



The International Treaty

ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE



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**INTERNATIONAL TREATY ON PLANT GENETIC RESOURCES
FOR FOOD AND AGRICULTURE**

**FIRST MEETING OF THE EXPERT CONSULTATION ON THE GLOBAL
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**Improving Interoperability of PGRFA Data within the Global
Information System**

EXECUTIVE SUMMARY

1. *The document presents a series of consideration related to the different levels of interoperability that the Global Information System could take into account in dealing with a great diversity of information, data sources and stakeholders. It also presents examples of how other systems have articulated this diversity at operational level and describes the functions of the Stakeholder's Platform to link existing PGRFA's information systems, their products and services.*
2. *It also presents some of the challenges the PGRFA Community faces to stimulate inclusive and participatory processes where groups and individuals can contribute and generate innovation. The document provides possible elements for the setting up of a platform to connect, among others, plant breeders, farmers, decision makers, the private sector and national research systems.*
3. *The extent to which the benefits from genetic resources information systems, programs and tools on sustainable agricultural development can actually be achieved, in developed and developing countries, depends to a great extent on the general ability to collect, analyze, interpret and exchange information in the wider context of agricultural development and the document provides examples of initiatives that have promoted the use of open data and have developed portals to facilitate access to data sets and information services to boost impact.*

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I. INTRODUCTION

1. The global agricultural community has been witnessing constant progress in the use of information systems for plant genetic resources for food and agriculture (PGRFA) since the publication of the first report on the State of the World on Plant Genetic Resources in 1996. Different information systems operate at multiple levels, from collection and on-farm to ex situ and genetic. Functions such as early warning, monitoring and reporting facilitation have been streamlined into the information systems.¹

2. The development of genebank information systems has been the object of combined efforts to make the collections more visible. These processes have led to the setting up of PGRFA documentation groups that have exchanged resources and ideas and that have fostered collaboration with good results in developed regions and in selected crop networks, where common portals or management tools have been created. Efforts have also been deployed at regional and sub-regional levels with the integration of Multi-Crop passport information between the CGIAR Centers. At regional and global levels, advancements in linking accession data with characterization and evaluation data are on-going, although with limited results to date. Most recently, other types of information being generated by genomic projects and other ‘omics’ technologies have become good candidates to contribute to more efficient use of PGRFA. However, the PGRFA community still faces important and evolving challenges.

3. In most of these projects and initiatives, as well in other initiatives focusing on collection and on-farm, their promoters envisioned the opportunity to put together information that was already available but disconnected in dispersed, often offline, databases. The approach has been oriented towards improving what was already in place. In some cases, additional services were provided, but the integration was arduous, the cost high and the use of these information systems by the intended users limited. In order to improve the management of ex-situ collections and encourage an increased use of germplasm, documentation, characterization and evaluation, need to be strengthened and harmonized and the data need to be made more accessible. Greater standardization of data and information management systems is needed².

4. An illustration of the limited impact on users comes from genebank information systems. It is common knowledge that many intended users, such as plant breeders and farmers, still prefer to visit the genebanks, phone the data curator or exchange extensive correspondence before ordering material. Plant breeders usually request small amounts of material while the larger orders placed usually come from other genebanks. This is also true for some collections included in the Multilateral System of Access and Benefit-Sharing (Multilateral System)³. The Secretariat has had the opportunity to discuss some of the reason for this limited used with genebank managers of provider institutions through individual interviews and with the coordinator of major initiatives. Some of the reasons they have gathered from the users are the difficulty in understanding and using the catalogues and the online ordering systems, and the lack of sufficient information to take a decision on whether the material “on offer” responds to their needs. On the other side, genebank managers have also indicated that one of the reasons the online systems are not user-friendly enough is that they were not intended to be ordering systems from the beginning, but rather genebank management systems that have subsequently been put online and to which ordering functions have been added later on.

