

**Working Paper
Volume 2021 Number 545**

Open Data for Agriculture and Nutrition: A Literature Review and Proposed Conceptual Framework

Tony Roberts and Kevin Hernandez

January 2021

The Institute of Development Studies (IDS) delivers world-class research, learning and teaching that transform the knowledge, action and leadership needed for more equitable and sustainable development globally.



© Institute of Development Studies 2021

Working Paper Volume 2021 Number 545

Open Data for Agriculture and Nutrition: A Literature Review and Proposed Conceptual Framework

Tony Roberts and Kevin Hernandez

January 2021

First published by the Institute of Development Studies in January 2021

ISSN: 2040-0209 ISBN: 978-1-78118-763-0

DOI: [10.19088/IDS.2021.018](https://doi.org/10.19088/IDS.2021.018)

Suggested citation: Roberts, T. and Hernandez, K. (2021) *Open Data for Agriculture and Nutrition: A Literature Review and Proposed Conceptual Framework*, IDS Working Paper 545, Brighton: Institute of Development Studies, DOI: [10.19088/IDS.2021.018](https://doi.org/10.19088/IDS.2021.018)

A catalogue record for this publication is available from the British Library

This paper was produced as part of the Global Open Data for Agriculture and Nutrition (GODAN) initiative, funded by the former UK Department for International Development (DFID). The opinions expressed are those of the author and do not necessarily reflect the views or policies of IDS or the UK government.

This is an Open Access paper distributed under the terms of the [Creative Commons Attribution 4.0 International licence](https://creativecommons.org/licenses/by/4.0/) (CC BY), which permits unrestricted use, distribution, and reproduction in any medium, provided the original authors and source are credited and any modifications or adaptations are indicated.

No potential conflict of interest was reported by the authors.

Available from:

Institute of Development Studies, Library Road

Brighton, BN1 9RE, United Kingdom

+44 (0)1273 915637

ids.ac.uk

IDS is a charitable company limited by guarantee and registered in England

Charity Registration Number 306371

Charitable Company Number 877338

Working Paper
Volume 2021 Number 545

Open Data for Agriculture and Nutrition: A Literature Review and Proposed Conceptual Framework

Tony Roberts and Kevin Hernandez
January 2021

Open Data for Agriculture and Nutrition: A Literature Review and Proposed Conceptual Framework

Tony Roberts and Kevin Hernandez
January 2021

Summary

This paper begins by locating the Global Open Data for Agriculture and Nutrition project (GODAN) in the context of wider debates in the open data movement by first reviewing the literature on open data (OD) and open data for agriculture and nutrition (ODAN).

The review identifies a number of important gaps and limitations in the existing literature. There has been no independent evaluation of who most benefits or who is being left behind regarding ODAN. There has been no independent evaluation of gender or diversity in ODAN or of the development outcomes or impacts of ODAN. The existing research on ODAN is over-reliant on key open data organisations and open data insiders who produce most of the research. This creates bias in the data and analysis. The authors recommend that these gaps are addressed in future research.

The paper contributes a novel conceptual 'SCOTA' framework for analysing the barriers to and drivers of open data adoption, which could be readily applied in other domains. Using this framework to review the existing literature highlights the fact that ODAN research and practice has been predominantly supply-side focused on the production of open data. The authors argue that if open data is to 'leave no one behind', greater attention now needs to be paid to understanding the demand-side of the equation and the role of intermediaries. The paper argues that there is a compelling need to improve the participation of women, people living with disabilities, and other marginalised groups in all aspects of open data for agriculture and nutrition. The authors see a need for further research and action to enhance the capabilities of marginalised people to make effective use of open data.

The paper concludes with the recommendation that an independent strategic review of open data in agriculture and nutrition is overdue. Such a review should encompass the structural factors shaping the process of ODAN; include a focus on the intermediary and demand-side processes; and identify who benefits and who is being left behind.

Keywords

Open data, digital, technology, access, GODAN, agriculture, nutrition, SCOTA, ICT4D.

Authors

Tony Roberts is a Research Fellow in the Digital and Technology team at the Institute of Development Studies. He has been working at the intersection of digital technologies, international development and social justice since 1988 as a volunteer, lecturer, practitioner, trustee and researcher. Tony founded and directed two international development agencies, most recently Computer Aid International. He then completed a PhD at Royal Holloway, University of London using participatory video in women's organisations in Zambia. He was a Research Fellow in the Gender Technology Lab of the United Nations University before joining IDS in 2016. His research focuses on digital rights and inequalities. A full list of publications and blogposts is available on his website AppropriatingTechnology.Org.

Kevin Hernandez is a Research Officer at the Institute of Development Studies. After completing an MA in Globalisation, Business and Development at IDS, he worked on a foresight study looking at synergies and trade-offs between equality, sustainability, and inclusive societies. Kevin's published research includes the impact of digital technology on economic growth, productivity, employment and equality, the use of real-time data for decision-making in the development sector, frontier technologies for development, and foresight studies on the future of digital technologies. He also provides technical support to entrepreneurs in two innovation funds.

Contents

Acronyms	8
<hr/>	
1. Introduction	9
<hr/>	
2. Open data	10
2.1 Open government data	10
2.2 Open data ecosystems	11
<hr/>	
3. GODAN	13
<hr/>	
4. Barriers to open data use	15
4.1 Publishing, interpretation and use	15
4.2 The 6 'A's of open data for development	19
<hr/>	
5. Gender barriers to open data	22
5.1 Power structures	23
<hr/>	
6. Open Data for Agriculture and Nutrition	25
<hr/>	
7. Conclusions and future issues in ODAN	33
7.1 Gaps in the existing research literature	34
7.2 Recommendations	34
<hr/>	
References	35

Figures

Figure 4.1 Three phases of open data	16
Figure 4.2 The 5 'A's of technology access	17
Figure 4.3 Three phases of open data and barriers to access – the 6 'A's	18
Figure 5.1 Structural context of technology access (SCOTA) framework	24
Figure 6.1 Agricultural open data actors and their relationships	26

Acronyms

AIMS	Agricultural Information Management Standards
AODN	African Open Data Network
CAFDO	Conférence d'Afrique Francophone sur les Données Ouvertes
CTA	Technical Centre for Agricultural and Rural Co-operation
GODAN	Global Open Data for Agriculture and Nutrition programme
IATI	International Aid Transparency Initiative
ICT	information and communications technology
IGAD	Interest Group on Agricultural Data
ILDA	Iniciativa Latinoamericana por los Datos Abiertos
IVR	Interactive Voice Response
OD	open data
ODAN	Open Data for Agriculture and Nutrition
OD4D	Open Data for Development
OGP	Open Government Partnership
RDA	Research Data Alliance
USAID	United States Agency for International Development

1. Introduction

This paper reviews the existing literature on Open Data for Agriculture and Nutrition (ODAN). The review was commissioned as a background paper for a performance evaluation of the Global Open Data for Agriculture and Nutrition programme (GODAN). GODAN was established to help secure the potential development benefits of producing and using open data for agriculture and nutrition. GODAN's founding objectives include (a) **empowering the ecosystem** of organisations working on open data for agriculture and nutrition by working with policymakers to provide an enabling environment; and (b) **increasing the supply and use** of open data to stimulate innovation, equitable access, transparency and accountability, service delivery, and economic growth (Carolan 2016). These objectives inform the scope of this review.

This paper begins by first locating GODAN in the context of the wider open data movement. It reviews the literature on open data (OD), then open data for agriculture and nutrition (ODAN), before focusing in on GODAN specifically. The literature review was neither systematic nor exhaustive due to time and resource restrictions. The desk-based research was carried out during February and March of 2020 using an iterative process in which the focus and scope was adapted to reflect the emergent needs of the performance evaluation. Relevant literature was identified in consultation with domain experts, by using snowballing and reverse snowballing techniques, and using Google Scholar to identify more than 100 unique sources. The review identified significantly more existing literature on OD than on ODAN, and very little on GODAN specifically. The review also found that the existing literature on ODAN and GODAN is over-dependent on studies and reports produced by the GODAN programme and affiliates, and would benefit from alternative perspectives. The literature review produced a new conceptual framework for analysing open data initiatives, which helps to identify opportunities to improve access, effective use and equity of application. The framework can be readily applied to open data in domains other than agriculture and nutrition. The literature review identifies gaps in the existing research and makes recommendations for future ODAN policy and practice. These include the need to improve the participation of women, people living with disabilities, and other marginalised groups in all aspects of open data for agriculture and nutrition.

The next section begins with some issues of definition before outlining the history and rationale of open data for development.

2. Open data

Although there is no universally agreed definition, the Open Knowledge Foundation defines open data as ‘data that can be freely used, modified, and shared by anyone for any purpose’.¹ In an increasingly digital world this definition refers predominantly to digital data that is easy to access and free to download in a format readily processed on a computer and which is made available under an open source licence. To facilitate making digital data open, the FAIR Data Principles² are a set of guidelines for making open data Findable, Accessible, Interoperable and Reusable to all stakeholders in the relevant ecosystem³ (cited in Wilkinson *et al.* 2016). Pawelke *et al.* (2017) are among those to argue that the binary categories of open and closed data do not reflect the reality that most data is neither fully open nor fully closed, and can be made to move along the continuum between the two.

