CORN FLAKES AREN'T JUST FOR KELLOGG'S: A LOOK AT CORN STOVER AND ITS EFFECT ON LEASING IN THE LANDLORD-TENANT FARMER RELATIONSHIP

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I. INTRODUCTION: CORN STOVER AND ITS "PRODIGAL" HISTORY

When traveling the flat plains of the American Midwest, what is the land's most distinguished characteristic? Is there anything beyond those tall, golden brown stalks of corn stretching into the distant horizon? How about late fall, when the farmer's skin is bronzed from a summer of laborious days behind the wheel of some rusted, growling piece of farm equipment tearing through those bristle tipped corn stalks? Once they are gone, what is left behind? What

possible worth might these leftover cobs and shorn corn stalks have? In reality, billions.

When discussing the ownership of the increasingly valuable corn stover on rented agricultural property a few issues arise. Though the amount of rented farmland varies from state to state, overall nearly one-third of the nation's farmland is rented, a number that has remained fairly constant throughout the years.[1] According to a report from Iowa State University, fifty-four percent of Iowa farmland was rented in 2007.[2] Additionally, of this fifty-four percent of rented farmland, nearly fifty-nine percent of Iowa share leases are oral, and cash rent leases range in the 40th percentile.[3] These statistics indicate a high number of oral leases for farmland in the biggest corn-growing state in the country.[4]

Because of the near infinite possibilities for using corn stover as biomass, and its economic impact, a growing problem is beginning to arise between the landowner and the tenant farmer. That problem is escalating, and the ultimate questions are, in landlord-tenant farmer relationships, who owns the stover, and is harvesting the stover worth the work? This Note is a discussion of current and potential uses for corn stover in the ethanol industry and beyond, and the need to shift to comprehensive written leases to help facilitate the ownership of corn stover between tenants and landlords. Part II of this Note will discuss some general positive and negative aspects of corn stover and ethanol production. In Part III, this Note will discuss the aspects of farmland ownership revolving around the types and forms of leases, with emphasis in and on the state of Iowa. Finally, Part IV will narrow in on the problems and possible solutions regarding ownership of corn stover when farmland leases are involved.

A. *What is Corn Stover?*

Corn stover is made up of stalks, leaves, and cobs remaining aboveground on the field after the harvest of corn kernels.[5] This leftover corn stover is

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1. James D. Libbin, *Farm Rental Agreements*, N.M. STATE UNIV. EXTENSION, 1 (2004), http://aces.nmsu.edu/pubs/_circulars/CR-598.pdf.

2. Michael Duffy et al., Iowa State Univ. Extension, *Survey of Iowa Leasing Practices, 2007*, AG DECISION MAKER, 1 (2008), http://www.extension.iastate.edu/agdm/wholefarm/pdf/c2-15.pdf.

3. *Id.* at 1–2.

4. NAT'L AGRIC. STATISTICS SERV., USDA, AGRICULTURAL STATISTICS 2011, I-22 tbl.1-37 (2011), *available at* http://www.nass.usda.gov/Publications/Ag_Statistics/2011/2011_Final.pdf.

5. David Glassner et al., *Corn Stover Potential: Recasting the Corn Sweetener Industry*, *in* PERSPECTIVES ON NEW CROPS AND NEW USES 74, 74 (Jules Janick ed., 1999).

a burgeoning hot topic in the world of agriculture and fuel production. Stover, despite its lonely home in the forgotten fall fields, is one of the largest underutilized crops in the United States.[6] Interestingly enough, these simple stalks and leaves can be used for a variety of purposes, including "animal feed, animal bedding, fuel for a boiler furnace, composite products such as fiberboard, pulp and paper, chemicals, and liquid fuels."[7] All things considered, the greatest value for corn stover collection at present time is its use as a biofuel since it is a biomass that can be used for the production of ethanol.[8]

Biomass is an all-encompassing term that describes any organic matter of the plant produced by photosynthesis.[9] Corn stover, a specific type of biomass, is the focus of this Note. Corn stover is an attractive feedstock for bioethanol production, as it is the most abundant crop residue available for collection.[10] Of the 194 million dry tons of biomass available to be used for bioenergy, corn stover makes up about 75 million dry tons.[11] This is the single largest source available for use in creating bioenergy and bioproducts.[12] Looking at these staggering numbers, the idea of leftover corn stalks and cobs milling alone in the fields after harvest doesn't seem like a forgotten and lonely destiny anymore.

Despite its many uses, the value of corn stover is difficult to determine in a constantly-fluctuating market.[13] Economic uses of corn stover, however, are not limited to the products created after being removed from farmland. Roughly twelve dollars per ton of crop nutrients are removed from fields when stover is

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6. J.E. ATCHISON & J.R. HETTENHAUS, NAT'L RENEWABLE ENERGY LAB., NREL/SR-510-33893, INNOVATIVE METHODS FOR CORN STOVER COLLECTING, HANDLING, STORING AND TRANSPORTING 1 (2004), *available at* http://www.nrel.gov/docs/fy04osti/33893.pdf.

7. Kiran L. Kadam & James D. McMillan, *Logistical Aspects of Using Corn Stover as a Feedstock for Bioethanol Production*, AGRIC. MARKETING RESOURCE CTR., 1 (2009), http://www.agmrc.org/media/cms/34267_8FA6DD136C222.pdf (last visited Sept. 26, 2012).

8. *See id.*

9. SARAH ASHTON ET AL., NAT'L ASS'N OF CONSERVATION DISTS., WOODY BIOMASS DESK GUIDE AND TOOLKIT 9 (Eleanor K. Sommer, ed., 2009), http://www.nacdnet.org/resources/guides/biomass/pdfs/Chapter2.pdf.

10. NAT'L RENEWABLE ENERGY LAB., DOE/GO-102001-1273, CORN STOVER FOR BIOETHANOL—YOUR NEW CASH CROP? 1 (2001), *available at* www.nrel.gov/docs/fy01osti/29691.pdf.

11. ROBERT D. PERLACK ET AL., U.S. DEPT. OF ENERGY & USDA, DOE/GO-102005-2135, BIOMASS AS FEEDSTOCK FOR A BIOENERGY AND BIOPRODUCTS INDUSTRY: THE TECHNICAL FEASIBILITY OF A BILLION-TON ANNUAL SUPPLY 21 (2005), *available at* http://www1.eere.energy.gov/biomass/pdfs/final_billionton_vision_report2.pdf.

