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Rights in a Cloud of Dust: The Value and Qualities of Farm Data and How Its Property Rights Should Be Viewed Moving Forward

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RIGHTS IN A CLOUD OF DUST: THE VALUE AND QUALITIES OF FARM DATA AND HOW ITS PROPERTY RIGHTS SHOULD BE VIEWED MOVING FORWARD*

"Agriculture not only gives riches to a nation, but the only riches she can call her own."

- Samuel Johnson[1]

INTRODUCTION

Historically, technology growth has been slower in agriculture than other industries.[2] However, a rising demand for food and an increase in efficient farm practices has changed this, leading to a rise in precision farming technologies.[3] Now, entities that provide services or information to farmers need precision farming technologies to compete,[4] and more farmers are adopting

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1. Meurig Raymond, *A Brexit That Benefits Agriculture is a Brexit That Benefits the Nation*, THE TELEGRAPH (Feb. 21, 2017), http://www.telegraph.co.uk/ news/ 2017/ 02/ 21/ brexit- benefits- agriculture- brexit- benefits- nation-ministers/ [https://perma.cc/94XT-LRLW].

2. Chenghai Yang et al., *Precision Agriculture in Large-Scale Mechanized Farming*, *in* PRECISION AGRICULTURE TECHNOLOGY FOR CROP FARMING 177, 178 (Qin Zhang ed., 2016).

3. Jessica Lindblom et al., *Promoting Sustainable Intensification in Precision Agriculture: Review of Decision Support Systems Development and Strategies*, 18 PRECISION AGRIC. 309, 310 (2017); *see also Precision Farming Market by Technology (Guidance System, Remote Sensing, Variable Rate Technology), Offering (Hardware Automation & Control System, Sensor & Monitoring Device, Software, Services), Application, and Geography—Global Forecast to 2022*, MARKETSANDMARKETS.COM (Jan. 2017) [hereinafter *Global Forecast*], http://www.marketsandmarkets.com/ Market-Reports/ precision-farming-market-1243.html [https://perma.cc/D9BC-26SJ].

4. Joseph Russo, *Precision Agriculture, Then and Now*, PRECISIONAG (Sept. 29, 2014), http://www.precisionag.com/ professionals/ precision-agriculture-then-and-now/ [https://perma.cc/CSE4-M7LT] (explaining how precision agriculture has grown since pioneered in the 1990s).

precision farming technologies.[5] These technologies help farmers, but questions still remain about ownership rights in the data that farmers create.[6]

Aggregated data created by precision farming contains valuable information. For example, farmers use sensors and analytics to gather information, or "farm data," about their agricultural operation.[7] An agriculture technology provider (ATP) then aggregates the data for the farmer, organizing and presenting the data in a way that allows the farmer to make decisions about his farm operation.[8] Jason Tatge of Farmobile considers farm data "to be a $20 to $25 billion revenue" venture.[9] Precision farming technologies, such as field-mapping or yield-recording, produce data that improves farm-management practices by providing more information for farmers and producers to use while making decisions about their business's future.[10] These technologies allow farmers to increase productivity and lower costs by decreasing labor and non-labor input costs.[11] By using "cloud computing" software, dashboard

5. Paul Hollis, *More Southern Farmers Adopting Precision Farming Practices*, SE. FARMPRESS (Apr. 2, 2014), http://www.southeastfarmpress.com/equipment/more-southern-farmers-adopting-precision-farming-practices [https://perma.cc/96XS-2WJZ] ("Sixty-six percent [of the farmers who responded to the survey] were using GPS guidance systems . . . .").

6. *See* Ben Potter, *6 Questions Farmers Should Ask Precision Providers*, AGWEB, http:// www.agweb.com/ article/ 6-questions-farmers-should-ask-precision-providers-naa-ben-potter/ [https://perma.cc/J3P3-NQKA] (finding that a portion of farmers who use precision farm technologies do not inquire about their data rights).

7. Shannon L. Ferrell, *Legal Issues on the Farm Data Frontier, Part I: Managing First-Degree Relationships in Farm Data Transfers*, 21 DRAKE J. AGRIC. L. 13, 15-18 (2016).

8. *Id.* at 15-16.

9. Jason Tatge, *The Land Grab for Farm Data*, TECHCRUNCH (July 6, 2016), https:// techcrunch.com/ 2016/ 07/ 06/ the- land- grab-for-farm-data/ [https://perma.cc/2Q2B-AGBP]; *see also Global Forecast*, *supra* note 3 (noting that the precision farm industry has an expected market growth of $4.67 billion by 2022).

10. John M. Antle et al., *Next Generation Agricultural Systems Models and Knowledge Products: Synthesis and Strategy*, 155 AGRIC. SYSTEMS 179, 179 (2017).

11. *See* KEITH O. FUGLIE ET AL., USDA ECONOMIC RESEARCH SERVICE, ECON. BRIEF NO. 9, PRODUCTIVITY GROWTH IN U.S. AGRICULTURE 2, 4-6 (2007), https:// www. ers. usda.gov/ webdocs/ publications/ 42924/ 11854_ eb9_ 1_ .pdf [https://perma.cc/ABN6-A7XG] ("In recent years, applications of new biotechnology and information technology to agriculture have . . . been a source of productivity growth for the sector."); *see also* Mark Yu et al., *Economic Impacts of Precision Farming in Irrigated Cotton Production*, 16 TEX. J. AGRIC. & NAT. RESOURCES 1, 1, 13 (2003) ("In short, precision farming practices . . . improve productivity . . . .").

monitors, and Wi-Fi communications, farmers and ATPs are now able to take data that, when aggregated with larger sets of data, allows others to make more accurate predictions and decisions.[12]

Because many parties interact with farm data from the time it is created to the time it is aggregated, it is important to determine who controls the data. Specifically, do ATPs such as Monsanto have the right to control and use all aspects of the data collected from farmers that they created using precision farming technologies?[13] Or, do farmers have the right, or even the ability, to use precision agricultural technologies and not forfeit their rights in their own data to an ATP?[14] Similarly, is there footing to create a large, public database of precision farm data due to a significant public interest?[15]

This Comment focuses on these questions and suggests the need for clarity in precision farm data ownership rights. Specifically, this Comment finds that ownership rights in farm data are unclear and regulation is necessary. Because data from precision farming has significant monetary value[16] and is changing the agricultural industry, it is necessary to provide a structure as to what can and cannot be done with this data and what it can and cannot be used for. On October 22, 2015, the House Agriculture Committee conducted a hearing on big data and agriculture and Blake Hurst, the President of Missouri Farm Bureau, discussed how government involvement that created easy access to USDA programs was preferred.[17] In addition, Professor Shannon Ferrell of Oklahoma State University stated that ownership of farm data is a difficult concept because the data does

12. *See* BERNARD MARR, BIG DATA: USING SMART BIG DATA, ANALYTICS AND METRICS TO MAKE BETTER DECISIONS AND IMPROVE PERFORMANCE 10, 74 (2015).

13. *See* Isabelle M. Carbonell, *The Ethics of Big Data in Big Agriculture*, 5 INTERNET POL'Y REV. 1, 1-3 (2016) ("Agribusinesses . . . have high stakes in big data, as it gives them the ability to construct an unprecedented predictive business model over each aspect of farming.").

14. *See id*. at 5-6.

15. *See About OADA*, OPEN AG DATA ALLIANCE, http://openag.io/about-us/ [https://perma.cc/Q487-6QQV].

16. *See* Lyndsey Gilpin, *How Big Data is Going to Help Feed Nine Billion People by 2050*, TECHREPUBLIC (May 9, 2014), http://www.techrepublic.com/article/how-big-data-is-going-to-help-feed-9-billion-people-by-2050/ (stating that Monsanto considers farm data a multi-billion dollar investment).

17. *Big Data and Agriculture: Innovation and Implications: Hearing Before the H. Comm. on Agric.*, 114th Cong. 6-7 (2015) (statement of Blake Hurst, President, Missouri Farm Bureau).

not fit into any category already regulated by federal law.[18] The ambiguous nature of farm data requires regulation that would help clarify data ownership.

Part I explains the technology behind precision farming and big data, describes the information created and processed between these two technologies, and discusses how they intertwine. This part will also introduce the Privacy and Security Principles of Farm Data (the "Privacy Principles"), a code of ethics that helps define data security and rights between ATPs and technology users.[19] Part II analyzes the concepts behind ATP and user property and ownership rights in precision farm data. Part III illustrates the ambiguous nature of the Privacy Principles and suggests that legislation can help clarify property rights between ATPs and users over the data created. Part IV proposes creating a public database where aggregated data could be stored, the policy reasons for creating it, how it could be done, and potential arguments against the policy. Part V concludes and notes how clarity in farm data can help move the industry forward.

