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Editorial

Open Science meets Food Modelling: Introducing the Food Modelling Journal (FMJ)

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Abstract

This Editorial describes the rationale, focus, scope and technology behind the newly launched, open access, innovative Food Modelling Journal (FMJ). The Journal is designed to publish those outputs of the research cycle that usually precede the publication of the research article, but have their own value and re-usability potential. Such outputs are methods, models, software and data. The Food Modelling Journal is launched by the AGINFRA+ community and is integrated with the AGINFRA+ Virtual Research Environment (VRE) to facilitate and streamline the authoring, peer review and publication of the manuscripts via the ARPHA Publishing Platform.

Keywords

Open Science, Agri-food, Infrastructure, Modelling, Knowledge exchange, Data analytics, Data analysis workflows, Information exchange formats, Software tools, Web services, Databases, Data collections

Introduction and rationale

Mathematical models and experimental or observational data play a fundamental role in assuring and improving food supply, quality and safety in our globalised and rapidly changing world (McDonald and Sun 1999, McMeekin et al. 2007, Ercsey-Ravasz et al. 2012). This has encouraged food science specialists, agronomists and computer scientists to come together to forming a strategic cross-disciplinary alliance (Karampiperis et al. 2018). At the same time, the rapid development of new research methods alongside both software and hardware technologies led to an ever-increasing generation and production of data, models and tools, often referred to as "data deluge" (Bell et al. 2009). While the long-lasting tradition in science used to focus on crediting researchers' work through conventional research articles and especially by counting their citations, many exciting, useful and often invaluable products of the research cycle, such as data, software scripts, visualisation routines or models (usually called "research objects") normally stay undervalued, underused and uncredited, despite their importance for scientific progress (Smith et al. 2016). Many of these research objects remain poorly known, rarely acknowledged and even less cited in articles, despite the fact that "intermediate" products of the research cycle are, in fact, of primary interest, not only for the scientific audience, but also for industry and other stakeholders. The consequences of this neglect of the initial and intermediate steps of the research cycle in favour of the research articles or research books are obvious: scientists often repeat efforts done by others instead of using these as a stepping stone for further analyses and generating new knowledge, let alone the impossible or restricted reproducibility and reusability of research results. Besides, a vast majority of precious data, software tools and other kinds of research outcomes have often been and still are easily lost, for example, tools hosted on academic web pages that become inactive with time (Mangul et al. 2019), as there is no opportunity to publish them as part of a research article and relevant long-term preservation infrastructure is lacking.

The Open Science movement came to crown the transition from Open Access to Open Data, meant at the beginning as a barrier-free access to the research articles (Budapest Open Access Initiative 2002, Suber 2012) and then to the data and data processing procedures that underpin the research results. Shortly after that and following the natural logic of the research cycle, other valuable products of that cycle besides the article content and underlying data, for example, software, methods, protocols, models etc. came to light as discrete and openly publishable research objects, linked to each other either via repositories or within their end product - the research article, ensuring reproducibility and reusability of research (David 2004, Pontika et al. 2015, Vicente-Saez and Martinez-Fuentes 2018, see also the TED talk video of Michael Nielsen). The Open Science idea influenced, in fact, all stages and aspects of the research process and other activities beyond it, including scholarly publishing (Mietchen et al. 2015, Penev 2017) and has soon been materialised in funders', governmental and EU policy documents (European Commission 2016, European Commission 2018).

The new open science peer-reviewed **Food Modelling Journal** **(FMJ)*** [1] comes to help research scientists, modellers and software developers in the domain of food science to properly share their valuable research objects in a more efficient way compared to conventional research articles or information repositories. Specifically, it aims at providing the much-needed scientific record and credit for dedicated **models, data, data analytics workflows and software** and, by this, fostering the overall reproducibility and reusability of research.

FMJ has been launched after intensive preliminary consultations with various communities participating in the AGINFRA+ project and beyond and we are happy to enjoy their support and encouragement. Of special importance is the support of the Risk Assessment Modelling and Knowledge Integration Platform (RAKIP) community (Plaza-Rodríguez et al. 2018). RAKIP was established by three European institutions specialising in food safety risk assessment [Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail (ANSES)* [2], Bundestinstitut für Risikobewerting (BfR)* [3] and National Food Institute (DTU Food)* [4]] to provide an infrastructure for hosting, saving and preservation of "a variety of scientific knowledge (e.g. scientific publications, experimental data and mathematical models) and resources (databases and software tools for model generation and application), based on harmonized data formats and consistent rules for knowledge annotation" (FoodRisk Labs 2016c). Now FMJ is expected to support this and many other community activities in the domain of food modelling by adding a scholarly publishing infrastructure that will facilitate the exchange of digital assets at high, community- and industry-accepted standards.

