

Building synergies in Capacity Development – Recommendations and Capacity Development Resource Kit



RDA Recommendation

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Abstract: This Recommendation package from the Capacity Development for Agriculture Data WG comprises two documents, the Recommendations document and the Capacity Development Resource Kit.

This Capacity Development Resource Kit presents both the training requirements as defined by the IGAD community and available resources from the aforementioned groups: The Capacity Development for Agriculture Data Working Group conducted a survey to find out more about the training needs that would support the adaptation of the working group recommendations. The survey results are presented in this document.

This document also includes an overview about available and free training resources in the area of agricultural data management. A detailed description is provided for resources that are in some way related to RDA, like the Open Data Management in Agriculture and Nutrition Course that was developed in Godan Action, a Spanish online course on data management developed by IGAD and FAO, the Farm Data Management Sharing and Services for Agriculture Development Course, the CODATA-RDA Schools of Research Data Science and resources created by the Geospatial IG. Other free resources that are available online are listed as well.

Impact: These documents include an overview about available and free training resources in the area of agricultural data management. A detailed description is provided for resources that are related to RDA. Other free resources that are available online are listed as well.

Language: English

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RDA webpage: <https://rd-alliance.org/group/capacity-development-agriculture-datawg/outcomes/recommendations-and-capacity-development>

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Building synergies in Capacity Development - Recommendations

Capacity development is important to foster the adaptation of new findings in the RDA working groups. However the implementation of capacity development requires human resources, materials and elaborated curricula. The effort of setting up capacity development activities can significantly be reduced by reemploying existing training materials and by creating synergies with training partners. The capacity development working group has gathered free capacity development opportunities and looked at factors that favour the success of capacity development measures and that are listed here as recommendations. These recommendations build on experiences from performed capacity development activities (especially the GODAN Action online course and the Farm Data Management course), the working group survey and several group meetings along the RDA plenaries. Together with the recommendations, the portrayed success stories provide an idea of how synergies can be used to create new training curricula that can reach a high number of people in the field.

Portrayed success stories

The following success stories portray two Massive Open Online Courses (MOOCs) that are linked to participants of the Capacity Development Working Group and were measured objectively. In addition, MOOCs have the advantage of the potential to reach thousands of stakeholders in a predefined time that can be intensively supported during the learning process. However, these recommendations are not limited to groups that wish to create and implement MOOCs. The Capacity Development Resource Kit

(<https://doi.org/10.15497/RDA00054>) provides an overview about further types of capacity development formats that might take less resources to be created, such as webinars, guide books, presentations etc.

GODAN Action online course on Open Data Management in Agriculture and Nutrition

GODAN Action project developed a free MOOC on Open Data Management in Agriculture and Nutrition. This course was delivered 5 times between November 2017 and November 2018, reaching over 5000 people globally, before being made available for unrestricted use on GODAN's website. The course materials are now available in French.

Besides being freely accessible, the MOOC curriculum has a modular design that allows interested parties to reuse exactly what is needed for a future training course.

The contents of the GODAN Action online course can be found here: <https://www.godan.info/open-data-management-agriculture-and-nutrition-course-english> The course is also DOI registered through Zenodo in Gitbook format: <https://doi.org/10.5281/zenodo.3588148>

Farm Data Management course

The Technical Centre for Agricultural and Rural Cooperation (CTA) and the Food and Agricultural Organization of the United Nations together with the Pan African Farmers'

Organisation (PAFO) built on the content of the GODAN Action online course on Open Data Management in Agriculture and Nutrition and adapted the curriculum to the specific area of farm data management. It supported the work of 5,125 participants from 153 countries. professionals involved in data management in the context of farms and farmer organizations. The farm data management course is a good example of how synergies between different organizations can be used to create capacity development resources that build on the experiences of past initiatives. The GODAN Action provided training materials about data management aspects that are relevant for many working groups in RDA and that can be easily taken over and adapted to other facets of effectively handling research data.

The Farm Data Management course aimed to strengthen the skills of professionals who use, manage data for the benefit of farmers and farmers organisations by exposing them to topics on importance of data in the agriculture value chain and how new and existing technologies, products and services can leverage farm level and/or global data to improve yield, reduce loss, add value and increase profitability and resilience. The objective was to create awareness of data on and for farmers as well as the products and services driving expectations and investments in ICT4Ag including e-extension, precision agriculture and digital financial services, while highlighting shared data principles, including FAIR and other open data conceptual frameworks and also emphasizing the legal and ethical considerations for data rights, privacy and protections.

The course is also DOI registered through Zenodo in Gitbook format:

<https://doi.org/10.5281/zenodo.3663553>

Recommendations

- Capacity development should be integrated in the project work plan with the involvement of experts of the fields from the beginning to ensure that the community benefits from your course and training materials. This will also increase capacity development programs as an integral activity aligned with the actual technical work.
- Explore and find existing materials that can be reused. The working group worked on a Capacity Development Resource Kit that lists available and free training resources in the area of Open Data Management. Many of the listed resources have a relation to the areas of agriculture and nutrition but they can be adapted as well to other topics of interest <https://doi.org/10.15497/RDA0005> 4
- Once capacity development materials were developed, share them online with an Open Access license, so that as many interested people and initiatives as possible can benefit. One of the most common licenses is provided by the non-profit organisation Creative Commons (CC) which offers six main combinations of licenses depending on the need of the authors: <https://creativecommons.org/> .
- There is a need not only for making the course materials available freely but also looking into ways to increase the discoverability, accessibility and reusability of knowledge. For example, Agriculture Knowledge Hubs need to be developed with access to educational resources , research papers, software algorithms, data , methods and results for verification. This is especially important for lowering the barriers for agriculture research in developing countries. Of course, the building of knowledge hubs would also be beneficial in other areas.

- Appropriate funding needs to be made for translation of already developed course materials into different languages to promote capacity development and diversity of users for a more effective accessibility, use, engagement and understanding of research data.



RDA IGAD

Capacity Development for Agriculture Data WG

Capacity Development Resource Kit

November 2019



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Introduction

The aim of the Capacity Development for Agriculture Data Working Group (WG) has been to develop synergies between existing education and training activities and agricultural science needs by performing a landscape assessment to identify existing gaps and training requirements within the Interest Group on Agricultural Data (IGAD) and related WGs. A particular focus was set on sharing knowledge about training initiatives and technologies, reducing digital divides so that researchers and practitioners in developing countries can benefit as well. It also aimed to empower the existing collaboration with GODAN and GODAN Action.