I. PRECISION FARMING AND BIG DATA

While farming has historically offered labor-based jobs, it now offers more service-focused jobs to help farmers manage their labor and costs more efficiently.[20] This change has resulted in an "information revolution" for agriculture where "[j]obs are shifting from the manufacturing economy to the services and knowledge economy."[21] None of these services are more

18. *See id.* at 31 (statement of Shannon Ferrell, Associate Professor and Faculty Teaching Fellow, Oklahoma State University).

19. Todd Janzen, *Ag Industry Releases Core Principles for Farm Data Privacy*, LEXISNEXIS (Feb. 2, 2015, 10:21 AM), https:// www.lexisnexis.com/ legalnewsroom/ environmental/ b/ environmentalregulation/ archive/ 2015/ 02/ 02/ ag-industry-releases-core-principles-for-farm-data-privacy.aspx [https://perma.cc/N68Q-D2TK]; *see also Privacy and Security Principles for Farm Data*, AMERICAN FARM BUREAU FED'N. (Apr. 1, 2016) [hereinafter *Principles of Farm Data*], https://www.fb.org/ issues/ technology/ data-privacy/ privacy- and- security- principles- for- farm- data [https://perma.cc/9DSY-SXTK].

20. JONATHAN DYER, NUFFIELD AUSTL. FARMING SCHOLARS, PROJECT NO. 1506, THE DATA FARM: AN INVESTIGATION OF THE IMPLICATIONS OF COLLECTING DATA ON FARM 11, 13 (2016), https:// slidelegend.com/ the- data- farm- nuffield-international_59b9d4da1723dd995c2f4d34.html [https://perma.cc/V3FQ-CG8P] ("The spectrum of ways to collect data is as wide as the number of issues are on [a] farm to collect data about.").

21. *Id.* at 11.

important in agriculture than the precision farming technologies offered to farmers. These technologies help farmers in a variety of ways,[22] and the ability to accurately match farm inputs such as water, seed count, and fertilizer to soil and vegetation features helps maximize effectiveness and profitability.[23] Precision farming plays a large part in aggregating farm data, so understanding the basic principles of these technologies is vital.

A. Precision Farming

There is no precise definition for precision farming. The National Research Council has defined precision agriculture as "a management strategy that uses information technologies to bring data from multiple sources to bear on decisions associated with crop production."[24] The Council found that precision agriculture consisted of three components: acquiring data at an appropriate rate, interpreting and analyzing the data, and applying data to management in a timely manner.[25] The third component is essential to precision farming, as it offers a way for farmers to apply the aggregated data and "provid[es] [them] the means [to] observ[e], assess[] and control[] their agricultural practices."[26]

Precision farming is a combination of different technologies that help farmers in different ways. One of the more commonly known technologies is positioning systems, which use satellites to provide global positioning system (GPS) coordinates and

22. *See* Margaret A Oliver, *An Overview of Precision Agriculture*, *in* PRECISION AGRICULTURE FOR SUSTAINABILITY AND ENVIRONMENTAL PROTECTION 1, 3-6 (Margaret Oliver et al. eds., 2013) (opining that precision agricultural technologies can lower environmental impacts, particularize pesticide application, assist soil-erosion management, lessen irrigation usage, and reduce farming expenses).

23. *See* Yang et al., *supra* note 2, at 178.

24. Oliver, *supra* note 22, at 6 (citations omitted); *see also* Matt Hopkins, *Precision Agriculture: Terms and Definitions*, PRECISIONAG (Oct. 20, 2015), http://www.precisionag.com/professionals/precision-agriculture-terms-and-definitions/ [https://perma.cc/SH6K-VM7K] (finding that precision agriculture is the use of all technologies in agriculture whether the technology is for growers or agricultural retailers, and is specifically helpful for measuring crop inputs).

25. Oliver, *supra* note 22.

26. Aline Baggio, *Wireless Sensor Networks in Precision Agriculture*, *in* REALWSN 2005: PROCEEDINGS OF THE FIRST WORKSHOP ON REAL-WORLD WIRELESS SENSOR NETWORKS 107, 107 (2005), http://soda.swedishict.se/2370/1/SICS-T—2005-09—SE.pdf [https://perma.cc/2VPD-NUH6] ("[Precision agriculture] covers a wide range of agricultural concerns from daily herd management through horticulture to field crop production . . . .").

ground-level receivers that take the signals and compute the receiver's range and position on the earth's surface.[27] Four satellites, using three-dimensional space, determine the exact position on the earth's surface.[28] The receiver, which attaches to a piece of equipment, determines the "amount of time a radio wave takes to travel from a satellite to a receiver."[29] The time it takes for these radio waves and signals to transfer from receiver to satellite allows the satellite to determine the location of the receiver.[30] The ground-level receiver finds its location by constantly sending these signals to the satellites.[31] The farmer is then able to determine the location of the instrument the positioning system is tracking.

Another common technology used in precision farming is yield maps.[32] Farmers use these maps[33] to determine crop productivity and the factors, such as moisture levels, that led to a particular yield.[34] Yield-mapping technologies measure the flow-rate of crops and generate a periodic record of how much of a specific crop a farmer harvested over time.[35] Equipment records the yield using different types of signals such as the grain-flow rate and moisture in the grain.[36] Most harvesting equipment, such as combines, is outfitted with yield mapping technologies and "synchronized with location address[es] obtained from onboard

27. Pinaki Mondal & V.K. Tewari, *Present Status of Precision Farming: A Review*, 2 INT'L J. AGRIC. RES. 1, 2 (2007).

28. ROBERT GRISSO ET AL., PRECISION FARMING TOOLS: GLOBAL POSITIONING SYSTEM (GPS) 2 (Va. Coop. Extension Pub. No. 442-503, 2009), http://pubs.ext.vt.edu/content/ dam/ pubs_ ext_ vt_ edu/ 442/ 442-503/ 442-503_pdf.pdf [https://perma.cc/M67S-ZQMN].

29. *Id.*

30. *Id.*

31. *See id.*

32. *See* M. Zhang et al., *Yield Mapping in Precision Farming*, *in* COMPUTER AND COMPUTING TECHNOLOGIES IN AGRICULTURE, VOLUME II 1407, 1407 (2007) ("A yield map is the basis for understanding the yield variability within the field, analyzing reasons behind the yield viability, and improving management according to the increase in the profit.").

33. *See* Todd Janzen, *What Makes Agronomic Farm Data Different from Other Types of Intellectual Property?*, AGWEB: JANZEN AG L. BLOG (May 15, 2015), http://www.agweb.com/blog/janzen-ag-law-blog/what-makes-agronomic-farm-data-different-from-other-types-of-intellectual-property/ [https://perma.cc/J7J5-GSSQ] (stating that yield data is a type of agronomic farm data).

34. *Id.*

35. M. Zhang et al., *supra* note 32.

36. *Id.* at 1421.

GPS system[s] . . . ."[37] Yield maps, which correlate with field maps, are then stored for review.[38] Their "temporal variability of different agronomic parameters"[39] helps farmers analyze the reasons for yield differences and manage their farms proficiently in coordination with these reports.[40]

Another type of technology is remote sensing shown through satellite images. By combining satellite technologies and GPS systems, the variable weed coverage across fields can be seen clearer and chemical inputs can be controlled better by farmers, saving costs, time, and lowering their inputs' environmental impact.[41] These satellite images help farmers see potential crop infection within their fields and predict yields based on the growth stage of their crops.[42] These images also provide a vegetation index imagery that shows red where there is a large weed presence in the field and green for a lower weed presence.[43] These technologies help dictate input applications by determining herbicide and fertilizer rates for weed control based on vegetation presence and coverage.[44]

Precision farming also offers soil and crop sensing technologies, which measure specific soil qualities to determine proper farm management.[45] These technologies have direct

37. Mondal & Tewari, *supra* note 27, at 2.

38. Jess Lowenberg-Deboer, *The Precision Agriculture Revolution: Making the Modern Farmer*, 94 FOREIGN AFF. (2015), https://www.foreignaffairs.com/articles/united-states/2015-04-20/precision-agriculture-revolution ("[Yield maps] can help a farmer arrive at yield numbers for the purpose of insurance or government programs, measure the results of experiments that test the qualities of genetically modified crops or the effectiveness of various cultivation practices, and reveal which parts of the field aren't living up to their potential.").

