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Food and Agriculture Organization of the United Nations

International Treaty on Plant Genetic Resources for Food and Agriculture

Item 3.1 of the Provisional Agenda
INTERNATIONAL TREATY ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE
FIFTH MEETING OF THE SCIENTIFIC ADVISORY COMMITTEE ON THE GLOBAL INFORMATION SYSTEM
Rome, Italy, 8–9 May 2023
REPORT ON OPERATIONS AND IMPLEMENTATION OF THE PROGRAMME OF WORK

I.   INTRODUCTION

1.   At its Ninth Session, the Governing Body decided to reconvene the Scientific Advisory Committee (Committee) and requested the Secretary to continue updating the Committee on progress in the implementation of the Programme of Work of the Global Information System (PoW-GLIS).

2.   Section II of this document describes the recent progress in the promotion and use of Digital Objects Identifiers (DOIs) with detailed figures and statistics. It also illustrates the progress in interlinkages with other scientific communities through the use of DOIs. Section III describes the most recent support provided to Contracting Parties and other stakeholders of GLIS.

3.   Section IV provides information on recent improvements in the GLIS Portal, including the integration of the Toolbox for Sustainable Use of PGRFA (Toolbox) and the development of the module on crop wild relatives (CWR) conserved *in situ*. Section V provides other updates on the maintenance and upgrade of the GLIS information technology infrastructure and illustrates some of the major partnerships in this area of work.

4.   In response to an invitation from the Governing Body for the Committee to consider ways to increase the use of the descriptor "Country of provenance", Section VI provides some background and statistics on its use.

5.   Finally, Section VII provides a few elements for the Committee to provide the Secretary with advice.

II.   PROMOTION AND USE OF DIGITAL OBJECT IDENTIFIERS

6.   At its Ninth Session, the Governing Body took note of the progress made with the promotion of DOIs and encouraged the Secretary, subject to the availability of resources, to continue promoting their use, on a voluntary basis, and to expand the efforts to build the capacity of relevant stakeholders, especially in developing countries. This activity was also included in the Programme of Work under the section on interoperability.

7.   The number of DOIs recorded in the GLIS Portal has grown from 1 154 455 in mid-March 2021 to 1 430 579 (+24%) in mid-March 2023. This includes the 48 925 DOIs assigned so far by the INCREASE Citizen Science Experiment. In the following, updates on DOI adoption are provided for the period mid-March 2021 to mid-March 2023.

8.   New DOI registrants have been enrolled, namely:

Table 1. *Latest registrants of materials in GLIS since March 2021[1].*

Registrant	Country/Territory	DOIs
Australian Pastures Genebank	Australia	85.101
World Vegetable Center	Taiwan Province of China	69.827
National Centre for Genetic Resources and Biotechnology	Nigeria	4.293
Scientific Centre of Vegetable and Industrial Crops	Armenia	2.118
Institut d'Economie Rurale	Mali	1.882
Rice Research Institute	Philippines	1.872
Institute of Plant Genetics, Polish Academy of Sciences	Poland	1.595
Institute of Plant Genetic Resources	Bulgaria	1.211
Agricultural Institute	Slovenia	1.098
Genetic Resources Department of Agricultural Research Ministry	Qatar	917
Lupane State University	Zimbabwe	799
Agriculture Research and Extension Authority	Yemen	395
Plant Breeding and Acclimatization Institute	Poland	218
Bomvitae Agro Industries Ltd.	Uganda	166
INRAE PS2	France	158
Plant Genetic Resource Center	Albania	152
EMBRAPA	Brazil	138
Institute of Field and Vegetable Crops	Serbia	117
National Agricultural Research Center	Jordan	87
National Agricultural Research Institute	PNG	70
Institute of Biological Research Cluj-Napoca	Romania	66
UMR Le Moulon	France	66
Banca de Resurse Genetice Vegetale "Mihai Cristea" Suceava	Romania	16
Red Nacional de Semillas Nativas y Criollas	Uruguay	6
	Total	**172.368**

9.   Particularly relevant are the new registrations from The Australian Pastures Genebank and the World Vegetable Center. Also, a number of national institutions are now registering

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[1] All data and figures are Source: Secretariat of the ITPGRFA. March 2023

DOIs, such as: INIA, Serbian and Bulgarian genebanks and the Agricultural Institute of Slovenia.

10.   The Alliance of Bioversity International and CIAT has adopted the XML Integration Protocol abandoning the Excel-based batch registration. CIMMYT, that is regularly registering DOIs through GRIN-Global, is adopting batch registration for international nurseries and regional offices.