12. *Id.*

13. *See* William Edwards, Iowa State Univ. Extension & Outreach, *Estimating a Value for Corn Stover*, AG DECISION MAKER (Dec. 2011), www.extension.iastate.edu/agdm/crops/pdf/a1-70.pdf (describing various factors to consider when valuing corn stover, especially for bioethanol production).

harvested.[14] These nutrients are vital for the sustainable use of fertile farmland. The true effects of harvesting corn stover and its effects on the land will be discussed later in this Note.

B. *History of Corn Stover and its Role in Biomass Fuel Production*

Ethanol has been used in the United States as a fuel since the early twentieth century.[15] In the 1970s, a crisis in the oil industry inspired "interest in the United States [to develop] domestic and renewable energy resources."[16] The 1973 oil embargo and the Iranian Revolution of 1978 caused rapid increases in the price of oil.[17] With concerns over the security of national energy supplies, corn-based ethanol was considered as a means to increase the United States' gas supplies.[18] These concerns were based in large part on our country's significant demand for fuel, coupled with its reliance on non-renewable and foreign oil.[19] A realization began to sink in among the populous; a more comprehensive understanding that oil was a finite resource and would eventually run out some day.[20]

Ethanol was in its infant steps of production by the early 1970s. Only a few million gallons of ethanol were being produced in the United States.[21] At the same time, fuel ethanol was becoming viable as a gasoline extender, an alternative way to grow the domestic gas supply.[22] Focus on climate change, air quality, water quality, and an overall sense of stewardship of Mother Earth increased the appeal of an alternative fuel supply based on biofuels.[23]

The passage of the Clean Air Act Amendments of 1990 paved the way for a drastic change in the production of ethanol.[24] During the George H.W.

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14. Ann Toner, *Weigh 6 Factors to Decide Whether to Harvest Stover*, NEB. FARMER, Dec., 2007, at 26, http://magissues.farmprogress.com/NEF/NF12Dec07/nef051.pdf.

15. JOSEPH DIPARDO, ENERGY INFO. ADMIN., OUTLOOK FOR BIOMASS ETHANOL PRODUCTION AND DEMAND 1 (2000), *available at* http://www.eia.gov/oiaf/analysispaper/pdf/biomass.pdf.

16. John Sheehan et al., *Energy and Environmental Aspects of Using Corn Stover for Fuel Ethanol*, 7 J. INDUS. ECOLOGY 117, 118 (2004).

17. HOSEIN SHAPOURI ET AL., USDA, AER-813, THE ENERGY BALANCE OF CORN ETHANOL: AN UPDATE 1 (2002), *available at* http://www.transportation.anl.gov/pdfs/AF/265.pdf.

18. *Id.*

19. Sheehan et al., *supra* note 16, at 118.

20. ANDREW MCALOON ET AL., NAT'L RENEWABLE ENERGY LAB., NREL/TP-580-28893, DETERMINING THE COST OF PRODUCING ETHANOL FROM CORN STARCH AND LIGNOCELLULOSIC FEEDSTOCKS 4 (2000), *available at* www.nrel.gov/docs/fy01osti/28893.pdf.

21. SHAPOURI ET AL., *supra* note 17, at 1.

22. *Id.*

23. Sheehan et al., *supra* note 16, at 118.

24. SHAPOURI ET AL., *supra* note 17, at 1; *see generally* Clean Air Act Amendments of 1990, Pub. L. No. 101-549, 104 Stat. 2399 (codified at 42 U.S.C. §§ 7401–7671q).

Bush administration, when environmental goals replaced energy security issues, the U.S. Environmental Protection Agency (EPA) began enforcing various parts of the Clean Air Act.[25] Beginning around 1995, ethanol production from corn became important because gasoline was being altered to burn more completely to reduce the adverse health effects of tailpipe emissions.[26] Political support from farm groups gave ethanol a boost, creating value-added enterprises which could potentially shrink crop surpluses and boost corn prices.[27] Environmental investigation into the Clean Air Act and agency implementation by the EPA show that the 1990s were an important time for corn ethanol and gave rise to important alternative uses for corn residue.[28]

Because of the changes in the United States economy and environmental worries over fuel sources and consumption, the ethanol industry has seen a boon in the recent decades. The 1980s saw the United States producing about 175 million gallons of ethanol.[29] By 1998, production had risen to 1.4 billion gallons.[30] In 2011, this number had increased to 13.9 billion gallons, and more than ninety-five percent of the U.S. fuel supply was blended with ethanol.[31] By 2008, nearly one-third of the U.S. corn crop was being used for biofuels.[32] Around the same time period ninety-seven percent of ethanol being produced was corn ethanol.[33]

In 2011 there were 193 ethanol plants in operation in the United States, with a total maximum production capacity of over 14.3 billion gallons annually.[34]

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25. Douglas G. Tiffany, *Economic and Environmental Impacts of U.S. Corn Ethanol Production and Use*, 5 REGIONAL ECON. DEV. 42, 43 (2009), http://research.stlouisfed.org/publications/red/2009/01/Tiffany.pdf.

26. *Id.*

27. *Id.*

28. *See* STEVEN WALLANDER ET AL., USDA, ECON. RESEARCH SERV., ECON. INFO. BULL. NO. 79, THE ETHANOL DECADE: AN EXPANSION OF U.S. CORN PRODUCTION, 2000–09, at 3 fig.1 (2011), *available at* http://www.ers.usda.gov/Publications/EIB79/EIB79.pdf (showing increasing trend of residual corn usage since 1975).

29. DIPARDO, *supra* note 15, at 1.

30. *Id.*

31. RENEWABLE FUELS ASS'N, ACCELERATING INDUSTRY INNOVATION: 2012 ETHANOL INDUSTRY OUTLOOK 2, 10 (2012), *available at* http://ethanolrfa.3cdn.net/d4ad995ffb7ae8fbfe_1vm62ypzd.pdf.