39. Mondal & Tewari, *supra* note 27, at 2.

40. M. Zhang et al., *supra* note 32, at 1407.

41. Santhosh K. Seelan et al., *Remote Sensing Applications for Precision Agriculture: A Learning Community Approach*, 88 REMOTE SENSING ENV'T 157, 158, 160-62 (2003); see *also* Christoph Kunz et al., *Benefits of Precision Farming Technologies for Mechanical Weed Control in Soybean and Sugar Beet—Comparison of Precision Hoeing with Conventional Mechanical Weed Control*, 5 AGRONOMY 130, 131-32 (2015) (stating that precision farming methods help lower weed density in fields through automated guidance systems).

42. *See* Mondal & Tewari, *supra* note 27, at 3 ("Spatial assessments of the physiological status of wheat crops has been done by using infrared thermal imagery.").

43. *See* Seelan et al., *supra* note 41, at 159-63 (stating that by analyzing the vegetation cover patterns on a field the farmer can control inputs of fertilizer and water, but also for management purposes).

44. *See id.* at 165-66.

45. *See* Kenneth G. Cassman, *Ecological Intensification of Cereal Production*

contact with the soil and measure soil penetration resistance, moisture content, and electrical conductivity in the soil.[46] A cutting disc or a hand-held electromagnetic probe measures these factors.[47] These factors together help determine soil density, changes in soil properties, water-holding capacity, salt and pH levels, and a field's nitrogen levels.[48] Farmers' use this aggregated data to reduce management costs by eliminating the need to consult outside vendors for management recommendations.[49] Similarly, when farmers link their crop status to their field and soil characteristics it presents an opportunity to significantly lower input costs; when farmers can manage on a site-specific basis, their yields can improve over time.[50] Understanding exact crop responses to specific variables helps farmers manage their farms better.[51]

Lastly, farmers use variable-rate technologies to lower input costs tied to crop applications. Fertilizer and pesticide applications vary across farms and fields, and factors that affect yield variability are not uniform across a single field or farm, so similar application management is not ideal.[52] For soil and crop sensing, when farmers determine a field's soil types and weed vegetation they can determine application rates for that field based on their data.[53] Farmers can apply farm data to the variability of fields and crops to manage better and avoid errors in application rates. This helps achieve maximum yield potential and field efficiency when farmers use only the base-input amount required according to their data.[54] Variable rate technologies "ha[ve] the potential to improve input efficiency, field profitability, and environmental stewardship."[55] Because

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Systems: Yield Potential, Soil Quality, and Precision Agriculture, 96 PROC. NAT'L ACAD. SCI. U.S. 5952, 5957 (1999).

46. *See* Mondal & Tewari, *supra* note 27, at 4.

47. *Id*.

48. *Id*. at 4-5.

49. *See id*. at 5.

50. Cassman, *supra* note 45, at 5957.

51. *See id.*

52. J.E. Sawyer, *Concepts of Variable Rate Technology with Considerations for Fertilizer Application*, 7 J. PRODUCTION AGRIC. 195, 195 (1994).

53. *Id*. at 196.

54. *See id*.

55. *Id*. at 195.

efficiency and lowering waste is crucial for farmers,[56] the more quickly they adopt these technologies, the smaller their environmental impact will be.[57]

B. Big Data

Big data involves large sets of data, data sources, and the speed at which someone aggregates large amounts of data.[58] For perspective, in 2012 the world used more than 2.8 zettabytes of data. That's 2.8 trillion gigabytes.[59] Large and unorganized amounts of data are difficult for laypeople to understand; finding value in big data often requires technologies and expertise that most farmers do not have.[60] An information value chain finds the value in big data, transforming "data into information" and "information into knowledge."[61] The information and knowledge one needs will dictate how he or she interprets the data.[62]

Big data has four characteristics: volume, variety, velocity, and veracity.[63] To determine the applicability of these characteristics, experts use a big-data information value chain to

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56. *See* Andy Linn, *Agriculture Sector Poised to Soar with Drone Integration, But Federal Regulation May Ground the Industry Before It Can Take Off*, 48 TEX. TECH L. REV. 975, 979-80 (2016) ("By increasing production and minimizing waste of resources and loss of crops during the growing season, farmers may provide more accurate yield predications and produce a greater crop yield at harvest.").

57. Yang et al., *supra* note 2, at 178.

58. Amir Gandomi & Murtaza Haider, *Beyond the Hype: Big Data Concepts, Methods, and Analytics*, 35 INT'L J. INFO. MGMT. 137, 138-39 (2015) (finding that big data was difficult to define, and that size is the term's key component).

59. John Burn-Murdoch, *Study: Less Than 1% of the World's Data is Analyzed, Over 80% is Unprotected*, THE GUARDIAN (Dec. 19, 2012, 12:05 PM), https://www.theguardian.com/news/datablog/2012/dec/19/big-data-study-digital-universe-global-volume [https://perma.cc/V3DM-UVFE].

60. Carbonell, *supra* note 13, at 2, 8.

61. Ahmed Abbasi et al., *Big Data Research in Information Systems: Toward an Inclusive Research Agenda*, 17 J. ASS'N INFO. SYSTEMS i, iii (2016).

62. *Id.* at iii, xviii ("The economics of big data has important implications for information systems. . . . In the context of big data, assessing information's value is more critical than ever.").

63. Alba Amato & Salvatore Venticinque, *Big Data Management Systems for the Exploitation of Pervasive Environments*, *in* BIG DATA AND INTERNET OF THINGS: A ROADMAP FOR SMART ENVIRONMENTS 67, 68-69 (Nik Bessis & Ciprian Dobre ed., 2014) (finding that volume refers to the large sets of data; variety shows the structured, semi-structured, and unstructured data sets; velocity refers to the high rate in which the data is collected and how fast one processes the data; and veracity denotes the unpredictability of the data).

get value from big data.[64] First, information technologies that contain data include in-memory databases and data lakes, which are big-data platforms managed by big-data architects.[65] Here, data scientists construct the data into data storages.[66] After programmers construct and store the data, it then becomes information.[67] Here, programmers use analytics to develop the information into better forms of data.[68] The data then becomes knowledge through prescriptive tools created by developers that help influence the data so that one could use it.[69] Finally, users (farmers) use the knowledge for decision making. This is the true value of the data—using it for better real-time decision making.

Farmers' need for instant decision making helps push the growth of big data in agriculture. Aggregating large amounts of information helps farmers make better decisions—whether it is watering a field, measuring the amount of pesticide needed, or deciding if crops are harvestable. The next section explores how precision farming and big data intertwine, and how farmers use these technologies to make decisions.

C. How Big Data and Precision Farming Interact

Farmers are familiar with predicting outcomes. They predict the quality of their crops and the value of those crops. Farm data allows farmers to make more accurate predictions in each aspect of farming through precision farming technologies.[70] Data sharing can happen "instantaneously and seamlessly through the Internet."[71] And both farmers and agribusinesses, such as John Deere or Monsanto, are able to use these data-sharing technologies.[72] Big data, when collected from many sources, can

64. Abbasi et al., *supra* note 61, at v.

65. *Id*. at v-vi.

66. *See id*.

67. *Id*. at vi-vii.

68. *Id.*

69. *See* Abbasi et al., *supra* note 61, at vi-vii (stating that the biggest shift in big data organization comes where consuming analytics in real time with the help of self-service technologies is vital where managers are required to make decisions faster than ever).

70. Yang, *supra* note 2, at 178.

71. David B. Ramsey, *Data Security: Evolving Legal Disputes and Challenges for Franchise Systems*, 20 J. INTERNET L. 3, 3 (2016).

72. Carbonell, *supra* note 13, at 1.

interpret past events and predict future events or trends.[73] In the past, larger farms have used these technologies more than smaller farms.[74] But the number of smaller farms using these technologies is growing.[75]

Farmers historically kept written records of inputs, watering plans, and yields that they would reference.[76] When using precision farming technologies, farmers now use digital tools that help make their decision making more efficient.[77] For example, farmers now use "generic [agricultural] software, email/text alerts, online calculators or guidance, phone apps, and paper-based" tools, such a summarized reports.[78] These technologies used to be local and specialized for farmers,[79] and this created little debate over data ownership.[80]

Now, farmers submit the data to technology providers because of their ability to aggregate the data faster[81] using cloud technologies.[82] Cloud technologies that aggregate data sets are based on communication and resource sharing between devices through the "cloud," which is simply the internet.[83] Cloud technology's main goal is processing data faster using specialized servers that connect the technologies the farmers use.[84] When using this technology, a farmer connects to the cloud using his devices and operates the device the way that he wants while the

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73. *Id*.

