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Advancing the Use of Digital Technology by Africa's Female Farmers: Shortcomings in Data Protection Regulations

Uchenna Felicia Ugwu*

Abstract: Over the past few decades, the nature of agricultural activity has been transformed by the development of digital technology, along with the creation of data protection rights in intellectual property agreements. While the potential of data and digital technologies to help Africa overcome food insecurity and poverty, and the importance of female small-scale farmers (FSF) in improving food security in Africa are generally acknowledged,[1] the legal and policy framework necessary for enhancing the use of digital technology by Africa's FSF remains relatively unknown. This paper helps to fill in the gap by examining the issues that affect the ability of African women to utilize digital technology for better agricultural productivity and how these are influenced by data protection regulations.

The paper highlights the need for an integrated approach to data regulation, that involves providing specific provisions for enhancing gender equality and inclusiveness for females, as key to closing the gender gap to accessing digitalization by female smallholder farmers in Africa. Further, by reviewing examples of best practices and policies of countries that have provisions for inclusivity in current data protection laws, the paper proposes a template for how the 'inclusivity' principle can be applied in designing data protection systems laws and policies that are suitable for advancing productivity by female smallholder farmers in Africa. Analysis is made of four issues: I. The Relationship between Data Protection, Precision farming and Female Smallholder Farmers in Africa; II. The Forms of Data Generated by Female Smallholder Farmers in Africa; III. Challenges in Data Protection Rules Inhibiting Utilization of Agricultural Data Technology by Africa's Female Smallholder Farmers; and IV. Recommendations for Integrating Africa's FSF's Needs within Data Protection Regulations.

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See WFO Policy on Women in Agriculture, World Farmers' Org. (last visited Nov. 23, 2021), https://www.wfo-oma.org/wp-content/uploads/2019/05/WFO_Policy_on_Women_in_Agriculture.pdf; U.N. Secretary-General, *The role of science, technology and innovation in ensuring food security by 2030*, delivered to ESCOR, ¶¶ 56-57, 73-75, U.N. Doc. E/CN.16/2017/3 (Feb. 27, 2017); SOFA Team & Cheryl Doss, *The Role of Women in Agriculture* (UN FAO Agrifood. Econ. Div. (ESA), Working Paper No. 11-02, 2011) [hereinafter ESA Working Paper], https://www.fao.org/3/am307e/am307e00.pdf; Wanjiru Kamau-Rutenberg, *Gender equality in African agriculture: An innovation imperative*, WIPO Mag. (Apr. 2018), https://www.wipo.int/wipo_magazine/en/2018/02/article_0006.html.

1 Introduction

Over the past few decades, the nature of agricultural activity has been transformed by the development of digital data technology. Digitalization has been defined as the use of digital technologies and data as well as their interconnection which results in new or changes to existing activities.[2] Agricultural technologies can provide information for farmers regarding potential weather changes, possible markets, improved agricultural processes and disease resistant varieties, that has the potential to advance agricultural production. Because data protection and information and communication technologies (ICT) regulations determine the condition for accessing digital technologies and related data useful for precision agriculture, they will affect sectors which utilize data, including agriculture, and influence rights connected to the sector such as food security and gender empowerment.

Agriculture is the most important sector of the African economy and will have to be its driving engine out of poverty. "It accounts for 65% of the continent's employment and 75% of its domestic trade."[3] It provides employment for about two-thirds of the continent's working population and for each country contributes an average of 30 to 60 percent of gross domestic product (GDP) and about 30 percent of the value of exports.[4] In contrast to developed countries, farming in Africa is dominated by smallholder subsistence farmers.[5] Women form a majority of the agricultural work force in African countries.[6] Thus, empowering FSF is especially important for sustainable economic growth.

Despite the potential that digitalization has for development, it has not been evenly accessible by all stakeholders. One group of people that have found it difficult to access digitalization is female smallholder farmers in Africa. *The Digitalisation of African Agriculture Report 2018-2019* estimates that in Sub-Saharan Africa (SSA) where 40–50% of smallholder farmers are women, only 25% are registered users of digitalization for agricultural solutions.[7] The data suggests that current IP and data related regulations are not sufficiently prioritizing gender and need to be re-designed to be more inclusive.

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2 OECD, *Bridging the Gender Divide: Include, Upskill, Innovate* (2018), https://www.oecd.org/digital/bridging-the-digital-gender-divide.pdf.

3 Kandeh K. Yumkella (Dir. Gen. U.N. Ind. Dev. Org.), quoted in Imara Afr. Sec. Team, Agriculture – 'The most important sector of the African economy', How we made it in Africa (Aug. 25, 2012), https://www.howwemadeitinafrica.com/agriculture-%E2%80%93-the-most-important-sector-of-the-african-economy/19649/; *Agriculture and Food Security (West African Regional)*, USAID (last updated Oct. 6, 2021) [hereinafter *Agr. & Food Sec.*], https://www.usaid.gov/west-africa-regional/agriculture-and-food-security.

4 *See Agriculture of Africa*, Britannica (last updated Sep. 28, 2021), https://www.britannica.com/place/Africa/Agriculture.

5 *See* Daniel Callo-Concha et al., *Farming in the West African Sudan Savanna: Insights in the context of climate change*, 8 Afr. J. Agric. Rsch. 4693 (2013); *Agr. & Food Sec.*, *supra* note 3.

6 *See* D.E. Tempelman, *Africa*, *in* FAO, *Rural Women and Food Security: Current Situation and Perspectives* (1998), http://www.fao.org/3/W8376E/w8376e03.htm.

7 Ctr. Agric. & Rural Coop. & Dalberg Advisors, *The Digitalisation of African Agriculture Report 2018-2019: Executive Summary* 15 (2019), available at CGSpace, https://cgspace.cgiar.org/bitstream/handle/10568/103198/Executive%20Summary%20V4.5%20ONLINE.pdf.

Because women form a large percentage of the subsistence farmers who supply food in the continent, this gender gap can have dire consequences for agricultural production and food security in Africa. Further, female smallholder farmers play a vital role in innovation by sharing knowledge of agricultural products, based on traditional knowledge, on plant varieties and their therapeutic uses. Thus, they are not just users of information, but also producers of data used for innovation, whose privacy and data ownership rights should be protected.[8] The large gender gap in utilization of data and digital technologies by women, makes it important to design a more inclusive framework for data regulation suitable for the African context.

While studies exist examining the role of digital data and ICT in advancing agricultural production, little analysis has been made of the relationship between intellectual property rights (IPRs), digital data regulation and the development of female smallholder farmers in Africa. Existing studies focus on the role of women as users of information, technology and markets,[9] rather than on their role as active participants in the innovative process. *This article takes the alternative approach focusing on the role of women farmers as generators, as well as users of data*. It applies an interdisciplinary research method to examine the following question: How can intellectual property (IP) and data protection regulations related to agriculture be adjusted to be more inclusive of the needs of female smallholder farmers in Africa? Analysis is carried out in the following steps: First an interdisciplinary review is made of relevant socio-economic, agricultural and legal literature, to define the relationship between data protection, precision farming and its benefits to Africa's women smallholder farmers. Second doctrinal analysis is made of relevant laws to determine the shortcomings in inclusiveness for women farmers in contemporary data policies. Third, critical analysis is made of how data protection regulations affect sustainable and equitable agriculture. Fourthly, recommendations are made for advancing inclusiveness of Africa's women farmers interests in data protection regulations.