32. Matthew J. Erickson & Wallace E. Tyner, *The Economics of Harvesting Corn Cobs for Energy*, PURDUE UNIV. EXTENSION, 1 (2010), http://www.extension.purdue.edu/extmedia/ID/ID-417-W.pdf.

33. HOSSEIN SHAPOURI & MICHAEL SALASSI, USDA, THE ECONOMIC FEASIBILITY OF ETHANOL PRODUCTION FROM SUGAR IN THE UNITED STATES 1 (2006), *available at* http://www.fsa.usda.gov/Internet/FSA_File/ethanol_fromsugar_july06.pdf.

34. *Petroleum and Other Liquids: U.S. Fuel Ethanol Plant Production Capacity*, U.S. ENERGY INFO. ADMIN. (May 30, 2012), http://www.eia.gov/petroleum/ethanolcapacity/.

These numbers are impressive when comparing the beginning of biofuel production from corn and other biomass in the 1970s, growing from 175 million gallons of ethanol produced in 1980[35] to an estimated 13.9 billion gallons of ethanol produced in 2011.[36] This is a staggering increase in production over just three decades. These numbers demonstrate that ethanol's roots have dug deep into America's soil. With the continuously-increasing production of ethanol and other biofuels, the abundance and availability of corn stover is a growing component in the economy and production of fuels.[37]

II. CORN STOVER FOR BIOFUELS: SOMETHING OLD, SOMETHING NEW, SOMETHING BORROWED, SOMETHING . . . GREEN?

A. *A Pricetag on Corn Stover*

One of the vital uses for corn stover is its role in ethanol production.[38] Carbohydrates, in the form of starch, sugar, cellulose, and hemicellulose, are the largest possible energy sources for the manufacture of ethanol.[39] These carbohydrates are ingredients found in the left-over corn stover.[40] Fiscally speaking, however, collecting and harvesting corn stover from the fall fields is by no means cheap.

This form of bioethanol has an expensive life cycle which includes: (1) production and harvesting from the fields; (2) transport from the farm to processing plants that produce the electricity and ethanol; (3) transport of the ethanol to fueling stations; and finally (4) use of the ethanol.[41] According to a study in the state of Indiana, step one, the harvesting and preparation for transport, costs an average of $34.92 per dry ton.[42] This Indiana analysis shows that in step two

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35. DIPARDO, *supra* note 15, at 1.

36. *Biorefinery Locations*, RENEWABLE FUELS ASS'N (May 20, 2012), http://www.ethanolrfa.org/bio-refinery-locations/ (showing production at each facility as well as total production nationwide).

37. *See Ethanol Blends*, U.S. DEPT. OF ENERGY (Mar. 29, 2012), http://www.afdc.energy.gov/afdc/fuels/ethanol_blends.html (stating that ninety-five percent of U.S. fuels contain at least ten percent ethanol).

38. *See* Seungo Kim & Bruce E. Dale, *Global Potential Bioethanol Production from Wasted Crops & Crop Residues*, 26 BIOMASS & BIOENERGY 361 (2004).

39. *Id.* at 362.

40. Liz Marshall & Zachary Sugg, *Corn Stover for Ethanol Production: Potentials and Pitfalls*, WORLD RES. INST. 2 (2009), http://pdf.wri.org/corn_stover_for_ethanol_production.pdf.

41. Sheehan et al., *supra* note 16, at 118.

42. Sarah Brechbill &Wallace E. Tyner, *The Economics of Renewable Energy: Corn Stover and Switchgrass*, PURDUE UNIV. EXTENSION, 3 tbl.2 (2008), http://www.ces.purdue.edu/extmedia/ID/ID-404.pdf.

of the life-cycle, depending on the distance the corn stover needs to travel, the transportation costs coupled with preparation costs can range from $38.22 (five miles) to $45.54 (fifty miles) per dry ton.[43] These costs will be borne by the farmer. In a different study from Story County, Iowa, the corn residue harvest costs were at $12.73 per ton, with the transportation cost at $2.15 per ton per mile.[44] At this rate five miles of transportation will cost $23.48, about $15 less than the Indiana study. At fifty miles, however, the $2.15 rate per ton per mile skyrockets the costs above the Indiana analysis.[45] Either scenario shows a budget buster for farmers, who bear the costs of harvesting and transporting the corn stover themselves.

Step three in the life-cycle, actual production of ethanol, was estimated to cost around $2.47 per gallon to produce in the late 1970s (in 2000 dollars).[46] In 1994 the price dropped to nearly $1.43 per gallon, and by the year 2000 it was estimated that the cost was about $.88 per gallon.[47] Several factors exist for this decrease in price per gallon of ethanol. New techniques in energy integration and use of molecular sieves for ethanol dehydration are two of many factors that have made the production of ethanol less energy intensive.[48] Secondly, the industry has made improvements in efficiency. The amount of pure ethanol produced from one bushel of corn has increased from 2.5 gallons to more than 2.7 gallons.[49]

Unfortunately, the price decreases in ethanol have not remained constant. In the 2003–2005 period, total production costs for a wet mill plant averaged $1.03 per gallon, while at the dry mill plants the costs were about $1.05 per gallon.[50] The highest per year cost from these numbers was in 2004, which de-

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43. *Id.* at 3 tbl.3.

44. PAUL GALLAGHER ET AL., USDA, AER-819, BIOMASS FROM CROP RESIDUES: COST AND SUPPLY ESTIMATES 11 tbl.2 (2003), *available at* www.usda.gov/oce/reports/energy/AER819.pdf.

45. Fifty miles at the $2.15 per dry ton rate would total $107.50, more than two times the Indiana study estimate.

46. MCALOON ET AL., *supra* note 20, at 4 (citing RAPHAEL KATZEN ASSOCS., GRAIN MOTOR FUEL ALCOHOL: TECHNICAL AND ECONOMIC ASSESSMENT (1979)).

47. *Id.* (citing Raphael Katzen Assocs., Presentation at the National Corn Growers Association Convention: Ethanol from Corn, State of the Art Technology and Economics (June 1994)).