74. *See* Kelly Bronson & Irena Knezevic, *Big Data in Food and Agriculture*, BIG DATA & SOC'Y, June 20, 2016, at 1, http:// bds.sagepub.com/ content/ 3/ 1/ 2053951716648174.

75. *See id.*

76. *See* Lynn F. Kime, *The Importance of Record Keeping*, PENN ST. EXTENSION (Aug. 8, 2017), https:// extension. psu. edu/ the- importance- of- record- keeping [https://perma.cc/488A-9JQK].

77. *See* Bronson & Knezevic, *supra* note 74 ("[T]he use of large information sets and the digital tools for collecting, aggregating, and analyzing them . . . has the potential to wade in on long-standing relationships between players in food and agriculture.").

78. David C. Rose et al., *Decision Support Tools for Agriculture: Towards Effective Design and Delivery*, 149 AGRIC. SYSTEMS 165, 166 (2016).

79. *See* Michael E. Sykuta, *Big Data in Agriculture: Property Rights, Privacy and Competition in Ag Data Services*, 19 INT'L FOOD & AGRIBUSINESS MGMT. REV., no. A, 2016, at 57, 60 (stating that a farmer's data was not aggregated with other data).

80. *Id*.

81. *Id*.

82. *Id*.

83. Sushma Talluri, *Big Data Using Cloud Technologies*, 16 GLOBAL J. COMPUTER SCI. & TECH., no. 2, 2016, at 17, 17.

84. *Id.* at 17-18

data is stored on the cloud.[85]

An example of this technology is Monsanto's FieldScripts program, which needs two years of farm data, such as yields, soil information, and field mapping, to "generate . . . planting prescriptions" that give farmers a broad view of their operations and suggestions for the future.[86] This technology allows farmers to examine their personal farm data and Monsanto to examine, aggregate, and analyze large sets of farm data.[87] Different tiers of the software offer different services, such as watering recommendations, suggested pesticide and fertilizer usage, a yield predictor, and other "tailored insights" based on "agronomic" factors and data.[88] Moreover, "compan[ies] can monitor and track what is in the soil, what the weather is, what kind of products the farmer is using, how much she's producing, [and] how much profit she's making . . . ."[89]

Farmers allow companies to collect information created by precision farming through independent, binding agreements with ATPs.[90] These contracts are based on the data principles the ATP provides[91] and the Privacy Principles.[92] Released in November of 2014,[93] the Privacy Principles are a nonbinding outline of

85. *See id.*

86. Sykuta, *supra* note 79, at 60, 62.

87. Carbonell, *supra* note 13, at 6 (stating that Monsanto's other technology provided farmers Climate Corp. maps which contained "multiple layers of data" and produced real-time temperature, weather, and soil moisture for fields, predicting when is the best time to plant based on present trends and weather data from the last 30 years); *see also* Sykuta, *supra* note 79, at 61 (stating that Pioneer's Field360 program provides seed rate recommendations, tracks field-level precipitation levels, and estimates crop growth based on climate and genetic characteristics to help the farmer notice deficiencies in his crops).

88. Carbonell, *supra* note 13, at 6; *see also* Sykuta, *supra* note 79, at 62 (stating that "less comprehensive" services from companies such as Agrible, Conservis, and AgLeader offer data and farm management services that help technologies of various types).

89. Carbonell, *supra* note 13, at 6.

90. Tatge, *supra* note 9; *see also* Jacob Bunge, *On the Farm: Startups Put Data in Farmers' Hands,* WALL STREET J. ONLINE (Aug. 31, 2015, 2:01 PM), http://www.wsj.com/articles/on-the-farm-startups-put-data-in-farmers-hands-1441044071 (stating that farmers could profit off of their data by selling it).

91. *See Privacy and Data: Enterprise Privacy Statement*, JOHN DEERE [hereinafter *Privacy and Data]*, https:// www.deere.com/ privacy_and_data/ policies_statements/ en_US/ data_principles/ data_principles.page [https://perma.cc/UH34-YRB3].

92. *See Principles of Farm Data*, *supra* note 19; *see also* Sykuta, *supra* note 79, at 66 ("The principles outline an agreed upon approach to dealing with data issues . . . .").

93. *Farm Groups and Ag Tech Companies Outline Data Privacy Protocols*, AGRI-PULSE (Nov. 13, 2014), http:// www.agri-pulse.com/ Farm- groups- ag- tech- companies-outline- data- privacy- protocols- 11122014.asp [https://perma.cc/R9XA-BPMW].

principles created by ATPs, farmer organizations, and major equipment companies such as John Deere and Syngenta[94] that serves as the basis for farm data agreements. These principles outline what ATPs and farmers agree about concerning data rights, and include statements such as:

> Ownership: We believe farmers own information generated on their farming operations. However, it is the responsibility of the farmer to agree upon data use and sharing with the other stakeholders with an economic interest, such as the tenant, landowner, cooperative, owner of the precision agriculture system hardware, and/or ATP etc. The farmer contracting with the ATP is responsible for ensuring that only the data they own or have permission to use is included in the account with the ATP.
>
> Transparency and Consistency: ATPs shall notify farmers about the purposes for which they collect and use farm data. They should provide information about how farmers can contact the ATP with any inquiries or complaints, the types of third parties to which they disclose the data and the choices the ATP offers for limiting its use and disclosure.
>
> Unlawful or Anti-Competitive Activities: ATPs should not use the data for unlawful or anti-competitive activities, such as a prohibition on the use of farm data by the ATP to speculate in commodity markets.
>
> Disclosure, Use, and Sale Limitations: An ATP will not sell and/or disclose non-aggregated farm data to a third party without first securing a legally binding commitment to be bound by the same terms and conditions as the ATP has with the farmer. Farmers must be notified if such a sale is going to take place and have the option to opt out or have their data removed prior to that sale. An ATP will not share or disclose original farm data with a third party in any manner that is inconsistent with the contract with the farmer. If the

94. *Principles of Farm Data*, *supra* note 19.

> agreement with the third party is not the same as the agreement with the ATP, farmers must be presented with the third party's terms for agreement or rejection.[95]

While the Privacy Principles signify progress for clarity in farm data ownership, questions remain regarding what the data can be used for and to what extent the data can be used.[96] The Privacy Principles are a nonbinding agreement that neither party is required to follow. Contract law is the basis for determining what can be done with farm data by both parties. The following sections will show that regulation can help clarify data rights.

II. RIGHTS IN THE DATA

Federal law does not recognize farm data as having any clear ownership or as being property.[97] The Privacy Principles try to say that farmers own the data created on their farm,[98] but possibly not beyond that. The reality is that ownership is a legal construct "recognized by courts or a law . . . ."[99] Unfortunately, precision farm data ownership is not clearly established or defined by either of these.[100] This lack of clarity confuses farmers and producers, making them think they own their data when in reality that is not exactly true.[101] An ATP can aggregate certain data from farmers, leaving them uncertain about ownership and with no options against ATPs or third parties,[102] such as landlords[103] and other

95. *Id.*

96. *See* James R. Walter, *A Brand New Harvest: Issues Regarding Precision Agriculture Data Ownership and Control*, 2 DRAKE J. AGRIC. L. 431, 445 (1997) (finding that contracts between farmers and ATPs often lack sufficient detail pertaining to data rights).

97. Todd Janzen, *What Makes Ag Data "Ownership" Unique*, JANZEN AG L. BLOG (Jan. 15, 2016), http:// www.aglaw.us/ janzenaglaw/ 2016/ 1/ 15/what-makes-ag-data-ownership-unique [https://perma.cc/4V6R-NM6V].

98. *See Principles of Farm Data*, *supra* note 19; Sykuta, *supra* note 79, at 67 ("[These] provision[s] [do] not distinguish between aggregated and farm-identifiable data, as with the farmer's retrieval policy.").

99. Janzen, *supra* note 97.

100. *See* Barbara J. Evans, *Much Ado About Data Ownership*, 25 HARV. J.L. & TECH. 69, 72-73 (2011).

101. *See. e.g.*, Janzen, *supra* note 97.

102. *See* Evans, *supra* note 100, at 93.