There is a recognised need for capacity development in the fields of agricultural data management. A number of different organisations are attempting to address this, however there does not appear to be a coordinated approach across all agricultural domains which can adequately identify training gaps and make recommendations. Language is a further obstacle for identifying and evaluating existing resources. This working group aims to address this gap by acting as a hub for coordinating the development and provision of training to agriculture practitioners, researchers and policy makers.

GODAN Action is a project to enable the effective use of open data in tackling the food security and nutrition challenges by building the capacity of potential stakeholders to both understand the potential of open data for agriculture and nutrition and to engage with it practically <http://www.godan.info/godan-action>.

This WG outputs will be of benefit to a wide range of stakeholders, users and communities in the agriculture and nutrition domains.

Key impacts

- Reduce effort and duplication in development of curricula
- Support capacity development for individuals, communities, and initiatives that will benefit from utilising Agricultural data outputs
- Advocate for collaborative efforts agriculture and nutrition open data initiatives through knowledge sharing among capacity development activities

The group has therefore explored ideas for closer collaborations between RDA/IGAD - [RDA/Geospatial IG](#) - [G ODAN Capacity Development](#) - [C ODATA](#) and synergies to set up joint education and training activities on [O pen Data](#) in food and agricultural sciences.

This Capacity Development Resource Kit presents both the training requirements as defined by the IGAD community and available resources from the aforementioned groups:

The Capacity Development for Agriculture Data Working Group conducted a survey to find out more about the training needs that would support the adaption of the working group recommendations. The survey results are presented in this document.

This document also includes an overview about available and free training resources in the area of agricultural data management. A detailed description is provided for resources that are in some way related to RDA, like the Open Data Management in Agriculture and Nutrition Course that was developed in Godan Action, a Spanish online course on data management developed by IGAD and FAO, the Farm Data Management Sharing and Services for Agriculture Development Course, the CODATA-RDA Schools of Research Data Science and resources created by the Geospatial IG. Other free resources that are available online are listed as well.

Survey within the IGAD Community

The Capacity Development for Agriculture Data Working Group (WG) created a survey about training requirements of the IGAD Working Groups in October 2018. The survey was disseminated to the IGAD community which has a membership of about 450 people and disseminated via the mailing lists of IGAD and the IGAD WGs. In addition, the survey was promoted in the IGAD meeting in Botswana prior to the RDA P12.

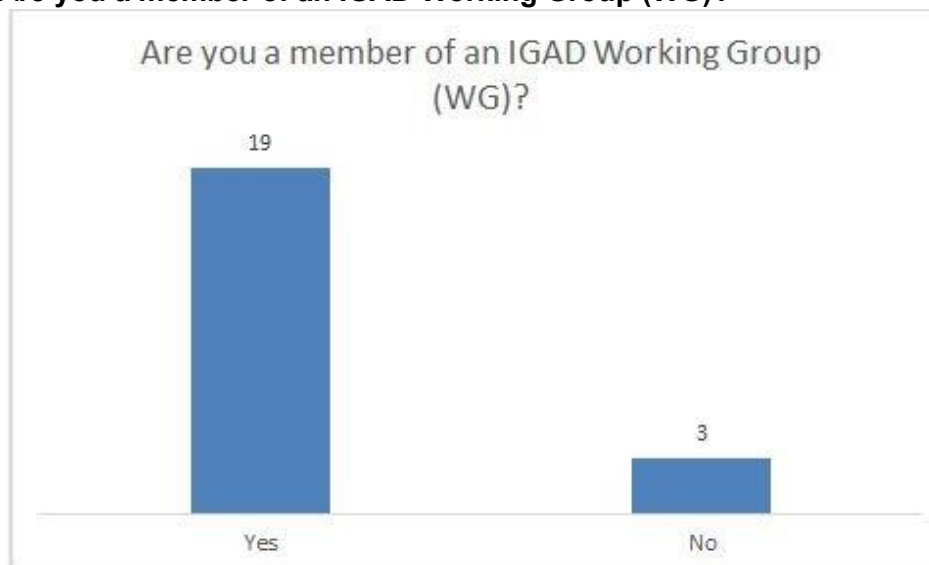
The objectives of this survey was the assessment the importance of training for the uptake of the working group recommendations, to understand training requirements of the IGAD group and the planning of capacity development for agriculture data. The results of the survey were also important to coordinate and link existing capacity development resources and efforts to maximise reach. The target audience were the members of IGAD and its working group members.

The main findings of the survey are that the main barriers for the working group recommendations' update are a lack of awareness of available resources such as funding or time. Training was indicated as an important activity to raise awareness and knowledge to implement the findings of the working groups. The participants suggested that there is a need for training in the areas of data interoperability frameworks, semantics and vocabularies and metadata. A preferred training method is blended training (a mix of face-to-face training and online training).

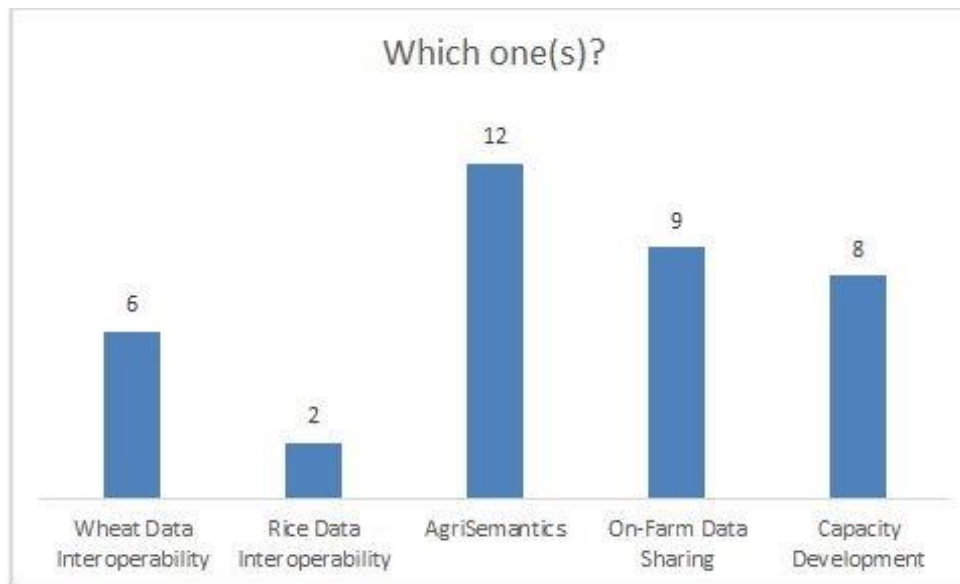
The survey overview

The group has received 22 responses from IGAD members and IGAD WG chairs. The survey is available in annex 1.

