EARTH FRIENDLY AGRICULTURE FOR SOIL, WATER, AND CLIMATE: A MULTIJURISDICTIONAL COOPERATIVE APPROACH

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I. INTRODUCTION

The combination of a growing global population and a rising global average temperature means there is an ever-present need for thinking about food and water security, adaptation for agriculture, and new transformative pathways to reduce and remove greenhouse

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gas emissions. At the nexus of potential solutions to these global common problems is an opportunity to pursue Earth Friendly Agriculture (EFA) that supports smart soil management – nutrient retention and reuse – that optimizes water use and also sequesters carbon. There has been global disconnect between the supply of agricultural commodities from sources that practice smart soil and water management with the demand from business for these commodities as an aspect of risk management and corporate social responsibility to reduce greenhouse gas (GHG) emissions. Perhaps this divide is a result of little attention given to agriculture over the past several decades of global climate change negotiations. More recently, however, a growing amount of dialogue has been spent on the role of agriculture in helping to solve climate change.[1] Nevertheless, there still is a lack of harmony between climate change advocates and members of the agriculture community.[2] Communities working on climate change solutions, including national and sub-national governments as well as businesses and civil society, view agriculture as a gap in climate change discourse to reduce and remove emissions. Yet, agriculture communities, including farmers and input suppliers, view policies and regulations that dictate specific agricultural practices as draconian interference.[3] With the recent rethink, described in the next section, of global climate change governance, there is a potential middle ground with a win-win outcome.

This paper proposes a solution that bridges the top-down global demand for climate-friendly agriculture with the differentiated needs of the bottom-up supply of smart soil management production practices for these commodities. The solution, however, will need strong leadership on building collective action, and the U.S. is well positioned to play this role. American agriculture needs to accelerate innovation, policy development, and the adoption of EFA practices to help keep the earth from warming more than 1.5 degrees Celsius (1.5°C). Currently, the American farming community is not participating at a transformative level.[4] It will take a focused effort to coordinate the assets of American agriculture to tackle climate change. Companies argue that a window is opening for U.S. farmers to lead the world in using agriculture to reduce emissions and sequester carbon ahead of regulations and in ways that create more resilient soils, cropping systems and rural economies, and yet with the pace of global warming quickening, an incentive will be needed to move agriculture further-faster in the right direction.[5]

1. *See* Gil Gullickson, *How to Cope with Climate Change*, SUCCESSFUL FARMING (Jan. 26, 2016), http://www.agriculture.com/farm-management/conservation/how-to-cope-with-climate-chge_556-ar52052.

2. *See* Beth Kowitt, *The Paradox of American Farmers and Climate Change*, FORTUNE (June 30, 2016, 4:01 PM), http://fortune.com/2016/06/29/monsanto-farmers-climate-change/.

3. *See GOP Platform on Agriculture Separates Instead of Unites*, NAT'L SUSTAINABLE AGRIC. COALITION: NSAC'S BLOG (July 19, 2016), http://sustainableagriculture.net/blog/gop-platform-on-agriculture-2016/.

4. *See* Neil D. Hamilton, *Farming an Uncertain Climate Future: What COP 15 Means For Agriculture*, 2011 U. ILL. L. REV. 341, 358 (2011).

5. Kacey Birchmier, *5 Lessons from United Nations Climate Change Conference*, SUCCESSFUL FARMING (Jan. 29, 2016), http://www.agriculture.com/farm-management/conservation/5-lessons-from-united-nations-climate_556-ar52105.

Time is of the essence because global warming is occurring at a faster rate than expected, and the effects of climate change will cause severe and irreversible devastation to the biosphere as well as multiply economic and national security threats if immediate action is not taken.[6] Until recently, there was also a lack of faith in the global policy community and in individuals about tackling climate change before it is too late. In 2015, this faith changed. There were two major international agreements that took place, the Paris Agreement that set a new global goal for climate change and the United Nations Sustainable Development Goals (SDGs).[7] Also in 2015, with the release of the Pope's encyclical letter entitled *Ladauto Si*,[8] the public finally started to sway back towards the belief that climate change is real, that it is human-caused, and that immediate action is necessary-taking into account differentiated development agendas.[9] Even though these historic moments produced new hope, there is much left to do to put the global population on the right trajectory to curtail global warming and develop sustainability—including overcoming concerns of food security—before humanity collides with nature.

This paper reviews the current trajectory of global warming, the link between solving climate change and sustainable development, especially in the context of food security, and then evaluates the ethical-economic drivers behind the initial set of actions to address these challenges. There are actions on the ground that promote climate friendly soil management practices from both sides of the supply-demand equation, yet the transformational changes to the full agriculture system are not at the pace to prevent the world from locking into a greater than 1.5°C average global temperature increase. In a world with a growing population and increasingly unfriendly climates for agriculture production, food security and other development agendas are at risk. Therefore, a spectrum of options are presented in this paper for pursuing transformational EFA pathways aligned to the 1.5°C goal. Each option has opportunities and barriers for success; notwithstanding, a case is made to combine elements of two options that can overcome the barriers for a win-win approach.

The proposed solution is the creation of a volunteer market for EFA at the nexus of improving soil, water, and climate change through a multijurisdictional cooperative approach (MCA) that can, overtime, link to a legal-based mechanism within the Paris Agreement.[10] There are four pillars of the market: (1) the suppliers of agriculture commodities–

6. Spencer Weart, *The Discovery of Global Warming: Impacts of Climate Change* (Dec. 2016), http://www.aip.org/history/climate/impacts.htm.

7. *See generally* U.N. FCCCOR, 21st Sess., Adoption of the Paris Agreement, U.N. Doc. CP/2015/L.9/Rev.1 (Dec. 12, 2015) [hereinafter U.N. FCCCOR, Adoption of the Paris Agreement], https://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf.

8. *See generally* POPE FRANCIS, ENCYCLICAL LETTER: ON CARE FOR OUR COMMON HOME (LADAUTO SI) (May 24, 2015), http://w2.vatican.va/content/dam/francesco/pdf/encyclicals/documents/papa-francesco_20150524_enciclica-laudato-si_en.pdf.

9. Seth Heald, *The Pope's Climate Message in the United States: Moral Arguments and Moral Disengagement*, ENV'T (May-June 2006), http://www.environmentmagazine.org/Archives/Back%20Issues/2016/May-June%202016/pope_full.html.

10. THE STANLEY FOUND. & CLIMATE STRATEGIES, MULTIJURISDICTIONAL APPROACHES TO CARBON PRICING: INTEGRATING DESIGN ELEMENTS FOR A LOW CARBON CLUB 2 (2016), http://www.stanleyfoundation.org/publications/report/MultijurisdictionalWkshpRpt_316.pdf.

farmers; (2) buyers of agriculture commodities—multinational corporations and small to medium sized enterprises; (3) national or sub-national jurisdictions from which agricultural products originate; and (4) the international organizations on climate change and sustainable development. In the design of a MCA for EFA, all of the stakeholders are beneficiaries. Working collectively, these stakeholders can, overtime, link to a formal mechanism within the Paris Agreement.

Currently, however, with the lack of available data to quantify the soil-based carbon sequestration potentials specific to land types across many jurisdictions, the argument is for a phased approach to incentivize both improved data collection and smart soil/water management. Overtime, with improved data on the reduction of GHG emissions from operations and carbon sequestration from improved soil management practices, EFA can evolve to linkup with carbon-pricing schemes such as those that will be governed by Article 6 of the Paris Agreement. Therefore, the authors argue that in the context of climate change and sustainable development, there is an ethical-economic connection that drives action, yet it is not moving fast enough; hence, after careful consideration of options for change, a voluntary EFA market that bridges top-down demand from buyers and bottom-up supply from farmers in collaboration with international organizations and multiple jurisdictions, will accelerate the ethical-economic drive to move further-faster, create better data capture, enhance transparency, and later link to various forms of carbon-pricing schemes.

II. 1.5°C PATHWAYS, SUSTAINABLE DEVELOPMENT, AND AGRICULTURE

Climate change is a serious threat to global peace and security, yet collective actions are currently insufficient to curtail the increase in the global average temperature to a safe level; nevertheless, there is still an opportunity to change the trajectory the world is on before humanity gravely collides with nature. According to the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report, the trajectory of global warming is likely to reach 4°C or more before the end of the century if no action is taken.[11] A more recent report released by the World Meteorological Organization stated that warming is now occurring even faster than what was predicted.[12] These studies also exclaim that without action now, humanity is on a crash course with nature. Only by reducing and removing greenhouse gases in the atmosphere is there a chance to curtail the looming devastation that will affect communities, worldwide. The new safe-climate goal of limiting warming to well below 2°C with an aim of a 1.5°C limit, which was detailed in Article 2 of the Paris Agreement reached by consensus of nearly 200 countries in Paris in 2015, at the United

11. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2014: SYNTHESIS REPORT 22 tbl.SPM.1 (2015) [hereinafter CLIMATE CHANGE 2014], http://www.ipcc.ch/pdf/assessment-report/ar5/syr/SYR_AR5_FINAL_full_wcover.pdf (indicating that the Representative Concentration Pathway RCP 8.6 suggests that the temperature increase range could be even high in a business-as-usual scenario).

12. *See* WORLD METEOROLOGICAL ORG., WMO-No. 1167, WMO STATEMENT ON THE STATUS OF THE GLOBAL CLIMATE IN 2015, at 5-6 (2016), http://library.wmo.int/pmb_ged/wmo_1167_en.pdf.

Nations Framework Convention on Climate Change (UNFCCC) 21st session of the Conference of the Parties (COP21)[13] The Paris Agreement gave the international community a new goal and with it, came hope; however, countries' Intended Nationally Determined Contributions (INDCs) within the agreement, if implemented, do not aggregate into a pathway for a safe climate world. The opportunity is within the framework of the Paris Agreement, yet much more climate action must occur within the next five to ten years to prevent global warming increase over 1.5°C compared to pre-industrial levels.

The fossil-fuel sector is traditionally viewed as the climate change culprit because it represents the majority of GHG, yet Agriculture, Forestry, and Other Land-Use (AFOLU) still represents approximately 24 percent of global emissions.[14] Within that segment, little attention has been given to the role of agriculture. Over the period 1990-2010 agriculture emissions increased by 8 percent whereas forestry and other land-use emissions decreased by 14 percent.[15] Agriculture should be a part of an immediate response to climate change with new innovations and practices, alas, why is agriculture missing from many of the discussions happening at the international level? If implementation of transformational practices needs to happen within the next ten years, the question becomes: Who is going to lead? As depicted later in this research, some regions of the world have begun to engage in the agriculture conversation through creating cooperative initiatives, but it is not enough.[16] The American agricultural community needs to engage the opportunity within the framework of the Paris Agreement and the Global Climate Action Agenda. This will require the agriculture community, led by American farmers, to leverage the productivity, infrastructure, research institutions, risk management tools, and public policy to not just produce for a growing world population but to develop solutions for stabilizing the climate and adapting to the changes already underway.[17]

Although hope was reborn with the Paris Agreement to eventually set the world on the right path, the fear is that without immediate and transformational action – regulated or voluntary – to reduce and remove GHG emissions, the world's communities might be locked into a pathway of greater increases in the global average temperature.[18] The lock-in will be the result of a delay on phasing out fossil fuels – including new capital investments in infrastructure – and a delay in transforming high-GHG activities. Presently, the

13. U.N. FCCCOR, Adoption of the Paris Agreement, *supra* note 7, at art. 2 ¶ 1.

14. CLIMATE CHANGE 2014, *supra* note 11, at 46.

15. Salvatore M. Tubiello et al., *Agriculture, Forestry and Other Land Use Emissions by Sources and Removals by Sinks* 18 (Food & Agric. Org., Working Paper No. ESS/14-02, 2014), http://www.fao.org/docrep/019/i3671e/i3671e.pdf.