103. *See* Tiffany Dowell, *Big Data on the Farm (Part II): What Laws Might Protect It?*, TEX. AGRIC. L. BLOG (Sept. 8, 2015), http://agrilife.org/ texasaglaw/ 2015/ 09/ 08/ big-

companies that have specific uses for aggregated data.[104]

Precision farm data is a difficult property-law concept. It is hard to "possess" due to its intellectual property characteristics.[105] Similarly, big data creates hierarchies about who owns the data and who has rights in the data.[106] While property ownership involves the rights to possess, use, destroy, or transfer property,[107] hierarchies pertaining to farmers, ATPs and third parties allows different parties to have rights in the data,[108] creating ownership confusion.[109]

Understanding the rights that parties have in farm data requires knowing that different parties utilize the data in different ways.[110] These parties include "those who create data, those who have the means to collect it, and those who have amassed the expertise to analyze" the data and calculate its value.[111] These rights and hierarchies are necessary to get the most value out of the data. It would be irrational for a farmer to install and use precision farming technologies but limit the benefits by limiting an ATP's right to view and interpret the data. Also, it would not make sense for ATPs to limit a farmer's rights to the data he or she created because the ATP benefits from the aggregated data. The full value of the data is only attainable when other parties, such as data experts, may access it.[112] Farmobile CEO Jason Tatge stated that the data that farmers generate is "inherently valuable" and that "farmers will make at least $2 per acre . . . in our Data Store [and] . . . will likely make more as the Data Store

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data- on- the- farm- part- ii- what- laws- might- protect- it/ [https://perma.cc/S3AZ-63H5].

104. *See* Dan Frieberg, *Who Owns Agriculture Data and Knowledge?*, CORN & SOYBEAN DIGEST (Dec. 18, 2014), http://cornandsoybeandigest.com/precision-ag/who-owns-agriculture-data-and-knowledge [https://perma.cc/N8V5-4E2T].

105. Ferrell, *supra* note 7, at 27-28.

106. *See* Carbonell, *supra* note 13, at 2-3.

107. Ferrell, *supra* note 7, at 27.

108. Carbonell, *supra* note 13, at 2-3.

109. *See id*. (questioning whether or not big data analytics can be used "equitably" in farming).

110. *Id.*

111. *Id.* (citation omitted); *see also* Ben Potter, *Farm Data Security Has a Thumb-Sized Problem*, AGWEB (June 8, 2016, 1:48 PM), http:// www.agweb.com/ article/ farm-data- security- has- a- thumb- sized- problem- naa- ben- potter/ [https://perma.cc/TZP5-ZSAW] (finding that farm data could be "of interest to a wide range of agribusinesses").

112. *See* Ben Potter, *What's Your Farm Data Worth?*, AGWEB (Apr. 13, 2016, 10:48 AM), http://www.agweb.com/mobile/article/whats-your-farm-data-worth-naa-ben-potter/ [https://perma.cc/8B5A-T59A].

grows."[113]

While precision farming technologies allow multiple parties to benefit from farm data, ownership questions remain due to a lack of transparency. Farmers see the "cloud" as a way for big companies to cheat them.[114] It is common for farmers to have concerns about the privacy and security of their personal and farm data.[115] While ATPs have addressed those security concerns at the margin, data hacking is still possible.[116] ATPs defending against data hacking shows that ATPs have an interest in the data similar to farmers. ATPs do not create the data, but they aggregate it and create value in it. Disclosure of what they do with data is important since many parties come in contact with the data from the time it's created by a farmer, to its aggregation, and application. While farmers take the first step in creating the data, other parties need rights to access the data.

Transparency regarding the parties is important, and farmers should be educated when dealing with precision farm data.[117] Education in precision farming technology systems is important,[118] but it is also crucial to understand that the technology requires multiple parties to interact with the data the farmer creates. For example, a farmer's data alone is not as

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113. *Id*. (also noting that Sarah Harper, director of sustainable solutions for K Koe Isom, finds that if farmers know the value of their data and are willing to be creative toward how they are compensated there are many opportunities available).

114. Jacob Strobel, *Agriculture Precision Farming: Who Owns the Property of Information? Is it the Farmer, The Company Who Helps Consult the Farmer on How to Use the Information Best, Or the Mechanical Company Who Built the Technology Itself?*, 19 DRAKE J. AGRIC. L. 239, 247 (2014) (stating that farmers are afraid their information is being passed to others to drive up prices and manipulate costs for their farm operations).

115. *See* Shruti Singh & Jack Kaskey, *Farmers Press Agribusiness Giants for Data Security*, BLOOMBERG L. (Jan. 23, 2014, 06:46 PM), http://www.bloomberg.com/ news/ articles/2014-01-23/farmers-press-agribusiness-giants-for-data-security [https://perma.cc/GVJ3-6U3T] (noting that it is common for famers to have concerns over the privacy of their farm data).

116. Hembree Brandon, *If You Aren't Worried About Data Security, You Should Be*, DELTA FARM PRESS (Sept. 28, 2016), http:// deltafarmpress.com/ blog/ if- you- aren- t- worried – about -data- security- you- should- be [https://perma.cc/M3P4-GKKB?type=image] (stating that since many farmers pay for data services from other parties the opportunity to disrupt a farm operation is greater).

117. Lauren Manning, *Setting the Table for Feast or Famine: How Education Will Play a Deciding Role in the Future of Precision Agriculture*, 11 J. FOOD L. & POL'Y 113, 152 (2015).

118. *Id.* at 152-53 (stating that farmers need to develop some competency for dealing with ATPs about their data).

valuable as multiple farmers' data aggregated to calculate growing trends. Farmers need the assistance and expertise of other parties.[119] A farmer's right to destroy the data and transfer it to others is still there,[120] but other parties have rights too. This idea is imperative for precision farming technologies moving forward.

III. AMBIGUITY OF RIGHTS BETWEEN FARMERS AND AGRICULTURE TECHNOLOGY PROVIDERS REQUIRES FEDERAL LEGISLATION

The Privacy Principles are unclear regarding data ownership rights. The Privacy Principles' vagueness is a flaw in the agreement, which individual ATP and farmer agreements reflect.[121] The Privacy Principles do not present clear ideas that ATPs can easily follow, and leave room for farmer confusion when conducting business with ATPs.

The Privacy Principles are composed of thirteen principles that each ATP should adopt when conducting data-related business with farmers or producers.[122] "Ownership" is the second principle of the agreement and states, "We believe farmers own information generated on their farming operation."[123] This suggests that farmers only own the information generated on their specific farm operation and any kind of aggregation of that information cuts off a farmer's ownership.[124] Also, the definition suggests that "recommendations [from] ATPs, such as planting guides[,]" do not belong to farmers, even if their information helped create the planting guides.[125]

Similarly, the Privacy Principles say that collection and use of data require a farmer's consent through contract, signed or digital.[126] However, John Deere's Business Data Principles, under the "Data Uses" section, state, "We may use your [machine

119. *Id*. at 154.

120. *Principles of Farm Data*, *supra* note 19.

121. *See generally Privacy and Data*, *supra* note 91 (the agreement states that machine and production data may be provided to "affiliates, suppliers, and [other] service providers" to perform "business operations").

122. *Principles of Farm Data*, *supra* note 19.

123. *Id*.

124. Sykuta, *supra* note 79, at 66.

125. *Id.*

126. *Principles of Farm Data*, *supra* note 19; *see Privacy and Data*, *supra* note 91.

and production] data to develop and improve products and services."[127] Similarly, the "Data Disclosures" section states that, "[T]o perform our business operations we may disclose machine and production data to affiliates, suppliers and our service providers."[128] This deviation from the Privacy Principles shows the potential bargaining power that ATPs have over farmers. When contracts discuss different data types,[129] and ATPs present farmers with lengthy, boilerplate contracts,[130] the average farmer is not in a position to say no to such provisions due to how important the technology is to his or her operation.

The Privacy Principles also say that ATPs may not "sell and/or disclose non-aggregated farm data to a third party" without getting the farmer's permission first.[131] John Deere's Business Data Principles do not mention aggregated data, they just refer to a farmer's personal data.[132] Therefore, ATPs may sell or transfer aggregated data since a single farmer's data is not as valuable as a large group of aggregated data.[133] While the Privacy Principles have an "Unlawful or Anti-Competitive Activities" section that generally states farm data may not be used "to speculate in commodity markets,"[134] it is not likely that a set of nonbinding principles and policies will prevent such behavior.[135] This is especially apparent if the contract only mentions the farmer's data and not aggregated data.

While a discussion of what an ATP could unethically do with aggregated data is outside the scope of this Comment,[136] the need

127. *Privacy and Data*, *supra* note 91.