The term ‘open data’ was first used in 1995 by scientists who argued that the public interest in tackling climate and environmental change required institutions to open and share data to advance the public interest (Chignard 2013). The open data movement is an alliance of diverse actors with a range of motivations but the shared goals of increasing the supply of open data, adoption of open data policies, and building capacity to enable the effective use of open data for social benefit. Advocates of open data have argued that we should move from a position where data is closed by default to a situation where it is open by default so that everyone is able to use it without permission, controls, or restrictions (*ibid.*). The rationale behind open data includes the proposition that the opening up of data will lead to greater scrutiny of data, improve its quality, and enable its innovative use to create value for the public good (Davies *et al.* 2019).

2.1 Open government data

An initial target for the open data movement was to open up government data. Government departments hold significant amounts of data that is ‘closed’ or not readily accessible (often not even to other ministries). This government data includes, but is not limited to, information on weather, land use, nutrition, health care, education, and economics. As government data is produced with public funds, members of the open data movement argued that it should be made freely available to the public, for the public benefit. It was argued that some of the

¹ **Open Definition** is a project of the Open Knowledge Foundation.

² **FAIR Data Principles**, LIBER Europe.

³ The term ‘ecosystem’ in this paper refers to a network of stakeholder organisations which are all involved in a product or service through either cooperation or competition, including producers, distributors, customers, regulators, government agencies, research institutes, etc.

specific advantages of open data would be to increase transparency, enable accountability, and stimulate innovation and economic growth (Open Data Institute 2018). Where government data has been opened, this has enabled the innovation of mobile apps and online platforms including those that enable citizens to check the voting record of elected representatives, to report problems to local government, to live-track buses and trains, and to check crop prices⁴ at multiple markets in real time (Pawelke *et al.* 2017). Critical voices have cautioned that claims for the radical potential of open data often underplay the obduracy of political power and risk reproducing old inequalities (McGee and Edwards 2016). This view is supported by the findings of Berdou and Lokers (2019) in their guidelines for the use of open nutritional data, which emphasise the importance of political context in limiting or enabling the impact of open data use in social change.

In 2007, advocates of open government data met and produced the Sebastopol Principles for Open Government Data, which argued that data should be complete, primary, timely, accessible, machine-processable, non-discriminatory, non-proprietary and licence-free.⁵ Since 2011, when the Open Government Partnership⁶ was founded, 78 countries have signed up to a process where each member submits an action plan co-created with civil society that includes concrete commitments to enhance transparency, accountability and public participation in government (OGP 2018). However, commitment to gender equity remains a concern. In the most recent Open Data for Development Report (IDRC 2019), despite 3,000 commitments made in country action plans, less than 1 per cent of countries included any gender commitments. The Open Government Partnership has since set an ambitious target of 30 per cent gender-sensitive commitments by the end of 2020 (*ibid.*).

2.2 Open data ecosystems

Open government data organisations are part of a wider global open data movement that requires coordination between a complex network of political, business, regulator, technical, practitioner, funder and research stakeholders (Open Data Institute 2018). Together, these organisations form the global open data ecosystem. Key coordinating initiatives at the global level include the Open Data for Development network (OD4D), the Open Data Charter, the Open Government Partnership (OGP), the Open Data Barometer, the Impact Map, the Open Data Leaders Network, and the Open Data Working Group (Davies *et al.* 2019). In recent years, partly in an effort to become more demand-led and

⁴ For example, keeping track of parliamentarians on [TheyWorkForYou](#); reporting local problems on [FixMyStreet](#); live transport information such as [Transport for London's](#) bus arrivals; connecting farmers and buyers in Kenya via [M-Farm](#).

⁵ [The 8 Principles of Open Government Data](#).

⁶ [Open Government Partnership website](#).

problem-oriented, the open data movement has shifted to focus more around regional, thematic, and issue-oriented initiatives (*ibid.*). It can be useful to understand this emerging ecosystem using typologies of data sources, geographies, or thematic sectors.

In addition to government data, open data is increasingly drawn from other **data sources** including private companies (e.g. satellite data), civil society organisations (e.g. funding data), academia (e.g. research data sets) and even 'citizen data' (including citizen science and crowdsourced data) (Pawelke *et al.* 2017). This represents a shift away from open data being dependent primarily on open government data, and requires a broader alignment of protocols and standards across diverse actors in the private sector, civil society, and government (Davies and Perini 2016; Davies *et al.* 2019).

As well as global open data networks there are **local, national and regional** networks. Open data initiatives with a global remit include the Open Data for Development Network,⁷ the Global Partnership for Sustainable Development Data and the Open Data Institute. Examples of geographic open data networks include the African Open Data Network (AODN), Open Data Asia and the Iniciativa Latinoamericana por los Datos Abiertos (ILDA).⁸

Open data is now applied in a wide range of **thematic sectors** (Davies *et al.* 2019) including organisations established to support the Open Government Partnership, the International Aid Transparency Initiative (IATI),⁹ which focuses on opening data in the international development sector, and Publish What You Pay,¹⁰ which works to open data in the extractive industries sector. It is within this global open data ecosystem that GODAN is located as the Global Open Data for Agriculture and Nutrition programme. The next section will introduce the open data for agriculture and nutrition sector and present the rationale for GODAN's work.

⁷ The **Open Data for Development** Network website (OD4D).

⁸ These examples are on the **OD4D Regional Hubs** website.

⁹ The **International Aid Transparency Initiative website**.

¹⁰ The **Publish What You Pay** website.

3. GODAN

Agriculture and nutrition are two separate but inter-related sectors that have attracted the attention of the open data movement because of the development potential of open data to benefit rural livelihoods, health and wellbeing. The challenge of facilitating the open data movement in agriculture and nutrition is increased by the volume and diversity of organisations in the ODAN sector.

In contrast to other industries, agriculture has a relatively broad spectrum of stakeholders. Agricultural producers range from part-time, small-scale farmers to high-tech multinational conglomerates, and supply chains begin in some of the world's most remote areas. 'Farm to fork' products go from being raw materials, through processing, trading, hedging and brokering to eventually make it to the customer's table. All of the stakeholders involved in these processes are potential producers as well as consumers of data. (Allemang and Teegarden 2017)

The diversity of non-standard and non-interoperable data types and formats in the ODAN sector increases the complexity of the challenge. The theory of change for the Global Open Data for Agriculture and Nutrition (GODAN) programme refers to this diversity, describing the sector as composing 'an immensely complex system of actors from diverse fields, specialisations, jurisdiction and sectors of the economy acting individually and importantly, in concert' (Carolan 2016).

The GODAN programme was established in 2013 in response to these challenges to coordinate stakeholders and improve the application of open data in the sector. The **GODAN** vision statement reads:

We are a group of actors working towards a world where the value chain for agriculture and nutrition is more efficient, innovative, equitable (e.g. by gender, socio-economic status) and accountable; from, for example greater yields and access to markets for farmers, through to more nutritious and safe food on plates. We believe that improving the open **availability**, use and enrichment of data, and meaningful engagement with stakeholders will enable this vision. We observe that the agriculture and food sector currently suffer from information asymmetries and closed data practices that limits progress, value generation and the fair distribution of resources.

To reverse these information asymmetries and to contribute to more equitable outcomes, GODAN focuses its activities on delivering a range of 'intermediate-

level impacts' that include improved interoperability, increased innovation, transparency and accountability, new business creation, and improved service delivery. Also targeted are more **accessible** information products, data-driven decision-making, and **increased access to data by disadvantaged communities**. The GODAN vision also states, 'We will proactively seek to address gender balance in our engagement'.

Evidence of progress against GODAN objectives is reviewed in a later section but first, in order to situate ODAN in its broader context, the next section reviews the wider open data literature and builds a conceptual framework for analysing open data for agriculture and nutrition.

4. Barriers to open data use

In Section 2, we defined open data as ‘data that can be freely accessed, used, modified, and shared by anyone for any purpose’. However, not everyone has equal opportunity to freely access, use, modify or share open data. Individuals have different endowments; they operate in different political and regulatory contexts; and they experience a range of different barriers to accessing, using, modifying, and sharing open data. This section reviews the existing literature to produce a conceptual framework for analysing the barriers that shape unequal access and use of open data.