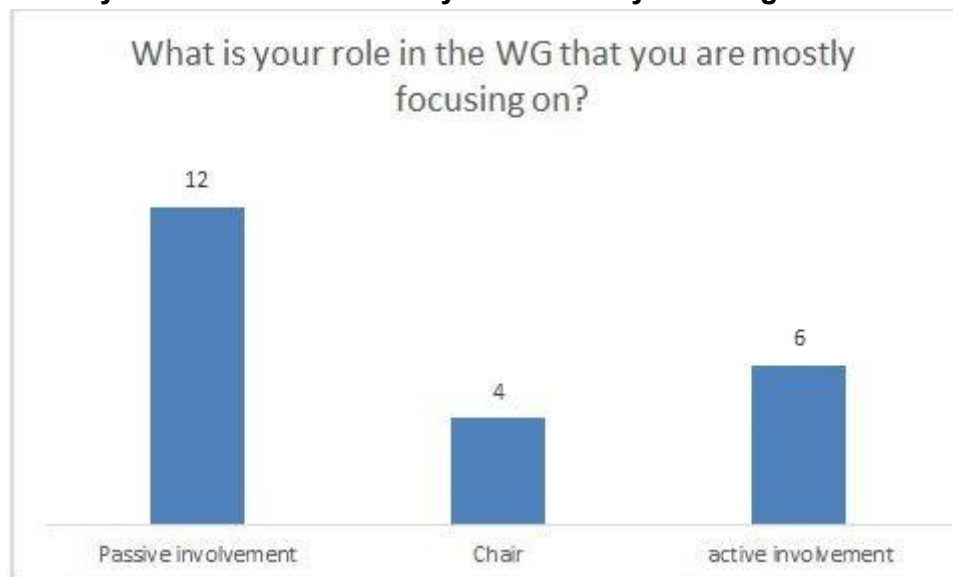
Are you a member of an IGAD Working Group (WG)?



Which one(s) ?



What is your role in the WG that you are mostly focusing on?



Your area of expertise

- Environmental Research Infrastructure
- CS
- inf
- Semantic Web, Ontologies
- Cyber Infrastructure
- bibliometrics
- Information and Data Management
- KM and IM, Change Management
- Data management, Data governance, ontologies, data standards
- information organization and management
- Knowledge & Information Management

- technical
- Semantic, Open Data, Big Data, Data sharing
- agronomy for data science
- bio
- semantics, natural language processing
- Spatial statistics
- intellectual Property, contracts, data ownership , privacy
- Librarianship/research data management
- Research Data management
- crop modeling
- GIS

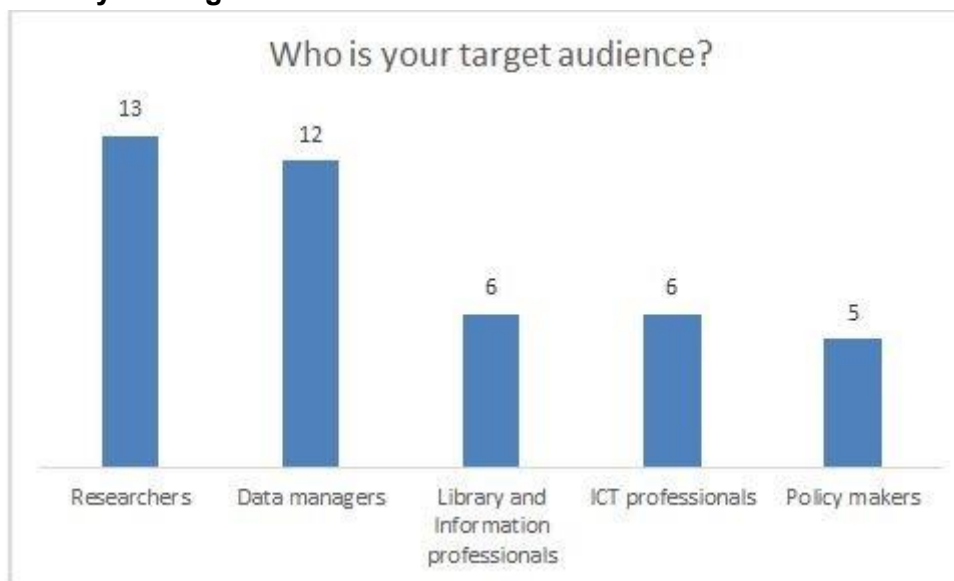
Each working group is working or has developed recommendations and/or guidelines on good practices in the research domain, including data sharing policies, data management plans, and data interoperability. To what extent are the below barriers to adoption or uptake of your WG's recommendations. Please mention others that you know off.



Is there any training foreseen as part of your WG activities?



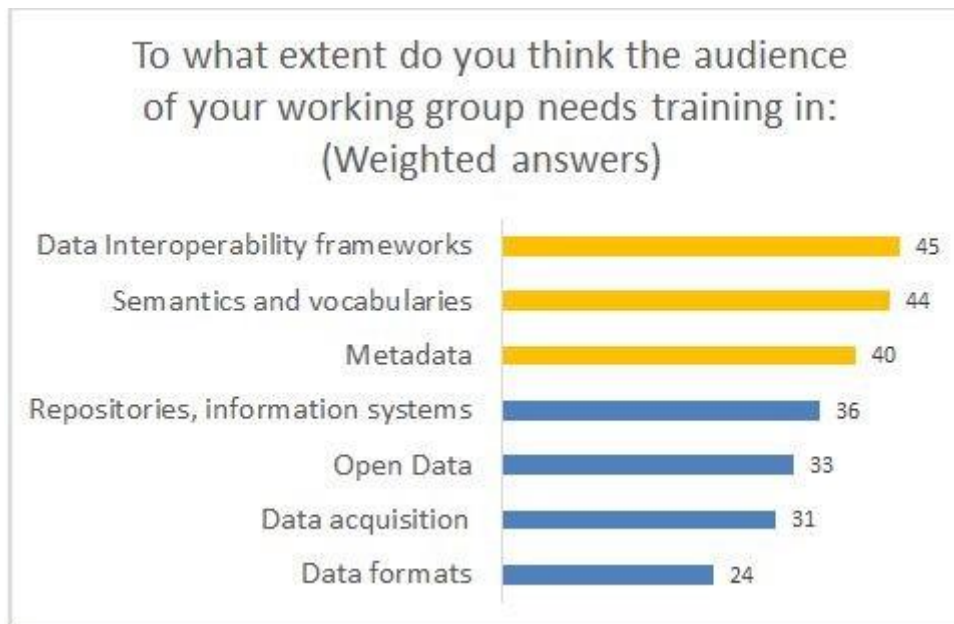
Who is your target audience?



