

ENCOURAGING CLIMATE ADAPTATION THROUGH REFORM OF FEDERAL CROP INSURANCE SUBSIDIES

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Climate change is expected to have immensely detrimental effects on agriculture. Changing climate patterns will also make many locations inhospitable to the crops currently grown there. In order to mitigate the effects of climate change on agriculture, farmers should adapt by changing the mix of crops grown in a given location. Federal crop insurance masks incentives American farmers would otherwise have to adapt to climate change through crop choice. Large premium subsidies—with most insured farmers paying less than half of the actuarially sound premium—are a huge part of this problem. This Note explains the connection between crop choice and climate change. It then analyzes existing proposals for reforming the crop insurance system to better incentivize adaptation to climate change, and highlights some political and practical obstacles to doing so. Finally, it argues that a tiered subsidy system—in which crops at high risk of failure due to location-specific climate risks would receive lower subsidies—could be a feasible, incremental solution to the problem.

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INTRODUCTION

Any American who has attempted outdoor gardening is probably familiar with the plant hardiness zone map produced by the United States Department of Agriculture (USDA).¹ This color-coded map, which divides the U.S. into zones based on the average minimum yearly temperature from the period 1976 to 2005, is intended to serve as a guide in selecting plants that will do well in a particular location’s climate. When the map was updated in 2012, nearly the entire U.S. was one half-zone (five degrees Fahrenheit) warmer than on the previous version of the map (which had been based on data from 1974 to 1986) and the USDA had added two new zones for even warmer minimum temperatures.² One study concludes that, taking into account minimum temperatures in recent years (instead of the average minimum over thirty years, as the USDA did), one-third of the country is actually a half-zone warmer than the 2012 USDA map indicates and one-fifth of the country is a full zone warmer.³ Although the map represents only a small set of climactic data, it serves as an example of two important points: (1) some crops are better suited than others to be grown in a given location; and (2) climate change will alter which crops those are for a given location.

One simple solution for dealing with the effects of climate change on agriculture is to change which crops are grown in a specific area, and many people have already made this suggestion. A 2009 report suggested that in order to mitigate the risks posed to California agriculture by climate change, farmers would need to change the mixture of crops they grow.⁴ A recent economic research paper predicts that

¹ *Plant Hardiness Zone Map*, AGRIC. RESEARCH SERV., USDA, <http://planthardiness.ars.usda.gov/PHZMWeb/> (last visited Oct. 9, 2016).

² See Kim Kaplan, *USDA Unveils New Plant Hardiness Zone Map*, AGRIC. RESEARCH SERV., USDA (Jan. 25, 2012), <http://www.ars.usda.gov/is/br/zonemap/zonemap.htm> (describing changes in the new USDA map).

³ Nir Y. Krakauer, *Estimating Climate Trends: Application to United States Plant Hardiness Zones*, ADVANCES IN METEOROLOGY, May 30, 2012, at 1, 7.

⁴ L.E. JACKSON ET AL., CAL. CLIMATE CHANGE CTR., CEC-500-2009-044-F, POTENTIAL FOR ADAPTATION TO CLIMATE CHANGE IN AN AGRICULTURAL LANDSCAPE IN

changing which crops are grown in various areas across the globe would result in only one-third of the global GDP loss that would occur if no farmers changed which crops they grew.⁵

Although some shift in which crops are grown in given locations is already taking place as farmers respond to weather patterns and climate change,⁶ several features of the federal crop insurance program mask incentives that farmers would otherwise have to adapt to climate change. Most importantly, highly subsidized premiums for crop insurance keep farmers from internalizing the full risk of their planting decisions. There are a number of existing proposals to address this problem, having varying levels of likely success and political feasibility. This Note suggests an additional proposal, arguing that a tiered system of subsidies may be effective in encouraging farmers to better adapt to climate change by changing which crops they grow.

This Note proceeds as follows: Part I analyzes how federally subsidized crop insurance works and the ways in which it blunts farmers' incentives to adapt to long-term climate change. Part II describes obstacles to crop insurance reform and evaluates existing reform proposals for better incentivizing climate adaptation through crop choice. Part III proposes a system of tiered subsidies and analyzes the feasibility and effectiveness of such a system as a solution.

I

THE CLIMATE CHANGE–CROP INSURANCE NEXUS

Both climate change and agriculture influence everyone's lives, but are not always well-understood. Part I will therefore provide the framework necessary to understand the policy discussion that follows. It will begin by explaining the anticipated effects of climate change on agriculture. Then, it will provide a brief overview of federal crop insurance's history and current structure. Finally, it will explain the

THE CENTRAL VALLEY OF CALIFORNIA 1–2 (2009), <http://www.energy.ca.gov/2009publications/CEC-500-2009-044/CEC-500-2009-044-F.pdf>.

⁵ Arnaud Costinot et al., *Evolving Comparative Advantage and the Impact of Climate Change in Agricultural Markets: Evidence from 1.7 Million Fields Around the World*, 124 J. POL. ECON. 205, 208 (2016) (finding that climate change would cause a decrease of 0.26% in global GDP if farmers change the mixture of crops grown, compared to 0.78% if farmers don't change crops).

⁶ See, e.g., Hiroko Tabuchi, *A Once-Flourishing Pima Cotton Industry Withers in an Arid California*, N.Y. TIMES (Aug. 7, 2015), <http://www.nytimes.com/2015/08/08/business/a-once-flourishing-pima-cotton-industry-withers-in-an-arid-california.html> (describing how drought has led the growth of cotton in California to decline); Whitney Blair Wyckoff, *Alaska Farmer Turns Icy Patch of Tundra into a Breadbasket*, NPR (Feb. 26, 2015, 1:47 PM), <http://www.npr.org/sections/thesalt/2015/02/26/389011370/alaska-farmer-turns-icy-patch-of-tundra-into-a-breadbasket> (describing one Alaskan farmer who is able to plant a greater variety of crops due to warmer weather caused by climate change).

four main ways in which the current system of subsidized crop insurance blunts incentives for farmers to adapt to climate change.

A. *Expected Impacts of Climate Change on Agriculture*

Negative impacts of climate change on crop yield in the United States have already occurred and are expected to continue.⁷ Extreme heat and drought are expected to increase,⁸ as are heavy precipitation events that can lead to increased soil erosion.⁹ While rising temperatures and carbon dioxide levels may increase yields of some crops, the overall effect is likely to be a net decrease in yield.¹⁰ Similarly, while some regions of the U.S. might experience more favorable growing conditions, the aggregate effect on U.S. agriculture will likely be negative.¹¹ Many perennial crops that require cold periods of specific durations during the winter might not fare well in their current growing locations if winters warm;¹² fruit and nut trees in California and cherries in the Northeast are some examples.¹³ Increased temperatures at key stages of development can make plants more prone to failure.¹⁴ Plants already stressed by high temperatures and drought will be even more vulnerable to diseases and pests that are expected to have increased negative impact on crops.¹⁵ Increases in temperature and carbon dioxide will benefit many weed species more than they will crops, meaning that weeds will increasingly compete with crops.¹⁶

As regional climates change, some crops which once thrived in a given location will become prone to failure, and continuing to grow these crops will result in wastefulness. Growing food results in consumption of natural resources, emission of greenhouse gases, and the release of pollutants.¹⁷ It is illogical to expend resources and emit pol-

⁷ See U.S. GLOB. CHANGE RESEARCH PROGRAM, CLIMATE CHANGE IMPACTS IN THE UNITED STATES: THE THIRD NATIONAL CLIMATE ASSESSMENT 152 (Jerry M. Melillo et al. eds., 2014) (stating that climate change has already had “detectable impacts on [agricultural] production due to increasing temperatures”).

⁸ *Id.* at 161.

⁹ *Id.* at 159.

¹⁰ See ELIZABETH MARSHALL ET AL., USDA, ERR-201, CLIMATE CHANGE, WATER SCARCITY, AND ADAPTATION IN THE U.S. FIELD CROP SECTOR 21 (2015), www.ers.usda.gov/publications/err-economic-research-report/err201 (finding that climate change causes a general decline of crop yields).

¹¹ *Id.* at 62.

¹² U.S. GLOB. CHANGE RESEARCH PROGRAM, *supra* note 7, at 156–57.

¹³ *Id.*

¹⁴ See *id.* at 155 (stating that exposure to high temperatures during the pollination stage increases risk of failure for some crops).

¹⁵ *Id.* at 158.

¹⁶ *Id.*

¹⁷ See, e.g., Tara Garnett, *Where Are the Best Opportunities for Reducing Greenhouse Gas Emissions in the Food System (Including the Food Chain)?*, 36 FOOD POL’Y S23, S23

lution to grow crops that are likely to fail.¹⁸ Even if the crops do not completely fail, a crop grown on a farm with a low per-acre yield will typically have a larger carbon footprint than the same crop grown on a farm with a high per-acre yield.¹⁹

Growing a given crop in one location may use more resources and create more pollution than growing it in another. The greenhouse gas emissions and pesticide use from the growth of a given crop can vary widely by location.²⁰ The difference in greenhouse gas emissions by food grown in different locations is often large enough that food transported hundreds of miles can have a smaller greenhouse gas footprint than local food.²¹ An example of an input that varies by location is irrigation, which requires large amounts of energy to pressurize sprinklers,²² run drip irrigation systems,²³ or pump groundwater to the surface.²⁴ One study that looked at the energy intensity of irrigation in various locations in California's Central Valley found that, no matter which irrigation method was examined, some locations always reported more energy used per cubic meter of irrigation water than other locations.²⁵

(2011) (stating that growing crops results in nitrous oxide, methane, and carbon dioxide emissions from soil or other components of the farming process).

¹⁸ See, e.g., Nicholas St. Fleur, *Drought and Heat Took a Heavy Toll on Crops, Study Finds*, N.Y. TIMES (Jan. 6, 2016), <http://www.nytimes.com/2016/01/07/science/study-measures-damage-from-weather-disasters-on-cereal-crops.html> (“By losing 10 percent of our production, we’re emitting greenhouse gases and using water, oil, energy and land for nothing and not feeding anybody with it.”).

¹⁹ See, e.g., Gareth Edwards-Jones, *Does Eating Local Food Reduce the Environmental Impact of Food Production and Enhance Consumer Health?*, 69 PROC. NUTRITION SOC'Y 582, 584 (2010) (describing how growing location can affect yield and, consequently, carbon footprint).

²⁰ See Gareth Edwards-Jones et al., *Testing the Assertion that ‘Local Food Is Best’: The Challenges of an Evidence-Based Approach*, 19 TRENDS FOOD SCI. & TECH. 265, 269–71 (2008) (discussing the variations in greenhouse gas emissions, pesticide use, and other environmental impacts based on a crop's growing location).

²¹ This undercuts the premise that “food miles” (the distance a food item travels from the farm to the consumer) can serve as a proxy for the ecological footprint of a food item. See Edwards-Jones, *supra* note 19, at 585 (“The existence of this variation in the carbon footprint at the point of production serves to complicate the idea that the GHG emissions from transport alone render the carbon footprint of non-local food greater than that of local food.”).

²² See, e.g., A.K. Plappally & J.H. Lienhard V, *Energy Requirements for Water Production, Treatment, End Use, Reclamation, and Disposal*, 16 RENEWABLE & SUSTAINABLE ENERGY REVS. 4818, 4837 (2012) (finding that energy usage is higher in sprinkler than surface irrigation).

²³ See, e.g., *id.* at 4837–38 (charting the energy consumption of drip irrigation).

²⁴ *Id.* at 4821. In many areas of the U.S., even surface water captured for irrigation must be pumped uphill. See *id.* at 4821.