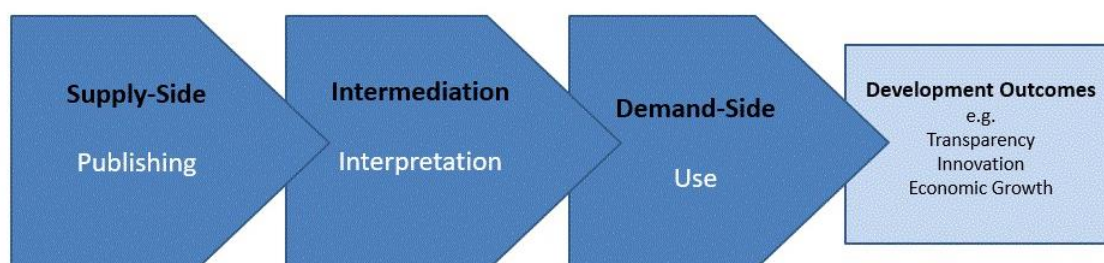
Inequality of ability to make practical use of open data led early practitioners and researchers to pose critical questions. ‘Open to whom?’ was one such question. Gurstein (2011) was among those who argued that the publishing of open data was not in itself a development outcome and that it could lead to more inequality rather than less. In his paper ‘Open data: Empowering the empowered or effective data use for everyone?’, Gurstein argued that the primary impact of publishing open data is to empower those who are already advantaged in terms of their access to the digital infrastructure, skills and capacity necessary to exploit such data, leading to the further empowerment and enrichment of the already privileged. Rumbul (2015) has documented how urban men are over-represented among users of digital governance technologies, and Davies and Perini (2016) have noted that open data use is similarly skewed towards middle class and well-educated users. These findings echo others from a wider review of the digital development literature, which found that the use of digital technologies often **reflects, reproduces and amplifies** existing patterns of (dis)advantage along lines including gender, ethnicity and caste/class (Hernandez and Roberts 2018). Gurstein (2003) argued that to ensure equitable access and effective use of open data, adequate attention would need to be paid to building awareness of open data and digital literacy abilities among excluded communities. The next sections focus attention on how this can be achieved in practice.

4.1 Publishing, interpretation and use

Pawelke *et al.* (2017) have argued that it is useful to break down open data into three related processes: (i) open data publishing; (ii) intermediaries converting open data to actionable information; and (iii) citizens, government officials, and other stakeholders using open data to further their goals (Pawelke *et al.* 2017). To some extent this mirrors Gurstein’s earlier (2011) three-part model for analysing open data: (a) access, (b) interpretation, and (c) use. These tripartite approaches are illustrated in Figure 4.1. In Gurstein’s model the first ‘access’

phase is concerned with the supply-side issues necessary to make open data available from the outset. In this first phase decisions about publishing data in specific formats or standards, and the language and location of publication can create unequal access by making data only open to some people with specific linguistic or technical skills. Gurstein argued that a second phase of 'interpretation' was often necessary to help people make meaning of open data and clarify its relevance to their priorities and goals. Intermediaries are often necessary to make open data meaningful, accessible, and practically 'actionable' by end users. In the third phase, Gurstein focuses on the often neglected demand-side issues of people's ability to make 'effective use' of open data, where effective use is defined as a person's ability to apply open data to accomplish their development goals (Gurstein 2003). Put otherwise, if open data efforts focus only on supply-side issues they risk benefiting already privileged groups, so – if equitable outcomes are desired – it is essential to invest in demand-side activities to build the capacity of less privileged groups to make effective use of open data.

Figure 4.1 Three phases of open data



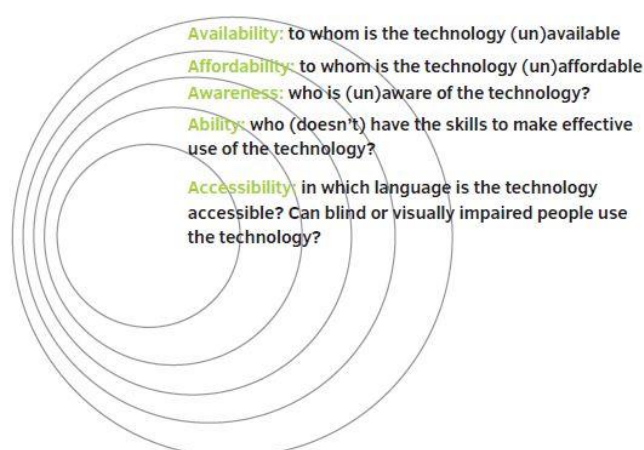
Source: Authors' own

The analytical models of both Gurstein (2011) and Pawelke *et al.* (2017) are valuable in visualising the three functional phases of making open data **available, actionable and applied**. Gurstein's approach is additionally advantageous in asking the critical questions of 'open to whom?', 'who benefits?' and 'who is left behind?'. These questions are important in any evaluation of whether open data is making processes more or less equitable (which is an element of the GODAN theory of change).

Roberts (2017) built on Gurstein's critical approach with his 5 'A's of Technology Access model. The 5 'A's provide a framework for analysing a range of barriers that structure (dis)advantage in technology access. For example, in most countries there are individuals who live in rural or remote areas where there is no **availability** of cellular or broadband connectivity so access is practically impossible. However, even where a technology is available, there usually exists

a smaller group for whom **affordability** is the key barrier to access. A person with little or no disposable income is less able to afford internet connectivity than a relatively wealthy neighbour. Among those for whom the internet is both available and affordable, a lack of **awareness** can be a third barrier to access. Awareness-raising activities are generally necessary to create visibility of a new open data service as well as its practical relevance to people's lives and goals. Even when awareness exists, a lack of **abilities** such as digital literacy skills may be a barrier to access. Finally, even for those with the necessary availability, affordability, awareness and abilities, **accessibility** can be a barrier because the user interface is unavailable in a local language, lacks adaptations for people with visual impairments, or lacks content relevant to local priorities and concerns. As depicted in Figure 4.2, the 5 'A's can be conceived of as a series of concentric barriers to technology access and use (Roberts 2017).

Figure 4.2 The 5 'A's of technology access

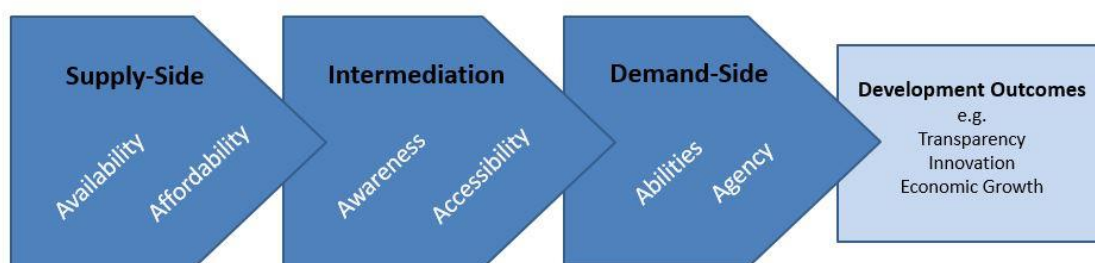


Source: Roberts (2017)

Roberts and Hernandez (2019) added a sixth 'A': **agency**. Agency is the capacity to act in the world in pursuit of your goals (Sen 1999). Empowerment can be measured as increases in agency (Ibrahim and Alkire 2007). Sometimes powerful social norms result in individuals lacking the agency to make effective use of a technology in their lives. For example, in some places people are socialised to believe that using mobile phones is inappropriate for respectable women or that the internet is only suitable for male / upper caste / university-educated people. Open data organisations often seek to empower people to achieve their goals by increasing the supply and effective use of open data. From this perspective, the open data movement is centrally about enhancing the agency of individuals or groups. Doing so requires more than the supply-side provision of data and must include the demand-side increase of abilities and agency. Unless abilities and agency are increased, the benefits of open data will accrue disproportionately to the already privileged and advantaged.

Schematically we find it useful to overlay the barriers of the 6 'A's onto the three-part process model (see Figure 4.3) in order to foreground how different barriers to technology access are encountered at different points in the open data process.

Figure 4.3 Three phases of open data and barriers to access – the 6 'A's



Source: Authors' own

The barriers of **availability** and **affordability** relate primarily (though not exclusively) to the **supply-side** functions of open data organisations. This includes work to increase the supply of open data by working with governments to make their data open, interoperable, machine readable and so on. By getting data suppliers to make their data freely available in ways that conform to FAIR principles, open data organisations aim to reduce the cost barriers to open data access.

The burden of **awareness-raising** and **accessibility** adaptation falls primarily to **intermediary** organisations in the open data ecosystem. This work includes making the existence of open data known, helping groups to interpret the relevance of open data to the goals of specific groups, and creating translations and visualisation of open data to make it actionable. This need for intermediaries to make open data actionable raises the critical question of 'open to whom?' and the wider issues of accessibility. If open data is to be accessible to indigenous people, it must be published in their languages. To be relevant to all parts of the community, open data must provide content on subjects that are the priorities and goals of, for example, black and minority ethnic groups. And if open data is to be used by the 15 per cent of the population who are visually impaired or those who are print-illiterate, it must be published with their **accessibility** in mind. Leaving no one behind in the open data movement will require an increasing focus on accessibility if existing exclusions and disadvantages are not to be reinforced by open data.

Building the **abilities** and **agency** of marginalised actors in the open data ecosystem is core to activities on the **demand-side**. The two are often linked because building people's practical skills and competencies is one effective way to boost their self-efficacy and sense of agency (Bandura 1995). If the efforts of the open data movement were to end with the successful production of actionable open data, we would expect the majority of the benefits to accrue to organisations already privileged with the most capital, expertise and technical capabilities (Gurstein 2011). Open data initiatives can avoid the risk of reflecting, reproducing and amplifying existing (dis)advantage by including measures to increase availability and affordability, improve awareness and accessibility, and enhance the abilities and agency of under-represented and marginalised groups to make effective use of open data.