Other:

- Agronomists, Agrifood experts
- undergraduate students

To what extent do you think the audience of your working group needs training in:



Are there specific types of data that you are focusing on and that you would like to include in your training material? Please specify which ones?

- Semantic resources and their use
- management of toxicology data (urgent), phenotyping data, field data, weather data etc
- EO data, FArme data
- Precision agriculture, value of data for farmers (cf. EU Code of Conduct on agricultural data sharing)
- semantics and vocabularies
- Census and statistics

Which methods are best to meet the training needs of your audience:



Have you already conducted any training or awareness creation activities as part of your WG?



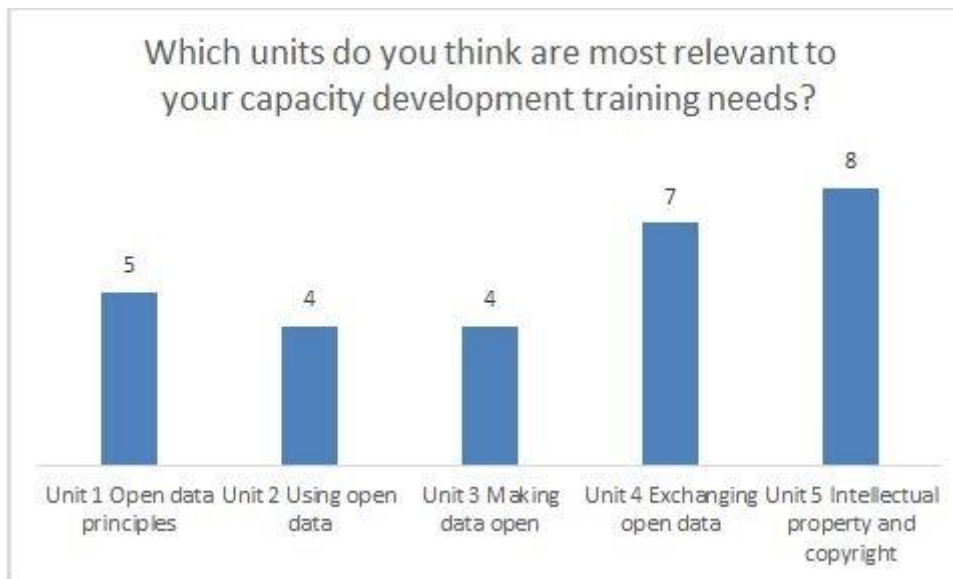
If so, please provide us with more information about this training.

- Semantic

Have you heard about the GODAN Action Online Course Curriculum before? See the outline below. (GODAN Final Curriculum) This is a modular course on Open Data Management in Agriculture and Nutrition.



From the outline of the curriculum above - Which units do you think are most relevant (or can be re-adapted) to your capacity development training needs? Please check all that are relevant.



Comments:

- I have already done the GODAN course, Open Data Management in Agriculture and Nutrition
- I would enforce the explicit use of ontologies/vocabularies to make data FAIR.

Are you aware of any other training resources relevant to the scope of your WG?



If so, could you please provide the name and website of the training resource?

- FOSTER Project. Courses: <https://www.fosteropenscience.eu/courses>
- DC Metadata Initiative. Webinars: <http://www.dublincore.org/resources/training/>
- <http://www.cema-agri.org/publication/new-brochure-eu-code-conduct-agricultural-datasharing>
- <https://www.pwc.fr/fr/publications/agribusiness/cooperatives-agricoles-2016.html>

- Web Sémantique et Web de Données (FUN) (in French only)
- <https://www.mooc-list.com/course/web-s%C3%A9mantique-et-web-de-donn%C3%A9es-fun>
- GODAN Capacity Development WG

Do you have any additional comments?

- All the activities in the RDA WGs are great and I wish I could (we could) do more ... but this always come aside in addition of the normal day to day stuff. We would need some "delegation" of our time on main job to work/train on RDA WGs/Recommendation..

Conclusions of the survey

Although the survey was completed only by a low number of people, key people from different IGAD working groups provided their feedback. One of the key messages is that the main barriers for the working group recommendations' update are the lack of awareness and the lack of available resources such as funding or time. The participants suggested that there is a need for training in the areas of data interoperability frameworks, semantics and vocabularies and metadata. A preferred training method is blended training.

As a result, this document maps out available resources in the next sections and looks for existing gaps where training needs cannot be covered by these resources.

All resources that were already mentioned by the people who completed the questionnaire were used as a starting point as well as the information about the awareness of the GODAN Action curriculum.

A Selection of Available Training Resources

In the following we present a selection of available resources and training events for research data management and related areas. Most of the resources focus on research data management in all disciplines and a minor number focus on more narrow and specific topics that are related to research data management, like geospatial data or metadata.

There is a range of available trainings that include materials that are instantly and freely available as well as face-to-face trainings that are given and supervised by experts in the field. The different modes of courses available are enlisted as below:

Online Training:

The advantage is that everybody can access the resources at any time from anywhere. Disadvantages might be that no questions can be clarified and that the materials are usually not adapted to individual needs. Many of the materials that will be listed in this document only give basic information about research data management without going more into technical detail. Some forms of online training are not supervised and thus cannot address specific questions or needs of the audience.

Face-to-face Training:

Face-to-face training events allow to focus on the training contents more in depth. The presence of experts that teach the contents allows questions and an adaption to the needs of the individual learner. However participation in these trainings require time and a travel budget even if the organizers do not charge for the course itself.

Supervised and Blended Courses:

A compromise between both training forms are online courses, that can be offered more often and for more participants than face-to-face workshops but that are still supervised by experts who can provide online tutorials or webinars to get in contact with the learners. Sometimes online courses are given in a blended training approach that consists of an online course as a preparation for face-to-face training that is provided after the course has been successfully completed.