128. *Id.*

129. *See id.*

130. *The Future of Farming: Technological Innovations, Opportunities, and Challenges for Producers: Hearing Before the Subcomm. on Gen. Farm Commodities & Risk Mgmt. of the H. Comm. on Agric.*, 115th Cong. 21 (2017) (statement of Todd J. Janzen, President, Janzen Agricultural Law LLC).

131. *Principles of Farm Data*, *supra* note 19.

132. *Privacy and Data*, *supra* note 91 (making no mention of aggregated data).

133. Sykuta, *supra* note 79, at 67-68.

134. *Id.* at 68; *Principles of Farm Data*, *supra* note 19.

135. *See* Sykuta, *supra* note 79, at 68.

136. *See* Am. Farm Bureau Fed'n, *Farm Data: Farmers Worry Regulators, Market Speculators Might Get Private Info*, SE. FARM PRESS (Oct. 24, 2014), http:// www. southeastfarmpress.com/ government/ farm- data- farmers- worry- regulators- market-speculators-might-get-private-info [https://perma.cc/RMR9-EV2P] (noting that 76% of farmers questioned are concerned that their information could be used for commodity speculation).

for resolution over data-ownership rights is imperative in limiting precision farm data's market influence.[137] ATPs have addressed concerns that farmers have with their own, personal, farm-level data,[138] yet they leave farmers in the dark regarding aggregating their data with other data.[139] As this technology grows and farmers become more aware, federal legislation needs to offer structure for property rights beyond a set of nonbinding principles.

IV. SUGGESTION FOR CLARITY, A PUBLIC DATABASE FOR PRECISION FARM DATA

In 2015, President Obama announced the Federal Government's investment in the Precision Medicine Initiative.[140] Now including the *All of Us* research program, this program is a "participant-engaged" database that produces medical knowledge to prolong health and treat disease.[141] These medical databases collect patient information to conduct health surveillance without the disclosure of personal information.[142] Medical experts can conduct health surveillance using aggregated medical data from many sources.[143] While the database has privacy issues, the aggregation of medical data for the greater good will help connect specialists with large amounts of data quickly.[144]

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137. *See* Sykuta, *supra* note 79, at 70-71 (finding that aggregated data taken during harvest and planting seasons could harm farmers due to ATPs becoming aware of agricultural-market trends based on the data that they themselves have aggregated).

138. *See Privacy and Data*, *supra* note 91 (noting that data is used to service and administer the farmer's account).

139. Nicole Erwin, *Data Farming: How Big Data is Revolutionizing Big Ag*, OHIO VALLEY RESOURCE (Sept. 16, 2016), http://ohiovalleyresource.org/2016/09/16/data-farming-big-data-revolutionizing-big-ag/ [https://perma.cc/W3UG-NDCZ] (stating that Terry Griffin, a cropping system economist at Kansas State University, finds that the farmers he talks to are concerned with who owns the data and how it affects their farmland).

140. Press Release, White House, Fact Sheet: President Obama's Precision Medicine Initiative (Jan. 30, 2015), https:// obamawhitehouse.archives.gov/ the- press-office/ 2015/ 01/ 30/fact-sheet-president-obama-s-precision-medicine-initiative [https://perma.cc/9W45-S3LN].

141. *About the* All of Us *Research Program*, NAT'L INSTITUTES HEALTH, https://allofus.nih.gov/about/about-all-us-research-program [https://perma.cc/EU23-66FW].

142. Sharona Hoffman & Andy Podgurski, *The Use and Misuse of Biomedical Data: Is Bigger Really Better?*, 39 AM. J.L. & MED. 497, 512-13 (2013) (stating the positives of public medical databases for the general population and health community).

143. *Id.*

144. *See* Mona Lalwani, *Public Medical Database Aims to "Open-Source" Your*

Creating a public database for precision farm data similar to the Precision Medicine Initiative allows for open-data analysis in the agriculture industry.[145] This open-data structure helps clarify ownership rights by allowing everyone to benefit from the aggregated data.[146] Similarly, "open source technologies . . . may help farmers . . . reclaim their data ownership and regain some autonomy."[147] This database would show timely updates on the status of U.S. agriculture in multiple areas, similar to the Census of Agriculture conducted by the United States Department of Agriculture (USDA)[148] and statistics taken by the National Agriculture Statistics Service (NASS).[149] The statistics gathered by NASS and the USDA summarize U.S. agriculture, and updates from aggregated farm data to these current functions would show a clearer vision of U.S. agriculture.

Currently, the USDA conducts surveys and prepares reports on American agriculture.[150] The reports cover U.S. agricultural qualities such as production and supplies, prices paid and received by farmers, and chemical use.[151] Farmers report this information to the USDA and NASS to establish their eligibility for government benefit programs.[152] The Quick Stats tool on the NASS website allows a user to search farm data by sectors such as crops, animals, or environmental; by groups such as dairy, energy, poultry; and by commodities.[153]

Body, ENGADGET (Mar. 25, 2015), https://www.engadget.com/2015/03/25/public-medical-database-aims-to-open-source-your-body/ [https://perma.cc/MNH8-A4ZP].

145. *See* Manning, *supra* note 117, at 127; *see also* Carbonell, *supra* note 13, at 7-8 (analyzing the benefits of open-source data); Walter, *supra* note 96, at 444 (finding that farmers combining their data fully captures the potential of precision farming data); Greg R. Vetter, *The Collaborative Integrity of Open-Source Software*, 2004 UTAH L. REV. 563, 595 (noting that open-source software is a more generalized model of a "public-good").

146. Walter, *supra* note 96, at 444.

147. Carbonell, *supra* note 13, at 7.

148. *See, e.g.*, *Census of Agriculture*, USDA, https://www.agcensus.usda.gov [https://perma.cc/E5P3-6S7Z].

149. *See Data and Statistics*, NAT'L AGRIC. STAT. SERV. (Feb. 1, 2018), https://www.nass.usda.gov/Data_and_Statistics/index.php [https://perma.cc/6VLF-2ERA].

150. *See Agency Overview*, NAT'L AGRIC. STAT. SERV. (Jan. 26, 2018), https://www.nass.usda.gov/About_NASS/index.php [https://perma.cc/87Y4-AHZS].

151. *Id*. (stating that the reports also detail demographic changes in producers and farm labor and wages).

152. *See* Multi Ag Media LLC v. USDA, 515 F.3d 1224, 1226 (D.C. Cir. 2008).

153. *Quick Stats*, NAT'L AGRIC. STAT. SERV., https://quickstats.nass.usda.gov [https://perma.cc/NQZ4-Y35L] (showing that users can also search by geographical level and year).

Similar to these programs, farmers would choose to submit their aggregated data that they receive from ATPs and receive benefits for their contributions. The offered benefits provide a motivation to submit data, and farmers receive a fixed rate for sharing their data. That data would then be aggregated with other data and displayed to the public in a government database. The database would serve the public interest by displaying the country's agricultural statistics at any given time. The data would be downloadable and usable by anyone who wants the aggregated sets of data. The data would share a common goal of "open knowledge" and "enable real-time processing, analyzing, sharing, and visualizing of information."[154] This "collaborative" view on open data reflects the "advances in technology" because it is now "possible to share data in more meaningful ways" due to extensive technological advances in farm technologies.[155] This large aggregation would allow researchers and specialists interested in the data access to real-time farm data instead of waiting on time-delayed reports. Thus, the database would serve a public good.

For contracts between ATPs and farmers, NASS promises that data security is a top priority regarding the information it collects, and that it protects data from cybersecurity threats.[156] Strict security principles are important because data security is a central concern of farmers.[157] The USDA and NASS collect data independent from names and addresses and do not produce information that would identify data contributors.[158] In data publications, neither the USDA nor NASS reveals the private personal financial information of the farmers.[159]

A public database would not disclose any personal information regarding an individual farmer.[160] The Court of

154. *See* Jillian Raines, *The Digital Accountability and Transparency Act of 2011 (DATA): Using Open Data Principles to Revamp Spending Transparency Legislation*, 57 N.Y.L. SCH. L. REV. 313, 325-26 (2013) (discussing modern open data principles).

155. *Id.* at 326.

156. *Agency Overview*, *supra* note 150.

157. *See* Walter, *supra* note 96, at 444.

158. *Confidentiality Pledge*, NAT'L AGRIC. STAT. SERV., https://www.nass.usda.gov/ About_NASS/ Confidentiality_Pledge/ index.php [https://perma.cc/8SMA-BJHY].

159. *See* Multi Ag Media LLC v. USDA, 515 F.3d 1224, 1229 (D.C. Cir. 2008).