2 The Relationship between Data Protection, Precision Farming and Africa's Women Smallholder Farmers

2.1 The Nature of Precision Farming

Precision farming is an agricultural method that makes intensive use of data about specific geographical location and crop genetics to enhance production. In contrast to conventional agricultural methods, using precision farming can increase agricultural productivity while reducing the negative environmental effects of agriculture.[10]

8 *See* Stella E. Igun, *Gender and National Information and Communication Technology (ICT) Policies in Nigeria*, *in* Blessing Maumbe & Julius J. Okello eds., Technology, Sustainability and Rural Development in Africa 284, 287 (2013).

9 *See* Julius J. Okello et al., *A Framework for Analyzing the Role of ICT on Agricultural Commercialization and Household Food Security*, 1 Int'l J. ICT Rsch. & Dev. Africa 38 (2010); Maumbe & Okello eds., *supra* note 8.

10 *See* Simone Geisler, *Digitisation in agriculture – from precision farming to farming 4.0*, Bioökonomie (Apr. 9, 2018), https://www.biooekonomie-bw.de/en/articles/dossiers/digitisation-in-agriculture-from-precision-farming-to-farming-40.

An example of precision farming is where sensors are used to provide data regarding soil properties, disease resistant crop varieties, temperature and moisture, that would help farmers know how to irrigate their farms while using less water. Hydroponics is another precision farming method where the plants are grown in a nutrient solution rather than in soil.[11] Hydroponic farming reduces the need for soil, eliminating soil-borne diseases and pests, weeds, and the use of herbicides and pesticides, while producing ten times the quantity of crops as traditional farming. Hydroponic systems also reduce water waste and the number of natural resources needed to grow while allowing greater control over climate, nutrients and growing conditions.[12] Utilising hydroponics in farming requires a vast amount of data regarding when to farm, the type and quantity of nutrients that can be used instead of soil, the temperatures required, and the seeds and conditions suitable for each individual crop.

What is precision farming technology?
A hypothetical example: A company has designed a mobile app for smallholders that is paired with cheap and easy to use soil sensors. The sensor uses light emitting diode (LED) signals to tell the farmer when it is time to irrigate their crops. The app uses the farmer's global positioning system (GPS) location data, and pairs it with the soil information collected by the sensors, and then provides recommendations to the farmer about the right fertilizers and seeds to use based on their individual particular needs. The app also includes a free texting service that responds to the farmer's questions about things like pests and disease control and provides information about market prices for the crops the farmer is growing. Farmers who have used this service can reduce their water usage, use the right inputs for their land and get better prices for their produce. An example of such technology is the Azure FarmBeats app being developed by Microsoft.[13]

2.2 What Kind of Data Does the Use of Precision Farming Generate?

Precision farming generates specific on-farm data regarding soil properties, water and fertilizer usage, crop varieties, weather and climate change patterns, seed viability, conservation, disease history, nutrition, and geography.[14] It also generates personal data relating to a farmer's expenditures, sales and marketing access. The right to use digitalized agrotechnology often requires farmers to sign a contract that

11 *See Hydroponic Systems*, U. Mass. Amherst (2009), https://ag.umass.edu/greenhouse-floriculture/fact-sheets/hydroponic-systems#:~:text=Hydroponics%2C%20in%20its%20most%20basic,basic%20system%20have%20been%20developed%3E (created by Umass Extension Greenhouse Crops & Floriculture Program, Ctr. Agric. & Env't.)

12 *See, e.g.*, *Hydroponic Supplies*, FarmTek (last visited Nov. 22, 2021), https://www.farmtek.com/farm/supplies/cat1a%3Bft_hydroponic_supplies.html.

13 *See FarmBeats: AI, Edge and IoT for agriculture*, Microsoft (last visited Nov. 22, 2021), https://www.microsoft.com/en-us/research/project/farmbeats-iot-agriculture/ (established May 14, 2015).

14 *See* Michael Kremer & Gilbert Fosson Houngbo, *Grow back better? Here's how digital agriculture could revolutionise rural communities affected by COVID-19*, World Econ. F. (July 9, 2020), https://www.weforum.org/agenda/2020/07/digital-agriculture-technology/.

grants ownership of data to the collector companies. Precision farming requires the aggregation of data from large number of farms, the surrender of custody of data from the farmer to the agricultural technology provider, and the use of data for purposes outside the farm. In practice, this means that collector companies can make money from the sale of farmers' data, but that the financial benefits from sale of the data is not shared with farmers. Farmers also cannot 're-access' their data that has been collected by a company, without paying an access fee to the collector company.

What data do farmers generate when they use precision farming technology? Who owns this data and can benefit from it?

An example: A company that has developed an app that gathers information from farms can sell data about the farmer's soil and location to fertilizer and seed companies, who can then send marketing representatives to the farm to sell the farmer inputs just in time for planting. The company can also sell the questions that the farmer asked via the texting service to companies that sell pesticides.

Because of the way most countries data and intellectual property laws are written, it is the company, not the farmer, who owns the data collected by the sensors and the app.

Why is this a problem? For two main reasons. Firstly, more often than not farmers do not get any of the money that the app developer makes in selling that data to third party seed, fertilizer and pesticide companies. Secondly, current data protection regulation limits the ability of women farmers to re-access the data to inform their decision making and farming practice. In this instance, the company would use the farmer's data to improve the company's (and third companies') services and products, but the farmer would not re-access their own data to improve their own farming practices.

Laws need to be better designed to ensure that farmers, especially women, can share in the benefits of the data and that it is not only restricted to the companies who collect it.

2.3 Benefits of Precision Farming for Africa's Women Farmers

Precision farming enables women farmers to save time and labour and to grow more food using less land.[15] These attributes are especially important for Africa's women farmers because they typically have: less access to and control of land than men; fewer financial resources; less capacity and knowledge of agricultural technology; less information regarding markets; and less time (as women face the triple burden of caring for the house, their children, and the farms) than their male counterparts. Growing more on less land would mean increased productivity and greater income for women farmers. In addition, precision farming would enable women to play a more active role in environmental protection, as technologies like GPS and satellites enable more

15 *See* ESA Working Paper, *supra* note 1.

reliable monitoring of the impact of farming on natural resources, like air and water quality. This could help to prevent deforestation from agricultural expansion and frees up land for conservation, reducing disruption of natural ecosystems. Precision farming also gives producers greater control over plant and animal production, processing, distribution, and storage, which results in: *greater efficiencies and lower prices; safer growing conditions and safer foods; and reduced environmental and ecological impact*.[16]

Though the use of precision farming technologies is more widespread in large commercial farms in high income settings, it is no longer solely focused on large-scale farmers in these countries. Today, its application is increasingly being designed for use in rural low-income areas. For example, precision farming practices – such as mobile-based advice, soil mapping, precise irrigation systems and the use of modern sensors – can be adopted at low cost and with ease by small-scale farmers in low-income countries.[17] Given this reality, it is important that data regulation keep ahead of the curve. With increased access to data technologies (e.g., mobile phone applications) in developing countries, and given the rapid speed of digital innovation, we are likely to see continued technology updates. It seems unlikely that low- and middle-income countries – where most women smallholder farmers live – will do better without active and deliberate policy interventions to keep up with these innovations. This will require as a first step national legislation, which should be informed by public debates involving rural small-scale women farmers._

The increased proliferation of precision farming technologies suitable for small-scale agriculture creates new questions and potential risks around who owns, and can benefit from, the data generated. Questions asked include: who owns the data generated on local farms? How will such data be re-accessed and shared? And, who is entitled to benefit from the value of the data?[18] Because contemporary data protection regulations favors agricultural technology providers, large scale farms, and crops with high economic value for export (sectors in which women farmers are not prominent), by granting them strong rights, with little obligatory provisions protecting the rights of data generators, traditional knowledge and local plant varieties, women farmers have raised concerns over privacy and ownership.[19] The following section helps answer these concerns by examining issues that affect the relationship between data protection, precision farming and female farmers in Africa.