In this chapter we present several examples for the different kinds of available trainings that are all provided free of charge. The resources that are presented more prominently in this section are all related to RDA and provide detailed information about their curricula.

Open Data Management in Agriculture and Nutrition Course

The Open Data Management in Agriculture and Nutrition course is an online course that is supervised by experts of the field. It has been offered already four times and trained 4448 people from 148 countries. It can also be used to provide blended training to the learners which has been done in the last course that was provided in October 2018.

The course curriculum has been developed by the GODAN Action project partners to strengthen the capacity of data producers and data consumers to manage and use open data in agriculture and nutrition. The main objective of the course is:

“to be used in the context of different institutions in agricultural and nutrition knowledge networks and raise awareness on the different types of data formats and uses, and on the importance of reliability, accessibility and transparency”

GODAN Action Curriculum

Unit 1. Open Data Principles	Unit 4. Exchanging Open Data
Lesson 1.1. What is Open Data	Lesson 4.1. Open Data Exchange Principles
Lesson 1.2. Ethics and Open Data	Lesson 4.2. Interoperability
Unit 2. Using Open Data	Unit 5. Intellectual Property and Copyright
Lesson 2.1. Discovering Open Data	Lesson 5.1. Intellectual Property Rights
Lesson 2.2. Quality and Provenance	Lesson 5.2. Copyright and Database Law
Lesson 2.3. Data Retrieval, Analysis and Visualization	Lesson 5.3. Licensing
Lesson 2.4. Open Data in Policy Cycles	
Lesson 2.5. Referencing Data	
Unit 3. Making Data Open	
Lesson 3.1. Managing Data Sets	
Lesson 3.2. Managing Dynamic Data Sets	
Lesson 3.3. Creating and Managing Open Data Repositories	
Lesson 3.4. Advocate for Capacity Development on Open Data	
Lesson 3.5. Developing Strategies for Implementing Open Data Plans	

With different learning paths and use cases for the different target audiences

It targets three audience groups:

1. infomediaries, which includes ICT workers, technologist - journalists, communication officers, librarians and
2. extensionists
3. policy makers, administrators and project managers,
4. researchers and scientists.

In the following, possible learning paths for the different audience groups are presented:

Table 1. Overview of the learning paths by target audience and use case

Target audience	Use case	Unit 1		Unit 2					Unit 3					Unit 4					Unit 5			
		1.1	1.2	2.1	2.2	2.3	2.4	2.5	3.1	3.2	3.3	3.4	3.4.1	3.5	4.1	4.2	4.3	4.4	4.4.1	5.1	5.2	
Infomediaries	A	x	x	x	x	x	x	x													x	x
	B	x	x						x	x	x	x	x	x	x	x	x	x	x		x	x
Researchers	C	x	x						x	x	x	x	x	x	x	x	x	x		x	x	
	D	x	x	x	x	x	x	x						x						x	x	
Policy makers	E	x	x	x	x	x	x	x				x	x	x						x	x	
	F	x	x	x	x	x	x	x				x	x	x						x	x	
	G	x	x	x	x	x	x	x				x	x	x	x	x	x	x	x	x	x	

By the end of the course learners will be able to:

- understand the principles and benefits of open data and responsible use of data
- identify the steps to advocate for open data policies
- understand how and where to find open data
- understand ethics

- apply techniques to data analysis and visualisation
- recognise the necessary steps to set up an open data repository
- define the FAIR data principles
- understand the basics of copyright and database rights • apply open licenses to data

The full [outline of the curriculum](#) can be found here:

https://www.godan.info/sites/default/files/documents/Curriculum_final.pdf

All units of the course can be accessed here (CC BY-SA License):

- <https://www.godan.info/pages/capacity-development-and-training>
- <http://aims.fao.org/online-courses/open-data-management-agriculture-and-nutrition>

Introduction to Research Data Management (Spanish Online Course)

"Introduction to Research Data Management" (Spanish: "Introducción a la Gestión de Datos de Investigación") is an online course that aims to enhance agricultural research data management skills and knowledge about data management tools particularly in Latin America. It was developed within the framework of the [Agricultura I Data Interest Group](#) (IGAD) of the [Research Data Alliance](#) (RDA) and [Agricultura I Information Management Standards](#) (AIMS). It is delivered by the [Food and Agriculture Organization of the United Nations](#) (FAO) in collaboration with [Polytechnic University of Valencia](#) (UPV). The course is designed to serve the needs of researchers, librarians, students and other professionals who are operating with agricultural research data from nutrition to fisheries. Participants get familiarized with the characteristics of agricultural research data, concepts of open data, data storage mechanisms, metadata requirements, data preservation, accessibility of data and resources for agricultural research data management. Three editions of the course have taken place since its first announcement in July 2015.

Course Design

The course is provided in Spanish. It consists of four units and lasts four weeks having an assesment and evaluation at the end. Participants are expected to spend five hours weekly on average to complete readings and engage in activities such as online tutorials and webinars. Attendance of certificate is provided for those who passed the end of course exam.

- **Unit I: Terminology and State of the Art** (*Terminología y estado de la cuestión*)
- **Unit II: Standardized production of data: Design Stage** (*Producción estandarizada de datos: etapa de diseño*)
- **Unit III: Share data with Research Groups: Management Stage** (*Compartir datos con el grupo de investigación: etapa de gestión*)
- **Unit IV: Publication, Reuse and Preservation of Data: Publication Stage**

(Publicación, reutilización y preservación de datos: etapa de publicación)

The course is based on a methodology that includes both theoretical and practical elements and presents different information management tools, use cases and experience reports. The course works with readings, practical exercises, supportive videos, webinars and tutorials.

More information: <http://aims.fao.org/online-courses/spanish-course-research-data-management>

Farm Data Management, Sharing and Services for Agriculture Development

This course builds on the content and experience of the GODAN Action online courses - “Open Data for Agriculture and Nutrition”, which has been offered since November 2017 and has trained over 4400 participants. The Farm Data Management, Sharing and Services for Agriculture Development online course focuses on strengthening the skills of professionals who use, manage data for the benefit of farmers and farmers organisations. The course explores the importance of data in the agriculture value chain and how new and existing technologies, products and services can leverage farm level and global data to improve yield, reduce loss, add value and increase profitability and resilience.

There is an exponential growth in data accompanying the digitalisation of agriculture through the proliferation of mobile technology, remote sensing technologies and distributed computing capabilities among others. The effective management of this data will open up new opportunities to better the lives and livelihoods of smallholder farmers by lowering cost and reducing information asymmetries.