²⁵ *Id.* at 4839, 4840 figs.35 & 36, 4837 figs.30 & 31.

Growing high-risk crops can also increase the occurrence of environmental harms, including those caused by destructive farming practices intended to offset the negative effects of climate change on crop yields. The effects of climate change have already led farmers to increase use of pesticides,²⁶ and increased herbicide use is also anticipated as climate change renders herbicides less effective against progressively more resilient weeds.²⁷ Farming in areas prone to floods or extreme precipitation events can lead to excessive soil erosion and increased runoff.²⁸ Runoff from farm fields in a number of arid areas in the American West increases the salinity of aquifers and soil, negatively affecting wildlife and the future ability to grow crops there.²⁹ Increased utilization of fertilizer to offset some of the yield loss from plants overstressed by temperature, pests, and drought can also be problematic. While untreated soil naturally emits greenhouse gases, including carbon dioxide and nitrous oxides,³⁰ increased application of fertilizer results in increased emission of nitrous oxides by soils.³¹ Additionally, fertilizer that is carried to the ocean through runoff causes algae blooms.³² These blooms can lead to hypoxia (lack of oxygen in the water), which makes the water an unsuitable habitat for fish and other aquatic species.³³

B. How Crop Insurance Works

The federal government began offering crop insurance during the 1930s to help agriculture recover from the Dust Bowl and the Great Depression, and originally considered it an experimental program.³⁴ In the 1980s, with the passage of the Federal Crop Insurance Act

²⁶ See *id.* at 161 (stating that increased pesticide use is an adaptation strategy currently used by farmers).

²⁷ See U.S. GLOB. CHANGE RESEARCH PROGRAM, *supra* note 7, at 158.

²⁸ See *id.* at 159 (noting increased erosion in Iowa due to increased intensity of precipitation).

²⁹ See, e.g., MARC REISNER, *CADILLAC DESERT: THE AMERICAN WEST AND ITS DISAPPEARING WATER* 459–62 (Penguin Books 1993) (1986) (describing how irrigation leads to soil salinification in the American Southwest).

³⁰ See Edwards-Jones, et al., *supra* note 20, at 269 (stating that soil microbes produce carbon dioxide and nitrous oxide and that respiring plant roots also produce carbon dioxide).

³¹ See *id.* (explaining that soil treated with fertilizers containing nitrogen emits higher levels of nitrous oxide).

³² See, e.g., John H. Davidson, *Factory Fields: Agricultural Practices, Polluted Water and Hypoxic Oceans*, 9 GREAT PLAINS NAT. RESOURCES J. 1, 4 (2004). The Gulf of Mexico is currently suffering from hypoxia because of large quantities of fertilizer that run off of Midwestern farm fields and are carried to the Gulf by the Mississippi River. See *id.*

³³ *Id.* at 4–5.

³⁴ *History of the Crop Insurance Program*, RISK MGMT. AGENCY, USDA, <http://www.rma.usda.gov/aboutrma/what/history.html> (last visited Oct. 9, 2016).

(FCIA), the program was greatly expanded to cover more crops and more counties.³⁵ The FCIA specifically says that the government will subsidize insurance premiums “[f]or the purpose of encouraging the broadest possible participation of producers.”³⁶ The point of encouraging farmers to use the crop insurance program was to ensure that the government would not have to make large disaster assistance program payouts for which farmers pay nothing.³⁷ In addition to being expensive for the government, disaster assistance payments were viewed as encouraging farmers to grow on risky land.³⁸ Today that same criticism is being leveled against crop insurance.³⁹ Changes to the program in the 1990s further incentivized participation by requiring farmers to either purchase crop insurance or waive disaster payment eligibility in order to receive certain other federal benefits.⁴⁰ Laws passed in the 1990s and in 2000 also increased the premium subsidies, which further boosted participation in the program.⁴¹

The specifics of crop insurance, like many other federal agricultural programs, have changed as new “Farm Bills” are passed approximately every five years.⁴² The crop insurance program is currently governed by the Agricultural Act of 2014⁴³ and applies to over one hundred crops.⁴⁴ This marks a huge expansion from 1980 when only

³⁵ *Id.*

³⁶ 7 U.S.C. § 1508(e)(1) (2012).

³⁷ See Keith H. Coble & Barry J. Barnett, *Why Do We Subsidize Crop Insurance?*, 95 AM. J. AGRIC. ECON. 498, 498 (2013) (“[P]olicy-makers expressed an objective of increasing federal crop insurance participation to a level where federal *ex post* disaster assistance would no longer be necessary.” (citation omitted)).

³⁸ See, e.g., Joseph W. Glauber, *The Growth of the Federal Crop Insurance Program, 1990–2011*, 95 AM. J. AGRIC. ECON. 482, 483 (2013) (describing criticisms that emerged in the 1970s that the program created moral hazard in the form of incentives to plant crops in arid areas in order to capture more payments).

³⁹ See *infra* note 116.

⁴⁰ See *History of the Crop Insurance Program*, *supra* note 34 (describing the 1994 Federal Crop Insurance Reform Act’s requirement that farmers participate in the crop insurance program in order to qualify for a number of benefits, and its 1996 replacement with a requirement that farmers who accept certain benefits either purchase crop insurance or waive eligibility for disaster benefits).

⁴¹ See, e.g., Glauber, *supra* note 38, at 483 (describing how the Crop Insurance Reform Act of 1994’s increased premium subsidies, supplemental premium subsidies provided by Congress in 1999 and 2000, and the 2000 Agricultural Risk Protection Act have increased enrollment in the crop insurance program).

⁴² See, e.g., Kate Giessel, Note, *On the Permanence of Permanent Law: An Argument for the Continued Presence of the Permanent Law Provisions in the Farm Bill*, 13 CARDOZO PUB. L. POL’Y & ETHICS J. 765, 791 (2015).

⁴³ Pub. L. No. 113-79, 128 Stat. 649 (2014).

⁴⁴ See *2015 County Crop Programs*, RISK MGMT. AGENCY, USDA, <http://www.rma.usda.gov/data/cropprograms/2015cropprograms.html> (last visited Oct. 9, 2016) (listing crops eligible for insurance in crop year 2015). Although it is called “crop” insurance, the

twenty-six crops were eligible.⁴⁵ The Agricultural Act of 2014 also eliminated some of the more controversial subsidies for commodity crops, including direct payments,⁴⁶ instead substituting commodity programs that are similar in structure to crop insurance⁴⁷ and additional special types of crop insurance that are only available for commodity crops.⁴⁸ This brief history illustrates that over time, crop insurance has become increasingly central to U.S. farm policy and farmers' risk management because of wider availability, higher subsidies, and fewer alternative support programs.

Two subagencies of the USDA have primary responsibility for crop insurance, but farmers actually contract for insurance with private insurance companies.⁴⁹ The Federal Crop Insurance Corporation (FCIC) was created in 1938 to administer the program.⁵⁰ In 1996, the Risk Management Agency (RMA) was created⁵¹ to develop market-based risk management tools and provide education and outreach to farmers and rural communities.⁵² The FCIC serves as a reinsurer for the private insurance companies.⁵³ The FCIC also pays the premium subsidies to the insurance companies, as well as paying for some of the companies' administrative and operating expenses.⁵⁴

There are two primary categories of crop insurance: yield protection and revenue protection.⁵⁵ Yield protection covers farmers when their yield falls below a certain percentage of the expected yield,

program also covers other aspects of agriculture unrelated to growing plants, such as livestock, apiculture, and clams. *Id.*

⁴⁵ Glauber, *supra* note 38, at 483.

⁴⁶ RALPH M. CHITE, CONG. RESEARCH SERV., R43076, THE 2014 FARM BILL (P.L. 113-79): SUMMARY AND SIDE-BY-SIDE 6 (2014).

⁴⁷ These new programs include Agricultural Risk Coverage, which pays farmers when they lose expected revenue, and Price Loss Coverage, which makes payments to farmers when the price of a commodity drops below a certain reference price. *Id.* at 6–7.

⁴⁸ The primary example of this is the new Supplemental Coverage Option, which is what is known as a “shallow loss” program because it allows a farmer to insure at a higher percentage coverage level, effectively covering part of the loss that would otherwise comprise their deductible. *See id.* at 17.

⁴⁹ DENNIS A. SHIELDS, CONG. RESEARCH SERV., R43494, CROP INSURANCE PROVISIONS IN THE 2014 FARM BILL (P.L. 113-79) 3 (2014).

⁵⁰ *History of the Crop Insurance Program*, *supra* note 34.

⁵¹ *Id.*

⁵² *See About the Risk Management*, RISK MGMT. AGENCY, USDA, <http://www.rma.usda.gov/pubs/rme/aboutrma.pdf> (last updated July 2016) (describing the Risk Management Agency's role).

⁵³ *See* 7 U.S.C. § 1508(k) (2012) (describing the FCIC's role).

⁵⁴ *See* U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-14-700, CROP INSURANCE: CONSIDERATIONS IN REDUCING FEDERAL PREMIUM SUBSIDIES 5–6 (2014), <http://www.gao.gov/assets/670/665267.pdf>. *See generally* 7 U.S.C. § 1508(k).

⁵⁵ *See, e.g., Crop Insurance Program Provisions—Title XI*, ECON. RESEARCH SERV., USDA, <http://www.ers.usda.gov/topics/farm-economy/farm-commodity-policy/crop-insurance-program-provisions-title-xi.aspx> (last updated May 11, 2016).

which is calculated based on historical yield.⁵⁶ Revenue protection covers farmers if their revenue falls below a certain percentage of expected revenue,⁵⁷ whether because of yield loss or because the price of a given crop falls. The vast majority of federal spending on crop insurance premium subsidies is to subsidize revenue protection plans.⁵⁸ For example, \$5.5 billion of the \$6.7 billion spent on subsidies in 2012 was for revenue protection premium subsidies.⁵⁹ This is particularly notable since only a few crops are eligible for revenue protection insurance.⁶⁰

Before each insurance year begins, the USDA makes a number of determinations for the crop insurance program for that year. It determines the counties in which each crop will be covered.⁶¹ It also sets the “target” premium rate (representing the actuarially sound rate) for each combination of crop, insurance type, coverage level, and county.⁶² For a number of reasons, this target rate might not be the actual rate that is selected as the “base” rate for the county.⁶³ The base rate is then personalized for each individual farmer using a number of factors that depend on the type of insurance, such as their individual yield history and their chosen coverage level.⁶⁴ Under most traditional crop insurance policies, farmers can opt for coverage levels (the percentage of their expected revenue or yield that they would like to guarantee) from 50% to 85%, in increments of 5%.⁶⁵

By law, the USDA can increase crop insurance premiums by no more than 20% per year.⁶⁶ Currently, many premiums are below the actuarially sound level, some so much so that even an increase of 20% would not make the premium high enough to cover the expected

⁵⁶ *Id.*

⁵⁷ *Id.*

⁵⁸ See U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 54, at 10 fig.3 (charting expenditures on revenue insurance versus other crop insurance policies for the years 2003 to 2012).

⁵⁹ *Id.* at 8–9.

⁶⁰ See *id.* at 14 tbl.1 (listing ten eligible crops).

⁶¹ See *2015 County Crop Programs*, *supra* note 44 (providing a map, for each year and each covered crop, of the counties in which the crop would be insurable).

⁶² U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-15-215, CROP INSURANCE: IN AREAS WITH HIGHER CROP PRODUCTION RISKS, COSTS ARE GREATER, AND PREMIUMS MAY NOT COVER EXPECTED LOSSES 8 (2015), <http://www.gao.gov/assets/670/668358.pdf>.