16 *See Agricultural Technology*, U.S.D.A. (last visited Nov. 22, 2021), https://nifa.usda.gov/topic/agriculture-technology.

17 *See* U.N. Int'l Fund Agric. Dev., Precision Agriculture to Support Inclusive Food System Transformation, at 2 ¶ 6, U.N. Doc. EB 2020/130/R.2 (2020), https://webapps.ifad.org/members/eb/130/docs/EB-2020-130-R-2.pdf.

18 *See* Leanne Wiseman & Jay Sanderson, *Farms create lots of data, but farmers don't control where it ends up and who can use it*, The Conversation (Apr. 16, 2019), https://theconversation.com/farms-create-lots-of-data-but-farmers-dont-control-where-it-ends-up-and-who-can-use-it-115228.

19 *See* Jody L. Ferris, *Data Privacy and Protection in the Agriculture Industry: Is Federal Regulation Necessary?* 18 Minn. J. L., Sci. & Tech. (2017), https://scholarship.law.umn.edu/cgi/viewcontent.cgi?article=1422&context=mjlst.

3 Shortcomings for Gender Protection in Africa's Human Rights and IP Protection Laws

A review of multilateral and regional agreements to which African countries are signatories indicates several provisions requiring protection of the socio-economic rights of women. Provisions requiring states to ensure lack of discrimination against people based on gender, and encouraging states to provide special supports for women as vulnerable people can be found in the human rights conventions, as well as the regional trade agreements signed by African countries. However, the fact that large gender gaps in agricultural production and utilization of agrotechnology continue to exist in many African countries, indicates shortcomings and gaps in current models. Some of such gaps are examined below.

3.1 Intellectual Property Rights and Data Protection Regulations

To understand how current data protection and IP laws prevent women smallholder farmers from benefiting from the data that they generate, it is important to know that data is generated through a three-step process which involves the contributors, collectors and consumers of data.[20] Contributors provide access to the phenomenon being captured. They are often farmers, landholders, and front-line workers. Collectors gather data and make it available. Typically comprised of firms, intermediaries, and governments, collectors are the legal owners of the data and are responsible for opening access through licensing.[21] Consumers use data to gain insights, develop applications, and make decisions. Contributors often consume data or benefit from the work of consumers. In IP law the contributor of data is not necessarily the owner of the resulting data set. When applied to agricultural data, this means that the farmer, as a data contributor, will not necessarily have rights in the resulting agricultural data set.[22]

Africa's female smallholder farmers (FSF) can be categorized mainly as both contributors to and consumers of data. As a resource which has mainly intangible value, ownership of data is governed by intellectual property rights (IPR) and data protection laws. Through their use of technology and application of intellectual property law, collectors hold proprietary ownership rights to data.[23] This may limit the ability of the FSF to access and manage important agricultural data which they actively contributed to. For example, the Oubli berry is a fruit of a plant native to the West African people of Gabon, who originally discovered and nurtured the plant,

20 *See* Lev Manovich, *Trending: The Promises and the Challenges of Big Social Data*, *in* Debates in the Digital Humanities 460-75, 504 (Matthew K. Gold ed., 2012).

21 *See* Jeremy de Beer, *Ownership of Open Data: Governance Options for Agriculture and Nutrition* 14, Glob. Open Data Agric. & Nutrition (2016), .

22 *See ADC study reveals future trends in Ag data sharing, storage*, Agric. Data Coal. (Apr. 30, 2020) [hereinafter *ADC study*], /.

23 *See* Jerimiah Baarbé et al., *A Data Commons for Food Security* 8 (Open Afr. Innovation Rsch., IASC 2017 Conf. Paper, Working Paper 7, 2017), https://openair.africa/wp-content/uploads/2020/05/WP-7-A-Data-Commons-for-Food-Security.pdf.

which was traditionally used by breastfeeding mothers to help their nursing infants during the process of weaning. The harvested plant was also a source of income for many Gabonese women. Upon observing the therapeutic use of the plant among the women, a researcher from the University of Wisconsin took samples of the plant to the university and carried out scientific analysis of its contents. The researchers from the University of Wisconsin identified the protein Brazzein in the Oubli berry as the source of its positive nutritional effects. They then obtained various patents for isolating and reproducing the protein Brazzein, which is 500 to 2,000 times sweeter than sugar and is used as a natural low-calorie sweetener.[24] Though the patent was developed based on the data contributed by women farmers in Gabon, provision was not made to recognize the women or to allow them to benefit from sales of the patented product. Further, the industrial large-scale production of the protein in the USA, at lower cost and using artificial materials, eradicated the need to cultivate and collect the plant in Gabon. This led to a drop in prices, sales and loss of income to many Gabonese women who planted and harvested the local Oubli berry plant.[25]

One method to avoid such misappropriation of farmers data is to require a disclosure of origin obligation in IP applications.[26] A disclosure of origin would require applicants for patent protection to: disclose the origin of any genetic resources and/or traditional knowledge used in their invention; evidence that they received prior informed consent from the indigenous people or originating countries to use their data; and evidence provision for fair and equitable benefit sharing in agreements.[27] This would support the rights and interests of Africa's women farmers. If applied in the Oubli berry case, a disclosure requirement would give the Gabonese women the right to share in the benefits of the patent obtained based on their data contribution of traditional knowledge.

The key areas of law relevant to agricultural data are IP laws on copyright and data protection. Specifically, Art. 10.2 of the World Trade Organization's *TRIPS Agreement* states that: "Compilations of data or other material, whether in machine readable or other form, which by reason of the selection or arrangement of their contents constitute intellectual creations shall be protected as such. Such protection, which shall not extend to the data or material itself, shall be without prejudice to any copyright subsisting in the data or material itself."[28]

24 *See* Ghazaleh Jerban, *The SDGs and gender: The case of indigenous and local women's traditional knowledge* 1 (Ctr. Int'l Governance Innovation, Pol'y Brief No.3, 2019), https://www.cigionline.org/static/documents/documents/PB%20no.3.pdf.

25 *Id.*

26 *See TRIPS: Reviews, Article 27.3(b) and Related Issues*, WTO (last updated Nov. 2008), https://www.wto.org/english/tratop_e/trips_e/art27_3b_background_e.htm; Meeting Documents, Intergovernmental Comm. Intell. Prop. & Genetic Res., Traditional Knowledge & Folklore, Eighth Session, WIPO (June 6-10, 2005), https://www.wipo.int/meetings/en/details.jsp?meeting_id=7130.