Course Design

Unit 1: Data, Services and Applications covers the topics of value of data in agriculture to support farmers, increase their income and develop food production; digital farmer profiling and the strategies to design business model for profiling.

- *Lesson 1.1. Data for agriculture*
- *Lesson 1.2. Farmer profiling*

Unit 2: Data Sharing Principles focuses on the topics of principles and benefits of open data; the potential of using and publishing data in agriculture; responsible data sharing practises for farm data; ethical and legal sensitivities of data-driven services; and data protection.

- *Lesson 2.1. What is shared and open data?*
- *Lesson 2.2. Challenges for smallholders in data value chains*
- *Lesson 2.3. Responsible data sharing in agricultural value chains*
- *Lesson 2.4. Personal data protection*

Unit 3: Using Data guides through how and where to find open data; data quality elements, analyse, data analysis and visualization.

- *Lesson 3.1. Discovering shared and open data*
- *Lesson 3.2. Quality and provenance*
- *Lesson 3.3. Data retrieval, analysis and visualization*
- *Lesson 3.4. Open data in policy cycles*

Unit 4: Exposing Data covers the topics of conceptual frameworks for sharing data; and the ways to make data findable, accessible, interoperable, and reusable.

- *Lesson 4.1. Managing data for reuse*
- *Lesson 4.2. Guiding frameworks for data sharing*
- *Lesson 4.3. Introduction to data interoperability*
- *Lesson 4.4. Interoperability of farm data*
- *Lesson 4.5. Open licensing for data*

More information can be found here:

<http://aims.fao.org/online-courses/farm-data-management-sharing-and-services-agriculture-development>

CODATA-RDA Schools of Research Data Science

The CODATA-RDA Schools of Research Data Science are face-to-face training events that aim to address recognised need for Research Data Science skills across all disciplines. Past summer schools were organized in different regions. CODATA aims to build up a network to scale up the availability of the courses. The courses are designed to be realised face-to-face even though additional online materials are offered and available at:

<https://zenodo.org/communities/codata-rda-research-data-science-summer-school/search?page=1&size=20>

The full background of the Summer Schools is available at <http://www.codata.org/working-groups/research-data-science-summer-schools>

CODATA recognises the need for foundational data skills in all disciplines for the realisation of contemporary research. The range of the following skills are defined as Research Data Science:

Principles and practice of

- open science,
- research data management and curation,
- the use of a range of data platforms and infrastructures,
- large scale analysis,
- statistics,
- visualisation and modelling techniques,
- software development
- and annotation.¹

CODATA addresses these skills in their Summer schools. This is the preliminary curriculum of the CODATA-RDA School of Research Data Science in August 2016 that was taken as a basis for the other summer school as well:²

- Open Science
 - The goals of Open Science
 - reproducibility,
 - “nullius in verba”,
 - speeding up research.
 - Open sessions to reflect on personal impact of Open Science
- Open Research Data
 - Incentives for curation.
 - The data curation life-cycle.

¹ <http://www.codata.org/working-groups/research-data-science-summer-schools>, accessed in May 2019.

² <http://indico.ictp.it/event/7658/material/6/0.pdf>, accessed in May 2019.

- Methods for data publishing (such as Zenodo). Examples from different communities.
- Metadata standards
- Data Carpentry
 - Introduction to SQLite Manager, SQL and relational databases.
 - Motivation of the use of relational databases.
 - Import files to SQL.
 - SELECTing data from SQL.
 - Filtering data from SQL.
 - COUNT, GROUP BY commands.
 - JOINS, ALIASES.
- Software Carpentry
 - introduction to the Unix shell.
 - File concepts in Unix.
 - Combining Unix commands, pipes and filters.
 - Shell scripts.
 - Functions in R.
 - Conditionals in R.
 - Command line R programs.
 - Best practices in R.
 - Building your own R packages.
 - Setting up Git.
 - Creating a Git repository.
 - Tracking changes in Git.
 - Collaboration and Open Science with Git ●

Analysis

- Modelling data and significance,
- Machine Learning -supervised and unsupervised learning,
- Machine Learning -cross-validation, ○ Clustering data.
- Visualisation
 - Data wrangling.
 - Visualisation packages in R (such as ggplot2).
 - [Optional] Visualisation in Python.
 - Workshop based approaches to critical assessment of visualisation
- Computational Infrastructures
 - Introduction to cloud computing concepts such as IaaS and PaaS.
 - Secure authentication
 - Launching a VM on an IaaS cloud.
 - Deploying scripts.
 - Interacting with mass storage.
 - Use of batch schedulers of containers.

Geospatial Data Science Resources

Some of the resources that can be used for geo data science and training are listed below. The resources are freely and instantly available:

- QGIS Userguide and documentation at [h ttps://qgis.org/en/docs/index.html](https://qgis.org/en/docs/index.html)
- An introduction to GIS at [h ttps://docs.qgis.org/2.18/en/docs/gentle_gis_introduction/](https://docs.qgis.org/2.18/en/docs/gentle_gis_introduction/)
- Free and open geospatial software and training materials at <http://www.osgeo.org/initiatives/geo-for-all/in-your-classroom/>
- OSGeo Live resources at <https://live.osgeo.org/en/index.htm> !

The page also presents the **FOSS4G GeoAcademy Curriculum**³:

Thirty-five (35) FOSS4G University-level lectures and labs are maintained and made available for download from the Spatial {Query} Lab on behalf of the [GeoAcademy](#). The lectures focus on a vendor-agnostic set of theories and principles. The labs focus on the use of [Q GIS](#), [GRASS](#), and [inkscape](#).⁴

- GST 101 – Introduction to Geospatial Technology (QGIS)
 - Module 0 – Getting to Know FOSS and FOSS4G
 - Module 1 – Geographic Information Systems – Introduction
 - Module 2 – Understanding Geospatial Data Models
 - Module 3- Understanding Coordinate Systems and Map Projections
 - Module 4 – Displaying Geospatial Data
 - Module 5 – Creating Geospatial Data
 - Module 6 – Understanding Remote Sensing and Aerial Photography
 - Module 7 – Basic Geospatial Analysis Techniques
- GST 102 – Spatial Analysis (QGIS)
 - Module 1 – Reviewing the Basics of Geospatial Data
 - Module 2 – Introduction to Geospatial Analysis
 - Module 3 – Using Attribute and Spatial Queries for Data Exploration
 - Module 4 – Vector Data Analysis – Overlay Techniques
 - Module 5 – Vector Data Analysis – Creating a Site Selection Model
 - Module 6 – Vector Data Analysis – Network Analysis
 - Module 7 – Raster Data Analysis – Working with Topographic Data
 - Module 8 – Raster Data Analysis – Density Surfaces
- GST 103 – Data Acquisition and Management (QGIS)
 - Module 1 – Reviewing the Basics of Geospatial Data
 - Module 2 – Setting Up a Project Database

³ Made available by GeoAcademy (<https://foss4geo.wordpress.com/>, accessed May 2019) under a CC BY 3.0 license.