16. *See Id.* at 72.

17. David Biello, *U.S. Agriculture Secretary Thinks Farmers Can Help Solve Global Warming*, SCI. AM. (June 1, 2016), http://www.scientificamerican.com/article/u-s-agriculture-secretary-thinks-farmers-can-help-solve-global-warming/?platform=hootsuite.

18. *2013 Gap Report Strengthens Case for Wide-Ranging Global Action to Close Emissions Gap*, U.N. ENV'T PROGRAMME (May 11, 2013), http://www.unep.org/climatechange/News/PressRelease/tabid/416/language/en-US/Default.aspx?DocumentId=2755&ArticleId=9683.

aggregation of the INDCs shows that lock-in is inevitable without drastic changes to globally differentiated socio-economic systems. The current trajectory of global warming, taking into account the INDCs, is a range of 2.7°C to 3.5°C above pre-industrial levels.[19] With a likely lock-in to increases in the global average temperature greater than what was agreed upon in Paris comes the risk of graver global threats to peace and security.

With global warming comes changes to climates, and the effect will be threats to food and water security, global public health, and an increase in climate related threat multipliers especially in conflict prone areas.[20] The largest predicted effect for agriculture in the Midwest region of the United States (U.S.) is increases in rainfall and flooding that can affect food production and water quality.[21] Climate change will also lead to likely future deployment of military personnel.[22] Not to mention that U.S., global, and local economies will be negatively affected due to the devastation to infrastructure and adaptation to climatic change, such as what happened in Iowa with the floods of 2008.[23] Such threats might spur heavier top-down regulations and/or even the deployment of solar radiation management (SRM) techniques for which the economic cost and environmental externalities are still unknown.[24]

Outside of climate change discourse, 1.5°C does not have much meaning; however in the right context it means that the world's governments, businesses, and individuals must cooperate in innovative and transformational ways to reduce and to remove greenhouse gas emissions, and these pathways must also acknowledge the various development needs such as to rid poverty and address food security. This is where the international conversation on climate change aligns to sustainable development and the United Nations Sustainable Development Goals (SDGs), formerly agreed on by countries in the 2015 UN General Assembly resolution "Transforming our world: the 2030 Agenda for Sustainable Development."[25] As the Paris Agreement marks a point in history that acknowledges the differentiation of development agendas around the world, the SDGs also call for action on climate as an important factor in ensuring that countries develop with the least resistance from natural disasters. Moreover, as excerpted in Table 1, both the Paris Agreement and the SDGs recognize the importance of land use and food security in a world with a growing

19. *Climate Scoreboard: U.N. Climate Pledge Analysis*, CLIMATE INTERACTIVE, https://www.climateinteractive.org/programs/scoreboard/ (last visited Jan. 19, 2017).

20. *Climate Security: Building National Security*, AM. SECURITY PROJECT, http://www.americansecurityproject.org/climate-security/ (last visited Jan. 19, 2017).

21. Sara C. Pryor et al., U.S. Glob. Change Research Program, *Midwest, in* CLIMATE CHANGE IMPACTS IN THE U.S. 418, 419 (2014), http://nca2014.globalchange.gov/report/regions/midwest.

22. *Climate Security: Building National Security*, *supra* note 20.

23. *See generally Iowa Flood of 2008*, WIKIPEDIA, https://en.wikipedia.org/wiki/Iowa_flood_of_2008 (last visited Jan. 19, 2017).

24. *See generally Solar Radiation Management*, WIKIPEDIA https://en.wikipedia.org/wiki/Solar_radiation_management (last visited Jan. 19, 2017).

25. *Sustainable Development Goals*, WIKIPEDIA, https://en.wikipedia.org/wiki/Sustainable_Development_Goals (last visited Jan. 19, 2017).

population as well as the effect that climate change will have on the need to adapt food systems to new climates around the world – some with draught, some with floods, and some that will simply perish.

Table 1 - Comparison of the SDGs and the Paris Agreement: the nexus of development, climate, and food security

UN SDGs	Paris Agreement
Goal 2. End hunger, achieve food security, and improved nutrition and promote sustainable agriculture Goal 6. Ensure availability and sustainable management of water and sanitation for all Goal 13. Take urgent action to combat climate change and its impacts Goal 15. Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	"Recognizing the fundamental priority of safeguarding food security and ending hunger, and the particular vulnerabilities of food production systems to the adverse impacts of climate change," "Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production;" "Recognizing the importance of the conservation and enhancement, as appropriate, of sinks and reservoirs of the greenhouse gases referred to in the Convention,"

A global average temperature increase above 1.5°C will have devastating effects on development, and there are now international agreements on climate change and sustainable development. So, what is the way forward to ensure that global warming is limited to the new goal in order to reduce the threats of climate change, especially around development agendas? The Paris Agreement provides a framework for answering this question.[26] The Agreement is flexible in the sense that it allows bottom-up, innovative, and transformational approaches that can be pursued through either regulated or voluntary initiatives, and the Agreement, as discussed below, links these approaches to sustainable development. The remainder of this section will focus on how the Paris Agreement provides an opportunity to reduce and remove emissions that can also support food security as an aspect of differentiated sustainable development agendas. As will be illustrated later, agriculture is a link between the two where action can be accelerated with mutual benefits for all stakeholders.[27]

Presented in this paper are five Articles of the Paris Agreement, which will go into effect in 2020, and two components in the COP21 Decision that are active currently - there are other Articles and parts of the Decision not mentioned that reinforce, yet do not require examination for this paper's argument. Detailed more in Table 2: (1) Article 2 - Long-

26. *See* U.N. FCCCOR, Adoption of the Paris Agreement, *supra* note 7, at 2.

27. *See* Gullickson, *supra* note 1 (showing that even agribusiness giant Monsanto is optimistic farmers can increase productivity and develop practices to fight climate change at the same time).

term goal; (2) Article 4 – Intended Nationally Determined Contributions; (3) Article 5 - Sinks and reservoirs; (4) Article 6 - Cooperative approaches; and (5) Article 14 - Global stocktake. Moreover, to spur climate action prior to the date in which the Paris Agreement goes into effect, 2020, are the Action Agenda and the Non-state Actor Zone on Climate Action (NAZCA) that was agreed upon by the Parties of COP21 in the COP Decision that includes the Paris Agreement as its annex.

Table 2 – Selected excerpts from Articles of the Paris Agreement and components of the COP21 Decision[28]

Article/Decision	Details
Article 2: Long-term goal	"*Emphasizing* with serious concern the urgent need to address the significant gap between the aggregate effect of Parties' mitigation pledges in terms of global annual emissions of greenhouse gases by 2020 and aggregate emission pathways consistent with holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels"
Article 4: Nationally Determined Contributions	"In order to achieve the long-term temperature goal set out in Article 2, Parties aim to reach global peaking of greenhouse gas emissions as soon as possible, . . . a balance between [reducing] anthropogenic emissions by sources and removals by sinks . . . in the context of sustainable development and efforts to eradicate poverty." . . . "Each Party shall communicate a nationally determined contribution every five years . . . and be informed by the outcomes of the global stocktake referred to in Article 14."
Article 5: Sinks and reservoirs	"Parties should take action to conserve and enhance, as appropriate, sinks and reservoirs of greenhouse gases as referred to in Article 4, paragraph 1(d), of the Convention, including forests."
Article 6: Cooperative approaches	"Parties shall, where engaging on a voluntary basis in cooperative approaches that involve the use of internationally transferred mitigation outcomes towards nationally determined contributions, . . . " "A mechanism to contribute to the mitigation of greenhouse gas emissions and support sustainable development is hereby established . . . It shall be supervised by a body designated by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement, and shall aim: (a) To promote the mitigation of greenhouse gas emissions while fostering sustainable development; (b) To incentivize and facilitate participation in the mitigation of greenhouse gas emissions by public and private entities authorized by a Party;"

28. *See generally* U.N. FCCCOR, Adoption of the Paris Agreement, *supra* note 7.

Article 14: Global Stocktake	"The Conference of the Parties serving as the meeting of the Parties to the Paris Agreement shall periodically take stock of the implementation of this Agreement to assess the collective progress towards achieving the purpose of this Agreement and its long-term goals . . ."
COP Decision: Action Agenda	*Agreeing* to uphold and promote regional and international cooperation in order to mobilize stronger and more ambitious climate action by all Parties and non-Party stakeholders, including civil society, the private sector, financial institutions, cities and other subnational authorities, local communities and indigenous peoples.
COP Decision: NAZCA	*"Welcomes* the efforts of non-Party stakeholders to scale up their climate actions, and *encourages* the registration of those actions in the Non-State Actor Zone for Climate Action platform."

Article 2 set a new global target for limiting the increase in the global average temperature that is both scientifically and politically determined as the safest limit that is feasible to achieve.[29] However, a press release from UNFCCC summarized one of their recent reports entitled, "Synthesis report on the aggregate effect of the intended nationally determined contributions," which determined that the current expected rise in the global average temperature could be limited to 2.7°C.[30] This report evaluated submissions of 119 Intended Nationally Determined Contributions (INDCs) communicated by 147 Parties to the UNFCCC.[31]

Moreover, third-party analysis such as work done by Climate Interactive, suggests that the INDCs will only limit warming to 3.5°C with the assumption that countries do not have to continue their contributions past the date they specified.[32] Regardless, the range is between 2.7°C and 3.5°C if the INDCs are implemented, and since the implementation start date is 2020, there is an increasing level of fear that lock-in will occur prior to the first ratchet-up of the INDCs unless immediate and transformational action is taken now in the pre-2020 period.[33]

Article 4 is a ratchet-up mechanism for INDCs whereby the countries will reevaluate and resubmit national contributions with higher levels of mitigation and resilience contributions every five years.[34] Therefore, even though the current aggregate of INDCs puts the world on a trajectory that is greater than the goal established in Article 2, there is a

29. *Id.* at 21.

30. Press Release, UNFCCC, Global Response to Climate Change Keeps Door Open to 2 Degree C Temperature Limit: New UN Report Synthesizes National Climate Plans from 146 Countries (Oct. 30, 2015) [hereinafter Global Response to Climate Change], http://newsroom.unfccc.int/unfccc-newsroom/indc-synthesis-report-press-release/.

31. *Id.*

32. *Climate Scoreboard: U.N. Climate Pledge Analysis*, *supra* note 19.

33. *See id.*

34. *See* U.N. FCCCOR, Adoption of the Paris Agreement, *supra* note 7, at art. 4 ¶ 9.

follow-through element to the Agreement that induces countries to do more.[35] Climate Interactive suggests what needs to be done to achieve a 1.5°C world in Table 3.