11.   The share of DOIs assigned by genus is illustrated in the following chart:

Figure 1: PGRFA registration by genus as of March 2023
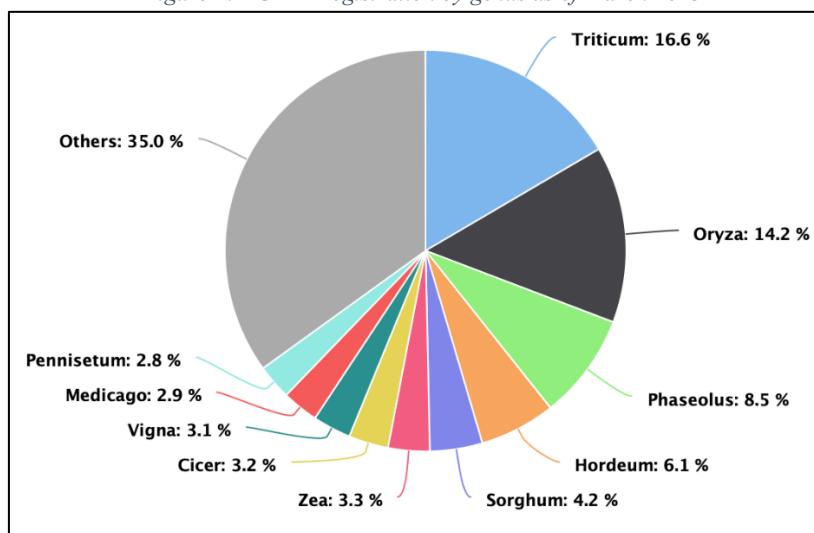
12.   DOIs have been registered by batch upload (129 765 or 47%) and via the XML Integration Protocol (146 323 or 53%). Also, 36 DOIs have been registered manually by six registrants.

13.   The total number of registrants is 101 (up from 69) from 62 different countries/territories (up from 47) with their share by type as shown in the chart below:

Figure 2: Share of registrants by type
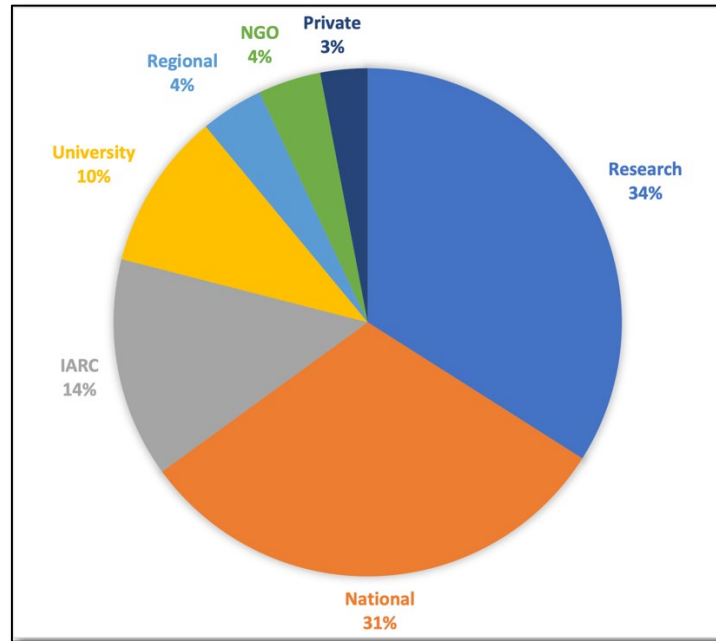
14.   The impact of GLIS continues to grow steadily. Comparing March 2021 to March 2023:

  i.   The number of users exploring GLIS grew from 396 to 547 (+38%).

  ii.   The monthly number of impressions, i.e. Google search results including GLIS links, increased from 56 200 to 58 200 (+4%).

  iii. GLIS's position in the Google search results moved from 13.6 to 11.9, showing increased relevance.

  iv.   The share of sessions by country during February 2023 is presented in Figure 3 below.

Figure 3: Share of GLIS sessions by country in March 2021
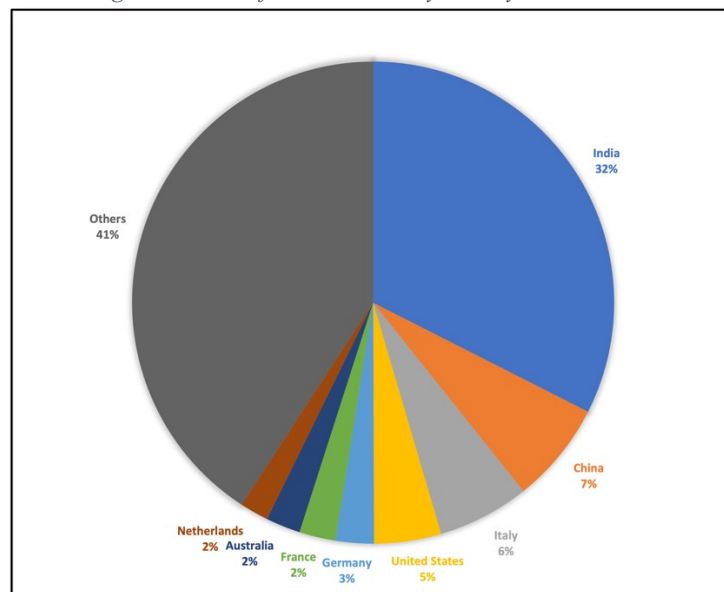
15.   During the period from March 2021 to March 2023, the Secretariat has collaborated with implementing partners of several projects funded by the Benefit-sharing Fund of the International Treaty (BSF), assisting them in assigning DOIs to materials resulting from project activities that have not been deposited in a genebank. At the time of this document,