⁴ <http://www.osgeo.org/initiatives/geo-for-all/in-your-classroom/>, accessed May 2019

- Module 3 – Vector Data Structure and Quality
- Module 4 – Spatial Data Quality
- Module 5 – Raster Data Structure
- Module 6 Lab – Data Sources
- GST 104 – Cartographic Design (QGIS and Inkscape)
 - Module 1 -Introduction to Cartographic Design
 - Module 2 – Geodesy and Map Projections
 - Module 3 – Map Elements and Design Principles
 - Module 4 – Types of Maps
 - Module 5 – Data for a Map
 - Module 6 – Map Symbols and Visual Variables
 - Module 7 – Typography
- GST 105 – Introduction to Remote Sensing (QGIS and GRASS)
 - All Module Labs
 - Module 3 Lab – Image Composite, Mosaic, Subset
 - Module 4 Lab – Image Rectification
 - Module 5 Lab – Unsupervised Classification
 - Module 6 Lab – Supervised Classification
 - Module 7 Lab – Accuracy Assessment

Other Available Free Online Resources

The table below provides an overview about other training resources in the area of data management that are available online and free of charge.

Name	Provider	Type	URL	Focus	Availability
Access to Scientific Information Resources in Agriculture (ASIRA) Online Course for Low-Income Countries	FAO AIMS	Online Course (moderated)	http://aims.fao.org/asira	Access to Agricultural Online Resources	regularly

Open Data Online Learning	World Bank	Online Courses for Data Producers, Users and Policymakers	http://opendatatoolkit.worldbank.org/en/essentials.html#elearning	Open Data	instantly
Open Data Essentials	The ODI	Online Course	https://accelerate.theodi.org/	Open Data	instantly
Essentials of Data Management	School of Data	Online Courses	https://schoolofdata.org/courses/	Data Management	instantly
Introduction to Data Management	University of Minnesota	Online Course	https://sites.google.com/a/umn.edu/data-management-workshop-series/module1	Data Management	instantly
Mantra Research Data Management Training	The University of Edinburgh	Online Course	https://mantra.edina.ac.uk/	Research Data Management	instantly
USGS	USGS	Online Course	https://www1.usgs.gov/csas/training/	Data Management	instantly
France Université Numérique (FUN) MOOC	Various	Aggregator of Online Courses (moderated)	https://www.fun-mooc.fr/	Only a few courses in the area of Research Data Management can be found	some courses are not active
FOSTER	Various	Online Platform for OERs	https://www.fosteropenscience.eu	Open Science	instantly

MOOC List	Various	Aggregator of Online Courses (also moderated)	https://www.mooc-list.com/tags/semantic-web	Various	some courses are not active and some are not for free
Data Management & Curation	ICPSR	Guides	https://www.icpsr.umich.edu/icpsrweb/content/datamanagement/index.html	Data Management	instantly

Data Management Expert Guide	CESSDA (Consortium of European Social Science Data Archives)	Guides	https://www.cessda.eu/Training/Training-Resources/Library/Data-Management-Expert-Guide	Data Management	instantly
GFBio Consortium	GFBio Consortium	Guides	https://www.gfbio.org/training/materials	Data Management	instantly
Guides and Resources	Australian National Data Service	Guides	https://www.andis.org.au/guides	Research Data Management	instantly
Learning Resources	Data Management Training (DMT) Clearinghouse	Guides	http://dmtclearinghouse.esipfed.org/browse	Data Management	instantly
Guides of University of Konstanz	University of Konstanz	Guides	https://www.forschungsdaten.info	Data Management	instantly
How-to Guides & Checklists	Digital Curation Centre (DCC)	Guides and Checklists	http://www.dcc.ac.uk/resources/how-guides	Data Management	instantly
Godan Webinars	Godan	Webinars	https://www.godan.info/pages/webinars	Open Data Management in Agriculture & Nutrition	instantly
AIMS Webinars	FAO AIMS	Webinars	http://aims.fao.org/capacity-development/webinars	Information Management in Agriculture	instantly
Data management training resources	UK Data Service	Several Presentations	https://www.ukdataservice.ac.uk/manage-data/training	Data Management	instantly
DoRANum	Various	Videos, Documents, etc	https://doranum.fr/	Data Management	instantly
Dublin Core Metadata Initiative	Various	Webinars, Tutorials	http://www.dublincore.org/resources/training/#regionalTutorials	Metadata	most slides are available, webinar recordings are mostly not available

Eudat	EUDAT	Webinars, Videos, Documents, etc	https://eudat.eu/training	Research Data Management	instantly
MitOpenCourseware	MitOpenCourseware, Massachusetts Institute of Technology	Workshop Materials, Presentations	https://ocw.mit.edu/resources/res-str-002-data-management-spring-2016/	Data Management	instantly
Zenodo	Various	Posters and Presentations	https://zenodo.org/communities/dcc-rdm-training-materials/?page=1&size=20	Research Data Management	instantly

Summary

There are many free resources about research data management available online and most of them focus on research data management in general with few exceptions like the presented resources on geospatial information. The survey revealed that a lack of awareness could be one of the main obstacles why the recommendations of the IGAD working groups might not be implemented. To create awareness and the necessary skills, training is needed on specific data management topics related to IGAD.

The GODAN Action curriculum of the Open Data Management in Agriculture and Nutrition Course was well received by the survey participants. The survey also revealed that blended training (a mix of online and face-to-face training) would be the preferred way to provide training to the audiences of the working groups. The creators of the Godan Action course designed the course in a way that allows both the implementation of just online courses and blended training. Furthermore the course allows to train a huge amount of people in a relatively short period of time by still providing guidance to the participants. These are the two important advantages this kind of training resource has compared to other training methods. However this course cannot be implemented as it is in the IGAD community because it does not specifically cover the area of research data management and specific IGAD topics like semantics that were named to be important by the survey participants.