48. *Id.*

49. *Id.*

50. *See* SHAPOURI & SALASSI, *supra* note 33, at 22 tbls.18–19. These figures were calculated from the average cash and net feedstock costs over the three-year period from 2003–2005. *Id.* Dry milling is the taking of cooked corn mash and converting it into alcohol through fermentation. *Id.* Wet milling of corn, on the other hand, breaks down the kernels into different materials, using only the pure starch obtained for ethanol production. *Id.* Dry milling is the more popular

creased in 2005.[51] Some reasons for the increasing trend are higher transportation costs, the growing costs of additional fertilizer need when the corn residue is harvested, and the increasing cost of equipment needed for harvest.[52] This highlights the possibility that the production costs of ethanol from corn and corn products are beginning to rise. These numbers also predate the economic crash the United States, and the world, experienced in late 2008.

Various other factors can have an effect on the cost of harvesting stover. Some of these factors include weather, demand, and improved harvesting methods.[53] A 2002 study predicted that, based on then-prevailing stover collection costs, the interplay of these factors could cause a price spike as high as $1.35 a gallon per dry ton purchases at $55.[54] Other cost-determining factors are geographic density of residues, residue yield, and market demand from competing stover uses, such as livestock feed.[55] As indicated above, prices for ethanol production are on the rise, so the prediction from this study may not be far off course.

Financial costs are not the only consideration in the production of ethanol from corn stover. In addition to the increasing costs of producing ethanol, there are many environmental issues connected with its production, from not only corn stover, but other crops as well. Farms are some of the largest contributors of greenhouse gas (GHG) emissions, typically through the production and use of fertilizer.[56] Fertilizers are not only used in the production of corn, but for the replacement of the lost nutrients from corn residue. Corn ethanol requires a more involved process and leaves a greater footprint in land use than that of other fossil-fuel refinement processes.[57] For example, nitrogen fertilizers and other major nutrients such as phosphorus and potassium are typically applied to promote

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method, with seventy-nine percent of ethanol being produced from corn converted via dry milling, while only twenty-one percent is wet milling. *Id.* at 11.

51. *Id.* at 22 tbls.18–19. The wet milling price reached $1.0662 per gallon in 2004, and decreased to $1.0022 in 2005; the dry milling price also decreased, from $1.0745 to $1.0651. *Id.*

52. *See* GALLAGHER ET AL., *supra* note 44, at 8–10.

53. A. ADEN ET AL., NAT'L RENEWABLE ENERGY LAB., LIGNOCELLULOSIC BIOMASS TO ETHANOL PROCESS DESIGN AND ECONOMICS UTILIZING CO-CURRENT DILUTE ACID PREHYDROLYSIS AND ENZYMATIC HYDROLYSIS FOR CORN STOVER 72 (2002), *available at* http://www1.eere.energy.gov/biomass/pdfs/32438.pdf.

54. *Id.* at 73.

55. GALLAGHER ET AL., *supra* note 44, at 1.

56. U.S. ENVTL. PROT. AGENCY, EPA 430-R-12-001, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990–2010, 2-7 tbl.2-3, 2-17 tbl.2-12 (2012), *available at* http://www.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2012-Main-Text.pdf.

57. Tiffany, *supra* note 25, at 44.

growth, which themselves require energy inputs in refinement, mining, and transport.[58]

Besides the environmental challenges with the required inputs for growing a corn crop, stover removal may also deplete the soil in various ways. Some of the environmental impacts of turning corn stover into ethanol include soil erosion, nutrient loss, and GHG emissions.[59] In 2007, water erosion resulted in the loss of roughly 960 million tons of cropland soil, and wind erosion claimed another 765 million tons.[60] This "[d]eterioration of the soil structure due to erosion can reduce the long-term productivity of cropland soils."[61] As noted above, the removal of the corn stover increases the need for fertilizer use. This increased use contributes even more to the already prevalent use of chemical fertilizers and animal manure on the farm fields and is a significant source of impairment to the quality of water.[62] Animal manure runoff, herbicide and pesticide leaching, and unmentioned chemicals can all contribute to water quality degradation.[63]

Discussion about global warming is ongoing and the role of GHG emissions are well known. An expansion in the production and use of biofuels, may enhance our nation's energy security and possibly lower GHG emissions due to decreased fossil fuel uses is in the foreseeable future.[64] There is a catch, however. The various life-cycle stages of corn ethanol production add to the GHG emissions of methane, carbon dioxide, and nitrous oxide.[65] Additional studies need be conducted to determine the negative effects of ethanol production on GHG emissions and compare them to its overall benefit.

Ethanol production from corn stover and other biomass has some benefits irrespective of the costs. The growing market for ethanol can create additional value for stover, but because harvesting and transportation of corn stover carries significant costs to the farmer, the profit margin may be significantly undercut.[66] Additionally, it will remain important to continue studying and watch-

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58. *Id.*

59. SCOTT A. MALCOLM ET AL., ECON. RESEARCH SERV., USDA, REPORT NO. 86, ETHANOL AND A CHANGING AGRICULTURAL LANDSCAPE 10 (2009), *available at* http://www.ers.usda.gov/Publications/ERR86/ERR86.pdf.

60. *National Soil Erosion Results Tables*, NATURAL RES. CONSERVATION SERV., USDA, tbls.18 & 19, http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/technical/nra/nri/results/?&cid=stelprdb1041678 (last visited Sept. 26, 2012).

61. MALCOLM ET AL., *supra* note 59, at 10.

62. *Id.*

63. *Id.*

64. *Id.*

65. *Id.*

66. *See* discussion, *supra* Part I.B (discussing growing market for corn stover as an alternative fuel source, which could make fulfilling such a need economically lucrative).

ing the environmental impacts from the added removal of the corn residue and its effects on the farmland.

B. *Stover, Huh, Yeah. What is it Good For? Absolutely Something.*[67]

Corn stover's value, however, is not limited to use in ethanol production. Various other uses for corn stover exist, such as feedstocks for biofuels, livestock feed, production of electricity and steam, and adding a cycle of nutrients to farmland soil after each harvest.[68] Other ancillary benefits of corn stover use in biofuels production exist, aside from the actual use of the fuel. These include the previously mentioned potential reductions in GHG emissions, a stimulation of the farm and rural communities' economies, and a minimization of obstacles to the production of crops, such as the reduction of diseases and insects in the up-and-coming crop yields by eliminating source of infection.[69]

Corn stover is comprised of lignin, a substance able to be combusted to generate electricity and steam.[70] At 18.69%, corn stover has a higher concentration of lignin than other popular biomass products; sorghum straw and wheat straw have 15.0% and 16.0% respectively.[71] Tests show that raw corn stover has the possibility to be used as a substrate for electricity generation.[72] One study found that corn stover conversion to electricity meets or exceeds estimates of its energy potential in ethanol fuel production.[73] The study likewise showed ethanol plants using corn stover to generate electricity could provide renewable power to the grid.[74] While electricity generation from corn stover is still in its infancy, these early studies demonstrate potential for stover's expanded use beyond conversion to ethanol fuel.