9 839 (+23% since the last SAC meeting) DOIs have been associated to 18 (+80%) BSF projects, led by 22 different countries (+275%) including the 9 235 registered by the BSF project led by Indonesia that resulted in the Integration Toolkit.

16.   The Secretariat is also closely following the development of DataCite's Global Access Program (GAP)[2], funded by the Chan Zuckerberg Initiative, aiming to increase access to and adoption of DOIs and other permanent identifier services and infrastructure for communities beyond the Global North. GAP is based on three pillars: increasing community awareness, supporting and developing infrastructure, and lowering financial barriers to access. The collaboration with GAP could provide mutual benefits to the International Treaty as well as other non-PGR user communities in developing countries.

III.   SUPPORT TO CONTRACTING PARTIES AND USERS

17.   The Secretariat has collaborated with ICRISAT on the adoption of the Integration Toolkit for the assignation of DOIs. The Toolkit has been incorporated into a self-developed application supporting breeding activities. In particular, the application records the progenitors of breeding materials leading to graphs similar to the ones reported below (see Fig. 4). Currently, the GLIS Graph Database stores about 92 000 nodes (a node corresponds to a DOI associated to a PGRFA) with over 120 000 relationships among them. Based on the ongoing collaborations, the Secretariat plans to develop use cases in the coming months.[3]

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[2] See https://blog.datacite.org/datacite-launches-global-access-program-with-support-from-czi/

[3] A detailed description of the GLIS Graph Database has been provided in the Working Document IT/GB-9/SAC-GLIS-4/21/3.1/2 "Update on the DOI Module" released for the Fourth Meeting of the Scientific Advisory Committee on the Global Information System of Article 17 (SAC-GLIS-4) and available at www.fao.org/3/cb4317en/cb4317en.pdf

Figure 4: Relationship graph for Cicer arietinum *breeding experiment at ICARDA*
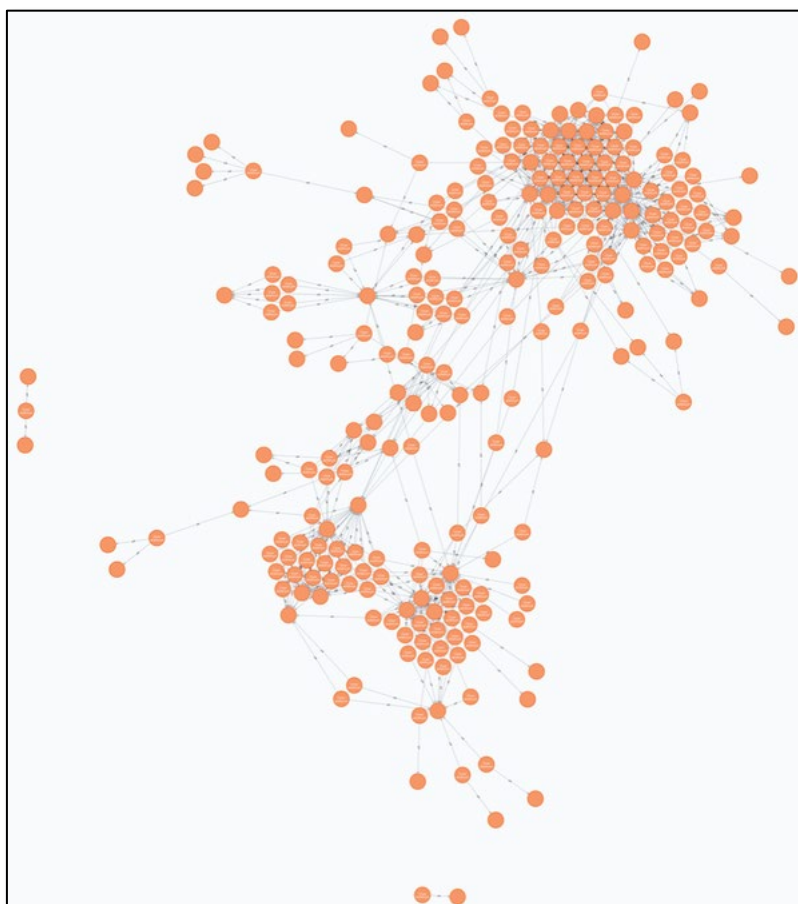
18.   Following the feedback received by users and members of the Committee, the Secretariat is assessing options for implementing a registry of national databases linking to existing *ex situ* inventories and repositories, giving visibility to information shared by national focal points to the International Treaty and the Commission on Genetic Resources for Food and Agriculture. The repository would include regional networks, national databases, *ex situ* repositories and collections from other organizations that are voluntarily disclosed.

