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Fact Sheet

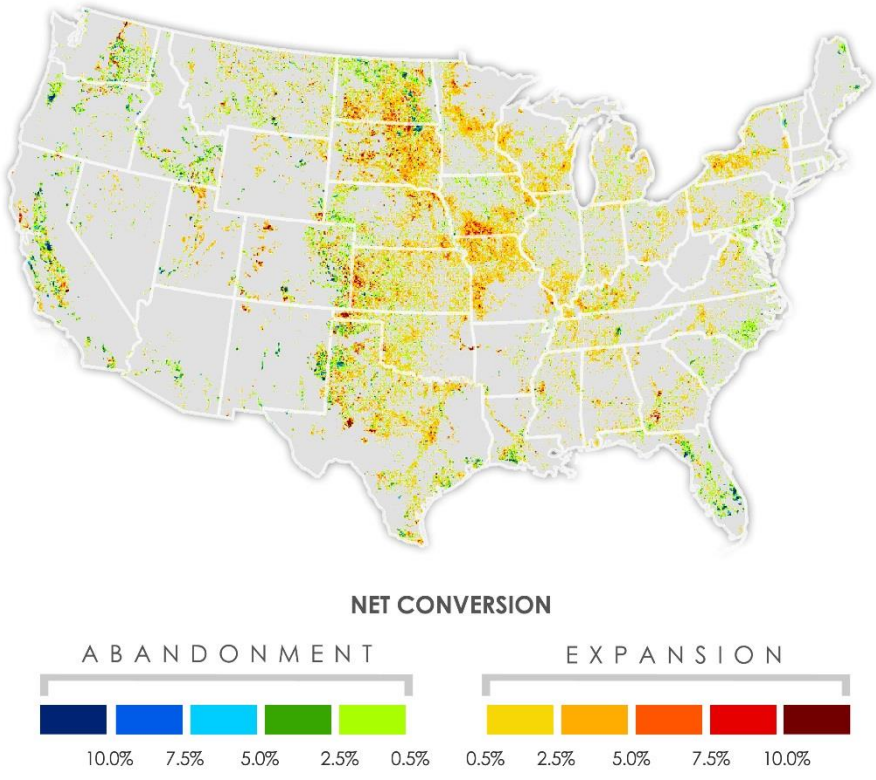
Recent domestic land-use change: Environmental impacts and policy implications

Summary

This report summarizes the findings of a new study that uses remote sensing and other data to assess nationwide land-use changes between 2008 and 2012 and discusses its policy implications. Following the passage of the Renewable Fuel Standard (RFS), the study details the extent and location of land-use changes during the build-out of the corn ethanol industry. As such, the study has implications for the Renewable Fuels Standard (RFS) and the farm bill. In addition, we argue that the scale and impacts of recent land-use change should be considered by the EPA as it finalizes its approach to biogenic carbon (i.e., carbon emitted by biomass-fueled power plants), particularly given the rapid rise of the pellet export industry.

Scope and methods

The study is the first crop- and spatially-explicit nationwide assessment of land use changes in the post-RFS period. Written by Tyler Lark, Meghan Salmon, Holly Gibbs, the study is entitled "Cropland expansion outpaces agricultural and biofuel policies in the United States."[i] Lark et al. use satellite and land cover maps from 1992-2012, including USDA Cropland Data Layer (CDL, 2008-2012) and the National Land Cover Database (NLCD), and used numerous methods to reduce error and increase confidence in results (for detail on methods, see end notes[ii]).



During the build-out of the corn ethanol industry, over seven million acres of forests, wetlands, and grasslands were converted to cropland. Far beyond the Corn Belt and Upper Midwest, every region of the country had land converted to cropland, with a net nationwide conversion of almost three million acres.