Another important consideration in the use of corn stover is its removal and how much should be left remaining on the farmland. There are multiple reasons for certain portions of the stover to be left behind in the field.[75] One of the

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67. *See generally* EDWIN STARR, *War*, *on* WAR & PEACE (Universal Music 1989) (1970).

68. Kadam & McMillan, *supra* note 7, at 1.

69. W.W. Wilhelm et al., *Crop and Soil Productivity Response to Corn Residue Removal: A Literature Review*, 96 AGRONOMY J. 1, 3 (2004).

70. Kim & Dale, *supra* note 38, at 362.

71. *Id.* at 363 tbl.2.

72. Xin Wang et al., *Bioaugmentation for Electricity Generation from Corn Stover Biomass Using Microbial Fuel Cells*, 43 ENVTL. SCI. & TECH. 6088, 6092 (2009).

73. R.V. Morey et al., *Biomass for Electricity and Process Heat at Ethanol Plants*, 22 APPLIED ENGINEERING AGRIC. 723, 728 (2006).

74. *Id.*

75. Wilhelm et al., *supra* note 69, at 2–3 (stating that crop residues are important to form "soil organic matter," which makes soil more stable, and that residue also prevents erosion, reduces evaporation, and influences radiation balance).

key functions of leftover stover is its role in farmland erosion protection.[76] Crop residue, in this case corn stover, protects soil from the detrimental impacts of wind, sunlight, and rain.[77] Because leaving some stover in the fields defends the soil from the elements, this tradition helps lead to improved soil structure, increased infiltration, lower soil temperatures, and reduced runoff, evaporation, and erosion.[78] With soil losses from wind and water erosion in the United States exceeding three billion tons annually, reducing soil productivity, erosion control is of vital importance.[79]

One final point regarding emerging uses of corn stover is its application in heating buildings is worth noting. This isn't referring to just piling it together, tossing on some Kingsford, and pulling out the Zippo. The University of Minnesota has started an interesting program using corn stover as an alternative for reducing heating costs. The University plans on heating its buildings on the Morris campus by burning corn stover in a process called "gasification."[80] A scientist from North Dakota found farmers inside a ten-mile radius around the campus were able to produce enough corn cobs and stover to supply this gasification plant once it is operational.[81] One of the main, if not the most important, advantages is the sustainability of stover and its relation to long-term profitability and environmental quality.[82] The estimated amount of stover needed is about 10,000 tons a year, while the area within this ten-mile circle alone produces, on average, 22,595 tons of corncobs a year.[83]

Another use of corn stover at these gasification plants is using corncobs to replace some natural gas use in ethanol fuel production.[84] Stover use in these plants has the potential to be seen as a replacement or alternative for the current fuel of choice, natural gas.[85] As with many of the future uses of corn stover

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76. *Id.* at 3.

77. SOIL QUALITY NAT'L TECH. DEV. TEAM, NATURAL RES. CONSERVATION SERV., USDA, CROP RESIDUE REMOVAL FOR BIOMASS ENERGY PRODUCTION: EFFECTS ON SOILS AND RECOMMENDATIONS 2 (2006), *available at* http://soils.usda.gov/sqi/management/files/sq_atn_19.pdf.

78. *Id.*

79. H.P. Collins et al., *Reduced Tillage in an Irrigated Potato Rotation*, *in* CLIMATE FRIENDLY FARMING ch. 20, at 1 (2010), *available at* http://csanr.wsu.edu/publications/research reports/CFF%20Report/CSANR2010-001.Ch20.pdf.

80. Don Comis & Ann Perry, *Growing Biofuel Crops Sustainably*, AGRIC. RESEARCH, Sept. 2009, at 7, www.ars.usda.gov/is/AR/archive/sep09/crops0909.pdf.

81. *Id.*

82. *Id.*

83. *Id.*

84. *Id.*

85. *Id.* The study could be used as a model for using plant residue as fuel in other areas. *Id.*

(corncobs in this instance), its role in the production of heat energy and as a replacement for natural gas is just beginning to emerge.

Corn stover is a valuable commodity in an important industry. In 2011, the ethanol industry was estimated to support upwards of 401,000 jobs and saved nearly $49.7 billion in avoided foreign oil imports.[86] While corn stover is a valuable resource associated with ethanol manufacturing, its role in energy production is expanding beyond this form of fuel to other new processes. While many alternative uses are still in early development, corn stover is seeing increased attention for potential applications in both old and new ways. Corn stover has historically been left in the field for nutrient recycling and erosion control, but expansive alternatives such as heating and generation of energy from electrical and steam sources are beginning to emerge as counterparts to the already booming ethanol industry.

C. *How Much Stover Could a Farmer Farm, if a Farmer Could Farm Stover?*

The approximate make-up of corn stover is "50% stalk, 22% leaves, 15% cob, and 13% husk," not counting the crown or surface roots.[87] The main considerations for how much stover should be removed from the fields include "erosion control, moisture retention, winter forage practices, and soil carbon impacts."[88] One looming fear is that the harvesting of too much cellulose materials could drastically increase food production costs, shrink production potential, and add to the already existing world hunger problems.[89] Aside from the financial and hunger issues, the removal of corn stover from the fields can have a varying, possibly negative, impact on the maintenance and quality of the nutrient and organic matter found in soil.[90]

Around the country studies are being done to determine precisely how much stover can be removed without detrimental impact.[91] Ten years ago, nearly ninety percent of the stover was left in the fields, and most of this stover was

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86. John M. Urbanchuck, *Contribution of the Ethanol Industry to the Economy of the United States*, RENEWABLE FUELS ASS'N. 8 tbl.3, 10 (2012), *available at* http://ethanolrfa.3cdn.net/c0db7443e48926e95f_j7m6i6zi2.pdf.