19.   The Secretariat continues addressing the questions most frequently asked by users and event participants. For example, user questions have been collected at the workshop in Zimbabwe mentioned in section V below. Among them, the most common relate to updating the descriptors associated to a DOI, how to display a DOI on seed bag labels (e.g. using barcodes), and how to register DOIs when some descriptors are missing.

20.   Some users have enquired about the criteria to use for "Descriptor M03:Date", especially for old accessions that are not well documented. The advice provided in the Booklet[4] on acquisition method "Inherited" (i.e. to indicate that the accession was inherited from the previous genebank manager and using the date in which the current genebank manager took office) helps addressing the enquiry.

21.   Assistance was provided to the Global Crop Diversity Trust with descriptor "R07:MLS status" in the GRIN-Global Community Edition documentation, by providing some real-world examples. In general, it is documented that the DOI assignment exercise has resulted in a better understanding and exchange of Multi-Crop Passport Descriptors (MCPD) by some registrants.

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[4] See www.fao.org/3/I8840en/i8840en.pdf, page 18

# IV.   RECENT UPDATES ON THE IMPLEMENTATION OF THE GLIS PORTAL

22.   At its Ninth Session, the Governing Body requested the Secretary to further develop and manage the GLIS Portal focusing on a directory of links and services. The GLIS Portal offers facilitated access to information sources grouped by subject. Each subject group is called *channel* and is associated to a web page containing multiple *sections* further grouping the links. By way of example, the Added Value Chain *channel* leads to a page containing the Genomics and Phenomics, Breeding and Other Useful Links *sections*. In some cases, for example, when geographical coverage is involved, such as in *section* Farmer's networks of *channel* Users' themes, a section can be further divided into *subsections*.

23.   With the feedback received at the 2022 regional workshops, the Secretariat assigned priority to integrate the Toolbox into the GLIS Portal as described in the following subsection.

A.   TOOLBOX FOR SUSTAINABLE USE OF PGRFA

24.   The Toolbox contains links to resources relevant to users of the GLIS Portal and developed under the guidance of the Ad-hoc Technical Advisory Committee on Conservation and Sustainable Use. Its publication on the GLIS Portal has been scheduled in two steps. The first one, completed in March 2023, focused on making all the content available through a dedicated section. This work has required some additional quality checks on the data previously published on the website of the International Treaty. The second step, still ongoing, is the full integration of the content of the Toolbox with the Link Directory into a single source of links to information resources.

Figure 5: Toolbox for sustainable use of PGRFA in the GLIS home page
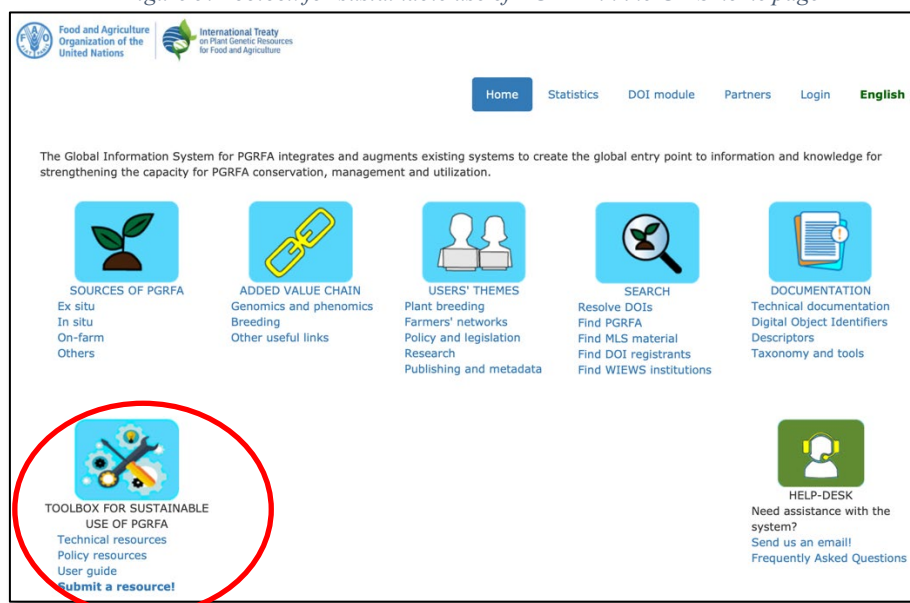
25.   The publication of the Toolbox has already benefited the GLIS Portal users with over 1 600 new resources available. The GLIS Module to manage the Toolbox has resulted in new functions for the editing of resources, custom searches and a use monitoring function, that will be extended to the GLIS Link Directory.