5. Most of the existing projects and activities have followed a “host-centric” approach, that is, they have concentrated on the provider’s side of information generation and exchange. Although the assumption that providers and users of PGRFA information partially juxtapose, remains valid, the

¹ The Secretariat has outlined the current PGRFA information systems in documentation for past sessions of the Governing Body. See <http://www.planttreaty.org/sites/default/files/gb4w19e.pdf> and http://www.planttreaty.org/sites/default/files/gb5w17e_Article17_GIS_corr1_clean.pdf

² The Second Report on the State of the World’s PGRFA. Chapter 3 on “The state of ex situ conservation”, section 12 on “Gaps and needs”. <http://www.fao.org/docrep/013/i1500e/i1500e.pdf>

³ IT/COGIS-1/15/Inf.3, *EASY-SMTA and the Generation of Data on the Global Flow of Plant Genetic Resources for Food and Agriculture*, available at: <http://www.planttreaty.org/sites/default/files/cogis1Inf3.pdf>

need for user focus appears prominent. The Secretariat of the International Treaty has conducted a survey on the major elements of the Global Information System on PGRFA in 2014.⁴ Most respondents agreed with the statements that the Global Information System should be innovative, dynamic, decentralized, collaborated, quality-focused and, user-centric.

6. In the development of information systems for agriculture and rural development the term “user - centric” has been used to express the ideas of networking and the need to establish participatory mechanisms where citizens and stakeholders become the protagonists, and not just the final, passive recipients.

7. This document attempts to develop the values that the above statements on the Global Information System contain, with “user-centric” as the axis of the System, and to translate them into actionable processes (i.e. user-centric interoperability as an element of the Vision of the Global Information System) and activities for the future development of the System (i.e. an overarching framework and a Stakeholders’ Platform as elements of the Roadmap for the Global Information System).

II. PARADIGM SHIFT

8. Most of the existing PGRFA information systems have been created on the demand side to make available existing information and resources, utilizing information technology. While system-internal quality and accuracy have been the goals, there has been a rather limited impact from these programs on the work of the potential users or declared beneficiaries. The extent to which the benefits from PGRFA information systems, programs and tools can actually be realized depends to a great extent on the general ability to generate, collect and analyze information linked to the multiple dimensions of the sustainable use of PGRFA across the entire production chain, which links to the wider goals of sustainable agricultural development and food security.

9. These multiple dimensions certainly require a quantitative expansion. As the Strategic Plans funded by the Benefit-sharing Fund show, there is the need to connect PGRFA information with data from other sectors to mitigate the negative effect of natural disasters, climate change, land use changes and a greater frequency of natural and socio-economic crises. As an example, we can give the work undertaken for the elaboration of the Strategic Action Plan for Mesoamerica⁵ where the responsible team had to complement the compilation and comprehensive analysis of scientific evidence and relevant policies on conservation, access and use of PGRFA with a study on genebanks and a survey administered to more than one hundred farmers in the region.

10. Hence, there is value in a joint multi-sector approach to sustainable use of PGRFA, with a geographical perspective. This calls for interoperability, to help society to make better use of existing PGRFA information systems and to consider multifaceted aspects of sustainable agricultural development, such as sustainable livelihoods, water resources management and agri-food systems.

11. However, for interoperability to be realized and to produce results, an enabling work environment is needed. Hence, the Global Information System could support a wider paradigm shift, that does not only focus on building linkages among information systems, within and outside the PGRFA domain, but also embeds information system developments in a strategic and cooperative framework for stakeholders. This framework could focus on co-design and co-development of innovative, user-oriented, and practical solutions that support conservation, utilization and development of PGRFA and place them into the bigger picture of sustainable agricultural development.