Table 3—Improvements to National Climate Pledges (INDCS) to Meet 2℃ and 1.5℃ Goals[36]

	Current INDC for 2025/2030	Improved INDC for 2030 to get below 2°C	Improved INDC for 2030 to get below 1.5°C
EU	40% below 1990 by 2030	47% below 1990 levels by 2030 (45% below 2005)	62% below 1990 levels by 2030 (60% below 2005)
U.S.	26% below 2005 levels by 2025	45% below 2005 levels by 2030	60% below 2005 levels by 2030
Other Developed	2% decrease below 2005 emissions by 2030*	45% below 2005 levels by 2030 (51% below 1990)	60% below 2005 levels by 2030 (64% below 1990)
China	Peak CO_2 by 2030, at 60% below 2005 intensity	Peak by 2025	Peak no later than 2025
Other Developing	14% below BAU by 2030*	Peak by 2027	Peak no later than 2025

*Level of ambition of the aggregate of individual INDCs within this group

Therefore, not only do the INDCs need to be ratcheted up, but they need to be ratcheted to a transformational extent, and soon, as countries are just now in their planning for implementing the first set of INDCs starting in 2020. In order to meet the Article 2 goal of 1.5°C, then all regions of the world will need to rethink their emissions reductions, and they will also need to implement negative emissions strategies. Negative emissions strategies include the AFOLU sectors along with technologies such as carbon capture and storage.[37]

35. *See id.*

36. ANDREW JONES ET AL., CLIMATE INTERACTIVE, DEEPER, EARLIER EMISSIONS CUTS NEEDED TO REACH PARIS GOALS 4 (2016), https://www.climateinteractive.org/programs/scoreboard/early-ambition/.

37. *See* Tubiello et al., *supra* note 15, at 6.

Negative emissions strategies from agriculture have great potential, for example, it may help in halting "the annual increase in [carbon dioxide] in the atmosphere" through improving soil management to hold 0.4 percent more carbon per year; however, the data is simply not adequate enough to give certainty.[38] As a leader in innovation and information (data), the U.S. has an opportune role to play. The American agricultural system can assume a dynamic role as a leader in helping meet the 1.5°C goal through both the reduction and the removal (negative emissions) of greenhouse gas emissions, but the pathway to success requires political, moral, and economic will.

The role of AFOLU to reduce and especially remove emissions is covered in Article 5 on the use of sinks and reservoirs.[39] The Article calls out forests; agriculture is not mentioned although it has great potential.[40] As AFOLU relates back to Article 4 and ties into Article 5, agriculture is mentioned in a number of countries' INDCs.[41] Below are two excerpts in the Land Use, Land Use Change and Forestry (LULUCF) section from the UNFCCC synthesis report of the INDCs:

> Most Parties included emissions and removals from LULUCF. A few Parties indicated that a common framework for LULUCF accounting may be desirable, which could be based on existing guidance and experience under the Convention and its Kyoto Protocol. However many of the [intended INDCs] do not provide comprehensive information on the assumptions and methods applied in relation to LULUCF, which presents a major challenge for the quantitative evaluation of the aggregate effect of the [INDCs].[42]

> Several of the [INDCs] highlight the link between the implied actions to address climate change and the development priorities, including social and economic development and poverty eradication. Some Parties highlighted synergies between their development and climate action, while a few further noted specific co-benefits of action to address climate change, including improvements in air quality, human health, job creation and others, as well as

38. *Understand the "4 per 1000" Initiative*, 4 POUR 1000, http://4p1000.org/understand (last visited Jan. 19, 2017). *But see* Sivan Kartha & Kate Dooley, *The Risks of Relying on Tomorrow's 'Negative Emissions' to Guide Today's Mitigation Action* 3 (Stockholm Env't Inst., Working Paper No. 2016-08, 2016), http://www.fern.org/sites/fern.org/files/Kate%20Dooley%20Negative%20Emissions%20.pdf (analyzing the risks that may come with the implementation of negative emission technologies).

39. *See* U.N. FCCCOR, Adoption of the Paris Agreement, *supra* note 7, at art. 5.

40. *Id.* at art. 5 ¶ 2.

41. U.N. FCCCOR, 21st Sess., Synthesis Report on the Aggregate Effect of the Intended Nationally Determined Contributions, U.N. Doc. CP/2015/7, at 29 (Oct. 30, 2015) [hereinafter U.N. FCCCOR, Synthesis Report], http://unfccc.int/resource/docs/2015/cop21/eng/07.pdf.

42. *Id.* at 6.

> synergies between adaptation and mitigation actions, in particular in agriculture and forestry.[43]

So, even though agriculture is not explicitly called out in the Paris Agreement, countries' [INDCs] do have some provisions for reducing and removing emissions through agriculture.[44] Data is still a barrier, however, to give certainty around the quantity AFOLU related emission reductions and removals. Once the data and accounting issue is resolved, then countries can start to use more AFOLU to meet their [INDCs]. Even though Americans could be a leader in this area, the U.S. did not mention agriculture within its [INDC] report.[45]

Article 6 calls for a mechanism to be created that will foster markets to promote the reduction and removal of emissions with a provision to benefit sustainable development.[46] This Article is important to the argument laid out in this paper insofar as it provides an opportunity to eventually tie removals of GHGs through AFOLU to carbon-pricing schemes within the global context. To get to this point in the future, however, other steps should be taken especially around improving the data management of agriculture.[47] The mechanism(s) called for in this Article are yet to be defined, and so the agriculture community needs to engage the stakeholders responsible for creating the mechanism(s) if agriculture is to have a role within a formally established market mechanism.[48] With foresight into the possibility of agriculture's role in reducing and removing emissions, there is a seemingly uncontested leadership opportunity on constructing an international market mechanism within the Paris Agreement that incentivizes Earth Friendly Agriculture. Engaging early-on could provide the U.S. agricultural community an opportunity to leverage incentives and resources from the marketplace rather than reactively relying on regulations in the future.[49]

Article 14 calls for a global stocktake of the implementation of INDCs as they relate to limiting global warming to well below 2°C with an aim to limit warming to 1.5°C.[50] The global stocktake is intended to inform Parties to the Convention of what remains to be done to achieve the goal set in Article 2.[51] Therefore, Article 14 is tied to Article 4 on ratcheting

43. *Id.* at 7.

44. *See Id.* at 6-7.

45. *See* U.S., U.S. COVER NOTE, INDC AND ACCOMPANYING INFORMATION 1 (Mar. 31, 2015) [hereinafter U.S. COVER NOTE], http://www4.unfccc.int/submissions/INDC/Published%20Documents/United%20States%20of%20America/1/U.S.%20Cover%20Note%20INDC%20and%20Accompanying%20Information.pdf (responding "to the request in Lima to communicate to the secretariat its intended nationally determined contributions towards achieving the objective of the Convention as set out in its Article 2 . . .").

46. U.N. FCCCOR, Adoption of the Paris Agreement, *supra* note 7, at art. 6 ¶ 4.

47. *See* U.S. COVER NOTE, *supra* note 45, at 4.

48. *See* U.N. FCCCOR, Adoption of the Paris Agreement, *supra* note 7, at art. 6 ¶ 4.

49. *See, e.g.*, *The Alliance*, FIELD TO MKT., http://ww2.fieldtomarket.org/the-alliance/ (last visited Jan. 19, 2017).

50. U.N. FCCCOR, Adoption of the Paris Agreement, *supra* note 7, at art. 14 ¶ 1.

51. *Id.* at art. 14 ¶ 1-2.

up INDCs.[52] The issue at hand, however, is that by the time the first stocktake is completed in 2023, it is likely that lock-in will be improbable to avoid.[53] Therefore, a fast-start on the dialogue is needed to build pre-2020 action to reduce and remove emissions as a vital element for a safe climate world, and agriculture has a critical role to play.

With the understanding that pre-2020 climate action is needed, the Action Agenda and the Non-state Actor Zone for Climate Action (NAZCA) that were included in the COP21 Decision taken on December 12, 2015, are the vehicles to catalyze greater INDC ambition. The Action Agenda, formally noted in the COP Decision as the Lima-Paris Action Agenda, and now being coined the Global Climate Action Agenda, is a platform that encourages, recognizes, and showcases cooperative initiatives on climate and sustainable development from partnerships amongst and between countries, businesses, sub-national governments, and other non-state actors. NAZCA is an online portal that captures these and other actions to showcase, structure, and inspire more climate action on the ground as a means to send market and policy signals to decision makers.[54] It is within the Action Agenda and the NAZCA portal where gaps in the INDCs can be closed through the use of cooperative initiatives amongst non-Parties to the Convention or businesses and sub-national jurisdictions – also with the ability to link the initiatives to Parties – with the aim of helping countries meet their INDCs and swiftly ratchet their contributions with confidence.

Since agriculture has great potential for reducing and removing GHG emissions from the atmosphere,[55] and this is a gap within the Agreement and within the mitigation sections of the INDCs, there is an untapped leadership opportunity for agriculture to contribute to solving climate change and support sustainable development starting in the pre-2020 period. Through the Action Agenda and NAZCA, a cooperative initiative can be built that links together the ethical-economic rationale for a win-win approach across suppliers and buyers. Initiating a multi-stakeholder/multi-jurisdictional cooperative approach on agriculture now can also inform the international negotiations about how best to construct a market mechanism in Article 6 that incorporates options to purchase negative emissions certificates/credits from the agriculture sector, which would institutionalize an incentive for broader global engagement in the sector and move the world farther-faster toward limiting warming to 1.5°C. This is where the U.S. could take a leadership role as described later.

There are several reasons to create a win-win voluntary approach amongst like-minded businesses and governments that understand the need for improvements in agriculture to promote food security and reduce environmental impacts. There is an existing top-down demand from businesses, albeit not universal, for what is termed Climate Smart Agriculture

52. *Id.* at art. 4.

53. *See* Allen A. Fawcett et al., *Can Paris Pledges Avert Severe Climate Change?*, 350 SCI. 1168, 1169 (2015).

54. *About NAZCA*, GLOBAL CLIMATE ACTION, http://climateaction.unfccc.int/about (last visited Jan. 19, 2017).

55. Gullickson, *supra* note 1.

(CSA), and this demand is being met through disparate sources.[56] There are four barriers, however, that include: (1) the supply of CSA not moving quickly enough; (2) the incentives are not yet in place to quicken the pace; (3) a culmination of the prior two barriers, whereas the supply pace lags due to the lack of incentives because there is not a separate commodity market for CSA; and (4) CSA does not translate to farmers, stewards of the land, because its title is perceived as a focus on climate and not better land management practices.[57] As described later, a voluntary approach amongst jurisdictions and businesses to promote Earth Friendly Agriculture (EFA) could help farmers overcome these barriers, including the issue of being a steward of the land versus trying to improve the climate, as well as create more of a universal demand.

Closing the existing gap between ethics and economics – the farmers and businesses currently willing to engage in better land management and climate and earth friendly practices respectively – is the first step in accelerating the merry-go-round of action and policy between the bottom-up and the top-down approaches. Some actors are starting to participate in EFA through cooperate initiatives – depicted later in this paper – which has started a so called merry-go-round effect driven by a centrifugal push and pull between ethical stewardship (both from farmers and businesses) and economic benefits. As more actors board the merry-go-round it will begin to go faster, yet – knowing that time is of the essence for a safe climate world – a catalyst is needed that brings the market incentives to facilitate greater ethical stewardship amongst all actors.

To overcome both the discontent and lag-time with regulations and top-down policy approaches, actors need to seize the opportunities that now exist to find the middle ground between the "ethical push" and the "economic pull," and this could initially be accomplished within the Action Agenda and later through the cooperative market mechanism(s) in Article 6 of the Paris Agreement.[58] Most countries engage in climate change policy or sustainable development through the interest of national and economic security, but the tides are beginning to turn as sub-national and non-state actors have been introduced, which added the variable of individual ethical and corporate social responsibility as a driving force behind sub-state and non-state actors taking action.