27 *See* Convention on Biological Diversity arts. 8(j) & 15, Dec. 29, 1993, 1760 U.N.T.S. 79 [hereinafter CBD], available at https://treaties.un.org/doc/Treaties/1992/06/19920605%2008-44%20PM/Ch_XXVII_08p.pdf.

28 Agreement on Trade-Related Aspects of Intellectual Property Rights art. 10.2, Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1C, 1869 U.N.T.S. 3 [hereinafter TRIPS], available at https://www.wto.org/english/docs_e/legal_e/27-trips.pdf (entered into force Jan. 1, 1995).

Copyright grants the owners of data compilations the exclusive right to exploit and commercialize the data. While copyright law does not protect information, ideas, or mere facts (i.e., single data points), a collection of data (database) may be protected. *In IP law the contributor of data is not necessarily the owner of the resulting data set. When applied to agricultural data, this means that the farmer, as a data contributor, will not necessarily have rights in the resulting agricultural data set*.[29]

Copyrights and database rights do not accrue to the person about whom the data pertains, or the person who provided the data, rather such rights are owned by the entity that invested in the collection, selection, or arrangement of the data. Such data is legally controlled by the entity that holds IPRs to it, not the person it relates to (except for personally identifiable information). Data can only then be accessed through licenses based on terms and conditions established by the data owner, which leaves the ability of others to utilize data subject to the caprices of the data owner.[30] The equity of this allocation of rights is questionable, as data is created by persuading contributors, including for example rural communities and female smallholder farmers, to provide access to the desired phenomena. Organizations then invest in the collecting, selecting, and aggregating the data, thereby creating distinct legal rights in newly formed data sets. In this process, contributors lack enforceable data rights, which adds to inequality and lack of inclusiveness. This can lead contributors, especially Africa's women farmers, to be vulnerable to the whims of collectors that own the data. Scholars emphasize that for data to yield benefits for these groups, there must be a reconfiguration of the data governance structure that allows for more efficient and equitable appropriation and access to data by marginalized groups.[31]

This study proposes that because Africa's women farmers are active contributors to agricultural data, they should be considered as owners, like author's under copyright, who should continue to be able to access conclusions drawn based on data generated from their farms. This perspective is similar to Article 15 of the ICESCR which recognizes the right of authors of scientific, literary, or artistic works to benefit from their innovations. Allowing women to benefit from farm data can also be justified based on the human right to non-discrimination in Article 27.1 of the UDHR, which states that "Everyone has the right freely to participate in the cultural life of the community, to enjoy the arts and to share in scientific advancement and its benefits." Similarly, Article 18 of the Organization of African Unity's African (Banjul) Charter on Human and Peoples' Rights specifically mentions the obligation of African States to "ensure the elimination of every discrimination against women". The Charter's Protocol on the Rights of Women in Africa (Maputo Protocol) was adopted in 2003. Discrimination encompasses any difference in treatment that intentionally or unintentionally disadvantages women.[32]

29 *See ADC study*, *supra* note 22.
30 *See* de Beer, *supra* note 21, at 14.
31 *See* Baarbé et al., *supra* note 23, at 7.
32 *See* UN OCHR, Women's Rights are Human Rights 6-8, UN Doc. HR/PUB/14/2 (2014), available at https://www.ohchr.org/documents/events/whrd/womenrightsarehr.pdf.

3.1.1 The WTO's TRIPS Agreement: The first agreement to protect undisclosed data internationally outside of North America was the WTO TRIPS Agreement. Article 39.3 of TRIPS requires WTO Member States to protect test data submitted for the marketing approval of pharmaceuticals and chemical products for agriculture. Test data must be protected if national authorities require its submission. In addition, Article 39.3 does not require protection to be given to data that are already publicly available, but only to undisclosed data. Thus, agricultural data of farmers would not be recognized or protected under TRIPS provisions.

Furthermore, protection is mandated only for new chemical entities. WTO Members have considerable discretion in defining this concept. Finally, in order to grant protection, national regulatory authorities may request the applicant to prove that the information for which protection is sought is the result of significant investment. The investment of women farmers is often not significant in comparison to male farmers and multinational corporations. Article 39.3 requires countries to protect test data against "unfair commercial use". Thus, protection is to be conferred against dishonest commercial practices. Practices that reduce gender equality may be inequitable, but not unfair commercially.[33] For example, women often receive less pay for their labor than men. While this may be inequitable, it is commercially viable for companies who seek cheaper labor costs to maximize profits.

The fact that the TRIPS Agreement does not include any specific provisions on gender equality and does not support agricultural data or small and medium industries makes it less supportive of gender equality and the interests of Africa's women farmers.

3.1.2 The African Continental Free Trade Agreement (AfCFTA): The preamble of the AfCFTA contains explicit reference to the importance of gender equality for the development of international trade and economic cooperation, while article 3 (e) emphasizes the promotion of inclusive socio-economic development and gender equality as one of the general objectives of AfCFTA. These provisions indicate that gender equity is part of the development objective of the agreement. The main shortcoming of these provisions is that they are couched in general language using words like 'are' and 'should', rather than obligatory words like 'shall' used to describe the IPRs. Also, because they are contained in the preamble and objectives of the agreement, they are not mainstreamed into the substantive content of the laws.

In Article 27 of the AfCFTA, African countries commit to mobilizing resources to improve the export capacity of women entrepreneurs and women-owned SMEs. This provision is important, as mobilizing funds for gender-related commitments is fundamental for their implementation. In the absence of finance made available for this purpose, the resource-constrained African countries may lack sufficient resources to invest in the women-favoring promises they might have made in trade instruments.[34] In the absence of a provision or chapter on gender in AfCFTA the

33 *See* Kathleen Sexsmith, *Promoting Gender Equality in Foreign Agricultural Investments: Lessons from voluntary sustainability standards* 5-9, Int'l Inst. Sustainable Dev. (2017), https://www.iisd.org/system/files/publications/promoting-gender-equality-foreign-agricultural-investments.pdf.

gender-sensitive trade strategies advanced in Africa's regional economic communities shall be maintained until a comprehensive customs union agreement is negotiated.[35]

Considering the lack of provision for enforceable gender sensitive trade policies, to ensure that the gains from AfCFTA support gender equality and the sustainable economic empowerment of women, gender needs to be mainstreamed into AfCFTA's national strategies. Mainstreaming involves ensuring that gender perspectives and the objective of gender equity should be taken into consideration in the agreement.

3.2 Human Rights Agreements

Under Articles 13, 14 and 15 of the *Convention on the Elimination of All Forms of Discrimination against Women* (CEDAW),[36] governments have international obligations to protect and advance women's economic activities. The convention goes beyond civil and political rights, to affirm the economic, social and cultural rights of women (rights to work, health, property, education and financial credit). Article 14 of CEDAW is especially important to Africa's women farmers, as it demands that special attention be given to the problems faced by rural women, whose particular struggles and vital economic contributions authorize *special and differential treatment* in policy planning. Overlooking 'non-discrimination' and the 'equal rights' of women is justification for annulling contracts. This is highlighted in Article 15, CEDAW which proclaims that any legal instrument that has the effect of restricting the capacity of women "shall be deemed null and void."