87. *Talking About Corn Stover with Jim Hettenhaus*, CARBOHYDRATE ECON. (Inst. for Local Self-Reliance), Summer 2002, at 1, *available at* http://infohouse.p2ric.org/ref/24/23976.pdf.

88. NAT'L RENEWABLE ENERGY LAB., *supra* note 10, at 2.

89. R.M. Cruse & C.G. Herndl, *Balancing Corn Stover Harvest for Biofuels with Soil and Water Conservation*, 64 J. SOIL & WATER CONSERVATION 286, 290 (2009).

90. ERICKSON & TYNER, *supra* note 32, at 1.

91. *See* NAT'L RENEWABLE ENERGY LAB., *supra* note 10, at 2 (stating that the USDA and the Department of Energy are spearheading efforts throughout the Corn Belt to better understand the effects of corn stover removal).

being plowed back into the soil for crop benefits including maximum yields, elimination of weed seeds, insects, disease, and the reduction of alpha-toxin threat to the corn.[92] The quantities to be left in the field are a function of soil type and topography, climate, crop rotation, and management practices, in particular tilling.[93] Of the corn stover left after harvesting, nearly eighty-five percent rots on the field, causing a release of carbon dioxide, while the last fifteen percent is distributed into the land as organic matter.[94] In a study done in eastern Nebraska, the first five years of the study showed there was a significant decrease in crop yield when half of the corn stover was removed.[95]

There is a vital need to understand exactly how much stover should be removed before it affects land quality and crop production. After erosion and quality needs have been met, removing the remaining excess stover has the potential to reduce the necessary tillage, promote income growth, and provide nearly one hundred million dry tons or more feedstock for fuel production, and other uses.[96] In the state of Iowa, studies performed by the USDA and Department of Energy (DOE) have estimated that nearly fifty-seven percent of stover could be removed from the fields without an increase in erosion.[97]

A study at the University of Minnesota Morris campus found that when forty percent of the stover was removed from the farmland there was an increase in soil erosion by only 0.25 tons an acre per year.[98] Additional findings from the study support the proposition that erosions levels could be diminished by "harvesting stover from areas less susceptible to erosion, removing stover at lower rates, and by using conservation tillage" and diverse crop rotations.[99] Both studies recognize a common thread: a high percentage of corn stover may be removed from a harvested field without much, if any, negative impact upon the farmland itself.

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92. Glassner et al., *supra* note 5, at 74.

93. *See* Iowa Learning Farms, *Economics of Residue*, IOWA STATE UNIV. EXTENSION, Sept. 2010, http://www.extension.iastate.edu/NR/rdonlyres/82093D1A-557E-43D3-AE12-8CAF62C36985/135604/Economics_of_residue.pdf.

94. *Life-Cycle Analysis of Ethanol from Corn Stover*, NAT'L RENEWAL ENERGY LAB., 2 (2002), http://www.nrel.gov/docs/gen/fy02/31792.pdf.

95. AGRIC. RESEARCH SERV., USDA, BIOENERGY & ENERGY ALTERNATIVES: ARS NATIONAL PROGRAM 307 ACCOMPLISHMENT REPORT 1999–2006, at 59 (2007), *available at* http://www.ars.usda.gov/SP2UserFiles/Program/307/NP307AccomplishmentReportFinal-web.pdf.

96. ATCHISON & HETTENHAUS, *supra* note 6, at 1.

97. NAT'L RENEWABLE ENERGY LAB., *supra* note 10, at 2.

98. Don Comis, *How Much Corn Stover Can a Corn Grower Pick?* AGRIC. RESEARCH SERV., USDA (Sept. 21, 2009), http://www.ars.usda.gov/is/pr/2009/090921.htm.

99. *Id.*

Looking specifically to the removal of the cobs (15% of the stover),[100] good signs are on the horizon. Today, the main use for leftover cobs is localized nutrient management by tilling the cobs back into the soil and allowing them to decompose.[101] Many still believe it important that cobs remain in the field for the nutrients they release when they decompose.[102] Nutrient content in cobs, however, is relatively minimal.[103] In a joint study by Iowa State University and POET Bio-refining (the world's largest ethanol producer),[104] the two programs found that the removal of cobs from the field during harvest had minimal impact on the nutrient content of the soil.[105] These studies indicate fertilizer treatment on a field with removed cobs would be similar to fields where the cobs were not removed.[106] Though cobs make up only fifteen percent of the stover remaining after harvest, it is important to understand a high percentage of cobs can be removed without affecting nutrient content.

Studies concerning the removal of corn residue from farmland are ongoing, but their results could be revealing by telling us how much of the residue can be removed for its alternative benefits without decreasing the next crop yield.[107] Once these studies are completed, those involved in the actual removal and use of corn stover will be able to better determine costs and future benefits.

III. FARMLAND LEASING: WHY BUY WHEN YOU CAN RENT?

A. *A Tale of Two Owners*

Longstanding tradition warps the layperson's view of who farms and what they are farming. Movies like "Field of Dreams" portray a poor farmer

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100. *Talking About Corn Stover with Jim Hettenhaus*, *supra* note 87, at 1.

101. ERICKSON & TYNER, *supra* note 32, at 1.

102. *See id.* "The primary use for corn cobs today is using the nutrients and tilling them back into the ground." *Id.*

103. *Id.*

104. *See Company at a Glance*, POET, http://www.poet.com/at-a-glance (last visited Sept. 26, 2012). POET owns a network of twenty-seven ethanol plants with a combined production capacity of 1.6 billion gallons. *Id.*

105. Press Release, POET, Research Reinforces Economic, Environmental Benefits of Corn Cobs as Source for Cellulosic Ethanol (May 21, 2009), *available at* http://www.rhapsodyingreen.com/pr/research-reinforces-economic-environmental-benefits-of-corn-cobs-as-s.

