

Statement to the Secretariat of the International Treaty on Plant Genetic Resources for Food and Agriculture on the application of Digital Object Identifiers (DOIs) as permanent unique identifiers for Plant Genetic Resources for Food and Agriculture in genebanks

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The national genebanks for plant genetic resources for food and agriculture of the two countries of the FAO North America Region, PGRC of Canada and the NPGS of the United States, have considered, from the context of their practical genebank operations, the current concept, rationale, and assumptions underlying the system for permanent unique identifiers (PUIs) in the form of digital object identifiers (DOIs) for genebank accessions as promoted by the Secretariat of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA, or “Treaty”).

Implementation of such a DOI system, although voluntary, has major implications for the functioning of the Global Information System (GLIS) for Plant Genetic Resources for Food and Agriculture, for the practical work of genebanks, for the interactions of genebanks with recipients of germplasm and for the recipients themselves.

We transmit our views to the Treaty Secretariat in response to the request made to the Secretariat in paragraph 4 of [Governing Body Resolution 5/2017](#):

The Governing Body...

Further requests the Secretary to interact with a broad range of user categories in order to define through user cases the user-oriented entry points in the GLIS web-based Portal and to facilitate, on a voluntary basis, the incorporation of DOIs into the workflow of existing databases and systems;

As potential users of DOIs as permanent unique identifiers, we provide this input in the context of paragraph 10 from document [IT/SAC-GLIS-3/18](#) Report of the Third meeting of the Scientific Advisory Committee on the Global Information System of Article 17 of the Treaty, which states:

The Committee recalled that the use of DOIs is voluntary, as indicated in the Guidelines, and advised the Secretary on the list of user and stakeholders, contained in *Appendix 2*, to document experiences on the application of DOIs by early adopters and gather information on the expectations for DOIs from other potential users, as well as other cases identified.

We appreciate the efforts made by the Treaty Secretariat to provide information about the reports and documents reviewed by the Scientific Advisory Committee to the GLIS and we note that additional information and videos explaining the use of DOIs as permanent unique identifiers were produced by the Secretariat and placed on the Treaty website (<http://www.fao.org/plant-treaty/areas-of-work/global-information-system/en/>).

The DOI is a useful and powerful tool as a permanent unique identifier. When DOIs are applied to germplasm accessions in genebanks, which are living material, and as such different from non-living objects, such as publications or herbarium specimens, some inherent complications can occur, because living material is not static. We are convinced that for genebank accessions the DOI should identify just the specific physical living material. It is not useful to have different DOIs associated with the same material depending on where and by whom that material is used or maintained.

The document "[Digital Object Identifiers for food crops](#)" (Alercia et al. 2018) page 4, states: "DOIs can be used to identify PGRFA held by any individual or organization." For genebank accessions the authors specify under the second bullet point on page 8 that the DOI identifying the material held by the provider should be different to the DOI assigned to the same material by the recipient, and that "... hence there could be two DOIs for samples that are intended to be the same genetic material but conserved by different genebanks".

On page 9 Alercia et al. (2018) describe three options for handling the assignment of DOIs to material received, i.e. in our case genebank accessions: (1) use the same DOI the provider had already assigned; (2) assign a new DOI and keep record of the old DOI assigned by the provider; or (3) obtain a new DOI without cross-reference to the DOI accompanying the materials received.

On page 10 Alercia et al. (2018) mention that a new function of GLIS should be to enable GLIS to document relationships between the various DOIs associated with the same material. To fully achieve this, it is required that all germplasm recipients strictly adhere to the option (2) outlined above and request a new DOI for the same material when entering it in their collection or using it for research or breeding.

We have the following concerns regarding this concept advocated by the Secretariat for assigning DOIs to genebank accessions:

1. In our view the purpose of the DOI is to uniquely identify the material rather than the material and the holder of that material. For the latter function the local identifier exists which is unique and associates the DOI with the holder. For example, the "PI numbers" associated with U.S. germplasm holdings have served as reliable identifiers for NPGS germplasm in publications and databases for more than 100 years. PGRC has used "CN" accession numbers in a similar manner. Therefore, it is not desirable for a recipient to request a new DOI for any material/accession that already has been assigned a DOI.
2. Complete traceability for PGRFA via the GLIS using DOIs as presently promoted by the Treaty Secretariat and some CGIAR Centers for is not required by the ITPGRFA, is not the role of the GLIS, nor is it realistic. According to ITPGRFA Article 12.3 b: "Access shall be accorded expeditiously, without the need to track individual accessions...". The DOI concept promoted by the Treaty Secretariat apparently aims to achieve tracking for all material. Because adoption of DOIs is voluntary, and because recipients have in the past often not referred to the

providers' accession ID, despite encouragement by the providers (as noted by Alercia et al. (2018), page 9), there can be no assurance that DOIs would correctly reflect the transfers of materials. We expect it will be unlikely all recipients will take the extra effort to request a new DOI for material received, even if encouraged.