⁶³ *Id.* Additionally, different base rates may apply depending on various practices, such as whether they are organic. See FED. CROP INS. CORP., USDA, FCIC 18010, 2016 CROP INSURANCE HANDBOOK 125, 140–41 (2015), http://www.rma.usda.gov/handbooks/18000/2016/16_18010.pdf (discussing when a “premium rate for an organic practice” applies).

⁶⁴ U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 62, at 7–8.

⁶⁵ U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 54, at 11 n.11.

⁶⁶ 7 U.S.C. § 1508(i)(1) (2012).

payouts.⁶⁷ This is despite the fact that the FCIC by law is supposed to “adopt, as soon as practicable, rates and coverages that will improve the actuarial soundness of the insurance operations of the Corporation for those crops that are determined to be insured at rates that are not actuarially sound.”⁶⁸

The percentage at which the government subsidizes insurance premiums for each crop and insurance type is established by law and requires congressional action to change.⁶⁹ Most current premium subsidies range from 38% to 80%, with an average subsidy in 2012 of 63%.⁷⁰ This represents an increase from the average subsidy of 37% in 2000.⁷¹ Because the subsidies are set percentages of the premiums, the government pays more in subsidies for crops in areas with higher premiums. The USDA individually informs farmers of the amount of their subsidy and the full cost of their premium, a practice that it asserts will cause farmers to take account of the full amount of their risk.⁷² It seems unlikely, however, that farmers truly internalize the risk just because they have been informed of it.⁷³

No primer on crop insurance would be complete without acknowledging that the cost of the crop insurance program to the federal government is massive and has been increasing. The nominal dollar amount the government spent annually on premium subsidies increased from \$1.8 billion in 2003 to \$6.7 billion in 2012.⁷⁴ During that same time period, the number of acres covered increased from 183.7 million to 265.2 million acres.⁷⁵ Farmers have also been opting for higher coverage levels, which require higher premiums and thus higher subsidies. The percentage of acres with coverage levels of 80% or more increased from 14.7% in 2003 to 27.6% in 2012.⁷⁶ The cost of crops during that period also increased, which means that premiums and the subsidized portions of those premiums correspondingly increased.⁷⁷ Farmers also increasingly choose revenue protection poli-

⁶⁷ U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 62, at 26, 27 tbl.2.

⁶⁸ § 1508(i)(1).

⁶⁹ U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 54, at 5.

⁷⁰ *Id.*

⁷¹ *Id.*

⁷² U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-15-28, CLIMATE CHANGE: BETTER MANAGEMENT OF EXPOSURE TO POTENTIAL FUTURE LOSSES IS NEEDED FOR FEDERAL FLOOD AND CROP INSURANCE 22, 39–40 (2014), <http://www.gao.gov/assets/670/666698.pdf>.

⁷³ See Steven Shavell, *On Moral Hazard and Insurance*, 93 Q. J. ECON., 541, 541 (1979) (explaining that having insurance changes people's incentives to prevent loss).

⁷⁴ U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 54, at 9.

⁷⁵ *Id.* at 10.

⁷⁶ *Id.* at 11.

⁷⁷ See U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 62, at 9 (noting that premium subsidy rates increased from a 37% average in 2000 to a 62% average in 2013).

cies,⁷⁸ which have higher premiums and therefore cost the government more in subsidies.⁷⁹ Total liability was approximately \$20 billion in 2001, and \$117 billion in 2012.⁸⁰

C. *How Crop Insurance Affects Crop Choice and Climate Adaptation*

Four main features of the crop insurance system affect farmers' decisions in ways that make them less likely to adapt to climate change. First, the mere existence of insurance can distort people's perception of risks. This problem is exacerbated by the remaining three factors, which all lead to the premiums farmers pay being too low. The second factor is that the premiums are set in a way that accounts for historical risk but does not encourage planning for future risks. Third is the fact that many premiums are below the actuarially sound level. Fourth and finally, the fact that premiums are subsidized means that farmers are not internalizing the full risks of their planting decisions. This last factor is exacerbated by the flat percentage structure of the subsidy, which in many cases leads to farmers in the riskiest areas capturing the most value from the subsidy.

The fact that insurance affects people's risk management decisions is well-known.⁸¹ People will generally be less risk averse when they know that they have insurance,⁸² and there is evidence that this proposition holds true for crop insurance. For example, a recent economic analysis concluded that federal crop insurance was making corn and soybean farmers less likely to adapt in the face of extreme heat events compared to farmers whose crops were not insured.⁸³ Another study found that crop insurance had a measurable impact on crop choice, including on crop rotation, and that these changes would have a modest negative impact on environmental quality.⁸⁴ Because crop choice is one of the ways farmers can adapt to climate change, the

⁷⁸ U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 54, at 9; DENNIS A. SHIELDS, CONG. RESEARCH SERV., R40532, FEDERAL CROP INSURANCE: BACKGROUND 10 (2015).

⁷⁹ U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 62, at 17.

⁸⁰ RISK MGMT. AGENCY, USDA, ABOUT THE RISK MANAGEMENT AGENCY (2013), <http://www.rma.usda.gov/pubs/rme/2013aboutrma.pdf>. Note, the total liability did decrease to \$102 billion in 2015. *About the Risk Management Agency*, *supra* note 52.

⁸¹ See Steven Shavell, *On Liability and Insurance*, 13 BELL J. ECON. 120, 120 (1982) (discussing how insurance affects people's risk management decisions).

⁸² See Louis Kaplow, *An Economic Analysis of Legal Transitions*, 99 HARV. L. REV. 509, 537–38 (1986) (stating that having insurance gives people less incentive to prevent loss).

⁸³ Francis Annan & Wolfram Schlenker, *Federal Crop Insurance and the Disincentive to Adapt to Extreme Heat*, 105 AM. ECON. REV. 262, 265–66 (2015).

⁸⁴ Roger Claassen et al., *Impacts of Federal Crop Insurance on Land Use and Environmental Quality* 4, 22, 24 (USDA Nat'l Inst. Food & Agric., Award No. 2012-70002-

effects of insurance on crop choice are relevant to any proposal to better incentivize adaptation.

The second factor is that the structure of the premium-setting mechanisms—which looks backward at past risks instead of forward at anticipated risks, and which calculates risk one year at a time—does not incentivize farmers to engage in long-term planning to deal with the anticipated risks of climate change.⁸⁵ While crop insurance was recently changed to be based mostly on more recent years, it still is essentially backward-looking.⁸⁶ Actual yield history for individual farmers is typically determined by looking back over their yields from the past ten years.⁸⁷ Farmers can choose to exclude from their yield history years in which the per-acre county yield was less than half of the average county yield over the past ten years.⁸⁸ This exclusion essentially leads to distortion in expected yields that work in farmers' favor and is intended to avoid punishing farmers for rare weather-related disasters. Farmers choosing this exclusion option then pay a higher premium for their insurance.⁸⁹ There is also evidence that typical American strategies focused on maximizing short-term yields result in agriculture being less resilient to extreme weather events. A recent study of global agricultural losses due to weather disasters found that droughts throughout the Twentieth Century had a bigger negative impact on the yields of cereal crops in developed nations than in developing nations.⁹⁰ Two of the theories the study put forward to explain this difference were that farmers in developing nations are more likely to have a diverse mix of crops that is more resilient and that farmers in developing nations are more likely to

19388, 2015), http://ageconsearch.umn.edu/bitstream/205340/2/Crop%20Insurance_AAEA%202015.pdf.

⁸⁵ See, e.g., U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 72, at 23–24.

⁸⁶ See *id.* at 19 (noting that prior to 2012, RMA calculated yields based on the average of all years from 1975 onward).

⁸⁷ See, e.g., FED. CROP INS. CORP., *supra* note 63, at 227. For some policies, the historic yield or revenue is calculated based on the historical county average, and for some it is calculated based on the historical average of the individual farm. See *Crop Insurance Program Provisions—Title XI*, *supra* note 55.

⁸⁸ FED. CROP INS. CORP., *supra* note 63, at 259; *Actual Production History Yield Exclusion*, RISK MGMT. AGENCY, USDA, <http://www.rma.usda.gov/pubs/rme/aphye.pdf> (last updated July 2016).

⁸⁹ *Actual Production History Yield Exclusion*, *supra* note 88.

⁹⁰ See Corey Lesk et al., *Influence of Extreme Weather Disasters on Global Crop Production*, 529 *NATURE* 84, 85 (2016). Average drought-related yield losses were nearly 20% in North America, Europe, and Australasia, compared to 12.1% in Asia, 9.2% in Africa, and negligible effects in South America and the Caribbean. *Id.*

“use risk-minimizing strategies compared to the yield-maximizing ones prevalent in higher-income countries.”⁹¹

The third factor, as already mentioned, is that the premiums in numerous areas are below the actuarially sound level.⁹² A recent Government Accountability Office (GAO) report found that the difference between the actuarially sound “target” premium level and the actual premium level is larger in counties that are higher-risk for growing that crop.⁹³ GAO defined counties as “higher risk areas” for the studied crops if the county’s target premium rate was in the top 20% of premium rates across the country.⁹⁴ While the premium rates in the lower-risk areas (those counties in the bottom 80% based on premium rates) were all 20% or less of the insured value of the crops, the premiums in the higher-risk areas ranged from 20% to 83%.⁹⁵ Compared to premiums charged for other types of insurance, such as homeowner’s insurance, rates of 20–83% are relatively high.⁹⁶ These high rates indicate an especially high level of risk in these counties.⁹⁷ The discrepancies between target and actual premium rates found by the study demonstrate that at least some of the highest risk farmers are not facing incentives that are proportional to their greatly increased risk.

Crop insurance subsidies can influence crop choice at the most macro level: whether to cultivate crops on a given plot of land at all. A study of large crop insurance subsidy increases in the 1990s suggested that subsidy increases led to an increase in enrolled acreage that, though small, could have an outsized effect on the environment.⁹⁸ Even though the overall amount of cropland in cultivation in the U.S. has remained fairly stable, the aggregate data masks the fact that much marginal land is moved into and out of production on an annual

⁹¹ *Id.* Because the study examined yield loss only from *harvested* acres, the authors noted that the complete failure of some acreage of crops due to drought in Asia may be making the yield loss percentages there look better than they actually are, and that yields across the developing world may just be lower under fair weather conditions than they are in the developed world. *Id.*

⁹² See *supra* note 67 and accompanying text.

⁹³ U.S. GOV’T ACCOUNTABILITY OFFICE, *supra* note 62, at 24–25.

⁹⁴ *Id.* at 11. This is a different definition of high risk than the RMA uses. The RMA designates areas as “high risk” for certain crops on a very limited basis—typically reserving this designation for areas that fall within a flood plain—and charges a higher premium for crops grown in these areas. *Id.* at 31; see also FED. CROP INS. CORP., *supra* note 63, at 20.

⁹⁵ U.S. GOV’T ACCOUNTABILITY OFFICE, *supra* note 62, at 11.