12. The Global Information System could contribute to this broad paradigm shift by improving capabilities of existing organizations, initiatives and networks, and by developing a Platform applying

⁴ IT/COGIS-1/15/Inf.1, *Analysis of the landscape and genomics surveys in the context of the Global Information System*, <http://www.planttreaty.org/sites/default/files/cogis1/Inf1.pdf>

⁵ *Strategic action plan to strengthen conservation and use of Mesoamerican plant genetic resources in adapting agriculture to climate change*. Bioversity International. 2014. http://www.planttreaty.org/sites/default/files/SAP_Mesoamerica_S2BSFcycle.pdf

participatory innovation processes. A participatory process involving large groups of stakeholders seems a requisite of sustainability. In other processes, participatory innovation has been coupled with citizen sensing, social media analysis and visualization of information, combined with sustainable agri-food systems and socially inclusive business and policy models⁶. If this combination of increased capacities and participatory innovation is triggered for PGRFA, the Global Information System could generate real support for individuals and communities to seamlessly grow their PGRFA-based solutions.

13. In other words, the Global Information System may gravitate on the development of a powerful and proven methodological framework to address the significance of information systems solutions, a framework based on evidence of how participatory innovation can enhance the impact of the use of PGRFA information systems. For example, the Global Information System could develop enabling mechanisms for the members of the Platform to go beyond the package of data connection activities and to jointly develop decision support applications and grassroots solutions as it has already been applied and evaluated in the biodiversity sector⁷. Such collaborative framework would increase the capacity in addressing multi-dimensional challenges that have emerged and will continue to appear in the future.

14. Among the strategic elements of the new framework, is an expanded definition of “interoperability” beyond the technological aspects. This is needed in order to ensure the success of the user-based approach in all activities related to data and information exchange. This can be achieved by identifying and conducting the integration of key information systems (e.g. ex-situ, in-situ and on-farm information integrated into environmental, economic and social data), and by creating a content flow to foster the generation of value-added products and services.

III. INTEROPERABILITY CHALLENGES

15. Traditionally, the concept of interoperability has been understood as the ability of different information technology systems and computer applications to communicate and exchange data. This function is defined as “syntactic interoperability” and it mainly refers to data formats and communication protocols.

16. This concept has evolved over time to include the ability to automatically interpret the information being exchanged in a meaningful way to provide products and services for the users under the expression “Semantic interoperability”. It has also been broadened to include social, policy and organizations aspects that impact on the performance of the systems. This has been called “cross-domain interoperability” and it appears as fundamental to achieve the goals of the Global Information System on PGRFA. Figure 1 summarizes the different aspects of interoperability.

17. For this expert consultation on the Global Information System, the Treaty Secretariat has prepared a document to facilitate technical interoperability by stimulating the discussion on the adoption of permanent unique identifiers.⁸ While there is the need to connect data and technical infrastructure, this alone is not a warrantee of cross domain inter-operability.

18. The cross-domain interoperability challenges have more to do with the policy and strategic factors of interoperability, which are essential for data and information sharing and which involve many stakeholders groups. Recently, new research methodological approaches have been adopted to bring to the forefront the strategic set of factors and components of cross-domain interoperability. In the case of the PGRFA domain, there is the need to increase linkages with environmental community, but also with the development agenda of farmers and indigenous communities.

⁶ *The Living Lab Methodology Handbook*. 2012.

http://www.ltu.se/cms_fs/1.101555!/file/LivingLabsMethodologyBook_web.pdf

⁷ See, for example, *INSPIRE and Social Empowerment for Environmental Sustainability*, edited by M. Navarro, A. Sáez and J. Estrada. TRAGSA. 2013. Available at: www.inspiredhabitats.eu

⁸ *Technical options to facilitate the establishment of data links in the field of plant genetic resources for food and agriculture: permanent unique identifiers* <http://www.planttreaty.org/sites/default/files/cogis1w3.pdf>

