Importance of FAIR in the Bioscience Research World

Context

In recent years, the volume of data produced across disciplines, especially in bioscience research, globally has grown exponentially. Data science holds promise for advancement in innovative research that offers solution to food security challenges and underpins the importance of effective scientific data management. However, producing high quality data and making them openly available in the form that they are easily findable, accessible, interoperable and reusable (FAIR) has been a challenge and, therefore, requires practicing good data management and stewardship.

Scope of the Issue

The FAIR guiding principles, which consist of 15 principles divided among the four key foundational characteristics and apply to all digital resources, was developed by a group of scholars[1] to advance a more structured and purposeful data management and stewardship to maximize the value of data. Implementation of FAIR principles in bioscience research has direct and indirect benefits to stakeholders, particularly funders, researchers and policy makers. FAIR enables digital data transformation, thereby making it easily discoverable and accessible for humans and machines.[2] Application of FAIR reduces research duplication (funding, time, and effort), enhances collaboration and innovation for food security and knowledge discovery, strengthens management and stewardship of digital resources (especially data) and increases trust and transparency among stakeholders within the food system and recognition of researchers and funders. Combined data (big data) can be used for meta-analysis and, most times, offers robust insights that can inform production and policy decisions at the farm and national levels respectively.[3]

FAIR principles have not been a common practice in many disciplines, including biosciences, with major challenges including persistent lack of identifiers for data, metadata and datasets; format and information to be provided on metadata[4]; existence of competing standards for data and metadata; inadequate incentives for data sharing; privacy and confidentiality concerns; and perceived costs in terms of time and money to acquire requisite digital infrastructure to publish FAIR data.

Recommendations

Ideally, agricultural data should be findable and easily accessible. However, interoperability and reusability pose a major challenge. To achieve FAIRness in bioscience research data and other digital resources, a range of practices should be encouraged:

1. There is need to increase awareness about FAIR principles and the benefits and costs associated with not having FAIR research data for researchers.
2. There is need for FAIR policy to be adopted within the bioscience research domain. The policy framework should stipulate the minimum threshold of FAIRness and provide guidelines that will enhance data governance and stewardship. This will facilitate data harmonization, sharing and reuse.
3. Datasets should be prepared in structured and machine-readable formats to increase findability, accessibility and reusability.[5]
4. Data governance frameworks that define common standards and vocabularies should be developed and implemented.
5. Institutional support in the area of research (data) infrastructure should be strengthened while incentives should be provided to researchers for providing and making data openly available for reuse.

Conclusion

In practice, absence of FAIR results in inefficiencies. Policies that promote FAIR principles and incentivize data sharing should be implemented at both institutional and national levels. Relevant research data infrastructure and investment in human capital development are then needed to facilitate data storage and sharing.

References

1. Wilkinson, M.D. et al. 2016. The FAIR guiding principles for scientific data management and stewardship. Nature, 3(160018), 1-9. https://doi.org/10.1038/sdata.2016.18
2. Wise, J. et al. 2019. Implementation and Relevance of FAIR Data Principles in Biopharmaceutical R & D. *Drug Discovery Today*, Vol. 24, number 4, April 2019.

3. Roche, D.G. et al. 2014. Troubleshooting public data archiving: suggestions to increase participation. *PLoS Biol* (2014) 12(1): e1001779. https://doi.org/10.1371/journal.pbio.1001779
4. European Commission, 2018. Cost-Benefit analysis for FAIR research data – cost of not having FAIR research data. DOI: 10.2777/02999
5. Wong, M. et al. 2019. Implementing FAIR in the Agricultural Research Federation. eResearch Australasia Conference, Brisbane Australia, 21 – 25 October 2019