4.2 The 6 'A's of open data for development

The next sections review the open data literature through the conceptual lens developed above and illustrated in Figure 4.3.

Availability: Increasing the supply-side availability of open data is a stated objective of many organisations in the open data movement including GODAN. Obstacles to increasing the availability of open data can be political, economic, social, or technical, and will vary dynamically over time and space. Barriers may include a lack of political will, the expense of migrating to open data, the inertia of entrenched operating practices, or the clash of incompatible file formats. These situated political, economic, social and technical (PEST) factors are 'key not only in understanding how open data influences change but also with regard to understanding barriers and opportunities that characterise the landscape' (Lokers, Berdou and Ayala 2019: 5–6).

In some contexts, the political will may not exist to publish data to combat government corruption. Research by the Web Foundation (2017: 18) found that 'Open data portals do not contain the data people really want (e.g. data on budget, spending, contracting and company registers). These datasets tend to be highly opaque and are often the least open'. In countries such as Ethiopia, a lack of political will to open government data can be combined with poor internet infrastructure and a tendency of government to frequently shut down the internet for political reasons (Netblocks 2019). However, sometimes there is simply no availability of data to open (e.g. no land title data exists in any format for a region). It is important to recognise that availability is not binary. Sometimes it is available but in low quality: one of the Philippines' foremost open data professionals quipped that the very slow connection speeds available at his home meant that he has plenty of time to go and boil his rice while waiting for a single data set to download (Roberts and Hernandez 2017).

Affordability: Digital devices and data connectivity come at a cost. The process of downloading, processing and analysing data carries financial, time, and opportunity costs. The cost of computers, internet connectivity, and the time of data analysts and staff mean that different organisations have different capacity to acquire, analyse, and apply open data. Affordability issues create inequities between different governments, between corporations and citizens, and between genders. Governments may find it unaffordable to reorganise data collection, update storage and sharing protocols, or to properly maintain and keep open data portals up to date (Davies *et al.* 2019). Multinational companies are less likely to experience affordability barriers when compared to small businesses or civil society organisations. Women's organisations may lack the necessary resources to play an active role in the open data ecosystem or to make effective use of open data in their organisations (Feminist Open Government 2019). Developing open data skills and building influence within the open data movement requires the expenditure of significant amounts of 'free time', a resource that women lack relative to men due to the unequal burden of childcare, cooking and cleaning (Brandusescu and Nwakanma 2019; Feminist Open Government 2019).

Awareness: In order for data to be useful, potential users need to be aware of its existence, its importance and potential applications, and its relevance to their goals and priorities. Zuiderwijk *et al.* (2015) found that lack of awareness about the usefulness and applicability of open data to improve work and life leads to available open data being underutilised. *The State of Open Data* report (Figshare and Digital Science 2019) recently found that awareness of open data is still low even within academic circles and among frequent data sharers, with the majority unaware of open data principles or licensing requirements. Low levels of awareness also exist within civil society with the Feminist Open Government (2019) study finding that women's organisations tend to lack awareness of open data. Organisations advocating the increased supply and use of open data often dedicate significant resources to raising awareness both on the supply-side, encouraging the publication of open data, and on the demand-side, encouraging use. Sometimes those with awareness of the value of open data (e.g. librarians) lack the social power to leverage change. Increasing the agency of open data 'champions' to enhance effective use has been identified as a potential method to increase awareness (Zuiderwijk *et al.* 2015).

Accessibility: Intermediary organisations fulfil multiple roles in the open data movement, including help with the interpretation and translation of open data into actionable formats readily accessible by users. Research by the Web Foundation found that much of the data that is made open is only available in inaccessible formats, where only '7% of government datasets across 115 countries meet all requirements to be considered open data' (2017: 12). In other cases open data may exist in accessible technical formats but not in indigenous

languages, may lack locally relevant content, or be produced in formats that are not accessible to people with visual impairments or by those who are print-illiterate. Ding, Wald and Wills (2014) carried out a survey of open accessibility data which could benefit people with accessibility needs, but such work remains peripheral to the mainstream to date.

Abilities: Demand-side interventions in open data often include efforts to build skills to access and apply online data sets to meet specific goals. The abilities required are most often a combination of digital literacies and sector-specific expertise, neither of which are evenly spread across populations. While government and corporations may be able to purchase these skillsets, they can present a formidable barrier to small businesses, civil society organisations, or disadvantaged individuals wishing to use open data. Open data sets can vary in quality and low levels of user-friendly design have also been identified as a barrier to open data uptake (Zuiderwijk *et al.* 2015). Achieving increased supply and use of open data requires new abilities among open data actors, not just to access data but to develop new services, tools and business models (Berdou *et al.* 2017). These ability barriers have resulted in a role for intermediary organisations to help interpret and make open data actionable by those who do not have specialist technical or sectoral abilities (Gurstein 2011; Zuiderwijk *et al.* 2015; Davies and Perini 2016; Lokers *et al.* 2019; Berdou and Ayala 2019).

Agency: Increasing the supply of **material** resources like data, devices and digital skills can help build a person's agency, but agency is also importantly about a person's psychological resources, including self-confidence and self-efficacy (Roberts 2015). Two people with precisely the same measurable skills and resources may have very different beliefs about their ability to accomplish goals (Bandura 1995). Bandura's body of research established that a person with an elevated sense of their own ability and entitlement is more likely to succeed than an equally talented or able person who has a low sense of their ability and entitlement. This is true for members of all demographic groups but when interventions aim to improve equity of outcomes, it is especially important for groups who have experienced persistent disadvantage or deprivation and who, as a result, have revised downwards their expectations and beliefs about what they are capable of achieving or deserve (Sen 1999).

5. Gender barriers to open data

Gender inequalities pervade the technology sector in general, and the open data movement is no exception. Data is gender-biased (Criado-Perez 2019), is rarely gender-disaggregated (Buvinic *et al.* 2014), and large gender data gaps exist. Brandusescu and Nwakanma argue convincingly that ‘as long as gender data gaps persist, any open datasets created based on raw data that does not adequately represent women will have limited potential to support transformative action on gender equity’ (2019: 194). Women are also under-represented as users of the internet, and of open data in particular. Web Foundation (2017) research found that women are 20 per cent less likely to use the internet to seek out information; are less likely to be consulted on the design of data policies and initiatives; and are under-represented among the ranks of data scientists. Multiple regression analyses from a study of open data usage in India showed that women are less likely to use open data sets than men and that men are more likely to use open data for professional purposes (Saxena and Janssen 2017).

Women are under-represented as participants and employees in the open data movement, especially in senior positions (Brandusescu and Nwakanma 2019), just as they are in science, technology, engineering and mathematics (STEM) in general (UNESCO 2017). In the open data sector women are less likely to be represented in ‘leadership in open data organisations, leading to a gender bias in data collection and publication’ (Brandusescu and Nwakanma 2019: 291). These gendered social norms are internalised and can negatively affect women’s agency to enter and play active roles as producers and users of technology.

Not all women are equally (dis)advantaged. Women from black and minority ethnic communities and women living with disabilities experience overlapping forms of disadvantage (Crenshaw 1989). In their study, the Web Foundation (2017: 20) noted that ‘groups with lower income and/or less political power tend to be excluded from consultation and decision-making processes around open data, frequently lack internet connectivity and the skills to access open data, and may also be less visible in the data in itself’. The Web Foundation (*ibid.*) also found that ‘few open data initiatives actively promote inclusion and equity’. As a result, unless specific and sustained measures are taken, the open data sector risks reproducing and potentially amplifying existing gender and intersectional inequalities. Two recent publications have argued that gender equity needs to be the next frontier in open data (Brandusescu and Nwakanma 2019; Davies *et al.* 2019).