160. *See* Richard L. Huff & Craig E. Merutka, *Freedom of Information Act Access to Personal Information Contained in Government Records: Public Property or Protected Information?*, ARMY LAW., Jan. 2010, at 2, 4-5 (stating that Freedom of Information Laws

Appeals for the District of Columbia Circuit held that information that could lead to individual farmer identification, such as maps, has a *"de minimis"* privacy interest in Freedom of Information Requests and that the public interest in the USDA agricultural statistics overrides such privacy interests.[161] Similarly, a public database for farm data would adhere to these privacy laws and not identify specific farmers by using any information that directly implicates them.

There are currently private companies similar to a government-regulated agricultural database that offer services similar to what a database would provide. Open Ag Data Alliance (OADA) allows farmers to obtain aggregated agricultural information and does so without creating data-ownership questions.[162] The website states that farmers today require an "open solution" for accessing data because it "encourages transparency of privacy policies, and paves the way for rapid entrepreneurial innovation."[163] Also, the database aims to create a "community" where all parties associated with agriculture can use the tools and services it offers.[164] OADA hopes to serve as a foundation for value creation that will drive the necessary exponential growth in the emerging ag-data market.[165] A government-regulated database would offer similar services. It would present data and information to parties openly while reimbursing farmers for their submissions.

In addition, the aggregated data would be in one place, and anyone could access the data in real time similar to how anyone can access USDA agriculture reports. This prevents unfair commodity-market practices and puts everyone on an even playing field regarding their access to precision-farming information. The aggregated information would disclose crop summaries and reports based on farm data, allowing the reports to give a more accurate sense of the U.S. crop report based on more precise data. This relieves farmers' concerns relating to

protect a person's personal privacy or identifiable information).

161. *Multi Ag Media LLC*, 515 F.3d at 1231; *see also* Sykuta, *supra* note 79, at 62-63.

162. *About OADA*, *supra* note 15; *see also* Carbonell, *supra* note 13, at 7-8.

163. *About OADA*, *supra* note 15.

164. *Id.* (stating that "developers, companies, farmers, and academics" may use the tools available).

165. *Id.*; *see also* Carbonell, *supra* note 13, at 8.

anyone using their information unethically.[166] When the information is aggregated, everyone gets access to the same information, regardless of who they are.

Creating a public database requires the consent of both ATPs and farmers. Since not every farmer uses the same ATP for his or her technologies, ATPs such as John Deere or Monsanto would need to agree to aggregate the data that they each collect into one place, similar to how the USDA provides reports on all agricultural statistics. Similarly, farmers would need to consent to this usage of their data. But farmers already send in their data to the USDA in order to qualify for certain benefits.[167] If farmers receive the same benefits for giving their information to the public database as they do by providing their information to the USDA, there would be no disadvantages to submitting their information. Farmers would benefit from the openness of this information and the database would assist farmers similarly to the tools they use now in acquiring information and making decisions.

A. Legislative Authority

Congress has the power to regulate interstate commerce among the several states.[168] Courts have held that Congress has the power to regulate "channels of interstate commerce," "the instrumentalities of interstate commerce," and "activities having a substantial relation to interstate commerce."[169] The question here is: does Congress have the right to regulate the use of an open-data database for farm data? Courts have repeatedly held that the use of the internet is a channel of commerce in which Congress may regulate.[170] In *United States v. MacEwan*,[171] the Third Circuit found that regulating the internet under the Commerce Clause fell under the "channels of interstate commerce" section of the Clause, stating that the act of downloading a picture off of the internet was "intertwined with

166. *See* Am. Farm Bureau Fed'n, *supra* note 136.

167. *See* Multi Ag Media LLC v. USDA, 515 F.3d 1224, 1226 (D.C. Cir. 2008).

168. U.S. CONST. art. I, § 8, cl. 3.

169. United States v. Lopez, 514 U.S. 549, 558-59 (1995) (noting that the test to determine whether Congress has the right to regulate a particular activity is whether that activity substantially affects interstate commerce).

170. *See* United States v. Hornaday, 392 F.3d 1306, 1311 (11th Cir. 2004).

171. 445 F.3d 237, 245 (3rd Cir. 2006).

the use of channels and instrumentalities of interstate commerce."[172] Similarly, the Supreme Court has approved Congressional regulation of database activity under the Commerce Clause.[173] In *Reno v. Condon*,[174] the Court held that a statute governing the disclosure of personal driver's license information was valid because it was a proper exercise of Congress's authority to regulate interstate commerce.[175] Here, the Court noted that Congress has the power to regulate information that public and private actors have historically sold for interstate commerce.[176]

Based on these precedents, Congress has the power to regulate precision farm data sent from farmers to ATPs. The transfer of farm data using cloud technologies, whether interstate or intrastate, brings the data under Congress' control.[177] Moreover, transferring farm data is a commercial activity that can be regulated.[178] Based on the holding in *Reno*, Congress has power to control this type of activity. Therefore, Congress has the power to create a database that farmers can selectively disclose their information to.

The public database presents an opportunity for farmers to choose whether or not their data is sent to the government and displayed on a public database. The Supreme Court has held that the government has regulatory power to obtain data through interstate commerce even when the data is *required* to be disclosed.[179] In *Whalen v. Roe*,[180] the Court held that a New York statute that *required* the state be provided with personal identification was constitutional.[181] The Court reasoned that the database containing personal medical information was "not

172. *Id.* at 245.

173. Shaun A. Sparks, Reno v. Condon*: The Supreme Court Addresses Congressional Choices in Data Privacy Regulation*, 12 WIDENER L.J. 135, 137 (2003).

174. 528 U.S. 141 (2000).

175. *Id.* at 148.

176. *Id.* at 148-49.

177. *See MacEwan*, 445 F.3d at 245-46 (citing United States v. Lopez, 514 U.S. 549, 558 (1995)) (stating that it does not matter whether images were downloaded on a server in-state or across state lines, the internet is interstate commerce that can be regulated).

178. *See Principles of Farm Data*, *supra* note 19.

179. Sparks, *supra* note 173, at 141-42 (citing Whalen v. Roe, 429 U.S. 589, 592-93 (1977)).

180. 429 U.S. 589.

181. *Id.* at 597-98.

unreasonable" and "the patient-identification requirement might aid in the enforcement of laws designed to minimize [drug use]."[182] The Court also discussed privacy concerns surrounding New York's obtaining of medical data[183] and concluded that such disclosure was "not significantly different" than the disclosure required under previous laws.[184]

Here, the individual farm data would be created by farmers, sent to ATPs to be aggregated, and then sent to the government database where it would be displayed in a manner similar to USDA farm reports.[185] The disclosure of precision farm data from farmers would support good farming practices by providing agricultural data to everyone. Presenting the data on a public database allows farmers to improve their farming practices.[186] Farmers may use the information and compare it to their personal data to see how they measure up to other farms in their region or across the nation. Also, farmers would still have the right to acquire and use ATPs and their technology in ways that they see fit.[187] Here, the limited reporting of information to the government would not constitute an invasion of privacy, as farmers' personal information would not be displayed in the aggregated information.[188]

B. Congressional Interference with Expectations

Congress creating a database for precision farm data would not constitute a taking under the Fifth Amendment. In *Omnia Commercial Co. v. United States*,[189] the Court held that a Congressional regulation of commerce is not a taking when the affected contracts are "consequential[ly] injur[ed]" and not "indirect[ly] harm[ed]."[190] Only "appropriation" of a contract, not a "frustration," constitutes a taking.[191] However, if the

182. *Id.*
183. *Id.* at 598-600.
184. *Id.* at 602.
185. *See supra* Part IV.
186. *See supra* Part I.C.
187. *See Whalen*, 429 U.S. at 603 (noting that no individual was deprived of the right to acquire certain drugs under the New York statute).
188. *Id.* at 606 (Brennan, J., concurring).
189. 261 U.S. 502 (1923).
190. *Id.* at 510 (quoting Knox v. Lee, 79 U.S. 457, 551 (1870)).
191. *Id.* at 513.

congressional legislation "targets" an existing contract rather than incidentally affecting it, the *Penn Central* test is used to balance the interests of the government and the parties.[192] The test establishes three factors to determine when congressional regulation constitutes a taking: the economic impact that the legislation has on the plaintiff, the extent of the interference with investment-backed expectations, and the character of the government action.[193]

It is unlikely that Congress creating a public database for farm data would constitute a taking. When the government is not involved in the contract that is being regulated, courts are hesitant to find that the government has interfered.[194] The courts view the government as a "neutral arbitrator of competing societal interest whose decisions warrant deference."[195] Moreover, the federal government has greater freedom to interfere with private contracts than a state government.[196] Thus, successful challenges to federal interference with private contracts are uncommon.[197] Similarly, non-physical takings often do not constitute a Fifth Amendment taking due to their promotion of the common good.[198]

The database would not directly harm the parties to the contracts (the farmers and ATPs) because the database would simply display the aggregated data collected by ATPs to the public and benefit all parties. There could potentially be a "frustration" of expectations, but ATPs disclosing aggregated data to the government to display on the database would not substantially interfere with the contracts enough to create a

192. *See* ROBERT MELTZ, CONG. RESEARCH SERV., REPORT NO. R42635, WHEN CONGRESSIONAL LEGISLATION INTERFERES WITH EXISTING CONTRACTS: LEGAL ISSUES 14-15 (2012) ("[O]ne must not confuse the contract (the promise of steel delivery) with the subject matter (the steel)."); *see also* Penn Cent. Transp. Co. v. City of New York, 438 U.S. 104, 123 (1978).