The Food Modelling Journal will be focusing on the publication of information objects and digital resources in the food science domain, related (but not limited) to: food safety, food quality, food control, food defence and food design, documenting the following outcomes of the research cycle: data, models, software and services, data analytics pipelines, visualisation methods and related digital resources. The focus and scope of the journal are supported by a number of specific key features:

- **Quality but not quantity**. FMJ will be focusing on important outcomes of the research cycle other than research papers, which nonetheless meet rigorous scientific quality standards. FMJ's subject editors are amongst the world-leading international experts and will overview and control the peer review process.

- **Cross-disciplinary approach**. The journal takes a cross-disciplinary direction from its very start, aiming to bridge the gap between basic and applied research, reflected by the various non-conventional article types, such as models, data analytics, software descriptions and design concepts, to name some of them.

- **Open data and software code policy**. FMJ strictly follows the principles of open science and strives to achieve maximum reproducibility of research. Therefore, the authors have to make all data, software or models described in the article compliant to the FAIR principles (Wilkinson et al. 2016). This will ensure maximum transparency and reproducibility of research.

- **Rapid turnaround time.** The innovative, entirely XML-based publishing workflow, provided by the publisher Pensoft provides FMJ with the required tools to publish accepted manuscripts within a period of two to three days after acceptance.

- **Advanced open access and machine-readability.** All articles in FMJ will be published in semantically enhanced HTML, JATS XML and PDF formats, thereby multiplying the opportunities for content dissemination, data and text mining, discovery through automated and targeted searches and barrier-free data sharing.

From the technical point of view, FMJ is backed up by the novel ARPHA-XML journal publishing workflow of Pensoft (Penev et al. 2017), which supports all stages of the publication of manuscripts to happen in a single online collaborative working space, starting from the writing of a manuscript all the way through peer review, publication, distribution and archiving of the published content. Amongst its most distinct and partly unique services are:

1. The ARPHA Writing Tool provides a collaborative manuscript authoring environment and a set of pre-defined, but flexible article templates covering most types of research outcomes.

2. Within the ARPHA Writing Tool, the co-authors may work collaboratively on a manuscript, but can also invite external contributors, such as mentors, pre-submission reviewers, linguistic and copy editors or just colleagues, who may correct and comment on the manuscript before submission. These external contributors are not included amongst the co-authors of the manuscript.

3. A rich set of functionalities of the ARPHA Writing Tool allows for search and import of literature and data references, cross-referencing of in-text citations, import of tables, upload of images and multimedia, building plates of images and many more.

4. An automated technical validation step will save authors' and editors' time by checking the manuscript for consistency, in addition to a human-provided, pre-submission, technical validation by the FMJ's Editorial Office.

5. On choice of the authors, pre-submission external peer-review(s) can still be performed during the authoring process in the ARPHA Writing Tool. Pre-submission reviews can be submitted together with the manuscript to speed up post-submission evaluation and publication.

6. The collaborative peer-review process provides an easy communication environment through change tracking, comments and replies and automated, but customisable email and social network notifications.

7. For the convenience of editors, peer reviews in ARPHA are automatically consolidated into a single online file that makes the editorial process straightforward, easy and pleasant.

8. Published papers can be commented on via both the inbuilt ARPHA commenting tool and an integrated hypothes.is plugin and can also be a subject of an open, post-publication peer review.

9. Authors can convert published papers back into editing mode in the ARPHA Writing Tool at the click of a button. The manuscript can then be revised and re-published in a new version under different DOI, linked to previous versions via CrossMark, realising in this way the concept of a "living article".

10. Last but not least, the users of food model repositories may automatically convert **FSK-ML (Food Safety Knowledge Markup Language)** (de Alba Aparicio et al. 2018, FoodRisk Labs 2016a, FoodRisk Labs 2016b) metadata describing their models into manuscripts in the ARPHA Writing Tool, which can then be further elaborated, submitted, peer reviewed and published in the Food Modelling Journal (Fig. 1).