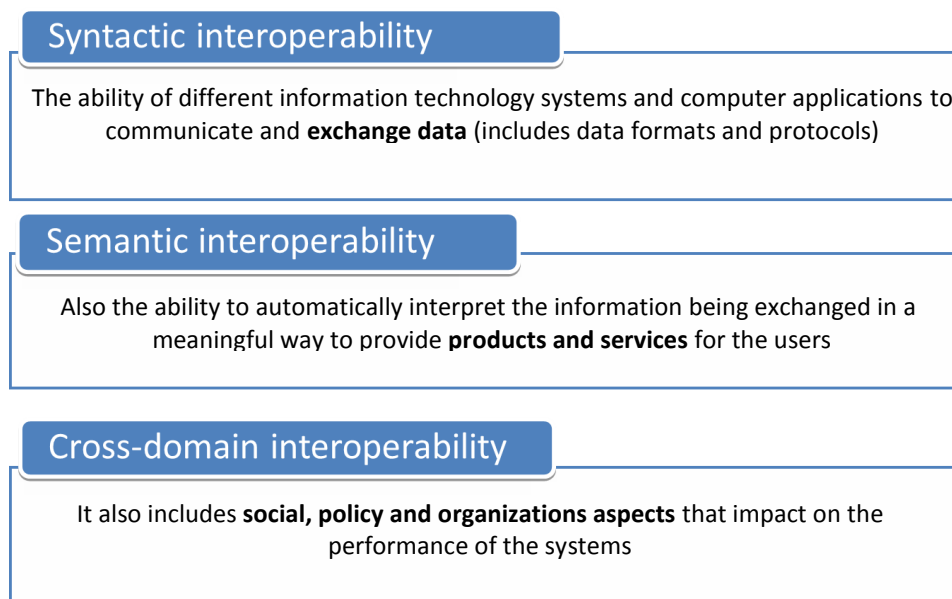


Figure 1. Expanded Dimensions of Interoperability

19. The interoperability requirements related to PGRFA information access, analysis and processing are influenced by policy processes at different levels. The role of the Governing Body and the guidance that it will provide for the development of Article 17 is one example at international level. An effective interoperability strategy for the Global Information System could take into account:

- the global needs and requirements for system applications;
- the need to develop of human capacity and the required ability to link information across sectors;
- the integration of a geographic dimension of the information - as indicated by the Strategic Plans funded by the Benefit-sharing Fund under its second call;
- links to the product development chain;
- mechanisms to facilitate the involvement of stakeholders and social groups of interest;
- the integration of information on PGRFA policy – this could also be achieved by linking the Global Information System with the reporting by State Contracting Parties under the Compliance Procedures⁹.

20. The social, institutional and policy factors¹⁰ of the semantic interoperability comprise critical requirements for the Global Information System that are essential for more general usability. Some of these issues are of technical, operational and commercial nature and have to be considered in a wider context and with the appropriate information to create an enabling environment where users and stakeholders within the different domains collaborate to overcome major social and policy barriers and obstacles to the sustainable use of PGRFA.

⁹ See section V.1 of the *Procedures and Operational Mechanisms to Promote Compliance and Address Issues of Non-Compliance*, and the related reporting format, respectively available at <http://www.planttreaty.org/content/resolution-22011-procedures-and-operational-mechanisms-promote-compliance-and-address-issues> and <http://www.planttreaty.org/content/resolution-92013-procedures-and-operational-mechanisms-promote-compliance-and-address-issues>

¹⁰ IT/COGIS-1/15/6, *Institutional and Policy Designs for the Global Information System*, available at <http://www.planttreaty.org/sites/default/files/cogis1w6.pdf>

21. The Vision for the Global Information System could include the designing and application of methodological approaches can take into account the activities and processes supported by the Benefit-sharing Fund of the International Treaty through the regional Strategic Action Plans on PGRFA. These plans pay attention to the information component when setting up frameworks for implementation of activities and impact assessment. They have also contributed to setting up or strengthening regional or sub-regional partnerships and collaborations.

22. Implementation of the Vision for the Global Information System could include a comprehensive package of tools to handle information systems about present-day conditions of PGRFA materials, and about agro-ecological, economic and social conditions such as natural resource degradation and climatic events, economic crises, water management policies. PGRFA information products could significantly enhance the impact of the Treaty on sustainable agriculture if new ways would be devised to share information within an integrated, systematic, inter-disciplinary framework. This would require the integration of many databases and information resources based on similar contexts, such as agro-ecological systems. This framework would be able to capture the communalities of the types of problems and solutions that characterize the environments and conditions where PGRFA are conserved and used across the world.