Key agricultural states within the U.S. can still become a leader in this area, yet they are not participating at a transformational level. Before the world is either locked-in above 1.5°C or if by chance other countries assume leadership in this area, then it may be too late for the U.S. to safely board the merry-go-round without undesirable heavy-handed regulatory action. This paper will continue to explore the role of agriculture within the ethical-

56. *See Climate-Smart Agriculture*, FAO, http://www.fao.org/climate-smart-agriculture/en/ (last visited Jan. 19, 2017).

57. *See* Damiano Luchetti et al., *Module 6: Conservation and Sustainable use of Genetic Resources for Food and Agriculture*, *in* CLIMATE-SMART AGRIC. SOURCEBOOK 177-78 (FAO ed. 2013), http://www.fao.org/docrep/018/i3325e06.pdf; *see also* Current research by the Drake University Agricultural Law Center supports the claim that farmers are struggling to articulate a connection between land management practices and climate change. Forthcoming research publication spring 2017.

58. *See* U.N. FCCCOR, Adoption of the Paris Agreement, *supra* note 7, at art. 6, ¶ 2.

economic merry-go-round of accelerating EFA supply and demand. Since there is a global leadership opportunity for a voluntary cooperative initiative as a catalyst for closing the gap on agriculture and climate, and the U.S. could assume the leadership role, this research and policy analysis will also present a case for a multijurisdictional cooperative approach (MCA) on EFA within the subnational jurisdiction of Iowa within the U.S.

American agriculture will require many components to construct a MCA on EFA, such as: (1) farmers as business owners; (2) commodity and general farm groups; (3) fully developed (mature) agribusiness community; (4) public/private partnerships including a multitude of partnerships at Land Grant universities; (5) local, state, and national policy efforts; and (6) governmental organizations that involve farmers at every level (i.e. local extension councils, Farm Service Agency county committees, statewide Natural Resources Conservation Service (NRCS) technical committees, and the Farm Credit Council at the national level). This complex infrastructure of farmers, agri-businesses, NGOs, bureaucratic entities, lenders, and universities has not been fully engaged on the issues surrounding climate change. Illustrating this dynamic is the recent policy report on agricultural research, "Retaking the Field," that argues for increased investments in agricultural research but fails to mention research regarding agriculture and climate change except for a one-sided reference.[59] Developing the moral courage, the economic motivations, and the political will to leverage American agricultural resources to tackle climate change could unleash the power of American agriculture to lead.

III. THE ETHICAL-ECONOMIC RATIONALE FOR EARTH FRIENDLY AGRICULTURE

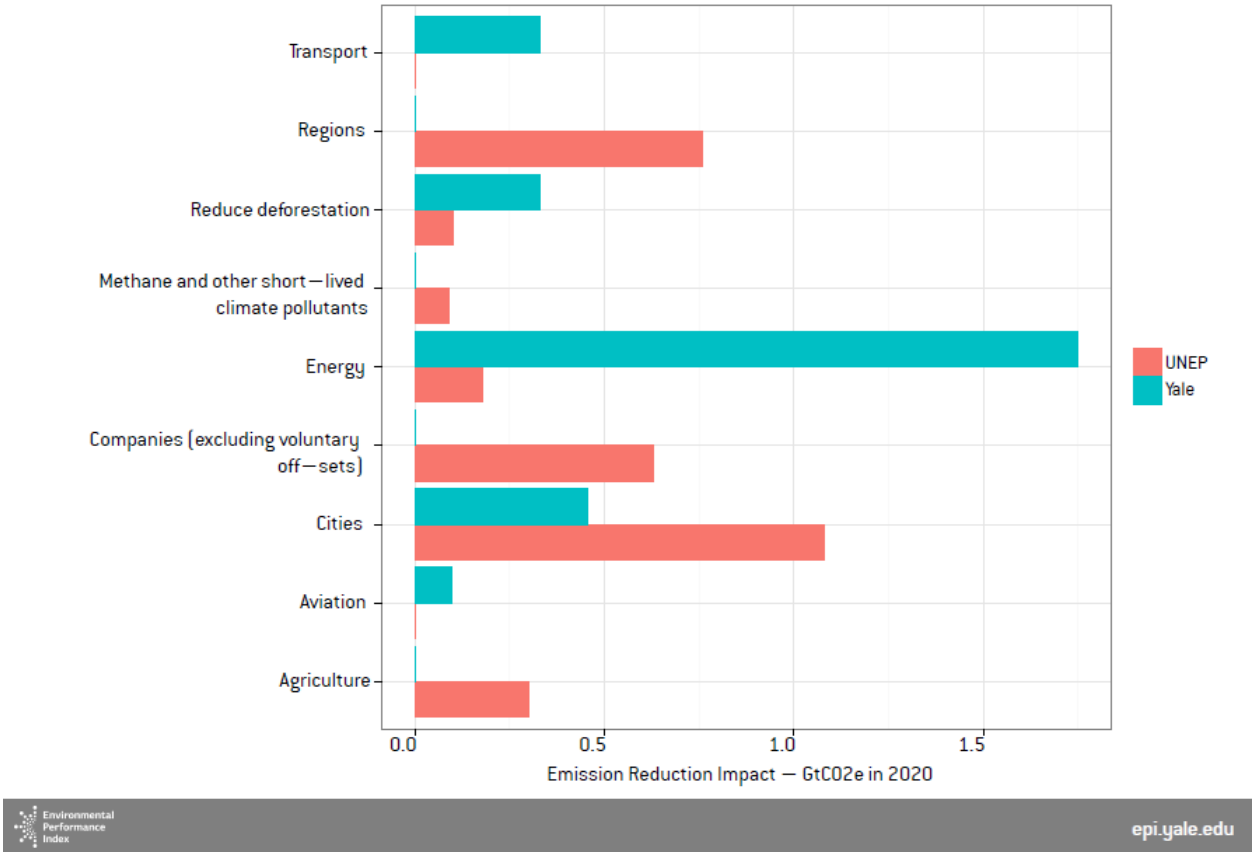
In the United States, discussions about solutions to climate change are often fueled by a dichotomy between moral/ethical arguments and economic arguments. Jurisprudence on this dichotomy divides the ethical argument into a case about natural law – securing a peaceful and just world for all – and the economic argument is a case for legal obligations – positive law that currently omits environmental externalities. Moving beyond this either/or dichotomy and then finding bridges to solutions will be key to keeping global temperatures to a 1.5°C increase. The agricultural community can provide an important pathway for achieving an effective interplay between the economic and the ethical motivations for addressing climate change.

Economic motivations can drive policies to capture benefits and dissuade continued pollution; whereas ethical motivations can drive vested actors—suppliers and buyers—and voters to engage in the necessary political actions required to pursue economic-related policy change. Together, the economic and ethical need to create a cohesive, not disparate, feedback loop that will help to accelerate agricultural change. In 2015, three international documents emerged providing an example that frames such a feedback loop: the Paris Agreement, the UN SDGs, and the papal encyclical, Laudato Si. Each document, in its own way, espouses the normative argument for combining ethics with economics. Each document also progressively changed the perspective of the world on this dichotomy, yet

59. SOAR FOUND., RETAKING THE FIELD: THE CASE FOR A SURGE IN AGRICULTURAL RESEARCH 9 (2016), http://supportagresearch.org/wp-content/uploads/2016/04/soar_retaking_the_field-FINAL.pdf (discussing only air pollution as a potential risk to agriculture).

action on the ground still lags and time is still of the essence. Perhaps the year 2017 will very well be the tipping point in yoking the economics and the ethics. Figure 1 below shows how much action is taking place on the ground from cooperative initiatives (from the 2014 UN Climate Summit and the University of Cambridge Cooperative Initiative database) from countries, sub-nationals, and non-state actors. Certainly, a feedback loop between the economic and moral has already begun within the sub-national and non-state realm, but how is it accelerated, and what role should the agriculture sector play?

Figure 1-United Nations Environment Programme (UNEP) and Yale: Cooperative Initiative Comparison by Emissions impact[60]



60. Don Mosteller & Angel Hsu, *Getting to Two Degrees: Measuring What Cities, Companies, and Others Have Promised*, ENVTL. PERFORMANCE INDEX (June 11, 2015), http://archive.epi.yale.edu/the-metric/getting-two-degrees-measuring-what-cities-companies-and-others-have-promised.

The report of the comparison also noted that while UNEP identified 15 initiatives out of 180 that could be quantified, Yale only identified eight out of the twenty-nine initiatives announced at the UN Climate Summit (2014) because, "most lacked emission reduction goals, targets, or baseline reference points . . . ."[61] Thus, even though there is enormous potential within the groundswell for mitigation (and resilience) there is still clearly a need for additional information about cooperative initiatives and criteria for making them count.

In terms of the Paris Agreement, agriculture is noticeably absent.[62] This is quickly changing as the agriculture community begins to see the economic downside of not being at the table.[63] Agriculture is both a contributor of emissions as well as a potential source for removing pollutants, thus, policy makers and business leaders are recognizing that agriculture needs to play a greater role in providing solutions to the problems associated with climate change,[64] yet, the ethical-economic tension needs to be addressed. Pope Francis perhaps says it best.

In June 2015, Pope Francis promulgated the encyclical Laudato Si: On Care of Our Common Home. Laudato Si, a papal letter to the entire Catholic Church, also invites all religions to join in the call to work together to overcome environmental challenges. Pope Francis writes, "[t]he natural environment is a collective good, the patrimony of all humanity and the responsibility of everyone."[65] He argues the world is mistreated and abused, but humanity is capable of, and called to partner with, the creator to heal the Earth. In multiple sections, he references agriculture as a source of the symptoms of sickness: problems with soil, water, air, and all forms of life. However, he also talks about agriculture as a source of healing and providing powerful solutions in overcoming environmental challenges. The Pope frames the debate not in terms of a technical problem, but in terms of a moral challenge. His call is for an "ecological conversion."[66]

Laudato Si provides hopefulness for humanity in the face of an ecological crisis. The call to action is urgent and the identifying of accountability is razor sharp. Yet, the encyclical celebrates the possibilities for humanity to solve the problems. The Pope suggests people are capable of finding the technical solutions so long as they are moved by the moral argument for action.[67] American farmers and the entire American agricultural community are uniquely suited to respond to this call as the United States has some of the most productive soils, beneficial regional climates, advanced technical infrastructure, resourceful farmers, developed agribusinesses, and supportive public policies as anywhere on the

61. *Id.*

62. *See generally* U. N. FCCCOR, Adoption of the Paris Agreement, *supra* note 7.

63. John W. McArthur, *Agriculture in the COP21 Agenda, in* COP21 AT PARIS: THE ISSUES, THE ACTORS, AND THE ROAD AHEAD ON CLIMATE CHANGE 37, 37 (Brookings Inst., Nov. 20, 2015), https://www.brookings.edu/wp-content/uploads/2015/11/cop21atparis.pdf.

64. USDA, USDA BUILDING BLOCKS FOR CLIMATE SMART AGRICULTURE AND FORESTRY 55-56 (May 2016) [hereinafter USDA BUILDING BLOCKS], http://www.usda.gov/documents/building-blocks-implementation-plan-progress-report.pdf.

65. POPE FRANCIS, *supra* note 8, at 70.

66. *Id.* at 159.

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

globe.[68] The Pope argues for the principle of differentiated responsibilities.[69] In the past 150 years, American agriculture has benefited from the use of carbon polluting fuels and other carbon-emission related inputs. The leadership position of American agriculture is unsurpassed anywhere in the world. Ethically, American agriculture needs to play a leading role in developing new agricultural systems and practices. It is a moral responsibility. Laudato Si is a moral call for the American farmer to embrace the challenge.