Similarly, under Article 8 (Economic and social welfare rights) of the African Union's *Protocol on the Rights of Women in Africa* (Maputo Protocol),[37] states shall adopt and enforce legislative and policy measures to guarantee women equal opportunities in work and career advancement and other economic opportunities. In this respect, states shall: (e) Create conditions to promote and support the occupations and economic activities of women, in particular, within the informal sector.

Women's rights are closely linked to sustainable development. Under Article 18(2) of the Maputo Protocol (the right of women to live in a healthy and sustainable environment), States Parties shall take appropriate measures to: a) Ensure greater participation of women in the planning, management and preservation of the environment and the sustainable use of natural resources at all levels; b) Promote research and investment in new and renewable energy sources and appropriate technologies, including information technologies and facilitate women's access to, and participation in their control; c) Protect and enable the development of women's indigenous knowledge systems.

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34 *See* Amrita Bahri, *Women at the Frontline of COVID-19: Can Gender Mainstreaming in Free Trade Help?*, 23 J. Int'l Econ. L. 563, 576 (2020).

35 *See* Clair Gammage & Mariam Momodu, *The Economic Empowerment of Women in Africa: Regional Approaches to Gender Sensitive Trade Policies*, 1 Afr. J. Int'l Econ. L. 1, 32 (2020).

36 Convention on the Elimination of All Forms of Discrimination against Women arts. 13-15, Dec. 18, 1979, 1249 U.N.T.S. 13, available at https://treaties.un.org/doc/Treaties/1981/09/19810903%2005-18%20AM/Ch_IV_8p.pdf.

Promoting gender equality also requires that women be granted ownership and control of reproductive resources and property (Article 19, Maputo). Considering the important role that data now plays in precision agriculture, this verse could be read as requiring states to take measures to ensure that women are empowered with the appropriate credit finances, skills, training, and extension services to utilize data and data driven technologies related to agriculture, to advance their development. Women are to also participate in the procedure of data legislation. This requires states to take proactive action to ensure that the negative effects of free trade and IP policies are reduced to the minimum for women.

This emphasizes the interlinkedness of social, economic and environmental factors in advancing gender equality.[38] As both human rights and IPRs are widely recognized legal regimes, states should ensure appropriate balancing between both sets of rights. Though human rights are recognized as a goal of IP protection, they might be difficult to enforce as they are phrased in vague unenforceable language.

SDG 5

The goal of SDG 5, to which African countries are signatories, is to "Achieve gender equality and empower all women and girls."[39] This would require not just giving equal opportunities to men and women, but recognizing their special different needs and making provisions to close existing gaps between the sexes. Three methods for achieving the SDG 5 goal of parity between genders are: fostering equal rights to economic resources, property ownership and financial services for women; promoting empowerment of women through technology; and adopting, strengthening and enforcing laws and policies for gender equality.[40] Gender equality is not only a fundamental human right, but a necessary principle for expanding economic growth and inclusive sustainable development.[41] Thus, it should be mainstreamed in IP and trade regulations.

Though both men and women have been identified as equally active in agricultural innovation, women hold fewer IPRs and have less access to digital

37 African Union, Protocol to the African Charter on Human and People's Rights on the Rights of Women in Africa, July 11, 2003, available at: https://au.int/sites/default/files/treaties/37077-treaty-charter_on_rights_of_women_in_africa.pdf (entered into force Nov. 25, 2005).

38 *See* UNESCO*, Science will play a key role in realizing Agenda 2030,* UNESCO Science Report: towards 2030, at 9-11 (2015), available at: https://unesdoc.unesco.org/ark:/48223/pf0000235406 (last visited Nov. 23, 2021) (opinion piece based on a policy brief prepared by the Scientific Advisory Board of the Secretary General of the United Nations).

39 *See Gender equality*, U.N. Sustainable Dev. Goals (last visited Nov. 23, 2021), https://www.un.org/sustainabledevelopment/gender-equality/.

40 *See Sustainable Development Goal 5: Achieve gender equality and empower all women and girls*, SDG Tracker (2018), https://sdg-tracker.org/gender-equality.

41 *See* East African Community, Gender Equality and Development Bill art. 3(1), Jan. 8, 2016, 1 E. Afr. Cmty. Gazette, Bill Supp. No. 3, available at: https://www.eala.org/uploads/the_eac_gender_equality_and_devolopment.pdf (last visited Nov. 23, 2021).

products than their male counterparts.[42] While women comprise almost half of the labour force in Africa's agriculture sector, yet they generally produce less per hectare than men.[43] Studies on small scale agriculture in Africa have linked the disadvantages in IP ownership and productivity faced by female smallholder farmers in Africa to the numerous disadvantages that women face including their lack of education, limited access to information, markets, capital, land tenure and even basic inputs like fertilizers and seeds in comparison to men.[44] This constitutes a form of inequity which goes against the principles of equality stated in SDG 5. Also, in Sub-Saharan Africa, women are 41% less likely than men to use mobile phones or the internet, and rural populations are 58% less likely to use mobile internet than urban populations.[45] Thus, for IP laws and policies to advance digitalization by Africa's women farmers, they should integrate the protection of IPR with advancing the socio-economic rights of women. This may occur by providing exceptions to IPR that support gender equity and clarifying the social and non-economic objectives of data and ICT regulations as was done in the WTO Doha Declaration

In contrast to the approach adopted in the WTO-TRIPS and WIPO agreements, that recognizes the right to data protection as an autonomous right, differentiating it from the human right to development, this article proposes IP and data protection rights as instruments for advancing SDGs. This requires the protection of both property rights and human rights. For example, where different groups (women farmers and ICT companies) have participated in the information creation process, the rights of both data generators and data collectors should be protected by data regulations to ensure that the resulting databases and benefits are shared equitably by these participating groups for mutual development.

4 How Data Protection Affects Sustainable and Equitable Agriculture

Sustainable agriculture is the efficient production of safe, high quality foodstuffs in a manner that protects and improves the natural environment; the social and economic conditions of farmers, their employees and local communities; and safeguards the health and welfare of all farmed species.[46] The importance of sustainable agriculture to food security was highlighted by the United Nations (UN) Economic and Social Council (ESC) when it opined that: "[e]nding hunger and malnutrition relies heavily on *sustainable food production systems* and resilient agricultural practices."[47] It was

42 *See Gender Equality, Diversity and Intellectual Property*, WIPO (last visited Nov. 23, 2021), https://www.wipo.int/women-and-ip/en/.

43 *See* FAO, The State of Food and Agriculture 2010-2011: Women in Agriculture: Closing the Gender Gap for Development 5 (2011), https://www.fao.org/3/i2050e/i2050e.pdf.

44 *See* Lewis Ndichu, *Africa's female farmers need better access to resources*, China Daily (Apr. 1, 2020), http://global.chinadaily.com.cn/a/202004/01/WS5e83e915a3101282172837cf.html.

45 *See Mobile Internet Connectivity 2019: Sub-Saharan Africa Factsheet*, at 1-2, GSMA (July 2019), https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2019/07/Mobile-Internet-Connectivity-SSA-Factsheet.pdf.