3. We realize, however, that the International Agricultural Research Centres, which distribute much plant genetic resources that are material under development, welcome a tracking function which can operate on a single accession basis (López Noriega et al. 2019).
4. Requiring that recipients of germplasm must request a new DOI for material obtained with a previously-assigned DOI would involve the GLIS in interactions between the provider and recipient of germplasm. National genebanks as providers cannot be mandated to oblige their recipients to comply with this and they cannot ensure that the recipients do so.
5. Assigning new DOIs to the same material after each transfer from a provider to a recipient will result in a never-ending series of DOIs assigned to precisely the same genetic material. For example, a single accession of maize from the US NPGS has been distributed to more than 1,000 different recipients during the last 20+ years. Assigning a new DOI to the same genetic material with each transfer would overload the GLIS with redundant data and will confuse rather than guide PGRFA users.
6. In addition, with the GLIS responsible for maintaining ever changing DOIs assigned to the same material, the GLIS would become an ever-expanding entity requiring significant and expanding resources to function.

Therefore, we suggest a different concept for application of DOIs as permanent unique identifiers for PGRFA:

A single unique DOI associated with a genebank accession could be useful as a permanent unique identifier. It must be permanently and unambiguously associated with the genetic material, and the same genetic material should have the same DOI, regardless of where it is maintained.

Such a principle has been established for permanent unique identifiers by the Global Biodiversity Information Facility (see page 2, paragraph 5 in: [GBIF, 2011](#)). These DOIs will have the same function on a global scale, i.e. the unique identification of the specific material. If a genetic change is observed or intentionally produced by selecting, pure-lining or other intervention, a new DOI should be assigned to the altered material by the holder. Assigning a new accession number in such cases has long been common practice in genebanks.

If all genebanks adhered to this principle the GLIS could serve as a stable global registry that clearly points to the associated material in genebanks that hold the respective accession, and in some cases one DOI will point to several genebanks that hold the same accession. Such a DOI can also point to other information if used in publications etc. The total number of DOIs assigned will not grow indefinitely but would

reflect the number of unique genebank accessions held globally. Such a DOI concept will be much more robust than the system presently promoted by the Treaty Secretariat because its usage is much simpler and straightforward.

To summarize:

- The role of the GLIS would be to assign the DOI once and only once to specific material and to point to all databases where this DOI appears. This would allow the GLIS to function as expected, to point to genebanks or databases that hold the material or information associated with a given DOI.
- A globally-applicable permanent unique identifier number, such as a DOI, could help identify all holders and users of an accession independently of the GLIS, for example by a simple use of a search engine on the Internet.

In addition:

- It would be desirable to not restrict such DOIs to material that falls under Annex 1 of the ITPGRFA.

On a global scale, this would be a major achievement and improvement compared to the current situation. Therefore, we suggest that genebanks adhere to the first option described on page 9 in the document “Digital Object Identifiers for food crops” (Alercia et al. 2018) which is to “Use the DOI for the material as registered by the provider”. This proposed practice would result in much more reliable permanent unique identifiers for PGRFA.

We hope that the consultations with other national genebanks requested in the Report of the Third meeting of the Scientific Advisory Committee on the Global Information System of Article 17 of the Treaty, as well as the pilot studies conducted with the applications of DOIs, will help to clarify the concept of the DOIs and possibly lead to an improved version of the Guidelines for the optimal use of DOIs as permanent unique identifiers for Plant Genetic Resources for Food and Agriculture. We also welcome any further opportunities for interaction with the Treaty Secretariat and other stakeholders on this issue regarding our input.

Conclusion

At present, the national genebanks of Canada and the United States are not prepared to assign DOIs in addition to the currently used permanent and unique local accession numbers assigned to genebank accessions under their stewardship. The concept of DOIs we would support is different from the concept currently promoted by the Treaty Secretariat. This would by no means prevent others, including those to whom we provide germplasm, from using the DOIs for this material or derived progeny and to associate the DOI with our local genebank accession numbers.

References

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