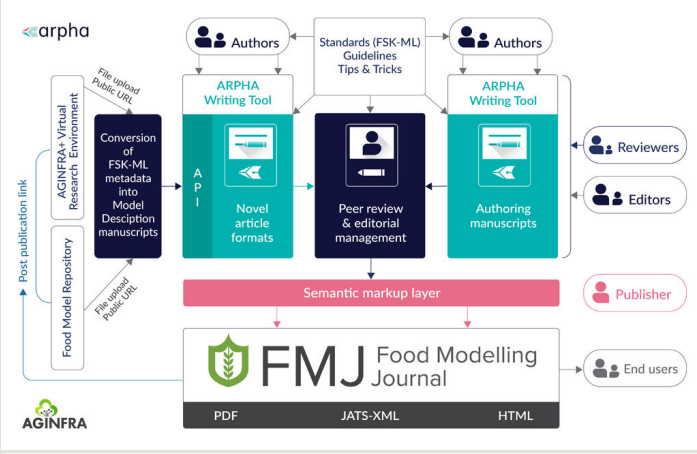

Figure 1.

Workflow for conversion of FSK-ML metadata into Model manuscripts.

In addition to the options above, authors can rely on the Virtual Research Environment based solution developed by the AGINFRA+ project (Ballis et al. 2018). In fact, the ARPHA Writing Tool has been integrated with the rest of the services which the AGINFRA+ platform is capable of offering to its users when doing their research activities. The AGINFRA+ platform follows the *system of systems* approach (Maier 2014), where the constituent systems offer "resources" (namely services) for the implementation of the resulting system facilities. In particular, such a platform aggregates "resources" from "domain agnostic" service providers (e.g. D4Science*[6], EGI*[7], OpenAIRE*[8]), as well as from community-specific ones (e.g. AgroDataCube (Janssen et al. 2018), AGROVOC (Caracciolo et al. 2013), RAKIP model repository (FoodRisk Labs 2016a)) to build a unifying space where the aggregated resources can be exploited via VREs (Assante et al. 2019, Candela et al. 2013). The AGINFRA+ platform is made available to its users by a gateway*

[5] realising a web-based single access point to the rest of the services including (a) a *shared workspace*, for storing, organising and sharing any version of a research artefact, including dataset and model implementation; (b) a *social networking area* enabling collaborative and open discussions on any topic and disseminating information of interest for the community (e.g. the availability of a research outcome); (c) a rich array of *semantic data management solutions* for managing semantic resources (e.g. ontologies, thesauri, vocabularies) and for benefitting from such resources in tasks related with data management; (d) *data analytics solutions* including a workbench (see the gCube Data Analytics in Assante et al. 2019) to execute analytics tasks either by relying on methods provided by the user or by others that is well integrated and complements an RStudio-based development environment, a Jupyter-based notebook environment and a Galaxy-based workflow management system; (e) *data visualisation and publishing services* including the ARPHA Writing Tool, a graphs management workbench for creating several typologies of interactive graphs ranging from generic ones (e.g. Spline, Scatter, Bar, Line, Step, Pie, Doughnut, Polar) to very specific ones (e.g. graphs reporting the height of plants across time with values and images), a catalogue-based publishing platform to disseminate artefacts, according to the FAIR principles (Ballis et al. 2018). By relying on this platform, users are allowed to mix the narrative of a traditional paper with links aiming at giving effective access to the digital version of the research products.

We are convinced that the Food Modelling Journal will fill in an obvious gap in the publishing landscape by bringing to light research outputs of exceptional value to the benefit of their authors and the food science community in general. We invite everybody to share our passion for Open Science by submitting manuscripts to FMJ and to spread the news about it throughout the community.

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Endnotes

*1 Food Modelling Journal webpage fmj.pensoft.net

*2 Agence nationale de sécurité sanitaire de l'alimentation, de l'environment et du travail www.anses.fr

*3 The German Federal Institute for Risk Assessment (BfR) www.bfr.bund.de

*4 The National Food Institute www.food.dtu.dk

*5 AGINFRA+ Gateway aginfra.d4science.org

*6 D4Science Consortium, “D4Science: an e-infrastructure supporting virtual research environments,” www.d4science.org

*7 EGI Foundation, “EGI e-infrastructure,” www.egi.eu

*8 OpenAIRE Consortium, “OpenAIRE: the european scholarly communication data infrastructure,” www.openaire.eu