46 *See Who We Are*, SAI Platform (last visited Nov. 23, 2021), https://saiplatform.org/who-we-are/.

also affirmed by the United Nations Development Program (UNDP) comments in relation to goal two of the United Nations (UN) Sustainable Development Goals (SDGs),[48] (SDG 2) which aims at ending hunger, achieving food security, improving nutrition and promoting sustainable agriculture. UNDP noted that attaining SDG2 "involves promoting *sustainable agricultural practices*: supporting small scale farmers and allowing equal access to land, technology and markets.

Data is a necessity for adopting environmentally friendly farming procedures that are native to Africa (such as composting, mulching, crop rotation, irrigation and vegetation conservation); and for maintaining ecological practices like crop diversification, less use of agrochemicals, and the planting of resist resistant varieties of crops.[49] Data could also be used to add value to agricultural produce through innovation which would enable women to have a higher place in the value chain for agricultural production. For example, under the Women's Organic Cooperatives in Uganda, women have accessed agricultural data to produce improved crop varieties. They also learned about better markets where their produce could fetch a higher price as well as the most appropriate crops to grow. Essentially the data helped women farmers in choosing locally adapted crops for an existing market.[50] They have gone from buying seeds every year to producing their own sustainable varieties locally.

However, for such data to benefit female farmers, it would need to be resourced either through the data collection companies, or third parties that are licensed to such companies. There is also a loss in access and benefit sharing, as the current framework for data protection recognizes collectors as the owners of data, who monetize and profit from such data without returning the benefits to the original data generators. Lack of access to the conclusions drawn based on analysis of agricultural data inhibits women from innovating and improving their agricultural produce. For example, farmers have cried out against John Deere's tractors which contain sensors that obtain data on a farm, but do not allow the farmer access to the conclusions drawn for maintenance of farming machines, except by re-licensing.[51]

47 *See* U.N. Secretary-General, *Progress Towards the Sustainable Development Goals*, Rep. to Econ. & Soc. Council, U.N. Doc. E/2016/75 (June 3, 2016), available at: https://unstats.un.org/sdgs/files/report/2016/secretary-general-sdg-report-2016--en.pdf (last visited Nov. 23, 2021).

48 *See* G.A. Res. 70/1, Transforming our world: the 2030 Agenda for Sustainable Development, ¶ 54 (Sep. 25, 2015), https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E.

49 *See* Eleni Mourdoukoutas, *Digital revolution holds bright promises for Africa*, U.N. Afr. Renewal Mag. (Dec. 2017 – Mar. 2018), https://www.un.org/africarenewal/magazine/december-2017-march-2018/digital-revolution-holds-bright-promises-africa (last visited Nov. 23, 2021).

50 *See* Cathy Farnworth & Jessica Hutchings, *Organic Agriculture and Womens' Empowerment* 64, IFOAM – Organics Int'l (2009), available at: http://static1.squarespace.com/static/551bb3ade4b0404100c31678/t/5628f31ce4b00d6d1577c4d0/1445524252516/Organic+Agriculture+Womens+Empowerment++Farnworth+and+Hutchings.pdf (last visited Nov. 23, 2021).

51 *See* Peter Waldman & Lydia Mulvany, *Farmers Fight John Deere Over Who Gets to Fix an $800,000 Tractor*, Bloomberg Businessweek (Mar. 5, 2020), https://www.bloomberg.com/news/features/2020-03-05/farmers-fight-john-deere-over-who-gets-to-fix-an-800-000-tractor.

Gender equity is an important concern for sustainable agricultural development in Africa, as women farmers have been traditionally known to conserve biodiversity through selection and preservation of local plant varieties. Because Africa's women farmers often rely on the free exchange of data relating to traditional plant varieties for agricultural production, data on traditional knowledge plays a prominent role in sustaining informal agricultural innovation among them.[52] Yet, data relating to traditional agriculture often does not qualify for protection under database regulations because as specified by the four landmark decisions of the EU Court of Justice in 2004, protection is granted where there is a considerable investment in the obtaining, presentation and verification of data, but not when the investment is the creation of data.[53] Legal protections are required to protect the misappropriation of women's traditional knowledge relating to forest conservation and sustainable agriculture by agro-technology and database companies.[54] The following section examines the question of how to ensure that Africa's female farmers can reap the full benefits of the agricultural data that they generate?

5 Recommendations for making data protection laws more beneficial to Africa's women farmers

Below are six ways in which current IP and data regulations and policies can be re-designed to be more inclusive of women. We also provide examples of best practices adopted by countries that reflect these principles. Against this backdrop, data protection laws shall:

5.1 Policy recommendation 1-Protect the ownership rights of data contributors along with users' rights: Women farmers are mostly generators and users of data. However, current data regimes grant ownership rights to the intermediaries that invest in databases (who are mainly constituted of men) and not to the farmers providing the data or the users.[55] Protecting the rights of generators and users of data would enable

52 *See* David J. Claudie et al., *Ancient but New: Developing Locally Driven Enterprises Based on Traditional Medicines in Kuuku I'yu Northern Kaanju Homelands, Cape York, Queensland, Australia*, *in* Indigenous People's Innovation: Intellectual Property Pathways to Development 29, 36-55 (Peter Drahos & Susy Frankel eds., 2012).

53 *See* Christiana Sappa, *How data protection fits with the algorithmic society via two intellectual property rights – a comparative analysis*, 14 J. Intell. Prop. L. & Prac. 407, 413 (2019).

54 *See* Cholthira Satyawadhana, *Appropriation of Women's Indigenous Knowledge: The Case of Matrilineal Lua in Northern Thailand,* 5 Gender, Tech. & Dev. 91-112 (2001).

55 Africa's contemporary regulations for data privacy and use include: African Union, Convention on Cyber Security and Personal Protection, May 11, 2020, available at: https://au.int/sites/default/files/treaties/29560-treaty-0048_-_african_union_convention_on_cyber_security_and_personal_data_protection_e.pdf; Economic Community of West African States, Supplementary Act A/SA.1/01/10 on Personal Data Protection Within ECOWAS, Feb. 16, 2010, available at: https://www.statewatch.org/media/documents/news/2013/mar/ecowas-dp-act.pdf; East African Community, Draft EAC Legal Framework for Cyberlaws, Nov. 2018, available at: http://repository.eac.int:8080/bitstream/handle/11671/1815/EAC%20Framework%20for%20Cyberlaws.pdf?seq.

women farmers to re-access data without paying for it a second time through licensing fees. In this regard, provisions should be made requiring

(a) prior informed consent and access of local farmers for use of their data by companies; and
(b) sharing of benefits between farmers (especially women who are most times left out) and companies from the use of agricultural data generated by them.