In terms of the moral argument of the papal encyclical, agriculture is often cited or referenced. In fact, reading with an eye to agriculture, one can find over thirty references within the encyclical.[70] Clearly, Pope Francis and the Vatican see an important role for agriculture to "protect our common home."[71] The argument uses science and economics but is clearly rooted in a moral call to action.[72] The document recognizes the power of agricultural systems to heal or scar the earth and calls on the farming community to develop more healing systems while reducing or eliminating practices that harm.[73]

On the economic side, there are two distinct dynamics for how agricultural production can help solve problems associated with climate change.[74] The first is being driven by the consumption end of the supply chain, which is considered the "pulling" of more sustainable products up the supply chain.[75] Unilever and General Mills are examples of companies at the top-end of the supply chain calling for more sustainable practices, or CSA, throughout the entire chain, even going as far as encouraging/discouraging particular practices in the field.[76] The second opportunity, which is presently underdeveloped as an approach to dealing with climate change, is for farmers to push the value of their production practices and services up the supply chain.[77] In the latter, farmers would be rewarded for how they integrate production and practices for multiple commodities on a whole farm basis.[78]

As with most complex situations, an either/or approach sets up a false and unhelpful dichotomy. Agricultural solutions to climate change are going to require a complex set of

68. Biello, *supra* note 17.

69. POPE FRANCIS, *supra* note 8, at 38.

70. *See, e.g.*, *id.* at 97, 122, 132.

71. *Id.* at 12.

72. Heald, *supra* note 9.

73. *See* Matt Russell, *On Climate Change, We Must Put the Apple Down*, NAT'L CATH. REP., (Aug. 5, 2015) [hereinafter Russell, *On Climate Change*], https://www.ncronline.org/blogs/eco-catholic/climate-change-we-must-put-apple-down.

74. *See* B. Gail Smith, *Developing Sustainable Food Supply Chairs*, 363 PHIL. TRANSACTIONS ROYAL SOC'Y 849, 850 (2008).

75. *Id.*

76. Birchmier, *supra* note 5; *See also* David Gelles, *Unilever Finds That Shrinking its Footprint is a Giant Task*, N.Y. TIMES (Nov. 21, 2015), http://www.nytimes.com/2015/11/22/business/unilever-finds-that-shrinking-its-footprint-is-a-giant-task.html?_r=1.

77. Smith, *supra* note 74, at 858.

78. *Id.*

approaches all along the supply chain.[79] Developing complimentary pulls from the buyers-end of the supply chain along with pushes from the suppliers-end will be key to accelerating agricultural innovation to be responsive enough in terms of scale and time to keep the planet from warming more than 1.5°C.[80]

For the past 10,000 years, agriculture has been a powerful tool to solve complicated human problems. Most recently, farmers and agribusinesses have used agriculture to grow new products and provide new services for an exponentially increasing population. Biofuels in the U.S. "corn belt" is an example of a new product, and multifunctional agriculture in Europe provides examples of new services such as environmental services, landscape preservation, and cultural promotion.

In the next thirty years, agriculture will be used at a minimum to sequester carbon. The benefits of developing the products and services to do this will likely consolidate around the innovators. Will American farmers, situated in rural communities be the innovators or will another group (or groups) of people provide the innovation that uses agriculture as a tool to stabilize the climate? What opportunities would American farmers and their rural communities miss if they only play a small or insignificant role in the innovation?

On the moral side, American farmers have been slow to acknowledge the ethical challenges created by environmental degradation and economic inequality that climate change threatens to unleash.[81] There is an increasing number of experts arguing that the challenges are already unfolding faster and in more significant ways than have been predicted.[82] Is there an opportunity for leaders interested in engaging farmers as innovators to develop the argument for feeding the world, which has been used effectively to develop pro-production policies at the state and federal levels, to also include the "should" of stabilizing the climate? As the flywheel of innovation accelerates, will U.S. farmers participate as early innovators or mid-term adaptors or be left behind as other global sources of innovation assume the mantel for the next revolution in agriculture? Solving the problems of global climate change by developing a successful interplay between a moral call to action and effective policies for economic development will be key to creating new agricultural products and practices. New ways to bring these innovations to the marketplace will also need to be developed. This interplay creates an innovation flywheel effect where new ideas shatter thought traps, blow up assumptions, and unleash additional innovations. Another way to think about this is the aforementioned merry-go-round, which at some point will move so fast that it will make it difficult for new innovators to get on. The year 2015 may well be the year the merry-go-round started to accelerate. Will American agriculture in general and American farmers specifically get on the merry-go-round early enough to lead

79. CLIMATE CHANGE 2014, *supra* note 11, at 48.

80. THEMATIC GRP. ON SUSTAINABLE AGRIC. & FOOD SYS., SUSTAINABLE DEV. SOL. NETWORK, SOLUTIONS FOR SUSTAINABLE AGRICULTURE AND FOOD SYSTEMS 54 (2013), http://unsdsn.org/wp-content/uploads/2014/02/130919-TG07-Agriculture-Report-WEB.pdf.

81. Daniel Looker, *Farmers Can Adapt to Changing Climate*, SUCCESSFUL FARMING (Mar. 31, 2014), http://www.agriculture.com/news/crops/farmers-c-adapt-to-chging-climate_2-ar42553.

82. *See* Kowitt, *supra* note 2.

the innovation, or will they be left to watch as others create new agricultural practices and markets?

IV. ROLE OF AGRICULTURE IN REDUCING AND REMOVING EMISSIONS

Unlike many industries, agriculture cannot only reduce its greenhouse gas pollution, it can also remove greenhouse gas pollution from the atmosphere. Agriculture has struggled to play either role. Much development work needs to happen. New practices will need to be developed for agriculture to both reduce and remove GHG emissions. In terms of reduction strategies, much of the pollution associated with agriculture happens in the supply chain. Further up the supply chain, there are transportation, manufacturing, and storage issues associated with emissions. Some members of the supply-chain closer to consumers are interested in targeting on-farm emissions as a way to reduce their products' carbon footprints. On-site emissions are a problem that agriculture is coming to recognize. One example is the dairy industry capturing methane from waste and using it to generate energy.[83] A number of other practices that make-up components to EFA include higher efficiency tractors, reducing the number of passes across a field by using practices such as no-till, introducing cover crops, and new technologies to improve nutrient efficiency.[84]

Strategies for removing are more complicated but hold more promise for farmers to make a significant contribution to solving the challenges of climate change. Essentially, the carbon content in soil is dynamic. Contemporary farming systems have not paid much attention to the carbon content. That situation is changing rapidly as farmers and researchers are discovering the capacity to sequester carbon in the soil, the potential for storing carbon in soil, and the co-benefits of productivity gains within the soil as the carbon content increases. Increased carbon sequestration benefits soil on many fronts including holding more water, which is beneficial for both extreme rain and drought events.[85] Greater carbon in soils can improve the efficiency of nutrient cycling. These benefits can increase yields, which means less land is needed to grow the same amount of crops. This takes pressure off of bringing additional land into production such as clearing forests or draining wetlands. So far, supply chain strategies have focused on individual commodities. This is to be expected because manufacturers source individual commodities. An example of this is Unilever working with Iowa farmers to document sustainable practices in order to lay claim to sustainably raised soybeans for Hellman's mayonnaise.[86]

The power of manufacturers and retailers to pull more sustainable products up the supply chain is impressive. The conversation in the agriculture community is changing because of the marketplace, especially if an economic incentive is developed. A carbon-pricing mechanism could provide an attractive incentive to American farmers. With the

83. Office of the Chief Economist, *Dairy Power - Food Waste Repurposing to Renewable Energy and Nutrients*, USDA, http://www.usda.gov/oce/foodwaste/commitments/innovation/dairy.html (last visited Jan. 19, 2017).

84. Gullickson, *supra* note 1.

85. *Id.*

86. Gelles, *supra* note 76.

Paris Agreement and the Action Agenda, the incentives for businesses to get more serious about changing to keep the world from getting more than 1.5°C hotter are multiplying. Businesses are starting to compete with each other for sourcing more sustainable commodities, inputs, and ingredients.[87]

The pull of more sustainable commodities is helpful but does little to fundamentally change the functionality of agricultural land. The most efficient way to reduce agricultural pollution and to use the farm to sequester carbon is to take a whole farm approach rather than a single commodity approach.[88] In the interim, the fastest means to achieve this end is to accelerate the merry-go-round. Nonetheless, the end objective is to optimally sequester carbon, whereby farmers should implement changes such as longer rotations, perennial components such as woody buffer strips, and better integration of livestock. Hence, farms that sequester the most carbon will be more diverse in the future rather than more specialized than they are today.

To transform agriculture, farmers will need to develop markets for a wider range of production and in the case of climate change, environmental services. Farmers are going to need to work together to push a package of benefits up the supply chain. This puts farmers in the driver's seat helping to create a market for something that does not yet exist. Rather than participate on a commodity-by-commodity bases, farmers could sell or at least be rewarded for a complex mix of products and environmental services. Farmers could also benefit from integrating practices that are beneficial to climate with practices beneficial to water, air, and soil quality/health. There is little evidence that retailers and manufacturers in the supply chain interested in green branded commodities focused on GHG emissions are equally aggressive in investing in a much more complex set of qualities and products that also improve soil health and water quality.[89] The Paris Agreement does offer an opportunity within the Action Agenda, NAZCA, and Article 6 to develop a cooperate initiative that can evolve into an institutionalized international mechanism that will promote these transformational changes.

V. A SPECTRUM OF OPTIONS FOR EARTH FRIENDLY AGRICULTURE

If EFA is something that is viewed as pertinent to both the climate change community and the agriculture community, then a plan should be put in place to spur this development to go further-faster because time is of the essence. Previously noted, there are suppliers and buyers who are already engaged in EFA-like practices who likely understand both the ethical and economic sides of the equation, yet, to speed things along, there needs to be an

87. *See generally id.*

88. Biello, *supra* note 17.

89. Current research by the Drake University Agricultural Law Center is at actors in the supply chain wanting to document GHG emission reductions on farms. Interviews and research into projects are not revealing any direct interest by these companies in linking practices with GHG reducing qualities with practices that could also improve soil health and improve water quality. Often there are complimentary benefits, but companies are not focusing much if any attention on how to maximize these co-benefits. Forthcoming research publication spring 2017.

intervention that connects the seemingly disparate relationships between these actors. Fortunately, options exist for how to bring about this transformational change in a timely and effective manner.[90] These options range from win-win voluntary approaches to more draconian tactics such as supply-side regulations or a universally accepted international treaty.

The following section explores the spectrum of options, analyzing both barriers and opportunities and argues that a strategically constructed mix of voluntary approaches with phased-in regulations on the demand side (rather than the supply side) is the best option to accelerate EFA.