⁹⁶ *Id.*

⁹⁷ See *id.*

⁹⁸ See RUBEN N. LUBOWSKI ET AL., ECON. RESEARCH SERV., USDA, ERR-25, ENVIRONMENTAL EFFECTS OF AGRICULTURAL LAND-USE CHANGE: THE ROLE OF ECONOMICS AND POLICY 46–47 (2006) (stating that there was an increase in cultivated cropland of 0.82% (2.5 million acres) that was concentrated on marginal land).

basis because of economic forces and other factors.⁹⁹ This marginal land primarily switches between being used as cultivated cropland and uncultivated rangeland or forest.¹⁰⁰ The land most likely to be moved into cultivated production because of crop insurance was found to be both economically and environmentally marginal, with lower yields, higher erosion, and higher nutrient loss than other land.¹⁰¹ The increase in crop insurance subsidies in the 1990s may have encouraged farmers both to move marginal land into production and to continue producing on marginal land instead of enrolling it in the Conservation Reserve Program, which pays farmers to keep certain sensitive land out of production.¹⁰²

While subsidy percentages are the same for a given crop across all areas in which it is grown, there are indications that farmers in the highest risk areas—who both pay the highest premiums and receive the highest subsidies—are receiving more value than other farmers.¹⁰³ Overall, farmers in those higher risk areas that GAO studied—those areas with the top 20% highest premiums—had much higher net gains from insurance than farmers in lower risk areas: their gains per dollar of crop value were over four times greater and their gains per dollar of subsidy paid were over twice as great.¹⁰⁴ Additionally, the amount of government-funded premium subsidy per dollar of expected crop value was higher in high-risk counties—eleven cents of subsidy per dollar of crop value, compared to four cents per dollar in lower risk counties—suggesting that these farmers may be receiving more subsidies than are necessary to afford them adequate risk protection.¹⁰⁵ These discrepancies mean that farmers in these higher risk areas are not facing signals that accurately reflect their proportionately higher risk and that, relative to lower risk farmers, they do not receive appropriate incentives.

As a result of the combination of these four factors—(1) insurance, (2) backward-looking instead of forward-looking risk management, (3) actuarially unsound premiums, and (4) subsidies, which often benefit high-risk crop farmers the most—the government effectively spends significant amounts of taxpayer money to subsidize the riskiest of crops, blunting farmers' incentives to choose less-risky crops. Because of highly subsidized crop insurance, farmers are more

⁹⁹ *Id.* at 8, 12.

¹⁰⁰ *Id.* at 3, 6.

¹⁰¹ *Id.* at 53.

¹⁰² *Id.* at 5, 49–50.

¹⁰³ See U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 62, at 18.

¹⁰⁴ *Id.*

¹⁰⁵ *Id.* at 20.

likely to continue to grow crops that have a high chance of harming the environment and a high likelihood of failure, leading to both wastefulness and increased indemnity costs to the federal government. The question, then, is what should be done to remedy this problem.

II

OBSTACLES TO CHANGE AND EXISTING PROPOSALS

Although many proposed reforms to the crop insurance program have focused on saving the government money, increasing attention is also being paid to the nexus between crop insurance and climate adaptation. Concerned legal scholars have argued for reforms to crop insurance¹⁰⁶ and related drought programs¹⁰⁷ to promote climate adaptation by farmers. Before addressing existing proposals and analyzing their likely degrees of success in incentivizing climate adaptation, this Note will describe the obstacles to instituting reforms that have the effect of increasing the cost of or decreasing access to crop insurance.

A. *Obstacles to Crop Insurance Subsidy Reform*

1. *Political Obstacles*

Any attempt to reform crop insurance subsidies to better incentivize climate adaptation will face substantial political obstacles. Such cuts will appear to harm a vulnerable, sympathetic group and will be opposed by powerful lobbies funded by corporate interests. The lack of success in recent attempts to reduce subsidies for crop insurance and the analogous flood insurance program illustrates how difficult subsidy cuts or premium increases may be to implement. There are also particular difficulties for any proposal that seeks to incentivize farmers to change which crops are grown in given areas.

Farmers are a small and diffuse group of the U.S. population,¹⁰⁸ yet farm interests are incredibly politically powerful. The outsized

¹⁰⁶ See, e.g., Paul Janda, Note, *Fire, Flood, Famine, and Pestilence: Climate Change and Federal Crop Insurance*, 26 COLO. NAT. RESOURCES ENERGY & ENVTL. L. REV. 81, 101–03 (2015) (arguing that the federal government should encourage adaptation to climate change “by passing more risk through to producers by requiring producers to pay crop insurance deductibles, by creating crop insurance rates that signal the real risk of agriculture production, and by creating a long-term structure to place incentives for adaptation in disaster assistance legislation”).

¹⁰⁷ See, e.g., Robert W. Adler, *Balancing Compassion and Risk in Climate Adaptation: U.S. Water, Drought, and Agricultural Law*, 64 FLA. L. REV. 201, 201 (2012) (arguing for reforms to drought disaster assistance policies that would encourage agriculture to adapt to climate change and be more resilient).

¹⁰⁸ See *Employment by Major Industry Sector*, BUREAU OF LABOR STATISTICS, http://www.bls.gov/emp/ep_table_201.htm#ep_table_201.f.3 (last updated Dec. 8, 2015)

political power of low-population rural states¹⁰⁹—for example, Iowa with its crucial caucuses¹¹⁰—can contribute to this seeming imbalance. Additionally, many subsidies are thought of as the status quo, creating a sort of political inertia.¹¹¹ The sympathetic picture of the average American farmer—most U.S. farms are small farms and an even higher percentage are family farms¹¹²—means that cutting crop insurance subsidies that have been around for years and upon which many farmers have built reliance interests would be a potential public relations nightmare for any politician.

Perhaps the biggest political obstacle to changes in crop insurance are the corporate-funded lobbies that spend millions to influence politicians every time a new Farm Bill must be passed. Large farming corporations lobby heavily for agriculture programs, including crop insurance, that are to their benefit.¹¹³ Banks and the insurance industry also lobby in favor of crop insurance.¹¹⁴ Downstream users of crops—such as biofuel companies, makers of processed foods, and meat and dairy producers who use feed crops—also have interests in policies that keep the prices of certain crops low.¹¹⁵

The lack of success in recent attempts to reform the federal flood insurance program may foreshadow similar difficulties in increasing premiums or decreasing subsidies for crop insurance. Flood insurance is commonly analogized to crop insurance because both are federally

(indicating that in 2014 less than 2% of the U.S. workforce worked in “[a]griculture, forestry, fishing, and hunting”).

¹⁰⁹ See, e.g., William S. Eubanks II, *A Rotten System: Subsidizing Environmental Degradation and Poor Public Health with Our Nation's Tax Dollars*, 28 STAN. ENVTL. L.J. 213, 223 (2009) (describing the higher per capita political representation that exists in sparsely populated states).

¹¹⁰ See, e.g., Burgess Everett, *Cruz Flips Vote on Ag Issue Critical for Iowa*, POLITICO (Dec. 4, 2015, 2:46 PM), <http://www.politico.com/story/2015/12/ted-cruz-flips-vote-crop-insurance-cuts-216432> (suggesting that pressure from the agricultural interests in Iowa, important in presidential races because of its early caucus, might have caused noted fiscal conservative Ted Cruz to vote in favor of restoring crop insurance subsidies).

¹¹¹ See David Bullock & Jay S. Coggins, *Do Farmers Receive Huge Rents for Small Lobbying Efforts?*, in AGRICULTURAL POLICY FOR THE 21ST CENTURY 146, 151 (Luther Tweeten & Stanley R. Thompson eds., 2002).

¹¹² See ECON. RESEARCH SERV., USDA, EIB-146, AMERICA'S DIVERSE FAMILY FARMS 2–3 (2016) (stating that 90% of U.S. farms are small farms and that approximately 99% of U.S. farms are family owned).

¹¹³ See, e.g., Peggy Lowe, *Lobbyists of All Kinds Flock to Farm Bill*, HARVEST PUB. MEDIA (July 13, 2014), <http://harvestpublicmedia.org/article/lobbyists-all-kinds-flock-farm-bill> (describing lobbying related to the 2014 Farm Bill and changes made therein to the crop insurance program).

¹¹⁴ *Id.* (estimating that “banks and insurance companies spent at least \$52.6 million” in lobbying related to the 2014 Farm Bill).

¹¹⁵ See, e.g., DANIEL IMHOFF, FOOD FIGHT 84–85 (2012) (discussing the incentives of downstream users of agricultural products).

subsidized insurance programs that serve to disincentivize climate adaptation by private parties.¹¹⁶ Like crop insurance premiums, flood insurance premiums have historically been subsidized and too low to accurately reflect risk.¹¹⁷ In 2012, the Biggert-Waters Act,¹¹⁸ which implemented a number of flood insurance reforms, was passed. The primary reforms were decreasing subsidies, increasing premiums to reflect actual risk, and eliminating the practice of grandfathering in lower rates for properties purchased before an area was upgraded to a higher risk classification.¹¹⁹ These cuts sparked much public opposition and several legal challenges.¹²⁰ Ultimately, many of the Biggert-Waters reforms were repealed or significantly delayed in 2014 by the Homeowner Flood Insurance Affordability Act.¹²¹

A recent legislative attempt to reduce crop insurance subsidies was also unsuccessful. In late 2015, due to political pressure, Congress repealed a budget cut passed earlier in the year to reduce federal spending on crop insurance subsidies by \$3 billion over a decade.¹²² Those cuts were not even targeted toward the farmers themselves, but were designed to cut into the profit margins of the private insurers who administer the program.¹²³ That even such cuts were so strongly opposed shows that any crop insurance cuts are likely to be highly difficult to implement.

Crop insurance reforms that are intended to make farmers switch crops are likely to face especially steep opposition. For an individual small farmer, the cost of new equipment and gaining the expertise to

¹¹⁶ See, e.g., U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 72, at 23–25 (discussing how flood and crop insurance each distort incentives for climate change adaptation); Sarah Fox, *This Is Adaptation: The Elimination of Subsidies Under the National Flood Insurance Program*, 39 COLUM. J. ENVTL. L. 205, 208–09 (2014) (describing both crop insurance and flood insurance as “government support for ultimately environmentally destructive land use patterns”).

¹¹⁷ See Fox, *supra* note 116, at 217 (noting that the heavily-subsidized premiums paid under the National Flood Insurance Program have historically been insufficient to cover claims).

¹¹⁸ Moving Ahead for Progress in the 21st Century Act, Pub. L. No. 112-141, §§ 100201–100253, 126 Stat. 405, 916–78 (2012) (codified as amended at 42 U.S.C. §§ 4001–4129 (2012)).

¹¹⁹ Fox, *supra* note 116, at 227–29.

¹²⁰ See *id.* at 230–31 (describing legal challenges and public opposition).

¹²¹ Pub. L. No. 113-89, 128 Stat. 1020 (2014); Fox, *supra* note 116, at 231–32 (listing repealed provisions).

¹²² Jackie Calmes, *Crop Insurance Subsidies Prove Cutting Budget Is Easier Said than Done*, N.Y. TIMES (Nov. 26, 2015), <http://www.nytimes.com/2015/11/27/us/politics/crop-insurance-subsidies-prove-cutting-budget-is-easier-said-than-done.html>.

¹²³ See *id.* (stating that the law would have decreased the target rate of return for insurers from 14.5% to 8.9%).

grow a new crop can be very steep.¹²⁴ For some crops, particularly certain vineyard and tree crops, there is also a lag time of several years before the new crop will be profitable.¹²⁵ Many industry associations and lobbying groups are based around a single crop,¹²⁶ so even if individual small farm owners were willing to transition to different crops, there are powerful forces with large stakes in certain crops remaining dominant. Because agriculture in many regions is dominated by a few monoculture crops,¹²⁷ many farm organizations that are geographically based may end up being crop-based by default. There are also many big businesses dependent upon agriculture, such as major chemical companies that provide pesticides, herbicides, and genetically modified patented seeds, that are heavily invested in certain crops maintaining dominance.¹²⁸

The geographic heterogeneity of both the agriculture industry and the effects of climate change mean that reforms targeted to climate change adaptation will negatively impact some regions' economies more than others, likely leading to intense local opposition in the hardest-hit areas. Congress, based as it is on geographic representation, will likely be sensitive to this localized opposition. To take an example from a different context, much of the opposition to recent policies that would decrease use of coal for electricity generation, such as the Clean Power Plan,¹²⁹ has come from areas whose economies are

¹²⁴ See, e.g., David W. Wolfe, *Contributions to Climate Change Solutions from the Agronomy Perspective*, in HANDBOOK OF CLIMATE CHANGE AND AGROECOSYSTEMS: GLOBAL AND REGIONAL ASPECTS AND IMPLICATIONS 16–17 (Daniel Hillel & Cynthia Rosenzweig eds., 2013) (describing situations in which changing varieties of crops might be expensive or ineffective).