26.   At this stage, the use monitoring function is being applied to the Link Directory offering some early statistics on page visits. Fig. 5 above shows the number of visits to the individual section pages (i.e. when the user clicked on one of the links below the icons in the Portal home page to access that specific section of the corresponding channel). Fig. 6 below shows the number of visits to the entire channel pages (i.e. when the user clicked one of the

icons in the Portal home page), while Fig. 7 shows a breakdown of the visits to specific section pages.

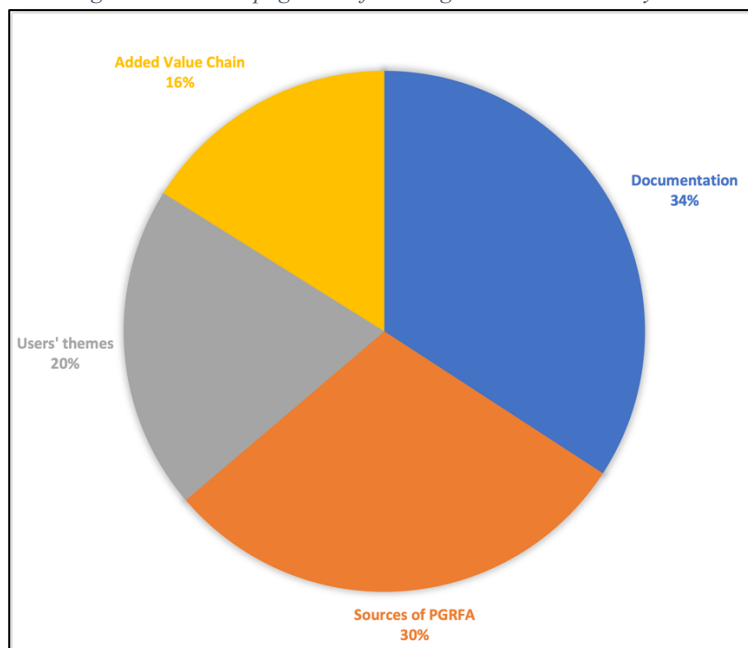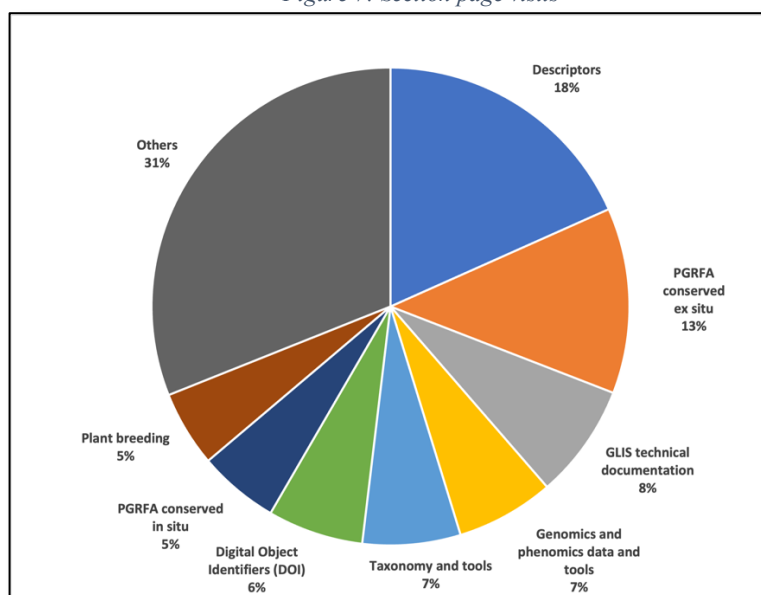*Figure 6: Channel page visits from August 2022 to February 2023*

Figure 7: Section page visits

### B.   SUPPORTING DOCUMENTATION OF *IN SITU* MATERIAL

27.   The vision adopted by the Governing Body foresees four main types of sources of PGRFA, namely *ex situ*, *in situ*, on-farm and other. At the time of the first development of the GLIS Portal, a module for reference material conserved *in situ* was created. The Secretariat has further developed the module as follows.