Research has shown that women and girls are significantly less likely to have access to digital devices and internet connectivity, and are more likely to only

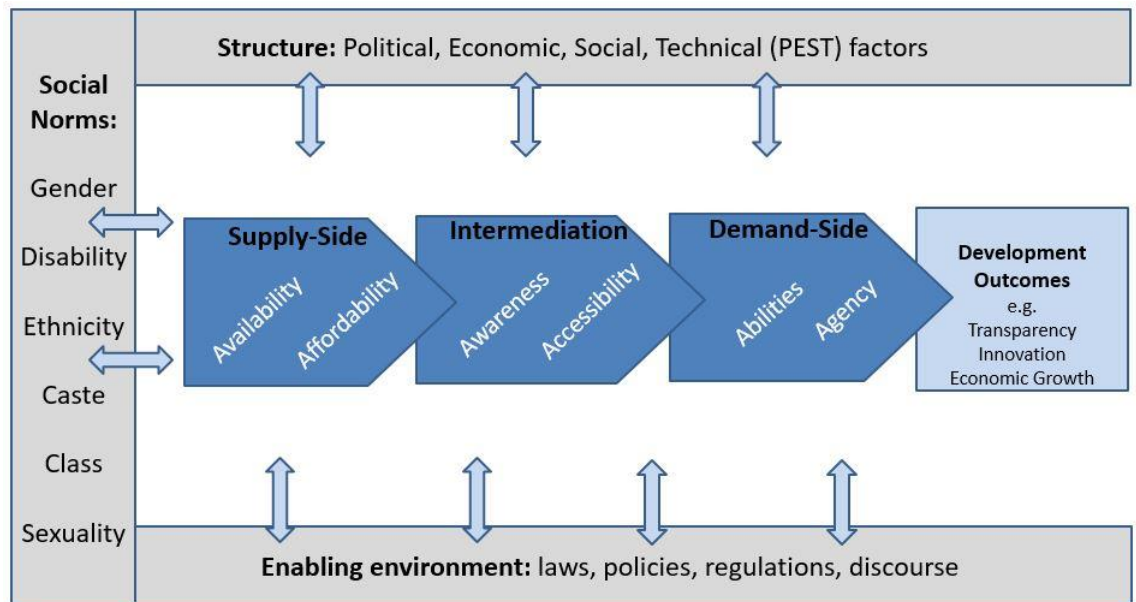
have shared access compared to boys and men (Davies *et al.* 2019; Girl Effect 2018). Moreover, women in the global South tend only to have access to the internet through mobile phones, but most open data applications and tools are not optimised for mobile phones (Brandusescu and Nwakanma 2019). Women are more likely to lack the capacity to contribute to and use data (Brandusescu and Nwakanma 2019). We know that women are under-represented in Open Government Partnership action plan consultations and that gender considerations rarely feature in national action plan commitments (Feminist Open Government 2019). As a result, issues which women find particularly important, including economic empowerment, political leadership, and violence against women, remain largely absent from Open Government Partnership action plans (Feminist Open Government 2019: 9).

These gender barriers to open data are particularly relevant for the purposes of this literature review as the GODAN vision statement specifically targets agriculture and nutrition systems that are more equitable (by gender and socioeconomic status) and GODAN's theory of change commits to proactively seek to address gender imbalance in its engagements (Carolan 2016).

5.1 Power structures

The previous sections reviewed a range of conceptual approaches to analysing open data and used them to apply a critical lens to the existing open data literature. We found the three-phase approaches of Pawelke *et al.* (2017) and Gurstein (2011) to be useful as a way of understanding **supply-side** activities to increase the publication of open data, the **intermediation** of organisations to make open data actionable, and **demand-side** activities to increase the effective use and application of open data. This three-part approach was complemented by the 5 'A's of technology access and required the addition of a sixth 'A' to enable open data accessibility by those with disabilities or speaking indigenous languages. Finally, following McGee and Edwards (2016) and Lokers *et al.* (2019), we found it necessary to situate the open data value chain within the wider context of political, economic, social, and technical factors that shape open data for development, and which open data for development initiatives often seek to shape (hence the two-way arrows below). Together these elements provide us with a conceptual framework for analysing the structural context of technology access (the SCOTA Framework), which is illustrated in Figure 5.1.

Figure 5.1 Structural context of technology access (SCOTA) framework



Source: Authors' own

We find this approach particularly appropriate for evaluating the performance of GODAN because its logframe and theory of change speak directly of 'increasing the supply' of open data, empowering ecosystem intermediaries, and 'increasing the use' of open data. GODAN objectives also explicitly include making open data more available and affordable, and their activities specifically include raising awareness and enhancing abilities.

The next sections use this framework to review the literature on open data for agriculture and nutrition (ODAN) as well as GODAN more specifically.

6. Open Data for Agriculture and Nutrition

Governments, agribusiness, universities, and individual farmers are increasingly producers and consumers of data to improve yields, innovation, and income. Open data holds significant potential for improved environmental, economic and development outcomes. However, asymmetries of power, information and resources present potential barriers to equitable outcomes. A number of organisations have emerged to strengthen the ODAN ecosystem and increase the supply of open data for development.

The agriculture and nutrition sectors present specific challenges for the promotion of open data due to the volume and diversity of stakeholders. The ODAN ecosystem is composed of organisations of farmers, private sector companies, civil society organisations, governments, and multilateral agencies. It includes many specialist groups including agronomists, meteorologists, data scientists, lawyers, land rights activists, and academics. GODAN is one of several global networks that advocate for open data in agriculture and nutrition. The agricultural and nutrition sectors are composed of many inter-related sub-sectors and these inter-connect with many other sectors (e.g. food systems, ecology, nutrition, human health, the environment). To make matters even more complex, each related sector and sub-sector is composed of value chains with many – sometimes thousands – of diverse stakeholders, both internal (e.g. farmers, producer groups, input suppliers, traders, processors, exporters, etc.) and external (e.g. regulators), who are generating different data types, formats, and ontologies and who themselves have differing data needs (Musker *et al.* 2018).

Key organisations in the open data for agriculture and nutrition ecosystem include: the Research Data Alliance (RDA);¹¹ the Global Forum for Agricultural Research;¹² Global Partnership for Sustainable Development Data;¹³ AgriCord;¹⁴

¹¹ The Research Data Alliance has more than 200 members and seeks 'to promote good practice in the research domain'. The Research Data Alliance hosts the Agricultural Data Interest Group (IGAD).

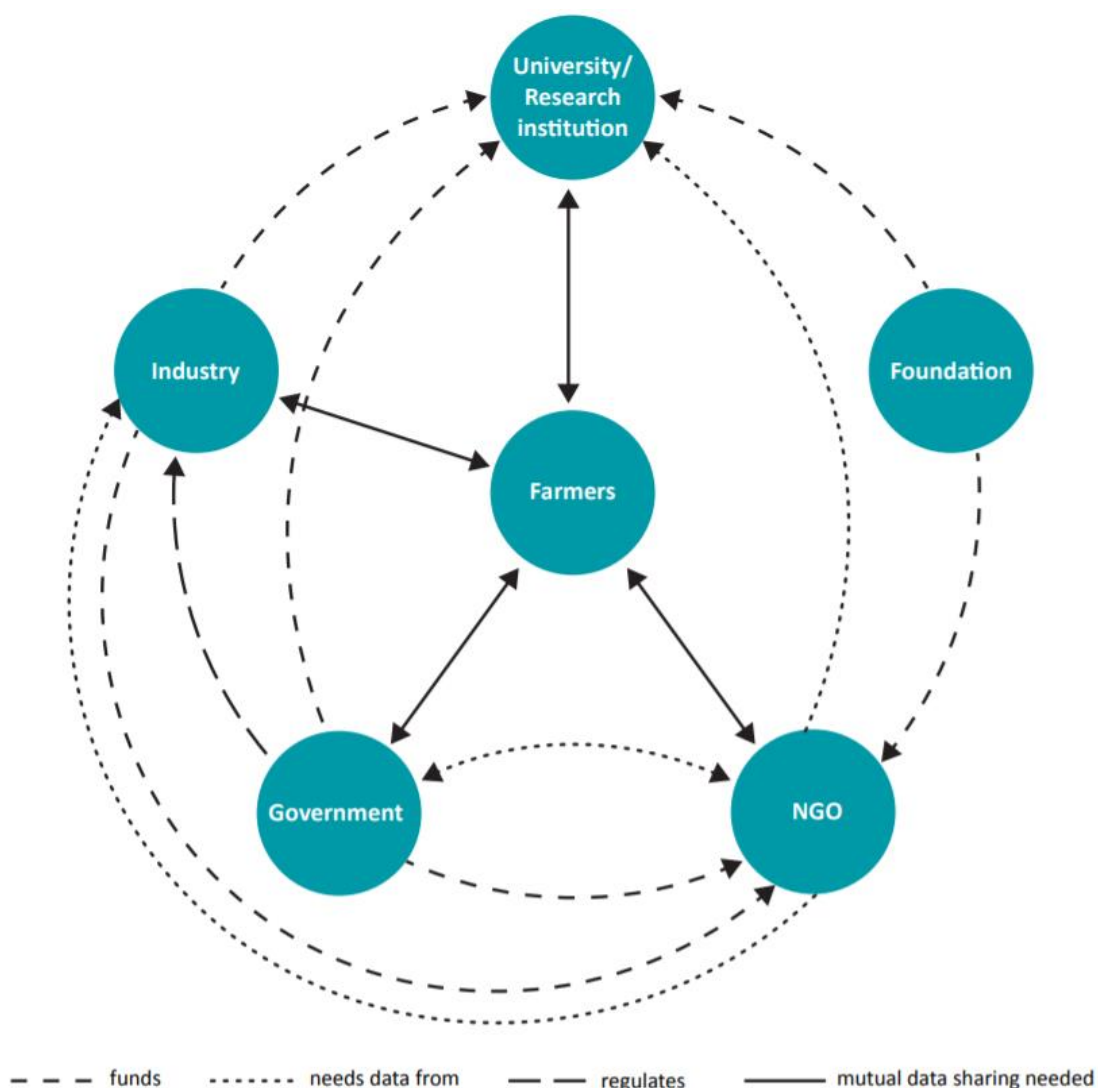
¹² The Global Forum for Agricultural Research is an open and voluntary multi-stakeholder agri-food research and innovation forum with more than 600 partner organisations.