¹²⁵ See *id.* (noting that new plantings take several years to reach maximum productivity).

¹²⁶ See, e.g., TEX. WORKFORCE COMM'N, FARM & RANCH ASS'N DIRECTORY 1–23 (2014), <http://www.twc.state.tx.us/files/partners/farm-ranch-association-directory-twc.pdf> (listing farm and ranch industry associations in Texas, including many based on specific crops).

¹²⁷ See, e.g., Scott C. Lucas, *Halting the Downward Spiral of Monoculturation and Genetic Vulnerability: Toward a Sustainable and Biodiverse Food Supply*, 17 J. ENVTL. L. & LITIG. 161, 166–68 (2002) (describing increased monoculture agriculture in American farms). An example of how dominant some crops can be in local agricultural economies: 57% of total farm receipts from Illinois crops in 2014 came from corn and 37% from soy; in neighboring Iowa, these numbers were 60% and 38%, respectively. See *Farm Income and Wealth Statistics*, ECON. RESEARCH SERV., USDA, http://www.ers.usda.gov/data-products/farm-income-and-wealth-statistics/cash-receipts-by-state.aspx#P920c6dcf015a47fd925cadd73a68580_20_16iT0R0x14 (last updated Aug. 30, 2016) (displaying individual state statistics).

¹²⁸ See, e.g., Lucas, *supra* note 127, at 167–68 (discussing economic pressure to maintain the status quo).

¹²⁹ Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units (Clean Power Plan), 80 Fed. Reg. 64,661 (Oct. 23, 2015) (to be codified at 40 C.F.R. pt. 60).

dependent upon coal mining, such as West Virginia.¹³⁰ One attempt to fend off opposition to the Clean Power Plan has been the allocation of government funds for job training programs that would help displaced coal industry workers find new jobs.¹³¹ A similar approach could be taken to minimizing opposition to changes in crop insurance intended to promote climate change adaptation of agriculture. Instead of subsidizing farmers, year after year, to grow crops in inhospitable climates in which they are likely to fail, the government can provide one-time grants to help farmers transition to more suitable crops or, in the case of farmers growing in areas that are not truly suitable to any crops, to purchase land in another area or to transition their land into another profitable use. One difficulty with using one-time grants to buy off political opposition to reforms is the possibility that voters may oppose a solution with a high upfront cost, even if it ends up being cheaper in the long term.

2. *Practical Limitations*

Even if there were the political will to create major reform to crop insurance, the signals that crop insurance sends to farms about crop choice may not be able to overcome competing signals. Market forces, consumer preferences, and other governmental programs may also influence farmers' crop choices.

One of the key reasons that a change in the crop insurance program might not induce farmers to switch to low-risk crops is that higher risk crops may still be much more profitable. After all, the recent increase in nut acreage in California occurred because nuts, despite being one of the most water-intensive crops, are one of the most profitable crops.¹³² It is unsurprising that farmers are drawn not to the crops that most efficiently turn inputs such as land, water, and fossil fuel into nutrients, but the crops that are most efficient at turning those inputs into money. An Economic Research Service report notes that, in a future in which higher energy and water prices make irrigation more expensive, farmers would logically turn toward crops that are a higher value per acre, even if they are more water-

¹³⁰ See *EPA Rules for New and Existing Coal-Fired Power Plants: Litigation and Rulemaking Documents*, OFFICE OF THE W. VA. ATT'Y GEN., <http://www.ago.wv.gov/publicresources/epa/Pages/default.aspx> (last updated Aug. 17, 2016) (describing the West Virginia Attorney General's opposition to the Clean Power Plan).

¹³¹ See, e.g., OFFICE OF MGMT. & BUDGET, *INVESTING IN COAL COMMUNITIES, WORKERS, AND TECHNOLOGY: THE POWER+ PLAN 2* (2016), <https://www.whitehouse.gov/omb/budget/key-issue-fact-sheets>.

¹³² See, e.g., Tom Philpott, *California Goes Nuts*, MOTHER JONES, Nov./Dec. 2014, <http://www.motherjones.com/environment/2015/01/california-drought-almonds-water-use> (describing California's almond boom).

intensive overall.¹³³ These market signals may ultimately be one of the biggest limitations on the effectiveness of crop insurance reforms as an incentive to adapt to climate change.

There are many federal programs aside from crop insurance that would induce farmers to choose one crop or production method over another and which may send signals that conflict with those sent by crop insurance. These programs include support for biofuels that encourage the growth of certain crops¹³⁴ and for federally subsidized irrigation projects that make it more feasible to grow on otherwise marginal land.¹³⁵ There are also tariffs and international trade agreements that might make one crop more profitable in the global market than another.¹³⁶ Finally, in addition to being eligible for crop insurance, commodity crops also benefit from commodity-specific federal programs.¹³⁷

Changing consumption patterns—which, in turn, may be influenced by federal nutrition guidelines, by industry group marketing of a given crop,¹³⁸ or by food trends—may send signals strong enough to outweigh those sent by crop insurance subsidy changes. Because much U.S. cropland is not used to grow fruits, vegetables, and grains for human consumption, but to grow animal feed, consumer choices regarding meat and dairy will also influence farmers' crop choices. For example, in 2013, there were 336 million acres of cropland planted in the United States,¹³⁹ and approximately 95 million of those acres were

¹³³ See MARSHALL ET AL., *supra* note 10, at 60 (describing modeling that predicts a shift to higher-value irrigated crops in a water-scarce future).

¹³⁴ See, e.g., *Federal Laws and Incentives for Biodiesel*, ALT. FUELS DATA CTR., U.S. DEP'T OF ENERGY, <http://www.afdc.energy.gov/fuels/laws/BIOD/US> (last updated Apr. 27, 2016) (listing federal incentives for biodiesel production); *Federal Laws and Incentives for Ethanol*, ALT. FUELS DATA CTR., U.S. DEP'T OF ENERGY, <http://www.afdc.energy.gov/fuels/laws/ETH/US> (last updated Apr. 27, 2016) (listing federal incentives for ethanol production).

¹³⁵ See Reed D. Benson, *Dams, Duties, and Discretion: Bureau of Reclamation Water Project Operations and the Endangered Species Act*, 33 COLUM. J. ENVTL. L. 1, 6–9 (2008) (describing the history and structure of federal irrigation projects administered by the United States Bureau of Reclamation).

¹³⁶ See, e.g., *Sugar and Sweeteners: Policy*, ECON. RESEARCH SERV., USDA, <http://www.ers.usda.gov/topics/crops/sugar-sweeteners/policy.aspx#sugar> (last updated Nov. 5, 2015) (describing price supports and tariffs for sugar).

¹³⁷ For a brief summary of the commodity crop provisions of the 2014 Farm Bill, see generally CHITE, *supra* note 46, at 6–8.

¹³⁸ See, e.g., Olga Khazan, *The Selling of the Avocado*, ATLANTIC (Jan. 31, 2015), <http://www.theatlantic.com/health/archive/2015/01/the-selling-of-the-avocado/385047/> (describing the rising popularity of avocados as the result of successful marketing).

¹³⁹ See *Major Land Uses*, ECON. RESEARCH SERV., USDA, <http://www.ers.usda.gov/data-products/major-land-uses.aspx> (follow “Summary Table 3: Cropland Used for Crops: Cropland Harvested (Including Double Cropped), Crop Failure, and Cultivated Summer Fallow for the United States, Annual, 1910-2014” hyperlink) (last updated Mar. 25, 2016).

used to grow corn.¹⁴⁰ Of the corn used domestically in 2015, less than 12% was actually used for “[o]ther food, seed, and industrial uses,” whereas 44% was used for animal feed and residual use.¹⁴¹ Although nuts grown in California have been demonized because they are particularly water-intensive, the single crop that used the largest share of California’s water in recent years was alfalfa, much of which is destined to serve as cattle feed.¹⁴² A third of global cropland¹⁴³ and more than a third of the water used by California agriculture¹⁴⁴ are used to grow animal feed.

Consumer pressure on the meat and dairy industries may be able to turn farmers away from feed crops. Americans’ per capita consumption of meat has been on a recent downward trend after rising steadily for decades,¹⁴⁵ and increasing attention is being paid to the ecological footprint of meat.¹⁴⁶ Americans are also increasingly turning away from drinking dairy milk.¹⁴⁷ However, the meat and

¹⁴⁰ NAT’L AGRIC. STATISTICS SERV., USDA, AGRICULTURAL STATISTICS 2014, at I–21, tbl.1-35 (2014).

¹⁴¹ *U.S. Domestic Corn Use*, ECON. RESEARCH SERV., USDA, <http://www.ers.usda.gov/media/866543/cornusetable.html> (last visited Oct. 9, 2016).

¹⁴² See Eric Holthaus, *Stop Vilifying Almonds*, SLATE (Apr. 17, 2015, 7:17 PM), http://www.slate.com/articles/business/moneybox/2015/04/almonds_in_california_they_use_up_a_lot_of_water_but_they_deserve_a_place.single.html (describing concerns about extensive water use associated with almond cultivation and naming alfalfa growers as California’s top agricultural water users); see also Josué Medellín-Azuara & Jay Lund, *Dollars and Drops per California Crop*, CAL. WATERBLOG (Apr. 14, 2015), <http://californiawaterblog.com/2015/04/14/dollars-and-drops-per-crop-in-california/> (providing data that shows that alfalfa was responsible for 18% of California’s net agricultural water use and that all fruit and nut crops combined were only 33.5% of net agricultural water use).

¹⁴³ FOOD & AGRIC. ORG., LIVESTOCK’S LONG SHADOW: ENVIRONMENTAL ISSUES AND OPTIONS 74 (2006), <ftp://ftp.fao.org/docrep/fao/010/a0701e/a0701e.pdf>.

¹⁴⁴ Medellín-Azuara & Lund, *supra* note 142 (stating that 37% of water is used to grow alfalfa, corn, and other feed crops).

¹⁴⁵ See Rani Molla, *How Much Meat Do Americans Eat?: Then and Now*, WALL ST. J.: THE NUMBERS (Oct. 2, 2014, 2:48 PM), <http://blogs.wsj.com/numbers/how-much-meat-do-americans-eat-then-and-now-1792/> (charting per capita meat consumption in the years since 1970).

¹⁴⁶ See Dan Charles, *Congress to Nutritionists: Don’t Talk About the Environment*, NPR (Dec. 23, 2014, 3:25 AM), <http://www.npr.org/sections/thesalt/2014/12/15/370427441/congress-to-nutritionists-dont-talk-about-the-environment> (describing how nutritionists intended to take the environmental impacts of meat into consideration in setting the most recent USDA dietary guidelines).