A. Voluntary approaches through existing cooperative initiatives

There are some examples of voluntary cooperative initiatives to solving climate change issues within the agriculture sector, and most of these approaches also have co-benefits that include public health, poverty reduction, adaptation, economic growth, technology development, and more. Most often these cooperative initiatives are in the form of a public-private-partnership (PPP). Table 4 provides an overview of a set of cooperative initiatives that currently exist in the realm of agriculture and are listed on NAZCA.[91]

Table 4 - *Select cooperative initiatives on agriculture (showcased on NAZCA)*[92]

Name of Initiative	Overview (sourced from NAZCA)
4/1000 (4 per one-thousand)	Engage stakeholders in shifting towards resilient agriculture through sustainable soil management
Promotion of Smart Agriculture towards climate change and agroecology transition in West Africa	Adopt agroecology practices by 25 million households in West Africa by 2025
R4 Rural Resilience Initiative	Through integrating risk management systems, ensure 100,000 farmers increase their resilience by 2017
Zero Deforestation Commitments from Commodity producers and traders	Eliminate deforestation from the production of agricultural commodities by 2020

Of the eight cooperative initiatives listed on NAZCA in the agriculture sector only one, 4/1000, was in place prior to the Paris Agreement; the others were listed on NAZCA 2016 in 2016 along with one additional initiative that was announced in May but had not yet

90. *See* Majory-Anne Bromhead & Reuben Sessa, *Module 13: Mainstreaming CSA into National Policies and Programmes*, *in* CLIMATE-SMART AGRICULTURE SOURCEBOOK 353, 357 (FAO ed. 2013), http://www.fao.org/3/a-i3325e/i3325e13.pdf.

91. *See Abount NAZCA*, *supra* note 54.

92. *Cooperative Initiatives*, GLOBAL CLIMATE ACTION, http://climateaction.unfccc.int/cooperative-initiatives/themes/agriculutre (last visited Jan. 19, 2017).

been recorded on NAZCA, "Adaptation, Agriculture and Africa."[93] The initiatives promote various aspects of sustainable agriculture with mitigation and adaptation benefits. However, a gap that exists amongst all of the agriculture based initiatives is an incentive-based component for farmers to participate. Empirically, agriculture has been an afterthought and even though the cooperative initiatives are progress, there is much that remains to entice this sector to bring farmers to the table of transformative climate actions. Therefore, attempting to broaden the current cooperative initiatives could be beneficial; however, without incentivizing the connection between suppliers and buyers this process will not accelerate transformational actions needed for limiting global warming to 1.5°C.

B. Regulatory approaches through national/state/local schemes

There seems to be discontent within the agriculture community about the need for more regulation. Many farmers feel agriculture is one of the most regulated industries in the U.S., but others outside agriculture argue the industry gets a pass on things like water quality.[94] Much of the regulation on the federal level is tied to incentivized subsidies like United States Department of Agriculture's (USDA) commodity, loan, and crop insurance programs. On the state level, there are regulations such as the requirement to file a manure management plan.[95] At the county level, there might be zoning requirements, which may limit agriculture or in other cases may protect agriculture. Currently, very little of the incentive or regulatory regimes are focused at all on climate change. Farmers have the power to change this dynamic. If the world is demanding solutions to greenhouse gas pollution, farmers can tackle this challenge. American farmers will have to change their collective worldview to first identify there is a problem and then innovate to solve that problem. This paper acknowledges that difficult political reality, but it does not attempt to solve it. However, the thought exercise in Section 6, Figure 2, does provide some ways that farmers have organized in the past to create something similar to a MCA and can use existing assets to create an actual MCA in response to the emerging markets and regulations associated with climate change. This of course will require the farming community to embrace the challenges and opportunities created by climate change.

On the incentive side, American agriculture has an enormous armory of tools to shape its industry. The lion's share of these incentives comes through federal farm policy. Only

93. *See* Elwyn Grainger-Jones, *African Nations have the Will to Adapt Agriculture to Climate Change*, THOMSON REUTERS FOUND. NEWS (Nov. 15, 2016, 8:12 AM), http://news.trust.org/item/20161115141212-7j4tb/ (stating that disappointingly, "here at COP22 in Marrakech, dubbed both 'The African COP' and 'The COP of Action,' talks to include agriculture in the climate change negotiations have once again collapsed.").

94. Daniel C. Vock, *Farmers and Cities Play the Water Pollution Blame Game*, GOVERNING: INFRASTRUCTURE & ENV'T (June 2015), http://www.governing.com/topics/transportation-infrastructure/gov-pollution-des-moines.html.

95. *See Too Much Information?*, PORK PROD. (Iowa Pork Producers Ass'n, Clive, IA), June 2015, at 2, http://www.iowapork.org/wp-content/uploads/2015/06/productionbulletin05.pdf.

recently has USDA intentionally targeted resources to help farmers think about overcoming the problems posed by climate change.[96] Furthermore, these efforts have mostly been about adaptation. In some cases, energy programs have pointed to reducing carbon footprints such as methane digesters on dairy farms.[97] However, in the past, it seems like the USDA has been cautious about talking about fixes to climate change. The farming community has been skeptical about anthropogenic climate change while at the same time acknowledging a serious increase in extreme weather.[98] USDA's approach to providing services and programs around climate change has followed a similar dynamic focusing on helping farmers adapt to extreme weather first and only now starting to make commitments to strategies for removing greenhouse gas pollution.[99] If humans caused climate change, then they should fix it. If it's a problem they can solve, then this paper argues agriculture has arguably some of the best tools to fix big problems like this.

The historical arc of agriculture has been to develop the production and practices needed to solve humanity's biggest problems. For over 150 years, the federal government has supported American farmers using public policy. While the programs require participants to do or not do certain things, participation is generally voluntary and based on incentives. From a policy standpoint, the opportunity may indeed be ripening to use these programs to incentivize farmer action and innovation on not just reducing emissions and becoming more resilient to extreme weather, but to actually remove emissions as well. The Paris Agreement demonstrates a new global resolve to tackling climate change. Economic models are being developed, and a moral call to action appears to be having some affect.[100] American agriculture has an opportunity with its current set of tools and relationships to engage climate change in ways that could benefit farmers, rural communities, soil health, and water quality.

American agriculture already has the policy structure and the delivery system in place to radically accelerate agricultural innovation for stabilizing the climate. Identifying and developing economic opportunities will be key. On the political side, there is much work to do to get farmers behind this idea of having the productivity of their farms associated not only with yields but with global services focused on reducing emissions and removing

96. *Agriculture and Forestry: Part of the Climate Solution*, USDA, http://www.usda.gov/wps/portal/usda/usdahome?contentid=climate-smart.html (last modified June 3, 2016).

97. THEMATIC GRP. ON SUSTAINABLE AGRIC. & FOOD SYS., *supra* note 80, at 54.

98. Chris Clayton, *The Dirt on Ag & Adaptation*, SOC'Y ENVTL. JOURNALISTS (Oct. 15, 2013), http://www.sej.org/publications/sejournal-fa13/dirt-ag-adaptation. Chris Clayton has also self-published a book documenting the policy and ideological battles around American agriculture and climate change, leading up to and including much of the time of the Obama administration. *See* THE ELEPHANT IN THE CORN FIELD: THE POLITICS OF AGRICULTURE AND CLIMATE CHANGE, http://www.theelephantinthecornfield.com/home.html (last visited Jan. 20, 2017).

99. Biello, *supra* note 17.

100. Heald, *supra* note 9.

pollution.[101] This is where the ethical argument is starting to enter the debate. The feedback loop between the ethical "should" and the economic "benefits" is beginning to accelerate, and ideas, that just a few years ago would not have been spoken in public, are now starting to be explored in gatherings of farm organizations and among USDA staff.[102] This paper culminates in the argument for farmers, farm organizations, and governmental bodies to start a multijurisdictional cooperative approach (MCA) that promotes a whole-farm strategy to implement sustainable practices and develop products to solve global climate change.

The argument can be made that federal farm policy does not need to be completely overhauled in order to incentivize farmers to implement practices to sequester more carbon. Rules would need to be changed and some legislation likely would need to be passed, but existing programs could be modified within their agencies or jurisdictions to accelerate change and encourage farmers to help the U.S. meet its INDCs. USDA is developing strategies for Climate Smart Agriculture.[103] There are well over two-dozen existing programs providing direct assistance to farmers that could be modified to incentivize farmers for them to innovate and implement climate-protecting practices.[104] Moreover, there are state examples, such as the Iowa Nutrient Reduction Strategy that could work with or compliment federal programs. Currently, these types of programs are focused on increasing production, lowering risk, and improving conservation. Hence, the programs could be modified to add an emphasis on climate smart (or earth friendly) agriculture.[105]

A cooperative approach is recognized in the Paris Agreement. This is the bottom-up counter punch to a failed, or at least underperforming, top-down approach to reducing GHG pollution. How subnational actors will contribute is being worked out around the globe. What could this mean for American agriculture? Figure 4 in the next Section explores how existing components could be leveraged and organized to establish an MCA focused on delivering EFA as a solution to reducing GHG pollution in the atmosphere.

101. Gullickson, *supra* note 1.

102. As referenced earlier, the April 2016 workshop hosted by the Drake University Agricultural Law Center indicates an increasing interest throughout the Iowa agriculture community to discuss climate change and public policy approaches to helping Iowa farmers engage to both reduce GHG emissions and to remove these emissions with how Iowa farmers manage their land. *See* Drake Univ. Agric. Law Ctr. & ISU Leopold Ctr. for Sustainable Agric., *Climate Change Workshop* (Apr. 14, 2016), www.drakeaglaw.org/climate-change-workshop.

103. *See Agriculture and Forestry: Part of the Climate Solution*, *supra* note 96.

104. *See, e.g.*, FARMER VETERAN COALITION, GOVERNMENT RESOURCES GUIDE FOR FARMER VETERANS (2015), http://23s3fo39hfh74assfc2eeu2y.wpengine.netdna-cdn.com/wp-content/uploads/2012/12/Government_Resources_Guide_for_Farmer_Veterans_102015.pdf.

105. The public policy rationale for agriculture has long been a plentiful, stable, and inexpensive supply of food. There has also been a strong emphasis on conservation. Going forward, the agriculture community needs to develop an ethic for public policy to support global climate services.

C. Treaty approach through an accord or protocol on eliminating sequestration potentials

In the most extreme case of instilling EFA practices, if voluntary or regulatory approaches do not work to improve soil management and optimize its carbon sequestration potential for a safe climate world, then, in the wake of looming global catastrophic climatic events, the international policy community could elect to create a treaty on eliminating sequestration-depleting substances. The current soil nutrient programs have proven to deplete soil sequestration. Generally, there are few major producers of these nutrient substances compared to the number of farmers who might otherwise face strict regulation. Therefore, similar to the Montreal Protocol that only affected a handful of chemical companies producing chlorofluorocarbons (CFCs) – ozone depleting substances – a new international accord could require the phase-out of sequestration depleting substances similar to the phase-out of CFCs. This would move the financial pressure away from the suppliers, require chemical companies to invest in new research and development, and overtime, EFA will be accomplished de facto a treaty that governs the chemical manufacturers. The benefits are that it would have direct and measurable impact on the climate; however, the political feasibility at this point in time is nearly absent. There is also a salient, although unproven, argument that replacement products or practices could not be developed quickly enough to maintain productivity and thus, global food security. This translates into the very real possibility that the implementation of a treaty would come too late in the game.

D. No action through taking a business as usual approach

In the event that voluntary, regulatory, or international treaty approaches do not come into fruition, then it is likely that without the sequestration (removal or negative emissions) of carbon dioxide from the atmosphere the international community (or a single state actor) will deploy a form of solar radiation management (SRM). Currently conceived ideas on SRM are the deployment of particulate matter into the stratosphere to reflect sunlight or to increase the albedo of the Earth through the use of mirrors. Dispersing particulate matter, however, is the most likely type of SRM to be deployed if it is required because it reflects sunlight prior to it hitting the Earth's surfaces – including oceans that absorb heat. SRM technologies are still in development and not ready for deployment, and most individuals within the scientific community believe it should only be deployed as a backstop. SRM should be a tool of last resort.