28.   At its Ninth Session, the Governing Body took note of the publication of the *Descriptors for Crop Wild Relatives Conserved in situ* (CWRI) and thanked the Government of Germany for the financial support provided for the documentation of CWR conserved *in situ*.

29.   The CWRI project has resulted in advancements with the module for material conserved *in situ*.[5] The module is currently available on the GLIS test server,[6] in collaboration with the national documentation teams participating in the project, with the first records provided by Cuba, Costa Rica, and Spain and additional collaboration planned with Jordan, Malawi and Tanzania.

30.   To facilitate the integration of the module, changes have been made to the search channel in the homepage (see Fig. 8) and specific search functions have been developed (see Fig. 9). Additionally, a separate editing form is provided (see Fig. 10) for manual registrations or updates.

Figure 8: Search options for CWRI in the homepage fo the GLIS test server
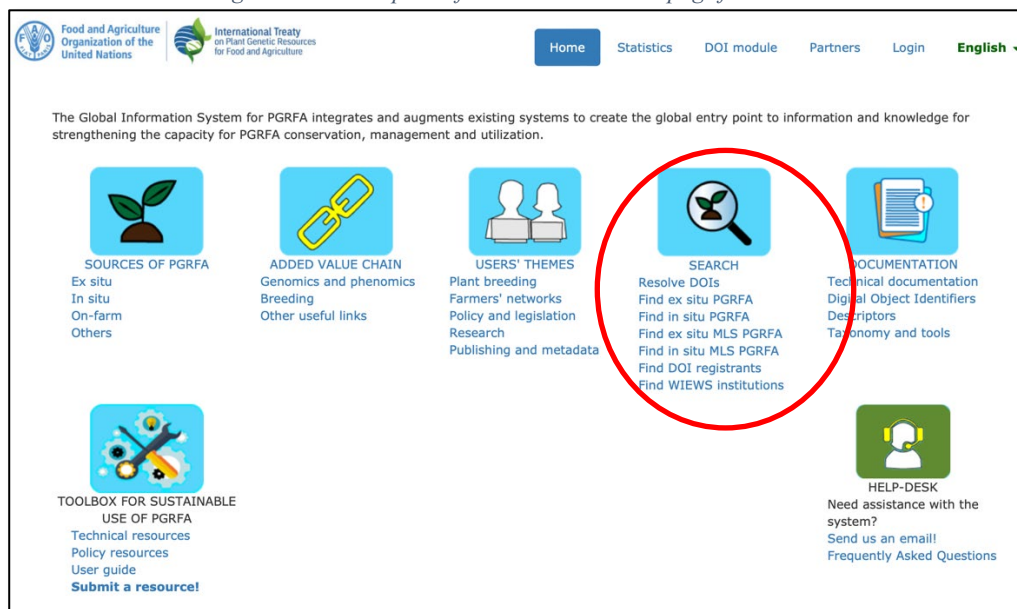
31.   The new module has been developed in such a way that no change is required to the procedures adopted by registrants of *ex situ* PGRFA. Also, external systems interacting with GLIS through the XML protocol to register or update DOIs associated to *ex situ* PGRFA, including the Integration Toolkit, continue to work without any modification.

32.   Data collection is facilitated through the CWR Descriptor Tool v.1, which presents the descriptors in spreadsheet format with data entry options and built-in validation checks. The CWRI Module will be released once the ongoing testing phase will be completed.[7]

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[5] www.fao.org/3/cb3256en/cb3256en.pdf

[6] See glistest.planttreaty.org/glis. Please be advised that the GLIS test server is only used to demonstrate the system and for user testing. The information it contains is not to be considered accurate and can be deleted at any time. Additionally, DOIs assigned by the GLIS test server are not valid and must never be used in any actual application or referenced in any way.

[7] The Tool can be downloaded at ssl.fao.org/glis/web/docs/Menu_Descriptors_tool_20221202.xlsm.

Figure 9: CWRI-specific search page

Figure 10: CWRI editing form

C.   OTHER TECHNICAL UPDATES

33.   The Secretariat has completed the translation of the portal into other languages. The user interface, consisting of the Homepage, the DOI Module forms and lists, as well as the Link Directory pages are now available in the six Official UN Languages.

34.   It is now possible to export the list of DOIs resulting from a query in a MCPD-compatible, TAB-separated text file (see Fig. 11). This option, together with the possibility of downloading passport data associated with the DOIs of materials received in a click-wrap SMTA[8], facilitates data transfer and improves data quality.