23. The information materials produced need to be based on user needs, aimed at communication and training, and not limited to specialized audiences. This framework for the Global Information System could greatly enhance the effectiveness of some priorities of the Second Global Plan of Action on PGRFA¹¹ and some of the major operational systems established by the Treaty, first and foremost, the Multilateral System of Access and Benefit Sharing.

IV. THE ENGAGEMENT OF USERS AND OTHER STAKEHOLDERS

24. The main user groups of PGRFA information are plant breeders, plant scientists, genebank managers, farmers and indigenous communities, NGOs, farmers' organizations and policy makers at various levels. For PGRFA information to be and remain user-relevant over time, one of the main tasks of the Global Information System will be the continuous identification of other key user groups which might exist in both developed and developing countries, and to characterize users' needs and information requirements.

25. A framework with a participatory innovation approach, adaptable and flexible, for the co-design and co-development of content and tools would help to facilitate the contribution from diverse user groups, with unique cultural and social characteristics. The Global Information System could foresee the involvement of multiple types of user and groups, including scientific networks, policy-makers, and farmers groups. This element could be promoted and expanded through a scaling-up plan over time.

26. Such element requires that information on user-needs and expectations on operational functionalities will regularly be updated and reflected on the priorities of the Global Information System. These activities cannot simple be understood as feedback to be collected from users, but rather the actual involvement of different stakeholders in the implementation of these functionalities and in the development of content. There will be also the need for setting up validation processes with users.

27. In this context, an overarching framework for the Global Information System will have to take into account a set of rules and principles, but also incentives to:

- Engage users and stakeholder groups, in developed and developing countries, in a co-creation-based innovation process of uptake and adoption of new standards and applications, as one of the functions of the Stakeholder Platform;
- Promote participatory innovation, interoperability and inter-connection of groups and communities. This includes the strengthening of the users and stakeholders groups to

¹¹ <http://www.fao.org/docrep/015/i2624e/i2624e00.htm>

overcome the current tendency of building closed production systems. The legal and operational framework of the Multilateral System has the potential to become one of the nodes of the Platform;

- Support the linkage of multilevel governance and networking at various cultural and geographical scales.

V. THE STAKEHOLDERS' PLATFORM

28. The creation of a Stakeholders' Platform to support the implementation of the Global Information is in line with the existence of an overarching institutional, legal and policy framework for the management of PGRFA information where interoperability and participatory innovation are at the center. The Platform will help to generate synergies and monitor impact and will help to introduce different approaches that may be taken to assess information systems effectiveness towards the Treaty's overall goals.

29. Being the Global Information System based on existing information systems, the experiences accumulated in other PGRFA processes are a great asset. The monitoring of the Global Plan of Action on PGRFA is one of the closest examples and different stakeholder perspectives are also valuable, in particular, with regard to the use of information in decision making processes related to PGRFA.

30. The Stakeholders' Platform, understood as a network of partners, will directly support conservation and sustainable use of PGRFA through the improvement of information management and sharing. Figure 2 illustrates the possible components of such Platform. With the indicated components, the Platform has the potential to:

- Provide useful information to the Governing Body and to policy makers at different levels for strengthening the operations of the Multilateral System;
- Contribute to understand the role of spatial data in improving PGRFA policies;
- Show the positive impacts of public investments on PGRFA on local livelihoods;
- Increase potential collaboration among the Treaty's stakeholders, for example among the educational and academic institutions and the private sector companies;
- Improve strategic management of PGRFA by increasing the understanding of where impacts are being made (or failing to be made) so as identify options to improve plant breeding and conservation programmes;
- Check whether policies are having the anticipated results, for example in the context of the post-2015 Development Agenda.
- Develop an understanding of how policies in other related sectors might be adjusted to increase impact in food security, income generation and livelihoods sustainability;
- Develop insights into the different responses and needs of different users' groups.