¹⁴⁷ See Roberto A. Ferdman, *The Mysterious Case of America’s Plummeting Milk Consumption*, WASH. POST (June 20, 2014), <https://www.washingtonpost.com/news/wonk/wp/2014/06/20/the-mysterious-case-of-americas-plummeting-milk-consumption/> (discussing the downward trend in liquid milk consumption). While the dairy industry used to run commercials encouraging consumers to drink milk and portraying it as healthy, they now run commercials attempting to convince consumers to shift from almond milk back to dairy milk. See Milk, *Almond Milk vs. Dairy Milk Ingredient Spelling Bee—Milk Life TV*

dairy industries remain powerful political forces, as evidenced by the passage of “ag gag” laws¹⁴⁸ and the fact that the sustainability of meat was kept out of the recently updated Federal My Plate nutrition guidelines.¹⁴⁹ Even if Americans turn away from meat and dairy, the increasing wealth in many other countries has led to an increasing demand for those foods, which can affect American farmers’ crop choices.¹⁵⁰ For instance, much of the alfalfa grown in California is exported to China to feed dairy cows.¹⁵¹ However, there is reason to believe that increased attention to the environmental consequences of meat and dairy may lead consumers to make more environmentally responsible decisions.

B. Existing Proposals to Promote Climate Adaptation by Reforming Subsidies

1. Eliminating Insurance for the Riskiest Crops/Counties

One potential option that must be mentioned, not because it has been seriously suggested as a reform, but because it is so obvious, is for the USDA to simply refuse to issue insurance for the riskiest of crop/county combinations. To the extent that private insurance is not available, this reform would eliminate the first problem highlighted: that the mere existence of insurance distorts farmers’ incentives to adapt to climate risk. The USDA has the authority to implement this reform because it determines each year the crops for which insurance will be offered in a given county. Selectively eliminating coverage would certainly create a strong incentive for farmers to change crops

Commercial Ad, YOUTUBE (May 29, 2015), <https://www.youtube.com/watch?v=oTS1RIZboqU>.

¹⁴⁸ See Ted Genoways, *Gagged by Big Ag*, MOTHER JONES, July/Aug. 2013, <http://www.motherjones.com/environment/2013/06/ag-gag-laws-mowmar-farms> (chronicling the spread of “ag gag” legislation designed to limit the ability of activists to whistleblow on conditions in animal agriculture facilities).

¹⁴⁹ See Allison Aubrey & Maria Godoy, *New Dietary Guidelines Crack Down on Sugar. But Red Meat Gets a Pass*, NPR (Jan. 7, 2016, 7:00 AM), <http://www.npr.org/sections/the-salt/2016/01/07/462160303/new-dietary-guidelines-crack-down-on-sugar-but-red-meat-gets-a-pass> (stating that the final guidelines did not address sustainability, likely because of opposition from the meat industry); Charles, *supra* note 146 (describing how the original recommendations from the committee of experts for the new nutrition guidelines were to include sustainability, but that Congress opposed this plan).

¹⁵⁰ See FOOD & AGRIC. ORG., *supra* note 143, at 8–9 (noting an increase in China’s demand for animal products as wealth increased, and projecting that increased wealth in other developing nations will lead to a similar increase in demand for meat and dairy).

¹⁵¹ See David Pierson, *U.S. Farmers Making Hay with Alfalfa Exports to China*, L.A. TIMES (June 8, 2014), <http://www.latimes.com/business/la-fi-feeding-china-hay-20140609-story.html#page=1> (noting that one-third of all hay—including alfalfa and other varieties—produced in California’s Imperial Valley is exported and that China is a major buyer of U.S. hay).

because it could specifically target the crops that face the greatest climate risk. It is unlikely, however, to be seriously considered as an option. It would face an incredible amount of political backlash because it is the harshest of all possible options. Eliminating insurance for some crop/county combinations entirely would be hard to justify when marginally less risky crops continue to receive fully subsidized insurance. Additionally, the USDA has historically been oriented toward increasing, rather than decreasing, the number of crop/county combinations in which insurance is available.¹⁵² For example, farmers can request that insurance be expanded to their county if they grow a crop for which the USDA offers insurance in other counties; even if the USDA declines to expand coverage, the farmer may be able to individually insure that crop through a “written agreement.”¹⁵³ Eliminating coverage in some areas would also likely raise strong fears that farmers may continue to grow these uninsured crops, resulting in pressure for the government to offer ad hoc disaster payments if these farmers faced catastrophic losses.

2. *Eliminating or Reducing Subsidies Across the Board*

Many have suggested either eliminating or drastically decreasing subsidies across the board.¹⁵⁴ Such a proposal would likely succeed in addressing the fourth issue highlighted in Section I.C because decreased subsidies would result in increased incentives to adapt to climate change. Although the percentage reduction in subsidy would be the same for all areas, those farmers growing in the highest risk, high-premium areas would face the greatest additional dollar amount of cost due to the reduced subsidies. Therefore, these farmers may face the strongest increase in incentives to change their farming practices.

Across-the-board cuts, however, would do nothing to address the problem of actuarially unsound premiums. Nor would they change the fact that farmers in the high-risk areas collect the greatest returns

¹⁵² See Keith H. Coble & Thomas O. Knight, *Crop Insurance as a Tool for Price and Yield Risk Management*, in A COMPREHENSIVE ASSESSMENT OF THE ROLE OF RISK IN U.S. AGRICULTURE 445, 446–49 (Richard E. Just & Rulon D. Pope eds., 2002) (providing a historical overview of the program’s growth); *supra* notes 34–48 and accompanying text.

¹⁵³ See *Frequently Asked Questions: Crop Insurance Basics*, RISK MGMT. AGENCY, USDA (Aug. 14, 2008), <http://www.rma.usda.gov/help/faq/basics.html> (describing the process for obtaining a written agreement); PROD. ADMIN. & STANDARDS DIV., USDA, FCIC 24020, WRITTEN AGREEMENT HANDBOOK: 2013 AND SUCCEEDING CROP YEARS 3–9 (2012) (describing the process for obtaining a written agreement).

¹⁵⁴ See, e.g., BRUCE BABCOCK, CUTTING WASTE IN THE CROP INSURANCE PROGRAM 11–13 (2013) (suggesting cuts to subsidies as a way to save taxpayer money); U.S. GOV’T ACCOUNTABILITY OFFICE, *supra* note 54, at 29 (recommending that Congress cut premium subsidies).

from insurance; although all farmers would likely have lower returns if subsidies were cut, the underlying discrepancy would remain. Subsidy cuts are therefore unlikely to fully solve the problem unless they are paired with other reforms intended to address these issues.

As discussed in Section II.A, any drastic cuts to or elimination of subsidies are likely to be so politically unpopular that they would be unlikely to pass, yet any cuts in subsidies that are too small might not overcome other competing signals. The success of this solution would therefore depend on striking the right balance between cuts that are too drastic to pass and cuts that are too small to provide an incentive to most farmers.

One of the main reasons that the government might be loath to reduce subsidies is a fear that doing so would cause a reduction in participation in the crop insurance program.¹⁵⁵ The concern would be that the government would be forced to bail out uninsured farmers with ad hoc disaster payments, as it did before crop insurance was widely popular. Much of the uncertainty about how decreased subsidies may affect crop insurance participation stems from the fact that there are past instances of farmers' crop insurance costs suddenly decreasing because of higher subsidies, but farmers' crop insurance costs have never been suddenly, drastically raised through decreased subsidies.¹⁵⁶

Data on the effects of subsidy increases can be used to extrapolate the effects of subsidy decreases, and a number of studies do suggest that farmers would not flee en masse from crop insurance. The USDA's Economic Research Service concluded that the large increases in premium subsidies in 2000 induced farmers to buy higher levels of coverage,¹⁵⁷ but did not seem to have a significant effect on the number of acres insured.¹⁵⁸ Therefore, the study concluded, a decrease in premium subsidies would probably lead farmers to purchase lower levels of insurance, but not to abandon crop insurance entirely.¹⁵⁹ However, there were some limitations to the study: it examined data at the county, not individual farm, level, and it

¹⁵⁵ See U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 54, at 26 (discussing the concern that reducing subsidies would reduce participation in crop insurance).

¹⁵⁶ See *id.* at 26–27 (noting that the lack of data makes it difficult to determine the effects of a premium subsidy change).

¹⁵⁷ See ERIK J. O'DONOGHUE, ECON. RESEARCH SERV., USDA, ERR-169, *THE EFFECTS OF PREMIUM SUBSIDIES ON DEMAND FOR CROP INSURANCE 1* (2014). The study examined choices of growers of corn, soybeans, and wheat in top-producing states for each of those commodities. *Id.* at 10–11.

¹⁵⁸ *Id.* at 15.

¹⁵⁹ *Id.*

examined each crop individually.¹⁶⁰ As a result, it did not necessarily capture substitutions induced by the change in premium subsidies, such as a farmer substituting one crop for another or opting for a lower coverage level on one crop in exchange for a higher level on another.¹⁶¹ Additionally, the 2000 subsidy increases were greater for higher levels of insurance coverage,¹⁶² making increased selection of the higher coverage levels unsurprising. As noted in Section I.C, the large subsidy increases in the 1990s precipitated a small increase in farmed acreage, particularly in acreage of marginal land.¹⁶³ It might therefore be reasonable to extrapolate that decreases in crop insurance subsidies would cause a similarly small decrease in farmed acreage, and that this decrease would be similarly concentrated on the most marginal of cropland.

One GAO study concluded that the impact of subsidy decreases in the range of 5–20% would likely be minimal.¹⁶⁴ Farmers might not leave the program even if premiums were increased or subsidies decreased because many lenders look favorably on farmers who have crop insurance, and farmers would not want to risk losing access to credit.¹⁶⁵ Another reason farmers might not turn away from crop insurance is that other programs of support for farmers—such as ad hoc disaster programs and direct payments for commodity crops—have been discontinued or reduced recently, meaning that farmers may now be more reliant on crop insurance than they have been previously.¹⁶⁶ Additionally, subsidy decreases in the range of 5–20% were expected to cause only a small increase in farmers’ overall cost per acre, meaning that, depending on their profit margin, most farmers would be unlikely to experience a large difference in income.¹⁶⁷

3. *Actively Defining Sustainable Farming Practices*

A recent GAO report on federal exposure to climate change–related risks suggested a crop insurance reform that relies on an existing provision of law.¹⁶⁸ This provision states that the USDA cannot insure for losses due to “the failure of the producer to follow good farming practices, including scientifically sound sustainable and

¹⁶⁰ *Id.* at 17.

¹⁶¹ *Id.* at 6, 17.

¹⁶² *Id.* at 9, 13.

¹⁶³ See *supra* notes 98–102 and accompanying text.

¹⁶⁴ U.S. GOV’T ACCOUNTABILITY OFFICE, *supra* note 54, at 26–28.

¹⁶⁵ *Id.* at 28.

¹⁶⁶ See, e.g., O’DONOGHUE, *supra* note 157, at 17.

¹⁶⁷ Cf. U.S. GOV’T ACCOUNTABILITY OFFICE, *supra* note 54, at 24–26 (finding the increase in cost was typically less than 2% an acre).