¹³ The Global Partnership for Sustainable Development Data is a multi-stakeholder network of more than 150 data champions harnessing the data revolution for sustainable development, including ODAN members such as the Food and Agriculture Organization and GODAN.

¹⁴ AgriCord is a global alliance of more than 200 farmer organisations from more than 50 developing countries that are part of the Farmers Fighting Poverty programme. It partners with CTA and others to provide support, seeking to strengthen farmer organisations' use of data and ICT.

and Presidents United to Solve Hunger¹⁵ (Schaap *et al.* 2019). Musker *et al.* (2018) mapped the different kinds of actors relevant to open data in agriculture and nutrition and indicated their relationships to one another (see Figure 6.1).

Figure 6.1 Agricultural open data actors and their relationships



Source: Schaap *et al.* (2019: 39), **CC BY 4.0**.

Governments are key actors in the supply side of opening agriculture and nutrition data because they have the power to increase the availability of open data sets such as meteorological, land registry, and nutrition data. The US and the UK were early adopters of open data in agriculture. The availability of open

¹⁵ Presidents United to Solve Hunger is a consortium of 110-plus universities from around the world that have the collective mission to end hunger and poverty, both locally and globally. In partnership with GODAN, the consortium publishes tools and materials that help universities to open up their data.

weather data in the US and the UK generated substantial innovation resulting in economic and social impact through the creation of a multi-million dollar industry of weather tools and information products. Availability of real-time open weather data has enabled some farmers to improve their yields (Mey *et al.* 2019). GODAN has been active on the supply side encouraging government to publish open data sets. GODAN found that governments are often reluctant to open up agricultural and nutrition data for political reasons. For example, in Ethiopia, the ability of private companies to develop applications and tools using weather data is limited by a law that states that only the government is allowed to broadcast localised weather information (Lokers *et al.* 2019). Tanzania recently introduced and revoked a law that made it illegal for anyone to publish data that invalidates or questions government statistics (Lokers *et al.* 2019). There may be economic reasons to keep land data sets closed in order make it easier to sell off plots of land to foreign investors (Mey, Miguel Ayala and Lokers 2018). In fact, 70 per cent of land data is unregistered (Mey *et al.* 2018). However, in many cases, land data cannot be made open because land ownership has never been documented and the cost of land registry maintenance is unaffordable (Lokers *et al.* 2019).

Governments are important not only as producers of their own data. They are also key because of their power to require private sector and academic actors to open their data (Schaap *et al.* 2019). Governments can help to provide an enabling environment for open agricultural data through the creation of laws, policies, and regulation, but also by leading a public discourse on the benefits of ODAN. GODAN has successfully leveraged this power by including national governments in the ODAN ecosystem. GODAN played a central role in facilitating the 2017 Nairobi Ministerial Conference on Global Open Data for Agriculture and Nutrition at which 15 African ministers signed a declaration of commitment to publish open data and to raise awareness around open data for agriculture and nutrition. The Nairobi Declaration has inspired Francophone countries to develop their own network, the Conference d’Afrique Francophone sur les Données Ouvertes (CAFDO) (Schaap *et al.* 2019). GODAN has published a guide to opening data for agriculture to help other countries to join the movement (Open Data Charter and GODAN 2018). This is clear evidence of GODAN progress against its logframe objective ‘to empower the ecosystem by creating an overarching enabling environment for open data for agriculture and nutrition’.

Standard-setting has been identified as essential supply-side activity to improve interoperability and so increase open data availability and use. The many sub-fields of agriculture and other related fields each have their own data standards. However, these standards tend not to be interoperable with one another, making it difficult for users to combine data sets within and across value chains to garner insights (Schaap *et al.* 2019). GODAN Action mapped agricultural standards and found a low level of interoperability (Schaap *et al.* 2019). For example, GODAN

has found that nutrition data is often labelled differently by different organisations using different categories for regions and sub-regions, and different terms to describe nutritional status (Berdou and Lokers 2019; Lokers *et al.* 2019). GODAN Action found that only 56 per cent of agri-food data standards are machine-readable; just 21 per cent are available under an open licence; and 16 per cent are not even available online (Pesce *et al.* 2018; Schaap *et al.* 2019). GODAN is actively working on this important supply-side issue, seeking to increase the availability of open data by promoting open and interoperable standards through the VEST Registry in partnership with the Agricultural Information Management Standards (AIMS) initiative. The literature review was unable to identify evidence of the extent to which this has been accomplished or to what extent gains that have been made were attributable to GODAN activities.

Farmers are at the centre of the ODAN ecosystem, as illustrated above in Figure 6.1. This includes global agribusinesses down to individual smallholders. GODAN has multinational agribusiness companies, including Syngenta, among its members. A power imbalance exists between actors with regard to data availability and affordability (Ferris and Rahman 2017). Organisations are able to interpret and apply data for agriculture and nutrition in proportion to their capital, connectivity and capacity. This has led to new ethical concerns about who owns farm data and who profits from its aggregation and sale, as well as concerns about the lack of transparency about how data is ultimately used by more powerful actors (*ibid.*). Given the profit motive of private companies, some of their data sets are seen as commercial assets and are thus not opened up, even when they hold the potential to improve sustainable development outcomes (Schaap *et al.* 2019). Although many agribusiness companies in the private sector lack transparency and have shown minimal interest in opening their data, some are beginning to see opening data as part of maintaining a 'licence to operate'. Syngenta is one company that has made open data a centrepiece of its transparency strategy (Schaap *et al.* 2019).

Farmers and farm machinery increasingly generate primary agricultural data that can potentially be used to improve yields and profits. Although this data may be open and freely available, an **affordability** barrier often remains for smallholder farmers who lack the means to collect or use such data. 'Financial cost [is] the most common challenge mentioned by GODAN partners when working towards open data' (Musker *et al.* 2018: 8). Private sector companies are less likely to face an affordability barrier than smallholders who may have to depend on **intermediaries** (Gurstein 2011). Intermediary organisations from government, the private sector, universities, or NGOs, have emerged to help farmers interpret and apply open data. Intermediaries 'develop portals, apps, and tools that allow farmers to benefit from data on a range of topics, such as weather, infestations, or soil quality, that would otherwise be unavailable to them' (Schaap *et al.* 2019: 40). Intermediaries have also piloted accessibility solutions to overcome barriers of

language and literacies. Communicating open data through Interactive Voice Response (IVR) has been proposed as a potential solution but has been found to be expensive for farmers and service providers (Ferris and Rahman 2017). Universities and academics are often intermediaries and play active roles in producing open agriculture and nutrition data;¹⁶ or take part in data discovery networks like the RDA and the Interest Group on Agricultural Data (IGAD) (Schaap *et al.* 2019). Funders of agricultural research are increasingly requiring that data collected during projects they fund is made public, including USAID and the Gates Foundation (*ibid.*).

Ferris and Rahman (2017) found that farmers often lack awareness of open data and its potential benefits, and that this limits its uptake once data is published openly. Lokers *et al.* (2019) found that ODAN initiatives are often stymied by low levels of awareness and understanding about the existence of open data and its relevance for agriculture and nutrition. GODAN and intermediary ODAN organisations have had significant success in raising high-level awareness about the potential of open data for agriculture and nutrition. However, at the lower level of marginalised groups, the literature review was unable to find independent evidence of GODAN's intermediate-level objective of 'increasing access to open data in disadvantaged constituencies'. A Google Scholar search of articles with 'open data' and 'agriculture' in the title returned only 49 results, many of which were technical concept notes for proposed future open data solutions; were about something other than open data; or was GODAN-commissioned research, or reference to GODAN-convened events or workshops. A search for published material with 'open data' and 'nutrition' in the title returned only 20 results with similar drawbacks. This echoes Davies and Perini's (2016) findings about open data research more widely, that although the literature is expanding, there is very little sustained empirical work on the intermediate outcomes or development impacts of open data. The open data for agriculture and nutrition research that does exist is focused primarily on supply-side potentials, problems, and policy alternatives rather than evaluation of outcomes. This means that there is no substantial evidence base to support claims of the efficacy of open data for agriculture and nutrition pro-poor outcomes.

GODAN does publish its own series of 'impact narratives', which are very effective in communicating potential, but which cannot be considered to be independent evidence of achievement against its intermediate high-level impacts. GODAN Action's nutrition impact narratives have shown how open data collated by intermediaries like the Global Nutrition Report could be interpreted and repurposed to fit regional and local needs through the African Nutrition Scorecard to support local awareness-raising and advocacy for data-based decision-making on policies, programmes, and targeted interventions that meet

¹⁶ For example, [the e-ROSA Project](#) on the GODAN website.

local demands (Lokers *et al.* 2019). This outcome was the result of Global Nutrition Report shifting its focus from only producing a document with data contained within, to becoming a 'living repository' and open data publisher by also making its metadata and data available openly.