193. *Penn. Cent. Transp. Co.*, 438 U.S. at 124; *see also* MELTZ, *supra* note 192, at 16 (noting that there are two other limits under the the *Omnia* rule that do not apply here: when the government takes over a contractual right and when one party did not perform its duty under the contract).

194. MELTZ, *supra* note 192, at 13.

195. *Id.*

196. *Id.*

197. *Id.*

198. *See* Steven J. Eagle, *"Character" as "Worthiness": A New Meaning for* Penn Central*'s Third Test?*, ZONING & PLANNING L. REP., June 2004, at 1, 4 (citing *Penn Cent. Transp. Co.*, 438 U.S. at 124).

taking. Creating this database does not present the necessary economic impact to constitute a taking under the *Penn Central* test. Promoting clarity for farmers would balance the slight economic impact that the database creation would have on an ATP's expectations.[199] Also, promoting a common good by displaying the aggregated data and allowing others to benefit would lower the economic impact. Therefore, it is unlikely that this congressional regulation would qualify as a taking.

C. Concerns: Government Maintenance and Liability

For this database, when farmers turn over their precision farm data to ATPs, the farmers would be allowing the ATPs to send their aggregated data to the government. The farmers would then receive their benefits from the government for turning over their data for the greater good. A potential shortcoming for the database is the possibility that farmers' personal information, which the database itself would not expose, would be breached and personal information would be exposed. Databases themselves are important social tools for education that are "an indispensable part of the U.S. economy."[200] However, even some of the largest companies in the world experience database breaches that disclose users' personal information.[201] An anonymous hacker inadvertently displaying user or consumer information puts the user or consumer in a situation where he or she "lacks . . . redress until [the consumer] realizes damages."[202] Due to the rise in "cyber-crime[,]" public and private entities must come up with new ways to fight against these "technology-enabled crimes."[203]

Because of the increased sophistication of agricultural technologies, farmers are having to familiarize themselves with technologies that aggregate their information and show them a

199. Brad Haire, *Ag Data: Its Value, Who Owns It and Where's It Going?*, SE. FARMPRESS (Nov. 14, 2014), http://www.southeastfarmpress.com/cotton/ag-data-its-value-who-owns-it-and-where-s-it-going [https://perma.cc/8RSX-CCP6?type=image].

200. J. Ryan Mitchell, *If at* Feist *You Don't Succeed, Try, Try Again: An Evaluation of the Proposed Collections of Information Antipiracy Act*, 78 NEB. L. REV. 900, 908 (1999).

201. *See* Brandon Faulkner, *Hacking Into Data Breach Notification Laws*, 59 FLA. L. REV. 1097, 1098 (2007) (referencing a MasterCard data breach that resulted in forty million hacked customer records).

202. *Id.* at 1100-01.

203. *Id.* at 1099.

summary.[204] Within all of this data linking and aggregation there are "valid concerns about sharing data."[205] These concerns come from the fact that there is no privacy standard for agricultural data and every farmer negotiates his or her own privacy contract with an ATP.[206] Thus, the establishment of an open-data database that displays aggregated sets of data would still need to establish adequate security measures due to recent large-scale data breaches.[207]

The database would need to thoroughly outline its data security regulations in order to survive the potential scrutiny it would receive. However, there are no federal regulations that monitor agricultural data, only the Privacy Principles.[208] This is concerning since farmers are sensitive as to who may view some of their personal information regarding their farm operation.[209] Although agricultural data, historically, has not been classified as a highly-regulated data source due to its lack of personal information, the lack of transparency regarding what ATPs do with aggregated data is changing that narrative.[210]

An aggregated database must create a sense of security and serve as a standard for agricultural data security. As one commenter noted, "An industry-specific regulation may be more effective at protecting agricultural data as rules can be promulgated by an agency that deals with agricultural issues on a regular basis and whose expertise may be helpful in designing

204. *See* Manning, *supra* note 117, at 146-47.

205. Kenneth Qin, *Why Privacy is an Essential Piece of Agriculture's Big-Data Revolution*, ENVTL. DEF. FUND (Feb. 9, 2017), http:// blogs.edf.org/ growingreturns/ 2017/ 02/ 09/why- privacy- is- an- essential- piece- of- agricultures- big- data- revolution/ [https://perma.cc/7PFR-Z2BR].

206. *Id.*

207. *See* Sarah Kuranda, *The 10 Biggest Data Breaches of 2016 (So Far)*, CRN (July 28, 2016, 10:02 AM), http://www.crn.com/slide-shows/security/300081491/the-10-biggest-data-breaches-of-2016-so-far.htm [https://perma.cc/8KQU-D46Q].

208. *See supra* Part I.C; *see also* Jody L. Ferris, Note, *Data Privacy and Protection in the Agriculture Industry: Is Federal Regulation Necessary?*, 18 MINN. J.L. SCI. & TECH. 309, 331-32 (2017) (stating that there is a lack of federal regulation for agricultural-data security).

209. *See* Ferris, *supra* note 208, at 332 (quoting Laurie Bedord, *2016 Commodity Classic: Data Privacy & Security Principles Encourage Use of Tools*, AGRICULTURE.COM (Mar. 9, 2015), http://www.agriculture.com/technology/data/2016-commodity-classic-data-privacy_575-ar47862 [https://perma.cc/7E22-B6TZ] ("Many farmers guard their data like a chef guarding a prized recipe.")).

210. *Id.* at 333.

new data privacy rules for the agriculture industry."[211] Thus, the database would be agricultural-specific and would adhere to the specific standards of the industry.[212]

Because federal privacy models have not adequately protected consumers,[213] a database that permits open data must appropriately protect the information of both farmers and ATPs that decide to submit their data. The government must take measures to affirm to consumers that their data is protected to gain data; otherwise the database will be less attractive to potential consumers. If the government takes appropriate measures to assure data security, agriculture could be the industry that offers a true, open-data database that allows all users to benefit.

V. CONCLUSION

As more farmers use precision farming technologies to improve their operations, these technologies become more important to agriculture. These technologies allow farmers to operate more efficiently and maximize food production for the world.[214] As technology advances, clear ownership rights regarding data are essential—essential to concerned farmers, who often seek clarity on what is being done with the data that they produced on their farms.[215] The Privacy Principles give simple guidelines for ATPs to follow, but a set of nonbinding principles is not enough. Providing an aggregated database of precision farm data similar to USDA agriculture reports would give more clarity to all parties. It would allow everyone interested an opportunity to view the impact that precision farming has on agriculture through a clear display of aggregated data.

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211. *Id.* at 339 (stating that any agricultural-data regulation should take place at the federal level to create a standard so that subsequent states do not interfere with any uniformity).

212. *Id.*

213. *See* Charlotte A. Tschider, *Experimenting with Privacy: Driving Efficiency Through a State-Informed Federal Data Breach Notification and Data Protection Law*, 18 TUL. J. TECH. & INTELL. PROP. 45, 53, 57 (2015).

214. Richard E. Plant et al., *Precision Agriculture Can Increase Profits and Limit Environmental Impacts*, Cal. Agric., Jul-Aug. 2000, at 66, 66-67 (stating that precision agriculture technologies can maximize food production, reduce cost, and limit environmental impact).

215. *See* Christopher Doering, *Big Data Means Big Profits, Risks for Farmers*, USA TODAY (May 11, 2014, 1:40 PM), http://usat.ly/1gbj0ac.