¹⁶⁸ U.S. GOV’T ACCOUNTABILITY OFFICE, *supra* note 72, at 24–25, 31.

organic farming practices.”¹⁶⁹ The USDA currently relies on the opinions of agricultural experts, who are often employees of the USDA’s Cooperative Extension System or university agriculture departments, to define good farming practices.¹⁷⁰ GAO suggests that the USDA should be more proactive and forward-looking in defining what farming practices count as “good” and “sustainable,”¹⁷¹ essentially forcing farmers to comply with USDA-set standards or risk receiving no indemnity for losses to insured crops. The current good farming practices are typically designed to maximize short-term yield, not long-term resiliency.¹⁷² Many practices that maximize short-term yield may actually increase a farm’s future vulnerability.¹⁷³

If this reform were adopted, it could be effective at incentivizing climate adaptation and would directly address the issue that the current system is not future-oriented enough. By utilizing an existing element of the law, this proposal avoids the administrative complexity of crafting a new system. By law, a farmer has a right to administrative and judicial review of a decision that their losses were due to failure to follow good farming practices,¹⁷⁴ so there is recourse for farmers who feel wronged by such determinations. Additionally, there is precedent for requiring adherence to environmental standards in order to receive agricultural subsidies. The 2014 Farm Bill requires farmers to comply with conservation and wetlands requirements to be eligible for crop insurance¹⁷⁵ and lowers, in certain states, subsidy amounts to farmers for the first four years of planting on native sod.¹⁷⁶

This proposal is one that could be implemented by the USDA and does not require congressional action; however, it also suffers from political infeasibility, at least as long as the current leadership remains. In response to GAO’s proposal, the USDA explicitly stated

¹⁶⁹ 7 U.S.C. § 1508(a)(3)(A)(iii) (2012).

¹⁷⁰ See *Good Farming Practices Protect Your Investment in Crop Insurance*, RISK MGMT. AGENCY, USDA, 2, http://www.rma.usda.gov/pubs/2011/good_farming_practices.pdf (last visited Oct. 9, 2016) (describing credentials of experts currently approved by the RMA).

¹⁷¹ U.S. GOV’T ACCOUNTABILITY OFFICE, *supra* note 72, at 32.

¹⁷² See *id.* at 24 (describing tillage and traditional irrigation methods as examples).

¹⁷³ *Id.* at 24–25; see Lesk et al., *supra* note 90, at 85–87 (postulating that strategies used to maximize short-term yield in developed nations explain the fact that those nations’ crops show decreased resiliency (relative to developing nations’ crops) to extreme weather events, which are anticipated to increase because of climate change).

¹⁷⁴ See § 1508(a)(3)(B); see also Chad G. Marzen & J. Grant Ballard, *Climate Change and Federal Crop Insurance*, 43 B.C. ENVTL. AFF. L. REV. 387, 400–07 (2016) (surveying court cases reviewing good farming practices determinations).

¹⁷⁵ Agricultural Act of 2014, Pub. L. No. 113-79, § 2611, 128 Stat. 649, 762–66 (2014).

¹⁷⁶ *Id.* § 11014(a), 128 Stat. at 961–62 (stating that “the crop insurance premium subsidy . . . shall be 50 percentage points less than the premium subsidy that would otherwise apply”).

that it does not want to define good farming practices.¹⁷⁷ The USDA's reluctance to take on this role might be because such a system could be viewed as an inefficient command and control regulation in which an agency sets a technology standard despite having less information about conditions on the ground than the farmer does. Some farmers might be resistant to the idea that they should follow practices that do not maximize their short-term yield. The USDA has also stated its belief that, because farmers must pay a deductible on their losses and are informed of the full cost of insurance and the subsidy amount, farmers already internalize the full risk they face.¹⁷⁸ The increasing pressures of climate change and the growing costs of crop insurance may lead the USDA to take a more favorable attitude toward this proposal in the near future, however.

4. *Decoupling Subsidies from Premium Amounts*

As discussed above in Section I.C, farmers in some of the highest risk areas collect the highest return per premium dollar paid for insurance. At least two reform suggestions propose fixing this discrepancy by providing crop insurance subsidies in an amount that is not calculated as a percentage of the premium. Both proposals would entail providing farmers with a fixed grant that they could then spend for the crop insurance product of their choice. Economist Bruce Babcock proposes providing the grant at a fixed dollar amount per acre.¹⁷⁹ The second suggestion, made by Carl Zulauf and Gary Schnitkey, is that subsidies should be a specific percentage, not of the crop insurance premium, but of the expected gross revenue from the crop.¹⁸⁰

Providing a subsidy in the form of a grant is intended to lead farmers to make better risk management decisions, while still encouraging them to remain enrolled in crop insurance.¹⁸¹ Babcock's studies revealed that, in their decisionmaking processes, farmers currently treat crop insurance more like a lottery system than a risk manage-

¹⁷⁷ U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 72, at 39 ("RMA does not direct producers to take or carry out certain agronomic practices, but rather it relies on guidance from agricultural experts in the area."). As suggested in a recent law review article, another possibility would be to implement this reform legislatively by amending the statutory definition of "good farming practices" to explicitly include climate change mitigation measures. Marzen & Ballard, *supra* note 174, at 407–10.

¹⁷⁸ U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 72, at 39–40.

¹⁷⁹ BRUCE A. BABCOCK, ENVTL. WORKING GRP., CROP INSURANCE: A LOTTERY THAT'S A SURE BET 12–13 (2016).

¹⁸⁰ Carl Zulauf & Gary Schnitkey, *Distribution of Crop Insurance Net Farm Payments by Crop and State*, FARMDOC DAILY (Feb. 8, 2013), <http://farmdocdaily.illinois.edu/2013/02/distribution-of-crop-insurance.html>.

¹⁸¹ See BABCOCK, *supra* note 179, at 12–13.

ment system.¹⁸² Babcock believes that switching to a subsidy in the form of a set grant amount would encourage farmers to only buy a higher coverage level if the marginal benefit of additional coverage is greater than its marginal cost.¹⁸³ In other words, farmers would decide which insurance product to buy by matching it to their risk instead of gaming the system by buying a product that they know will give them a higher rate of return. Proponents of this solution believe that it will not drive farmers to drop crop insurance because, as long as farmers would be receiving at least some subsidy for crop insurance, they would have adequate incentive to remain enrolled.¹⁸⁴

Implementing either of these decoupling proposals would require congressional action and would amount to a significant restructuring of the current crop insurance program. Because it would create a regime so different from the current, familiar structure of the crop insurance subsidy system, a change to a grant-based system is likely to face significant resistance. The great amount of flexibility that the grant system gives to farmers could help temper this resistance, however, especially if it is presented as an alternative to one of the other proposals that more significantly constrains farmers' options. Resistance would also be minimized if the grant was not a large reduction in dollar amount compared to the current subsidies farmers receive.

5. *Ensuring that Premiums Accurately Reflect Risk*

Perhaps the most modest reform that would help incentivize farmers to adapt to climate change would be to directly address the third issue highlighted in Section I.C by adjusting any actuarially unsound premiums upward to accurately reflect the risk in high-risk areas.¹⁸⁵ Setting the premiums everywhere at the actuarially sound level would incentivize climate change adaptation by reducing the current discrepancy in which some farmers in high-risk areas, compared to those in low-risk areas, do not face incentives that are proportional to their increased risk. The USDA already faces a statutory directive to set premiums at the actuarially sound level, so it could move forward without any congressional action. While the USDA is somewhat constrained by the fact that it cannot increase premiums by more than 20% per year, it should still be able, over the course of several years, to achieve actuarially sound premiums.

¹⁸² *Id.* at 10–11.

¹⁸³ *Id.* at 12–13.

¹⁸⁴ *See id.*

¹⁸⁵ *See* U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 62, at 30 (suggesting adjusting premiums to the actuarially sound level).

There are, however, significant limitations to the feasibility and potential effectiveness of this solution. One of the main difficulties with this solution is that, unless subsidies were simultaneously decreased, increasing the premiums would result in higher costs to the government for subsidies. Because the crop insurance program is already so costly, increased spending in this area would probably face much resistance, especially from fiscal conservatives. Additionally, just increasing premiums does nothing to correct the distortionary effect created by the existence of the subsidies themselves. Therefore, an increase in premiums to the actuarially sound levels would best be accompanied by a simultaneous decrease in subsidies if the goal is to incentivize climate adaptation by farmers.¹⁸⁶ Another limitation on this solution is that the premiums are below the actuarially sound level in only some places.¹⁸⁷ The proposal's effectiveness would thus be limited to those areas and would do nothing to promote climate adaptation in high-risk areas where the premiums are currently actuarially sound.

III

A PROPOSAL FOR TIERED SUBSIDIES

Perhaps the ideal policy from a climate change adaptation perspective would involve a restructuring of the entire crop insurance program and related commodity and conservation programs. However, such an outcome seems infeasible in the current political climate, so incremental alternatives should be explored.¹⁸⁸ Because the largest amount of government spending and the largest potential for waste and environmental harm are concentrated in crops grown in areas in which they are at high risk, the best incremental reforms would target these crops and areas. A system of tiered subsidies would target these areas, would be a moderate solution, would be politically feasible, and would potentially eliminate some of the issues of implementing an administrative solution. This proposal would serve to address three of the factors that cause crop insurance to distort incentives: the backward-looking nature of the program, the actuarially-unsound premiums, and the fact that there are large subsidies that disproportionately provide value for the highest risk crops. Of course,

¹⁸⁶ See U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 72, at 30.

¹⁸⁷ See U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 62, at 25 fig.7 (indicating, for various crops, the percentage of counties in which target premium rates exceed base premium rates).

¹⁸⁸ For a discussion of the improbability of major Farm Bill reform and the importance of incremental advances, see William S. Eubanks II, *The Future of Federal Farm Policy: Steps for Achieving a More Sustainable Food System*, 37 VT. L. REV. 957 (2013).

such a solution will face political and practical obstacles. Additionally, there are questions about how effective such a temperate solution would be.¹⁸⁹

A. *The Proposed Reform*

The best incremental solution would be one which decreases the subsidy percentage for those crops that are in higher risk areas, creating a “nudge” for farmers to switch to crops more suited to a given locale’s climate. The simplest way to do this would be to create a definition of high-risk crop/county combinations and then apply a percentage reduction to the subsidy as a penalty for growing in the high-risk area. A more complex solution could, instead of having only a single high-risk subsidy reduction, create multiple tiers. For example, some areas could be considered high risk and receive a 10% reduction in subsidy, and some areas could be considered highest risk and receive a 15% reduction in subsidy. This proposal would target the highest risk areas—those in which GAO determined that premiums are most likely to be below the actuarially sound levels and farmers receive greater returns per subsidy dollar spent.¹⁹⁰ At the same time, it would avoid the harshness of denying insurance coverage altogether to farmers who continue historic planting patterns.

Implementing this solution would require cooperation between Congress and the USDA. Because subsidy percentages are set by law,¹⁹¹ the number of tiers and percentage amount of reductions would have to be specified by Congress. Congress could explicitly define the criteria by which specific crop/county combinations would be placed in a given risk tier, or it could mandate that the USDA promulgate regulations on the matter. The USDA would then have the final authority to decide, for each year, into which risk tier a particular crop falls in each county.

Implementing this proposal would necessitate the USDA developing a definition of “high risk” that would effectively target the crops facing the largest climate-related risk. This definition should refer not just to the land itself, but to the combination of the land and the crop being grown there. For example, cotton might be considered a high-risk crop in a given county, whereas corn might not be. Ideally, the USDA would go beyond the use of traditional, backward-looking actuarial data in developing the high-risk classification, and would incorporate near-term climate projections. The data that would be

¹⁸⁹ See *infra* notes 206–07 and accompanying text.

¹⁹⁰ See *supra* notes 92–97, 103–05 and accompanying text.