The consequences of SRM on biodiversity are unknown.[106] Particulate matter either "falls-out" or is transformed through chemical reactions in the atmosphere. The result of either "fall-out" or chemical reactions could have long-term devastating effects on biodiversity and agriculture including effects from the unbalanced PH levels in rainfall and/or further depletion of soil sequestration potentials. These consequences require additional study; however, at this time there is not an internationally recognized mechanism to govern

106. *See* SOLAR RADIATION MGMT. GOVERNANCE INITIATIVE, SOLAR RADIATION MANAGEMENT: THE GOVERNANCE OF RESEARCH 24 (2011), https://royalsociety.org/~/media/Royal_Society_Content/policy/projects/solar-radiation-governance/DES2391_SRMGI%20report_web.pdf.

SRM. Therefore, a single state-actor could unilaterally deploy these technologies at any time. As the world warms to 1.5°C or more, there is greater likelihood that SRM will be deployed, which is yet another reason why time is of the essence.

Knowing that agricultural solutions to climate change are financially viable, have multiple benefits, and are more likely to be successful, the world should not wait until the point in time when SRM is viewed as the only option for a safe climate world. The problem is that agricultural solutions require complex technical, economic, and moral components. They take time to develop and even more time to implement. Even so, accelerating agricultural innovation would be a far more benign and efficient strategy than such drastic measures as SRM deployment. Agriculture is a better and safer investment with multiple side benefits as well. How rapidly we can put together the policies and economic systems to make this work are heavily dependent on how rapidly the merry-go-round can go round and change the perspectives of the actors involved - farmers, businesses, and governments. This is also why we need to accelerate the engagement of American agriculture around these problems.

E. Multijurisdictional Cooperative Approach through Voluntary and Regulatory Concepts

There is an industry "pull" for CSA that is risk, economic, and to some extent, ethically based, and there is a farmer led "push" that also has the same basis, yet perhaps more weight on the ethics and more focus on community-based development. There are also international and sub-national initiatives that are currently trying to "pull," but they are new, not moving fast enough, and do not meet the "push" in the middle. To meet corporate social responsibility goals that are aligned with long-term risk reduction and economic gain – or competitive advantage – industry leaders (the buyers) demand agriculture commodities to meet specified production practices. A separate commodity market for these differentiated goods has not yet been developed; however, there are programs that help industry source their demand from designated suppliers or through tracking the quantity of outputs prior to their co-mingling with conventional commodities.[107] The suppliers of the differentiated and EFA-like commodities are largely not incentivized except through some partnerships with industry, but in many cases, the supply-side is only meeting the demand or is practicing sustainable agriculture as an ethical aspect of land stewardship, thus, progress is slow. Therefore, if there can be a mechanism in which the markets are better differentiated, incentives are provided, data/tracking systems are incorporated and improved, and industries are prompted to disclose their procurement – such as within CDP (formerly Carbon Disclosure Project) questionnaires or on Security and Exchange material disclosure forms – then catalysts for the merry-go-round can be created in a win-win approach.[108]

This win-win catalyst is described in more detail in the next section as a multijurisdictional cooperative approach (MCA). MCA can optimize the potentials and overcome the boundaries through linking current cooperative initiatives – such as those listed on NAZCA

107. *See Cooperative Initiatives*, *supra* note 92.

108. *Why Disclose?*, CDP, https://www.cdp.net/en/companies-discloser (last visited Jan. 20, 2017).

or domestic action such as California's Healthy Soils Initiative[109] – to normative (and eventually positive) supply-side regulation.

MCA for EFA is an optimal blend of push and pull. From the push side, we need farmers to lead this. We need farmers, their organizations, colleges of agriculture at universities, advocates for public policy and all levels of agribusiness working together to create a system where whole-farm approaches leverage the resources to compensate farmers and rural communities to reduce emissions and sequester carbon. On the pull side, industry is already moving, but they seem to be dictating to farmers around specific commodities, and there is little evidence retailers and manufacturers will provide resources unless made to do so.[110] Farmers need to organize to leverage their assets to make sure emerging opportunities benefit their own development. American agriculture is well suited to provide a model that includes profit, credit, risk management, governance, and farmer led research and development. It is important for American agriculture to accelerate the ethical-economic merry-go-round.

VI. DESIGNING A MCA ON EFA LINKED TO THE PARIS AGREEMENT

A differentiated commodity market is needed for industries that "pull" (buy) CSA to transact with farmers that "push" (supply) commodities that are produced with smart soil and water management practices, hence, the combination would be a market for EFA at the nexus of soil, water, and climate. However, creating an entirely new infrastructure for a supply-stream of differentiated commodities is not practical. There is no reason to setup separate physical distribution systems that allow for these transactions to occur; it only needs to be virtual and with transparency/accountability. Farmers and local governments should meet specified criteria, such as the soil management practices and training outlined in the 4/1000 initiative, as shown in Table 5, and agree to certain principles such as no-deforestation.[111]

Table 5 - Guidelines 4 per 1000[112]

The implementation of agricultural practices at the local level and management of the environment favorable to the restoration of soils, to increase their organic carbon stock;
The protection of carbon-rich soils and biodiversity;
The implementation of training and outreach programs to encourage such practices;

109. *See Healthy Soils Initiative*, CAL. DEP'T FOOD & AGRIC., https://www.cdfa.ca.gov/oefi/healthysoils/ (last visited Jan. 20, 2017).

110. *See Sustainable Soy: Continuous Improvement Program*, IOWA ST. EXTENSION, http://www.extension.iastate.edu/marshall/sites/www.extension.iastate.edu/files/marshall/15-2640%20ADM%20Unilever%20Brochure-6%20(00000002).pdf (last visited Jan. 20, 2017).

111. MINISTRY OF AGRIC., AGRIFOOD & FORESTRY, JOIN THE [4-PER-1000] INITIATIVE: SOILS FOR FOOD SECURITY AND CLIMATE 6, http://newsroom.unfccc.int/media/408539/4-per-1000-initiative.pdf (last visited Jan. 20, 2017).

112. *Take Action! Agriculture in Support of Climate Change*, 4 POUR 1000, http://4p1000.org/act (last visited Jan. 20, 2017).

The financing of projects to restore, improve and/or preserve carbon stocks in soils; The development and implementation of public policies and appropriate tools; The development of supply chains of soil-friendly agricultural products, and so on.

Farmers who voluntarily agree to practice these principles, such as those listed in 6, would receive an EFA certificate based on quantity produced. The certificate could then be sold to the industries that demand the EFA commodities. It is simple in form, yet the structure is slightly more complex as there are several additional sets of actors that should be involved in order to ensure accountability and transparency with the aim to improve data collection and management that could eventually lead to a more formal carbon-based market mechanism that will be defined as part of Article 6 of the Paris Agreement. Yet, before that Article is defined, EFA can contribute to the Action Agenda as part of the pre-2020 ambition on limiting global warming to 1.5°C. The remainder of this section details the design of what an MCA on EFA could resemble and how it will link to the Paris Agreement.

Table 6 *– Initial Guidelines for farmers to practice EFA – with acceleration over time*[113]

Never leave soil bare and work it less, for example by using no-till methods; Introduce more intermediate crops, more row intercropping, and more grass strips; Add to the hedges at field boundaries and develop agroforestry; Optimize pasture management – with longer grazing periods for example; Restore land in poor condition (e.g. the world's arid and semi-arid regions).

A. Jurisdictions (National, Sub-national states/provinces/cities/ communities)

Jurisdictions are responsible for the monitoring of the agriculture output – the data collection that the output follows certain guidelines for soil management – that starts with a check-list based on the requirements determined from the MCA participants (and/or local needs). The jurisdictions certify the EFA and administer the "transaction" of the EFA certificates to a secretariat. The jurisdiction receives a proportion of the transaction costs to cover administration and interjurisdictional programs for EFA capacity building and implementation. Thus, the jurisdiction also benefits.

Since the governance is at the jurisdiction level, it means that it could be linked to Article 6 of the Paris Agreement (eventually) but could start as an initiative within the Action Agenda of the Paris Agreement and be showcased on the Non-state Action Zone of Climate Actions (NAZCA) as a cooperative initiative. This could begin through existing coalitions or jurisdictions working to promote healthy soils such as the European Union (EU), California, Iowa, and jurisdictions in Africa that are taking part in the cooperative initiatives listed on NAZCA. Jurisdictions could also set their own standards outside of

113. *Understand the "4-per-1000" Initiative, supra* note 38.

the MCA, for example all ethanol/biomass procurements within their jurisdiction could be required to transact EFA certificates.

B. Secretariat (at the international level)

The secretariat should be an international body that works on finance and sustainable development, such as the Global Environment Facility (GEF) that is already working on agriculture. The secretariat creates a market for the multiple jurisdictions to transact in EFA certificates with the buyers who demand CSA, thus meeting the demand without the need for a physically differentiated commodity market. The secretariat also receives a small portion of the transaction costs for administrative needs, capacity building, and sustainable development on agriculture.

The creation of an international secretariat will, however, require political need and therefore political demand. Before such an institutional arrangement can be made, a leader on EFA will need to present the case for its benefits in terms of how an MCA on EFA can help meet INDCs for all countries that are Parties to the UNFCCC. The U.S. and/or its sub-national actors such as the states of California and Iowa can assume this role.

C. Industry (Multinational Corporations and Small-to-Medium Enterprises)

The procurers of the commodities (buyers) transact for their certificates with the Secretariat and disclose on their CDP questionnaire, corporate social responsibility (CSR) reports, and eventually on SEC material risk disclosure forms – such as the 10K in the U.S. Therefore, with disclosure, industry can differentiate the leaders in business and showcase their awareness of the risks related to climate change and agriculture to the investor and insurance companies. (This could later be linked into a new SEC rating/bond rating systems that are being worked on by organizations such as Climate Transparency and the World Bank.) Overall, with the transaction of EFA certificates, industry leaders are given a competitive advantage prior to new disclosure requirements.

Moreover, there are already business coalitions, such as, We Mean Business, that focus on sustainable land-use and are calling for a price to be put on carbon around the world. Once a price is put on carbon from within a particular jurisdiction, then the progressive businesses are already ahead of the game in terms of their GHG reduction and removal. For businesses that support EFA, a price on carbon only means that they will have a strong competitive advantage compared to businesses that do not transact in EFA certificates if (1) Article 6 includes agriculture; and (2) if the data collection and management from agriculture can be improved. Hence, the role of jurisdictions is a necessary component to the process of finding the middle ground between the push and the pull.

D. Farmers

The majority of the transaction costs go back to the farmers, which would be facilitated through the governing jurisdiction. Farmers participating in the EFA certificate program receive benefits from the jurisdiction through the local programs created that are differentiated for the needs of that jurisdiction, which could be cover crop seed programs, soil testing, etc. The EFA creates an incentive that can catalyze the merry-go-round as more

and more farmers are brought into the MCA. Farmers are only required, on a voluntary basis to take part in the MCA, to supply data to the jurisdiction that conforms to the practices and principles needed to participate. Getting American farmers to organize around climate change will be difficult but the moral arguments and the economic benefits are starting to line up to help make this possible.

Figure 2 - Theoretical simulation of US leadership

Case Study of American Leadership in support of MCA

The idea is to assemble these components—farmers, organizations, policies, agribusinesses, end users, and governmental jurisdictions—in a way that could potentially provide INDCs for the United States' participation in the Paris Agreement. This idea also suggests ways American farms could capture value–dollars–while improving soil health and water quality.