GODAN Action's Open Land Data narratives illustrate how the intermediary organisation Land Portal was able to increase the quality, accessibility, interoperability, and global visibility and use of data from Land Conflict Watch, a local data journalism project in India (Lokers *et al.* 2019). Another land impact narrative published by GODAN Action illustrates how the intermediary organisation Open Development Cambodia was able to coordinate many actors from civil society that are collecting land data on land concessions to overcome issues of conflicting and inconsistent data, through aggregating and cleaning data using open data principles. Lokers *et al.* (2019: 46) found that through 'a unified basis and voice for the civil society, coupled with international media coverage and pressure, the government postponed the grant of land concessions to the private sector and hastened granting social land concessions to the poor'.

Intermediary organisations often play a key role in helping to interpret and translate open data for agriculture and nutrition in various ways. The format in which open data is available is important in enabling effective use. Evidence from the real-time data for development field has shown that the likelihood of data usage is increased if it is shared in multiple formats tailored to the needs and abilities of different user groups (Barnett and Edwards 2014). Similar findings have been recorded in the open data for nutrition literature. Rather than over-reliance on digital formats, synthesising findings from open data may be more appropriate for some audiences (Lokers *et al.* 2019); the African Scorecard on Nutrition found that accessibility was improved through the provision of hard-copy reports.

GODAN's own research found that the programme struggles to ensure that open data benefits farmers (Musker *et al.* 2018). It is widely accepted that smallholder farmers tend to have relatively little capacity to exploit data and that the gap in abilities and agency is greater in low-income countries, in rural areas, and for women (Schaap *et al.* 2019). This is particularly important in the areas of ODAN because making effective use of open data for agriculture and nutrition often requires domain-specific expertise as well as digital and data literacies. For example, nutrition data includes scientific classifications and measurements that may not be in the general lexicon. Similarly, because weather data is technical and scientific in nature, using it in its raw form requires scientific meteorological expertise (Lokers *et al.* 2019). We were unable to find independent research literature that provides evidence of measurable progress in demand-side initiatives to build the abilities and agency of marginalised groups to make

effective use of open data for agricultural and nutrition. GODAN and GODAN Action have run many training workshops and its online e-learning course has had an impressive 4,448 participants (Janssen 2019). However, people who are able to participate in online training programmes have levels of connectivity, digital literacy and language skills that are not typical in marginalised communities.

Withholding agency from open data programmes can sometimes be strategic on the part of citizens. Even when data is open and available, some people or groups may have reason not to trust data coming from government or see no probable benefit from providing it (Lokers *et al.* 2019). Citizens who mistrust powerful actors may withhold their agency and not engage in open data initiatives. For example, local land data-holders may choose to keep their data closed if they fear that sharing it with government might lead to their land title being usurped rather than legitimised (Mey *et al.* 2018). These fears are not unfounded. An early land registration digitisation project in Bangalore found that digitisation efforts led to increased corruption and facilitated the acquisition of settled but unregistered land by powerful private companies (Benjamin, Bhuvaneshwari and Rajan 2007), amplifying existing patterns of (dis)advantage.

The need to address **gender** inequalities and under-representation in open data has only recently begun to receive sufficient attention (Feminist Open Government 2019). Berdou and Lokers (2019) found that nutritional data tends not to be sufficiently disaggregated by gender and other demographics, making it more difficult to use data to advocate for the needs of women or develop policies and solutions that meet their needs. GODAN explicitly recognised the problems of gender data bias and the under-representation of women in ODAN when it wrote its gender mainstreaming policy in 2016 (GODAN 2016). A number of commitments were made in the gender mainstreaming policy including to build a diverse organisation and to integrate gender issues into the theory of change and logframe. However, the theory of change and logframe have not been updated to reflect these commitments. Although the GODAN theory of change mentions gender equity as an objective, the logframe lists no gender activities and contains no pathway activities designed to redress the gender inequities that GODAN identified in its gender mainstreaming policy. Although GODAN has contributed significantly to the evidence base on ODAN, it has not focused research attention on the intersection between gender and open data for agriculture and nutrition.

GODAN is playing a significant role in producing an evidence base for open data in agriculture and nutrition. However, there is little independent empirical or peer-reviewed literature measuring the impact of ODAN activities. Most of the evidence that does exist was produced by GODAN (Berdou *et al.* 2017; Berdou and Lokers 2019; Mey *et al.* 2019, 2018). Much of that evidence takes the form

of narratives of initiatives by GODAN partners and often does not make clear what role – if any – GODAN played in convening, equipping, or empowering the actors in the narratives. GODAN seems to play a key role but the existing literature does not detail its extent in a way that helps to inform a performance review.

7. Conclusions and future issues in ODAN

Based on our review of the existing literature, GODAN appears to have made substantial progress in achieving its supply-side objectives of expanding the quantity of organisations signed up to open data principles, and has played a central role in securing the increase in availability of open data for agriculture and nutrition. GODAN has been successful in creating high-level awareness and policy commitments that have contributed to generating political will and an enabling environment for open data in agriculture and nutrition. GODAN has also produced or contributed to a range of highly valuable tools, policy engagements, and research papers that have further advanced its objectives. GODAN members have played a range of influential intermediary roles, raising awareness and assisting others to interpret and apply open data.

This success is inevitably uneven across countries as well as among stakeholders within countries. There is less evidence of farm-level awareness, especially among rural smallholders, or of demand-side progress more generally. We found no evidence of sustained or systematic work to address the data accessibility needs of speakers of indigenous languages, print-illiterate stakeholders, or people living with disabilities. The GODAN theory of change and logframe lack activities or a planned pathway of change to address gender diversity and the under-representation of women in open data.

The relative lack of attention to demand-side factors, including building the abilities and agency of marginalised groups, may mean that GODAN operational objectives are met but with the unintended consequence that the organisations most empowered to exploit open data could be multinational agribusiness corporations.

The examples of Ethiopia, Tanzania and the US illustrate the point that initial gains in securing high-level support for open data can also be reversed when more authoritarian governments close civic space. We were unable to access data on GODAN's membership in an open and accessible FAIR format. The GODAN website lists members' logos but this data is not readily downloadable or searchable.

7.1 Gaps in the existing research literature

The majority of the research to date has been focused on supply-side mechanisms.

There has been no independent evaluation of who benefits or who is being left behind in open agriculture and nutrition data.

There has been no independent evaluation of gender or diversity in ODAN.

There has been no independent evaluation of the extent of the international development impacts of open data for agriculture and nutrition.

The existing research on open data for agriculture and nutrition is over-reliant on GODAN actors and open data insiders. This creates bias in the data.

7.2 Recommendations

ODAN organisations should increase the emphasis paid to demand-side and intermediary initiatives in order to ensure that marginalised communities are not left behind in open data initiatives.

Funders should commission a strategic review of ODAN that encompasses the structural factors shaping the process of ODAN and which pays attention to intermediary and demand-side processes. The SCOTA Framework may provide a useful starting point for such a review.

Research commissioners should prioritise independent research that addresses the gaps identified in the existing literature to determine who benefits most from ODAN, and who is being left behind in open agriculture and nutrition data.

References

- Allemang, D. and Teegarden, B. (2017) *A Global Data Ecosystem for Agriculture and Food*, GODAN (accessed 6 March 2020)
- Bandura, A. (1995) *Self-Efficacy in Changing Societies*, Cambridge: Cambridge University Press
- Barnett, I. and Edwards, D. (2014) *Mobile Phones for Real-time Nutrition Surveillance: Approaches, Challenges and Opportunities for Data Presentation and Dissemination*, IDS Evidence Report 75, Brighton: Institute of Development Studies (accessed 14 January 2021)
- Benjamin, D.S.; Bhuvanewari, R. and Rajan, P. (2007) *Bhoomi: 'E-Governance', Or, An Anti-Politics Machine Necessary to Globalize Bangalore?*, CASUM-m Working Paper 53, CASUM-m
- Berdou, E. and Ayala, L. (2018) *GODAN Action – A Review of Relevant Methods and Frameworks for Impact Evaluation of Open Data*, F1000 Research, DOI: 10.7490/f1000research.1115589.1 (accessed 25 January 2021)
- Berdou, E. and Lokers, R. (2019) *Nutrition Data Impact Evaluations: Guidelines for Analysing Pathways to Impact*, GODAN Action Learning Paper, GODAN (accessed 29 January 2020)
- Berdou, E.; Miguel Ayala, L.; Lokers, R.; Smith, F. and L'Henaff, P. (2017) *Impact Narratives: Pathways to Encourage and Support Co-Development of Farm Management Services*, GODAN Action Learning Paper, GODAN (accessed 29 January 2020)
- Brandusescu, A. and Nwakanma, N. (2019) *'Issues in Open Data: Gender Equity'*, in T. Davies, S.B. Walker, M. Rubinstein and F. Perini (eds), *The State of Open Data: Histories and Horizons*, Cape Town: African Minds (accessed 21 January 2020)
- Buvinic, M.; Furst-Nichols R. and Koolwal G. (2014) *Mapping Gender Data Gaps*, data2x.org (accessed 25 January 2021)
- Carolan, L. (2016) *GODAN Theory of Change* (accessed 12 March 2020)
- Chignard, S. (2013) *'A Brief History of Open Data'*, *Paris Innovation Review* (accessed 11 March 2020)
- Crenshaw, K. (1989) *Demarginalising the Intersection of Race and Sex: A Black Feminist Critique of Antidiscrimination Doctrine and Antiracist Politics*, University of Chicago Legal Forum 1989
- Criado Perez, C. (2019) *Invisible Women: Exposing Data Bias in a World Designed for Men*, London: Vintage
- Davies, T. and Perini, F. (2016) *'Researching the Emerging Impacts of Open Data: Revisiting the ODDC Conceptual Framework'*, *Journal of Community Informatics* 12.2 (accessed 27 January 2020)
- Davies, T.; Walker, S.B.; Rubinstein, M. and Perini, F. (eds) (2019) *The State of Open Data: Histories and Horizons*, Cape Town: African Minds (accessed 21 January 2020)
- Ding, C.; Wald, M. and Wills, G. (2014) *'A Survey of Open Accessibility Data'*, in Proceedings of the 11th Web for All Conference, April 2014, Article 37 (accessed 11 December 2020)
- Feminist Open Government (2019) *Addressing Gender Equity Challenges in Open Government Co-Creation Processes: Case Studies from Latin-America, Africa, and Asia*, Open Data for Development (OD4D) (accessed 14 January 2021)
- Ferris, L. and Rahman, Z. (2017) *'Responsible Data in Agriculture'*, F1000Research (accessed 14 January 2021)
- Figshare and Digital Science (2019) *The State of Open Data 2019*, Springer Nature (accessed 14 January 2021)
- Girl Effect (2018) *Real Girls, Real Lives, Connected: A Global Study of Access and Usage of Mobile, told through 3000 Voices*, Girl Effect (accessed 25 January 2021)
- GODAN (2016) *'Gender Mainstreaming Approach'*, Global Open Data for Agriculture and Nutrition (accessed 22 January 2021)
- Gurstein, M. (2011) *'Open Data: Empowering the Empowered or Effective Data Use for Everyone?'*, *First Monday* 16.2 (accessed 14 January 2021)

