing research protocols and methods. In most cases (but not mandatory), research protocols and methodology articles compare (at least) two methods: the proposed or alternative method and the currently used or "gold standard" method. The rapid development of non-invasive methods (e.g. based on sensors and cameras, in vitro systems) provides alternatives to more invasive research protocols and methods and these alternatives can be published in animal – open space. Method articles can also describe novel, improved or experimental extension and teaching methods in animal science used in either higher or continuing education. The authors of method articles should clearly demonstrate why the novel, improved or experimental methods were considered and provide a qualitative or quantitative assessment of the method.

Research article: Research articles correspond to all types of reproducible experimental research and include: 1) "Confirmational" research which may not be novel per se, but contributes to enlarging the knowledge that is essential to life sciences. 2) Pilot studies and proof-of-concept research for which the statistical power may be not sufficient to make clear conclusions on the outcome. 3) Applied animal research in which a management factor or solution is tested under field conditions. 4) Observational data papers in which the results are based on observations made in field conditions, and not necessarily controlled conditions. 5) Articles describing meta-analysis, modelling research or software tools are considered as research articles.

The raw data used to present in tables or graphs in research articles need to be published in data repository. Compared to a data paper, authors of a research article need to express their opinion on their results.

Compared to a "classical" journal, the articles will be subjected to an editorial review process, that is a review by an editorial staff of animal – open space. The evaluation process will focus mainly on the scope, transparency, reproducibility, clarity of writing, quality of English, ethics and the quality of the metadata. That means that Material and Method, Results and Metadata will be reviewed. The introduction and discussion/points of view of the authors are reviewed only for clarity but the responsibility of the contents is left to the authors.

With this journal we aim to bring animal - open space to a point where it is recognized as an important member of the animal family, and we hope that with the introduction of this new concept (open science, open review process), the journal will be able to initiate and foster the post-print interaction between its authors and readers.

EUREKA project – analysing knowledge supply of multi-actor projects

EUREKA is a Horizon 2020 project (https://www.h2020eureka.eu/) responding to the EU call "Reinforcing the EU agricultural knowledge base", with the aim of analysing multi-actor projects and assessing the feasibility of developing the agricultural knowledge base as an e-infrastructure and proposing options for the future, in particular to efficiently link existing communication and dissemination channels with national and regional agricultural knowledge and information systems (AKISs). The project EUREKA has several objectives, one of which is to analyse the projects from the point of view of the data generated in the multi-actor environment. In Horizon 2020 Framework Programme, the multi-actor approach (MAA) was introduced as an innovative concept to facilitate and accelerate the adoption of innovation in agriculture. The concept of MAA means addressing real problems and opportunities and actively involving different stakeholders in project activities to make the best use of complementary competencies in co-creating new knowledge and solutions and thus enhancing the practical implementation and impact of the projects.

The EUREKA project is exploring the feasibility of building an open data knowledge reservoir by

- analysing the supply of knowledge from MAA projects, and the profile of end-users
- engaging with MAA community to identify most relevant needs of end-users
- developing an e-platform to integrate knowledge and innovation in line with the FAIR principles.

In the frame of the EUREKA the funded MAA projects were analysed to identify the types of knowledge and data generated in order to recognize the knowledge supply of interest for an agricultural knowledge e-platform. The analysis included 101 MAA projects of different types and the clusters of various outputs are presented in Figure 1.

Figure 1: Clusters of outputs created in MAA projects

It was observed that there is a large diversity of outputs from MAA projects, and that outputs differ mainly according to the type of project (research and innovation action-RIA, coordination and support action-CSA, innovation action-IA). RIA projects typically put more emphasis on scientific publications, whereas CSA and IA projects are more knowledge-exploitation oriented. With respect to FAIR principles, the published outputs (scientific and technical papers) are in-line with them, whereas more efforts are needed to assure the access to other types of important outputs produced in the projects, e.g. raw data, software/applications. It has emerged that publication of raw (or primary) data papers should be encouraged for a better re-use of data. The importance of intangible benefits that MAA projects create was highlighted, as was the challenge for the sustainability of the created knowledge community. This last point is particularly important in the context of the MAA paradigm, since it helps in keeping alive the interactions between providers and users of the knowledge. It was recognised that there is a need for the "infrastructure" that would support the reuse of scholarly data and that a unique online repository could greatly increase the impact of projects.

In the interviews conducted with representatives of MAA projects it was also noted that such an e-platform should integrate raw data, knowledge objects and digital tools but at the same time enable the sustainability of networks and facilitate the knowledge community in general. With regard to end-users it should

be kept in mind that different stakeholders/actors have different information needs as well as different preferred ways to obtain the information they need. It has also been noted that if we are to provide the information to farmers, we need to provide the results in a way that farmers trust, and this is where personal contact should be prioritized over written information. In relation to the importance of developing an e-platform of knowledge, it was also noted that the results created by the projects need to be applied and disseminated widely and easily. There is also a need to increase the understanding of the importance of data management, adherence to the principles of FAIR and the associated adherence to open access. This should be done not only to comply with the policy but as a part of good scientific practice. Any multi-actor project represents a knowledge community whose sustainability is at risk once the project is completed. An e-platform capable of integrating different outputs of the multi-actor projects is important for the sustainability of the knowledge community after the end of the project.

Conclusions

Open Science changes the way research results are disseminated with the aim of making them freely available, reproducible, but also more understandable to a wider audience and not only to specialised scientists. In the area of animal production, *animal open space* platform offers a novel approach for disseminating research outputs and foresees research, methodology and data papers.

A concept of multi-actor approach in a project builds a knowledge community whose sustainability is not assured once the project is completed. An e-platform capable of integrating different outputs of the multi-actor projects is important for the sustainability of the knowledge community after the end of the project. In that respect the understanding of the importance of data management, and adherence to the principles of FAIR and open access to knowledge and data created by the projects is fundamental.

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Novi trendovi u objavljivanju istraživanja i prenošenju znanja o stočarstvu - predstavljanje projekat Animal Open Space i EUREKA

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Rezime

Otvorena nauka se ne sastoji samo u tome da rezultati istraživanja budu dostupni, već i u tome da ih učini razumljivim i reproducibilnim za širu javnost, a ne samo za specijalizovane naučnike. Time snažno utiče na istraživačko okruženje, posebno na način na koji se rezultati istraživanja šire i saopštavaju. Mnogi rezultati istraživanja ostaju neobjavljeni zbog nedostatka novina ili nedovoljne snage eksperimentalnog dizajna, što predstavlja gubitak za specifičnu zajednicu znanja. Ako se istraživanje može ponoviti i ako su povezani podaci dostupni, objavljivanje može otvoriti nove mogućnosti i ideje za ponovnu upotrebu podataka, značajno doprinoseći sticanju znanja. Dakle, klasičnom načinu objavljivanja rezultata istraživanja potrebni su alternativni pristupi. Ovaj rad predstavlja dve inicijative za širenje rezultata istraživanja proizvodnje u stočarstvu i poljoprivrede. Prvi je Animal Open Space na e-platformi (ANOPES), namenjen rezultatima istraživanja. Otvara mogućnost objavljivanja istraživačkih, metodoloških i podataka sa bržim pregledom i već je operativan. Druga inicijativa je studija dokazivanja koncepta u okviru projekta EUREKA za stvaranje e-platforme za jačanje znanja u poljoprivredi i inovacionog sistema Evropske unije. Za ANOPES su predstavljeni obim i mogućnosti objavljivanja. Za EUREKA projekat je predstavljena analiza podataka i objekata znanja nastalih u projektima sa više aktera i njihova relevantnost za repozitorijum znanja.

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