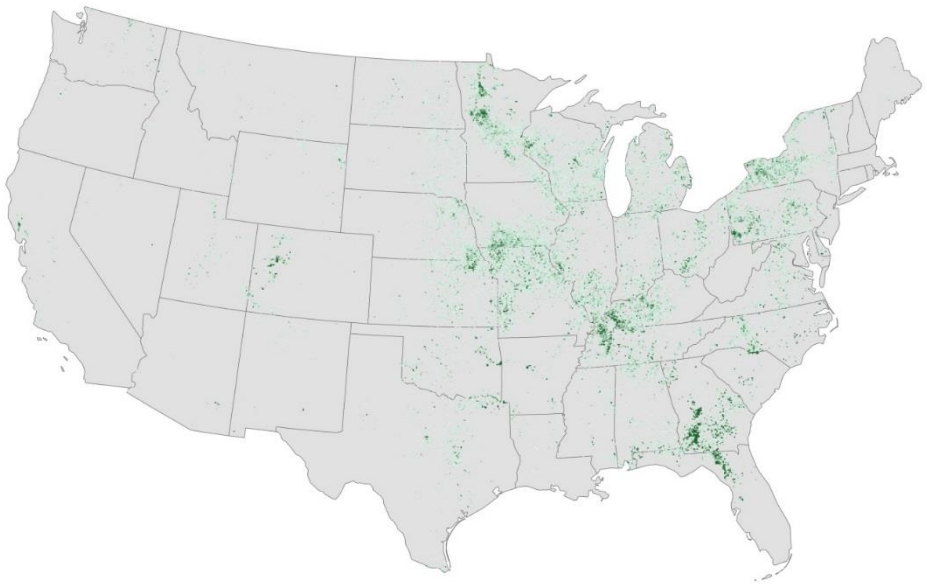
Findings

Between 2008 and 2012, Lark et al. found that though 4.4 million acres of cropland were abandoned, 7.3 million acres were converted, yielding a net increase in cropland of 2.9 million acres.[iii] This net increase in cropland is consistent with other recent national-scale

land use change estimates, including the Census of Agriculture 2007-2012, the NASS survey, and the Natural Resources Inventory.

Lark et al.'s findings are also crop- and spatially-specific, providing a more-detailed depiction of the conversions between cover types and crops—and in what regions, ecosystems, and soils the conversions occurred. They found that grasslands of one type or another (including native prairie, planted pasture, CRP, etc.) were the largest "source" of converted cropland, with 77% of new annual cropland coming from perennial grass cover. 27% of these grasslands had been in grass for over 20 years, forming what Lark et al. termed "long-term, unimproved grasslands." Amounting to an area the size of Delaware, these lost long-term grasslands will now emit considerable quantities of carbon (see below) and no longer provide critical wildlife habitat, an issue nationwide and of particular importance in the Prairie Pothole Region, a landscape with a matrix of grasslands, wetlands and croplands that produces a majority of the country's ducks.

Surprisingly, Lark et al. also found that forest was the source for about 3% of new cropland. In all, 198,000 acres of forest were cleared between 2008 and 2012 to create new cropland.



Almost 200,000 acres of forest was cleared for cropland.

Lark et al. found that wetlands conversions were concentrated in the Dakotas and Minnesota, with other concentrations in the lower Mississippi valley, and numerous other states, including GA and FL, WI and NE, and WA and CA. Wetlands were the source of about 2% of new cropland.

While all areas of the country lost grassland, wetlands, and/or forests, Lark et al. found that many conversions are concentrated in certain "hotspots" of cropland expansion, including the Dakotas, along the border of Southern Iowa and Northern Missouri, and in the Western parts of Kansas, Oklahoma, and the Texas panhandle. Lark et al. also found croplands are moving into traditionally non-cropped areas they termed "new frontiers of agriculture," including on the Western Plains from SD to NM, along the edge of the forests in northern MN and WI, in southern MO and eastern OK, and in the eastern and western piedmont of the Appalachians.