¹⁹¹ See 7 U.S.C. § 1508(i)(1) (2012).

necessary to make this determination already exists, and could be gathered by compiling USDA actuarial data and climate change projections.¹⁹²

There is precedent for applying a lowered or increased subsidy percentage to some subset of farmers. The Agricultural Act of 2014 introduced a 50% reduction in subsidies for farmers in certain states who convert native sod to cropland.¹⁹³ It also provided for a 10% increase in subsidies for farmers with five or fewer years of experience.¹⁹⁴ A provision that did not make it into the final Agricultural Act of 2014, but was included in a Senate bill, would have lowered subsidies by 15% for farmers whose yearly income was above a threshold amount.¹⁹⁵

One virtue of this proposal is that it is essentially a middle ground. At one extreme, the crop insurance program could continue as it is, subsidizing both low-risk and high-risk crops at the same percentage, resulting in a higher net dollar amount in subsidies and higher rates of returns accruing to high-risk crops.¹⁹⁶ At the other extreme, eliminating subsidies entirely or having the USDA refuse to issue insurance for certain crops in certain counties would be seen as forcing farmers' hands.¹⁹⁷ Even a proposal for the USDA to define good farming practices could be seen as extreme because it would require farmers to follow certain practices or risk receiving no indemnity. This proposal falls between those extremes. It would still allow farmers to continue growing high-risk crops that are much more lucrative than the less risky alternatives, but would nudge farmers whose crops are only economical to grow because of the vast subsidies toward growing different crops. The moderateness of this proposal and the way that it preserves choices for individual farmers could mitigate the resistance and political opposition it would face.

¹⁹² For instance, USDA currently collects data on crop failures and weather events at the county level. *Actual Production History Yield Exclusion*, *supra* note 88 (discussing yield exclusion that is calculated based on RMA yield data for individual crops at the county level); Patrick Marshall, *USDA's High-Res View of Fraud*, GCN (Oct. 9, 2013), <https://gcn.com/Articles/2013/10/09/GCN-Award-USDA-fraud-detection.aspx?Page=1> (discussing USDA's use of high resolution satellite imagery and data mining to evaluate patterns of suspicious crop insurance claims). NASA has released regional projections for climate change through 2100. See *NEX Global Daily Downscaled Climate Projections*, NASA EARTH EXCH., <https://nex.nasa.gov/nex/projects/1356/> (last visited Oct. 9, 2016).

¹⁹³ See Agricultural Act of 2014, Pub. L. No. 113-79, § 11014(a), 128 Stat. 649, 961–62 (2014).

¹⁹⁴ SHIELDS, *supra* note 49, at 10.

¹⁹⁵ *Id.* at 11–12.

¹⁹⁶ See *supra* notes 103–05 and accompanying text.

¹⁹⁷ See *supra* Sections II.B.1–3.

Although the recent inertia in Congress makes proposals requiring any congressional action appear less plausible, there are several reasons to believe that this proposal would nonetheless be feasible. Because only a few of the ongoing crop insurance programs are contained in “permanent provisions” of law, Congress must act to reauthorize many temporary crop insurance provisions approximately every five years with a new Farm Bill.¹⁹⁸ It is more reasonable to believe that Congress might change the law when they already must act, even to maintain the status quo. The fact that the 2014 Farm Bill introduced conservation-related eligibility requirements for crop insurance¹⁹⁹ is one sign that Congress might be willing to again use crop insurance to pressure farmers to be more environmentally responsible. The facts that crop insurance subsidies currently cost the federal government so much money and that much attention is currently being focused on issues of climate change and resilience may combine to create the political will for such a reform.

There are also reasons to believe that a legislative solution may be preferable to an administrative solution like the suggestion for the USDA to better define “good farming practices.” New regulations are often tied up in litigation funded by powerful interest groups.²⁰⁰ Legislation on the issue will be more decisive and will avoid the expense and delay of litigation. Additionally, a legislative solution would mean, unlike a regulatory solution that a new administration could easily overturn, that the experiment could have several years to play out.

B. *Obstacles to the Proposal*

There are several obstacles to this proposal. These include political opposition from the geographic areas most affected, the issue of drafting adequately decisive legislation, and the proposal’s administrative complexity. Additionally, questions may be raised regarding whether this proposal will send too weak an incentive to farmers and whether it may have unintended negative repercussions on food security or the price of food.

In addition to the political obstacles that this proposal shares with the other proposals discussed in Section II.B, it might suffer from a

¹⁹⁸ See Neil D. Hamilton, *The 2014 Farm Bill: Lessons in Patience, Politics, and Persuasion*, 19 *DRAKE J. AGRIC. L.* 1, 24 (2014).

¹⁹⁹ See Agricultural Act of 2014, Pub. L. No. 113-79, § 2001, 128 Stat. 649, 713–14 (2014).

²⁰⁰ For a discussion of this phenomenon, see Thomas O. McGarity, *The Courts and the Ossification of Rulemaking: A Response to Professor Seidenfeld*, 75 *TEX. L. REV.* 525, 535–36 (1997).

large degree of geography-based opposition due to its unequal regional impacts. GAO's analysis showing that the highest risk areas are in Texas, the Plains states, and some clustered areas in California, the Upper Midwest, and the Southeast²⁰¹ suggests that these regions would be hit hardest by the proposed reduction in subsidies. Politicians from these areas are likely to strongly resist any such cuts. However, it is important to note that these areas may be net losers only in the short term. In the long term, adapting to grow crops that are more sustainable and resilient may help these areas. The difficulty is getting farmers who are focused on the next year's profits and legislators who are focused on the next election to look a decade or more down the road.

Whether this legislative solution will be effective and more decisive than an administrative solution will greatly depend on the way the law is drafted. Depending on how Congress specified the mandate, there could still be a great deal of latitude for the USDA to regulate, opening up the possibility for those regulations to be challenged in court. A broad drafting of the statute could also lead to political maneuvering in which interest groups and local constituencies reach out, not to Congress, but to the USDA for their desired outcome.

One practical obstacle to implementing such a proposal is that it is administratively complicated. The high-risk classifications of certain crop and land combinations would have to be initially determined and then updated, probably on a yearly basis. This small change would add very little additional complexity, however, to the existing crop insurance system. Different subsidy percentages already exist for different crops grown in different areas with different practices, insured at different coverage levels.²⁰² The list of crops and counties for which insurance is available and the corresponding premium rates are already updated every year, so doing additional updates would not impose much additional administrative burden.

One of the most difficult issues in implementing this proposal would be the line-drawing problem of what counts as high risk. However, this is an issue inherent in many legal problems and should not be viewed as a fatal flaw in such a solution. For example, the USDA has already had to deal with the question of what constitutes a "drought" for some of their other programs.²⁰³ Based on GAO's report that premiums in the upper tier of risk are sharply higher than premiums for lower risk areas, there might also be a clear cutoff point

²⁰¹ U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 62, at 12 fig.1.

²⁰² See Coble & Barnett, *supra* note 37, at 501.

²⁰³ See Adler, *supra* note 107, at 209 (describing the difficulty of defining "drought" and the important role the definition plays).

above which risks steeply rise.²⁰⁴ Of course, in drawing such a line, the USDA must be sensitive to the need to balance the farmers' dependence on existing government subsidies with the need to limit government spending on risky and environmentally destructive farming decisions.²⁰⁵

Even if the obstacles to implementation can be overcome, the question of whether a tiered reduction in premium subsidies would create enough incentives for a farmer to adapt to climate change by planting more suitable crops remains. A GAO report analyzing 2012 data for seven different crops found that a decrease in revenue premium subsidies of 20% would result in average increases in per-acre production cost of only 0.9–3.3%.²⁰⁶ Because the farmers targeted by this proposed subsidy decrease would be the ones who receive the largest subsidies, it is possible that the increase in their per-acre costs would be rather higher than that, and thus provide a stronger incentive. The profit margins for many farms are small,²⁰⁷ so a small percentage increase in costs might be enough to have an impact on crop choice. Implementing this proposal would require further research in order to find the appropriate percentage reductions to achieve the desired goal.

While there are currently too many crops being grown in high-risk areas, one might wonder whether causing farmers to incur extra crop insurance costs will cause the price of food to increase or will lessen the United States' food security because important food crops will not be grown. This is an empirical question beyond the scope of this paper. It is interesting to note, however, that the vast majority of crop insurance subsidies go to only a handful of crops. Four crops—corn, wheat, soybeans, and cotton—received 83% of the crop insurance subsidy dollars in 2013²⁰⁸ and in a typical year make up more than 70% of the enrolled acres.²⁰⁹ Of these four crops, only wheat is primarily used to feed humans;²¹⁰ however, increasing the prices of

²⁰⁴ See *supra* note 95 and accompanying text.

²⁰⁵ See Adler, *supra* note 107, at 206 (discussing farmers' reliance interests in existing subsidies).

²⁰⁶ U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 54, at 25 tbl.4. The seven crops analyzed were barley, corn, cotton, grain sorghum, rice, soybeans, and wheat. *Id.*

²⁰⁷ See ROBERT A. HOPPE, ECON. RESEARCH SERV., USDA, EIB-132, STRUCTURE AND FINANCES OF U.S. FARMS: FAMILY FARM REPORT, 2014 EDITION 35–40 (2014) (showing operating profit margins, by farm type, for 2011).

²⁰⁸ SHIELDS, *supra* note 78, at 14.

²⁰⁹ *Id.* at 2.

²¹⁰ See Table 5—Wheat Supply and Disappearance, ECON. RESEARCH SERV., USDA, <http://www.ers.usda.gov/data-products/wheat-data.aspx> (last updated Feb. 10, 2016) (showing that in the 2014–15 crop year, 82% of domestic wheat use was for food). Cotton is obviously not consumed by humans; the majority of soybeans and corn are used for

corn and soy used as feed crops would probably drive up the costs of meat and dairy. The effects of climate change itself on agriculture are expected to reduce welfare both for producers and consumers because of reduced profits and increased food prices;²¹¹ however, efforts to shift acres toward crops more suited to the new climate are expected to decrease the loss of profits.²¹² The Farm Bill also carries provisions intended to address food insecurity,²¹³ so Congress can make a reasoned judgment about all these issues at once. Additionally, while climate change is expected to lead to negative effects on agriculture overall, there are numerous cold regions of the United States that may become more suitable to growing produce due to climate change.

In short, there are significant obstacles to this proposal, but none are insurmountable. While more research will be needed to define the line between high- and low-risk crops and determine the appropriate percentage reductions, an intelligently designed system of tiered subsidies can effectively incentivize climate change adaptation through crop choice.

CONCLUSION

Like climate change mitigation, climate change adaptation can seem to be a vast and unconquerable problem when viewed as a whole. Crop choice is an aspect of climate adaptation that is both important enough to warrant immediate attention and—though complex—small enough to meaningfully tackle. While an adjustment in crop insurance subsidies or premiums may serve as merely a gentle nudge toward climate change adaptation, it is a worthwhile reform. Massive restructuring of the crop insurance program and more informed consumer choices about products may be needed to fully deal with the effects of climate change and the risks and excess environmental harms caused by farmers who don't adequately adapt, but incremental reforms should be implemented in the interim.

animal feed. See *USDA Coexistence Fact Sheets Soybeans*, USDA (2015), <http://www.usda.gov/documents/coexistence-soybeans-factsheet.pdf> (stating that only 15% of American soybeans are used for human food, while 70% go to feed livestock); *U.S. Domestic Corn Use*, *supra* note 141 (showing less than 12% of corn used domestically in 2015 was for “food, industrial, and other use”).

²¹¹ See, e.g., MARSHALL ET AL., *supra* note 10, at 28–29.

²¹² See *supra* note 5 and accompanying text.

²¹³ For a brief summary of the nutrition provisions in the 2014 Farm Bill, see generally CHITE, *supra* note 46, at 10–12.