The online course about Research Data Management (in Spanish) that was spearheaded by IGAD in 2015 and conducted three times can add to the curriculum of the Open Data Management Course.

A merger between both online courses can cater the IGAD community and like minded communities with an online course that can teach both Research Data Management and Open Data and that can be used to train many people by experts both online and with blended trainings. In 2019, the Farm Data Management, Sharing and Services for Agriculture Development Course was developed for this purpose. The first edition has been launched from October to November 2019 and another edition will take place in November to December 2019. This is only one example of how the community can build on existing resources to create tailored training.

Conclusion

In this document, the Capacity Development for Agriculture Data WG presented different types of training resources that can be used by the IGAD community and similar communities as a basis to train their audiences or to create new tailored training resources according to the needs of different audiences.

All presented training resources are provided free of charge and include online courses (both self-paced and moderated) as well as webinars, guides, checklists, tutorials and other materials. A first example of using synergies between different training initiatives is the re-use of some of the presented training resources for the creation of the Farm Data Management, Sharing and Services for Agriculture Development Course. Courses on other IGAD related topics can be created in the same way. The members of the Capacity Development for Agriculture Data WG will continue to support IGAD on bridging training gaps of the community's audiences.

Annex 1

Capacity Development for Agriculture Data Working Group (WG) survey:

Dear colleagues,

This survey is conducted by the Interest Group on Agricultural Data (IGAD) Capacity Development Working Group (WG) that was recently endorsed by Research Data Alliance (RDA). As a result of this survey, the IGAD Capacity Development WG will perform a landscape assessment on the current state of play for training needs within the related IGAD WGs. It is also a first step to work towards the development of good practice guidelines for identifying and addressing training gaps in agricultural data management and interoperability.

The aim of the IGAD Capacity Development Working Group (WG) is to develop synergies between existing training activities and agricultural science needs by performing a landscape assessment to identify existing gaps and training requirements within the related Interest Group on Agricultural Data (IGAD) WGs. A particular focus will be on sharing knowledge about training initiatives and technologies, reducing digital divides so that researchers and practitioners in developing countries can also benefit. It will also empower the existing collaboration with GODAN and GODAN Action (<http://www.godan.info/godan-action>).

Your contribution will be very helpful and is highly appreciated.

General Information

1. Your name (optional)
2. Your organisation (optional)

3. Are you a member of an IGAD Working Group (WG)?
 - Yes
 - No
 - I don't know

If so, which one?

- Wheat Data Interoperability
- Rice Data Interoperability
- AgriSemantics
- On-Farm Data Sharing
- Other

4. Your role in the WG
- Chair
 - Active technical involvement
 - Passive involvement, staying updated about the WG
 - Other _____

5. Your area of expertise
- _____

Training needs

6. What do you think are the barriers to adoption or uptake of your WG's existing recommendations or outputs?

- Lack of awareness
- Lack of expertise
- Lack of institutional support
- Lack of resources
- Lack of interest
- Language
- Other

7. Is there any training foreseen as part of the WG activities?

- Yes
- No
- I don't know

8. Who is your target audience? (multiple choice)

- Researchers
- Industry
- Farming sector (farmers, advisors, etc.)
- Data managers
- Library and Information professionals
- ICT professionals
- Policy makers
- Other _____

9. To what extent do you think the audience of your working group needs training in:

- Data formats -- rating scale (1-5)
- Data standards -- rating scale (1-5)
- Metadata -- rating scale (1-5)
- Semantics and vocabularies -- rating scale (1-5)
- Repositories, information systems and data integration tools -- rating scale (1-5)

- Data acquisition -- rating scale (1-5)
- Open Data -- rating scale (1-5)
- Data Interoperability frameworks -- rating scale (1-5) ○
- Other_____rating scale (1-5)

10. Are there specific types of data that you are focusing on and that you would like to include in your training material? If so, which one?_____

11. Do you think that the training needs of your audience can be met by

- Face-to-face Training Workshops
- Online courses
- Webinars
- Blended Training (Combination of online training and Face2face Workshops)
- Conferences
- Other (please specify)_____

Past trainings and available training resources

12. Have you already conducted any training or awareness creation activities as part of your WG?

- Yes
- No

If so, please provide us with more information about this training.

a. Scope of the training

b. Audience of the training and approximate number of participants

c. Type of training

- Online training
- Face-to-face training
- Blended training

d. Is there a follow-up training planned?

- Yes
- No
- Maybe

13. Have you heard about the GODAN Action Curriculum before?

https://www.godan.info/sites/default/files/documents/Curriculum_final.pdf

- Yes
- No
- I don't know

14. Which units from the GODAN Action [Curriculum](#), do you think are most relevant (or can be re-adapted) to your capacity development training needs? Please check all that are relevant.

GODAN Action Curriculum

Unit 1. Open Data Principles	Unit 4. Exchanging Open Data
Lesson 1.1. What is Open Data	Lesson 4.1. Open Data Exchange Principles
Lesson 1.2. Ethics and Open Data	Lesson 4.2. Interoperability
Unit 2. Using Open Data	Unit 5. Intellectual Property and Copyright
Lesson 2.1. Discovering Open Data	Lesson 5.1. Intellectual Property Rights
Lesson 2.2. Quality and Provenance	Lesson 5.2. Copyright and Database Law
Lesson 2.3. Data Retrieval, Analysis and Visualization	Lesson 5.3. Licensing
Lesson 2.4. Open Data in Policy Cycles	
Lesson 2.5. Referencing Data	
Unit 3. Making Data Open	
Lesson 3.1. Managing Data Sets	
Lesson 3.2. Managing Dynamic Data Sets	
Lesson 3.3. Creating and Managing Open Data Repositories	
Lesson 3.4. Advocate for Capacity Development on Open Data	
Lesson 3.5. Developing Strategies for Implementing Open Data Plans	

With different learning paths and use cases for the different target audiences

- Unit 1 Open data principles
- Unit 2 Using open data
- Unit 3 Making data open
- Unit 4 Exchanging open data
- Unit 5 Intellectual property and copyright
- Comments

15. Are you aware of any other training resources relevant to the scope of your WG?

- Yes
- No
- I don't know

a. If so, could you please provide the name and website of the training resource?

16. Do you have any additional comments?

17. If you would like to become part of the IGAD Capacity Development WG, please provide us with your email:

Thank you very much for your participation!