Lark et al. found that compared to existing cropland, more of the newly-converted cropland is marginal land or unsuited to cropping, according to the Natural Resource Conservation Service's land capability classes. In 2008, 54% of cropland was categorized as prime, with 38% marginal and 8% unsuited. In contrast, for land converted between 2008 and 2012, the ratio of prime and marginal land was inversed, with 32% prime, 52% marginal and

16% (or twice as much) unsuited land. In addition to having worse ecological impacts, marginal lands will also have higher indemnity costs, i.e., pay-outs for crop failures and lower yields.

Lark et al. found that corn was the most likely first crop to be planted on converted land (26%), followed by wheat (25%) and soybeans (20%). More importantly, Lark et al. developed a method to allocate each crop's conversion "responsibility" based on each crop's net increase in acreage (crops that shrank in acreage were considered to not be "responsible" for conversion). With an increase in over 8.6 million acres, corn was assigned responsibility for 51% of the conversion. Cotton had the second greatest conversion responsibility, with 14% of conversion attributable to its net increase of 2.3 million acres.

Policy implications

RFS

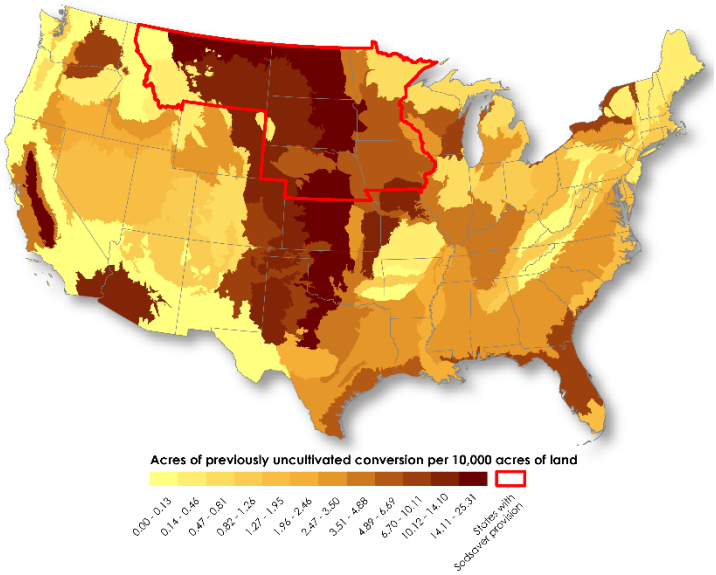
The RFS contains a protection against producing biofuels on grasslands, wetlands, and forests converted after RFS enactment, but instead of enforcing it, the EPA developed what it called an 'aggregate compliance approach,' which was based on the assumptions that crop prices would not drive conversion; that land not already converted must be so marginal as to be not worthwhile to farm; and that any native prairie conversion would occur only at minimal levels. Using the amount of cropland in 2007 as a baseline, aggregate compliance involves the annual comparison of current cropland to the baseline; if the current amount of current cropland doesn't get close to the baseline, the EPA assumes that neither significant conversion has occurred nor the use of feedstocks produced on ineligible land. Lark et al.'s data belies the presumptions underlying this aggregate compliance approach by 1) quantifying the significant scale of land conversion associated with the historically high crop prices after RFS passage, 2) documenting that especially marginal, new land was converted, and 3) identifying that over one million acres of land that hadn't been cultivated in at least 40 years (and perhaps had never been cultivated) had been converted to produce crops that could be used as biofuel feedstocks. Moreover, Lark et al.'s comparison of gross vs net conversion reveals how aggregate compliance systematically conceals high (gross) conversion rates, which reflects the conversion of ineligible and marginal lands.