35.   The GLIS server is currently hosted in the Server Farm located in the FAO headquarters in Rome. FAO's IT Services (CSI) has been managing the server since the beginning and subjecting it to the same strict security standards as any other official FAO application. CSI is now progressively migrating in-house servers to the Amazon Cloud (AWS)

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[8] This option is available only for click-wrap SMTAs and only when DOIs are specified for the materials in Annex 1 to the SMTA. The SMTA needs to be accepted as a click-wrap so that the Recipient is known to Easy-SMTA and can access its content from Easy-SMTA's "As Recipient" menu.

infrastructure to improve reliability and performance and reduce costs. At the time of this document, the operation of the GLIS server and its conversion from a single server to a cluster of virtual AWS machines is under testing, with positive results. The preparatory work for the migration was initiated in February and is planned to conclude in June 2023.

36.   In compliance with FAO regulations, several sections of the GLIS Portal have been updated to use the official maps provided by the UN Geospatial Services, as it was also done with Easy-SMTA. The Secretariat is approaching other FAO services, such as the Hand-in-Hand Geospatial Platform,[9] to explore the use of sophisticated mapping functions for the benefit of GLIS users, providing for a greater level of details.

Figure 11: Export of found DOIs in MCPD-compatible format

V.   PARTNERSHIPS AND OUTREACH

37.   Since the last meeting of the Committee, significant progress has been made in establishing or strengthening partnerships with relevant initiatives, briefly described below.

38.   The INCREASE project launched the 3rd round of its Citizen Science Experiment with over 9 000 citizens joining the 7 000 who participated in rounds 1 and 2.[10] All of them are receiving common beans to plant in their fields, terraces and orchards, and report data and photos for analysis by the project partners. The 3rd round introduced the possibility of exchanging materials among citizens pioneering a distributed conservation model. All exchanges within and outside the project and managed through SMTAs and DOIs are assigned to all materials. The Secretariat is actively supporting the operations of the projects with its systems and advice.

39.   One very interesting result of the INCREASE project is the Web-based Portal being developed by IPK in Germany to provide access to all information associated with the PGRFA studied and developed during the project, such as DNA sequences, test results. The portal is also expected to offer sophisticated data analysis functions.

40.   The South African Development Community (SADC) developed Web-SDIS, a genebank documentation system adopted by many countries in the region. Web-SDIS was

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[9] See https://www.fao.org/hih-geospatial-platform

[10] See www.pulsesincrease.eu is a EU-funded project focusing on chickpea, common bean, lentil and lupin, implement a new approach to conserve, manage and characterise genetic resources leading to benefits on different levels.

integrated with GLIS in 2021 and, as a result, about 19 000 DOIs have been assigned by the SADC Plant Genetic Resources Centre. Such new version of the system is being deployed in the region and a workshop was organized in Harare, Zimbabwe, on 13-17 February 2023, including in order to present GLIS, DOIs and the new CWRI module.

41.   In the past, the Secretariat received requests to host datasets and publications, especially from BSF Projects to ensure that valuable scientific results are not lost after the end of the project. In collaboration with the team supporting the Benefit-Sharing Fund projects portfolio and other stakeholders, the Secretariat is assessing the opportunity of using Zenodo[11] to store resources in a DOI-enabled repository. Zenodo is an open-source repository for research results offered by the European Organization for Nuclear Research (CERN) free of charge to users worldwide. The service offers the possibility of depositing not only datasets and publications, but also a wide range of resources such as photos, slides, diagrams, videos, software packages, posters etc.

42.   While implementing entities of the BSF projects continue registering DOIs for genetic material, Zenodo will enable the user community to access all results of BSF projects through metadata descriptions. Additionally, as it properly implements *data citation*,[12] GLIS will be able to automatically identify datasets and publications deposited in Zenodo that reference GLIS DOIs.

43.   The Secretariat is supporting the adoption of the GRIN-Global Community Edition (GG-CE), a web-based version of GRIN-Global developed by the Global Crop Diversity Trust. In addition to SMTA reporting, GG-CE now also supports DOI registration through the GLIS XML integration protocol.

44.   Since the last meeting of the Committee, the Secretariat has conducted numerous outreach activities, including various presentations to the target audience of the INCREASE project, regional webinars in preparation for the Ninth Session of the Governing Body, participated in various initiatives and meetings organized by the CBD Secretariat. The team also participated in the workshop, "Training on Genetic Resource and Gene Banks Management", at the Summer School organized by Rete Semi Rurali.

45.   The Secretariat also participated in various national webinars, including upon the request of the Oman Animal and Plant Genetic Resources Centre (MAWARID), and the Pakistan National Genebank.

46.   NordGen, after releasing an open-source library for SMTA reporting, is now finalizing a similar library for DOI registration that will be used to register their collection of over 33 000 accessions. The Secretariat assisted NordGen during the development and testing of such libraries. CGN changed the URL of the links to their documentation system's pages on the PGRFA registered in GLIS and the Secretariat updated the DOIs consequently.