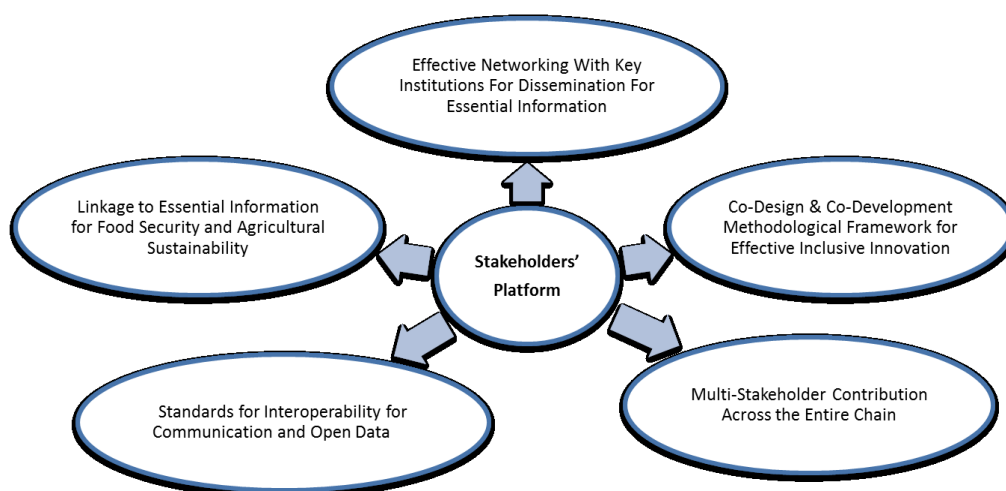


Figure 2. Stakeholders' Platform at the core of the innovative framework for the Global Information System

VI. OTHER CHALLENGES AND PARTNERSHIPS

31. One of the main challenges indicated by the respondents of the survey on the Global Information system is the establishment of linkages of policy legal and regulatory information regarding PGRFA and to make the material in the multilateral system more visible in order to facilitate its ordering. The respondents also requested the Global Information System to provide information on existing projects and initiatives working on specific PGRFA.

32. Regarding the visibility of the PGRFA in the Multilateral System, the Secretariat has already promoted over the last years several projects, in partnership with other relevant organizations, which have connected existing PGRFA databases at accession level¹². It has also developed an internet facility to make publicly available the notification received on material included in the Multilateral System from Contracting Parties, non-Contracting Parties and other organizations, including international organizations and the private sector. Nevertheless, this partnership approach has produced results that have only partially satisfied users on the one side which has not eased enough the reporting burdens on the other.

33. Regarding information on existing projects and initiatives working on specific PGRFA, there is extensive information available at the site of the World information sharing mechanism on GPA implementation, searchable by country. For example, at the end of 2014 users could find 1332 projects on wheat, 6367 on rice and 2089 on maize¹³.

34. There are great opportunities for partnership agreements regarding the establishment of a Platform with an internet portal to productively participate in developing the operational framework that will contribute to the methodological approach of "interoperability" expanded beyond the technological aspect. However, for partnerships to be efficient and effective for the intended beneficiaries, they are to be supported through a comprehensive package. The adoption of open data approaches combined with the strengthening of capacity of the staff working in PGRFA may offer attractive solutions.

35. It is not enough to make PGRFA data available to humans and the adoption of open data for PGRFA may help automatize data gathering and aggregation with computer processes. There are a number of ongoing promising initiatives in this area, such as GODAN¹⁴, an initiative that seeks to support global efforts to make agricultural and nutritional data available, accessible, and usable for unrestricted use worldwide. Annex 1 contains a brief description of GODAN.

36. But even in that scenario, when the data is available in an open format, there is the need to for data providers to indicate computer where to look for information. A web facility, such a central registry of data sets is also nowadays a common practice in many domains. The Routemap to Information Nodes and Gateways (RING) is a good example. RING is project implemented within the Coherence in Information for Agricultural Research for Development (CIARD) initiative and is led by the Global Forum on Agricultural Research (GFAR).