While it may not be universally popular or particularly easy, it clearly is possible to bring together the components of American agriculture to create a market for a product that provides perceived benefits that an unregulated and unsubsidized market would likely not generate. Farmers built the corn ethanol industry through a combination of policies that used both subsidies and regulations, created transferable credits, organized politically to promote the benefits and battle the detractors, and used market forces to effectively grow the industry.

In a sense, the ethanol industry provides a framework for what an agricultural MCA could look like. Whether or not someone is a supporter or detractor of the ethanol industry, it would be a difficult argument to make that the multiple and diverse actors involved and their use of public policy has failed to produce a significant source of targeted revenue for the stakeholders. Here's a summary of some of the components of the ethanol industry that could be leveraged similarly around EFA.

Farmers played a significant role in developing this industry and advocating for effective public policy.

The industry was built on an existing infrastructure of commodity production. There was significant construction but it did not radically displace commodity production. Instead it used that production as a platform for the industry.

The industry identified multiple benefits as a reason for existing: utilization of an excess resource (corn), displacement of an unpopular resource (imported oil), solution for an environmental problem (MTBE), diversification of farm household income, and community economic development.

Farmers and their organizations played the major role in developing the industry and continue to play important roles in protecting the industry.

The farming community joined policy makers to embrace the assumption that the industry could not develop without significant public policy support. This included subsidies by way of tax credits and regulation by way of the renewable fuel standard (RFS). An important, although complicated piece of the puzzle, is the renewable identification number (RIN). These RINs serve as a tradable certificate that helps put a value on the actions of other actors within the larger fuel economy.

The industry was mature enough to capitalize when the price of oil skyrocketed. The regulations and subsidies continued to help the industry as the price of oil plummeted. Members of the industry worked together to build a system before there was a strong demand for what they produced, were well positioned to capture the value when global demand needed their product, and retained a level of public resources to help navigate the downturn in demand. In other words, promoters built public-private partnerships that could sustain the industry in spite of volatile markets.

In the interest of community development, cities, counties, and states joined the "club" by offering additional support for recruiting the industry to their communities.

An effective political coalition was built and is maintained to protect and support multiple stakeholders.

Using these same components, these authors suggest a model of how American agriculture could imagine pulling together an MCA to produce what the world needs, monetize the value of that service, and capture the value of co-products and side businesses. For the sake of making this thought exercise as concrete as possible, the Iowa agriculture community is used as a model. Also the important contribution of this exercise is not to identify the silver bullet product or service but to illustrate the potential for American agriculture to leverage its untapped assets to create and maintain a successful strategy to combine public policy and market forces to remove GHG pollutants and store them long-term on farms.

There are unspoken assumptions in any system. Below are some assumptions that would need to be identified if a pilot project were to be created.

The most important assumption is that while high functioning carbon markets do not yet exist, the likelihood larger regional markets and eventually a global market for carbon will be developed. The Paris Agreement significantly moved the world in that direction.

Those markets will most likely be created by governmental action partnering with private industry.

The call for these markets and the innovation around these markets are increasing at exponential rates.

Farmers will be best served if they lead the efforts to define how they can produce for these markets and develop the public policies to support their participation in these markets.

A project of this nature begs a multitude of questions. Here are some questions and answers.

First, what might be the product? What is it that Iowa farmers could produce to make a difference in GHG pollution? In this model, carbon in the soil is offered. Working with USDA programs and partnering with Iowa Department of Agriculture and Land Stewardship (IDALS) and Iowa Department of Natural Resources (IDNR), a whole farm baseline of carbon in the soil could be established. The commodity then becomes the increase in the carbon in the soil on a whole farm basis.

Second, how could this work? The idea of USDA working on a whole farm basis already exists with the Agriculture Risk Coverage (ARC) and Price Loss Coverage (PLC) commodity programs and the Conservation Stewardship Program (CSP). USDA

already targets programs to regions and states. So partnering with IDALS and IDNR, USDA could establish a pilot program in Iowa. Long term this establishes a way in which American farmers could capture the value of any emerging markets that put a dollar value on carbon. Short term, Iowa farmers could be incentivized through existing USDA programs.

Third, what other co-products could Iowa farmers put in the mix? Efforts could build on the existing goals of water quality, soil health, and productivity. While the product to be traded might be carbon in the soil, these other benefits could be built into the program. In other words, the monetized value of the carbon sequestration could be used to further advance or pay for efforts to improve water quality and soil health.

Fourth, what are the jurisdictions and who are the actors in this emerging market? As illustrated by the ethanol industry, there is a rich tradition of cooperation and partnerships among these entities. Any level of complexity needed in terms of agreements or partnerships has likely already been negotiated or modeled with past joint actions. An example is the interplay among Iowa State University (Board of Regents), ISU Extension (National Institute of Food and Agriculture with USDA and county board of supervisors), and the Iowa legislature.

Jurisdictions:

International Agencies are being developed in response to the Paris Agreement.

Federal government, most notably United States Department of Agriculture.

State of Iowa—IDNR, IDALS, Iowa State University (ISU).

Counties –Soil and Water Conservation Districts (SWCD).

Cities—economic development.

Actors:

Farmers

Farmer organizations

Agri-businesses

Environmental groups

Other NGOs including chambers of commerce and economic development groups

Retailers

Manufacturers

Consumers

Fifth, how quickly could this start to happen? The 2014 farm bill expires on September 30, 2018. The agriculture community has begun hearings and organizing on the next farm bill. There is also some discussion about opening up and amending the 2014 farm bill earlier than 2018. To be fair, the challenge of organizing a new approach to US farm programs is daunting, but in terms of the time table, the opportunity is very real.

Like the ethanol industry, these levels of government and actors in the system could come together to build an infrastructure combining public policy and private investment.

Another example from rural Iowa is the investment in the wind energy industry. Arguably, Iowa's farmers, governments, NGOs, and businesses know how to do this kind of public policy and private investment leveraging.

Identifying a unit that can be traded in an emerging market and using public dollars to research, build structures, and develop practices would not dismantle Iowa's current agricultural platform. It might change it in some ways, yet the changes proposed build on the current platform of row crops and livestock rather than displacing them with a new platform.

Hence, the market and farmer innovation would shape the way these changes take place. The goal of the program would be a particular outcome and not a set of practices. Farmers, researchers, farm organizations, and agri-businesses would innovate around how to achieve the outcome. Farmers would be rewarded for capturing more carbon rather than simply installing a particular practice or structure. EFA depends on diversifying the landscape and focusing on soil health. In Iowa this means such things as longer rotations, cover crops, integrated livestock, reduced tillage, perineal buffers, precision agriculture, on farm energy production, and continuous innovation. EFA would be especially difficult on a farm specializing in only soybean production. Whole farm and not one product at a time is how farms will better function for greater environmental outcomes. Thus farmers need to come together to drive the system to reward whole farm management.

Economic actors in the supply chain are interested in branding their products as sustainable. One approach is to dictate to their commodity suppliers they want a lower carbon footprint. These are important developments, but unless farmers take a stronger stake in the process, change will likely come too slowly and innovation be too narrow. Farmers have the history, organization, political power, and public programs to create an effective MCA.

In this model, USDA could provide the major incentives supplemented by state programs. Diverse programs already exist that could be focused on climate change and the role of government in Iowa agriculture is already significant. Farmers will need to leverage the role of government to deliver benefits from end users. If farmers don't work together to do this, then the benefits of EFA will flow to the most powerful entities in the supply chains. Agricultural suppliers, manufacturers, and even retailers also need to benefit from the MCA. They can do so by accessing products from sustainable farms consumers are increasingly demanding and that global international agreements like the Paris Agreement are requiring.

In the case of Iowa, the state could match resources and prioritize general state level outcomes. The state, could integrate climate solutions with local soil health and water quality. The state could also focus on maximizing opportunities for local economic development. The wind energy industry in Iowa is a good example of how state government has complimented federal action to benefit local landowners and communities. Again, the assets exist to help Iowa farmers innovate on the land to leverage the benefits from the global community for solving the problem of climate change.

E. Next steps over time

With the jurisdictions as the local governing body, it is their responsibility to build in a plan for regular soil testing with soil scientists to determine that sequestration potentials and actual sequestration are happening within their jurisdiction based on the MCA for EFA. Further analysis is required; however, with improved data this could help national governments achieve and accelerate their INDCs. Additionally, with further analysis the data could be used to begin to quantify the carbon content related to jurisdiction specific EFA certificates. These certificates could – also over time – migrate to a linked carbon market approach if the jurisdiction is also participating in a carbon-pricing scheme. This would be overtime, because Article 6 of the Paris Agreement will not go into effect until 2020 (possibly before) and the scientific evidence is still needed on the rate of sequestration per jurisdiction/per unit of measurement.

One question that might arise when thinking of the EFA certificate approach is the concept of "additionality" that is often applied to Clean Development Mechanism (CDM); does agriculture need to meet the same additionality criteria? The additionality concept is that when projects want to sell emission reduction credits to an Emissions Trading Scheme (such as the EU Emissions Trading scheme), the project owners have to prove that there their low-carbon project will create fewer emissions than a Business As Usual (BAU) approach.[114] An example would be a solar installation in a Non-Annex (developing) country.

If the solar installation would have been done anyway instead of a coal installation, then it does not meet the criteria for additional incentives, or revenue from the emission reduction credit. Each project is reviewed at the outset, and the credits are granted on the additionality criteria. However, since agricultural output is on a yearly basis (or several cycles per year), the concept of additionality does not apply because it is not a project-by-project basis – it is cyclical. With each cycle the farmer could opt out of the EFA certificate program. There needs to be an ongoing incentive for EFA because once the soil goes back to conventional practices, then excess carbon is released. If the concept of additionality does not apply, then even though in some jurisdictions it is known that EFA is already a better economic choice, it does not matter because practices can revert —- the incentive is to accelerate the EFA practices.

VII. CONCLUSION

Ideally, there will be a way to accelerate the merry-go-round through an MCA on EFA before introducing any type of treaty or SRM technology. However, if an MCA approach does not suffice, then there is room for looking at other transformational pathways – these could look like the Montreal Protocol but with a universal phase out of certain soil sequestration depleting substances. The argument here is that a voluntary multijurisdictional approach is the best way forward. There is still more research to do, but discussions on the framework can begin now with the governing bodies identified within this research and the other actors within the MCA.

114. *What is Additionality*, CDM RULE BOOK, http://www.cdmrulebook.org/464.html (last visited Jan. 20, 2017).

The design of the MCA, which includes a voluntary EFA market that can segue into a carbon market – over time – could lead to more of a regulated regime. Presently, however, an EFA certificate scheme would create a differentiated commodity market and incentivize accelerated change, which is why an MCA to EFA is a win-win approach. The Global Environment Facility (GEF) could be the ideal secretariat for this as they are already working on climate friendly agriculture. In essence, this would be an evolutionary approach that combines (1) voluntary participation; (2) markets; and (3) regulations to avoid an international "top-down" accord. Creating a new virtual commodity market with both, pull and push dynamics, has economic benefits that remain in rural communities rather than entirely accumulating at the top of the supply chain. This is an opportunity for American agriculture to be on the leading edge of innovation rather than playing catch up or participating in markets developed by other farmers/agribusinesses around the globe or those outside of agriculture all together. With U.S. leadership, markets can be created to incentivize others around the world to change practices. Then it will become the new norm to have earth friendly agriculture.