47.   As mentioned above, several BSF projects such as PR-02-Albania, PR-152-PNG and PR-115-Burkina Faso registered their DOIs with the assistance of the Secretariat. In some cases, e.g. for the Institut d'Economie Rurale, in Mali, assistance on the registration of DOIs for the project resulted in the partners opting to register their entire collection. The South Pacific Commission has been assisted in reporting their SMTAs listing their DOIs in Annex 1.

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[11] Zenodo is available at www.zenodo.org

[12] Much like citations of other publications, data citation allow a resource to reference non-publications sources. In our case, a paper or a dataset could cite the GLIS DOIs of the PGRFA to which it refers. Through services made available by the DOI System, this association would be made available to GLIS so that a link to the paper or dataset can be displayed in the DOI detail page.

VI. OTHER ACTIVITIES BASED ON RESOLUTION 5/2022

48.   At its Ninth Session, the Governing Body invited the Committee to advise on ways to increase the declaration of the country of origin/provenance for its consideration at the Tenth Session. [13]

49.   In this context, there are three classes of descriptors used by the users to assign DOIS: mandatory, highly recommended, and additional. These classes form an objective classification intended to enhance data quality helping the registrant to enter correct data. They do not correspond to any subjective classification by "importance" of the descriptors. A mandatory descriptor is not necessarily more "important" than a highly recommended or additional descriptor. For example, the name of a variety or the country of provenance of a sample may be considered critically important. Yet, as some descriptors may not be known or applicable, they cannot be treated as mandatory.

50.   "Descriptor A03: Country of provenance", is generically equivalent to the "ORIGCTY" of the Multi-Crop Passport Descriptors. An "Additional" descriptor, if known, should be provided when the material is acquired from someone else (corresponding with the "Acquisition" value of the descriptor M04). The use of descriptor A03 is particularly encouraged when other descriptors are unknown.[14]

51.   The GLIS Portal offers selected statistics, including the provenance of the material as one of the pre-packaged queries. In particular, it allows users to select the provenance of PGRFA and list the genera, the number of DOIs registered and the holding countries. The Portal also allows the users to filter and export the results.

52.   In the statistic module of the GLIS Portal, page "DOI descriptor coverage" is also relevant for the consideration of the current trend on the use of Descriptor A03. It lists all non-mandatory descriptors and the number of DOIs with that descriptor populated out of the total number of DOIs registered.

53.   As of the end of March 2023, the GLIS Statistics show that 78 percent of the PGRFA registered have disclosed a value for the descriptor A03: Provenance. [15]

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[13] Paragraph 13 of Resolution 5/2022, www.fao.org/3/nk240en/nk240en.pdf

[14] The country in which the PGRFA material was either collected or bred or selected, or the first country in the known history of the PGRFA.

[15] ssl.fao.org/glis/stats/descov

Figure 12: Share of DOIs with descriptor A03 compared to other descriptors
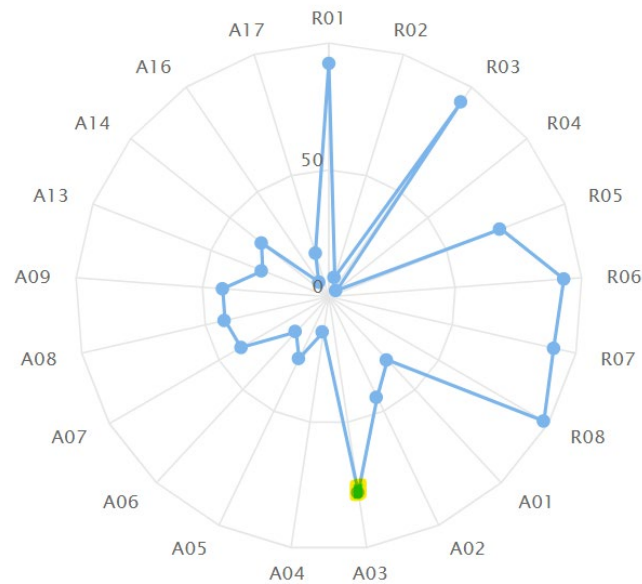
54.   While it would be difficult to classify the descriptor under "Mandatory", because this information is not necessarily available in all cases, the Committee may consider recommending descriptor A03 to be indicated as "Highly recommended", stressing the need to further increase its use and further alerting users wih a specific frequently asked question on the website. The Committee may also wish to advise the Secretary to include corresponding provisions in the draft Resolution for the Governing Body at its Tenth Session.

VII.   ADVICE SOUGHT

55.   The Committee is invited to take note of the activities undertaken so far, for the promotion and use of the DOIs and the GLIS Portal as well as the partnerships and collaborations developed or strengthened in this context.

56.   The Committee may wish to provide the Secretary with advice on the future operations of the GLIS Portal and support to Contracting Parties, as well as on further potential opportunities for partnerships and collaborations.