37. The RING facilitates access to web-based information services and datasets for agricultural research for development (ARD). It is the principal tool created through the CIARD initiative to allow information providers to register their services and datasets in various categories and so facilitate the discovery of sources of agriculture-related information across the world. The RING aims to provide

¹² *Vision paper on the further development of article 17, Global Information System*, section III, Update on Major Existing Initiatives and Programmes relevant to the Global Information System on Plant Genetic Resources for Food and Agriculture
http://www.planttreaty.org/sites/default/files/gb5w17e_Article17_GIS_corr1_clean.pdf

¹³ WISM-GPA, <http://www.pgrfa.org/gpa/selectcountry.jsp>

¹⁴ GODAN, <http://www.godan.info/>

an infrastructure to improve the accessibility of the outputs of agricultural research and of information relevant to ARD management. Annex 2 contains additional information on CIARD¹⁵.

38. One of the main potential collaboration opportunities for the Global Information System is the Partnership on Sustainable International Research and Knowledge Network Initiative on Land Management (Network of Networks, or NoN), which is a new initiative that matches well with the issues of interoperability of PGRFA, with the application of methodological frameworks, such as participatory innovation for extended interoperability. The NoN strategic objective that can benefit PGRFA data availability is to establish an international network of collaboration to strengthen the linkages between the policy dimension of agricultural, environmental sustainability and land use, with the scientific dimension and citizenship in society. The Consortium members of the NoN are emphasizing sustainable land use and agricultural adaptation to climate change, which is not only associated with the application of research information systems, but also the participation of rural citizens.¹⁶ The NoN can be used to link us with other information systems, processes and interrelations between environmental, economic and social dimensions through this initiative that will be open to the general public and worldwide institutions.

VII. ADVICE SOUGHT

39. Experts are invited to provide advice on the implementation of a framework for the co-design and co-development of the Global Information System and on effective ways to engage users, as well as on additional functions for the Stakeholders' Platform.

40. Taking into account the multiple dimensions of the use of PGRFA information, experts are also invited to discuss and provide advice to the Secretariat on the expanded concept of interoperability to be incorporated in the Vision for the Global Information System, including related products, services and well as organizational aspects and functions for a global PGRFA portal.

41. For the development of the Programme of Work, the Secretariat would like also to seek advice on the way to promote, encourage and incentivize the use of open data for PGRFA information and on other functions to improve access to datasets and information systems to ensure impact on conservation and sustainable use of PGRFA conservation, utilization and development of PGRFA.

¹⁵ To get more information you can also read the Handbook at:

<http://ring.ciard.net/sites/default/files/RING%20handbook%20NEW.pdf>

¹⁶ DesertNet International www.desertnet-international.org, World Overview of Conservation Approaches and Technologies (WOCAT) www.wocat.org, and the Global Network of Dryland Research Institutions (GNDRI) www.gndri.net

Annex I**The Global Open Data for Agriculture and Nutrition (GODAN) Initiative**

GODAN is an initiative that seeks to support global efforts to make agricultural and nutritional data available, accessible, and usable for unrestricted use worldwide. The initiative focuses on building high-level policy and public and private institutional support for open data. It focuses on encouraging collaboration and cooperation among existing agriculture and open data activities, without duplication, and encourages stakeholders to solve long-standing global problems.

Open access to research, and open publication of data are vital resources for food security and nutrition, driven by farmers, farmer organizations, researchers, extension experts, policy makers, governments, and other private sector and civil society stakeholders participating in "innovation systems" and along value chains. Lack of institutional, national, and international policies and openness of data limit the effectiveness of agricultural and nutritional data from research and innovation. Making open data work for agriculture and nutrition requires a shared agenda to increase the supply, quality, and interoperability of data, alongside action to build capacity for the use of data by all stakeholders.