An example of how this can be implemented practically is Clause 2 of the *Code of Conduct for Agriculture* developed by Global Open Data for Agriculture and Innovation, which requires that farmers own information generated on their farming operations. Specifically, the clause mandates that whoever has produced or collected data, either by technical means or individually, or has created data providers for this purpose, dominates in controlling the access to and use of data from their business. As farmers generate data individually from their farms, this would make them players in determining how their data is accessed and used. Also, it will enable farmers to benefit from royalties for sharing the data with any partner that wishes to use their data. Laws and regulations should ensure that data providers preserve the ability of the farmer to determine who can access and use individual farm data.[56]

Another example can be found in New Zealand's *Farm Data Code of Practice*, which requires organisations to specify actions and policies that they adopt to safeguard farmer generated data. Signatory companies agree to implement practises that provide farmers with high assurance that their data is managed without misappropriation.[57]

5.2 Policy recommendation 2-Allow for open access to agricultural data. Current data protection regimes are based on exclusivity and closed data, which typically grant the owners of data the right to exclude others from accessing data. Protected data is not open or shared (ODI, 2015) while open data is data that anyone can access, use, or share (ODI, 2018) and is potentially the most impactful way that big data can make a difference in agriculture and nutrition, as it would allow women farmers the right to share data relating to sustainable agriculture without additional costs. For example, the International Institute of Tropical Agriculture (IITA), Ibadan-Nigeria, developed improved varieties of cassava and maize suitable for Cameroonian farmers, which were disseminated through development projects like the Agricultural Investment and Market Development Project. Women farmers provided data on local crops which was then utilized by the IITA to improve local crop priorities and women were allowed access to improved varieties at less cost.[58] To ensure that women continued to access data regarding improved varieties without extra cost, IITA and PIDMA signed

56 *See Rights of the Data Originator*, Glob. Open Data Agric. & Nutrition (last visited Nov. 23, 2021), https://www.godan.info/codes/list/rights-data-originator.

57 *See New Zealand Farm Data Code of Practice*, Farm Data Accreditation Ltd (June 2014), available at: http://www.farmdatacode.org.nz/wp-content/uploads/2014/06/farm-data-code-of-practice-final.pdf.

58 *See* Bob Koigi, [Cameroon] PIDMA delivers technologies to farmer organizations for sustainable cassava and maize production, IITA News (Nov. 2, 2020), available at: https://africabusinesscommunities.com/agribusiness/news/cameroon-pidma-delivers-technologies-to-farmer-organizations-for-sustainable-cassava-and-maize-production/.

an open access agreement, which allowed for collective open access databases, and crowdsourcing by members of female farm unions.[59]

Open access should be granted not just to the initial data contributed, but also to any resultant agricultural product that utilizes the data in its creation. For example, in Mali female smallholder farmers learnt that the reason why a large proportion of their sorghum seeds crops failed to mature was because the seed was susceptible to disease caused by lack of certain nutrients. Based on this information, local farmers in collaboration with local scientists produced an open-pollinated variety of sorghum seeds which was disease resistant, by combining it with another locally produced crop. Open-pollinated varieties require less inputs in fertiliser and pesticides, are less expensive and are more affordable for low-income farmers. The information used by the scientists to produce the improved seed variety was given by the farmers and in turn, the improved seeds were supplied freely to them.[60] The locally improved seed variety is being utilized by farmers for increased production consequently leading to poverty reduction, as it has reduced farmers reliance on hybrid seed imports. As a result of these positive developments, the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) has also partnered with the national and regional authorities in Mali to register thirteen open-pollinated varieties whose use by farmers expanded under the hybrid sorghum programme.[61] In contrast, under contemporary data protection regulations, access to such data improved products will have to be resourced either through the data collection companies, patent holders, or third parties that are licensed to such companies.

5.3 Policy recommendation 3: Require balancing of interests by data companies in relation to gender. This policy recommendation may be achieved by granting exceptions to data protection laws which prioritize access for women in their roles as farmers, entrepreneurs and generators of data, to relevant agricultural data, agrotechnology, market information, and rural agricultural finance.

For example, the OECD Toolkit for mainstreaming data[62] provides measures which governments can take to mainstream gender equality, one of which is to employ gender quotas which will require that a certain percentage of users of data technology be women. Countries can also give tax concessions to companies that make available greater data that is relevant to women. Five countries, including Kenya and Rwanda have adopted policies promoting women's leadership in producers' organizations

59 *Id.*

60 *See* Dana Freshley & Maria Mar Delgado-Serrano, *Learning fromt the Past in the Transition to Open-Pollinated Varieties*, 12 Sustainability 4716, 4717 (2020), available at: https://www.mdpi.com/2071-1050/12/11/4716.

61 *See* Atul Bhargava & Shilpi Srivastava, Participatory Plant Breeding: Concept and Applications 109-27 (2019).

62 *See Gender balance measures*, OECD (last visited Nov. 23, 2021), https://www.oecd.org/gender/governance/toolkit/parliament/representation-at-all-levels/measures/.

63 *See* Elaine Panter & Nisha Arekapudi, *Mapping the Legal Gender Gap in Agriculture* 5-6, World Bank Group (2018), https://thedocs.worldbank.org/en/doc/264381545233395816-0050022018/original/MappingtheLegalGenderGapinAgricultureEBAWBL.pdf.

through quotas that mandate a minimum number of women be included on managing committees or boards.[63]

In addition to promoting gender equity and equality, data protection policies should also provide special support for women, rural communities and small-scale companies by supporting small and medium-scale businesses and protecting access to data regarding local seeds and plants. An example is the development of ICT/e-commerce projects by Kudumbashree, a government organization in India. Kudumbashree founded the Kasargod computer facility, which provided extra training on markets and helped the women create suitable networks to procure business deals.[64] The businesses established under the Kudumbashree project are all owned, managed and operated by women from poorer households, who were given technical training to utilize data collection and exchange software. Studies of the project show that the training and informational support provided to the women was helpful in aiding women's micro enterprises to flourish in India.[65]

5.4 Policy recommendation 4: Require capacity building for women using agricultural data and technologies as a form of technology transfer. Continuous capacity development for women to enhance their knowledge of their data rights as well as their ability to effectively use technologies and information at individual, organizational and institutional levels is essential for enhancing the ability of female smallholder farmers to utilize data for agriculture. Capacity building should be primarily carried out by the government. Public-private partnerships with the private sector can also be utilized.

Talking Book is an example of a digital solution made available to farming communities in Ghana, Kenya, Rwanda and Uganda. Executed by the non-governmental organization (NGO), Literacy Bridge, Talking Book implements a technology to disseminate information to rural stakeholders. It is a low-cost and programmable audio computer which is simple and easy to use, as it responds to users' oral messages. Low-skilled and low-literate communities in the four countries can gain on-demand access to over 100 hours of content on farming practices. Notably, Talking Book contains local content and uses local languages tailored to the agricultural needs of the user. Talking book enables low skilled and low literate rural users to collaborate in the production of data and information, as they can record their own knowledge in the audio library. Also, when connected with other Talking Book devices, the locally generated knowledge can be exchanged.[66]

64 *See* Rashmi M. & Lekshmi V Nair, *ICT and Employment Among Women: A Case Study of Kudumbasree ICT Project,* 10 Eur. Sci. J. 224, 227-28 (2014).

65 *See id.* at 231.

66 *See* Ronda Zelezny-Green et al., *A Landscape Review: Digital Inclusion for Low-skilled and Low-literate People* 51-52, UNESCO (2018), https://unesdoc.unesco.org/ark:/48223/pf0000261791.