106. *Id.*

107. *See, e.g.*, *Research Project: Regional Corn Stover Removal Impact Study (Florence Sc)*, AGRIC. RESEARCH SERV., USDA (June 18, 2012), http://www.ars.usda.gov/research/projects/projects.htm?accn_no=413424 (announcing four year study to "[d]etermine effects of crop residue removal on soil quality, crop yields, and residue feedstock quality," to conclude in September of 2012).

who can barely afford his land, and to save his family he must sell the land back to the bank (or count on ghosts to play baseball in his backyard).[108] This idea of a farmer working his own land is beautiful and poignant, but in many cases is not accurate. In many instances those farming the land are actually leasing it from the land owner.[109]

Generally speaking, a lease gives a party the right to use or possess property for a certain time-period, commonly in return for monetary payments.[110] In the farming community, there are two common types of leases found between the tenant farmer and the landowner. The first is a cash lease, where the tenant farmer pays a set amount regardless of how the crop or its value turns out.[111] The second, and more complex lease, is called a crop-share lease.[112] The typical crop-share lease usually involves "a predetermined percentage of the crop based on their contributions to production."[113] One major difference in this lease from the cash lease is that the landlord and tenant farmer may share management responsibilities of the land.[114]

The advantage of the straight cash lease is that it is a simple *quid pro quo* arrangement. For a landowner who knows little to nothing about farming, and wishes no involvement whatsoever, this may be the most beneficial lease for them. For a crop-share lease, the benefit to the landowner is the possible reward of a bountiful harvest, while for the tenant farmer it is the shared responsibilities taken on by the landlord.[115] But, with these added benefits come added disadvantages. Some of these disadvantages are increased recordkeeping, shared expenses for the landowner, and increased complexities for whom is owed what.[116] Other types of leases do exist, but as they are a small percentage of the overall number, and will not be discussed here.

In Iowa, cash leases are the most common. A 2007 study that found roughly seventy-seven percent of all leases in Iowa are cash leases.[117] This is a common trend as the use of cash leases was on the rise in the early 2000s.[118]

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108. *See* FIELD OF DREAMS (Universal 1989).

109. Phillip L. Kunkel et al., *Farm Leases*, UNIV. OF MINN. EXTENSION, 1 (June 2009), http://www.extension.umn.edu/distribution/businessmanagement/components/DF2593.pdf.

110. *Id.*

111. LIBBIN, *supra* note 1, at 3–4; *accord* Kunkel et al., *supra* note 109, at 1.

112. LIBBIN, *supra* note 1, at 4.

113. Kunkel et al., *supra* note 109, at 1.

114. LIBBIN, *supra* note 1, at 4; *accord* Kunkel et al., *supra* note 109, at 1.

115. *See Crop Share Lease Agreements*, COLO. STATE UNIV. COOP. EXTENSION, 1–2 (2008), *available at* http://www.coopext.colostate.edu/abm/abmcroplease.pdf (stating a benefit of crop-share leases is the sharing of profits from high yield and high prices).

116. *Id.* at 2; LIBBIN, *supra* note 1, at 4.

117. Duffy et al., *supra* note 2, at 1.

118. LIBBIN, *supra* note 1, at 3.

Several reasons exist for this trend, such as the flexibility cash leases provide for the tenant, the elimination of dividing crops and tracking expenses, the tenant's position to receive all the profit, the landowner being provided a predetermined amount of profit despite low or high crop yield, minimal landowner involvement, and benefits from certain tax provisions for retired farmers.[119]

The amount of farmland rented across the United States has varied over the years. In 1910, 31.6% of farmland was rented.[120] This amount peaked in 1935 at around 44.7%.[121] In the late-1980s through the mid-1990s rental rates stood slightly over 40%, and as of 2007, 38% of farmland was rented (excluding that land which was sub-leased).[122] This data makes clear that over one-third of farmed acres in the United States are farmed by tenant farmers, rather than the landowners themselves. While there is a mix of leasing types among this contingent of renters, the bigger question regarding crop ownership, specifically that of the corn stover, deals with the form of the lease itself.

B. *Types of Lease Forms for Farms: It Ain't Just Lip Service*

A leasing contract for farms can come in two distinct forms, written and oral. In Iowa, approximately two-thirds of farming leases are in written form.[123] This means one-third of Iowa farming leases are done by oral contract. Roughly fifty-four percent of Iowa's farmland is worked via leases and their tenant farmers.[124] This amounts to eighteen percent of Iowa's farmland being worked by a tenant farmer whose terms and conditions are dictated by spoken words and recall, lacking any written substance. As of 2007 there were nearly thirty-one million acres of farmland in Iowa.[125] This amounts to roughly 5.58 million acres of Iowa farmland being governed by an oral leasing contract.

Problems can arise when people are dealing with an oral lease, and these problems are not limited to fuzziness on the dictated terms. One potential issue with oral leases is the statute of frauds. In the Iowa Code, the law regarding the statute of fraud states:

> Except when otherwise specially provided, no evidence of the following enumerated contracts is competent, unless it be in writing and signed by the party charged or by

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119. *Id.* at 3–4.
120. NAT'L AGRIC. STATISTICS SERV., *supra* note 4, at IX-4 tbl.9-8.
121. *Id.*
122. *Id.*
123. Duffy et al., *supra* note 2, at 2.
124. *See id.* at 1 tbl.1.
125. NAT'L AGRIC. STATISTICS SERV., USDA, 2007 CENSUS OF AGRICULTURE: UNITED STATES SUMMARY AND STATE DATA 278 tbl.1 (2009), *available at* http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_2_US_State_Level/usv1.pdf.

> the party's authorized agent: . . . 3. Those for the creation or transfer of any interest in lands, except leases for a term not exceeding one year.[126]

As this statute reads, any *oral* farm lease agreement would be invalid were it to be for a tenancy longer than a year.[127]

When it comes to the 5.67 million acres of Iowa farmland being used by tenant farmers operating under an oral contract, however, all is not lost. An exception to section 622.32(3) exists, which reads:

> The provisions of subsection 3 off section 622.32 do not apply where the purchase money, or any portion thereof, has been received by the vendor, or when the vendee, with the actual or implied consent of the vendor, has taken and held possession of the premises under and by virtue of the contract, or when there is any other circumstance which, by the law heretofore in force, would have taken the case out of the statute of frauds.[128]

Aside from the named protections in the statute itself, the Iowa Supreme Court has interpreted this statute to provide additional exceptions. The court concluded that "the promissory estoppel doctrine is available as an exception to the statute of frauds for leases claimed to be in excess of one year."[129] The doctrine provides protection for those tenant farmers who relied on the oral agreement to make improvements and invest their own money into the land they rented.