The GODAN initiative is a voluntary association brought together around a shared purpose. Launched in October 2013, the initiative welcomes all those who share this purpose to join as members and to participate in shaping coordinated activities that can deliver on the potential of open data for agriculture and nutrition.

In line with global movements for open data and open access, the initiative seeks to advocate for open data and open access policies by default, in both public and private sectors, whilst respecting and working to balance openness with legitimate concerns in relation to privacy, security, community rights and commercial interests, advocate for the release and re-usability of data in support of Innovation and Economic Growth, Improved Service Delivery and Effective Governance, and Improved Environmental and Social Outcomes.

With a focus on open data for agriculture and nutrition, the initiative seeks to advocate for new and existing open data initiatives to set a core focus on agriculture and nutrition data, encourage the agreement on and release of a common set of agricultural and nutrition data. By increasing widespread awareness of on-going activities, innovations, and good practices, the initiative also advocates for collaborative efforts on future agriculture and nutrition open data endeavors and, advocate programs, good practices, and lessons learned that enable the use of open data particularly by and for the rural and urban poor.

Annex 2**The CIARD Routemap to Information Nodes and Gateways (RING)**

The CIARD Routemap to Information Nodes and Gateways (RING) is a project implemented within the Coherence in Information for Agricultural Research for Development (CIARD) initiative and is led by the Global Forum on Agricultural Research (GFAR).

The RING is a global directory of web-based information services and datasets for agricultural research for development (ARD). It is the principal tool created through the CIARD initiative to allow information providers to register their services and datasets in various categories and so facilitate the discovery of sources of agriculture-related information across the world. At the end of November 2014 it facilitated access to 1030 news services and 274 data sets in from 496 data providers.

The RING aims to provide an infrastructure to improve the accessibility of the outputs of agricultural research and of information relevant to ARD management including key functions focusing on providing key elements like a map of accessible information sources with instructions on how they can be used effectively, a dataset sharing platform for agriculture, examples of services that show good practices on implementing “interoperability”, to clarify the level and mode of interoperability of information sources, and provide instructions for building enhanced integrated services that repackage information in different ways. This makes the RING a real “routemap” that guides the user in discovering, accessing and exploiting the existing information sources. The RING is designed mainly for agricultural information professionals and website developers looking for interoperable data sources and information services, and also data scientists looking for datasets that can be processed. It can also serve consumers of agricultural information as a “bookmark” list of agricultural information services.

Using the RING allows data providers to publicize their services and datasets by registering them; it also provides technical metadata on information sources that enable providers of integrated services to discover, access and re-use the data.

The CIARD partners intend that the RING intends to become the principal global technical platform for accessing, sharing and exchanging datasets. To achieve this, a first phase, launched in November 2009, consists of the development of the directory, encouraging institutions to register and describe their current publicly accessible information sources and services. The metadata that are so collected allow categorization and interlinking of services according to specific criteria, like standards adopted, vocabulary used, technology used, protocols implemented, level of interoperability. These criteria have been developed within the Content Management Task Force (CMTF) of the Coherence in Information for Agricultural Research for Development (CIARD) initiative.

The idea is to provide detailed instructions on how the featured services can be 'interoperated', allow Information professionals and web developers to exploit information in the RING to build advanced services that tap into the registered services. The second phase 2 focuses on leveraging the RING Registry to build advanced services. It aims at leveraging the metadata about dataset interoperability in the RING to support other information systems automatically. This requires the adoption of a more advanced data model, based on the Data Catalogue Vocabulary (DCAT), recommended by the W3C for describing datasets, as well as a new campaign to invite data providers to share more accurate technical information about their datasets.

Once the descriptions collected about services are detailed and structured enough, and once the number of registered data sources is sufficiently large, some advanced services can be built directly on the content of the RING website. The RING database is also an accessible RDF store. An RDF store is a way of storing data using a machine-readable "grammar" (the Resource Description Framework) and documented semantics (RDF vocabularies). The standards that are covered by the RING are harvested directly from the registries of the Agricultural Information Management Standards (AIMS) website.