67 International Telecommunication Union, Declaration of Principles: Building the Information Society: a global challenge in the new Millennium, World Summit on the Information Society, Doc. No. WSIS-03/GENEVA/DOC/4-E (Dec. 12, 2003) [hereinafter WSIS Declaration of Principles], https://www.itu.int/net/wsis/docs/geneva/official/dop.html.

5.5 Policy recommendation 5: Ensure that local women farmers actively participate in the deliberations and formulation of data protection and ICT regulations. This policy is reflected in the World Summit on the Information Society (WSIS) Declaration of Principles, which states that, "Development of ICTs provides enormous opportunities for women, who should be an integral part of, and key actors, in the Information Society. We are committed to ensuring that the Information Society enables women's empowerment and their full participation on the basis of equality in all spheres of society and in all decision-making processes. To this end, we should mainstream a gender equality perspective and use ICTs as a tool to that end."[67] This policy should address gender barriers to participation in law and policy making and how they can be overcome (e.g. when, where and in what languages consultations are held and having gender disaggregated discussion groups). An example of how this can be practically implemented is the practice of the Ethiopian Institute of Agricultural Research (EIAR), which following a gender audit of government agricultural policymaking, called for greater participation of women in government policy making and special funding for women participation.[68]

5.6 Policy recommendation 6: Require digital databases to contain substantive local content, utilizable by local women farmers. This would include data relating to local crops, informal African agriculture, traditional knowledge and related genetic resources.

This policy is reflected in the WSIS *Declaration of Principles*, para. B8-54, which states that:

"The preservation of cultural heritage is a crucial component of identity and self-understanding of individuals that links a community to its past. The Information Society should harness and preserve cultural heritage for the future by all appropriate methods, *including digitisation*."[69]

One tool necessary for aiding the accessibility of agricultural data is to ensure that it is produced in diverse languages and suited for various contexts. "The development of local content suited to domestic or regional needs will encourage social and economic development and will stimulate participation of all stakeholders, including people living in rural, remote and marginal areas."[70]

An example is the G8 Digital Opportunities Task Force's 2001 Genoa Plan of Action, which encouraged the development of local content through making software applications available, and the participation of local stakeholders by expanding the local

68 *See* Kristie Drucza et al., *Doing research and 'doing gender' in Ethiopia's agricultural research systems*, 23 Gender, Tech. & Dev. 55-75 (2019).

69 *See* WSIS Declaration of Principles, *supra* note 67.

70 *See also* SDG 5 Target 5.B, *in Gender equality*, *supra* note 39; Sofie Isenberg, *Investing in information and communication technologies to reach gender equality and empower rural women* 19, 35, FAO (2009), https://www.fao.org/3/ca4182en/ca4182en.pdf.

71 *See* G8 Genoa Summit, Digital Opportunities for All: Meeting the Challenge: Report of the Digital Opportunity Task Force (DOT Force), including a proposal for a Genoa Plan of Action, May 11, 2001, available at: http://www.g8.utoronto.ca/summit/2001genoa/dotforce1.html (last visited Nov. 23, 2021).

language content available on the internet.[71] Canada implemented the latter policy in Africa by establishing IDRC telecentres in Zimbabwe, Uganda and Swaziland, which creates databases on local agricultural products and practices and networks for local farmers.[72] Since women farmers are more involved in local crops and are generally less educated, databases on local content in local languages will be more useful for them. Because the loss of crop diversity reduces the capacity of poor farmers to adapt to climate change, the FAO has worked with local women farmers in Tanzania and Kenya to develop databases on local practices for conservation agriculture, which draws on women's production strategies and experience in crop selection.[73]

5.6 Policy recommendation 7: Place a disclosure of origin of agricultural data obligation in IPR and data regulations: One method to avoid such misappropriation of farmers data is to require a disclosure of origin obligation in IP applications.[74] A disclosure of origin would require applicants for patent protection to: disclose the origin of any genetic resources and/or traditional knowledge used in their invention; evidence that they received prior informed consent from the indigenous people or originating countries to use their data; and evidence provision for fair and equitable benefit sharing in agreements.[75] This would support the rights and interests of Africa's women farmers. If applied in the Oubli berry case, a disclosure requirement would give the Gabonese women the right to share in the benefits of the patent obtained based on their data contribution of traditional knowledge.

6. Conclusion

Policymakers have generally tended to consider data regulations as gender neutral, based on the assumption that data protection and free trade brings equal opportunity for all people, and typically design trade agreements and strategies without reference to gender equality or social inclusion considerations. However, analysis in this paper has demonstrated the existence of a digital divide in the use of data driven agricultural technologies by Africa's female smallholder farmers. Gender gaps exist at five levels, through differences in: welfare, access, awareness, decision making and control/ ownership.[76] Analysis in section 3 of this paper recognizes that data protection laws

72 *See* Stephen Mutula, *Local content development projects in Africa*, 74 S. Afr. J. Libr. & Info. Sci. 105, 107 (2008).

73 *See* FAO, Bridging the gap: FAO's programme for gender equality in agriculture and rural development (2009), https://www.fao.org/3/i1243e/i1243e.pdf.

74 *See TRIPS: Reviews, Article 27.3(b) and Related Issues: Background and the current situation*, WTO (last updated Nov. 2008), https://www.wto.org/english/tratop_e/trips_e/art27_3b_background_e.htm; WIPO, Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore, Eighth Session, Doc. No. WIPO/GRTKF/IC/8/11 (May 17, 2005), https://www.wipo.int/edocs/mdocs/tk/en/wipo_grtkf_ic_8/wipo_grtkf_ic_8_11.pdf (document title: "Disclosure of Origin or Source of Genetic Resources and Associated Traditional Knowledge in Patent Applications").

75 *See* CBD, *supra* note 27, arts. 8(j) & 15.

76 *See* D.A. Patil et al., *ICT and Empowerment of Rural and Deprived Women in Asia*, 19 Asia-Pac. J. Rural Dev. 1, 8 (2009).

are not gender neutral, because they differentially impact African women working in agriculture. Therefore, special exceptions and limitations are needed in copyright and data protection regulations for women.

Despite the existence of vast amounts of data for precision agriculture, this information remains inaccessible to female smallholder farmers in Africa for several reasons, the principal ones being a lack of accessibility and affordability. Data is accumulated by a process that involves three categories of persons, the generators, collectors and users of data. However, current copyright and data protection laws grant exclusive private rights to those that collect data, including the right to determine access to and conditions (including costs) based on which such data can be accessed. Because Africa's women smallholder farmers are mostly generators and users of data, the current approach leaves them bereft of any enforceable legal right to access or control data, even that which is generated from activities on their own farms.

This paper proposes that because Africa's women farmers are active contributors to agricultural data, they should be considered as owners, with rights akin to authors under copyright, who should continue to be able to access conclusions drawn based on data generated from their farms. To implement this, the paper recommends the adoption of several policies on data regulation, as important tools for closing the gender gap and by which to make the utilization of digital and data driven agriculture more inclusive of female smallholder farmers in Africa. The recommendations address both the socio-economic and legal barriers that prevent women farmers from accessing agricultural data and precision farming. Without the adoption of such holistic policies by African economic communities (especially the African Union in AfCFTA), African and other developing countries as a proactive measure, there is little hope of bridging the digitalization gap, or of ensuring that the benefits of precision farming are more inclusive of women smallholder farmers.