Because there is such a large portion of Iowa farmland being operated by tenant farmers whose sole right to do so is governed by an oral lease, many questions can arise after-the-fact as to who owns the corn stover and what should be done with it.

IV. BEYOND IOWA'S THUNDERDOME, TWO MEN WANT IT, ONE MAN GETS IT: THE IMPORTANCE OF WRITTEN LEASES

As previously discussed, corn stover is a growing and valuable commodity in the biofuel industry.[130] But, corn stover's value in these markets must be weighed against the potential loss the removal from the fields can cause.[131] In these two ways the interest of the tenant farmer and the landowner may clash. The landowner should be primarily concerned with the value of the land itself, especially considering those landowners operating under a cash lease and who

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126. IOWA CODE § 622.32 (2011).
127. *See id.*
128. *Id.* § 622.33.
129. Kolkman v. Roth, 656 N.W.2d 148, 157 (Iowa 2003).
130. *See* discussion, *supra* Part II.A–B.
131. *See* discussion, *supra* Part II.C.

gain no benefit from an increased yield or income from the corn stover. If this interest in preserving the land clashes with the tenant farmer's interest in profit from the corn stover, who could win in this emerging competition? Due to the important interests involved, the stigma of written contracts must be bypassed so that the wishes of both the landowner and tenant farmer are written and preserved for future dealings.

In Iowa, the premonitions of this possible collision of interests have been heeded. The Iowa legislature passed House File 2380 dealing specifically with this issue in mind.[132] Codified into Iowa law and signed by Governor Chester J. Culver on March 3, 2010, HF 2380 provides the rights and benefits of the stover to the tenant farmer.[133] This section of the Code states, "[u]nless otherwise agreed to in writing by a lessor and farm tenant, a farm tenant may take any part of the aboveground part of a plant associated with a crop, at the time of harvest or after the harvest, until the farm tenancy terminates as provided in this chapter."[134]

This law essentially allows any tenant farmer with a valid oral agreement the rights to the corn stover. No limitation is provided on the amount the tenant farmer may remove, unless stipulated in writing.[135] This means a tenant farmer with an oral lease could remove all corn stover remaining after the harvest, despite having even failed to discuss the matter with the landowner. As the law reads, even those tenant farmers with a written contract have rights to the corn stover unless it is "otherwise agreed to in writing."[136] Even in written contracts it is plausible the issue of corn stover ownership is generally not discussed since it is likely a tenant farmer would be reluctant to bring up the subject of stover removal for fear of the landowner raising the rent.[137]

It seems fairly apparent section 562.5A is designed to favor the tenant farmer.[138] Analyzing the law, the tenant farmer by default has rights to the "aboveground parts of the plant" unless the tenancy has ended or another scenario was drafted in the written contract.[139] The question is, does this unfairly bur-

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132. H.F. 2380, 83d Gen. Assemb. (Iowa 2010) (codified at IOWA CODE § 562.5A (2011)). The bill was signed into law by Iowa Gov. Chester J. Culver on Mar. 3, 2010.

133. *Id.*

134. IOWA CODE § 562.5A (2011).

135. *Id.*

136. *See id.* "Unless otherwise agreed to" implies that unless removal is discussed in the written contract the tenant farmer will have rights to the corn stover until the end of the tenancy.

137. Tom M. Schechinger & James Hettenhaus, *Corn Stover Harvest: Grower, Custom Operator, and Processor Issues and Answers*, INFOHOUSE, 10 (1999), http://infohouse.p2ric.org/ref/40/39095.pdf.

138. *See* IOWA CODE § 562.5A.

139. *Id.*

den the landowner? The landowner has a bona fide interest in the leftover corn stover, as discussed above, and it has value in protecting and revitalizing the crop fields.[140] This idea highlights the supreme importance of the landowner involving stipulations on how corn stover is to be handled when written contracts are involved. Because of the overall fiscal impact corn stover has on the land and in the marketplace, a landowner would be wise to involve the matter in contract negotiations with the tenant farmer.

Some "old school" landlords may be leery of a written contract, because it may imply mistrust between the parties.[141] This is a frightening holdover from a past age. Considering the average age of farmers is on the rise, (the number of farmers seventy-five and older is rising, while the number of farmers under the age of twenty-five is decreasing) those left in the farming world may be more resistant to executing a written contract.[142] It is vital, and not simply because of the crop residue issue, for tenant farmers and landlords to get past their fears of mistrust and start implementing written leases. This will help clear up misunderstandings, possibly prevent future conflicts, and maybe even prevent future litigation. While the handshake has been a traditional form of agreement between parties throughout the countryside, with the increased value of corn stover and the stigma of the United States as a litigious society, it would be best for all parties involved to start implementing a written lease.

V. CONCLUSION

Iowa took the first step towards nudging the use of written contracts with its recently enacted law. While it is a good first step, it provides substantial advantages for the tenant farmer when it comes to ownership of the aboveground crop residue, especially that of the ever increasing value of corn stover. A landlord has just as much to lose or gain as they may have interest in profits through a crop share lease or the maintenance in the value and fertility of their land.

Landlords and tenant farmers need to begin their relationship on the right foot, and this starts with agreement on how the tenant-landlord relationship will proceed. With the value of corn stover having potentially large profits, this is a necessary component of these starting agreements. While Iowa law has laid some guidelines for ownership of crop residue, it would be prudent of a savvy

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140. *See* discussion, *supra* Part II B–C.

141. Kunkel et al., *supra* note 109, at 2.

142. *See* NAT'L AGRIC. STATISTICS SERV., USDA, 2007 CENSUS OF AGRICULTURE—UNITED STATES DATA 220 tbl.63 (2009), *available at* http://www.agcensus.usda.gov/Publications/2007/Full_Report/usv1.pdf (indicating that the average age of farm operators is 57.1 years, with the majority of farming operators over age 50).

landlord and tenant farmer to stipulate what is to happen to the crop residue. To secure a proper understanding of their relationship, dealings between tenant farmer and landlord should always be in writing, despite fears of seeming mistrustful. This will help protect the interests of all parties involved.