- Gurstein, M. (2003) '**Effective Use: A Community Informatics Strategy Beyond the Digital Divide**', *First Monday* 8.12 (accessed 14 January 2021)
- Hernandez, K. and Roberts, T. (2018) '**Leaving No One Behind in a Digital World**', K4D Emerging Issues Report, Brighton: Institute of Development Studies (accessed 11 December 2020)
- Ibrahim, S. and Alkire, S. (2007) *Agency and Empowerment: A Proposal for International Comparable Indicators*, OPHI Working Paper, Oxford: Oxford Poverty & Human Development Initiative
- IDRC (2019) '**Open Data for Development (OD4D) Annual Report 2018–19**', Ottawa: International Development Research Centre (accessed 25 January 2021)
- Janssen, S. (2019) '**GODAN Action – Lessons Learned**', webinar presented at the Interest Group on Agricultural Data (IGAD) Pre-Meeting of the Research Data Alliance (RDA) 13th Plenary 2019 (accessed 25 January 2021)
- Lokers, R.; Berdou, E. and Ayala, L.M. (2019) '**Guidelines for Analysing Pathways to Impact: Evaluation of Open Data for Development**', *F1000Research* 8:2115 (accessed 28 January 2019)
- Manyika, J. et al. (2013) *Open Data: Unlocking Innovation and Performance with Liquid Information*, London, San Francisco, Shanghai: McKinsey Global Institute
- McGee, R. and Edwards, D. (2016) '**Opening Governance – Change, Continuity and Conceptual Ambiguity**', *IDS Bulletin* 47.1: 1–22, DOI: [10.19088/1968-2016.103](https://doi.org/10.19088/1968-2016.103) (accessed 11 December 2020)
- Mey, L.; Berdou, E.; Miguel Ayala, L. and Lokers, R. (2019) '**Open Data Impact Narratives: Stories of Impact of Open Data in Agriculture and Nutrition**', GODAN Action Learning Paper, GODAN Action (accessed 29 January 2020)
- Mey, L.; Miguel Ayala, L. and Lokers, R. (2018) '**Land Data Impact Evaluations: Guidelines for Analysing Pathways to Impact**', GODAN Action Learning Paper, GODAN Action (accessed 29 January 2020)
- Musker, R.; Tumeo, J.; Schaap, B. and Parr, M. (2018) '**GODAN's Impact 2014-2018 – Improving Agriculture, Food and Nutrition with Open Data**', *F1000Research* 8:2115 (accessed 14 January 2021)
- Netblocks (2019) '**Ethiopia Internet Shutdown Continues Following Reported Coup Attempt**', 24 June (accessed 22 January 2021)
- OGP (2018) *The Skeptic's Guide to Open Government*, Washington DC: Open Government Partnership
- Open Data Charter and GODAN (2018) '**Open Up Guide for Agriculture**' (accessed 5 March 2020)
- Open Data Institute (n.d.) '**Our Vision – The ODI**', blog (accessed 11 March 2020)
- Open Data Institute (2018) '**Mapping Data Ecosystems**' (accessed 11 March 2020)
- Ornemark, C. (2017) 'Gender and Open Data: Is There an App for That?', *CTA ICT Update* 84: 16–18
- Pawelke, A.; Canares, M.; Hernandez, K. and Prieto Martín, P. (2017) '**Data for Development: What's Next? Concepts, Trends and Recommendations for German Development Cooperation**', Bonn: Web Foundation and Institute of Development Studies (accessed 25 January 2021)
- Pesce, V. et al. (2018) '**A Map of Agri-food Data Standards**' (accessed 14 January 2021)
- Rizk, N.; Salem, N. and Felsberger, S. (2019) '**Open Data Around the World: Middle East and North Africa**', in T. Davies, S.B. Walker, M. Rubinstein and F. Perini (eds), *The State of Open Data: Histories and Horizons*, Cape Town: African Minds (accessed 21 January 2020)
- Roberts, T. (2017) '**Digital Technologies Exclude**', Making All Voices Count Blog, 2 May (accessed 14 January 2021)
- Roberts, T. (2015) 'Critical Agency in ICT4D', unpublished PhD thesis, Royal Holloway, University of London
- Roberts, T. and Hernandez, K. (2019) '**Digital Access is Not Binary: The 5 'A's of Technology Access in the Philippines**', *Electronic Journal of Information Systems in Developing Countries*, DOI: [10.1002/isd2.12084](https://doi.org/10.1002/isd2.12084) (accessed 25 January 2021)
- Roberts, T. and Hernandez, K. (2017) '**The Techno-centric Gaze: Incorporating Citizen Participation Technologies into Participatory Governance Processes in the Philippines**', Making All Voices Count Research Report, Brighton: Institute of Development Studies (accessed 11 December 2020)
- Rumbul, R. (2016) '**Developing Transparency through Digital Means? Examining Institutional Responses to Civic Technology in Latin America**', *JeDEM* 8.3: 12–31 (accessed 25 January 2021)

Open Data for Agriculture and Nutrition: A Literature Review and Proposed Conceptual Framework

Sapkota, K. (2014) *Exploring the Impacts of Open Aid Data and Budget Data in Nepal*, Nepal: Open Data in Developing Countries (accessed 27 January 2019)

Saxena, S. and Janssen, M. (2017) '**Examining Open Government Data (OGD) Usage in India through UTAUT Framework**', *Foresight* 19.4: 421–36 (accessed 14 January 2021)

Schaap, B.; Musker, R.; Parr, M. and Laperriere, A. (2019) '**Open Data and Agriculture**', in T. Davies, S.B. Walker, M. Rubinstein and F. Perini (eds), *The State of Open Data: Histories and Horizons*, Cape Town: African Minds (accessed 21 January 2020)

Sen, A. (1999) *Development as Freedom*, Oxford: Oxford University Press

UNESCO (2017) *Cracking the Code: Girls' and Women's Education in Science, Technology, Engineering and Mathematics (STEM)*, Paris: UNESCO

Web Foundation (2017) *Open Data Barometer: Global Report*, Web Foundation (accessed 30 January 2020)

Web Foundation (2015) *Women's Rights Online Translating Access into Empowerment*, Web Foundation (accessed 25 May 2016)

Wilkinson, M. *et al.* (2016) '**The FAIR Guiding Principles for Scientific Data Management and Stewardship**', *Sci Data* 3: 160018, DOI: 10.1038/sdata.2016.18 (accessed 25 January 2021)

Zuiderwijk, A.; Janssen, M. and Dwivedi, Y.K. (2015) '**Acceptance and Use Predictors of Open Data Technologies: Drawing upon the Unified Theory of Acceptance and Use of Technology**', *Government Information Quarterly* 32.4: 429–40 (14 January 2021)



Delivering world-class research, learning and teaching that transforms the knowledge, action and leadership needed for more equitable and sustainable development globally.

Institute of Development Studies
Library Road
Brighton, BN1 9RE
United Kingdom
+44 (0)1273 606261
ids.ac.uk

Charity Registration Number 306371
Charitable Company Number 877338
© Institute of Development Studies 2021