Using published emissions factors, Lark et al. estimated that the carbon emissions from converting 1.6 million acres of unimproved grasslands amounted to ~87 MMT CO2e, equivalent of 23 coal-fired power plants or 14 million cars on the road for one year (which would be a 7%+ increase in number of US cars). Moreover, the study suggests that it is highly likely EPA's estimates of the GHG impacts of biofuel feedstock production missed some domestic land conversion emissions in two ways. First, the Food and Agriculture Sector Optimization Model (FASOM) that EPA used to estimate emissions doesn't allow rangeland to be converted to cropland (based on the assumption that rangeland is too marginal and arid). However, a significant amount of the 1.6 million acres of unimproved grassland that was converted to cropland was likely to be categorized as rangeland in FASOM, so these conversion emissions were not included in EPA's estimates of emissions from biofuel production, either in 2010 and in subsequent analyses of proposed pathways. Secondly, where EPA estimated in 2010 that by 2022 only 30,000 acres of forest would be converted to cropland, Lark et al. found that 190,000 acres forestland were converted to cropland by 2012—over six times higher than EPA's estimate, and in a shorter time period.

Finally, the concentration of land conversion in critical habitat areas has implications for approval of additional biofuel pathways. We believe EPA should not approve pathways that are likely to increase cropland demand and conversion rates in such areas. For example, the proposed barley pathway would increase demand for spring barley in the Dakotas and Montana and would worsen conversion in the Prairie Pothole Region.

Farm Bill

The study also has implications for the farm bill. The 2014 Farm Bill included a regional Sodsaver provision that reduces crop insurance subsidies for native grassland newly brought into cultivation, but it applies to only six states—Minnesota, Iowa, Nebraska, the Dakotas, and Montana. However, Lark et al.'s data show that only 36% of conversion of non-agricultural land occurred in the six states covered by the regional Sodsaver provision. Clearly the regional Sodsaver doesn't offer sufficient coverage or protection for what is truly a national issue. In the next farm bill, Sodsaver should be expanded to all states and to forestlands, in addition to grasslands.



Only about 1/3 of the land converted to agriculture occurred in the six states covered by the Sodsaver provision in the 2014 Farm Bill.

Indirectly, Lark et al.'s data suggest that current funding levels for grassland conservation are insufficient and should be increased. And lastly, the need for better understanding and tracking of land conversion calls for the Farm Service Agency to record and regularly release data on 'new breakings'—as they did in 2013, but for one year only.

Biogenic carbon

Lark et al.'s analysis has implications for biomass usage by stationary sources and EPA's development of its approach to biogenic carbon emissions. Indeed, in the memo EPA released with its revised framework on biogenic carbon framework, EPA said it wants to monitor ongoing dynamics related to bioenergy and land use. Given the experience of the RFS and land-use change, there is good reason for EPA to be cautious regarding projections about biomass demand, price and land-use impacts, particularly with the recent, rapid rise of woody biomass demand in the SE US driven by EU and UK bioenergy policy.

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[i] *Environmental Research Letters* (in press).

[ii] To reduce noise in the data, they used temporal and spatial filters. Lark et al. developed an innovative 'trajectory' analysis that tracked the sequence of non-crop and crop cover types on parcels over the five years, categorizing each sequence into one of 32 possible cropping trajectories. Lands that went in and out of production were categorized as intermittent cropland and not counted as having been converted. Spatially, they used a 15 acre minimum mapping unit; parcels smaller than fifteen acres were excluded to reduce the chance of CDL data classification errors (for example, incorrectly classifying a soybean field as a hayfield).[ii] They addressed the challenge of distinguishing native from planted grasslands with CDL data by using the NLCD from 1992, 2001, and 2006 to create a category of long-term, unimproved grasslands. Finally, Lark et al. developed an approach to assess the percentage of new cropland expansion on lands that had never before been cropped. Using USGS's long-term trends analysis between 1972 and 2002, they identified areas that were in cropland after 2008 but not previously categorized as cultivated in the USGS data, and then extrapolated to determine total conversion of previously uncultivated lands.

[iii]Only 3 million acres (a maximum of 42% of the land converted to annual crop production) could have come from expiring CRP contracts.